| **European Red List of Habitats Table** | | |
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| **Habitat Subgroup** | **Habitat Type Name** | **Habitat Description** |
| Baltic | 1 Kelp communities on Baltic infralittoral rock and mixed substrata (predominantly hard) | This is a Baltic Sea benthic habitat in the photic zone where at least 90% of the substrate is rock, boulders, stones and mixed (predominantly hard) substrates according to the HELCOM HUB classification. It is most common in wave exposed areas with kelp dominating the perennial algae and covering at least 10% of the seabed. *Saccharina latissima* and *Laminaria digitata* consitute at least 50% of the biovolume of such algae.  Two associated biotopes have been identified. ‘‘Baltic photic rock and boulders dominated by kelp’ (AA.A1C4) and ‘Baltic photic mixed substrate dominated by kelp’ (AA.M1C4). To identify this habitat mapping should take place during the months when the vegetation is fully developed.  Indicators of Quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. The lower depth limit of the kelp is a potential indicator of quality of this habitat.  Characteristic species:  The main species that creates kelp forests in the Baltic is *Laminaria digitata*. Other associated algae include *Chaetomorpha melagonium* and *Delesseria sanguinea*. Other associated species include hydroids, bryozoans, and molluscs. Kelp forests also provide an important habitat for fish such as *Centrolabrus rupestris* and *Gobisculus flavescens.* |
| Baltic | 2 Perennial algal communities (excluding kelp) on Baltic infralittoral rock and mixed substrata (predominantly hard) | This is a Baltic Sea benthic habitat in the photic zone where at least 90% of the substrate is rock, boulders or stones and mixed (predominantly hard) substrates according to the HELCOM HUB classification. Perennial attached algae such as *Fucus* spp., or perennial red algae cover at least 10% of the seabed and more than other perennial attached erect groups. It is most common in areas exposed to wave action and typically occurs to depths of around 0.5 m.  Eight associated biotopes with different dominant species of algae have been described by HELCOM. ‘Baltic photic rock and boulders/mixed substrata dominated by *Fucus* spp.’ (AA.A1C1/AAM1C1) such as *Fucus radicans, F. serratus* or *F. vesiculosus,* is found in depths of 0.5–5m and in salinities over 4 psu. ‘Baltic photic rock and boulders/mixed substrata dominated by perennial non-filamentous corticated red algae’ (AA.A1C2/AA.M1C2) such as *Furcellaria lumbricalis* occurs at a depths of 2–10 m in similar salinities. These four biotopes are present in all the Baltic Sea sub-basins and are widely distributed, although not Bothnian Bay nor the most eastern part of the Gulf of Finland. ‘Baltic photic rock and boulders/mixed substrata dominated by perennial foliose red algae’ (AA.A1C3/AA.M1C3) such as *Coccotylus* spp., *Phyllophora* spp. and *Delesseria* spp. is typically found in depths of 2–10 m and in salinities over 4 psu. They are present in all the Baltic Sea sub-basins and are also widely distributed although also not in the Bothnian Bay nor the eastern half of the Gulf of Finland. ‘Baltic photic rock and boulders/mixed substrata dominated by perennial filamentous algae’ (AA.A1C5/AA.M1C5) such as *Polysiphonia* spp, *Aegagrophila linnaei, Cladophora rupestris* is found at depths of 0.5–10 m, in all the Baltic Sea sub-basins.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis  The lower depth limit of algae, especially *Fucus* spp. where applicable, and the amount of epiphytic algae are potential indicators of quality of this habitat.  Characteristic species:  *Fucus* spp., *Furcellaria lumbricalis, Coccotylus truncatus, Phyllophora* spp., *Delesseria sanguinea, Polysiphonia* spp., *Cladophora rupestris, Sphacelaria* spp. |
| Baltic | 3 Aquatic moss communities on Baltic infralittoral rock and mixed substrata (predominantly hard) | This is a Baltic Sea benthic habitat in the photic zone where at least 90% of the substrate is rock, boulders or stones according to the HELCOM HUB classification, or mixed (predominantly hard) substrates where the percentage of rock is lower but between 10- 90%. Perennial mosses cover at least 10% of the seabed and more than other perennial attached erect groups. In some places the mosses form extensive underwater meadows which provide shelter and food for benthic animals. The habitat typically occurs where the salinity is <5 psu and usually from depths of 1-7m. Whilst more common in exposed areas, it does occur under other conditions of exposure to wave action and currents.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.Depth range, biodiversity and the amount of epiphytic ephemeral filamentous algae are potential indicators of quality.  Characteristic species:  *Fontinalis spp. Fissidens fontanus, Platyhypnidium riparioides* |
| Baltic | 4 Stable aggregations of unattached perennial vegetation on Baltic infralittoral mixed substrata (predominantly hard) | This is a Baltic Sea benthic habitat in the photic zone where more tham 10% of the seabed is a mix of both hard and soft substrata according to the HELCOM classification. Stable aggregations of unattached perennial vegetation covers at least 10%, while perennial attached erect groups or *Mytilus* cover less than 10% of the bottom. The habitat occurs in most of the Baltic Sea area where the salinity is <10 or 5 psu (depending on the area), the exposure is sheltered and the seabed is level over wide areas within the photic zone.  Four associated biotopes with different dominant species of vegetation (constituting at least 50% of the biovolume) have been identified. ‘Baltic photic mixed substrate dominated by stable aggregations of unattached *Fucus* spp. (typical form)’ (AA.M1Q1) and ‘Baltic photic mixed substrate dominated by stable aggregations of unattached *Furcellaria lumbricalis*’ (AA.M1Q3) are encountered at depths of 0.5 to 5 meters. The unattached *Furcellaria lumbricalis* may occur in specific, ball-shaped morphology adapted to soft bottom conditions, and was historically described as *Furcellaria* cf. *aegagropila*.; ‘Baltic photic mixed substrate dominated by stable aggregations of unattached rigid hornwort (*Ceratophyllum demersum*)’ (AA.M1Q4) is encountered at a depth of 0 to 2 meters.  ‘Baltic photic mixed substrate dominated by stable aggregations of unattached *Fucus* spp. (dwarf form)’ (AA.M1Q2) forms a characteristic biotope of shallow bays and lagoons between 0.25 and 2.5 m. This specific morphology of the *Fucus* spp. lacks bladders and holdfasts and the single plants can be loosely anchored in the sediment. Under more exposed conditions plants form a ball-shaped form, able to roll over the sea bottom. The *Fucus* dwarf forms coexist with attached *F. vesiculosus*, unattached *Furcellaria lumbricalis,* higher plants like *Ruppia* spp., *Zannichellia palustris, Stuckenia pectinatus* (formerly known as *Potamogeton pectinatus*)*, Zostera* spp. and several Charophytes. The unattached thalli can cover the sediment up to about 10 cm height and thus form a three-dimensional habitat comparable to the interstitial space in coarse sediments. Epifauna is seldom attached to the *Fucus* dwarf form, but gastropods, amphipods and insects look for shelter and food in between the loose lying thalli. If abundances of the unattached form are very high, the sediment below becomes deoxygenated and the associated infauna below the *Fucus* layer may die. Presently this biotope is only known to occur in Sweden and Germany. In Germany it exists only in very few coastal lagoons with low to moderate eutrophication pressures and salinities of around 7–10 psu.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Density of unattached *Fucus* spp. (typical and dwarf forms), the lower limit of the *Furcellaria* belt, the amount of epiphytic algae, and density of *Furcellaria* are potential indicators of quality of this habitat*.*  Characteristic species:  *Fucus vesiculosus* (typical and dwarf form), *Furcellaria lumbricalis* (incl. *Furcellaria* cf. *aegagropila*)*, Ceratophyllum demersum*. |
| Baltic | 5 Crustose algae communities on Baltic infralittoral rock and mixed substrata | This is a Baltic Sea benthic habitat in the photic zone , either with at least 90% coverage of rock, boulders or stones of more than 63 mm in diameter but also on mixed substrates with at least 10% coverage of rock, boulders or stones according to the HELCOM HUB classification. Soft crustose algae cover at least 10% of the seabed while all perennial attached erect groups cover less than 10%. This habitat covers the full salinity range of the Baltic Sea and is more common in areas exposed to waves and current.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  These include *Hildenbrandia* spp., *Pseudolithoderma* spp. with different species present depending on the salinity regime. |
| Baltic | 6 Annual algal communities on Baltic infralittoral rock and mixed substrata (predominantly hard) | This is a Baltic Sea benthic habitat in the photic zone where between 10-90% of the substrate is rock, boulders or stones or mixed  substrates according to the HELCOM HUB classification. Annual algae cover at least 10% of the seabed, while all other epibenthic biotic structures cover less than 10%. Annual algae can live as epiphytes (e.g. *Pilayella/Ectocarpus* on *Fucus* spp.or *Aglaothamnion* spp. on perennial red algae like *Furcellaria* or on *Mytilus*) where they may be considered quality descriptors, thus this habitat can be recognized only when annual algae grow directly on the hard substrate and not when they grow on perennial biotic structures. This habitat covers the full salinity range of the Baltic Sea and is more common in exposed areas, mainly within the surf zone, in which wave  energy prevents the establishment of perennial vegtation. Mapping should take place during the months when the vegetation is fully developed.  Indicators of quality:  The ratio of annual to perennial epibenthic components is used in several countries to describe habitat quality. As such the area of the habitat itself or the biomass of the corresponding species is used as an indicator for quality.In this particular case the lowest area or biomass is a sign of high quality as only in very high exposure levels should annual algae dominate. In all other circumstances perennials (*Fucus*) should dominate except where there is a low salinity (below 3 psu) as perennial algae growth does not generally occur under such conditions.  Characteristic species:  C*ladophora glomerata, Ceramium tenuicorne, , Chorda filum, Halosiphon tomentosus, Pilayella littoralis, Ulva*spp*. Dictypsiphon* spp. |
| Baltic | 7 Epifaunal communities on Baltic infralittoral rock and mixed substrata (predominantly hard) | This is a Baltic Sea benthic habitat in the photic zone where at least 90% of the substrate is rock, boulders or stones and  mixed (predominantly hard), according to the HELCOM HUB classification. Eleven associated biotopes have been identified dominated (at least 50% of the biomass) by either epibenthic bivalves, chordates, cnidarians, bryozoans, crustaceans or sponges. They are typically present in a depths of between 2-20 meters but have varying distributions depending on salinity and exposure. For example those biotopes where Mytilidae such as *Mytilus* spp. or *Modiolus modiolus*dominate typically occur in depths of 5 – 20 meters, in all exposure classes and in salinities over 5 psu. Biotopes dominated by the mussel *Dreissena polymorpha* (AA.A1E2/AA.M1E2) usually occupy a depth zone of between  2 – 10 meters, in sheltered to moderate exposure and in salinities less than 5 psu. They occur in the eastern parts of the Gulf of Finland and along the Estonian west coast. ‘Baltic photic rock and boulders/mixed sediment dominated by erect moss animals (*Flustra foliaceae*)’ (AA.A1H2/AA.M1H2) is found only in western and southwestern Baltic Sea due to salinity constraints (15 psu).  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Diversity, abundance and biomass of the dominate species and associated fauna are potential indicators of quality of this habitat  Characteristic species:  For mussel dominated biotopes *Mytilus*spp.*, Modiolus modiolus, Dreissena;*for epibenthic chordate dominated biotopes - Sea squirts (Ascidiaceae), for example*Ciona intestinalis, Dendrodoa grossularia, Molgula*spp.; for epibenthic chordate dominated biotopes - Hydroids (e.g. *Cordylophora caspia, Gonothraea loveni, Laomedea*spp), sea anemones, corals. For moss animal dominated biotopes *Electra crustulenta, Flustra foliacea*, other Bryozoa (*Eucratea loricata*), also sponges, sea squirts or hydrozoans. For epibenthic crustacean dominated biotopes - Balanidae, for example *Amphibalanus improvises, Balanus crenatus, Semibalanus balanoides*. For sponge dominated biotopes - *Ephydatia fluviatilis, Chalinula limbata, Halichondria panicea, Haliclona oculata.* |
| Baltic | 8 Sparse or absent epifaunal communities on Baltic infralittoral rock and mixed substrata (predominantly hard) | This habitat is distributed on Baltic bottoms in the photic zone with at least 90% coverage of rock, boulders or stones of more than 63 mm in diameter but this habitat type also occurs on mixed (predominantly hard) substrates where the percentage of rock is lower than 90% according to the HELCOM Hub classification. Less than 10% of the seabed is covered by perennial vegetation or attached epifauna. In some cases no epibenthic vegetation or macrofauna are present. Six associated biotopes have been identified. These are on rock and mixed (predominantly hard substrates) variously dominated (at least 50% of the biomass) by epibenthic macrocommunity and microphytobenthic organisms and grazing snails or with no macrocommunity The sub-biotope Baltic photic rock and boulders characterized by sparse epibenthic macrocommunity (AA.A2T) only occurs in the Gulf of Bothnia, Gulf of Finland and Gulf of Riga and the sub-biotope Baltic photic rock and boulders characterized by microphytobenthic organisms and grazing snails (AA.A2W) only occurs in the Gulf of Bothnia and Gulf of Finland.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Diversity, abundance and biomass of associated fauna may be indicators of quality.  Characteristic species:  For sparse epibenthic communities *Mytilus* spp.*, Bryozoa, Balanidae, Bryozoa, Porifera, Hydrozoa; f*or communities characterized by microphytobenthic organisms and grazing snails Snails*, e.g. Hydrobia* spp.*, Potamopyrgus antipodarum, Theodoxus fluviatilis, Bithynia* spp*., Radix* spp. Where there are no macrocommunities, by meiofauna and bacteria. |
| Baltic | 9 Communities on Baltic infralittoral clay and other hard substrata | This is a Baltic Sea benthic habitat in the photic zone with at least 90% coverage of hard clay, marlstone rock, ferromanganese concretions and/or peat according to the HELCOM HUB classification. Sessile/semi-sessile epibenthic bivalves cover of at least 10% of the seabed and no perennial attached erect group has more than 10% coverage. In some cases macrovegetation or macrofauna may be absent. The habitat is typically encountered in high energy exposure areas.  Seven associated biotopes have been identified. Four of these are associated with areas of hard clay and may be dominated (at least 50% of the biomass) by Mytilids (*Mytilus*spp., *Modiolus modiolus),* havea mixed epibenthic macrocommunity, a sparse epibenthic macrocommunity or have no dominant macrocommunity (AA.B1E1,  AA.B1V, AA.B2T and AA.B4U). The marlstone rock habitat  'AA.C: Baltic photic marl' is only present in the Baltic proper, Belt Sea and the Sound and  'AA.F: Baltic photic ferromanganese concretion bottoms' which is typically found below 10m occurs in Baltic proper, Gulf of Bothnia, Gulf of Finland, Gulf of Riga. 'AA.G: Baltic photic peat bottoms' which occurs in the Baltic proper and Belt Sea, has developed where marine erosion processes along the German and Danish coastline have laid these subfossil substrates bare. It is found salinity ranges between 7 and 18 psu, at all exposure classes and at depths from 0-20m. Knowledge about the latter biotope is scarce but the surface can be covered by filamentous annual algae and single juvenile *Fucus* spp. or *Chorda* spp. specimens. Normally peat bottom lacks epibenthic communities and only some specialised burrowing bivalves like *Barnea candida* or *Zirfaea crispata* may penetrate into the peat.  Indicators of quality;  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Diversity, abundance and biomass of the dominate species and associated fauna are potential indicators of quality of this habitat.  Characteristic species:  *Mytilus* spp., and *Modiolus modiolus* in hard clay dominated areas. *Barnea candida, Zirfaea crispata*, and macrophytes on peat dominated areas. |
| Baltic | 10 Kelp communities on Baltic infralittoral coarse sediment/shell gravel | This habitat occurs in the photic zone in areas where the more than 90% of the seabed is comprised of coarse sediments, including shell gravel and mixed substrates according to the HELCOM HUB classification. Kelp covers at least 10% of the seabed and more than other perennial attached erect groups.  It is more common in areas exposed to wave action than sheltered locations and present in depths from around 0.5-10 m.  Three associated biotopes have been identified. ‘Baltic photic shell gravel dominated by kelp’ (AA.E1C4), ‘Baltic photic mixed substrate dominated by kelp’ (AA.M1C4) and Baltic photic coarse sediment dominated by kelp’ (AA.I1C4) where perennial attached kelp species such as *Saccharina latissima* and *Laminaria digitata* constitute at least 50% of the biovolume of such algae.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. The lower depth limit of the kelp is a potential indicator of quality of this habitat.  Characteristic species:  *Saccharina latissima, Laminaria digitata* |
| Baltic | 11 Perennial algal communities (excluding kelp) on Baltic infralittoral coarse sediment | This habitat is distributed on Baltic bottomsin the photic zone with at least 90% coverage of coarse sediment according to the HELCOM HUB classification.  Perennial attached algae such as *Fucus* spp., or perennial red algae cover at least 10% of the seabed and more than other perennial attached erect groups.  It is most common in areas moderately exposed to wave action and in depths of up to 10 m.  Four associated biotopes with different dominant species of algae and some differences in depth and salnity preferences, resulting in variations in their geographical occurrence in the Baltic Sea have been described by HELCOM. These are: ‘Baltic photic coarse sediment dominated by *Fucus* spp.’ (AA.I1C1) such as *Fucus radicans, F. serratus or F. vesiculosus:*‘Baltic photic coarse sediment dominated by perennial non-filamentous corticated red algae’ (AA.I1C2) such as *Furcellaria lumbricalis;* ‘Baltic photic coarse sediment dominated by perennial foliose red algae’ (AA.I1C3) such as *Coccotylus* spp., *Phyllophora* spp. and *Delesseria* spp. and  ‘Baltic photic coarse sediment dominated by perennial filamentous algae’ (AA.I1C5) such as *Polysiphonia* spp, *Aegagrophila linnaei, Cladophora rupestris*.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. The lower depth limit of algae, especially *Fucus* spp. where applicable, and the amount of epiphytic algae are potential indicators of quality of this habitat.  Characteristic species:  *Fucus* spp., *Furcellaria lumbricalis, Coccotylus truncatus, Phyllophora* spp., *Deleseria sanguinea, Polysiphonia*spp*., Cladophora rupestris, Sphacelaria* spp. |
| Baltic | 12 Aquatic moss communities on Baltic infralittoral coarse sediment | This habitat occurs on Baltic bottoms in the photic zone where the seabed substrate is at least 90% coarse sediment according to the HELCOM HUB classification.  Aquatic moss covers at least 10% of the seabed and more than any other perennial attached erect groups. In some places the mosses form extensive underwater meadows which provide shelter and food for benthic animals. This habitat occurs where salinity is typically  <5 psu and in all exposure ranges although more common in areas exposed to wave action. It occupies the photic zone typically between 1 to 7 meters.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. The depth zone occupied and amount of epiphytic ephemeral filamentous algae are potential indicators of quality of this habitat.  Characteristic species:  *Fontinalis spp. Fissidens fontanus, Platyhypnidium riparioides.* |
| Baltic | 13 Stable aggregations of unattached perennial vegetation on Baltic infralittoral coarse sediment | This habitat is distributed on Baltic bottoms in the photic zone with at least 90% coverage of coarse sediment. Coarse sediment has less than 20% of mud/silt/clay fraction (<63 μm), and the proportion of gravel and pebbles (grain size 2–63 mm) exceeds 30% of the combined gravel and sand fraction according to the HELCOM HUB classification. Stable aggregations of unattached perennial vegetation cover at least 10%, while perennial attached erect groups or *Mytilus* cover less than 10% of the bottom. The habitat is rare but can be found in the photic zone of most of the Baltic Sea area where the salinity is <10 or 5 psu (depending on the area), the exposure is moderate to sheltered, and the seabed is level over wide areas.  Three associated biotopes with different dominant species of vegetation (at least 50% of the biovolume of the unattached perennial vegetation - *Fucus* spp. (typical or dwarf form) and *Furcellaria lumbricalis)*have been identified. ‘Baltic photic coarse sediment dominated by stable aggregations of unattached *Fucus* spp. (typical form)’ (AA.I1Q1) and ‘Baltic photic coarse sediment dominated by stable aggregations of unattached *Furcellaria lumbricalis*’ (AA.I1Q3) are encountered at 0.5 to 5 meters depth. Unattached *Furcellaria* *lumbricalis* may occur in specific, ball-shaped morphology adapted to soft bottom conditions, historically described as *Furcellaria* cf.a*egagropila*. ‘Baltic photic coarse sediment dominated by stable aggregations of unattached *Fucus* spp. (dwarf form)’ (AA.I1Q2) forms a characteristic biotope of shallow bays and lagoons between 0.25 and 2.5 m. This specific morphology of the *Fucus* spp. dwarf form lacks bladders and holdfasts; it is regularly dichotomous branched with branches of similar length resulting in a fan-shaped appearance of the thalli. The single plants can be loosely anchored in the sediment with its lower, dark brownish parts. The thalli are very fragile, break very easily into pieces and thus generate new thalli. Under more exposed conditions plants form a ball-shaped form, able to roll over the sea bottom. The *Fucus* dwarf forms coexist with attached *F. vesiculosus*, unattached *Furcellaria lumbricalis*, higher plants like *Ruppia* spp., *Zannichellia palustris, Stuckenia pectinatus*(formerly known as *Potamogeton pectinatus), Zostera* spp. and several Charophytes. The biotope exists in lower mesohaline salinities (7–10 psu) and moderately exposed to very sheltered conditions. The unattached thalli can cover the sediment up to about 10 cm height and thus form a three-dimensional habitat comparable to the interstitial space in coarse sediments. Epifauna is seldom attached to the *Fucus* dwarf form, but in between the loose lying thalli mobile gastropods, amphipods and insects look for shelter and food. However, if abundances of the unattached form are very high, the sediment below becomes deoxygenated and the associated infauna below the *Fucus* layer may die. Presently the dwarf form biotope is only known to occur in Sweden and Germany. In Germany it exists only in very few coastal lagoons with low to moderate eutrophication pressures and salinities of around 7–10 psu.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Density of unattached *Fucus* spp. (typical and dwarf forms), the lower limit of the *Furcellaria* belt, the amount of epiphytic algae, and density of *Furcellaria* are potential indicators of quality of this habitat.  Characteristic species:  *Fucus* spp., *Furcellaria lumbricalis*with morphologically typical forms and specific, ball-shaped morphologies |
| Baltic | 14 Annual algae communities on Baltic infralittoral coarse sediment | This benthic habitat is distributed in the photic zone with at least 90% coverage of coarse sediment. Coarse sediment has less than 20% of mud/silt/clay fraction (<63 µm), and the proportion of gravel and pebbles (grain size 2–63 mm) exceeds 30% of the combined gravel and sand fraction according to the HELCOM HUB classification. Annual algae cover at least 10% of the bottom, while all other epibenthic biotic structures like perennial algae, rooted plants or blue mussels cover less than 10%. The habitat is present in the full salinity range of the Baltic Sea and is more common in exposed areas, mainly within the surf zone, in which wave energy prevents the establishment of either perennial vegetation or blue mussels.  One associated biotope has been identified: ‘Baltic photic coarse sediment dominated by *Chorda filum* and/or *Halosiphon tomentosus*’ (AA.I1S2). This is encountered in the Baltic Sea up to the Quark, and is identified by a large representation of *Chorda filum* and/or *Halosiphon tomentosus*, at least 50% of the biovolume of annual algae.  Indicators of quality:  The ratio of annual to perennial epibenthic components is used in several countries to describe habitat quality. As such the area of the habitat itself or the biomass of the corresponding species is used as an indicator for quality.In this particular case the lowest area or biomass is a sign of high quality as only in very high exposure levels should annual algae dominate. In all other circumstances perennials (*Fucus*) should dominate except where there is a low salinity (below 3 psu) as perennial algae growth does not generally occur under such conditions.  Characteristic species:  *Chorda filum, Halosiphon tomentosus, ,Ulva* spp*.,* C*ladophora glomerata.* |
| Baltic | 15 Submerged rooted plant communities on Baltic infralittoral coarse sediment | This benthic habitat occurs  in the photic zone with at least 90% coverage of coarse sediment according to the HELCOM HUB classification. Coarse sediments covered by rooted plants  (which also includes plants with rhizoids,i.e. Charales) are mainly distributed in areas of moderate exposure to wave actioin. The habitat covers the full salinity range of the Baltic Sea and is distributed from the Belt Sea up to the northern part of Bothnian Bay. Depending on the salinity the dominant species (>50% of the biovolume), defining the associated biotope type, varies. They also occupy different depth zones. Five associated biotopes have been identified: ’Baltic photic coarse sediment dominated by pondweed (*Potamogeton perfoliatus* and/or *Stuckenia pectinata*)’ (AA.I1B1); ’Baltic photic coarse sediment dominated by *Ranunculus* spp.’ (AA.I1B6 );  ’Baltic photic coarse sediment dominated by Charales’ (AA.I1B4);  ’Baltic photic coarse sediment dominated by *Zannichellia* spp. and/or *Ruppia* spp. and/or *Zostera noltei*’ (AA.I1B2) and  ’Baltic photic coarse sediment dominated by common eelgrass (*Zostera marina)*’ (AA.I1B7).  The latter differs most strongly from the other biotopes in distribution, occurring mainly at moderate to high exposure and in salinities of 5 psu or higher. It is typically found in deeper waters than the other biotopes (1-6 m) and often marks the lower depth limit distribution of soft bottom vegetation. This biotope is absent from areas with low salinity in the inner part of the Gulf of Bothnia.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  The vertical depth limit of submerged rooted plants is used in several countries as a Water Framework Directive parameter for assessing ecological status. The overall quality and continued occurrence of this habitat is, however, largely dependent on the presence of the rooted plant species, which create the biogenic structural complexity on which the characteristic associated communities depend. The density and the maintenance of a viable population of these species is a key indicator of habitat quality, together with the visual evidence of presence or absence of physical damage.  Characteristic species:  *Chara baltica*, *Potamogeton perfoliatus, Ruppia cirrhosa, R. maritima, Stuckenia pectinata, Zannichellia palustris, Zostera marina,* and *Zostera noltei*(formerly known as *Z. noltii* or *Z. nana*), |
| Baltic | 16 Emergent vegetation communities on Baltic infralittoral coarse sediment | This is a Baltic Sea benthic habitat in the photic zone where at least 90% of the substrate is coarse sediment according to the HELCOM HUB classification. It is found across all salinity ranges in the Baltic and in areas where there is low to moderate exposure to wave action typically to depths of about 2 meters. The associated communities of sedges and/or reeds are more typically found in areas of soft sediment. Their presence on coarse sediment may indicate that siltation is already taking place and that the establishment of sedges and reeds will increase the rate of siltation, changing the substrate to finer sediments over time.  Two associated biotopes with different dominant plant species have been identified. The common reed (*Phragmites australis)* forms the charactersitic biotope in water depths of up to 2m and in moderately exposed conditions, where as sedges such as *Schoenoplectus* spp, *Bolbaschoenus maritimus* are generally in more sheltered and shallower waters.  Nutrient levels play a part in affecting the balance between the two biotopes with reed dominated areas favoured by conditions of eutrophication.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. The overall quality and continued occurrence of this habitat is, however, largely dependent on the presence of the emergent plant species which create the biogenic structural complexity on which the characteristic associated communities depend. The density and the maintenance of a viable population of these species is a key indicator of habitat quality, together with thevisual evidence of presence or absence of physical damage. In the case of this habitat the situation is further complicated because the reed dominated biotope is favoured by the deterioration of the sedge dominated biotope under conditions of eutrophication.  Characteristic species:  *Phragmites australis, Schoenoplectus spp, Bolbaschoenus maritimus*may be in areas of coarse sediment but are likely to be embedded in the patches of finer sediment. |
| Baltic | 17 Unvegetated epifaunal communities on Baltic infralittoral coarse sediment | This is a Baltic Sea benthic habitat in the photic zone where at least 90% of the substrate is coarse sediment according to the HELCOM HUB classification.  Three associated biotopes have been identified. ‘Baltic photic coarse sediment dominated by Mytilidae’ (AA.I1E1) is encountered in salinities higher than 5 psu, and is identified by a large representation of Mytilidae, at least 50% of the biomass among the epibenthic bivalves, and covering at least 10% of the seabed. The other two biotopes are 'Baltic photic coarse sediment characterized by mixed epibenthic macrocommunity' (AA.I1V) and 'Baltic photic coarse sediment dominated by microphytobenthic organisms and grazing snails' (AA.12W) where the benthic organisms or grazing snails (e.g. Hydrobiidae, *Theodoxus* spp, *Bithynia* spp, *Radix* spp) constitute at least 50% of the biomass or volume.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Mytilus* spp., *Hediste diversicolor*, Hydrobiidae, *Theodoxus* spp, *Bithynia* spp, *Radix* spp. |
| Baltic | 18 Infaunal communities of Baltic infralittoral coarse sediment | This is a Baltic Sea benthic habitat in the photic zone where at least 90% of the substrate is coarse sediment according to the HELCOM HUB classification. No macrovegetation or epibenthic macrofauna is present however infaunal bivalves/polychaetes/crustaceans/echinoderms or insects may dominate, comprising at least 50% of the biomass. It is encountered in areas of high energy associated with currents or wave action. Five associated biotopes have been identified but not all occur in all the sub-basins. For example  ‘Baltic photic coarse sediment characterised by infaunal bivalve species’ (AA.I3L), has only been reported in the Baltic Proper, The Belt Sea and The Sound. Where the substrate is well sorted with medium to coarse sand, gravel or small shell fragments, often building small patches inside finer sediments, the large variety of interstitial space, may be inhabited by species of specialised fauna, such the polychaetes *Ophelia limacina, O. rathkei*and *Travisia forbesii*. In areas of poorly sorted substrate there may be a higher species diversity with none of the characateristic species clearly dominant but including bivalves such as *Macoma calcarea, Mya truncata, Astarte* spp., and *Spisula* spp.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitatmay face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Diversity, abundance and biomass of the dominant species and associated fauna are potential indicators of quality of this habitat.  Characteristic species:  Depending on the particular associated biotope these include  *Macoma calcarea, Mya truncata, Astarte* spp., *Spisula* spp.  *Ophelia limacina, Travisia forbesii, Tanaissus* spp. and *Streptosyllis* spp. the sand digger shrimp (*Bathyporeia pilosa*), the echinoderms  *Amphiura* spp, *Ophiura* spp., *Brissopsis lyrifera, Echinocardium* spp. and infaunal insect larvae (Chironomidae). |
| Baltic | 19 Sparse or no macrofaunal communities on Baltic infralittoral coarse sediment | This Baltic Sea benthic habitat occurs in the photic zone with at least 90% coverage of coarse sediment according to the HELCOM HUB classification. Sessile/semi-sessile epifauna and flora is present but covers less than 10%. The habitat is encountered in high energy exposure areas whre the topmost level is mixed by wave action. Two associated biotopes have been identified ‘Baltic photic coarse sediment characterized by sparse epibenthic macrocommunity (AA.I2T) and Baltic photic coarse sediment characterized by no macrocommunity (AA.I4U)  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Mytilus*spp, Hydroids, *Amphibalanus improvisus* |
| Baltic | 20 Unvegetated communities on Baltic infralittoral shell gravel | This Baltic Sea benthic habitat occurs on with at least 90% coverage of shell gravel according to the HELCOM HUB classification.  Four biotopes and two sub-biotopes have been associated with this habitat. The sub-biotope 'Baltic photic shell gravel dominated by Mytilidae’ (AA.E1E1),  sessile/semi-sessile epibenthic bivalves cover at least 10% of the seabed and more than other perennial attached erect groups. This biotope is identified by a large representation of Mytilidae, at least 50% of the biomass among the epibenthic bivalves and often encountered in high energy exposure areas. It has been reported from the Baltic proper and Belt Sea. 'Baltic photic shell gravel dominated by vase tunicate (*Ciona intestinalis*) (AA.E1F1) is ony reported from the Belt Sea and occurs in areas where the bottom consists largely of mollusc shells or small shell fragments, often constituting small patches inside other sediments. Due to the combination of the extended interstitial space and the presence of biotic hard substrates, it is inhabited by a unique combination of endobenthic and epibenthic species, such as the vase tunicate (*Ciona intestinalis*). The biotopes 'Baltic photic shell gravel characterized by sparse or  by mixed epibenthic macrocommunities (AA.E2T and AA.E1V)' are characterised by a low (0-10%) coverage of macroscopic vegetation or sessile macroscopic epifauna and most often encountered in high energy exposure areas.  Indicators of Quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Mytilus* spp., *Modiolus modiolus, Ciona intestinalis.* |
| Baltic | 21 Infaunal communities on Baltic infralittoral shell gravel | This is a Baltic Sea benthic habitat in the photic zone where at least 90% of the substrate is shell gravel according to the HELCOM HUB classification. The shell gravel fragments are coarse and well-sorted. This habitat is most often encountered in high energy exposure areas and is only found in the southern parts of the Baltic. Whilst macroscopic infauna are present, there is typically no macrovegetation or epibenthic macrofauna.  Two associated biotopes have been identified: 'Baltic photic shell gravel characterised by mixed infaunal macrocommunity in coarse and well-sorted shells and shell fragments' (AA.E3X) and 'Baltic photic shell gravel characterized by mixed infaunal macrocommunity in fine sand-like shell fragments' (AA.E3Y). The benthic macroinfauna species vary as the interstitial spaces are smaller in the latter sand-like shell gravel substrate, enabling burrowing polychaetes and amphipods to build tunnels using the small grains.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Insufficiently studied to list at the present time. |
| Baltic | 22 Sparse or no communities on Baltic infralittoral shell gravel | This benthic Baltic Sea habitat occurs in the photic zone with at least 90% coverage of shell gravel according to the HELCOM HUB classification. Epibenthic macrovegetation or macrofauna does not occur. The habitat is most often encountered in high energy exposure areas and therefore believed to be limited to the Baltic Proper, Belt Sea and The Sound.  Indicators of quality:  Unknown  Characteristic species:  Unknown |
| Baltic | 23 Emergent vegetation communities on Baltic infralittoral mixed substrata (predominantly soft) | This is a Baltic Sea benthic habitat in the photic zone where at least 10%, but less than 90% of the substrate is a mix of hard and soft substrata.  Emergent vegetation covers at least 10% of the seabed and exceeds that of other perennial attached erect groups. The habitat occurs in areas of low to moderate exposure to wave action, typically to depths of about 2 meters.  Two associated biotopes with different dominant plant species have been identified. The common reed (*Phragmites australis*) forms the characteristic biotope in water depths of up to 2m and in moderately exposed conditions, whereas sedges such as *Schoenoplectus* spp, and *Bolbaschoenus maritimus* are generally present in more sheltered and shallower waters in areas of low to moderate salinity. Nutrient levels play a part in affecting the balance between the two biotopes with reed dominated areas favoured by conditions of eutrophication.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. The overall quality and continued occurrence of this habitat is, however, largely dependent on the presence of the emergent plant species which create the biogenic structural complexity on which the characteristic associated communities depend. The density and the maintenance of a viable population of these species is a key indicator of habitat quality, together with the visual evidence of presence or absence of physical damage. In the case of this habitat the situation is further complicated because the reed dominated biotope is favoured by the deterioration of the sedge dominated biotope under conditions of eutrophication.  Characteristic species:  *Phragmites australis, Schoenoplectus* spp.*, Bolbaschoenus maritimus*. |
| Baltic | 24 Submerged rooted plant communities on Baltic infralittoral mixed substrata (predominantly soft) | This benthic Baltic Sea habitat occurs in the photic zone with more than 10%, but less than 90% coverage of  hard and soft substrata according to the HELCOM HUB classification. Coverage of submerged rooted plants which also includes plants with rhizoids (i.e. Charales) cover at least 10% of the seabed, and more than other perennial attached erect groups. Mixed sediments covered by rooted plants are mainly distributed in moderate exposure levels but may also occur in sheltered conditions. The habitat covers the full salinity range of the Baltic Sea and is distributed from the Belt Sea up to the northern part of Bothnian Bay. Depending on the salinity and depth the dominant species (>50% of the biovolume), defining the associated biotope type, varies.  ’Baltic photic mixed substrate dominated by pondweed (*Potamogeton perfoliatus* and/or *Stuckenia pectinata*)’ (AA.M1B1) is found between 0.2-4 m depth in sheltered sites with up to 6 psu.  ‘Baltic photic mixed substrate dominated by watermilfoil (*Myriophyllumspicatum* and/or *Myriophyllum sibiricum*)’ (AA.M1B3) has a similar distribution but a more narrow depth range (0.2-2 m).  ’Baltic photic mixed substrate dominated by *Charales*’ is found in a wider range of salinity (2-15), depth (0.2-7 m) and wave exposure (low to moderate) (AA.M1B4).  ’Baltic photic mixed substrate dominated by *Zannichellia* spp. and/or *Ruppia* spp. and/or *Zostera noltii*’ is found at 0-4 m depth throughout the salinity gradient of the Baltic Sea and in low to moderate exposure (AA.M1B2).  ’Baltic photic mixed substrate dominated by common eelgrass (*Zostera marina*)’ (AA.M1B7) differs most strongly from the other sub-biotopes in distribution, occurring mainly at moderate exposure and in salinities of 5 psu or higher. It is typically found deeper than the other associated biotopes (1-6 m) and often marks the lower depth limit distribution of soft bottom vegetation. This biotope is absent from areas with low salinity in the inner part of Gulf of Finland and Gulf of Bothnia.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change overtime. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  The vertical depth limit of submerged rooted plants is used in several countries as a Water Framework Directive parameter for assessing ecological status. The overall quality and continued occurrence of this habitat is, however, largely dependent on the presence of the rooted plant species which create the biogenic structural complexity on which the characteristic associated communities depend. The density and the maintenance of a viable population of these species is a key indicator of habitat quality, together with the visual evidence of presence or absence of physical damage.  Characteristic species:  *Stuckenia pectinata, Potamogeton perfoliatus,Zostera marina, , Z. noltei, Ruppia cirrhosa, R. maritima, Zanichellia palustris, Myriophyllum spicatum, Chara baltica.* |
| Baltic | 25 Unvegetated Baltic infralittoral mixed sediment (hard and soft) with sparse or no macrofaunal community | This benthic Baltic Sea habitat occurs in the photic zone with a mix of more than 10%, but less than 90% coverage of either hard and soft substrata according to the HELCOM HUB classification. Typical examples include singular rocks or boulders/stones extending above the soft substrata as well as soft substrata aggregation between abundant rocks and stones/boulders. The amount of soft substrata is affected by energy, both in the lateral and horizontal dimension, leading to a typically continuous small-scale variation in substrate composition. Sessile/semi-sessile macroscopic epibenthic fauna and flora is present where there is a sparse macrofaunal community (less than 10% coverage). In these situations microphytobenthic organisms and grazing snails (e.g. Hydrobiidae, Theodoxus, Bithynia, Radix) dominate constituting 50% in biomass or volume. Elsewhere there may be no macrovegetation present and neither macroepifauna or macro infauna.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Hydrobiidae, Theodoxus, Bithynia, Radix where there is sparse macrofauna. Meiofauna and bacteria where is there is macrofaunal community. |
| Baltic | 26 Stable aggregations of unattached perennial vegetation on Baltic infralittoral sand | This benthic Baltic Sea habitat occurs in the photic zone with at least 90% coverage of sand according to the HELCOM HUB classification. Stable aggregations of unattached perennial vegetation covers at least 10%, while perennial attached erect groups or *Mytilus* cover less than 10% of the bottom. This habitat is rare, but can be found in most of the Baltic Sea area where the salinity is <10 or 5 psu (depending on the area), the exposure is moderate to sheltered and the seabed is level over wide areas within the photic zone.  Three associated biotopes with different dominant species of vegetation (at least 50% of the biovolume of the unattached perennial vegetation) have been identified (*Fucus* spp. (typical or dwarf form) and *Furcellaria lumbricalis*’). ‘Baltic photic sand dominated by stable aggregations of unattached *Fucus* spp. (typical form)’ (AA.J1Q1) is encountered down to a depth of 5 meters and ‘Baltic photic sand dominated by stable aggregations of unattached *Furcellaria lumbricalis*’ (AA.J1Q3) down to a depth of 10 meters. Unattached *Furcellaria* *lumbricalis* may occur in specific, ball-shaped morphology adapted to soft bottom conditions. For the biotope ‘Baltic photic sand dominated by stable aggregations of unattached *Fucus* spp. (dwarf form)’ (AA.J1Q2) the single plants can be loosely anchored in the sediment with its lower, dark brownish parts. Under more exposed conditions plants form a ball-shaped form, able to roll over the sea bottom. The *Fucus* dwarf forms coexist with attached *F. vesiculosus*, unattached *Furcellaria lumbricalis*, higher plants like *Ruppia* spp., *Zannichellia palustris, Stukenia pectinatus, Zostera* spp. and several charophytes.  The unattached thalli can cover the sediment up to about 10 cm height and thus form a three-dimensional habitat comparable to the interstitial space in coarse sediments. Epifauna is seldom attached to the *Fucus* dwarf form, but inbetween the loose lying thalli mobile gastropods, amphipods and insects look for shelter and food. However, if abundances of the unattached form are very high, the sediment below becomes deoxygenated and the associated infauna below the *Fucus* layer may die. Presently this biotope is only known to occur in Sweden and Germany. In Germany it exists only in very few coastal lagoons with low to moderate eutrophication pressures and salinities of around 7–10 psu.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. For this habitat the density of unattached *Fucus* spp. (typical and dwarf forms), lower limit of *Furcellaria* belt, amount of epiphytic algae, and density of *Furcellaria* are potential indicators of quality.  Characteristic species:  *Fucus* spp., *Furcellaria lumbricalis*with morphologically typical forms and specific soft bottom, ball-shaped morphologies. |
| Baltic | 27 Annual algal communities on Baltic infralittoral sand | This benthic Baltic Sea habitat occurs in the photic zone with at least 90% coverage of sand according to the HELCOM HUB classification. Annual algae cover at least 10%, while all other epibenthic biotic structures like rooted plants, unattached perennial algae or blue mussels cover less than 10%. The habitat occurs in the full salinity range of the Baltic Sea and is more common in moderate to sheltered, very shallow areas.  Two associated biotopes with different dominant species of algae (at least 50% of the biovolume of the annual algae) have been identified. ‘Baltic photic sand dominated by *Chorda filum* and/or *Halosiphon tomentosus*’ (AA.J1S2) usually down to a depth of 4 meters, in areas moderately exposed to wave action. These species give the appearance of growing on the sand but attach to small fractions of stable substrate like small stones, shell fragments or gravel buried in the sand. It is distributed in the whole Baltic Sea except in the most northern part of the Bothnian Bay.  A second associated biotope, ‘Baltic photic sand dominated by *Vaucheria* spp.’ (AA.J1S3), is usually present down to a depths of 7 meters, in areas more sheltered areas and in salinities less than 7 psu. It is distributed in the whole Baltic Sea except for the Belt Sea and the Sound.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.    Characteristic species:  *Chorda filum, Halosiphon tomentosus, Vaucheria* spp. |
| Baltic | 28 Submerged rooted plant communities on Baltic infralittoral sand | This is a Baltic Sea benthic habitat in the photic zone where at least 90% of the substrate is sand according to the HELCOM HUB classification. Submerged rooted plants, including plants with rhizoids (i.e. Charales) cover at least 10% of the seabed and more than other perennial attached erect groups. The habitat is present across the full salinity range of the Baltic, in locations that are moderately to very sheltered from wave action and in depths of up to 6m.  Eight associated biotopes with different dominant (>50% of the biovolume) macrophyte taxa (spiny naiad, spikerush, pondweed, watermilfoil, *Ranunculus* spp. Charales, and seagrass.) have been described.  They differ in their distribution along gradients in salinity, depth and wave exposure with the biotope dominated by the common eelgrass (*Zostera marina*)’ (AA.J1B7) differing most strongly from the others in distribution. This occurs mainly under conditions of moderate exposure to wave action and in salinities of 5 psu or higher. It is also typically found deeper than the other biotopes (1-6 m) and often marks the lower depth limit distribution of soft bottom vegetation. This biotope is absent from areas with low salinity in the inner part of Gulf of Finland and Gulf of Bothnia.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. The vertical depth limit of submerged rooted plants is used in several countries as a Water Framework Directive parameter for assessing ecological status. The overall quality and continued occurrence of this habitat is, however, largely dependent on the presence of the rooted plant communities which create the biogenic structural complexity on which the characteristic associated communities depend. The density and the maintenance of a viable population of these species is a key indicator of habitat quality, together with the visual evidence of presence or absence of physical damage.  Characteristic species:  *Stuckenia pectinata, Potamogeton perfoliatus, Zostera marina, Z. noltei, Ruppia cirrhosa, R maritima, Zannichellia palustris, Myriophyllum spicatum, Najas marina, Chara aspera Ch. baltica, Ch. canescens, Ranunculus peltatus* subsp*. baudotii, Eleocharis* spp. |
| Baltic | 29 Emergent vegetation communities on Baltic infralittoral sand | This is a Baltic Sea benthic habitat in the photic zone where at least 90% of the substrate is sand according to the HELCOM HUB classification. Emergent vegetation covers at least 10% of the seabed and exceeds that of other perennial attached erect groups. The habitat occurs in areas of low to moderate exposure to wave action, typically to depths of about about 3 meters. Two asociated biotopes with different dominant plant species (at least 50% of the biovolume of the emergent vegetation)  have been described. These are ‘Baltic photic sand dominated by common reed (*Phragmites australis*)’ (AA.J1A1) which is found in shallow water, down to a depth of 3 m and in moderate exposure, and ‘Baltic photic sand dominated by sedges (Cyperaseae)’ (AA.J1A2) where sedges such as *Schoenoplectus* spp. and *Bolbaschoenus maritimus* dominate. The latter is found in shallow water, down to a depth of 1m and in areas of moderate exposure to wave action. Nutrient levels play a part in affecting the balance between the two biotopes with reed dominated areas favoured by conditions of eutrophication.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. The overall quality and continued occurrence of this habitat is, however, largely dependent on the presence of the emergent plant species which create the biogenic structural complexity on which the characteristic associated communities depend. The density and the maintenance of a viable population of these species is a key indicator of habitat quality, together with the visual evidence of presence or absence of physical damage. In the case of this habitat the situation is further complicated because the reed dominated biotope is favoured by the deterioration of the sedge dominated biotope under conditions of eutrophication.  Characteristic species:  *Phragmites australis, Schoenoplectus spp., Bolbaschoenus maritimus.* |
| Baltic | 30 Epibenthic macrocommunity on Baltic infralittoral sand | This is a Baltic Sea benthic habitat in the photic zone where at least 90% of the substrate is sand according to the HELCOM HUB classification. No perennial attached vegetation is present but perennial unattached algae or annual algae may occur and cover more than 10% of the substrate. The habitat could occur across all salinity regimes in the Baltic and in areas moderately exposed to currents or wave action.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Insufficiently studied to list characteristic species at the present time. |
| Baltic | 31 Infaunal communities in Baltic infralittoral sand - bivalves | This is a Baltic Sea benthic habitat in the photic zone where at least 90% of the substrate is sand according to the HELCOM HUB classification.  There is a lack of macrovegetation or epibenthic macrofauna but infaunal bivalves make up at least 10% of the biomass. The habitat is present in areas of high energy associated with wave action or currents.  Six associated biotopes with different dominant species (at least 50% of the biomass of macrofauna) have been identified. Some have a restricted distribution in the Baltic. For example AB.J3L10 ‘Baltic aphotic sand dominated by multiple infaunal bivalve species: *Macoma calcarea, Mya truncata, Astarte* spp., *Spisula*spp.’  is only found at high salinities (> 18 psu) as all characteristic bivalves species are eumarine and do not tolerate lower salinities. The characteristic trait of the biotope is high species diversity. and it is encountered in the south-western Baltic Sea, from the Kiel bight to Isle of Fehmarn, and might occasionally occur from Mecklenburg Bight to Darss Sill. Where the substrate is well sorted medium to coarse sand, the large variety of interstitial space, may be inhabited by species of specialised fauna, such as the polychaetes *Ophelia limacina, O. rathkei*and*Travisia forbesii*. This fauna is restricted to the Belt Sea (sandbanks) and parts of the ‘submerged belt’ of the Arkona Basin.   Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determinedand applied on a location-specific basis. Diversity, abundance and biomass of fauna are potential indicators of quality.  Characteristic species:  Bivalves *Arctica islandica, Macoma balthica, Cerastoderma* spp., *Mya arenaria, Astarte*spp., *Thracia* spp, *Phaxas pellucidus,* andpolychaete species such as *Ophelia rathkei, Ophelia limacina, Travisia forbesii*and*Streptosyllis* spp. |
| Baltic | 32 Infaunal communities in Baltic infralittoral sand not dominated by bivalves | This is a Baltic Sea benthic habitat in the photic zone where at least 90% of the substrate is sand according to the HELCOM HUB classification. There is a lack of macrovegetation or epibenthic macrofauna but crustaceans, polychaetes and insect larvae may dominate the infauna. The habitat is present in areas of high energy associated with wave action or currents.  Where polychaetes dominate the infauna two associated biotopes with different dominant species of polychaetes (at least 50% of the biomass of the infaunal polychaetes) can be identified. ‘Baltic photic sand dominated by lugworms (*Arenicola marina*)’ (AA.J3M2) usually at a depth of 1 – 5 meters, in high exposure and in salinities over 10 psu. It is distributed in only in the western Baltic Sea, in the Sound and the Belt Sea. ‘Baltic photic sand dominated by multiple infaunal polychaete species: *Pygiospio elegans, Marenzelleria* spp. and *Hediste diversicolor*’ (AA.J3M4) distributed in the whole Baltic Sea. Where crustaceans dominate the infauna one associated biotope has been identified: ‘Baltic photic sand dominated by sand digger shrimp (*Bathyporeia pilosa*)’ (AA.J3N3). Depth of this biotope is typically from 1 to 10 meters, and it is encountered in areas of moderate to high wave exposure with salinity over 4 psu. Another biotope ‘Baltic photic sand dominated by midge larvae (Chironomidae)’ (AA.J3P1) is identified by a large representation of Midge larvae (Chironomidae).  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Diversity, abundance and biomass of fauna are potential indicators of quality.  Characteristic species:  *Arenicola marina* with *Mya arenaria* and *Cerastoderma* sp.; where mixed polychaetes dominate, P*ygospio elegans, Marenzelleria* spp., *Hediste diversicolor, Ophelia* spp. and *Travisia forbesii*; where crustaceans dominate *Monoporeia affinis*; and where insect larvae dominate Chironomid larvae. |
| Baltic | 33 Sparse or no macrofauna communities on Baltic infralittoral sand | This Baltic Sea benthic habitat occurs in the photic zone with at least 90% coverage of sand according to the HELCOM HUB classification. The substrate may be mobile and any macro or microvegetation, if present, is sparse. Macrofauna, eipfauna and infauna in this habitat are also sparse and it supports a low species diversity.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change overtime. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species;  Low species diversity but may include burrowing infauna such as  *Marenzelleria viridis, Pygospio elegans, Macoma baltica*or actively swimming nectobenthic forms such as *Bathyporeia pilosa* and*Crangon crangon.* |
| Baltic | 34 Stable aggregations of unattached perennial vegetation on Baltic infralittoral muddy sediment | This benthic Baltic Sea habitat occurs in the photic zone with at least 90% coverage of muddy sediment according to the HELCOM HUB classification. Stable aggregations of unattached perennial vegetation cover at least 10%, while perennial attached erect groups or *Mytilus* cover less than 10% of the bottom. The habitat is encountered in areas with salinity below 10 or 5 psu (depending on the area) and can be found in most of the Baltic Sea area, where the seabed is level over wide areas within the photic zone. The algae provide shelter and surface for attachment of invertebrates, however, if abundances of the unattached form are very high the sediment below may become deoxygenated and the associated infauna may die. The unattached forms of associated algae can coexist with attached forms and the characteristic rooted vegetation of bays, estuaries and lagoons.  Five associated biotopes have been described some of which have a more restricted distribution. These are variously dominated by unattached *Fucus* spp.,  *Furcellaria lumbricalis*, or by the dwarf form of *Fucus* species which coexists with attached *F. vesiculosus*, unattached *Furcellaria lumbricalis*, higher plants like *Ruppia* spp., *Zannichellia palustris, Stuckenia pectinatus* (formerly known as *Potamogeton pectinatus), Zostera* spp. and several charophytes. There are also biotopes dominated by stable aggregations of unattached rigid hornwort (*Ceratophyllun demersum*) and the unattached lake ball (*Aegagropila linnaei*).  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. For this habitat the density of unattached *Fucus* spp. (typical  and dwarf forms), lower limit of *Furcellaria* belt, amount of epiphytic algae, and density of *Furcellaria* are potential indicators of quality.  Characteristic species:  *Fucus vesiculosus* (typical and dwarf form), *Furcellaria lumbricalis, Ceratophyllum demersum, Aegagropila linnaei* |
| Baltic | 35 Annual algal communities on Baltic infralittoral muddy sediment | This Baltic Sea benthic habitat is occurs in the photic zone with at least 90% coverage of muddy sediment according to the HELCOM HUB classification. Annual algae cover at least 10% of the seabed, while all other epibenthic biotic structures like rooted plants, unattached perennial algae or blue mussels cover less than 10%. The habitat covers the full salinity range of the Baltic Sea and is common in sheltered, very shallow areas.  One associated biotope has been identified: ‘Baltic photic muddy sediment dominated by *Vaucheria* spp.’ (AA.H1S3). This is encountered most of the Baltic Sea with the exception of the more saline western parts (the Belt Sea and The Sound) and is identified by a large representation of *Vaucheria* spp., which constitutes at least 50% of the biovolume of the annual algae. It forms dense mats in bays with soft sediment, requires a salinity below 7 psu and is found at up to 7 meters depth.  Indicators of quality:  The ratio of annual to perennial epibenthic components is used in several countries to describe habitat quality. As such the area of the habitat itself or the biomass of the corresponding species is used as an indicator for quality.In this particular case the lowest area or biomass is a sign of high quality as only in very high exposure levels should annual algae dominate. In all other circumstances perennials (*Fucus*) should dominate except where there is a low salinity (below 3 psu) as perennial algae growth does not generally occur under such conditions.  Characteristic species:  *Vaucheria* spp. |
| Baltic | 36 Submerged rooted plant communities on Baltic infralittoral muddy sediment | This Baltic Sea benthic habitat occurs in the photic zone with at least 90% coverage of muddy sediment according to the HELCOM  HUB classification.  The habitat covers the full salinity range of the Baltic Sea and is distributed from lagoons in the Belt Sea up to the northern part of Bothnian Bay. Muddy bottoms covered by rooted plants are mainly distributed in sheltered to very sheltered exposure conditions. In this habitat submerged rooted plants, including plants with rhizoids (i.e. Charales) cover at least 10% of the seabed and more than any other perennial attached erect groups. The charactersitic species depends on the salinity and depth.  Eight associated biotopes have been described. AA.H1B5 ’Baltic photic muddy sediment dominated by spiny naiad (*Najas marina*)’ has a restricted distribution at 0-1 m depth in extremely sheltered areas at low salinity (<4 psu).  AA.H1B8 ’Baltic photic muddy sediment dominated by spikerush (*Eleocharis* spp.)’ is also found in shallow (0-2 m depth) and sheltered areas with low salinity (<5 psu). AA.H1B1 ’Baltic photic muddy sediment dominated by pondweed (*Potamogeton perfoliatus* and/or *Stuckenia pectinata*)’ is found between 0.2-4 m depth in sheltered sites with up to 6 psu. AA.H1B3 ‘Baltic photic muddy sediment dominated by watermilfoil (*Myriophyllumspicatum* and/or *Myriophyllumsibiricum*)’ has a similar distribution but a more narrow depth range (0.2-2 m). AA.H1B6 ’Baltic photic muddy sediment dominated by *Ranunculus* spp.’ is also found up to 6 psu but is restricted to extremely sheltered sites. AA.H1B4 ’Baltic photic muddy sediment dominated by Charales’ is found in a wider range of salinity (2-15psu), depth (0.2-7 m) and wave exposure (low to moderate).AA.H1B2 ’Baltic photic muddy sediment dominated by *Zannichellia* spp. and/or *Ruppia* spp. and/or *Zostera noltei*’ is found at 0-4 m depth throughout the salinity gradient of the Baltic Sea and in low to moderate exposure. AA.H1B7 ’Baltic photic muddy sediment dominated by common eelgrass (*Zostera marina*)’ differs most strongly from the other associated biotopes in distribution, occurring mainly at moderate to high exposure, in salinities of 5 psu or higher and sedldom on muddy sediments. It is typically found deeper than the other associated biotopes (1-6 m) and often marks the lower depth limit distribution of soft bottom vegetation. This biotope is absent from areas with low salinity in the inner part of the Gulf of Bothnia.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change overtime. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. The vertical depth limit of submerged rooted plants is used in several countries as a Water Framework Directive parameter for assessing ecological status.  Characteristic species:  *Stuckenia pectinata, Potamogeton perfoliatus, Zostera marina, Ruppia maritima, Zanichellia palustris, Myriophyllum spicatum, Najas marina, Chara tomentosa, Chara aspera, Ranunculus peltatus subsp. baudotii, Eleocharis*sp. |
| Baltic | 37 Emergent vegetation communities on Baltic infralittoral muddy sediment | This is a Baltic Sea benthic habitat in the photic zone where at least 90% of the substrate is muddy sediment according to the HELCOM HUB classification. Emergent vegetation covers at least 10% of the seabed and exceeds that of any other perennial attached erect groups. The habitat requires a salinity of less than 6 psu for the associated communities to develop and is encountered in sheltered areas down to a depth of 2 meters.  Two associated biotopes with different dominant plant species have been identified. The common reed (*Phragmites australis*) forms the characteristic biotope in water depths of up to 2m and in moderately exposed conditions, whereas sedges such as *Schoenoplectus* spp., and *Bolbaschoenus maritimus* are generally present in more sheltered and shallower waters in areas of low to moderate salinity.  In the Baltic Sea, sedges form large biotopes in shallow areas typically in estuaries and inlets. It can be found in very sheltered lagoons and in some estuaries around the whole Baltic Sea, but occurs mainly in the north along the Swedish and Finnish coasts of the Bothninan Bay and Gulf of Finland.  The species diversity is usually high because of the large variety and abundance of associated fish and birds. The benthic fauna consists mainly of soft-sediment invertebrates, such as polychaetes, crustaceans, bivalves and insect larvae. These shallow sheltered areas are of high biological productivity in a brackish environment. They form important breeding, resting, and feeding sites for water birds. The muddy substrate biotope dominated by the common reed (*Phragmites australis*) often occurs in the immediate vicinity of the biotope dominated by sedges and the two biotopes can form a mosaic.  Nutrient levels play a part in affecting the balance between the two biotopes with reed dominated areas favoured by conditions of eutrophication.  Indicators of quality*:*  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. The overall quality and continued occurrence of this habitat is, however, largely dependent on the presence of the emergent plant species which create the biogenic structural complexity on which the characteristic associated communities depend. The density and the maintenance of a viable population of these species is a key indicator of habitat quality, together with the visual evidence of presence or absence of physical damage. In the case of this habitat the situation is further complicated because the reed dominated biotope is favoured by the deterioration of the sedge dominated biotope under conditions of eutrophication.  Characteristic species:  *Phragmites australis, Schoenoplectus* spp.*, Bolbaschoenus maritimus.* |
| Baltic | 38 Epifaunal communities on Baltic infralittoral muddy sediment | This is a Baltic Sea benthic habitat in the photic zone where at least 90% of the substrate is muddy sediment according to the HELCOM HUB classification. No perennial attached erect group, perennial unattached algae or annual algae cover more than 10% of the substrate but there is at least 10% coverage by sessile/semi-sessile epibenthic polychaetes. This habitat is found in low to moderate energy exposure classes. Three associated biotopes have been identified where the dominant species constitute at least 50% of the biomass of the epibenthic bivalves. These are; ‘Baltic photic muddy sediment dominated by Mytilidae’ (AA.H1E1) ‘Baltic photic muddy sediment dominated by Zebra mussel (*Dreissena polymorpha*)’ (AA.H1E2); and  ‘Baltic photic muddy sediment dominated by valve snails (*Valvata* spp.)’ (AA.H1E3).  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Diversity, abundance and biomass of fauna are potential indicators of quality.  Characteristic species:  *Mytilus*spp*., Hediste diversicolor, Gammarus*spp*., Dreissena polymorpha* (depending on the biotope). |
| Baltic | 39 Infaunal communities in Baltic infralittoral muddy sediment - bivalves | This is a Baltic Sea benthic habitat in the photic zone where at least 90% of the substrate is muddy sediment according to the HELCOM HUB classification. Sessile/semi-sessile epibenthic macrofauna are absent and infaunal bivalves dominate the biomass at depths of below approximately 20 m. It is a habitat that is present in conditions of low to moderate exposure to wave action and currents.  Three associated biotopes with different dominant species of bivalves (at least 50% of the infaunal bivalves) and slightly different distributions have been identified. ‘Baltic aphotic muddy sediment dominated by Baltic tellin (*Macoma balthica*)’ (AB.H3L1) is commonly found all parts of the Baltic Sea. ‘Baltic aphotic muddy sediment dominated by ocean quahog (*Arctica islandica*)’ (AB.H3L3) can only be found in the southwestern parts in the Belt Sea where the salinity is > 15 psu and has an optimum depth range of between 25 and 80 m. ‘Baltic aphotic muddy sediment dominated by *Astarte* spp.’ (AB.H3L5) is only found in areas where the near bottom water exhibits a salinity range between 10 and 15 psu, a temperature between 3 and 8oC and relatively good oxygen conditions. It is encountered in the southern and western Baltic Sea, in the southern Baltic Proper, in the Belt Sea and the Sound. As an arctic-boreal species, *Astarte borealis* appears in these Baltic biotopes at its southern limit.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Diversity, abundance and biomass of fauna are potential indicators of quality.  Characteristic species:  *Macoma balthica, Arctica islandica, Astarte spp*. |
| Baltic | 40 Infaunal communities in Baltic infralittoral muddy sediment not dominated by bivalves | This Baltic Sea benthic habitat occurs in the  photic zone with at least 90% coverage of muddy sediment according to the HELCOM HUB classification. Macrovegetation and epibenthic macrofauna are typically absent and the biomass is dominated (at least 50%) by infaunal polychaetes, crustaceans, echinoderms or insect larvae. The associated biotopes occur over a range of depths, from 1m to over 100m, and  different degrees of energy exposure.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change overtime. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Diversity, abundance and biomass of fauna may be used as potential indicators of quality.  Characteristic species:  *Monoporeia affinis, Saduria entomon, Pontoporeia femorata, Corophium volutator*and*Apocorophium lacustre* where crustaceans dominate. Where polychaetes dominate *Polydora ciliata, Lagis koreni, Capitella capitata, Scoloplos (Scoloplos) armiger, Marenzelleria*spp*. (Marenzelleria arctia, Marenzelleria viridis, Marenzelleria neglecta)*; where insect larvae dominate, midge larvae (Chironomidae). |
| Baltic | 41 Sparse or no macrofaunal communities on Baltic infralittoral muddy sediment | This is a Baltic Sea benthic habitat in the photic zone where at least 90% of the substrate is muddy sediment according to the HELCOM HUB classification. It occurs in areas where there is low to medium exposure to wave action. Macrovegetation, epifauna and infauna are generally sparse or absent however the one associated biotope described has a large representation (more than 50% of biomass) of meiofauna. This is ‘Baltic photic muddy sediment dominated by meiofauna (Oligochaeta, Ostracoda, Nematoda)’ (AA.H4U1).  The benthic meiofauna in the Baltic Sea is a diverse group of small animals including Ostracoda, Nematoda, Oligochaeta, Rotifera, Turbellaria and Copepoda living on and in the sediments. In the north-western Baltic Sea Proper, Nematoda are the most abundant group of benthic meiofauna, making up between 67–91% of the species observed in the sediment. Only nematodes are found to be common below 2 cm depth in the sediment. Meiofauna can be split into surface feeders and subsurface feeders. Sedimentation of organic matter may have an effect on the meiofaunal community, as the increased rate of sedimentation can increase the abundance of surface feeding species.  Indicators of quality:  Quality indicators have not been described for this habitat. Generally the ecology of meiofaunal communities is less well understood than that of benthic macrofauna communities. Fewer studies have been carried out and in many studies meiofauna is only stated to be present in a certain abundance. Studies looking into the environmental requirements and species interactions are rare. It is also quite rare that meiofauna is taxonomically identified to species level which is the rule in macrofauna studies.    Characteristic species:  Oligochaeta, Ostracoda, Nematoda |
| Baltic | 42 Epifaunal communities on Baltic circalittoral rock and mixed substrata (predominantly hard) | This is a Baltic Sea benthic habitat in the aphotic zone where at least 90% of the substrate is rock, boulders or stones as well as on mixed (predominantly hard) substrates where the percentage of rock is between 10-90% according to the HELCOM HUB classification. The HELCOM HUB identifies 14 different biotopes associated with the habitat. In each case the dominate species or species group (in the biotope title) constitutes at least 50% of the biomass. These are: epibenthic bivalves, chordates, cnidarians, bryozoans, crustaceans and sponges.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. The amount of sediment covering the hard surfaces and the diversity, abundance and biomass of associated fauna are potential quality indicators for this habitat.  Characteristic species:  For mussel dominated biotopes *Mytilus* spp., *Modiolus modiolus; f*or epibenthic chordate dominated biotopes - seasquirts (Ascidiaceae), such as *Ciona intestinalis*, *Dendrodoa grossularia*, *Molgula* spp., *Corella parallellogramma*, *Ascidia mentula*, *Ascidia virginea* and *Ascidia obliqua;* For epibenthic cnidarians dominated biotopes- *Laomedea* spp., *Cordylophora caspia*, *Edwardsia* spp, *Metridium senile*, *Gonactinia prolifera*, *Urticina felina*, *Stomphia coccinea*, *Sagartia elegans;* for epibenthic moss animal (Bryozoa) dominated habitats. *Electra crustulenta*, *Flustra foliacea*, other Bryozoa (*Eucratea loricata*), also sponges, sea squirts or hydrozoans; for epibenthic crustacean dominated biotopes, Balanidae, for example *Amphibalanus* improvises, *Balanus crenatus*, *Semibalanus balanoides;* for sponge dominated biotopes *Haliclona oculata* and only rarely other species such as *Halichondria panicea*, *Halisarca dujardini* and *Scypha ciliata*. In the northern Baltic Sea only *Ephydatia fluviatilis.* |
| Baltic | 43 Sparse or no macrofaunal communities on Baltic circalittoral rock and mixed substrata (predominantly hard) | The Baltic Sea benthic habitat occurs in the aphotic zone with at least 90% coverage of rock, boulders or stones and mixed (predominantly hard) substrates according to the HELCOM HUB classification. It is typically found in depths of 20 meters or more Where sessile/semi-sessile epibenthic fauna is present they covers less than 10% of the seabed and in some cases no epibenthic vegetation or macrofauna is present. Though the habitat is more uncommon in the Northern Baltic (due to the siltation and prevalence of sand and soft bottoms) it does exist also in the Bothnian Bay where the aphotic zone starts in quite shallow water (5-10 m depth), increasing the amount of rock and hard bottom in the circalittoral zone.  Four associated biotopes have been identified:  Baltic aphotic rock and boulders characterized by sparse epibenthic macrocommunity (AB.A2T); Baltic aphotic mixed substrate characterized by sparse epibenthic fauna (AB.M2T); Baltic aphotic rock and boulders characterized by no macrocommunity ( AB.A4U); and  Baltic aphotic mixed substrate characterized by no macrocommunity (AB.M4U).  Indicators of quality:  Unknown.  Characteristic species:  For sparse epibenthic communities *Mytilus*spp.*Macoma balthica*Bryozoa, Balanidae, Bryozoa, Porifera, Hydrozoa. Where there are no macrocommunities, by meiofauna and bacteria. |
| Baltic | 44 Communities on Baltic circalittoral clay and other hard substrata | This is a Baltic Sea benthic habitat in the aphotic zone with at least 90% coverage of hard clay, marlstonerock, ferromanganese concretions and/or peat according to the HELCOM HUB classification. Hard clay substrates are known to occur mostly in high energy environments. Marlstone rock habitats have only been reported in the Baltic proper, Belt Sea and The Sound, and Ferromanganese concretions in the Baltic Proper, Gulf of Bothnia, Gulf of Finland and Gulf of Riga.  Sessile/semisessile epibenthic bivalves cover of at least 10% of the seabed and no perennial attached erect group has more than 10% coverage in this habitat. In some cases there may be no macrofauna but two associated biotopes with different dominant species of macrofauna have been identified: ‘Baltic aphotic hard clay dominated by Mytilidae’ (AB.B1E1) and ‘Baltic aphotic hard clay dominated by *Astarte* spp.’ (AB.B1E4). The latter is characterised by species preferring cold and saline water with *Astarte* spp. often making up between 70–90% of the total biomass.The near bottom water exhibits a salinity range between 10 and 15 psu, a temperature between 3 and 8°C and relatively good oxygen conditions. For ecological purposes, hard clay can be considered to be a hard substrate. Very few macrofauna species have the capacity to burrow into the substrate.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Diversity, abundance and biomass of the dominant species and associated fauna are potential indicators of quality of this habitat. species and associated fauna are potential indicators of quality of this habitat  Characteristic species:  *Mytilus* spp., *Astarte borealis, Astarte elliptica* |
| Baltic | 45 Epifaunal communities on Baltic upper circalittoral coarse sediment and shell gravel | This is a Baltic Sea benthic habitat in the aphotic zone where at least 90% of the substrate is coarse sediment or shell gravel according to the HELCOM HUB classification. Sessile/semi-sessile epibenthic bivalves/epibenthic chordates cover at least 10% of the seabed and more than other perennial attached erect groups. The habitat typically occurs below 20m and is mostly encountered in high energy exposure areas. In offshore areas shell gravel bottoms are mainly found permanently at the same location whereas closer inshore they are more likely to shift dynamically from one location to another.  Six associated biotopes have been described; ‘Baltic aphotic shell gravel dominated by epibenthic bivalves (AB.E1E) where there is one sub-habitat with a large representation (at least 50% of the biomass) of Mytilidae’ (AB.E1E1) and ‘Baltic photic shell gravel characterised by epibenthic chordates (AB.E1F) with a sub-habitat dominated by vase tunicate (*Ciona intestinalis*) (AB.E1F1)'. The latter, which is only, present in the Belt Sea, occurs in areas where the bottom consists largely of mollusc shells or small shell fragments, often in small patches along with other sediments. Due to the combination of the extended interstitial space and the presence of biotic hard substrates, it is inhabited by a unique combination of endobenthic and epibenthic species, such as the vase tunicate (*Ciona intestinalis*). In these habitats coverage of epibenthic chordates is at least 10% of the sea floor, of which vase tunicate (*Ciona intestinalis*), which is largely annual in the Baltic, often constitutes at least 50% of the biomass. The tunicates might be overgrown by *Ectocarpus* spp. or *Desmarestia* spp. during summer in the photic zone.  There are also associated aphotic shell gravel and coarse sediment biotopes characterised by mixed epibenthic communities (AB.I1V & AB.E1V) by epibenthic bivalves (AB.I1E) and shell gravel characterisied by a sparse epibenthic macrocommunities (AB.E2T).    Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Diversity, abundance and biomass of the dominant. species and associated fauna are potential indicators of quality of this habitat  Characteristic species:  *Mytilus* spp.*, Modiolus modiolus,* *Ciona intestinalis, Hediste diversicolor* |
| Baltic | 46 Infaunal communities in Baltic upper circalittoral coarse sediment and shell gravel dominated by bivalves | This is a Baltic Sea benthic habitat in the upper circalittoral where at least 90% of the substrate is coarse sediment or shell gravel according to the HELCOM HUB classification. The substrate is usually poorly sorted with different proportions of gravel, coarse or medium sand, but may also contain finer sediment fractions. Macrovegetation and epibenthic macrofauna are generally absent and the biomass is typically dominated by infaunal bivalves. This habitat occurs in high energy exposure areas and two associated biotopes with different dominant species of macrofauna (at least 50% of the biomass) have been described.  ‘Baltic aphotic coarse sediment dominated by multiple infaunal bivalve species: *Macoma calcarea, Mya truncata, Astarte* spp.*, Spisula* spp.’ (AB.I3L10) is mainly restricted to small patches between hard substrates on ridges formed by lag sediment and till (e.g. Fehmarnbelt) in the photic and aphotic zone. It supports a high species diversity and high  biomass and only occurs in areas where the salinity exceeds 18 psu as all characteristic bivalve species are eumarine. For this reason it  has only been reported from the Kiel Bight to Isle of Fehmarn, and occasionally present from Mecklenburg Bight to the Darss Sill.  ‘Baltic aphotic coarse sediment dominated by multiple infaunal polychaete species including *Ophelia* spp.’ (AB.I3L11) is an associated biotope where biomass of bivalves still dominates but due to the large variety of interstitial space there is a specialised infauna, e.g., the polychaetes *Ophelia limacina*, *O. rathkei* and *Travisia forbesii*. This biotope is restricted to the Belt Sea (sandbanks) and parts of the ‘submerged belt’ of the Arkona Basin in the south-western Baltic Sea.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values havebeen determined and applied on a location-specific basis. Diversity, abundance and biomass of the dominant. species and associated fauna are potential indicators of quality of this habitat  Characteristic species:  Depending on the biotope ‘*Macoma calcarea, Mya truncata, Astarte* spp*., Spisula spp.’ Ophelia rathkei, Ophelia limacina, Travisia forbesii, Tanaissus* spp. and *Streptosyllis* spp. |
| Baltic | 47 Infaunal communities in Baltic upper circalittoral coarse sediment and shell gravel not dominated by bivalves | This is a Baltic Sea benthic habitat in the upper circalittoral where at least 90% of the substrate is coarse sediment or shell gravel according to the HELCOM HUB classification. Four associated biotopes have been described characterised by mixed infaunal macrocommunities with substrates ranging from coarse and well sorted shells and shell fragments (AB.E3X) to fine shell fragments (AB.E3Y), and also areas where the substrate is predominantly coarse and the biotope characterised by infaunal polychaetes (AB.I3M) or infaunal crustaceans (AB.I3N). In the latter case a sub-habitat identified by a large representation of *Bathyporeia pilosa*, which constitutes at least 50% of the biomass of the infaunal crustacean has also been described.  The habitat occurs in high energy areas, typically below 20m and for the coase sediments more usually below 30m. The community composition of macroinfauna is presumed to be different in the sand like shell gravel sand compared to coarser shell gravel of mainly semi-intact shells. These substrates support many different animals including non-burrowing animals but where the interstitial space is smaller burrowing polychaetes and amphipods can build tunnels using the small grains. The biotopes on shell gravel have a restricted distribution in the Baltic, especially where the substrate is comprised of  fine sand-like shell fragments as this has only been reported from The Belt Sea.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values havebeen determined and applied on a location-specific basis. Diversity, abundance and biomass of the dominant. species and associated fauna are potential indicators of quality of this habitat  Characteristic species:  For the biotope AB.I3M: polychaetes mainly of the family Spionidae (*Pygospio elegans, Streblospio shrubsoli*), and for the biotope AB.I3N *Bathyporeia pilosa.* |
| Baltic | 48 Sparse or no macrofaunal community on Baltic upper circalittoral coarse sediment and shell gravel | This is a Baltic Sea benthic habitat in the upper circalittoral where at least 90% of the substrate is coarse sediment or shell gravel according to the HELCOM HUB classification. It is typically encountered in depths below 30 m in high energy exposure areas. Macrofauna, epifauna and infauna are generally sparse or absent. Where the habitat is dominated by meiofauna’ (AB.I4U1) they constitute at least 50% of the biomass.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values havebeen determined and applied on a location-specific basis.  Characteristic species:  In the biotope dominated by meiofauna the main species groups present are Oligochaetes, Ostracods and Nematodes. |
| Baltic | 49 Epibenthic communities in Baltic upper circalittoral mixed sediment | This is a Baltic Sea benthic habitat in the aphotic zone. The substrate is a mix of  soft or crystalline rock, boulders or stones mixed with mobile substrates such as sand or coarse substrate as well as muddy sands as defined in the HELCOM HUB classification. It typically occurs in depths from 20-150m and seven associated biotopes have been described, some of which are more common in particular depth zones. The biotopes are variously characterised by epibenthic bivalves, chordates, cnidarians (soft corals and sea anemones), bryozoans, crustaceans, sponges and a mixed epibenthic macrocommunity. Some occur in all the sub-basins of the Baltic Sea whereas as others, such as aphotic mixed substrates characterised by epibenthic sponges, are only reported from the Belt Sea and the Gulf of Bothnia. Depending on the dominant species the biotope may either be encrusting or form a layer of living material extending 20cm about the substrate.    Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Diversity, abundance and biomass of fauna are potential indicators of quality.  Characteristic species:  The characteristic species differ depening on the dominant biotope. They include ; *Mytilus* spp. and *Modiolus modiolus;* Ascidians, such as *Ciona intestinalis, Dendrodoa grossularia, Molgula* spp., *Corella parallellogramma, Ascidia mentula, Ascidia virginea*and *Ascidia obliqua;*epibenthic cnidarians *Laomedea* spp., C*ordylophora caspia, Edwardsia spp, Metridium senile, Gonactinia prolifera, Urticina felina, Stomphia coccinea, Sagartia elegans;* bryozoans *Electra crustulenta, Flustra foliacea,* *Eucratea loricata*) as well as barnacles *Amphibalanus improvises, Balanus crenatus, Semibalanus balanoides and sponges* such as  *Haliclona oculata*. |
| Baltic | 50 Infaunal communities in Baltic upper circalittoral mixed sediment | This habitat occurs in the Baltic on aphotic bottoms with 10- 90% coverage of hard (rock/boulders/stone) and 10-90% soft substrata (e.g. muddy/coarse sediment/sand) according to the HELCOM HUB classification.  Indicators of quality:  None indentified  Characteristic species:  None identified |
| Baltic | 51 Sparse or no macrofaunal community in Baltic upper circalittoral mixed sediment | This Baltic Sea benthic habitat occurs in the aphotic zone with 10- 90% coverage of hard (rock/boulders/stone) and 10-90% soft substrata (e.g. muddy/coarse sediment/sand) according to the HELCOM HUB classification. Sessile/semi-sessile epibenthic fauna are present but cover less than 10% of the seabed or absent. It is typically present in a depth zone of  20 to 100 m.    Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change overtime. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Mytilus*spp.,*Macoma balthica* may be present but this habitat is characterised by a scarce epibenthic  fauna. |
| Baltic | 52 Epifaunal communities of Baltic upper circalittoral sand | This is a Baltic Sea benthic habitat in the photic zone where at least 90% of the substrate is sand according to the HELCOM HUB classification. Sessile/semi-sessile epibenthic communities, including those dominated by bivalves, cover at least 10% of the seabed. It is typically found at depths below approximately 30 m in high energy exposure areas. One associated biotope has been described (AB.J1E1) which is characterised by a large representation of Mytilidae. These make up at least 50% of the biomass of the epibenthic bivalves present.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. The amount of sediment covering the hard surfaces and the diversity, abundance and biomass of associated fauna are potential quality indicators for this habitat.  Characteristic species:  *Mytilus* spp., *Hediste diversicolor* |
| Baltic | 53 Infaunal communities of Baltic upper circalittoral sand dominated by bivalves | This Baltic Sea benthic habitat occurs in the aphotic zone in high energy exposure areas with at least 90% coverage of sand according to the HELCOM HUB classification. Typically no macrovegetation or epibenthic macrofauna are present and infaunal bivalves make up at least 10% of the biomass.  Seven associated biotopes with different dominant species (at least 50% of the biomass) of macrofauna have been identified. These include the Baltic tellin (*Macoma balthica*) the ocean quahog (*Arctica islandica)* and the sand gaper (*Mya arenaria).*The dominance structure might vary considerably between stations and the substrate contains different proportions coarse or medium sand, but may also contain finer or coarser sediment fractions. The associated biotopes may also have some differences in distribution. For example ‘Baltic aphotic sand dominated by multiple infaunal polychaete species including *Ophelia* spp.’ (AB.J3L11) is restricted to the Belt Sea (sandbanks) and parts of the ‘submerged belt’ of the Arkona Basin in the western Baltic Sea; the biotope ‘Baltic aphotic sand dominated by multiple infaunal bivalve species: *Macoma calcarea*, *Mya truncata*, *Astarte* spp., *Spisula* spp.’ (AB.J3L10) is encountered in the western Baltic Sea, from the Kiel Bight to Isle of Fehmarn, and might occasionally occur from Mecklenburg Bight to the Darss Sill.  Characteristic species:  *Arctica islandica*, *Macoma balthica*, *Cerastoderma* spp., *Mya arenaria*, *Astarte* spp. In the case of ‘Baltica photic sand dominated by multiple infaunal bivalve species: *Macoma calcarea,* *Mya truncata*, *Astarte* spp., *Spisula spp.*’ (AB.J3L10) *Macoma calcarea*, *Mya truncata,* *Astarte* spp. and *Spisula* spp., additionally other marine bivalves like *Thracia* spp, *Phaxas pellucidus* and *Arctica islandica*. In the case of ‘Baltica photic sand dominated by multiple infaunal polychaete species (AB.J3L11) the dominating bivalve species *Arctica islandica* and *Astarte* spp. are characteristically accompanied by polychaete species like *Ophelia rathkei*, *Ophelia limacina,* *Travisia forbesii* and *Streptosyllis spp*.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change overtime. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Diversity, abundance and biomass of fauna my be indicators of quality for this habitat. |
| Baltic | 54 Infaunal communities of Baltic upper circalittoral sand not dominated by bivalves | This habitat occurs on Baltic aphotic bottoms with at least 90% coverage of sand according to the HELCOM HUB classification. Sessile/semi-sessile epibenthic macrofauna are generally not present while the biomass of infauna is typically dominated by polychaetes, crustaceans, or insect larvae. This habitat is encountered in sand typically at depths below 30m in moderate to high energy exposure areas. Three associated biotopes have been identified variously characterised by infaunal polychates (*Pygospio elegans, Marenzelleria spp. and Hediste diversicolor*), crustaceans (*Monoporeia affinis*and*Saduria entomon)*or midge larvae (Chironomidae). These species groups constitute at least 50% of the biomass.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change overtime. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Diversity, abundance and biomass of fauna are potential indicators of quality.  Characteristic species:  *Pygospio elegans, Marenzelleria* spp*., Hediste diversicolor, Ophelia* spp*., Travisia forbesii*, *Monoporeia affinis*, *Saduria entomon* and insect larvae *(*Chironomidae). |
| Baltic | 55 Sparse or no macrofaunal communities in Baltic upper circalittoral sand | This Baltic Sea benthic habitat occurs in the aphotic zone where there is least 90% coverage of sand according to the HELCOM HUB classification.  Macrofauna, epifauna and infauna are sparse or absent. It is typically present below depths of 30m and occurs in high energy exposure areas. One associated biotope has been identified: ‘Baltic aphotic sand dominated by meiofauna’ (AB.J4U1). This occurs in all wave exposure classes and is identified by a large representation of meiofauna (for example Oligochaeta, Ostracoda, Nematoda, Copepoda), which constitutes at least 50% of the biomass. In the Gulf of Bothnia nectobenthic Mysidae can be associated with the biotope, and Mysidae can also appear in benthic grab-samples.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change overtime. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Oligochaeta, Ostracoda, Nematoda, Copepoda. In the Gulf of Bothnia *nectobenthic Mysidae* can be associated with the habitat, and Mysidae can also appear in benthic grab-samples. |
| Baltic | 56 Epifaunal communities of Baltic upper circalittoral muddy sediment | This is a Baltic Sea benthic habitat in the aphotic zone where at least 90% of the substrate is  muddy sediment according to the HELCOM HUB classification. Sessile/semi-sessile epibenthic species cover at least 10% of the seabed and it is typically found below approximately 20 m in low to moderate energy exposure conditions. Six different biotopes associated with this habitat have been described. These are characterised by epibenthic bivalves, crustaceans, polychaetes and cnidarians, as well as biotopes with a mixed or sparse epibenthic community. Some of these biotopes have a restricted distribution in the Baltic e.g. those characterised by epibenthic polychaetes, or which have a sparse epibenthic macrocommunity which are only reported from The Belt Sea and The Sound. Aphotic muddy sediments characterised by epibenthic cnidarians are present in all the Baltic Sea sub-basins.  Water movement is relatively limited in deep muddy areas and this creates a favourable environment for small tube-building amphipods such as *Haploops* spp. which can  be visible as a dense mat of tubes on the surface of the sediment. These are important feeding grounds for many species of fish including cod. Where seapens such as *Virgularia mirabilis* and *Pennatula* *phosphorea* dominate the epibenthos, for example in parts of the Kattegat trench and the Djupa Rännan trench, they also provide food and shelter for many other species, including commercially imporant fish.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. The amount of sediment covering the hard surfaces and the diversity, abundance and biomass of associated fauna are potential quality indicators for this habitat.  Characteristic species:  There are different characteristic species depending on the biotope. These include *Mytillus* spp.  *Hediste diversicolor*, *Gammarus*spp.. *Haploops* spp., the Ostracod *Philomedes brenda,* the brittlestar *Ophiura robusta,*several species from the taxa Maldanidae and Terebellida, the seapens *Virgularia mirabilis*and *Pennatula phosphorea.* |
| Baltic | 57 Infaunal communities of Baltic upper circalittoral muddy sediment dominated by bivalves | This habitat occurs on Baltic Sea aphotic bottoms with at least 90% coverage of muddy sediment according to the HELCOM HUB classification. Sessile/semi-sessile epibenthic macrofauna is not present and the biomass of infaunal bivalves dominates. The habitat generally occurs below a depth of approximately 20 m in locations of energy exposure. Three associated biotopes have been identified with different species of bivalves dominating (more than 50% of the biomass). These are: ‘Baltic aphotic muddy sediment dominated by Baltic tellin (*Macoma balthica*)’ (AB.H3L1); ‘Baltic aphotic muddy sediment dominated by ocean quahog (*Arctica islandica*)’ (AB.H3L3); and ‘Baltic aphotic muddy sediment dominated by *Astarte*spp.’ (AB.H3L5). These biotopes have slightly different distributions in the Baltic because of different temperature and salinity preferences of the associated dominating species. For example as an arctic-boreal species, *Astarte borealis*appears in these Baltic biotopes at its southern limit. It is resistant to anoxic conditions, however recurring and long lasting anoxia is fatal.The biotope dominated by the ocean quahog (*Arctica islandica*) can only be found in the southwestern parts in the Belt Sea where the salinity is high. Compared to shallow bottoms, the deep muddy bottoms are structurally relatively monotonous therefore the large shells of *Arctica islandica* increase the complexity of the habitat. It plays an important role as a biomass producer, enhancer of benthopelagic coupling, reducer of water turbidity, and ecosystem engineer as well as being among the longest-lived and slowest growing marine bivalves.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Diversity, abundance and biomass of fauna are potential indicators of quality and, in the case biotopes dominated by *M. baltica,* the presence of a full size range of individuals in the population.  Characteristic species: *Macoma balthica, Arctica islandica, Astarte*spp. |
| Baltic | 58 Infaunal communities of Baltic upper circalittoral muddy sediment not dominated by bivalves | This habitat is distributed on Baltic aphotic bottoms with at least 90% coverage of muddy sediment according to the HELCOM HUB classification. Sessile/semi-sessile epibenthic macrofauna are generally not present and infaunal polychaetes/crustaceans/echinoderms/or insect larvae dominate in terms of biomass. This habitat typically occurs below approximately 20 m depth and is present in all energy exposure classes and in all the Baltic sub-basins. Four  associated biotopes have been identified: these are characterized by infaunal polychaetes where species such as *Polydora ciliata, Lagis koreni, Capitella capitata, Scoloplos (Scoloplos) armiger*constitute at least 50% of the infaunal biomass; by infaunal crustaceans  where the benthic amphipods *Monoporeia affinis*and/or*Pontoporeia femorata* dominate*;* or where insect larve where (Chironomidae) or echinoderms dominate the biomass. *M. affinis* is an important food source for several fish species, such as cod (*Gadus morhua*), herring (*Clupea harengus*), smelt (*Osmerus eperlanus*) and fourhorn sculpin (*Myoxocephalus quadricornis*). In favourable conditions, *M. affinis* and *Pontoporeia femorata* can occur in great abundances, even several thousand individuals per square meter.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Diversity, abundance and biomass of fauna may be indicators of quality.  Characteristic species:  *Polydora ciliata, Lagis koreni, Capitella capitata, Scoloplos (Scoloplos) armiger, Marenzelleria arctia, Marenzelleria viridis, Marenzelleria neglecta.* In biotopes characterized by infaunal crustaceans – *Monoporeia affinis, Saduria entomon*and *Pontoporeia femorata*. In biotopes characterized by insect larvae Chironomidae and in biotopes characterized by infaunal echinoderms *Amphiura filiformis, Brissopsis lyrifera*and *Amphiura chiajei.* The isopod *Saduria entomon* often occurs in this biotope. |
| Baltic | 59 Sparse epibenthic community of Baltic upper circalittoral muddy sediment | This Baltic Sea benthic habitat occurs in the aphotic zone where there is at least 90% coverage of muddy sediment according to the HELCOM HUB classification. Sessile/semi-sessile epibenthic fauna is present but covers less than 10% of the seabed. One associated biotope has been identified: ‘Baltic aphotic muddy sediment dominated by seapens’ (AB.H2T1). This is characterized by conspicuous populations of seapens that usually live scattered over the sea floor but usually cover less than 10% of the muddy surface. It occurs typically from 15 to 200 meters depth in low to moderate energy exposure classes in the highest salinity regions of the Baltic (up to 23 psu in The Sound). These deep water communities are crucially important to the function of the ecosystem. They provide food and shelter for many other species, including commercially important fish.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Diversity, abundance and biomass of fauna are suggested quality parameters including the presence of seapens which are both characterstic of this habitat and vulnerable to the most significant pressures.  Characteristic species:  In the Baltic Sea the most common seapens associated with this habitat are *Virgularia mirabilis* and *Pennatula phosphorea*. *Virgularia mirabilis* is found in sheltered areas where the seabed comprises soft sediments such as fine, muddy sand or mud in depths below 10 meters. It lives partly embedded in the sediment and can form colonies up to 60 cm tall.*Pennatula phosphorea* forms erect colonies up to 40 cm tall. |
| Baltic | 60 Sparse or no macrocommunities of Baltic upper circalittoral muddy sediment | This Baltic Sea benthic habitat occurs in the aphotic zone in areas with at least 90% coverage of muddy sediment. The sediment must contain at least 20% of mud, silt or clay (grain size less than 63 μm). The associated biotope is : ‘Baltic aphotic muddy sediment dominated by meiofauna (AB.H4U1) although when degraded this may be represented by ‘Baltic aphotic muddy sediment dominated by anerobic organisms (AB.H4U2). The balance between the two depends on whether conditions are aerobic or anerobic and deterioration in the former biotope may result in the habitat being dominated by the latter (anerobic) biotope more typical of degraded conditions.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Unknown |
| Baltic | 61 Communities of Baltic lower circalittoral soft sediments (mud and sand) | This is a Baltic Sea benthic habitat in the aphotic zone, comprising areas of soft sediment, predominantly mud, below the halocline . The upper water layer is separated from the more saline deepwater layer by a permanent halocline located at depths of about 70-100 m (there is no halocline in the shallower areas in the northeastern Baltic). The strong permanent halocline and seasonal thermocline in summer limits vertical mixing of the water column leading to the formation of oxygen-depeted zones in the deep areas of the central Baltic. The pycnocline in the Baltic occurs around 80m of depth and below this hypoxia and anoxia occur almost permanently. Salinity has risen since early records at the beginning of the 20th century and increasing stability of the halocline restricts water exchange between the more saline bottom layer and overlying water masses. The environmental conditions of the deep zone of the Baltic are not uniform but vary widely in terms of salinity (14-21 ppt) and oxygenation (3-80% saturation). The conditions depend in the first instance on influxes, which are very irregular, which renew the deep waters with oxygen. Between 1948-52, for example, when there was frequent renewal of deep waters, worms such as *Halicryptus spinulosus* and *Scoloplos armiger* were present whereas during 1956-57 lack of influxes led to the extinction of the fauna in the deeper parts of the Bornholm and Gdansk Deeps. The three deep basins in the central Baltic are the Bornholm Basin, Gdansk Deep and Gotland Basin. In the Bornholm Basin, the Central Basin and the Gulf of Finland, the bottom layer is separated from the surface layer by a permanent halocline. During periods of stagnation this separation gives rise to an oxygen deficit and periodically to complete oxygen depletion and formation of hydrogen sulphide. The result is a total disappearance of macrofauna in the deepest part of these basins. In places there is a constant oxygen poor zone which is virtually devoid of macrofauna and has an extremely improvershed meiofauna, which generally consists of only a few thousand nematodes per square meter. Comparison of the persistence of the soft bottom macrofauna in the deeper parts of the Baltic between areas that the communities of the Gulf of Bothnia are the most stable, while those of the Bornholm and Gdansk Deeps vary strongly, mainly owing to the periodic oxygen deficit. Physical forcing can remedy deoxygenation effects of eutrophication through enhanced vertical mixing. The Slupsk furrow differs from other deep water areas of the Baltic Proper in both the salinity and oxygen content. All the remaining deep areas (the Bornholm, Gdansk and Gotland Deeps) are plagued by periodic oxygen depletion and/or the presence of H2S in the near-bottom water. At present the Slupsk furrow is the only part of the Baltic Proper where bottom areas below the isohaline water layer are inhabited by a number of marine species which take advantage of the relatively high salinity and acceptable oxygen content.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Where there is sufficient oxygen and elevated salinity – Copepods (Harpacticoida) e.g. L*aophonte baltica, Amphiascoides dispar*and*Kliopsyllus constrictus*. In the deeps around Gotland the polychaetes *Scoloplos arminger* and where the substrate is predominantly clay *Pontoporeia femorata* and *Terebellides stroemi.* |
| Black Sea | A1.15 Pontic Supralittoral Rock | This habitat occurs in the rocky supralittoral zone (depth 0-5 m). It exists where the upper supralittoral rock is colonised by yellow lichens and cyanobacteria such as *Lyngbia* sp. and the lower supralittoral rock is colonised by encrusting black lichens, littorinids, isopods and barnacles. In locations of freshwater runoff and where nitrate levels are elevated the rock surfaces may be coated with green algae and a film of cyanobacteria.  Indicators of quality:  Species composition – presence of littorinid gastropod *Melaraphe neritoides*, isopod *Ligia italica,* barnacle *Chthamalus stellatus* as well as a high density of these species are indicative of a good quality habitat.  Characteristic species:  Cyanobacteria, algae and lichens are characteristic of this habitat. Typical species of cyanobacteria are *Lingbya lutea*, *L.semiplena*, and *L.confervoides*which create the olive slime covering the habitat in wet (exposed) conditions. Characteristic algae include *Feldmannia irregularis*, and *Urospora penicilliformis*and the lichens *Xanthoria*spp., *Caloplaca*spp., *Calothri*x spp., *Brachytrichia*spp., *Verrucaria*sp. Typical invertebrates which may be present include the littorinid gastropod *Melaraphe neritoides*, the isopod *Ligia italica,*and the barnacle *Chthamalus stellatus.*The terrestrial snail *Myosotella myositis*is sometimes (rarely) found under stones in this habitat. |
| Black Sea | A1.16 Invertebrate-dominated exposed Pontic mediolittoral rock | This habitat, which occurs in the exposed mediolittoral rock zone  in the microtidal Black Sea (tide range approx. 0.3 m), is limited to a narrow strip which receives regular but not continuous submersion. In such situations the abiotic conditions (i.e. waves, variations in atmospheric pressure and variations in wind) define the species composition. These conditions mean that there are few associated species and those which are present are typically encrusting, tolerant to desiccation, and capable of very firm attachment. They include barnacles, lichens and small mussels. Crabs may be found in sheltered crevices.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure, as well as more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Four distinct biotopes comprising different assemblages of invertebrates occur in the mediolittoral rock zone.  1. *Chthamalus stellatus, Melaraphe neritoides, Ligia italica, Mytilaster lineatus* occurs in exposed conditions on tall rocky coasts made up of volcanic or metamorphic rock, mostly on the Southern Bulgarian and Caucasus coasts.  2. *Diadumene lineata* and barnacles (*Chthamalus stellatus, Amphibalanus improvisus* ) is  the one most commonly occurring all around the Black Sea, on all types of rocky coasts.  3.*Patella* spp. occurs only on the Turkish coast of the Black Sea due to the somewhat higher salinity that can be found here.  4. Encrusting corallines (*Lithothamnion, Lithophyllum*) and *Lepidochitona caprearum* are characteristic of rocky coasts made of sedimentary rock (limestone, calcarenite), especially in shaded conditions. |
| Black Sea | A1.1xx Invertebrate-dominated moderately exposed Pontic mediolittoral rock | These communities are located in the moderately exposed mediolittoral rock zone. They result from a combination of moderate waves, variations in atmospheric pressure, and variations in wind.  This habitat is comprised of all invertebrate communities found in the moderately exposed mediolittoral rock zone.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Mytilids (Mytilus galloprovincialis, Mytilaster lineatus), barnacles (Chthamalus stellatus, Amphibalanus improvisus), Actinia equina, bryozoans, crust sponges and articulated corallines (Corallina elongata, C. officinalis). |
| Black Sea | A1.1xx Pontic exposed lower mediolittoral barren rock | In the Black Sea the lower mediolittoral rock is a narrow zone located just below the swash zone and is covered by water most of the time. This habitat is comprised of all exposed barren rock. Typically these areas are scoured by sand and rock resulting in areas lacking both faunal and floral communities.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Due to the barren nature of this habitat no characteristic species are present. |
| Black Sea | A1.1xx Turf algae on Pontic exposed lower mediolittoral rock | Exposed bedrock and boulders with algal turf cover in the lower mediolittoral zone. High and constant humidity, strong wave action and strong light are the dominant environmental factors for this habitat. In the Black Sea the lower mediolittoral rock is a narrow zone located in the lower part of the swash zone and is covered by water most of the time.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality, including: the presence of characteristic species and those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressures; and indices of habitat structure and function such as trophic index or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although some parameters may have been established in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Urospora penicilliformis, Bangia atropurpurea, Nemalion helminthoides, Cladophora laetevirens, Feldmannia irregularis, Gelidium pusillum/Gelidium crinale*, Ceramiales (Ceramium-Polysiphonia), *Laurencia, Ceramium virgatum, Corallina* spp. and *Grateloupia dichotoma*. |
| Black Sea | A1.1xx- Turf algae on Pontic moderately exposed lower mediolittoral rock. | Moderately exposed bedrock and boulders in the lower mediolittoral zone with a cover of algal turf. High and constant humidity, strong wave action and strong light are the dominant environmental factors for this habitat. In the Black Sea lower mediolittoral rock is a narrow zone located in the lower part of the swash zone and is covered by water most of the time. The habitat is found on rocky coasts in relatively pristine conditions.  Indicators of quality:  There are no known commonly agreed indicators of quality for this habitat, although particular parameters may be set in certain situations, e.g. protected features with Natura 2000 sites, where reference values may have been determined and applied on a location-specific basis. Some potential indicators of quality for this specifc habitat are the cover of corallines (erect and crustose; >80%), height of erect corallines (>25 mm), lack of ephemeral green and red algae and cyanobacteria.  Characteristic species:  Encrusting corallines *Lithophyllum incrustans*, articulated corallines *Corallina officinalis* and ephemeral macrophytes like *Ulva compressa*, *Cladophora* sp. and Ceramiales make up the algal cover. Characteristic fauna includes the chiton *Lepidochitona caprearum,* the limpet *Patella caerulea,* barnacles *Balanus improvisus,* anemones *Diadumene lineata,* mussels *Mytilaster lineatus* and *Mytilus galloprovincialis*, bryozoans, amphipod (*Hyale pontica*, *Ampithoe ramondi*) and isopod (*Idotea balthica*, *Sphaeroma pulchellum*) crustaceans, and the crabs *Pachygrapsus marmoratus* and *Eriphia verrucosa*. If the water is clean *Corallina* and *Mytilaster* may form dense turfs/belts, with sparse cover of other algae (Ceramiales, *Porphyra leucosticta, Ulva rigida, Scytosiphon lomentaria).* In degraded, enriched areas *Mytilus galloprovincialis* and *Balanus improvisus* dominate, with some cover of the algae *Cladophora vagabunda, Cladophora laetevirens, Ulva compressa, Ulva intestinalis,* and *Ulothrix flacca.* |
| Black Sea | A1.3x Sheltered Pontic mediolittoral rock | The habitat is located at 0-0.5 m deep on soft rocks (such aschalk,  marl and hard clay) into which habitat forming species can burrow. Empty burrows are often utilized by other invertebrate and fish species. This habitat occurs in sheltered situations.  Indicators of quality:  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Piddock (*Pholas dactylus*) beds |
| Black Sea | A1.42 Pontic mediolittoral rock pools | Rockpools occur where the topography of the shore allows seawater to be retained within depressions in the bedrock producing 'pools' on the retreat of overwashing waves. Alternatively seawater might be circulated by the surge through channels in the rock. As rockpool communities are permanently submerged they are not directly affected by height on the shore and normal rocky shore zonation patterns do not apply. For this reason rockpools have been dealt with as a separate habitat type, apart from the scheme of wave exposure and shore height. Four main rockpool habitat subtypes have been described:  A1.422  Pontic Upper mediolittoral shallow rockpools with green algae (*Ulva* spp. and *Cladophora* spp.)  A1.415 Pontic Upper mediolittoral deep rockpools with juveniles of *Mytilus galloprovincialis* and *Pachygrapsus marmoratus*  A1.41A Pontic Mediolittoral rockpools with anemones (*Actinia equina* and *Diadumene lineata*)  A1.41B Pontic Mediolittoral rockpools with articulated corallines and Ceramiales.  Indicators of quality:  Suitable biotic indicators of quality include: *Gobiesocida*e,  *Diadumene lineata* and crabs *Pachygrapsus marmoratus, Eriphia verrucosa* . Suitable abiotic indictors of quality include: water clarity and nutrient levels. There is insufficient information to set indicator thresholds required for monitoring purposes.  Characteristic species:  Species typically found in Pontic mediolittoral rockpools include *Cladophora, Ulva,* Ceramiales and Corallinales. Also present are *Mytilus, Mytilaster, Pachygrapsus, Actinia equina, Diadumene lineata* and small fish. |
| Black Sea | A1.44 Pontic mediolittoral caves and overhangs | Where caves and overhangs occur on rocky shores, the shaded nature of the habitat diminishes the amount of desiccation suffered by biota during Aeolian periods of low water which allows certain species to proliferate. In addition, the amount of scour, wave surge, sea spray and penetrating light determines the unique community assemblages found in upper, mid- and lower shore caves and overhangs on the lower shore. All around the Black Sea this habitat type occurs in the Sarmatian limestone cliffs in Russia, Ukraine, Romania, Bulgaria and Turkey. It may also occur in volcanic and metamorphic rocks, such as Maslen Nos Cape in Bulgaria. The height of the entrance varies from 50 cm up to 25 m depending on the strength of the waves. The length of the water gallery is between 3 and 50 m and is sometimes followed by dry or semi-dry galleries with sand, gravel and larger stones. Natural light does not reach the inner reaches of the longest caves. The temperature strongly depends on the situation outside the cave, although fluctuations are smaller and no extremely high or low values have been recorded.  Indicators of quality:  Biotic indicators of good quality include the presence of sponge assemblages and the abundance and extent of sponge crusts. Abiotic indictors of good quality include water quality (i.e. low nutrients: N, P) and absence  of rubbish. There is insufficient information to set indicator thresholds required for monitoring purposes.  Characteristic species:  During the warm season some of the larger caves are inhabited by colonies of bat species (*Miniopterus schreibersii*, *Myotis blythii*, *Myotis. myotis* and *Myotis. capaccinii*). Birds may often also nest at the entrance of the caves. Caves with sandy underground banks were once regularly inhabited by the Monk Seal (*Monachus monachus*), which is now extinct in the Black Sea. The marine part of the caves is covered by invertebrate- dominated communities. Sciaphilic algae is only present at or near the entrance, where there is still some, albeit diminished, light. Most frequent at the entrance are the red alga *Phyllophora crispa* and the brown alga *Zanardinia typus,* while inside the cave only encrusting algae (*Hildenbrandia*, *Lithophyllum*, *Phymatolithon*) occur. The completely dark interior is dominated by either hydrozoan and bryozoan turfs or extensive sponge crusts (erect sponges *Halichondia, Haliclona*, *Dysidea* spp. or thin crust sponges), depending on current intensity. |
| Black Sea | A2.132 Pontic mediolittoral cobbles and gravels | This mediolittoral habitat is found in areas of coarse sediment (shingle, cobbles, gravels, shells etc.). These develop in areas of high energy (currents or wave action). As the sediment is quite coarse it typically does not support large volumes of marine life. There may be accumulations of shell hash, for example of *Cerastoderma*, *Mya* and other molluscs.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species and those which are sensitive to the pressures the habitat may face; water quality parameters; and levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Few species present. |
| Black Sea | A2.2x Pontic mediolittoral sands | This habitat occurs in the mediolittoral zone in areas of coarse, medium and fine sands. It is typically exposed, moderately exposed or sheltered from wave action.  The dominant environmental conditions which define the sediment characteristic and species composition are high levels of physical disturbance from wave action, wide temperature variability, and periods of desiccation. In the microtidal Black Sea (tidal range of about 0.3 m) this habitat is limited to narrow beach strip covered by the swash.  Community composition depends on grain size and origin of sand (siliceous/calcareous, biogenic/abiogenic) with three associated biotopes distinguished. Diversity is usually low due to high physical disturbance from wave action but abundances may be high.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species and those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  The biotope associated with coarse and medium sands of exposed to moderately exposed beaches is inhabited by large numbers of the burrowing wedge clam *Donacilla cornea,* *Donacilla* distribution is normally strictly limited to the beach strip covered by the swash and only exceptionally it may extend towards the infralittoral to an approximate depth of 3 m – an area usually inhabited by *Donax trunculus*. Another characteristic species is the infaunal polychaete *Ophelia bicornis* which occupies the upper swash zone and the mysid shrimp *Gastrosaccus sanctus*. Typical interstitial species are the crustaceans *Eurydice dolfusi, Gastrosaccus sanctus,* and the polychaetes *Nerine cirratulus, Saccocirrus papillocercus, Pisione remota, Hesionides arenaria*.  A second biotope occurs on the sheltered shores of lagoons and estuaries from Crimea and Taman peninsula, where *Donacilla* occurs in a very narrow swash zone in muddy sands with significant organic load, together with polychaetes like *Hediste diversicolor* and *Alitta succinea*.  A third biotope occurs in marine situations in fine siliceous sands (freshwater-influenced) where the amphipod *Pontogammarus maeoticus* is highly abundant, while *Donacilla* and *Ophelia* disappear. |
| Black Sea | A2.32 Polychaete/oligochaete-dominated upper estuarine Pontic littoral mud | Upper estuarine sandy mud and mud shores, in areas with significant freshwater influence. Littoral mud typically forms mudflats, though dry compacted mud can form steep and even vertical structures, particularly at the top of the shore adjacent to saltmarshes. Little oxygen penetrates these cohesive sediments, and an anoxic layer is often present within millimetres of the sediment surface.  There are three oligochaete dominated upper estuarine mud biotopes variously dominated by polychaetes, oligochaetes and chironomids. The Pontic ‘Camca’ biotope which is associated with this habitat is unique to Danube River mouths.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species and those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure  and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  The upper estuarine mud communities support few infaunal species and are principally characterised by a restricted range of polychaetes and oligochaetes. Chironomids are present in the upper estuary where fresh water conditions are prevalent. |
| Black Sea | A2.42 Communities of Marmara littoral mixed sediment | Shores of mixed sediments ranging from muds with gravel and sand components to mixed sediments (pebbles, gravels, sands and mud in more even proportions). By definition, mixed sediments are poorly sorted. Similarly, there is unlikely to be an easily defined boundary between areas of mixed sediment with stable cobbles and boulders, and boulder fields which fall into the rocky shore category. Stable large cobbles or boulders may be present, which support epibiota such as fucoids and green seaweeds more commonly found on rocky and boulder shores. Mixed sediments which are predominantly muddy tend to support infaunal communities, which are similar to those of mud and sandy mud shores. Habitats with sheltered gravelly sandy mud, subject to reduced salinity, mainly on the mid and lower shore, may have an abundant community of ragworms *Hediste diversicolor*.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of particular species, water quality parameters, levels of exposure to a particular exposure as well as more integrated indices which describe habitat function and structure, such as trophic index, or successful stages of development in habitats that have a natural cycle of change over time. There are no known commonly agreed indicators of quality for this habitat, although particular parameters may be set in certain situations, e.g. protected features with Natura 2000 sites, where reference values may have been determined and applied on a location-specific basis. Some potential indicators of quality which can be used are the presence and abundance of indicated characteristic species.  Characteristic species:  *Ulva rigida*, *Aphelochaeta marioni, Capitella capitata, Cirriformia tentaculata, Sphaerosyllis taylori, Ostrea edulis, Cerastoderma edule, Hexaplex trunculus, Aora gracilis, Melita palmata, Microprotopus maculatus, Abra nitida, Pygospio elegans*, *Corophium volutator, Diogenes pugilator, Psidia bluteli, Pisidia longimana* and *Xantho poressa.* |
| Black Sea | A3.13 Exposed Pontic upper infralittoral rock with turf of Corallinales | Rocky habitats in the infralittoral zone exposed to wave action. Rocks, boulders and blocks are typically covered with a dense turf of articulated corallines and/or crustose corallines. These habitats occur on exposed rocky coasts, from low water up to depths of 3m.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of characteristic species and species sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Articulated corallines (*Corallina elongata, Corallina officinalis*) and crustose corallines (*Lithothamnion* spp, *Lithophyllum* spp.). |
| Black Sea | A3.15 Mytilid-dominated Pontic exposed upper infralittoral rock with foliose algae (other than Fucales) | Rocky habitats in the infralittoral zone exposed to wave action. Rocks are typically covered foliose algal communities. Mytilids are a constant component. These habitats occur on exposed rocky coasts, from low water up to depths of 10m. Winter storms may cause changes to species compositions and coverage.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Characteristic species includes: *Mytilus galloprovincialis*, *Mytilaster lineatus*, *Lophosiphonia obscura*, *Ceramium ciliatum*, *Padina pavonica*, *Grateloupia dichotoma*, *Dilophus fasciola*, *F. repens*, *Polysiphonia opaca*, *Ceramium ciliatum*, *Ulva compressa*, *Ulva intestinalis*, *Ulva linza.* |
| Black Sea | A3.1x Mytilid-dominated Pontic exposed upper infralittoral rock with Fucales | Rocky habitats in the infralittoral zone subject to strong wave action. Rocks are typically covered with Fucales communities. Cystoseria species are the most common species encountered. Mytilids are a constant component. These habitats occur on very exposed rocky coasts, from low water up to depths of 5m. Winter storms may cause changes to species compositions and coverage.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Characteristic species include: *Mytilus galloprincialis*, *Mytilaster lineatus*, *Cystoseira bosphorica*, *Cystoseira barbata* – *Cladostephus spongiosus* – *Corallina elongata*, *Cystoseira crinita* – *Dictyota fasciola*, *Cystoseira crinita* + *Cystoseira barbata* – *Polysiphonia subulifera* + *Ulva rigida*. |
| Black Sea | A3.1x Pontic exposed upper infralittoral rock with rock borers | Soft rocks (limestone) occurring in the infralittoral zone in areas of low to moderate exposure. The softer nature of limestone rocks makes them suitable for rock boring species such as *Petricola lithophaga*, which are the diagnostic feature of this habitat.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Petricola lithophaga*. |
| Black Sea | A3.23 Corallinales on moderately exposed Pontic upper infralittoral rock | Present in the upper infralittoral zone on hard rocks. Corallinales are the dominate species and are found in high densities on the rock surface. In moderately exposed and shaded upper infralittoral rock *Corallina elongate* is the dominant species.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Corallina elongata* |
| Black Sea | A3.2x Mytilid-dominated Pontic moderately exposed upper infralittoral rock, blocks and boulders with Fucales | Rocky habitats in the infralittoral zone subject to moderately exposed wave action. This habitat includes a range of rock sizes, from complete uninterrupted bedrock to fragmented rocks and boulder fields. Rocks are typically covered with Fucales. *Cystoseria* species are the most common species encountered; Mytilids are a constant component and Corrallines are also occasionally present. The habitat occurs from low water depths, where illumination is a key environmental factor. The moderately exposed nature of the habitat allows species less tolerant of high energy environments to colonise and become established.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe habitat quality including: the presence of characteristic species and those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure; and more integrated indices which describe habitat structure and function such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Mytilus galloprovincialis, Mytilaster lineatus, Cystoseira barbata* f. *hoppii*, *Ulva rigida, Polysiphonia subulifera / P.opaca, Cystoseira crinita*, and *Cladostephus spongiosus – Corallina elongata* communities. |
| Black Sea | A3.2x Mytilid-dominated Pontic moderately exposed upper infralittoral rock, blocks and boulders, with foliose algae (other than Fucales) | Rocky habitats in the infralittoral zone exposed to wave action. Rocks are typically covered by foliose algal communities. Mytilids are a constant component. These habitats occur on exposed rocky coasts, from low water up to depths of 10m. Winter storms may cause changes to species compositions and coverage.  Indicators of quality:  A set of categories common to the habitat indicating good biotic and abiotic quality. These indicators will be used, together with the general “Stages of Quality Decline” (applicable for all terrestrial and marine habitats), to assess the severity of quality decline over a certain time frame on a country/regional scale and for EU28 and EU28+.  Characteristic species:  Characteristic species includes: *Mytilus galloprovincialis*, *Mytilaster lineatus*, *Lophosiphonia obscura*, *Ceramium ciliatum*, *Padina pavonica*, *Grateloupia dichotoma*, *Dilophus fasciola*, *F. repens*, *Polysiphonia opaca*, *Ceramium ciliatum*, *Ulva compressa*, *Ulva intestinalis*, *Ulva linza*. |
| Black Sea | A3.34 - Fucales and other algae on Pontic sheltered upper infralittoral rock, well illuminated | This habitat is present in shallow sheltered waters, such as semi-enclosed bays on rocky substrates. Reported at depths of 1-14 m although also known to occur in deeper waters in the pre-eutrophication period in the early 1980s. *Cystoseira* belt, in this habitat is dominated by *C. barbata*, provides an ideal substrate and habitat for numerous photophilic and sciaphilic algal species, especially Rhodophyta.  *C. barbata*is typically the dominant canopy-forming species in this sheltered environment, with *C. crinita*and *C. bosphorica*being more common in exposed situations. Other species present include the algae *Ulva rigida, Polysiphonia subulifera, Cladophora*spp*., Gelidium spinosum*and occasionally present *C. crinita*and *Ceramium virgatum*. The bivalves *Mytilus galloprovincialis*and *Mytilaster lineatus*are also very abundant in this habitat and often colonise all the substrate available between the *C. barbata*plants, or attach to the main axis of the plants. An understory of *Dilophus fasciola*and *Cladostephus spongiosus*is typical of oligotrophic waters (*Cystoseiretum dilophoso-cladostephosum*). A third layer is formed by *Padina pavonia*and *Corallina elongata*. *Gelidium latifolium*with *G. spinosum*(*= G. crinale*) also present. A fourth layer of crust-forming *Hildenbrandia rubra*is also typical. Epiphytic algae include *Laurencia coronopus*, *Polysiphonia subulifera*, *Ceramium rubrum, Corynophlaea umbellata, Stilophora rhizodes,*and *Jania rubens.*  Suitable indicators of quality include: community and population structure, diversity, biomass and abundance, epiphytic species richness, water quality and substrate. Appropriate thresholds include:  1.       Cystoseira spp. canopies occur in all areas with suitable habitat. Habitat fragmentation is reduced.  2.       Cystoseira spp. cover inside the canopy is ≥50%  3.       Height of Cystoseira spp. thalli during the cold season is ≥100 cm for at least 50% of the population  4.       Epiphyte-free wet biomass of Cystoseira spp. is ≥3,000 g/m2 |
| Black Sea | A3.3q Pontic barren lower infralittoral rock | Lower infralittoral rock in the Black Sea occurs between depths of 10 and 18m. These areas are low energy and poorly illuminated which limits the species suited to the situation. Barren lower infralittoral rock in these areas are devoid of species and communities. It is still unclear what are the causes.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Due to the barren nature of this habitat no characteristic species are present. |
| Black Sea | A3.3w Invertebrate-dominated Pontic lower infralittoral rock | Present in the lower infralittoral zone of rocky reefs. Dominated by invertebrates, although there is still some light that would allow algae to develop. Several subtypes have been described:  -A3.3wa Lower infralittoral rock dominated by *Mytilus galloprovincialis*  -A3.3wb Lower infralittoral rock covered by crusts of colonial ascidians (*Botryllus schlosseri*), hydrozoans, bryozoans and sponges  -A3.3wc Lower infralittoral rock with colonies of erect sponges (*Halichondria spp., Haliclona spp.)*  -A3.3wd Lower infralittoral rock with extensive hydrozoan (*Obelia longissima)* canopies  -A3.3we Lower infralittoral soft rock with Pholadidae  -A3.3wf Lower infralittoral rock dominated by solitary ascidians (*Molgula manhattensis*)  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Mytilus galloprovincialis*, colonial ascidians (*Botryllus schlosseri*), hydrozoans, bryozoans and sponges, colonies of erect sponges (*Halichondria spp., Haliclona spp.*), large hydrozoan (*Obelia longissima*) canopies, Pholadidae and solitary ascidians (*Molgula manhattensis*). |
| Black Sea | A3.3x Foliose algae, other than Fucales on Pontic sheltered upper infralittoral rock, well illuminated | Present in shallow sheltered waters, such as semi-enclosed bays on rocky substrates. Reported at depths from 1 up to 14m although known to occur in deeper waters in the pre-eutrophication period in the early 1980s. The presence of light is a key environmental factor, as the sheltered nature of the rocky habitat. In more high energy environments the algal communities are scoured by wave action, preventing the characteristic species from colonising. The habitat is analogous to the Cystoseria canopies with the important distinction that Fucales are not present. Communities are typically comprised of Ulvaceae, *Laurencia coronopus*, Corralines, *Ceramium* spp. and *Scytosiphon lomentaria*.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Ulva intestinalis, Ceramium virgatum, Callithamnion corymbosum, Laurencia coronopus, Corallina elongata* and *Ceramium spp., Ulvaceae* and *Scytosiphon lomentaria.* |
| Black Sea | A3.3y Pontic sheltered, shaded upper infralittoral rock, with sciaphilic algae | Present in the upper infralittoral zone in areas sheltered from wave action and currents, as well as where light levels may be low. Algal cover is limited and patchy and includes species tolerant of low light levels but with weak attachment and which therefore cannot survive in wave exposed conditons. These sciaphilic algae generally form diffuse communities with low coverage.  Indicators of quality:  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Peyssonnelia squamaria*, *Phyllophora crispa* and, *Delesseria ruscifolia*. |
| Black Sea | A3.3z Pontic lower infralittoral rock, with siginificant cover of sciaphilic algae | Rocky habitat in the lower infralittoral zone characterised by low light conditions. Sciaphilic algae dominate this habitat where they form significant cover on the rocks.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Phyllophora crispa*, *Apoglossum ruscifolium*, *Gelidium spinosum*, *Zanardinia typus*, *Polysiphonia elongata*, *Antithamniom cruciatum*, *Lomentaria clavellosa*, *Nereia filiformis*, *Ectocarpus spp*., encrusting algae (*Hildenbrandia spp*., *Lithothamnion spp*., *Lithophyllum spp*.) and the gastropod *Gibbula sp*. |
| Black Sea | A3.74 Caves, overhangs and surge gullies in Pontic infralittoral rock | Caves and overhangs in the infralittoral zone are completely submerged at all states of the tide. Light conditions are generally poor which influences the species that can occur in these situations. As a result communities of sciaphillic algae, sponges and mussels are commonly present. Information on the biodiversity of sublittoral caves in the Black Sea is extremely fragmentary but some studies have been undertaken. e.g. describing the dominating sponge communities  in the  shallow semi-submerged karst caves on the Tarhankut peninsula, Crimea.    The habitat includes a range of situations including: vertical walls under overhangs, semi-dark tunnels and walls and floors of semi dark tunnels. Each of these may contain its own unique diagnostic communities which are also influenced by the rock type and the size of the cave - most semi-submerged caves from the Tarkhankut peninsula are small (5-10m) but the longest Kapchik-2 is 250m in length. Studies of caves in the Tarkhankut peninsula indicate a faunal zonation with depth into the cave.  The habitat is dominated by filter feeders in the surge gullies, robust species able to cope with the heavy wave action.      Indicators of quality:    Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Phyllophora nervosa, Lomentaria clavellosa, Hildenbrandia rubra, Zanardinia typus*, *Mytilus galloprovincialis*, erect sponges *Halichondria panicea , Haliclona simulans*, *Dysidea fragilis, Dysidea pallescens* or thin crust sponges like *Antho involvens*, *Haliclona flavescens* *, Haliclona cinerea*, *Suberites prototypus*, *Clathria cleistocheila* depending on current intensity, anemones *Actinia equina*, red mysid shrimp *Hemimysis pontica*, *Hemimysis serrata*., and turf hydrozoans. |
| Black Sea | A4.24 Invertebrate-dominated Pontic circalittoral rock | Circalittoral rock starts at the lower limit of distribution of photophilic plants and ends where the circalittoral rocky substrate gives way to sediments. On the Northwestern Black Sea shelf the habitat occurs on rocky coasts in depths between 10-15 m (depending on local conditions of light penetration, the upper limit of the habitat is defined as the lower limit of photophilic plants) down to 30-70m (depending on how deep rocky reefs occur at the location). The fauna is highly diverse, including many invertebrate and fish species which occur only in this habitat, some of them rare or protected. The habitat is very important due to the crucial ecological role of mussels in the self-cleansing capacity of the ecosystem and in benthic- pelagic coupling. One square meter of mussel-covered circalittoral rock has a clearance rate of 1.3 to 7.1 m3 m-2  h-1  and is able to filter 31-170 m3 of seawater per day. Biological production of this habitat is usually around 6 kg m-2  but can exceed 10 kg m-2  in favourable conditions, with complex foodweb linking it to other habitats. Also, it is an important feeding ground, nursery and refuge for many commercially valuable fish species and it provides the biofiltering capacity essential for maintaining the quality of nearshore waters.  Indicators of quality:  The following parameters and thresholds have been established for Romania:  1. Cover of *Mytilus galloprovincialis* (in the habitat subtype where it is dominant) ≥ 50%  2. Cover of invertebrate crusts, turfs and canopies (in the habitat subtype where they dominate) ≥ 80%  3. Median shell length of *Mytilus galloprovincialis* ≥ 50 mm SL  4. Live biomass of *Mytilus galloprovincialis* where dominant ≥ 6kg m-2  Characteristic species:  The dominant species is often the blue mussel *Mytilus galloprovincialis*, but in certain subtypes other benthic species may dominate:  - crusts and turfs formed by bryozoans, crust sponges (*Dysidea* sp.) or colonial tunicates *Botryllus schlosseri;*  - vertical walls and ridges can be covered either by dense colonies of erect, branched sponges  *Halichondria sp*. and *Haliclona sp.* or by solitary ascidians *Molgula manhattensis, Ascidiella aspersa, Ciona intestinalis;*  - Hydrozoans can form dense turfs and even tall canopies in the case of larger species *(Obelia longissima)* |
| Black Sea | A4.26 Marmara coralligenous communities moderately exposed circalittoral rock | Coralligenous habitats are hard bottoms of biogenic origin mainly produced by the accumulation of calcareous encrusting algae growing in dim light conditions. Although more widespread in the circalittoral zone, they can also develop in the infralittoral zone, provided that light is dim enough to allow growth of the coralline algae that produce the build-up; therefore, infralittoral coralligenous concretions always develop in almost vertical walls, deep channels, or overhangs, and occupy reduced surfaces. Coralligenous bioconcretions are always very complex in structure allowing the development of several kinds of communities including those dominated by living algae (on the upper part of the concretions), suspension feeders (upper and lower part of the concretions, wall cavities, and overhangs of the build-up), borers (inside the concretions), and even soft-bottom fauna (in the sediment deposited in cavities and holes). This is a highly variable habitat that can be subdivided into different sub-habitats.  Indicators of quality:  Several indicators have been proposed to assess the health of coralligenous habitats based on the composition and abundance of species (biotic cover and conspicuous species richness), including the percent cover of different benthic assemblages (encrusting calcified Rhodophyta, non-calcified encrusting algae and fauna, turf forming algae, and sediment), boring species marks, percent cover of each species and the percentage of necrosis, Bryozoa percent cover, sludge percent cover and the builder species percent cover. Pollution has a severe impact on coralligenous outcrops where coralline algae are substituted first by *Mesophyllum alternanas* and latterly by *Peyssonnelia rosa-marina*. High water turbidity decreases diversity, especially of Bryozoans, Crustaceans and Echinoderms. However the amount of bioeroders increases, i.e. Sipunculids and boring sponges (*Cliona*), along with more generalist species. Mechanical disturbance and breaks of the bioconstruction with increases of turbidity and sedimentation can also be observed. Fishing can affect the abundance of certain target species  and high sedimentation rates result in overgrowth and invasion by exotic algae, altering assemblage composition.  Characteristic species  Rhodophyta (red algae) - *Mesophyllum expansum, Mesophyllum alternans, Mesophyllum macedonis, Lithophyllum stictaeforme, Lithophyllum cabiochiae, Neogoniolithon mamillosum, Peyssonnelia rosa marina, Peyssonnelia rubra, Peyssonnelia harveyana, Peyssonnelia bornetii, Amphiroa beauvoisii, Aglaothamnion tripinnatum, Seirospora giraudyi, Gulsonia nodulosa, Balliella cladoderma, Eupogodon planus, Acrosorium ciliolatum, Erythroglossum balearicum, Erythroglossum sandrianum, Myriogramme tristromatica, Rodriguezella pinnata, Rodriguezella bornetii, Rodriguezella strafforelloi, Gloiocladia furcata, Gloiocladia microspora, Gloiocladia repens, Leptofauchea coralligena, Lomentaria subdichotoma, Botryocladia chiajeana, Sebdenia monardiana, Sebdenia rodrigueziana, Aeodes marginata, Halymenia floresii, Predaea ollivieri, Platoma cyclocolpum, Bonnemaisonia asparagoides, Schmitzia neapolitana, Neurocaulon foliosum, Kallymenia feldmannii, Kallymenia lacerata, Kallymenia patens, Kallymenia requienii, Sphaerococcus rhizophylloides, Ptilophora mediterranea*  Phaeophyta - *Halopteris filicina, Nereia filiformis,*  Chlorophyta (green algae) - *Palmophyllum crassum, Codium coralloides, Valonia macrophysa,*  Sponges - *Agelas oroides, Axinella cannabina, Axinella damicornis, Axinella polypoides, Axinella* |
| Black Sea | A4.2x Marmara circalittoral biogenic habitats- worm reefs | Worm reefs (formations) in the circalittoral zone in the Sea of Marmara are formed by several species, depending on the bottom composition. The most common are the *Hydroides* spp.and to a lesser extent *Salmacina incrustans* and *Salmacina dysteri* . Worms grow on hard substrates andalso build carbonate tubes.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of particular species, water quality parameters, levels of exposure to a particular factor, as well as more integrated indices which describe habitat function and structure such as trophic index, or successful stages of development in habitats that have a natural cycle of change over time. There are no known commonly agreed indicators of quality for this habitat, although particular parameters may be set in certain situations, e.g. protected features within Natura 2000 sites, where reference values may have been determined and applied on a location-specific basis.  Characteristic species:  Porifera like *Ciocalypta penicillus*, Echinoderms like *Antedon mediterranea, Ophiothrix fragilis* and *Asterias rubens,*and Cnidarians like *Parazoanthus axinellae*, *Paramuricea clavata, Paramuricea macrospina, Eunicella cavaloni, Paralcyonium spinulosum* and *Caryophyllia smithii* are some of the characteristic species that can be found in this formation. Molluscs and Decapods also occur. |
| Black Sea | A4.2x Pontic barren circalittoral rock | Circalittoral rock starts at the lower limit of distribution of photophilic algae (which may be as shallow a 10 m on the north-western Black Sea shelf and much deeper in Crimea or Turkey) and ends where the circalittoral rocky substrate gives way to sediments. This habitat is characterised by a complete lack of algal and faunal species.  Indicators of quality:  There are no commonly agreed indicators of quality for this habitat.  Characteristic species:  As this is a barren habitat, there are no characteristic species. |
| Black Sea | A4.2x Pontic circalittoral rock affected by sedimentation | Circalittoral rock starts at the lower limit of distribution of photophilic algae (which may be as shallow as 10 m on the north-western Black Sea shelf and much deeper in Crimea or Turkey) and ends where the circalittoral rocky substrate gives way to sediments. Where sedimentation occurs the habitat is characterised by lower levels of biodiversity. The biodiversity of the habitat consists of faunal species which include polychaete worms, sponges and solitary ascidians.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Spirobranchus triqueter*, sponges, solitary ascidians and *Actinothoe clavata*. |
| Black Sea | A4.71 Pontic circalittoral dark caves and tunnels | Caves and overhangs in the circalittoral zone are characterised by a lack of light. This is reflected in the species composition. The amount of wave surge influences the species composition of individual caves. All around the Black Sea this habitat type occurs in Sarmatian limestone cliffs in Russia, Ukraine, Romania, Bulgaria and Turkey. It may also occur in volcanic and metamorphic rocks, like in Bulgaria (Maslen Nos Cape).  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Turf hydrozoans, thin crust sponges like *Antho involvens*, *Haliclona flavescens* *, Haliclona cinerea*, *Suberites prototypus*, *Clathria cleistocheila* depending on current intensity, anemones *Actinia equina*, red mysid shrimp *Hemimysis pontica*, *Hemimysis serrata*., and rare shrimp species *Palaemon serratus* and *Lysmata seticaudata* |
| Black Sea | A4.AA Invertebrate-dominated Marmara circalittoral rock | Circalittoral rock starts at the lower limit of distribution of photophilic algae. In the Sea of Maramara a number of unique communities occur due to the high organic load characteristic of this region. In the upper levels (10-30 m) of outflowing Black Sea waters  a thick layer of Ophiurids occurs. In the lower levels (30-50 m) of inflowing Mediterranean waters a thick layer of Crinoids occurs. Throughout all depths (2 – 60m) a fragile layer of tubeworms (Serpulid polychaetes) can be found attached to rock faces.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Serpulid polychaetes, Crinoids* and *Ophiurids.* |
| Black Sea | A5.13 Pontic infralittoral mixed substrata | This habitat comprises mixed substrate in the infralittoral zone. The substrate is often patchy and is comprised of a mix of cobbles, pebbles, shelly gravels and silted cobbles. The effects of currents and wave action are varied, and influences the type of substrate present and whether it is overlain by any silt. These different substrates can support a diverse range of faunal communities. These include spirorbid worms, crustaceans and ascidians. Floral communities are not a diagnostic feature.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  These include: encrusting spirorbid worms, *Amphibalanus improvisus*, *Actinia aequina*, *Mytilus galloprovincialis* and *Pisidia longicornis*. |
| Black Sea | A5.22 Estuarine Pontic infralittoral sand | Estuarine infralittoral sands in front of the large rivers in the north-west Black Sea form an important habitat type. The largest river estuaries in the Black Sea are the Dniepro-Bugsky estuary in Ukraine and the estuarine waters of the Danube pro-Delta in Romania. Here numerous individual river mouths form a transition between the Danube Delta and the Black Sea. Underwater hydraulic dunes in the ‘Danube mouths’ are an important feature in this area. These are areas with reduced salinity, infauna abundance/diversity, feeding grounds for juvenile fish, birds, a naturally mobile habitat.  Smaller locations are the coastal zone of Kinburnskaya spit (Tendrovsky Bay), Grigorievsky, Tiligulsky, Berezansky, Kiziltakskiy estuaries.  Indicators of quality:  Biomass of infauna is one possible parameter that could be used to indicate quality of this habitat. At the mouth of Dniepro-Bugsky estuary average density of macrozoobenthos on sands is 80 ind/m-2, biomass – 11,28 g/ m-2, in the semi open estuaries with significant influence of the fresh waters the level of biomass of macrozoobenthos on the sands are higher (255 – 439,9 g/ m-2) due to the distribution of bivalve mollusks.  Characteristic species:  Mostly euryhaline species: - *Gammarus marinus, Idothea tricuspidata, Dikerogammarus haemobaphes, Palaemon adspersus, Cerastoderma glaucum, Bittium reticulatum* are common. The biocenosis of sands with *Cerastoderma* and *Monodacna* is typical for Grigorievsky, Tiligulsky and Berezansky estuaries. |
| Black Sea | A5.237 Pontic infralittoral sands and muddy sands without macroalgae | This habitat includes all sandy habitats dominated by faunal species occurring in the infralittoral zone down to 20m depth and comprises many different Level 5 habitats. This ranges from medium to coarse grained sands on exposed beaches to off-shore infralittoral fine sand banks and includes many types of surface features at different scales (banks, ripples, mounds and burrows of infauna). The depth and waves or current exposure are important elements in defining the species composition.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Donax trunculus, Upogebia pusilla, Lentidium mediterraneum, Cerastoderma glaucum, Mya arenaria, Chamelea gallina, Tellina tenuis, Anadara inaequivalvis, Cyclope neritea, Arenicola marina, Callianassidae, Gouldia minima, Donax semistriatus, Modiolus adriaticus, Solen marginatus* amphipods and *Aonides ornatus*. |
| Black Sea | A5.24 Pontic infralittoral muddy sand | Non-cohesive muddy sand (with 5% to 20% silt/clay) in the lower infralittoral zone. The habitat is dominated by faunal species including ghost shrimps and bivalves.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Upogebia pusilla, Mya arenaria, Anadara inaequivalvis, Abra alba,  Spisula subtruncata and Pitar rudis. |
| Black Sea | A5.26 Pontic circalittoral muddy sand | Non-cohesive muddy sand (with 20% to 80% silt/clay) in the circalittoral zone. The habitat is characterised by low light and low energy conditions. Species present typically belong to the bivalve and polychaete worm groups.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Mya arenaria, Cerastoderma glaucum, Abra alba, Parvicardium exiguum, Spisula subtruncatra, Pitar rudis* and *Aricidea claudiae*. |
| Black Sea | A5.32 Communities of Marmara infralittoral mud estuarine | This habitat occurs mainly in sheltered inlets along and after estuaries, where wave exposure is low enough to allow fine sediments to settle. It is characterized by a variable salinity range from brackish to fully marine conditions. In all cases, the resident populations comprise a small number of species that are strongly dominant in number and weight. These are species that are able to withstand violent variations in environmental conditions, among which salinity is only one example. Sudden influxes of salt water create recurrent disturbances that sometimes cause populations to disappear. Often, especially in shallower areas, beds of *Cymodocea nodosa* are present.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of particular species, water quality parameters, levels of exposure to a particular exposure as well as more integrated indices which describe habitat function and structure, such as trophic index, or successful stages of development in habitats that have a natural cycle of change over time. There are no known commonly agreed indicators of quality for this habitat, although particular parameters may be set in certain situations, e.g. protected features with Natura 2000 sites, where reference values may have been determined and applied on a location-specific basis. Some pontential indicators of quality for this specific habitat are the presence and abundance of indicated characteristic species.  Characteristic species:  *Tubificoides* spp *, Capitella capitata, Ficopomatus enigmaticus, Heterochaeta costata, Alitta succinea, Spio decoratus, Aphelochaeta marioni, Hydrobia acuta, Spisula subtruncata, Corophium orientale, Gammarus aequicauda, Carcinus aestuarii, Thalassodrilides gurwitschi.* |
| Black Sea | A5.33 Pontic infralittoral terrigenous muds | Infralittoral coastal terrigenous muds are characterized by mud and sandy mud and the presence of faunal species. There are two distinct sub habitats which are characterized by the dominant faunal communities. The first is dominated by polychaets, whilst the second is dominated by mussels (this one does not occur in Marmara Sea).  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Melinna palmata*, *Heteromastus filiformis*, *Aricidea claudiae, Mytilus galloprovincialis* and *Mytilaster lineatus*. |
| Black Sea | A5.34 Pontic infralittoral fine mud | These fine muddy habitats are situated in the lower infralittoral zone at the fronts formed by the mouths of large rivers (Danube, Dnepr, Bug)discharging onto the Northwestern Black Sea shelf . These fine muds mixed with terrestrial and freshwater detritus form soft, unstable deposits. Where the sediment content is lower in detritic organic particles terrigenous muds are more stable and sticky. In both zones the habitat is populated by bivalve molluscs and polychaete worms adapted to living in very soft substrata with high organic content.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Neanthes succinea, Nephthys hombergii* , *Abra prismatica*, *Mysella bidentata*, *Abra alba* and *Acanthocardium paucicostatum,* |
| Black Sea | A5.35 Pontic upper circalittoral sandy mud | This habitat consists of sandy muds in the upper circalittoral zone. It is found all around the Black Sea coast. There is no light influence. The habitat is characterised by faunal communities dominated by bivalve molluscs and polychaete worms.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Heteromastus filiformis*, *Dipolydora quadrilobata*, *Nephthys hombergii* **and** *Spisula subtruncata*. |
| Black Sea | A5.36 Pontic upper circalittoral fine mud | This habitat consists of fine muds in the upper circalittoral zone. It is found below the photic zone at depths between 20 and 50 meters. The habitat is characterised by faunal communities dominated by bivalves and polychaete worms.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of characteristic species and species sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Mya arenaria, Spisula subtruncata, Melinna palmata, Heteromastus filiformis* and *Aricidea claudiae*. |
| Black Sea | A5.37 Pontic lower circalittoral mud | It occurs at depths 60-180m. The sediment type varies between terrigenous muds, calcareous muds and biogenic detritic bottoms. There is no light influence at this depth. The benthic fauna is dominated by bean mussels *Modiolula phaseolina*, polychaetes and solitary ascidians. At the greatest depths the environment becomes hypoxic. Here the sediment consists of periazoic calcareous white muds and faunal communities become impoverished.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of characteristic species and species sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Modiolula phaseolina, Amphiura stepanovi*, *Terebellides stroemi*, *Pachycerianthus solitarius*, solitary ascidians (Ascidiella aspersa, Ciona intestinalis, Eugyra), hydrozoans (*Bougainvillia ramosa*), nematodes and oligochaetes. |
| Black Sea | A5.38 Communities of Marmara circalittoral muddy detritic bottoms | This biocenosis develops in areas where a detritus bottom is covered with mud formed by terrigenous deposits from rivers. The sediment is a very muddy sand or sandy mud, or even a rather compacted mud, rich in shell debris or vlocanic fragments (scoriae); sedimentation is slow enough to allow the development of sessile epifauna. Gravel, sand and mud are mixed in varying quantities, but mud always predominates. A subhabitat community of this habitat is made by Facies with Ophiothrix quinquemaculata  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Porifera: *Raspailia viminalis*  Cnidaria: *Alcyonum palmatum*, *Eloactis mazeli*, *Anemodactis mazeli*  Echinodermata – Holothuridae: *Psedothyone raphanus*  Mollusca – Pelecypoda *Tellina serrata*  Annelida – Sipunculida: *Golfingia elongata*  Annelida – Polychaeta: *Aphrodite aculeata*, *Polyodontes maxillosus*, *Eupanthalis kinbergi*, *Leiocapitella dollfussi*, *Clymene palermitana*  Crustacea – Isopoda: *Cirolana neglecta* |
| Black Sea | A5.39 Communities of Marmara infralittoral (coastal) terrigenous muds | The sediment is always pure mud, more or less clayey, almost always derived from the erosion of rocks on land carried to the sea by rivers (fluvial origin). Such coarse debris as may be deposited is quickly covered, with the result that no epifauna develops. In sheltered areas this habitat is characterized by associations with *Cymodocea nodosa* and *Zostera noltii.*  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of particular species, water quality parameters, levels of exposure to a particular exposure as well as more integrated indices which describe habitat function and structure, such as trophic index, or successful stages of development in habitats that have a natural cycle of change over time. There are no known commonly agreed indicators of quality for this habitat, although particular parameters may be set in certain situations, e.g. protected features with Natura 2000 sites, where reference values may have been determined and applied on a location-specific basis. Some potential indicators of quality for this specific habitat are the presence and abundance of indicated characteristic species.  Characteristic species:  *Turritella sp., Sternaspis scutata, Philine aperta, Sphaerocardium paucicostatum, Veretillum cynomorium, Aphrodita aculeata, Stichopus regalis, Holothuria tubulosa.* Also *Cymodocea nodosa* and *Zostera noltii.* |
| Black Sea | A5.46 Communities of Marmara infralittoral (coastal) detritic bottoms | This habitat is usually associated with the lower infralittoral zone. In the Sea of Marmara this consists of two layers, a less saline upper layer (influenced by inflowing water from the Black Sea) and a more saline lower layer (influenced by the Mediterranean Sea). The nature of the substratum varies widely and depends largely on the typology of the adjacent coast and of nearby infralittoral formations. This implies that substrata can sometimes be gravels and sands originating from predominant local rocks, sometimes shell debris from various molluscs (mainly *Mytilus galloprovincialis).* The interstices between these various components are partially filled by a greater or lesser proportion of sand and mud*.*  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of particular species, water quality parameters, levels of exposure to a particular exposure as well as more integrated indices which describe habitat function and structure, such as trophic index, or successful stages of development in habitats that have a natural cycle of change over time. There are no known commonly agreed indicators of quality for this habitat, although particular parameters may be set in certain situations, e.g. protected features with Natura 2000 sites, where reference values may have been determined and applied on a location-specific basis. Some potential indicators of quality for specific habitat are the presence and abundance of indicated characteristic species.  Characteristic species:  In the upper infralittoral layer, characteristic species include: *Gracilaria verrucosa, Pagurus anachoretus, Clibanarius erythropus, Ophiothrix fragilis, Astropecten irregularis, Astropecten spinulosus, Asterina gibbosa, Marthasterias glacialis, Asterias rubens, Pisidia bluteli, Pisidia longimana,* and*Botryllus schlosseri.*  In the lower infralittoral layer, characteristic species comprise: *Halymenia floresii*, *Veretillum cynomorium*, *Pteroeides spinosum*, *Philine aperta, Asterias rubens, Ocnus planci, Ciona intestinalis,* and *Phallusia mamillata.* |
| Black Sea | A5.53 Seagrass and rhizomatous algal meadows in Pontic freshwater-influenced sheltered infralittoral muddy sands and sandy muds | This habitat occurs in sheltered shallow (0.5-2 m) coastal waters (embayments, inlets, bights, harbours, estuaries), more or less influenced by freshwater (salinity 0.5-10 psu), where sedimentary stability leads to mudding of the sand. Mixed or monospecific meadows are formed by *Zostera noltei*, *Ruppia maritima, R. cirrhosa, Chara spp., Stuckenia pectinata* (formerly known as *Potamogeton pectinatus), Najas minor* and *Ranunculus baudotii.* Algae commonly found include species of *Cladophora* and *Ulva* which are tolerant of very low salinities.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of particular species, water quality parameters, levels of exposure to a particular exposure as well as more integrated indices which describe habitat function and structure, such as trophic index, or successful stages of development in habitats that have a natural cycle of change over time. There are no known commonly agreed indicators of quality for this habitat, although particular parameters may be set in certain situations, e.g. protected features with Natura 2000 sites, where reference values may have been determined and applied on a location-specific basis. Some potential indicators of quality for this specific habitat are thepresence of species (i.e. *Zanichellia* and *Ruppia*); species density; species composition; the ratio of higher plants to seagrasses; and biomass. There is insufficient information to set indicator thresholds required for monitoring purposes.  Characteristic species:  *Zostera noltii, Ruppia maritima, R. cirrhosa, Potamogeton pectinatus, Chara sp.* |
| Black Sea | A5.5w Seagrass meadows in Pontic lower infralittoral sands | Seagrass beds are found on sandy and sandy-muddy bottoms in sheltered habitats with sufficient lighting. Maximum development is in the summer. The habitat occurs all around the Black Sea as small and fragmented meadows. Its distribution is well documented in Russia, Ukraine, Romania and Bulgaria, while for Turkey it is mostly unknown. Off the coast of Georgia sparse eelgrass meadows are known to occur at Cape Souk-Sou (after *Cystoseira* communities at a depth of 6-10 m), in the Gulf of Skurge at a depth of 4-6 m. This habitat contains communities in both the upper and lower infralittoral sands with different dominant eelgrass species:  The habitat occurs in the deeper infralittoral zone, most typically where the sediment is silty sand and in the 10 m depth range. The meadows are found in sea water with salinity varying between 11 and 19 psu. Six species of seagrass may be present in this habitat but *Zostera marina* is generally dominant. There are also algae living on the eelgrass blades, mostly red algae. Species diversity develops two peaks, one in spring and the other in autumn. Seasonal dynamics of the biomass and density are less pronounced due to the depth. The communities of *Z. marina* display greatest diversity in the Kerch Strait with its special hydrological and hydrochemical conditions.  Indicators of quality:  Leaf length, biomass, shoot density have all been identified has indicators of quality. However, thresholds have not been set and these can and will vary between countries.  Characteristic species:  *Zostera marina* is the dominant seagrass species. It may form pure stands or be found in association with *Zostera noltei*, *Cystoseira barbata* and *Gracilaria gracilis*. 115 macroalgal species have been recorded in this habitat type in the Black Sea. Typical genera are: *Ceramium, Cladophora, Kylinia, Laurencia, Melobesia* and *Polysiphonia,* green and red algae prevail. |
| Black Sea | A5.5z Seagrass meadows in Pontic moderately exposed upper infralittoral clean sands | The habitat occurs in the upper infralittoral zone, on clean sands at depths between 0.2 to 3m. It is characterized by sedimentary stability and a low silt content of 5-10%. The dominant seagrass species is *Zostera noltei,* which may form monospecific or mixed meadows (with *Zostera marina, Ruppia* spp. and *Zannichellia pedicellata*)*.* Of areas surveyed in detail, the maximum biomass and density of this seagrass in the Black Sea has been measured in the Karkinitsky Bight, where it occurs on sandy substrate mixed with silt. Other species of seagrass are also present in this habitat and 62 macroalgal species. Algae with short life cycles, mostly red algae, dominate, with epiphytic and unattached forms usually prevailing over epilithic forms.  Indicators of quality:  Leaf length, biomass, shoot density have all been identified has indicators of quality. In Romania the following thresholds have been defined: Low fragmentation of habitat; cover of *Z. noltei* inside the meadow ≥50%; leaf length in June ≥70 cm; annual outward growth of rhizomes from the meadow ≥70 cm; above-ground biomass of *Z. noltei* in June ≥1,600 g/m2.  Characteristic species:  *Zostera noltei* is the dominant seagrass species. It may form pure stands or be found in association with *Zostera marina, Ruppia maritima* and *R. cirrhosa*. Algae commonly found include *Cladophora albida* |
| Black Sea | A5.61 Polychaete worm reefs in the Pontic infralittoral zone | A variety of polychaete worm reefs occur in the Black Sea. The habitat forming species are dependent on two variables: depth and exposure to wave action. In more sheltered and freshwater-influenced environments the non-native serpulid tubeworm *Ficopomatus enigmaticus* is the most common reef building species. In moderately exposed environments reefs formed by the serpulid *Vermiliopsis infundibulum* are present. Finally, on lower infralittoral rock serpulids form massive reefs in collaboration with bivalves (i.e. *Ostrea edulis*, *Mytilus galloprovincialis).* These reefs are an important component of the Black Sea ecosystem and are characterised by high biodiversity and fulfill important water filtration role.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species, species sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressures as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Ficopomatus enigmaticus, Vermiliopsis infundibulum* and serpulids. |
| Black Sea | A5.62 Mussel beds on Pontic circalittoral terrigenous muds | This habitat is comprised of mixed circalittoral sediments – terrigenous muds -  mixed with variable amounts of recent or subfossil shells, most of them belonging to the blue mussel *Mytilus galloprovincialis*, occurring offshore, between depths of 20 and 45 m. At these depths environmental conditions are relatively constant year-round: low light, low temperature (6-9°C), and a constant salinity of 18 ppt. *Mytilus galloprovincialis* forms biogenic reefs through the accumulation of mussel shells in time and aggregation of the shells by byssal threads. Over time, a hard substratum higher than the surrounding sediment is formed, on which living mussel colonies attach themselves. The reef is formed of numerous elongated patches and/or continuous ridges, always transverse to the prevailing bottom currents (which bring food to the filter-feeders). Between these lay the organic-rich “Mytilus mud” formed by accumulation of mussels’ faeces and pseudofaeces. The biomass of *Mytilus galloprovincialis* may vary between 200 and 1,500 g/m2.  Among the habitats which occur on sedimentary substratum in the Black Sea, the mussel beds have the highest biodiversity, due to both extending through a wide range of depths and to providing a multitude of microhabitats suitable for a large number of species. This biogenic reef is unique through the crucial ecological role played by the great biofiltration power of the mussel beds in, which ensures the benthic-pelagic coupling and provides enhanced ecosystem resilience. The ‘mussel mud’ formed by the blue mussels’ waste is an important source of food for deposit-feeding infauna living in the sediment around the mussel beds.  The high- biodiversity mussel beds harbour various threatened species and have socio-economical importance as a habitat (breeding grounds, nurseries) and fishing area for commercially valuable species (*Psetta maeotica, Squalus acanthias,* sturgeons, *Rapana venosa*). Mussels themselves are the most popular mollusc species for human consumption around the Black Sea, and mussel beds are a source of larvae and spat for aquaculture. The habitat is present all around the coasts of Bulgaria, Romania, Ukraine, Russia and Georgia as a discontinuous belt at variable depths between 20 and 45-80 m. Historically the habitat used to be present in front of the Turkish coast as well, but was completely destroyed due to intensive bottom trawling during the last 100 years.  Indicators of quality:  Biomass, density and cover are some of potential indicators of quality for this habitat.  In Romania the following thresholds have been established:  -Reduced habitat fragmentation – the area of enclaves of *Melinna palmata* muds occurring inside the habitat ≤10.5%  -Cover of living mussels inside patches ≥50%  -Median shell length of living *Mytilus galloprovincialis* inside patches ≥50 mm.  -Live biomass of *Mytilus galloprovincialis* ≥5,000 g/m2  In Russia and Ukraine the average biomass of macrozoobenthos in 1970-1980 was more than 450 g/m2, with a density of 350 ind/m2. Now some decline in the number and biomass is observed. In different regions average biomass varied from 220 to 300 g/m2, and density 250-270 ind/m2. Off the coast of Crimea average density and biomass of macrozoobenthos in the habitat were quite uneven as we can see from different authors: 3,700 ind/m2 and 59 g/m2, respectively and 844 ind/m2 and 227.7 g/m2, respectively.  Characteristic species:  Blue mussel beds have a particularly important ecological role on soft seabeds, as they provide a hard surface in otherwise muddy areas. This attracts and supports a greater range of marine life than would otherwise be found there including seaweeds, anemones, barnacles, molluscs, crustaceans, echinoderms and polychaetes. The species composition of the accompanying fauna is variable and depends on the sediment matrix and depth. Between 20 and 106 species of macrozoobenthos are known to occur in the habitat, maximum number of species recorded is 131. Circalittoral *Mytilus galloprovincialis* beds harbour a diverse range of epibiota and infauna:  *-*cnidarians: *Actinithoe clavata*  *-*sponges: *Dysidea* sp.  *-*molluscs: *Lepidochitona cinerea, Abra alba, Calyptraea chinensis, Retusa truncatella, Nassarius nitidus, Gouldia minima, Pitar rudis, Acanthocardium paucicostatum, Rapana venosa*  -polychaetes: *Terebellides stroemi, Aonides paucibranchiata, Melinna palmata, Capitella capitata, C. minima, Eumida sanguinea, Glycera alba, Hediste diversicolor, Heteromastus filiformis, Nephtys hombergii, Nereiphylla rubiginosa, Pectinaria koreni, Polycirrus jubatus, Polydora* spp., *Pomatoceros triqueter.*  *-*amphipods: *Ampelisca diadema, Orchomene humilis*  *-*echinoderms: *Amphiura stepanovi, Leptosynapta inhaerens*  *-*tunicates: *Ascidiella aspersa, Ciona intestinalis*  -elasmobranchs: *Raja clavata, Squalus acanthias*  -fish*: Acipenser gueldenstaedti, A. stellatus, Huso huso, Chelindonichthys lucernus, Mesogobius batrachocephalus, Psetta maeotica.* |
| Black Sea | A5.62 Musselbeds in the Pontic infralittoral zone | Found in a variety of habitats ranging from sheltered estuaries and marine inlets to open coasts and offshore areas they may occupy a range of substrata, although due to the stabilising effect such communities have on the substratum muddy mixed sediments are typical. A diverse range of epibiota and infauna often exists in these communities.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species, and species sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Mytilus galloprovincialis. |
| Black Sea | A5.64 Oyster reefs on Pontic lower infralittoral rock | Small oyster reefs occur as oyster clumps (5-10 oysters) on rocky outcrops. The reefs occur along theTurkish Black sea coast in the rocky infralittoral at depths of 10-20m.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and species sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species: *Ostrea edulis*. |
| Black Sea | A5.a Fauna-dominated Pontic infralittoral cobbles and gravels | This habitat is defined by faunal communities present in infralittoral coarse sediments including pebbles, cobbles, fine gravels, coarse sands and shell hash. The habitat comprises a diverse range of communities which include: sparse fauna on pebbles and gravels, environments beneath cobbles and gravels and shell hash with well defined characteristic species (Branchiostoma lanceolatum - Protodorvillea kefersteini - Ophelia limacina).  This biotope is found in coastal surge zones, as well as on wave lashed bottoms in open coast environments and deposits affected by unidirectional currents. Typical characterising species in coarse sand and shell gravel environments include the lancelet *Branchiostoma lanceolatum* and polychaetes *Protodorvillea kefersteini* and *Ophelia limacina*.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and species sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Spirobranchus triqueter, Branchiostoma lanceolatum, Protodorvillea kefersteini, Ophelia limacina, Flexopecten glaber ponticus* and *Polititapes aureus.* |
| Black Sea | A5.aa Pontic infralittoral sands and muddy sands with stable aggregations of perennial unattached macroalgae | This habitat occurs in infralittoral sands and muddy sands. It is most easily identified and defined by the presence of unattached forms of macroalgae, in particular the ball-like form of the red alga *Phyllophora crispa* var. *sphaerica*. The classic example of this habitat is the Small Phyllophora field (SPF) National Botanical Reserve, which lies in shallow water (less than 16 m) on sand with shells in Karkinitsky Bay, Ukraine and occupies some 300-400 km2. Smaller *Phyllophora* aggregations occur in shallow water (mostly 3-5 m) in Yagorlytsky, Dzharylgachsky, Tendrovsky and Yarylgachsky Bays, and near Cape Evpatoriysky.  Between 1938 and 1994, a shift in communities was observed in the SPF: the *Phyllophora* – oyster *Ostrea edulis* community was replaced by *Mytilus galloprovincialis* – *Phyllophora*, and the dominant species changed. From the 1970s, the most significant pressure was eutrophication which probably caused the greatest reductions in quantity and quality. After peaking in the 1980s, eutrophication has since reduced due to tighter controls on pollution in the catchment of the Danube and other rivers which enter the north-west Black Sea as well as industrial decline after the dissolution of the Soviet Union.  Indicators of quality:  Several elements of the “quality” of *Phyllophora* beds have been studied, including time series data comparing 3 patches of the SPF with regard to depth of occurrence, thickness of seaweed layers, biomass, and area covered, as well as the species composition of the benthic community.  Characteristic species:  Macrophyte species diversity is not high, comprising about 20 species, chiefly *Zostera noltii* and *P. crispa.* The *Phyllophora* beds support a specialized fauna of more than 110 species of invertebrates and 47 species of fish that use the alga for breeding, food and shelter (many even having a reddish colouration). The main groups of macrozoobenthos recorded from the SPF in 2000 in terms of number of species, abundance and biomass were molluscs, polychaetes and crustaceans, with the most common species (with occurrence >60%) being: *Mytilaster linneatus, Bittium reticulatum, Harmothoe reticulata, Nereis zonata,* and *Synisoma capito*. |
| Black Sea | A5.bb Pontic infralittoral sands and muddy sands with annual algae | Infralittoral sands and muddy sands in the Black Sea are typically found in sheltered environments close to the coast. Most commonly these are in deltas, bays, estuaries or lagoons. Due to the low energy environments algal species are able to form stands on the sediment surface. These algal stand are typically characterised by lamina green algae species of the genus *Ulva* and *Cladophora*.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and species sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Ulva* spp. and *Cladophora* spp. |
| Black Sea | A5.xx Pontic circalittoral biogenic detritic bottoms with dead or alive mussel beds, shell deposits, with encrusting corallines (*Phymatolithon, Lithothamnion*) and attached foliose sciaphilic macroalgae | *Zernov’s Phyllophora Field* is a bioengineered habitat type unique to the Black Sea, consisting of extensive stands of perennial red algae (genera *Phyllophora*, *Coccotylus*) developing on circalittoral hard substrata and a highly diverse associated fauna. Zernov’s *Phyllophora* Field - located on the northwestern shelf of the Black Sea – comprises the world’s most abundant stand of Phyllophoraceae. They develop on mixed sediments (shelly mud to pure shell hash) covered by dead or alive crustose corallines *Lithothamnion crispatum, Lithothamnion propontidis, Lithophyllum cystoseirae,* occurring offshore at depths of 30-50m. The crustose corallines are the preferred substrate for attachment of a more or less dense cover of *Phyllophora crispa* and *Coccotylus truncatus*. *Phyllophora crispa* may form extensive canopies here, which harbour a characteristic and diverse fauna.  During the historical period 32 macroalgae species were recorded from the ZPF. The most abundant algae were *Phyllophora crispa* (syn. *P. nervosa*), *Coccotylus truncatus*, *Polysiphonia sanguinea, Feldmania irregularis, Desmarestia viridis.*  Indicators of quality:  Suitable biotic indicators of quality include:  -Abundance of *Phyllophora crispa*  -Abundance of *Mytilus galloprovincialis*  -Biomass of *Phyllophora crispa*.  Suitable abiotic indictors of quality include:  -Water transparency  Indicator thresholds for monitoring purposes have not been set. Biomass of *Phyllophora crispa* in 1978 was 4-17000 gm-2. The habitat was considered to be of good quality during this period. However, due to severe degradation in the subsequent years this can no longer be considered a realistic target.  Characteristic species:  The dominant species which engineer this habitat are all red algae:  - *Phyllophora crispa* and *Coccotylus truncatus;*  - *Lithothamnion crispatum, L. propontidis* and *Lithophyllum cystoseirae*  *Phyllophora* fields in the northwest Black Sea have associated specialized faunal communities including more than 110 species of invertebrates and 47 species of fish. The species composition of theaccompanying fauna is variable and depends on the density of the *Phyllophora* canopy.  *-*cnidarians: *Actinothoe clavata*  *-*sponges: *Haliclona gracilis*  *-*molluscs: *Lepidochitona cinerea, Abra alba, Calyptraea chinensis, Retusa truncatella, Monophorus perversus, Pitar rudis, Cerastoderma glaucum, Polititapes aureus*  -polychaetes: *Harmothoe reticulata, Syllis elegans, Spirobranchus  triqueter.*  *-*amphipods: *Gammarus aequicauda, Apherusa bispinosa, Melita palmata*  *-*isopods: *Stenosoma capito*  *-*decapods: *Liocarcinus navigator, Crangon crangon*  *-*tunicates: *Ascidiella aspersa, Ciona intestinalis*  *-elasmobranchs: Raja clavata, Squalus acanthias*  *-fish: Acipenser gueldenstaedti, A. stellatus, Huso huso, Chelindonichthys lucernus, Lepadogaster gouani, L. microcephalus, Ctenolabrus rupestris, Psetta maeotica.* |
| Black Sea | A5.xy Pontic circalittoral biogenic detritic bottoms with unattached form of Phyllophora crispa | Mixed sediments (shelly mud to pure shell hash) occurring at depths within the circalittoral zone. The most important characterising component of this habitat is the spherical form of *Phyllophora* (*Phyllophora crispa sphaerica*).  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Phyllophora* fields in the northwest Black Sea have associated specialized faunal communities including more than 110 species of invertebrates and 47 species of fish. The main systematic groups of macrozoobenthos recorded from the Small *Phyllophora* field’ in 2000 in terms of number of species, abundance and biomass were molluscs, polychaetes and crustaceans. |
| Black Sea | A5.xZ Pontic circalittoral terrigenous muds | Terrigenous sediments are those derived from the weathering and erosion of rocks on land; thus they are derived from terrestrial rather than marine environments. The sediments generally consist of sand, mud and silt carried to the sea by watercourses, and their composition is usually related to their source material. Depending on the mechanism and rapidity of deposition of the sediments, the habitat comprises more or less firm muddy facies which are favoured by certain species.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Abra alba , Acanthocardium paucicostatum* and *Plagiocardium papillosum* |
| Black Sea | AA.XY Invertebrate-dominated Pontic other hard substrata | Sunken logs are often present along forested coasts and in estuaries, where they are brought as a result of river  floods or violent storms in coastal forests. They are inhabited by shipworms  (wood-boring bivalves) *Teredo navalis*.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species and those which are sensitive to the pressures the habitat may face, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Teredo navalis* |
| Black Sea | Communities of Marmara mediolittoral caves and overhangs | The mediolittoral caves and overhangs are a special habitat whose main distinctive trait is the low irradiance. Algal growth is thus restricted to a very few species that can withstand low light levels, low to high hydrodynamism, and extended periods of desiccation. Canopy-forming macroalgae are overall absent whilst encrusting rhodophytes are preponderant. The communities are, however, very poor in species. Two species of Rodophyta dominate: *Hildenbrandia rubra* and *Phymatholithon lenormandii*, which shape the habitat Eunis A1.144b.  Indicators of quality  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of particular species, water quality parameters, levels of exposure to a particular exposure as well as more integrated indices which describe habitat function and structure, such as trophic index, or successful stages of development in habitats that have a natural cycle of change over time. There are no known commonly agreed indicators of quality for this habitat, although particular parameters may be set in certain situations, e.g. protected features with Natura 2000 sites, where reference values may have been determined and applied on a location-specific basis. Some potential indicators of quality for this specific habitat are the presense of the characterissitc species mentioned.  Characteristic species  Rhodophyta (red algae): *Hildenbrandia rubra*., *Phymatolothon lenormandii*., *Gymnothamnion elegans*., *Corallina elongata*., Isopoda: *Ligia italica*., Cirripedia: *Perforatus perforatus*., *Chthamalus stellatus*., and *Chthamalus montagui.* |
| Mediterranean | A1.13: Communities of Mediterranean upper mediolittoral rock | This habitat occurs in the mediolittoral (surf zone) of the Mediterranean coast on areas of bedrock, boulders and stones.  The associated species are adapted to long periods of emersion. In the upper mediolittoral the main species present are barnacles, periwinkles and limpets forming a belt which may be more than three meters in highly swashed coasts. In the lower part of this habitat, the moister conditions mean that algae can become established and dominate. The characteristic species  include *Pyropia elongata, Bangia fuscopurpurea, Polysiphonia sertularioides, Rissoella verruculosa* and, on exposed shores of both calcareous and siliceous substrates, brown crusts of *Ralfsia verrucosa*.  Indicators of quality  Most of the species associated with this habitat are capable of withstanding rather high environmental pressures, even man-induced ones however *Rissoella verruculosa*, which is characteristic of one of the associated biotopes is sensitive to both pollution and human activities and may therefore be a potential quality indicator.  A "Quality of Rocky Bottoms index" (CFR by its Spanish acronym) used in Spanish Atlantic waters for the assessment of macroalgae communities on rocky shores may have some potentially application in assessment of quality of this habitat.  Characteristic species:  Rhodophyta (red algae)-*Rissoella verruculosa. Pyropia elongata, Themis ballesterosii, Nemalion helmintoides, Bangia fuscopurpurea, Hildenbrandia rubra, Polysiphonia sertularioides, Callithamnion granulatum.*  Phaeophyta (brown algae)-*Ralfsia verrucosa, Scytosiphon lomentaria, Hapalospongidion macrocarpum.*  Chlorophyta (green algae)-*Blidingia chadefaudii, Blidingia minima.*  Cyanophyta (blue-green algae)-*Rivularia atra,Rivularia mesenterica, Brachytrichia quoyi, Entophysalis granulosa, Lyngbya confervoides, Calothrix crustacea.*  Lichens-*Verrucaria amphibia, Pyrenocollema halodytes.*  Gastropoda- *Patella rustica, Melarhaphe neritoides, Echinolittorina punctata, Phorcus turbinatus*  Cirripedia- *Chthamalus stellatus, Chthamalus montagui, Euraphia depressa.*  Isopoda- *Ligia italica.*  Decapoda- *Pachygrapsus marmoratus.*  Insecta- *Fucellia sp.* |
| Mediterranean | A1.14: Communities of exposed Mediterranean lower mediolittoral rock | This habitat develops on the lower horizon of the mediolittoral rock. Although never completely submerged for long periods of time, the rock surfaces are kept moist by spray from wave action. It occupies a zone of variable extent, generally immediately above mean sea level. The hard surfaces are colonised by encrusting and erect epifauna with the dominant species depending on the wave exposure and shape different associated biotopes which are dominated by encrusting species. The mussel *Mytilus galloprovincialis* may be frequent, especially where there are high levels of organic matter. Encrusting coralline algae (*Lithophyllum spp.*) are also characteristic of this habitat with different species dominating depending on the rock type and geographical area.  Indicators of quality.  Some of the coralline algae associated with this habitat may be potential indicators of pollution (e.g. *Lithophyllum byssoides*) and the abundance of *Mytilus galloprovincialis* can be linked to decrease in environmental quality. An quality index based on the presence and abundance of macroalgal communities is being used in Spanish Atlantic waters to report on similar habitats (CRF Index).  Characteristic species  Rhodophyta (red algae)-*Lithophyllum byssoides, Lithophyllum cf. vickersiae, Corallina elongata, Hypnea musciformis, Callithamnion granulatum, Ceramium diaphanum, Lithophyllum incrustans, Callithamnion granulatum, Polysiphonia tripinnata, Boergeseniella fruticulosa, Polysiphonia sertularioides, Lithophyllum papillosum, Acrochaetium duboscqii, Ceramium virgatum, Ceramium ciliatum, Gelidium pusillum, Osmundea verlaquei, Palisada tenerrima, Laurencia glandulifera, Laurencia pyramidalis, Rissoella verruculosa,*  Phaeophyta (brown algae)-*Pseudolithoderma adriaticum, Ralfsia verrucosa, Nemoderma tingitanum.*  Chlorophyta (green algae)-*Chaetomorpha mediterranea v. crispa, Bryopsis muscosa, Cladophora spp., Ulva compressa, Ulva rigida, Ulva fasciata, Patella ulyssiponensis, Patella ferruginea.*  Bivalvia-*Mytilus galloprovincialis, Lasaea adansoni, Mytilaster minimus,*  Cirripedia-*Perforatus perforatus, Chthamalus stellatus, Chthamalus montagui.* |
| Mediterranean | A1.23: Communities of moderately exposed Mediterranean lower mediolittoral rock | This is an intertidal habitat which occurs on rocky and boulder shores, just above the mid tide levels. It is present in locations that are moderately exposed to wave action and may be subject to strong or moderate currents. The associated biotopes are dominated by the red alga *Corallina elongata* in the most exposed conditions, and *Gelidium pusillum* and *G.crinale* where there are elevated nutrient levels. In some situation the habitat is almost devoid of erect macroalgae, grazed by *Patella* spp., and characterised by crusts of the *Lithophyllum* spp. In the inner parts of bays or close to the beaches, other red algae species (mainly *Laurencia pyramidalis, Laurencia glandulifera, Palisada perforata* and *Osmundea verlaquei*) but also *Hypnea musciformis* and *Ceramium ciliatum* may dominate. There is also an associated biotope dominated by *Palisada tenerrima* which forms dense, almost monospecific turfs that completely cover the rock in the central and southern part of the Mediterranean and a dominance by *Haliptilon virgatum* in several Mediterranean regions characterised by warm waters and relatively high light irradiances.  Indicators of quality An increase in the abundance of many organisms: green algae, *Gelidium* spp., *Scytosiphon lomentaria, Petalonia fascia, Mytilus galloprovincialis* and, occasionally, *Corallina elongata* can be indicators of poor quality. Conversely species of the genus *Osmundea, Laurencia* and *Palisada* seem to avoid polluted waters. Their absence may therefore also be a potential indicator of changes in quality of the habitat.  A "Quality of Rocky Bottoms index" (CFR by its Spanish acronym) used in Spanish Atlantic waters for the assessment of macroalgae communities on rocky shores may have some potentially application in assessment of quality of this habitat.  Characteristic species:  Rhodophyta (red algae)-*Corallina elongata, Hypnea musciformis, Callithamnion granulatum, Gastroclonium clavatum, Grateloupia filicina, Ceramium ciliatum, Boergeseniella fruticulosa, Chondria boryana, Laurencia glandulifera, Gelidium crinale, Laurencia pyramidalis, Haliptilon virgatum, Ceramium diaphanum, Lithophyllum byssoides, Lithophyllum incrustans, Gelidium pusillum, Osmundea verlaquei, Antithamnionella elegans, Asparagopsis armata (sporophyte), Jania rubens, Ceramium tenerrimum, Hildenbrandia crouaniorum, Polysiphonia sertularioides, Chondracanthus acicularis, Lophosiphonia obscura, Ceramium echionotum, Lithophyllum pustulatum, Lophosiphonia cristata, Palisada perforata, Ceramium virgatum, Liagora viscida, Gayliella flaccida.*  Phaeophyta (brown algae)-*Cystoseira compressa, Sphacelaria cirrosa, Dictyota sp., Ralfsia verrucosa, Padina pavonica, Halopteris scoparia, Pseudolithoderma adriaticum, Cystoseira mediterranea.*  Chlorophyta (green algae)-*Ulva rigida, Ulva fasciata, Ulva compressa, Cladophora laetevirens, Bryopsis muscosa, Chaetomorpha aerea, Anadyomene stellata.*  Cnidaria-*Actinia equina, Anemonia viridis.*  Bivalvia-*Mytilus galloprovincialis, Mytilaster minimus.*  Gastropoda-*Phorcus turbinatus, Patella rustica, Patella ulyssiponensis, Stramonita hemastoma.*  Cirripedia-*Perforatus perforatus.*  Decapoda-*Pachygrapsus marmoratus.* |
| Mediterranean | A1.34: Communities of sheltered Mediterranean lower mediolittoral rock | This habitat develops on the lower horizon of mediolittoral rock in areas sheltered from wave action and currents although some of the associated species may also thrive on moderately exposed shores. The rock surfaces are dominated by algae, the characteristic species depending on the local conditions. In areas of gently almost horizontal slopes, the red algae *Ceramium ciliatum* can form an almost continuous carpet. There may be distinctive crusts of the brown algae *Nemoderma tingitatum* on the smooth rocky shores where there is moderate to low wave action, and in nutrient enriched areas the green algae of the genus *Ulva* dominates and may exclude settlement of other species of algae.  Indicators of quality: The only biotope which might be sensitive to pollution and man-induced impacts is that dominated by *Nemoderma tingitanum*. Reduction in the total percent cover of this species and overall species richness can indicate a decrease on ecological quality. Both the biotopes of *Ceramium ciliatum* and *Ulva* spp. show extraordinary resilience to environmental impacts and they appear even in degraded environments. A "Quality of Rocky Bottoms index" (CFR by its Spanish acronym) used in Spanish Atlantic waters for the assessment of macroalgae communities on rocky shores may have some potentially application in assessment of quality of this habitat.  Characteristic species: Rhodophyta (red algae)- *Ceramium ciliatum, Corallina elongata, Hypnea musciformis, Gelidium pusillum, Callithamnion granulatum, Gastroclonium clavatum, Laurencia pyramidalis, Ceramium diaphanum, Polysiphonia sertularioides.*  Phaeophyta (brown algae)- *Nemoderma tingitanum, Scytosiphon lomentaria, Sphacelaria cirrosa.*  Chlorophyta (green algae)- U*lva prolifera, Ulva compressa, Ulva intestinalis, Ulva fasciata, Ulva rigida, Cladophora albida, Cladophora sericea, Cladophora vagabunda, Chaetomorpha aerea, Cladophora dalmaica, Cladophora laetevirens.*  Cnidaria- *Actinia schmidti*.  Bivalvia- *Mytilus galloprovincialis.*  Gastropoda- *Patella ulyssiponensis, Patella caerulea, Phorcus turbinatus, Stramonita haemastoma, Phorcus articulatus.*  Cirripedia- *Chthamalus montagui.*  Isopoda- *Ligia italica.*  Decapoda- *Pachygrapsus marmoratus.* |
| Mediterranean | A1.41: Communities of Mediterranean mediolittoral rockpools | Rockpools occur where the topography of the shore allows seawater to be retained within depressions in the bedrock. As the associated communities are permanently submerged they are not directly affected by height on the shore and normal rocky shore zonation patterns do not apply. Factors such as pool depth, surface area, volume, orientation to sunlight, shading, internal topography, sediment content and type, together with wave exposure, shore height, and hence flushing rate, and the presence of absence of freshwater runoff, results in large spatial variation in community structure, even between adjacent pools at the same shore height.  The provision of seawater to this habitat can be completely interrupted during long periods of calm sea conditions. In these cases, the habitat may face important changes in temperature, pH, salinity and oxygen concentration. Nitrogen concentration is very often high and seasonal changes more abrupt than in the adjacent, regularly swashed communities. In these conditions, the development of macroalgal communities is hindered and green algae can dominate. Large numbers of benthic species and juvenile stages of some commercial species of fish may be present in rockpools.  Indicators of quality: Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Most of the associated species are opportunistic and show high turnover however changes in species richness and percent algae cover could indicate changes in the quality of the environment.  Characteristic species:  Rhodophyta (red algae): *Ceramium ciliatum, Gelidium pusillum, Ellisolandia elongata, Polysiphonia sertularioides, Hildenbrandia rubra, Neogoniolithon brassica-florida, Lithophyllum incrustans.*  Phaeophyta (brown algae): *Scytosiphon lomentaria, Petalonia fascia, Sphacelaria cirrosa, Cystoseira compressa.*  Chlorophyta (green algae): *Cladophora vagabunda, Chaetomorpha aerea, Ulva rigida, Ulva compressa, Ulva fasciata, Cladophora albida, Cladophora laetevirens, Cladophora dalmatica.*  Cyanophyta (blue-green algae): *Calotrix crustacea.*  Gastropoda: *Echinolittorina puncatata, Melaraphe neritoides, Phorcus turbinatus, Patella rustica.*  Cirripedia: *Chthamalus montagui.*  Decapoda: *Pachygrapsus marmoratus.*  Echinodermata: *Paracentrotus lividus, Arbaxia lixula* |
| Mediterranean | A1.44: Communities of Mediterranean mediolittoral caves and overhangs | Mediolittoral caves and overhangs are a special habitat whose main distinctive trait is the low irradiance. The habitat can be found on most rocky shores regardless of wave exposure. The shaded nature of caves and overhangs diminishes the amount of desiccation suffered by biota during periods of low tides which allows certain species to proliferate.  Algal growth is restricted to a very few species that can withstand low light levels, low to high hydrodynamism, and extended periods of desiccation. Canopy-forming macroalgae are absent whilst encrusting rhodophytes are dominant. Some variation in the species composition of the individual caves must be expected depending on local conditions although in general the communities are very poor in species. At the entrance to mediolittoral caves where there is sufficient light red algae may be present, particularly an association of nonâ€calcified encrusting red algae *Hildenbrandia rubra* and *Phymatholithon lenormandii*, under the red alga *Lithophyllum byssoides.*  In general, the biomass and diversity of algal species found in upper and midâ€shore littoral caves decreases with increasing depth into the cave as the light levels diminish. Fauna usually only occur on the lower and mid-level walls of the caves and generally comprise barnacles, anemones and tubeâ€forming polychaetes.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Rhodophyta (red algae) - *Hildenbrandia rubra*, *Phymatolithon lenormandii, Gymnothamnion elegans, Ellisolandia elongata, Lithophyllum byssoides.*  Anthozoa - *Actinia equina.*  Isopoda - *Ligia italica.*  Cirripedia - *Perforatus perforatus, Chthamalus stellatus, Chthamalus montagui.* |
| Mediterranean | A2.12 Communities of Mediterranean mediolittoral coarse sediment estuarine | This habitat comprises shores of coarse sediments (shingle, gravels and coarse sand) in the upper reaches of estuaries and other inlets which are subject to variable and reduced salinity conditions. The outflow of riverine freshwater at the heads of the inlets results in the washing out of fine particulate matter, leaving coarse sediments. This habitat is typically covers small areas and exhibit a great variability of physical and chemical parameters. It is a species-poor habitat and the fauna characterised by oligochaete worms.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  Indices developed to assess the ecological status of coastal waters, including estuaries, according to the Water Framework Directive, include physical indicators, water quality indicators and measures of benthic diversity, species richness and abundance. The latter group, which is particularly relevant to benthic habitats, includes a Benthic Quality Index, an Infaunal Trophic Index, a Marine Biotic index based on ecological groups, and the Benthic Opportunistic Polychaetes/Amphipods index.  Characteristic species:  Poorly studied but known to include Oligochaetessuch as *Grania* spp.and the gastropod *Littorina littorea.* |
| Mediterranean | A2.13 Communities of Mediterranean mediolittoral coarse sediment | Littoral coarse sediments are found along relatively exposed open shores, where wave action prevents finer sediments from settling. This habitat include shores of mobile pebbles, cobbles and gravel, sometimes with varying amounts of coarse sand. The sediment is highly mobile and subject to high degrees of drying between tides, while sediment particle size structure may vary seasonally, with relatively finer sediments able to settle during calmer conditions in summer. As a result, few species are able to survive in this environment. It is occupied by scavengers species that feed on various plant debris and waste material retained between the pebbles and gravel. Beaches of mobile cobbles and pebbles tend to be devoid of macroinfauna, while gravelly shores may support limited numbers of crustaceans, polychaetes and holothurians. These communities are exposed to alternating water submersion and emersion because of variations in the water level.  One of associated biotopes consist mainly of detritus-feeding species which draw their nourishment from decaying vegetation and miscellaneous debris caught up in the shingle. It is characterised by two crustaceans, the amphipod *Gammarus olivii* and the isopod *Sphaeroma serratum*.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations, e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Crustaceans:*Echinogammarus planicrurus, Gammarus marinus, Sphaeroma serratum* and polychaete *Perinereis cultrifera.* Other species include *Pachygrapsus marmoraturs, Allorchestes aquilinus, Perinereis cultifera, Holothuria tubulosa.* |
| Mediterranean | A2.25: Communities of Mediterranean mediolittoral sands | This habitat occupies the boundary between the poorly swashed, almost dry supralittoral sands and the permanently submerged infralittoral sands of Mediterranean beaches. The sediment grains range from gravels to fine sands. Coarser sediments are often found in beaches exposed to stronger wave action whilst finer sediments are common on the more sheltered shores. Depending on the sediment characteristics the infauna is dominated by polychaetes, oligochaetes, bivalves, amphipods and bivalves. Characateristic species of associated biotopes incude the polychaetes *Pisione remota*, *Saccocirrus papillocercus*, *Scolelepis squamata* and *Ophelia bicornis,* the isopod *Eurydice affinis* and on the lower shore by the bivalves *Donax semistriatus* and *D. trunculus* and the crab *Portumnus latipes.* This habitat is used for nesting by loggerhead turtle, *Caretta caretta* and green turtle, *Chelonia mydas* in parts of the eastern Mediterranean.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change overtime.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.   As most bivalves are sensitive to pollution, air exposure, and habitat destruction they could be potential indicators of quality for this habitat.    Characteristic species:  Polychaeta-*Pisione remota, Saccocirrus papillocercus, Hesionura serrata, Microphtalmus similis, Scolelepis squamata, Ophelia bicornis.*  Bivalvia- *Donax semistriatus, Donax trunculus, Donacilla cornea, Ensis minor, Dosinia lupinus, Kurtiella bidentata.*  Gastropoda- *Caecum trachea, Nassarius mutabilis.*  Amphipoda- *Ecchinogammarus foxi, Melita bulla, Stenothoe sp., Monocorphium sextonae.*  Isopoda- *Eurydice affinis, Sphaeroma serratum.*  Decapoda- *Portumnus latipes,* |
| Mediterranean | A2.31 Communities of Mediterranean mediolittoral mud estuarine | In Mediterranean estuaries tidal amplitude is very weak and tidal currents, which generate vertical mixing of the water, are negligible. This favors vertical stratification of salinity with a counter current of saline water beneath the less dense river water.(salt wedge estuaries). The small tidal range (20-40cms) also means that large expanses of mediolittoral soft sediments along estuaries are rare, especially when compared to more northern latitudes in Europe.  This habitat is present on estuarine shores of soft substrates, generally under substantial freshwater influence, and may form a delta at the mouth of the estuary. It occurs in the mediolittoral and the upper part of the infralittoral where the sediment is fine sand, muddy sands and mud according to the course of the river bed. The banks are relatively stable, but the beds change with the violent winter flooding. The surface salinity is low (0.03 to 2.5 psu for the Rhône) whereas that of the deep layer, in contact with the benthic fauna, is much higher (16 to 21 psu for the Rhône). A marine salty patch typically lies underneath the fresh water of the river. Tides are weak and only cause minor changes in the water chemistry. The winds have a more marked influence on the position of the salty patch. When parts of the estuary or estuary lagoons are cut off, either naturally or by human action, the salinity of the water may increase considerably.  In the absence of the tide effect, the transition is rapid between the (freshwater) limnic environment and the marine environment. Thus there is no gradient in the distribution of the fauna, which occurs patchily. This habitat is characterized by communities of polychaetes, bivalves and oligochaetes. The species present are typically have short cycles of development that permit rapid colonization. The habitat is used as a feeding area by birds and by some fishes (grey mullet and eels).  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  Indices developed to assess the ecological status of coastal waters, including estuaries, according to the Water Framework Directive, include physical indicators, water quality indicators and measures of benthic diversity, species richness and abundance. The latter group, which is particularly relevant to benthic habitats, includes a Benthic Quality Index, an Infaunal Trophic Index, a Marine Biotic index based on ecological groups, and the Benthic Opportunistic Polychaetes/Amphipods Index.  Species typical of environments with high organic loads such as *Capitella capitata, Heteromastus filiformis* and *Polydora* spp. may be potential indicators of degraded quality. Indicators used within the Water Framework Directive may also be applied for estuarine habitats as a whole.  Characteristic species:  These include polychaetes: *Armandia cirrosa, Capitella capitata, Hediste diversicolor, Heteromastus filiformis, Hydroides dianthus, Malacoceros fuliginosus, Naineris laevigata, Nephtys hombergii, Protoaricia oerstedii;*bivalves*: Abra alba, Abra ovata, Cerastoderma glaucum;* gastropods*: Ecrobia ventrosa, Loripes lucinalis, Mytilaster minimus, Ruditapes decussatus;* larval stages of arthropod *Chironomus* spp.; crustaceans*: Corophium insiduosum, Corophium volutator,*  *Iphinoe serrata,  Abludomelita aculeata,  Microdeutopus gryllotalpa.* |
| Mediterranean | A2.33 Communities of Mediterranean mediolittoral mud | This habitat is present in sheltered inlets and embayments which are not part of major estuarine systems. It may also form in areas that were previously rocky or cobble fields, but where pseudofaeces have accumulated from filter-feeding gastropods, leading to the presence of a thick layer of mud. Such a build up of pseudofaeces results in a bed that is very soft to walk on, and sediment which is anoxic to the surface.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations, e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  This habitat is characterised by species such as: Polychaetes: *Hediste diversicolor, Nephtys hombergii*, *Goniada emerita*, *Laonice bahusiensis*, *Notomastus latericeus;* bivalves: *Cerastoderma glaucum, Abra alba; g*astropods: *Hydrobia* spp; *and*crustaceans such as:*Monocorophium insidiosum, Gammarus* spp. |
| Mediterranean | A2.42 Communities of Mediterranean mediolittoral mixed sediment | Shores of mixed sediments range from muds with gravel and sand components to mixed sediments with pebbles, gravels, sands and mud in more even proportions. By definition, mixed sediments are poorly sorted. It is likely that there are broad transition areas between areas of mudflat or sandy mudflat, and mixed sediment biotopes where the sediment consists mainly of mud but has significant proportions of gravel and sand mixed in. Gravel mud may occur in patches on mudflats. Similarly, there is no easily defined boundary between areas of mixed sediment with stable cobbles and boulders, and boulder fields which fall into the rocky shore category.Stable large cobbles or boulders may be present which support epibiota such as fucoids and green seaweeds which are more commonly found on rocky and boulder shores.  Mixed sediments which are predominantly muddy tend to support infaunal communities which are similar to those of mud and sandy mud shores. Habitats with sheltered gravel sandy mud, which are subject to reduced salinity, mainly on the mid and lower shore, may have abundant communities of polychaetes.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations, e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Polychaetes: *Aphelochaeta marioni, Capitella capitata, Cirriformia tentaculata ,Sphaerosyllis taylori, Pygospio elegans;*bivalves*: Cerastoderma edule, Abra nitida;*oligochaetes*:Tubificoides pseudogaster;* crustaceans*: Aora gracilis, Melita palmata, Microprotopus maculatus,Corophium volutator.* |
| Mediterranean | A2.7x Biogenic habitats of Mediterranean mediolittoral rock | This habitat is formed by the biogenic, tridimensional, hard structures built by either the red algae *Lithophyllum* *byssoides* or the red algae *Neogoniolithon brassica-florida* associated with the gastropod *Dendropoma* *cristatum* (in the central Mediterranean) or *D. petraeum*. The rims of *L. byssoides* are generally found just above the mean sea level, in the mesolittoral zone, where waves break. They can reach more than one metre of vertical thickness. For this reason, the habitat is host to different assemblages from its upper portion, which is situated in the lower mediolittoral zone, to the lower, submerged one. The development of this type of habitat in specific areas of the Mediterranean depends on several climatic, hydrological and sedimentary conditions. It seems to develop better over calcareous rocks, on steep shores in areas with strong hydrodynamism and where the temperature of surface coastal waters is no lower than 14°C in the winter. Under these environmental conditions, the *L. byssoides* rims are more frequent in the northwestern Mediterranean, but they can also be found in Sicily and the Adriatic Sea. Mediterranean bioconcretions composed of *N. brassica- florida* and *D. petraeum* may grow for thousands of years forming huge structures of several metres wide.  These reefs are host to many species, which distribute differently over the bioconcretion depending on wave action and the position on the reef. In the seaward part of the reef, the reef crest, the concretion is made of shells of *Dendropoma* actively growing while *Neogoniolithon* cements the reef and triggers the vermetid settlement. Behind the reef crest, a shallow lagoon covered by photophilic algal communities develops. This part ends close to the shore, where *Neogoniolithon* and *Dendropoma* dominate again. *Neogoniolithon-Dendropoma* reefs better develop in southern Mediterranean areas although tiny reefs can be found across 40º N latitudes at their northern limit.  Indicators of quality:  The *Lithophyllum byssoides* rims are particularly vulnerable to physical impacts and trampling, and they seem to be very sensitive to environmental stresses related to water quality. Rims are very sensitive to the increase or decrease of the water level. The amount of dead *L. byssoides* thalli in the upper part of the reef can be used as a health indicator. Both reefs represent unique archives to reconstruct past Mediterranean climate and especially sea level oscillations.  Characteristic species:  Phaeophyta (brown algae): *Ralfsia verrucosa, Cystoseira compressa.*  Chlorophyta (green algae): *Cladophora laetevirens, Bryopsis muscosa, Chaetomorpha capillaris* var. *crispa, Chaetomorpha aérea.*  Cnidaria: *Actinia equina.*  Polyplacophora: *Acanthochitona fascicularis, Lepidochitona corrugata.*  Bivalvia: *Mytilus galloprovincialis, Lasaea adansoni, Mytilaster minimus.*  Gastropoda: *Patella rustica, Patella ulyssiponensis, Dendropoma petraeum, Purpura haemastoma, Onchidella celtica.* |
| Mediterranean | A3.13 Photophilic communities with canopy-forming algae in Mediterranean infralittoral and upper circalittoral rock | This habitat occurs on rocky bottoms and is characterised by communities macroalgae that form canopies. The structure includes bush-forming, turf forming algae, encrusting fauna and epiphytes. The coverage of the “bush” and turf strata is usually higher than in an assemblage dominated by canopy algae. Assemblages are also highly miniaturized (less than 20 cm high) and very rich in species (up to 110 species in a 400 cm2 area).  This habitat is present from the upper infalittoral zone (0 m) to the upper circalittoral zone. Assemblages are always algal-dominated, although some invertebrates can be common in the understory and growing as epiphytes. Species composition greatly differs according to the environmental conditions. Factors accounting for the variability on the assemblages include light availability, hydrodynamism, nutrient concentration in seawater, substrate, sedimentation, temperature, salinity, grazing intensity, predation, frequency of disturbances. High densities of sea urchins (*Paracentrotus lividus*) can graze the algae, producing structurally less complex assemblages and even barren areas. Grazing by other fish species (*Sarpa salpa* or the exotic *Siganus rivulatus*, *S. luridus*) can modify the species composition.  Several  associated biotopes have been described and are distinguished according to the dominant species. They include; *Corallina elongata* on shallow exposed shores; the red algae *Haliptilon virgatum*, growing on well-lit, shallow exposed shores in central and southern shores, usually accompanied by *Laurencia obtusa*, *Laurencia majuscula* and *Dictyota fasciola; Colpomenia sinuosa* growing on shallow sheltered rocks in nutrient-rich environments; *Cladophoropsis membranacea* growing on extremely sheltered zones in bays and lagoons; and *Arthrocladia villosa*and*Sporochnus pedunculatus* on moderately lit lower infralittoral to upper circalittoral rock, in places with strong unidirectional currents.  Indicators of quality:  This habitat is very variable according to the degree of anthropogenic disturbance. Indicators of quality can be measured by examining trends. The first signs of decline imply substitution of species, a decrease on diversity, an increase on invasive exotic species, and an increase in opportunistic, fast-growing species like some *Ulva*, *Cladophora*, *Acinetospora*, or stress resistant like *Corallina elongata* or *Lithophyllum incrustans*. Mussels can also replace the dominant algae in shallow waters when the charge of particulate organic matter is very high.  Characteristic species:  This community is characterised by the presence of many photophilic algae covering hard bottoms. The number of species is very large, and can be completely different according to the bathymetric level, exposure and geographical region.  They include:  Rhodophyta (red algae) - *Liagora viscida, Liagora distenta, Amphiroa rigida, Corallina elongata, Haliptilon virgatum, Tricleocarpa fragilis, Ceramium virgatum, Wrangelia penicillata, Chylocladia verticillata, Chrysymenia ventricosa, Halymenia floresii, Gelidium spinosum, Predaea ollivieri, Chondracanthus acicularis, Jania rubens, Lithophyllum incrustans, Neogoniolithon brassica-florida, Mesophyllum alternans, Halopithys incurva, Lophocladia lallemandii, Peyssonnelia squamaria, Asparagopsis armata, Asparagopsis taxiformis, Sphaerococcus coronopifolius, Laurencia obtusa, Laurencia majuscula, Digenea simplex, Rytiphlaea tinctoria, Alsidium corallinum, Pterothamnion crispum, Compsothamnion thuyoides, Plocamium cartilagineum, Schottera nicaeensis, Pterocladiella capillacea, Botryocladia botryoides, Peyssonnelia squamaria, Palisada patentiramea*  Phaeophyta - *Dictyota fasciola, Colpomenia sinuosa, Taonia atomaria, Dictyota cf. dichotoma, Dictyota mediterranea, Stypopodium schimperi, Lobophora variegata, Dictyota spiralis, Zonaria tournefortii, Padina pavonicoides, Padina ditristromatica, Arthrocladia villosa, Sporochnus pedunculatus, Carpomitra costata, Acinetospora crinita, Hydroclathus clathratus, Dictyota dichotoma v. intricata, Sphacelaria cirrosa,  Halopteris scoparia, Halopteris filicina, Padina pavonica, Cladostephus spongiosus, Dictyopteris polypodioides.*  Chlorophyta (green algae )- *Ulva rigida, Umbraulva olivascens, Dasycladus vermicularis, Flabellia petiolata, Acetabularia acetabulum, Parvocaulis parvulus, Caulerpa prolifera, Caulerpa cylindracea, Codium bursa, Anadyomene  stellata, Cladophoropsis membranacea, Cladophora prolifera.*  Porifera - *Crambe crambe, Phorbas topsentii, Sarcotragus fasciculatus, Sarcotragus spinosulus, Hemimycale columella.*  Mollusca - *Bittium reticulatum, Conus ventricosus, Columbella rustica, Rissoa guerinii.*  Crustacea - *Macropodia longirostris, Maja crispata.*  Echinodermata - *Echinaster sepositus, Marthasterias glacialis, Paracentrotus lividus, Arbacia lixula, Holothuria tubulosa, Ophidiaster ophidianus, Ophiothrix fragilis.*  Fish - *Labrus merula, Coris julis, Serranus cabrilla, Serranus scriba, Symphodus ocellatus, Symphodus tinca, Scorpaena porcus, Epinephelus marginatus, Sciaena umbra, Diplodus sargus, Diplodus vulgaris, Diplodus cervinus, Diplodus puntazzo, Siganus rivulatus, Parablennius pilicornis, Trypterygion delaisi, Symphodus mediterraneus, Siganus luridus, Epinephelus costae, Sarpa salpa, Chromis chromis, Mullus surmuletus, Dentex dentex, Symphodus roissali, Sparisoma cretense.* |
| Mediterranean | A3.1x Photophilic communities without canopy-forming algae in Mediterranean infralittoral and upper circalittoral rock | This habitat is present from the upper infralittoral zone to the upper circalittoral zone. Assemblages are always algal-dominated, although some invertebrates can be common in the understory and growing as epiphytes. It consists of rocky bottoms covered by erect macroalgae that do not form canopies. The structure includes bush-forming or turf forming algae, encrusting fauna and epiphytes. The coverage of the 'bush' and turf strata is usually higher than in an assemblage dominated by canopy algae. Assemblages are also highly miniaturized (less than 20 cm high) and very rich in species (up to 110 species in a 400 cm2 area).  Species composition differs greatly depending on environmental conditions. Factors accounting for the variability on the assemblages include light availability, hydrodynamism, nutrient concentration in the seawater, substrate type, sedimentation, temperature, salinity, grazing intensity, predation, and frequency of disturbances. High densities of sea urchins (*Paracentrotus lividus*) can graze the algae, producing structurally less complex assemblages and even barren areas. Grazing by other fish species (*Sarpa salpa* or the exotic *Siganus rivulatus*, *S. luridus*) can modify the species composition. The habitat can be present both in good environmental conditions, and in rather degraded situations.  Several associated biotopes have been described, distinguished according to the dominant species. They include; *Padina pavonica* and similar species growing on well-lit shallow sheltered areas subjected to a moderate grazing by sea urchins; *Pterothamnion crispum and Compsothamnion thuyoides* growing on shallow, shaded sheltered to moderately exposed rocks; *Corallina elongata* growing on shallow exposed shores; *Halopteris scoparia* growing on well-lit sheltered areas down to 25 meters depth, mainly on northern areas, sometimes associated to the brown algae *Cladostephus spongiosus;* and*Codium bursa* on moderately lit infralittoral rock.  Indicators of quality:  This habitat is very variable according to the degree of anthropogenic disturbance. Indicators of quality can be measured by examining trends. The first signs of decline imply substitution of species, a decrease on diversity, an increase on invasive exotic species, and an increase in opportunistic, fast-growing species like some *Ulva* spp., *Cladophora* spp., *Acinetospora* spp., or stress resistant like *Corallina elongata* or *Lithophyllum incrustans*. Mussels can also replace the dominant algae in shallow waters when the charge of particulate organic matter is very high.  Characteristic species:  This community is characterized by the presence of many photophilic algae covering hard bottoms. The number of species is huge, and it can be completely different according to the bathymetric level, exposure and geographical region.  Rhodophyta (red algae)-*Liagora viscida, Liagora distenta, Amphiroa rigida, Corallina elongata, Haliptilon virgatum, Tricleocarpa fragilis, Ceramium virgatum, Wrangelia penicillata, Chylocladia verticillata, Chrysymenia ventricosa, Halymenia floresii, Gelidium spinosum, Predaea ollivieri, Chondracanthus acicularis, Jania rubens, Lithophyllum incrustans, Neogoniolithon brassica-florida, Mesophyllum alternans, Halopithys incurva, Lophocladia lallemandii, Peyssonnelia squamaria, Asparagopsis armata, Asparagopsis taxiformis, Sphaerococcus coronopifolius, Laurencia obtusa, Laurencia majuscula, Digenea simplex, Rytiphlaea tinctoria, Alsidium corallinum, Pterothamnion crispum, Compsothamnion thuyoides, Plocamium cartilagineum, Schottera nicaeensis, Pterocladiella capillacea, Botryocladia botryoides, Peyssonnelia squamaria, Palisada patentiramea*  Phaeophyta- *Dictyota fasciola, Colpomenia sinuosa, Taonia atomaria, Dictyota cf. dichotoma, Dictyota mediterranea, Stypopodium schimperi, Lobophora variegata, Dictyota spiralis, Zonaria tournefortii, Padina pavonicoides, Padina ditristromatica, Arthrocladia villosa, Sporochnus pedunculatus, Carpomitra costata, Acinetospora crinita, Hydroclathus clathratus, Dictyota dichotoma v. intricata, Sphacelaria cirrosa,  Halopteris scoparia, Halopteris filicina, Padina pavonica, Cladostephus spongiosus, Dictyopteris polypodioides.*  Chlorophyta (green algae)- *Ulva rigida, Umbraulva olivascens, Dasycladus vermicularis, Flabellia petiolata, Acetabularia acetabulum, Parvocaulis parvulus, Caulerpa prolifera, Caulerpa cylindracea, Codium bursa, Anadyomene  stellata, Cladophoropsis membranacea, Cladophora prolifera.*  Porifera- *Crambe crambe, Phorbas topsentii, Sarcotragus fasciculatus, Sarcotragus spinosulus, Hemimycale columella.*  Mollusca- *Bittium reticulatum, Conus ventricosus, Columbella rustica, Rissoa guerinii.*  Crustacea- *Macropodia longirostris, Maja crispata.*  Echinodermata- *Echinaster sepositus, Marthasterias glacialis, Paracentrotus lividus, Arbacia lixula, Holothuria tubulosa, Ophidiaster ophidianus, Ophiothrix fragilis.*  Fish- *Labrus merula, Coris julis, Serranus cabrilla, Serranus scriba, Symphodus ocellatus, Symphodus tinca, Scorpaena porcus, Epinephelus marginatus, Sciaena umbra, Diplodus sargus, Diplodus vulgaris, Diplodus cervinus, Diplodus puntazzo, Siganus rivulatus, Parablennius pilicornis, Trypterygion delaisi, Symphodus mediterraneus, Siganus luridus, Epinephelus costae, Sarpa salpa, Chromis chromis, Mullus surmuletus, Dentex dentex, Symphodus roissali, Sparisoma cretense.* |
| Mediterranean | A3.23 Photophilic communities dominated by calcareous, habitat-forming algae. | This habitat occurs in shallow rocky bottoms with large coverage of calcareous, habitat-forming corallines that provide a persistent biogenic structure. It develops on vertical cliffs in well exposed and illuminated conditions. Two red algae species dominate this habitat: *Titanoderma trochanter* and *Tenarea tortuosa*. Both species can occur together. Erect macroalgae grow interspersed with the corallines. They grow in places with a good water quality, a moderate to low hydrodynamism, and above 1.5 meters depth.  Indicators of quality:  There is no information on indicators of quality. Both dominant species seem to be restricted to environments with a good water quality although no quantitative explorations have been performed on this issue to ascertain also what might be indicators for quality assessment.  Characteristic species:  These include: Rhodophyta (red algae):*Titanoderma trochanter, Tenarea tortuosa, Amphiroa rigida, Laurencia obtusa, Haliptilon virgatum, Jania rubens, Lithophyllum incrustans, Neogoniolithon brassica-florida.*Phaeophyta: *Dictyota fasciola, Padina pavonica, Cystoseira compressa, Cystoseira crinita, Cystoseira barbatula.*Chlorophyta (green algae): *Anadyomene stellata, Acetabularia acetabulum.* Mollusca: *Dendropoma petraeum.* Fish: *Sarpa salpa, Siganus luridus, Parablennius incognitus, Parablennius gattorugine.* |
| Mediterranean | A3.36 Communities of Mediterranean estuarine rock | This habitat is composed of intertidal and shallow subtidal rocky habitats which support faunal-dominated communities, with seaweed communities only poorly developed or absent. The variations associated communities are linked to climatic conditions, mainly the very great seasonal differences in temperature and salinity, which in the summer is particularly warm salty water and in the winter very low temperatures and sometimes brackish water.  The habitat supports species that are able to withstand quick variations in environmental conditions such as salinity. Sudden influxes of salt water and drying up in the summer create recurrent disturbances that sometimes cause populations to disappear. In this case, recolonisation will always be very rapid. In the Adriatic the characteristic species of this association is the endemic brown alga Fucus virsoides.  Indicators of quality:  Standard biotic and abiotic indicators have been used to describe marine habitat quality. Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of particular species, water quality parameters, levels of exposure to a particular exposure as well as more integrated indices which describe habitat function and structure, such as trophic index, or successful stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may be set in certain situations, e.g. protected features with Natura 2000 sites, where reference values may have been determined and applied on a location-specific basis.    Characteristic species:  Algae: *Fucus virsoides, Bangia* spp;  Cyanobacteria: *Rivularia polyotis*;  Crustaceans: *Lekanesphaera hookeri, Balanus* spp, *Sphaeroma serratum, Cyathura carinata, Monocorophium insidiosum, Gammarus aequicauda*;  Gastropods: *Patella coerulea;*  Bivalves: *Mytilus galloprovincialis*;  Cniadrians: *Actinia equina.* |
| Mediterranean | A4.23 Communities of Mediterranean soft circalittoral rock | This habitat type occurs on moderately wave-exposed, circalittoral soft bedrock subject to moderately strong tidal streams. As this complex is found in highly turbid water conditions, the circalittoral zone may begin at the low water mark, due to poor light penetration. This complex is dominated by the piddock (a marine rock boring bivalve mollusc) *Pholas dactylus  Barnea parva* and other boring bivalves. Other species typical of this complex include the tube building polychaete *Polydora* and *Bispira volutacornis*, the sponges *Cliona celata* and *Suberites ficus*, the bryozoan *Alcyonium coralloides*, and the crabs *Necora puber* and *Cancer pagurus*. Foliose red algae may also be present.  Indicators of quality:  Standard biotic and abiotic indicators have been used to describe marine habitat quality. Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of particular species, water quality parameters, levels of exposure to a particular exposure as well as more integrated indices which describe habitat function and structure, such as trophic index, or successful stages of development in habitats that have a natural cycle of change over time. There are no known commonly agreed indicators of quality for this habitat, although particular parameters may be set in certain situations, e.g. protected features with Natura 2000 sites, where reference values may have been determined and applied on a location-specific basis.  Characteristic species:  Bivalves: *Pholas dactylus*, Polychaetes: *Bispira volutacornis,* Sponges: *Cliona celata,* *Cliona viridis, Suberites ficus, Suberites carnosus,* Bryozoan: *Alcyonium coralloides*; Crustaceans: *Necora puber, Cancer pagurus; Ascidian: Polyclinum aurantium.* |
| Mediterranean | A4.27. Communities of Mediterranean lower circalittoral rock | This habitat is composed of hard substrata in areas with low hydrodynamics. It typically occurs on the edge of the continental shelf, on the rocks near the break of the slope and in some areas after the shelfbreak. Because of the depth,  macroscopic vegetation is absent. This is the assemblage of the lower circalittoral zone, which characterises the Mediterranean rocky reef, also linking the circalittoral coralligenous and the bathyal habitats.  The characteristic and dominant element of the biotic community of this habitat is represented mainly by erect large sponges such as *Poecillastra compressa, Phakellia ventilabrum, Tylodesma inornata,* and *Haliclona* (Halichoclona) *magna,* yellow cup coral *Dendrophylia cornigera*, the black corals *Antipatharia* sp (*Parantiathes larix, Antipathella subpinnata*), and the brachiopodes *Cistella cuneate, Gryphus vitreus* and *Mergerlia truncata.*  Indicators of quality:  Standard biotic and abiotic indicators have been used to describe marine habitat quality. Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of particular species, water quality parameters, levels of exposure to a particular exposure as well as more integrated indices which describe habitat function and structure, such as trophic index, or successful stages of development in habitats that have a natural cycle of change over time.  There are no known commonly agreed indicators of quality for this habitat, although particular parameters may be set in certain situations, e.g. protected features with Natura 2000 sites, where reference values may have been determined and applied on a location-specific basis.  Characteristic species:  Although other species are also found in relatively abundance in this habitat type, the most characteristic ones in this circalittoral lower habitat are the following:  Sponges: *Tylodesma inornata, Acanthella acuta, Axinella polypoides, A. damicornis, A. verrucosa, Petrosia* *ficiformis, Petrosia dura, Suberites carnosus* and one of the biggest and probably long-living and fragile species, *Haliclona* (Halichoclona) *magna.*  Cnidarians: *Corallium rubrum*, *Viminella flagellum, Ellisella paraplexauroides, Paramuricea clavata,* *Paramuricea macrospina, Callogorgia  verticillata, Acanthogorgia hirsuta, Villogorgia bebrycoides,* *Muriceides lepida,  Chironephthya mediterranea, Alcyonium acaule* and *Paralcyonium spinulosum.*  Bryozoans: *Porella cervicornis*.  Regarding mobile fauna, several species can be found, including many echinoderms such as *Cidaris cidaris, Ophiacantha setosa,* *Echinaster sepositus, Echinus melo, Holothuria forskali* and *Antedon mediterranea*; the Crustacean Decapoda *Munida rugosa* and the lobster *Palinurus elephas* as well as *P. mauritanicus.* |
| Mediterranean | A4.2x Circalittoral biogenic habitats in the Mediterranean - worm reefs | Worm reefs (formations) in the circalittoral zone in Mediterranean are formed by several species depending the bottom composition. The most common are the *Sabellaria spinulosa*, *Sabella pavonina* and to a lesser extent the *Filograna* spp./*Salmacina* spp. complex and *Sabella spallanzanii*. Worms grow in both soft/mud and hard substrates. *Sabellaria spinulosa* constructs unbranched dwelling tubes using mucus to bind together sand grains and broken shell to form a dense carpet on the bottom. *Filograna/Salmacina* build carbonate tubes and can occur in high densities attached to rock surfaces or algae like *Cystoseira* spp. and/or *Sargassum* spp. *Sabella pavonina* and *Sabella spallanzani* can form dense populations in areas of soft sediment not overgrown by algae.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of particular species, water quality parameters, levels of exposure to a particular exposure as well as more integrated indices which describe habitat function and structure, such as trophic index, or successful stages of development in habitats that have a natural cycle of change over time.  There are no known commonly agreed indicators of quality for this habitat, although particular parameters may be set in certain situations, e.g. protected features with Natura 2000 sites, where reference values may have been determined and applied on a location-specific basis.  Characteristic species:  Porifera like *Tethya aurantia* and *Ircinia* sp., bryozoans like *Pentapora fasciata*, *Myriapora truncata* and *Smittina* sp., Crustacean like *Balanus* sp. and Cnidarian like *Parazoanthus axinellae*, *Astroides calycularis* and *Dendrophyllia ramea* are some of the characteristic species that can be found in this formations. Molluscs and Decapods also occur. |
| Mediterranean | A4.71 Communities of Mediterranean circalittoral caves and overhangs | Caves and overhangs constitute typical features of the Mediterranean circalittoral rocky bottoms. They support a great variety of species and host a considerable proportion of the total Mediterranean diversity of certain phyla, such as Brachiopoda, Bryozoa, and Porifera. Several protected and rare species, including recently described species, as well as deep-sea species have been reported. Most of our knowledge comes from caves in the north-west Mediterranean as cave biodiversity is extremely understudied in the southern and eastern basins. They are characterised by high morphological complexity, reflected in abiotic gradients and marked biological zonation along the longitudinal cave axis, from the entrance to the inner cave sectors. Light availability and water confinement are acknowledged as the main driving forces shaping this zonation. Thus, circalittoral caves support a variety of sciaphilic assemblages, usually distributed according to the following scheme: (i) a sciaphilic algae-dominated community at the entrance zone, (ii) a semi-dark zone where sessile filter-feeding invertebrates (mainly sponges and anthozoans) dominate, favored by the disappearance of macroalgae, and (iii) a dark zone which is sparsely colonized by sponges, serpulid polychaetes, bryozoans and brachiopods.  The shift from semi-dark to dark cave communities is evidenced through a sharp decrease in biotic coverage, biomass, three-dimensional biotic complexity, species richness, and the appearance of a black mineral coating of Mn-Fe oxides on the substrate. Additional zones, such as a transitional zone between semi-dark and dark cave communities and an azoic zone at the aphotic cave edge, have been occasionally identified. The limits of these zones might vary among caves with different morphology (e.g. inner zones tend to appear closer to the cave entrance in deeper waters), while in some caves some specific zones might be absent. Semi-dark caves are community is typically dominated by sponges, bryozoans, brachiopods and polychaete species. Serpulid polychaetes (e.g. *Protula*spp.) can form aggregations, which in some cases constitute the basis for the creation of biogenic structures; these ‘biostalactites’ are constructed by invertebrates (serpulids, sponges, and bryozoans), foraminiferans and carbonate-forming microorganisms. A number of deep-sea species belonging to various taxonomic groups (e.g. sponges, anthozoans and bryozoans) have also been recorded in sublittoral dark caves, regardless of depth  Indicators of quality:  Marine caves are characterised by high levels of individuality and heterogeneity which, coupled to the poor understanding of the ecosystem functioning, make it difficult the assessment of their ecologic quality. However, a number of indicators of quality have been recently suggested for the marine cave ecosystem, such as:  - Presence of invertebrates offering three-dimensional complexity to the substrate, and particularly fragile slow-growing species (e.g. red coral, erect bryozoans)  - High spatial coverage of suspension feeders (i.e. anthozoans) and large filter feeders (e.g. massive sponges)  - Presence of large mysid swarms  - Presence of various omnivorous and carnivorous mobile species (e.g. fish and decapods)    Characteristic species:  Communities of semi-dark caves and overhangs:  Sponges: *Agelas oroides*, *Petrosia ficiformis*, *Spirastrella cunctatrix*, *Chondrosia reniformis*, *Phorbas tenacior*, *Axinella damicornis*,  *Aplysina cavernicola,*  *Oscarella*spp. and *Plakina*spp. Anthozoans: (scleractinian species) *Leptopsammia pruvoti*, *Madracis pharensis*, *Hoplangia durotrix*, *Polycyathus muellerae*, *Caryophyllia inornata*and *Astroides calycularis*. Facies of *Corallium rubrum* and *Parazoanthus axinellae.* Bryozoans: e.g. *Adeonella*spp. and *Reteporella*spp.  Communities of dark caves:  Sponges: *Petrosia ficiformis*,, *Petrobiona massiliana, Chondrosia reniformis*, *Diplastrella bistellata*, *Penares* *euastrum*, *P. helleri*, *Jaspis johnstoni*, and *Haliclona mucosa*. Serpulid polychaetes, e.g. *Protula*spp. Encrusting bryozoans e.g.*Onychocella marioni* and brachiopods  *Joania cordata*, *Argyrotheca cuneata*, and *Novocrania anomala*. Other species include mysids *Hemimysis margalefi* and*H. speluncola*, the decapods *Stenopus spinosus*, *Palinurus elephas*, and *Plesionika narval,*  the boring bivalve *Lithophaga lithophaga* and fish species such as *Apogon imberbis*and *Grammonus ater*. |
| Mediterranean | A5.13: Faunal communities in Mediterranean infralittoral coarse sediment | This habitat is usually associated with the mouths of big rivers and streams, but it is also found as a fringe close to the rocky margins in bays and adjacent to coarse sandy beaches (4-25 m depth) in exposed areas subjected to strong unidirectional bottom currents and/or wave action. The high exposure that this habitat experiences prevents the accumulation of organic matter and fine sediments. Coarse sediments provide a wide range of interstitial spaces that constitute a suitable habitat for many invertebrates, mainly carnivores, omnivores and filter feeders.  Bivalves (*Spisula subtruncata, Lucinella divaricata*, and in some cases *Loripes lucinalis*) are the most representative group of this habitat type, but infaunal polychaetes are also very abundant (*Aonides paucibranchiata, Spio decoratus, Protodorvillea kefersteini, Glycera tesselata, Lumbrinerides acuta, Aponuphis* spp., *Paradoneis armata* and *Mediomastus fragilis*). The amphipod *Siphonoecetes dellavallei* is the most frequent crustacean, together with *Apseudopsis latreilli,* in areas close to *Posidonia oceanica* meadows. Nematodes are common and abundant mainly in bottoms shallower than 20 m depth. The polychaete *Ditrupa arietina* is rare at less than 10 m but it can be found within a wide variety of sediments, being more abundant at increasing proportions of coarse material. The bivalves *Acanthocardia tuberculata* and *Callista chione* are also characteristic species of this habitat, and constitute an important contribution to the total biomass. Fishes such as the Greater Weever (*Trachinus draco*), the Spanish Bream (*Pagellus acarne*), the Striped Seabream (*Lithognathus mormyrus*) and the Mediterranean Sand Eel (*Gymnammodytes cicerelus*) are also common in this habitat. A particular fauna assemblage of this habitat is composed by the Amphioxus or Lancelets (*Branchiostoma lanceolatum*). This “Amphioxus sands” normally extends on gravel and coarse sand with shell fragments.  Indicators of quality:  Most of the species included in the habitat description are indicators of good environmental quality. The majority of bivalves are very sensitive to environmental disturbances and changes in the density and structure of these communities might indicate a change on habitat quality.  In general, *Branchiostoma lanceolatum* communities show a negative correlation between the amphioxus presence and the organic matter content of the habitat, changing also the dominant species with the enrichment in the sediment.  Characteristic species:  Molluscs: *Spisula subtruncata, Lucinella divaricata, Ruditapes decussatus, Acanthocardia tuberculata, Callista chione, Thracia papyracea, Caecum trachea, Chamelea gallina, Dosinia lupinus, Ensis minor, Tellina fabula, Loripes lucinalis.*  Crustacea: *Siphonoecetes dellvallei, Bathyporeia phaiophthalma, Apseudopsis latreilli, Lembos* sp.*, Diogenes pugilator, Megaluropus massiliensis.*  Nematoda:*Aspidosiphon muelleri.*  Annelida: *Oligochaeta, Aonides puacibranchiata, Spio decoratus, Protodorvillea kefersteini, Goniadella galaica, Glycera tesselata, Paradoneis ilvana, Mediomastus fragilis, Lumbrinerides acuta, Ditrupa arietina, Chone duneri, Paradoneis armata, Syllis* sp*., Aponuphis bilineata, Marphysa bellii, Owenia fusiformis.*  Cordata: *Branchiostoma lanceolatum.*  Fish: *Trachinus draco, Pagellus acarne, Lithognathus mormyrus, Gymnammodytes cicerelus.* |
| Mediterranean | A5.14 Communities of Mediterranean upper circalittoral coarse sediments | This habitat is characterized by tide-swept circalittoral coarse sand, gravel and shingle generally in depths of over 15-20 m. It may be found in tidal channels of marine inlets, along exposed coasts and offshore. As with shallower coarse sediments, it may be characterised by robust infaunal polychaetes, mobile crustacea and bivalves, and by a few ubiquitous robust and/or fast growing ephemeral species which are able to colonise pebbles and unstable cobbles and slates which are regularly moved by wave and tidal action. Bottom currents are moderate to strong.  Indicators of quality:  There are no commonly agreed indicators of quality for this habitat, thus both standard biotic and abiotic indicators may be used to describe marine habitat quality. In certain geographical areas this habitat may be under impact of fisheries activities, particularly trawling and dredging, thus the presence of characteristic commercially exploited species may indicate a quality of the habitat. Hence, presence and abundance of indicated characteristic species can also be used as an indicator of habitat quality.  Characteristic species:  Characteristic species arered algae species of the family *Corallinaceae;* Bivalves*: Atrina pectinata, Venus casina, Dosinia exoleta, Donax variegatus, Glycymeris glycymeris, Laevicardium crassum;* Echinoderms*: Spatangus purpureus;* Hydrozoans*: Lytocarpia myriophyllum;* Polychaetes*:* *Sigalion squamosus, Armandia polyophthalma;*Ophiuroids: *Ophiopsila annulosa;* Echinoids*: Spatangus purpureus; and*Crustaceans*: Anapagurus breviaculeatus, Thia scutellata.* |
| Mediterranean | A5.15 Communities of Mediterranean lower circalittoral coarse sediments | This habitat comprises offshore and deep (up to 200 m) circalittoral habitats with coarse sands and gravel or shell. According to some estimations such habitat may cover large areas of the offshore continental shelf. Lower circalittoral coarse habitats are quite diverse compared to its shallower versions and generally characterised by robust infaunal polychaete and bivalve species. Animal communities in this habitat are closely related to offshore mixed sediments. Bottom currents speed can vary from moderately strong (1-3 kn) to very weak (negligible).  Indicators of quality:  There are no commonly agreed indicators of quality for this habitat, thus both standard biotic and abiotic indicators have been used to describe marine habitat quality. Habitat is in the most geographical areas under impact of strong fisheries activities, particularly trawling and dredging, thus the presence of characteristic commercially exploited species may indicate a quality of the habitat. Hence, presence and abundance of indicated characteristic species can also be used as an indicator of habitat quality.  Characteristic species:  Characteristic species are polychaets: *Glycera tesselata, Psamathe fusca, Pista cristata, Prionospio banyulenis, Protodorvillea kefersteini; bivalves: Lentidium mediterraneum, Gari costulata, Timoclea ovata; crustaceans: Monoculodes carinatus, Urothoe brevicornis, brittle star: Amphipholis squamata,*  echinoids: Spatangus purpureus, Sphaerechinus granularis; lancelet: *Branchiostoma lanceolatum*. |
| Mediterranean | A5.23 Faunal communities in Mediterranean infralittoral fine sand | This habitat is formed on clean sands of shallow waters (between 4 and 25 m depth) on open coasts, subjected to moderate wave action, which allows for the accumulation of organic matter and fine sediments (<63 µm). These bottoms are dominated by deposit feeders, but filter feeders and carnivores are also present. Invertebrate assemblages found in this habitat correspond to those described as 'Littoral Fine Sand assemblages' (dominated by *Spisula subtruncata*), but are very close to muddy assemblages (Littoral Sandy Mud and Terrigenous Coastal Mud). Although this habitat typically lacks a significant seaweed or seagrass component, the presence of *Cymodocea nodosa* or *Posidonia oceanic*a is frequent.  Several sub-habitats have been described. These are a sub-habitat of *Spisula subtruncata,*characterized by the bivalves *Spisula subtruncata* and *Lucinella divaricate;* a *s*ub-habitat of *Nephthys hombergii* which is a transitional assemblage to circalittoral habitats;and a sub-habitat with *Lentidium mediterraneum* which is commonly associated to sandy flat areas shallower than 4 m depth, in estuaries and embayments.  Indicators of quality:  Most of the species included in the description of the habitat are bioindicators of environmental quality. The majority of bivalves are very sensitive to eutrophication and population changes in abundance and composition might indicate a change on habitat quality.    Characteristic species:  Molluscs: *Spisula subtruncata, Lucinella divaricata, Donax trunculus, Tellina fabula, Thracia papyracea, Dosinia lupinus, Loripes lucinalis, Lentidium mediterraneum, Corbula gibba, Cerastoderma glaucum, Tellina tenuis.*  Crustacea: *Apseudopsis latreillii, Siphonoecetes dellavallei, Lembos* sp*., Bathypoeia guillamsoniana, Ampelisca brevicornis, Perioculoides longimanus, Urothoe intermedia, Pseudocuma longicorne, Ampelisca diadema, Diogenes pugilator, Portumnus latipes.*  Fish: *Gymnammodytes cicerelus, Arnoglossus laterna, Xyrichtys novacula.*  Annelida: *Owenia fusiformis, Paradoneis armata, Spio decoratus, Prionospio caspersi, Mediomastus fragilis, Magelona mirabilis, Peresiella clymenoides, Ditrupa arietina, Notomastus aberans, Chone duneri, Nephthys hombergii, Aponuphis bilineata, Scolelepis squamata, Scoletoma impatiens, Lumbrineris latreilli, Spiochaetopterus costarum.*  Sipunculida: *Aspidosiphon* sp.  Echinodermata: *Spatangus purpureus, Echinocardium mediterraneum.*  Nematoda: different species. |
| Mediterranean | A5.25 Communities of Mediterranean circalittoral well-sorted fine sands | Clean fine sands with less than 5% silt/clay in water deeper than 30-35 m, either on the open coast or near, depending on geographical area. Circalittoral well-sorted fine sands are usually an extension at depth of the infralittoral and circalittoral very shallow fine sands. The sediment is of homogeneous granulometry and of mixed origin: terrigenous and organogenous. Existence of bottom currents is quite common. Bivalves and polychaetes are part of the infaunal communities.  Indicators of quality:  There are no commonly agreed indicators of quality for this habitat, thus both standard biotic and abiotic indicators have been used to describe marine habitat quality. Habitat is in the most geographical areas under impact of strong fisheries activities, particularly trawling and dredging, thus the presence of characteristic commercially exploited species may indicate a quality of the habitat. Presence and abundance of  characteristic species can also be used as an indicator of habitat quality.  Characteristic species:  Polychaetes: *Hyalinoecia tubicola, Laetmonice hystrix, Galathowenia oculata; B*ivalves: *Abra prismatica, Clausinella fasciata, Parvicardium scabrum, Pitar rudis, Striarca lactea;* echinoderms: *Anseropoda placenta; Holothuria forskali.*pelecypod molluscs (e.g. *Donax venustus*, *Tellina pulchella*, *Tellina planata*, *Cardium tuberculatum*), gastropods (e.g. *Nassa mutabilis* and *Neverita josephina*), crustaceans (e.g. *Crangon crangon* and *Iphinoe josephina*) and small fish (e.g. *Gobius microps*, *Callionymus belenus*, *Solea solea* and *Trachinus draco*). |
| Mediterranean | A5.25x Communities of Mediterranean very shallow circalittoral fine sand | Clean fine sands either on the open coast or in tide-swept channels of marine inlets in depths of over 15-20m. The habitat may also extend offshore and is characterised by a wide range of cnidarians, echinoderms, polychaetes and bivalves as part of the infauna.This habitat is generally more stable than shallower infralittoral sands, as there is less fluctuation in temperature and salinity.  Indicators of quality:  There are no commonly agreed indicators of quality for this habitat, thus both standard biotic and abiotic indicators have been used to describe marine habitat quality. In certain areas habitat can be under impact of fisheries activities, particularly trawling and dredging, thus the presence of characteristic commercially exploited species may indicate a quality of the habitat.  Characteristic species:  Characteristic species are bivalves: *Tellina pulchella, Spisula subtruncata,*Chamelea gallina; polychaets: *Aricidea cerrutii, Prionospio caspersi,* *Scolelepis squamosus;* echinoids*: Echinocardium cordatum;* bony fish*: Trachinus draco.* |
| Mediterranean | A5.27 Communities of Mediterranean lower circalittoral sand | A habitat in the deepest part of the circalittoral zone extending down to 200 m of depth. The sediment comprises fine sands or non-cohesive muddy sands. Whilst the process of sedimentation is constant, the movement of water masses is reduced compared to shallower areas making it a more stable environment. Animal communities dominate characterised by a diverse range of polychaetes, cnidarians, amphipods, bivalves and echinoderms. The lower circalittoral zone marks the survival boundary of autotrophic pluricellular algae.  Indicators of quality:  There are no commonly agreed indicators of quality for this habitat, thus both standard biotic and abiotic indicators have been used to describe marine habitat quality. As this habitat can be impacted by fisheries activities, particularly trawling, the presence or absence of characteristic commercially exploited species are a potential quality indicator.  Characteristic species:  The sea pen:*Penatula phosphorea;* polychaetes: *Aphrodite aculeata*, Bivalves: *Acanthocardia paucicostata, Pecten jacobeus, Parvicardium roseum*; sea cucumber*: Oerstergrenia digitata, Holothuria forskali*; starfish:*Anseropoda placenta.* |
| Mediterranean | A5.28: Faunal communities of sheltered Mediterranean infralittoral muddy sands | This habitat is situated in sheltered environments, such as embayments, with low hydrodynamic regime, and thus in stable sedimentary systems, at depths between 1-15 m. The substrate consists of a muddy-sandy sediment where the sand fraction is usually composed by mollusc shells. Organic matter and silt-clay contents are the primary driving factors determining species composition. The very variable environmental conditions of these shallow environments in terms of salinity and water temperature determine that these habitats are colonized by euryhaline and eurytherm organisms.  This habitat can be naturally colonized by seaweeds or seagrasses. When seaweeds and seagrasses are absent, polychaetes dominate the invertebrate assemblages, mainly *Neanthes caudata*, *Pseudomastus deltaicus*, *Notomastus latericeus*, *Ampharete finmarchica, Mediomastus fragilis, Aonides oxycephala* and *Heteromastus filiformis* together with some crustaceans (*Ampelisca brevicornis* and *Leucothoe incisa*). The phoronid *Phoronis psammophila* is also very abundant. The bivalves *Thracia papyracea* and *Cerastoderma glaucum* dominate amongst filter-feeding invertebrates although the presence of *Loripes lacteus* is also frequent. Holothurians and gastropods *Cyclope neritea* and *Nassarius reticulatus* are common deposit-feeders, sliding on the substrate. The presence of sensitive species such as the mollusc *Pinna nobilis* is not very frequent but it can be occasionally observed. The eel *Anguilla anguilla*, the Sea Bass *Dicentrarchus labrax*, the gobids *Gobius* spp. and soles (*Solea* spp.) are amongst the most common fishes. When macroalgal species are present, *Acetabularia calyculus*, *Ulva* spp. and *Cladophora* spp. are the most abundant. The main seagrasses are *Zostera noltii* and *Cymodocea nodosa*.  Five different sub-habitats have been described for muddy sands habitat, with different dominant species and under slightly different conditions. These are the sub-habitat with *Caulerpa prolifera* on sheltered superficial muddy sands; and the sub-habitat with *Pestarella* (=*Callianassa*) *thyrrena* and *Kellia* sp. where the silt-clay fraction is >5% and the organic matter content reaches moderate to high values. There is a sub-habitat associated to freshwater discharge with *Cerastoderma glaucum* and *Cyathura carinata* in compact sediments which is characteristic of organically polluted environments in brackish waters; aub-habitat with *Loripes lacteus* and *Ruditapes* species in muddy sands on bays, estuaries, coastal lagoons and other sheltered environments, always at shallow zones that are highly influenced by seawater; and a sub-habitat of hydrothermal oozes with *Cyclope neritea* and nematodes which is only present in shallow waters (< 10m) with high sulfide concentrations, high sediment temperatures and high salinities.  Indicators of quality:  Most of the species included in the habitat description are bioindicators of environmental quality. The majority of bivalves are very sensitive to eutrophication, and more tolerant and opportunistic species tend to dominate with increasing eutrophication. Changes in abundance and richness of fauna composition are good indicators of trends in habitat quality. *Ruditapes decussatus* has been proposed as a pollution bioindicator in areas where mussels are not available. The accumulation of pollutants in *Ruditapes’* tissues has been used to assess environmental quality.  Characteristic species:  Characteristic species include molluscs: *Cerastoderma glaucum, Thracia papyracea, Loripes lacteus, Cyclope neritea, Nassarius reticulatus, Pinna nobilis, Kellia* sp*., Scrobicularia plana, Abra* spp*., Ruditapes decussatus, Ruditapes philippinarum, Lentidium mediterraneum, Tellina tenuis, Venerupis aureus.*  Crustacea: *Ampelisca breviconis, Leucothoe incisa, Pestarella thyrrena, Corophium* spp.*, Cyathura carinata, Psudolirius kroyeri, Idotea baltica, Iphinoe inermis, Upogebia pusilla.*  Seagrasses: *Zostera noltei, Cymodocea nodosa; p*horonidea: *Phoronis psammophila;* nematoda: *Oncholaimus campylocercoides,* annelida: *Neanthes caudata, Pseudomastus deltaicus, Notomastus latericeus, Ampharete finmarchica, Heteromastus filiformis, Nephthys* spp., *Streblospio shrubsolii, Nereis diversicolor, Cirrophorus furcatus, Platynereis dumerilii, Capitella capitata, Mediomastus fragilis, Harmothoe spinifera, Abarenicola claparedii, Chone collaris, Petaloproctus terricolaâ€‹;*  Chlorophyta (green algae): *Caulerpa prolifera, Acetabularia calyculus, Ulva spp., Cladophora* spp*.*  and fish species such as: *Anguilla anguilla, Dicentrarchus labrax, Gobius* spp*., Solea* spp. |
| Mediterranean | A5.32 Communities of Mediterranean sublittoral estuarine sediments | In Mediterranean estuaries tidal amplitude is very weak and tidal currents, which generate vertical mixing of the water, are negligible. This favors vertical stratification of salinity with a counter current of saline water beneath the less dense river water (salt wedge estuaries). There are also distinct seasonal differences in salinity. In winter the estuary runoff from winter storms and greater flushing reduces the salinity. In spring, runoff becomes small and the estuary gradually returns to marine salinities. One consequence is that the benthos of the sublittoral sediments show rapid transitions from marine to freshwater species.  Typically there is an impoverished benthic macroinvertebrate community in the upper reaches of this estuarine habitat dominated by Tubificidae and Chiromidae. This contrasts with the lower reaches where there is a "salt wedge" community dominated by an abundance of polychates, molluscs and crustaceans. In shallower areas, beds of *Cymodocea nodosa* may be present. Species diversity is generally low but abundance may be high. Sudden influxes of salt water and drying up in the summer create recurrent disturbances that sometimes cause populations to disappear. In contrast, under oligotrophic conditions and long periods of salt wedge permance, the complexity of the benthic communites can increase.  Indicators of quality:  Many indicators of quality have been used for this habitat with particular parameters set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Indices developed to assess the ecological status of coastal waters, including estuaries, according to the Water Framework Directive, include physical indicators, water quality indicators and measures of benthic diversity, species richness and abundance. The latter group, which is particularly relevant to benthic habitats, includes a Benthic Quality Index, an Infaunal Trophic Index, a Marine Biotic index based on ecological groups, and the Benthic Opportunistic Polychaetes/Amphipods Index.  Characteristic species:  Oligochaetes:*Tubificoides* spp.*, Limnodrilus hoffmeisteri, Heterochaeta costata,* *Thalassodrilides gurwitschi;*Polychaetes: *Capitella capitata, Ficopomatus enigmaticus, Heteromastus filiformis,  Alitta succinea, Scolaricia typica, Spio decoratus, Aphelochaeta marioni; Gastropods: Hydrobia acuta;* Bivalves: *Spisula subtruncata,* Crustaceans*: Corophium orientale, Gammarus aequicauda, Carcinus mediterraneus.* |
| Mediterranean | A5.38 Communities of Mediterranean infralittoral muddy detritic bottoms | This habitat develops in areas where a detritus bottom is covered with mud formed by terrigenous deposits from rivers. The sediment is a very muddy sand or sandy mud, or even a rather compacted mud, 1 rich in shell debris or volcanic fragments (scoriae); sedimentation is slow enough to allow the development of sessile epifauna. Gravel, sand and mud are mixed in varying quantities, but mud always predominates. In some geographical areas, this habitat is characterized by facies with the brittlestar *Ophiothrix quinquemaculata* (Ophiuroidea) that extends to the circalittoral. This species in some places forms an extremely dense population which is almost 90% ophiuran.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Brittle star: *Ophiothrix quinquemaculata*;  Polychaete: *Phyloaricia foetida*, *Paradoneis lyra*;  Gastropods: *Cerithium vulgatum*, *C. rupestre*,  Bivalve: *Ruditapes decussatus*;  Crustaceans: *Upogebia pusilla*, *Clibanarius* *misanthropus*;  Sipunculid: *Golfingia vulgaris*. |
| Mediterranean | A5.38x: Communities of Mediterranean circalittoral muddy detritic bottoms | This habitat develops in areas where a detritus bottom is covered with mud formed by terrigenous deposits from rivers. The sediment is a very muddy sand or sandy mud, or even a rather compacted mud, rich in shell debris or volcanic fragments (scoriae). Sedimentation deposits slow enough to allow the development of sessile epifauna. Gravel, sand and mud are mixed in varying quantities, but mud always predominates.  This biocenosis hosts the facies of the brittlestar *Ophiothrix quinquemaculata.*This species in some places forms an extremely dense population which is formed almost by 90% ophiurans.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Porifera: *Raspailia viminalis.*  Cnidaria: *Alcyonum palmatum, Anemodactis mazeli.*  Holothuridae: *Psedothyone raphanus.*  Mollusca: Pelecypoda *Tellina serrata,* the gastropod *Turritella communis* and the bivalves *Abra prismatica, Corbula gibba, Myrtea spinifera, Nucula nitidosa* and *Thyasira flexuosa.*  Sipunculida: *Golfingia elongata.*  Polychaeta: *Aphrodite aculeata, Polyodontes maxillosus, Eupanthalis kinbergi, Leiocapitella dollfussi, Clymene palermitana.*  Isopoda: *Cirolana neglecta.* |
| Mediterranean | A5.39 Communities of Mediterranean infralittoral (coastal) terrigenous muds | The sediment that conforms this habitat is always pure mud, more or less clayey, almost always derived from the erosion of rocks on land carried to sea by rivers (of fluvial origin). Such coarse debris is quickly covered with no epifauna developing as a result. In sheltered areas, this habitat is characterized by associationswith *Cymodocea nodosa, Zostera noltii* and *Caulerpa prolifera.*  Indicators of quality:  Standard biotic and abiotic indicators have been used to describe marine habitat quality, but the presence and abundance of characteristic species can also be used as an indicator of habitat quality.  Characteristic species:  Include: gastropods *Turritella sp.;* polychaets:*Sternaspis scutata, Aphrodite aculeata;* bivalves: *Acanthocardia paucicostata; sea pen: Pennatula phosphorea, Veretillum cynomorium; crustacean: Medorippe lanata; sea cucumbers: Parastichopus regalis, Holothuria tubulosa.* |
| Mediterranean | A5.46. Communities of Mediterranean upper circalittoral coastal detritic bottoms | This habitat occurs in big bays and opens seas, on a substratum whose nature varies widely and depends largely on the typology of the nearby coast and of nearby infralittoral rock formations. It occurs on terrigenous and organogenous sediment: gravel with a sandy-muddy filling originating from predominant local rocks, sometimes shell debris from various molluscs, debris from big calcified bryozoans, tests of echinoderms or of some dead melobesies (coralline red algae *Melobesiae* spp). The interstices between these various components of coarse sands and gravel are partially filled by a greater or lesser proportion of sand and mud. The muddy portion is usually less than 20%, but various more or less muddy types exist.  It develops at depths of between 30 and 100 metres, usually as an extension at depth of the biocenosis of well sorted fine sands. Some facies with epiflora and epifauna may present, depending on certain currents. These may be characterised  by brittlestars, colonial ascidians and by big colonies of arborescent bryozoans, unattached or fixed to small substrata.  Indicators of quality:  Some species are indicators of more particular environmental conditions such as the echinoderms (*Echinocyamus pusillus, Spatangus purpureus, Astarte fusca*), the bivalves (*Cardium minimum, Venus ovata, Dentalium inaequicostatum),*the  opisthobranch mollusc*Philine aperta*, or species with a wide ecological distribution in loose substrata.  Characteristic species:  Phytobenthos: *Cryptonemia tunaeformis,* the many-branched calcareous rhodophytes (*Phymatholithon calcareum, Mesophyllum coralloides, Lithothamnion fruticulosum*), Peyssonnelia spp.  Zoobenthos: *Bubaris vermiculata, Suberites domuncula* (sponges): *Sarcodyctyon catenatum* (cnidarians); *Astropecten irregularis, Anseropoda placenta, Genocidaris maculata, Luidia ciliaris, Ophioconis forbesi, Psammechinus microtuberculatus, Paracucumaria hyndmani* (echinoderms); *Limea loscombei, Propeamussium incomparabile, Chlamys flexuosa, Laevicardium oblungum, Cardium deshayesi, Tellina donacina, Eulima polita, Turitella triplicata (molluscs); Hermione hystrix, Petta pusilla (polychaetes); Conilera cylindracea, Paguristes oculatus, Anapagurus laevis, Ebalia tuberosa, Ebalia edwardsi* (crustaceans); *Molgula oculata, Microcosmus vulgaris, Polycarpia pomaria, Polycarpia gracilis* (ascidians). |
| Mediterranean | A5.47: Communities of Mediterranean lower circalittoral (shelf-edge) detritic bottoms or open-sea detritic bottoms | This habitat develops on a mixture of gravel sediments, sand and mud. The fine part of the mix appears in a greater proportion than in the sediments that support the coastal detritic biocenosis. The gravel, mainly organogenic, is largely formed by calcareous debris of quaternary thanatocenoses. The open-water detritic bottoms normally belong to the lower circalittoral and constitute the deepest layer of the circalittoral zone on soft bottoms. These communities are present in detritic bottoms with abundance of dead shells, bryozoans and coral skeletons. This habitat hosts a biocenosis of great diversity and abundance. The high production of plankton at the shelf break makes it an important feeding ground for large shoals of fish and cetaceans. Some facies of the edge of the platform, such as the one made by the crinoid *Leptometra phalangium*, increase the structural complexity of the habitat enhancing the abundance and species richness. They also host a high abundance of spawners of commercially important species, e.g. Red Mullet (*Mullus barbatus*), Hake (*Merluccius merluccius*), Blue Whiting (*Micromesistius poutassou*) and *Trisopterus minutus capelanus.* Thus, the conservation of shelf-edge habitat is also important with a view to reducing the fish mortality in the sensitive phases (recruitment, spawning, postspawning) of the life cycle of demersal fish species.    Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations, e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Characteristic species include: Pelecypoda:*Pinna rudis, Astarte sulcata, Chlamys clavata, Pseudamussium clavatum;*Scaphopoda: *Dentalium panormitanum, Antalis panorma;*Bivalve: *Limopsis aurita;*Decapoda: *Ebalia granulosa;*Malacostraca: *Lophogaster typicus;*Amphipoda: *Haploops dellavallei;*and Echinoderms: *Ophiura carnea* and *Thyone gadeana.* Species present also include *Holothuria forskali*, the teleost *Gobius quadrimaculatus* and the brachiopod *Gryphus vitreus*. Sometimes the following species can also be found: the bivalve *Venus casina,* *Pseudamussium clavatumâ€‹* and *Astarte sulcata,* the irregular sea urchin *Spatangus purpureus*, and the brittle star *Ophiacantha setosa*. Some species of filter feeders like the sea pen *Funiculina quadrangularis* or the actinian *Actinauge richardii* are also very abundant in this type of community. |
| Mediterranean | A5.51 Rhodolith beds in the Mediterranean | Mediterranean rhodolith beds could be found between 20-150 m depth in normal marine conditions. The most common species is Lithothamnion corallioides and Phymatolithon calcareum is recorded less frequently. Different dominant species characterize the Mediterranean rhodolith beds, probably on the basis of biogeography and local environmental conditions.Characteristic associations include: Association with rhodoliths in coarse sands and fine gravels under the influence of bottom currents; and Association with rhodoliths on coastal detritic bottoms.  Rhodolith beds are defined by those sedimentary bottoms characterised by any morphology and species of unattached nongeniculate calcareous red algae (incompletely-coated grains excluded) with >10% of live cover. They occur in coarse clean sediments of gravels, clean sands and coastal detritic areas under the influence of bottom currents, which occur either on the open coast or in tide-swept channels of marine inlets (the latter often stony).  In general, fluent unidirectional hydrodynamism and laminar currents affect the seafloor. In the Mediterranean, the most favourable environment for this habitat to occur in biotopes with laminar bottom currents with a regular course. Changes in hydrodynamic conditions and intensity of light differentiate the presence of different associations, particularly in the community of the coastal detritic bottoms (circalittoral). The most frequent species of epiflora are Arthrocladia villosa and Sporochnus pedunculatus. Differences in intensity and typology of hydrodynamism and in species composition are able to determine differences in the growth form, structure and shape of the rhodoliths that can be summarized into three main morphologies: small and compact pralines, unattached branches, and large, irregular, boxwork rhodoliths. In the lower infralittoral zone this assemblage forms patches of organogenous pebbles of branched rhodoliths in various development stages. In the circalittoral zone the free calcareous algae formation can cover up to several square kilometres. Rhodolith beds can be considered as authentic carbonate factories, since they are among the highest producers of biogenic particles in European seas. The living part of the association is limited only to the surface of some centimetres of thickness. Subhabitat scomposed of non-nucleated, unattached growths of branching, twig-like coralline can be distinguished as maerl beds.  Characteristic species  Macroalgae:  Rhodophyceae, *Lithothamniom corallioides, Phymatolithon calcareum, Neogoniolithon brassica-florida,  Mesophyllum lichenoides, Peyssonnelia rosa-marina, Peyssonnelia bornetii , Peyssonnelia rubra,  Peyssonnelia squamaria, Peyssonnelia squamaria, Sporolithon ptychoides, Spongites fruticulosus, Neogoniolithon mamillosum, Mesophyllum macedonis , Mesophyllum alternans, Mesophyllum lichenoides, Lithophyllum racemosum, Lithothamnion valens, Lithothamnion minervae ,Lithothamnion crispatum ,Lithophyllum frondosum, Lithophyllum cabiochae, Leogoniolithon mamillosum, Lithophyllum racemus , Pseudolithophyllum expansum, Titanoderma pustulatum, Osmundaria volubilis, Osmundea pelagosae, Acrothamnion preissii* (Exotic), *Dasya rigidula, Polysiphonia subulifera, Womersleyella setacea (*Exotic), *Stylonema alsidii, Polysiphonia subulifera, Rodriguezelletum strafforellii.*  Chlorophyta:  *Valonia macrophysa, Palmophyllum crassum, Flabellia petiolata, Codium bursa, Dictyota dichotoma, Halimeda tuna, Fucophyceae, Cystoseira spinosa, Cystoseira zosteroides, Cystoseira corniculata, Sargassum hornschuchii.*  Bivalve:  *Gonilia calliglypta, Pteromeris minuta.*  Gastropoda:  *Bittium latreilli*  Crustacea:  *Cestopagurus timidus, Lysianassa costae, Ceradocus semiserratus, Maera grossimana, Calcinus tubularis, Galathea intermedia, Athanas nitescens, Cheirocratus sundevallii, Anapagus breviaculeatus, Socarnes filicornis, Amphitoe ramondi, Leptochelia savignyi.*  Polychaete:  *Lysidice ninetta, Eunice vittata, Nereis rava.*  Sypuncula:  *Aspidosiphon (A.) muelleri.*  Fishes :  *Scorpaena notata, Mullus barbatus, Mullus surmuletus , Pagellus erythrinus, Epinephelus marginatus, Sciaena umbra, , Coris julis, Dentex dentex, Symphodus mediterraneus, Symphodus tinca, Diplodus vulgaris, Apogon imberbis, Chromis chromis, Labrus merula.*  Indicators of quality  Surface area of the rhodolith bed, an area of> 500 sq m represents a well surface covered bed, high percentage cover by live rhodoliths with >50%, the thickness of the live layer of the rhodolith bed (superposed live rhodoliths), providing 3-D structure, high biodiversity of the habitat-engineers (coralline algae or calcareous Peyssonnelia spp.), and high biodiversity of the associated community. There are differences in species composition controlled by biogeographic patterns and oceanography, and along the depth gradient that require further investigations. |
| Mediterranean | A5.52A Algal dominated communities in the Mediterranean circalittoral sediment | Habitats formed in circalittoral sediments that usually have detritic components that allow erect macroalgae to grow over the seabed. The algal cover can be very variable, not always growing necessarily together with the maërl, and with a number of dominant species. They develop at low irradiances, usually between 5% and 0.5% of subsurface irradiance, at moderate to low hydrodynamism levels.  Several sub-habitats can be distinguished:  - Meadows of *Osmundaria volubilis* and *Phyllophora crispa* growing over detritic and gravel bottoms, between 50 and 90 meters depth. They can be very common in the central and North Western Mediterranean  - Kelp forests with *Laminaria rodriguezii*, below 70 meters depth and down to almost 100 meters depth from all the Mediterranean. This subhabitat can also grow shallower in special environmental conditions  - Kelp forests with L*aminaria ochroleuca* and *Sacccorhiza polyschides*, only in the Alboran Sea, northwestern coasts of Africa and the Strait of Messina, in places subjected to very strong currents.  - Beds of *Halopteris filicina,* between 55 and 100 meters depth.  - Gravel beds with *Arthrocladia villosa* and *Sporochnus pedunculatus,* between 30 and 50 meters depth.  - Gravel beds with *Cystoseira* spp.    Indicators of quality:  Habitat very variable according to several factors (nutrients, sedimentation, temperature, salinity, hydrodynamism) and to the main species dominating the assemblages. Some sub-habitats are rather constant through time (kelp habitats, *Osmundaria volubilis*) but others, like the subhabitat of *Arthrocladia villosa* and *Sporochnus,* are subjected to huge interannual variation in species composition and biomass.  Trends in abundance distribution and local species richness could be used as a proxy to examine quality overtime.The habitat can also change to non-native habitats dominated by two invasive species, *Caulerpa cylindracea* and *C. taxifolia*.    Characteristic species:  Rhodophyta (red algae)- *Phyllophora crispa, Osmundaria volubilis, Rytiphlaea tinctoria, Alsidium corallinum, Scinaia complanata, Lithophyllum racemus, Spongites fruticulosus, Lithothamnion corallioides, Mesophyllum sphaericum, Phymatolithon calcareum, Acrothamnion preissii, Dasya baillouviana, Erythroglossum balearicum, Myriogramme tristromatica, Brongniartella byssoides, Osmundea pelagosae, Peyssonnelia rosa-marina, Peyssonnelia harveyana, Peyssonnelia crispata, Chylocladia verticillata, Gloiocladia repens, Sebdenia dichotoma, Cryptonemia tuniformis, Halymenia elongata, Halymenia latifolia, Nemastoma dumontioides, Rhodophyllis divaricata, Kallymenia requienii, Kallymenia spathulata, Phyllophora heredia, Sphaerococcus rhizophylloides.*  Phaeophyta (brown algae)- *Laminaria rodriguezii, Laminaria ochroleuca, Saccorhiza polyschides, Phyllariopsis purpurascens, Phyllariopsis brevipes, Dictyopteris lucida, Dictyopteris polypodioides, Arthrocladia villosa, Sporochnus pedunculatus, Halopteris filicina, Carpomitra costata, Asperococcus bullosus, Spermatochnus paradoxus, Stictyosiphon adriaticus, Stictyosiphon soriferus, Cutleria chilosa, Zanardinia typus, Cystoseira abies marina, Cystoseira foeniculacea f. latiramosa, Cystoseira spinosa var. compressa, Cystoseira zosteroides.*  Chlorophyta (green algae)- *Umbraulva dangeardii, Caulerpa taxifolia, Caulerpa cylindracea.*  Tunicates- *Aplidium conicum, Rhopalaea neapolitana.*  Echinoderms- *Chaetaster longipes, Ophiomyxa pentagona, Ophiopsila aranea,*Spatangus purpureus.  Crustaceans- *Dardanus callidus, Dardanus arrossor, Pagurus prideaux, Lissa chiragra.*  Cnidarians- *Eunicella singularis, Eunicella verrucosa.*  Fish- *Dasyatis pastinaca, Zeus faber, Mullus surmuletus, Pagellus acarne, Pagellus erythrinus, Pagrus pagrus, Spicara maena, Blennius ocellaris.* |
| Mediterranean | A5.52B Algal dominated communities in the Mediterranean infralittoral sediment | This habitat develops on infralittoral sediment covered by algae in sheltered places and where organic matter enhances macroalgal growth. Different sub-habitats that can be distinguished by the dominant species composition and the environment they colonize. These include  *Caulerpa prolifera,* *Acetabularia calyculus,* growing on dead shells of cockles and other clams; *Penicillus capitatus,*usually on sediments covering dead rhizomes of *Posidonia oceanica* as well as *Valonia aegagropila, Rytiphlaea tinctoria* or *Alsidium corallinum, Ulva* spp., *Cladophora* spp. and *Gracilaria* spp. The habitat is also very variable depending on nutrients, sedimentation, temperature, salinity, and hydrodynamism.  Indicators of quality:  The habitat is able to withstand severe disturbances as the environment they live in is prone to a high frequency of these events. Moreover, in some cases they are naturally adapted to high nutrient levels as they are situated on estuarine environments. In general, the subhabitat of *Cystoseira barbata* f. *repens* is more vulnerable than other subhabitats to environmental pressures. Dominance by species of *Ulva*, *Cladophora* and *Gayralia* usually indicate high quantities of nutrients. The presence of Syngnathidae (*Hippocampus*, *Syngnathus*) usually indicates good environmental quality.    Characteristic species:  Only species living above the sediment are included.  Rhodophyta (red algae)**-***Rytiphlaea tinctoria, Alsidium corallinum, Osmundaria volubilis, Lithothamnion corallioides, Gracilaria gracilis, Gracilaria dura, Palisada patentiramea, Radicilingua thysanorhizans, Gracilariopsis longissima.*  Phaeophyta-*Cystoseira barbata f. repens, Dictyota mediterranea, Sargassum muticum, Undaria pinnatifida.*  Chlorophyta (green algae)-*Acetabularia calyculus, Caulerpa prolifera, Caulerpa cylindracea, Caulerpa taxifolia, Valonia aegagropila, Gayralia oxysperma, Ulva intestinalis, Ulva curvata, Ulva rigida, Ulva prolifera, Cladophora vagabunda, Cladophora echinus, Chaetomorpha linum, Chaetomorpha crassa.*  Bryozoans-*Zoobotryon verticillatum.*  Crustaceans-*Crangon crangon, Palaemon adspersus, Palaemon xiphias, Carcinus aestuarii, Gnatophyllum elegans, Ilia nucleus.*  Fish-*Gobius niger, Syngnathus abaster, Hippocampus guttulatus, Hippocampus hippocampus, Chelon labrosus, Liza ramada, Atherina boyeri, Atherina presbyter, Mugil cephalus.* |
| Mediterranean | A5.53: Seagrass beds (other than Posidonia) on Mediterranean infralittoral sand | Mediterranean seagrasses form dense and highly productive meadows or beds, between the surface to 15 m depth in coastal lagoons and down to 50 m depth in the open-sea, in clear water conditions. Besides the seagrass *Posidonia oceanica*, these meadows are built by several submerged magnoliophytes, such as: *Cymodocea nodosa,* *Zostera marina*, *Zostera noltei* or the introduced species *Halophila stipulacea*, and, in transitional waters and coastal lagoons by *Ruppia*sp. All these species can be found alone or combined among them to form mixed meadows. The basic physical requirements of seagrass meadows habitats are sufficient light, a suitable substratum (muddy or sandy bottom) and moderate levels of wave exposure. Their tolerance to variation of environmental factors (e.g. salinity, temperature, nutrient concentration) and their geographical distribution differ depending on the dominant seagrass species.  Seagrasses provide habitat for a large set of organisms. The leaf canopy and the network of rhizomes and roots provide substratum for attachment, and creates hiding places to avoid predation. As a result, the abundance and diversity of the fauna and flora living in seagrass meadows are consistently higher than those of adjacent unvegetated areas. In addition seagrass meadows play an important role as spawning zone and hatchery for several species of fishes and are wintering areas of several species of birds  Several sub-habitat can be distinguished. *Cymodocea nodosa* beds are widely distributed throughout the Mediterranean, and outside, around the Canary Islands and down the North African coast, and are usually frequent in areas with salinity fluctuations from 26 to 44%. These meadows are observed in coastal lagoons and in the open-sea. Eelgrass beds (*Z. marina*) are rare in the Mediterranean and it is found mostly as small isolated stands, down to 10-15 meters depth depending on water clarity. Dense meadows can however occur, especially, in coastal lagoons and transitional waters. They are distributed from the Arctic waters until the Mediterranean and are very abundant in the Baltic Sea, the North Sea and along the Atlantic coasts down to northern Spain. Ruppia beds grow in brackish waters, in permanent pools of mud or sand flats, as well as in inlets or estuaries. Mixed beds of Zostera and Ruppia can be observed in shallow sublittoral sediments. These communities are generally found in extremely sheltered bays and coastal lagoons, with very weak tidal currents.  Indicators of quality:  Extended seagrass beds with a good penetration to deep waters are characteristic of coastal waters with minimal anthropogenic impact. Since seagrasses are mostly perennial organisms, they reflect the temporally integrated environmental conditions, and, therefore, seagrasses are very good indicator on which environmental monitoring and management of coastal waters can focus. *Cymodocea nodosa* is considered at the Mediterranean level, as a biological quality element for the implementation of the Water Framework Directive and several indicators have been proposed for this assessment.  Characteristic species:  The leaf canopy hosts epiphytes community, made up of Rhodobiontes (e.g. *Acrochaetium daviesii, Chondria mairei, Laurencia obtusa*) and filamentous Phaeophyceae (e.g. *Castagnea cylindrica, Myriactula gracilis, Myrionema orbiculare*), small calcified incrusting rhodobionthes (few millimeters in general, like Hydrolithon...) (a few millimeters in general), Rhodobiontes calcified encrusting (e.g. *Hydrolithon farinosum, Pneophyllum fragile* by Bacillariophyceae (mainly Pennales) and by Dinobiontes (*Prorocentrum lima, Ostreopsis siamensis* and *Coolia monotis*). Several species of polychaetes *(Sigalion mathildae, Onuphis eremita, Diopatra neapolitana*, molluscs among them bivalves (*Acanthocardia tuberculata, Mactra stultorum, Tellina fabula, Donax venustus* and gastropods (*Acteon tornatilis Nassarius mutabilis Nassarius pygmaeus, Neverita josephinia*, crustacean (*Ampelisca brevicornis, Hippomedon massiliensis, Pariambus typicus, Idothea linearis*and echinoderms (Astropecten sp., *Echinocardium cordatum, Paracentrotus lividus*) are observed between the rhizomes or inside the sediment.  Teleost occupy all available habitats, from the sediment to the water column overcoming beds. Characteristic species are closely associated with the phyllosphere through a ventral sucker (*Opeatogenys gracilis , Apletodon dentatus*, or by hanging them by their tails (Hippocampus sp., Nerophis sp., Syngnathus sp.). Inside the canopy several species can be observed as *Atherina boyeri, Pomatoschistus marmoratus, Liza aurata, Liza saliens* or *Aphanius iberus.* Despite geographical differences, it is always the same families that dominate in number of species and individuals: Labridae (*Coris julis*, Symphodus sp., Labrus sp., *Xyrichtys novacula)*, Sparidae (*Diplodus sp., Sarpa salpa, Spondyliosoma cantharus, Sparus aurata, Dentex dentex*, Scorpaenidae, Serranidae, Mullidae (*Mullus surmuletus*). Planktivorous species (*Boops boops*, Spicara sp., *Chromis chromis*) present in the water column during the day, find refuge in the beds at night. |
| Mediterranean | A5.535: *Posidonia* beds in the Mediterranean infralittoral zone | This habitat is created by the ecosystem engineer species, the seagrass *Posidonia oceanica.* The plant of this seagrass consists of erected and plagiotropic rhizomes with at the top a 4 -8 leaves bundle, which has 8-11 mm wide and 20 to 80 cm long. The growth of the rhizomes allows the building of a specific structure called “*matte*” due to the accumulation of sediment between rhizomes and roots. This is a real engineering species, which constitutes characteristic formations called “Posidonia meadows” or “Posidonia beds”, between the sea- surface and 35 to 40 m depth. When the waters are particularly clear, these meadows can go deeper than 45 m deep (e.g. Corsica, Malta). They disappear when the salinity is below 33 % (optimum 35 to 39%). However, they support relatively large temperature variations from 9 to 29 ° C (17 optimum at 20 ° C). Posidonia beds can be present on various substrates (e.g. silt, fine sand, average and coarse, rocks), even if they prefer soft bottoms, rich in organic matter. This endemic species is the most widespread seagrass species throughout the Mediterranean. It is common on different types of substrate and habitats, from sandy bottoms to rocks. However, its biological characteristics with rare sexual reproduction and slow horizontal growth of rhizome edges, don’t allow a rapid recolonization of degraded or new forming beds.  Several sub-habitats have been described:  - Ecomorphosis of striped *Posidonia oceanica* meadows (A5.5351),  - Ecomorphosis of "barrier-reef" *Posidonia oceanica* meadows (A5.5352);  - Facies of dead "*mattes*" of *Posidonia oceanica* without much epiflora (A5.5353) and  - Association with *Caulerpa prolifera* on Posidonia beds (A5.5354).    Indicators of quality:    *Posidonia oceanica* is considered as good biological indicator of the quality of the marine environment and is considered as a biological quality element in the implementation of the European Framework Water Directive. Several descriptors are available to evaluate the quality of the Posidonia meadows habitat and many indicators of quality, based on combination of these descriptors have been established, particularly to monitor the habitat in the framework of European directives (e.g. Habitat, Fauna and Flora Directive, Water Framework Directive and recently Marine Strategy Framework Directive) or for conservation purposes (national or sub-national initiatives).  Characteristic species:  It is possible to divide the main characteristic species of the Posidonia meadows in three compartments and/or in different trophic levels:  - The species living within the thickness of the *matte* (endofauna). This assemblage is rich in polychetes (*Mediomastus capensis, Neanthes nubila, Lumbrineriopsis paradoxa, Pontogenia chrysocoma*), molluscs (*Modiolula phaseolina, Hiatella arctica, Limaria hians, Gourretia denticulata*) and crustacean (*Upogebia deltaura, Limnoria mazzellae*).  - The species living under the foliar shoots (sciaphilous strata) as algae (*Halimeda tuna, Flabellia petiolata*, *Peyssonnelia squamaria, Rhodymenia* sp.), the foraminifer (*Miniacina miniacea*), echinoderms (P*aracentrotus lividus, Sphaerechinus granularis, Holothuria tubulosa, Echinaster (Echinaster) sepositu*s, *Marthasterias glacialis, Ophiura ophiura* and *Ophioderma longicauda*); crustaceans (*Nototropis guttatus, Melita palmata, Gammarella fucicola, Cleantis prismatica and Sirpus zariquieyi*), bivalves (*Pinna nobilis*), ascidians (*Halocynthia papillosa, Microcosmus vulgaris*).  - The species living on the leaves (phyllosphere) and the vagile species present in the canopy, as encrusting algae (*Pneophyllum fragile*; *Electra posidoniae,*Hydrolithon sp.), hydrozoans (*Plumularia posidoniae, Sertularia perpusilla,* bryozoan, crustacean (*Idotea balthica*), cephalopods (*Octopus vulgaris, Sepia officinalis*), gastropods (*Synischia hectica, Achaeus cranchii, Pisa nodipes, Bittium reticulatum, Calliostoma laugieri, Cerithium vulgatum, Columbella rustica, Gibbula umbilicaris, Tricolia speciosa, Alvania lineata, Rissoa* sp. and *Jujubinu*s sp.) and fishes (S*arpa salpa, Hippocampus hippocampus, Symphodus sp., Coris julis, Chromis chromis, Diplodus vulgaris, Scorpaena porcus).* |
| Mediterranean | A5.5x Communities of Mediterranean infralittoral coastal detritic bottoms | This habitat is usually associated with the lower infralittoral zone. The nature of the substratum varies widely and depends largely on the typology of the nearby coast and of the nearby infralittoral formations. This implies that the substrata can sometimes be formed by gravels and sands originating from predominant local rocks, sometimes shell debris from various molluscs and echinoderms, sometimes debris from branched bryozoans or debris of dead and more or less corroded *Melobesiae* spp. The interstices between these various components are partially filled by a greater or lesser proportion of sand and mud*.*  Indicators of quality:  Standard biotic and abiotic indicators have been used to describe marine habitat quality, but the presence and abundance of indicated characteristic species can also be used as an indicator of habitat quality.  Characteristic species:  Demosponges: *Suberites domuncula; C*rustaceans: *Paguristes eremita, Anapagurus laevis;*Echinoderms: *Ophiura ophiura; Astropecten irregularis,* *Anseropoda placenta;*Ascidians: *Molgula oculata,* *Polycarpa pomaria*, *Microcosmus vulgaris.* |
| Mediterranean | A5.61: Polychaete worm reefs in the Mediterranean infralittoral zone | Worm reefs are large bioconstructions built by polychaetes the most important of which in the Mediterranean are the sabellarids *Sabellaria alveolata* and *S. spinulosa* and the serpulids *Hydroides dianthus* and *Ficopomatus enigmaticus.*The development of such reefs is assured by the gregarious settlement of polychaete larvae, which occurs mainly on pre-existing reefs or their dead remains.  *Sabellaria*bioconstructions can be relatively unstable and undergo a natural cycle of development and decay, they can form relatively quickly and may take the form of sheets, hummocks and reefs as well as evolving from globular formations into reef platforms. Reefs may persist in an area for many years although individual clumps may regularly form and disintegrate.  *Sabellaria alveolata* reefs in the Mediterranean are located between 1 to 7 m of depth where can reach 60 cm thick when they are well developed. In most sites, however, they tend to be very scattered and not particularly extensive  Most serpulids are considered to be 'secondary frame builders'. *Ficopomatus enigmaticus,*typically growing in coastal lagoons and brackish water lakes, can form large reefs. They can occur as a fringing reef along the rocky shoreline, forming a continuous layer that can reach up to 3 m thick, at a depth of about 1 m, or can develop as dense patch reefs growing from the bottom, with hemispherical forms called micro atolls (over 2 m height and 4 m in diameter) and with a distribution related to the depth (from 0.5 to 1.5 m).  This habitat provides a diversity of microhabitats increasing available substrate for numerous species; sheltering both hard and soft-bottom rare species which are potential colonizers of adjacent habitats; providing refuge for invertebrates including snails and crabs that may have an impact on native species communities and are attractive for some fish such as  *Sygnathus abasteri, Aphanius fasciatus* and *Knipowitschia panizzae*  Indicators of quality  The status and dynamics of the reefs must be defined integrating the physical characteristics, taking into account the degree of fragmentation of reef features (mainly produced by species which are known to degrade, smother and break up areas of *Sabellaria*, e.g. the mussel *Mytilus galloprovinciallis*), and the prevalence of different structural characteristics within the reef formations. The health of the reefs can  be determined with reference to the percentage of newly settled worms, those with crisp apertures, those with worn apertures and dead worms.  Characteristic species:  The associated fauna in *S. alveolata reefs*is rich and diversified. The most abundant species are *Apseudes latreillii, Quadrimaera inaequipes, Leptochelia savignyi*, and *Monocorophium sextonae*, among crustacean and *Striarca lactea* among mollusc. Abundant species of polychaete are *Nereis falsa* and *Eulalia ornate*.  *Ficopomatus enigmaticus* is the primary builder in the serpulid reefs. Its tubes form the bases of the biocontruction, but other organisms such as the barnacles *Balanus eburneus* and *B. amphitrite*, and the molluscs *Mytilaster lienatus* and *M. marioni* can contribute to the reef formation and can be treated as secondary builders. Other organisms such as the bryozoan *Conopeum seurati*, can stabilize the formation with its encrusting colonies which cementate the tubes. Other colonial organisms such as the hydroid *Cordylophora cassia*, the bryozoan *Bowerbankia gracilis*, and the tunicate *Botryllus schlosseri* can simply colonize this secondary substrate. The reef can host a lot of vagile invertebrates such as isopods (*Lekanesphaera hookeri, L. monody, Sphaeroma serratum, C. ascherusicum*) and gammarids (*Gammarus aequicauda, G. insensibilis*) and other polychaetes such as *Hediste diversicolor, Neanthes succinea*, and several polydorids |
| Mediterranean | A5.6v Mediterranean infralittoral mussel beds | Infralittoral mussel beds on rocky and soft bottoms comprised of either the horse mussel *Modiolus barbatus* or the common mussel *Mytilus galloprovincialis*/*edulis.* Attached by byssus threads to rocks and piers, within sheltered harbours and estuaries and on rocky shores of the open coast, sometimes living in dense masses on soft bottoms mixed with pebbles wherever there are suitable surfaces for attachment. The diet of mussels consists of phytoplankton and detritus filtered from the surrounding water. More frequently they can be found close to river mouth areas. There are three distinct habitat components; the interstices within the mussel matrix; the biodeposits beneath the bed; and the substratum afforded by the mussel shells themselves. A diverse range of epibiota and infauna often exists in these parts of the habitat.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of particular species, water quality parameters, levels of exposure to a particular exposure as well as more integrated indices which describe habitat function and structure, such as trophic index, or successful stages of development in habitats that have a natural cycle of change over time.  There are no known commonly agreed indicators of quality for this habitat, although particular parameters may be set in certain situations, e.g. protected features with Natura 2000 sites, where reference values may have been determined and applied on a location-specific basis.  Characteristic species:  Dense aggregations of the mussel *Mytilus galloprovincialis*/edulis or of the bearded horse mussel *Modiolus barbatus*. The mussels are often encrusted with barnacles and/or bryozoans. Gastropod molluscs such as species of the families Muricidae (e.g.*Hexaplex trunculus*, *Stramonita haemastoma*) feed on the mussels or on the bryozoans while polychaetes of several genera, crawl within the crevices looking for food. Copepods also live in the assemblage. |
| Mediterranean | A5.6w Mediterranean infralittoral oyster beds | Infralittoral oyster beds on rocky and soft bottoms comprised mainly by the European flat oyster *Ostrea edulis* with densities of 5 or more per m2. The oysters cement themself to the substratum and can form a dense cover. They may be found as individuals or clusters attached to rock surfaces, on other shelled animals like the endemic noble shell (*Pinna nobilis*) or on coarse sandy bottoms. The diet of oysters consists of phytoplankton and detritus filtered from the surrounding water. More frequently they can be found close to river mouth areas or estuaries and sheltered bays. There are three distinct habitat components; the interstices within the oyster matrix; the biodeposits beneath the bed; and the substratum afforded by the oyster shells themselves. A diverse range of epibiota and infauna often exists in these parts of the habitat.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of particular species, water quality parameters, levels of exposure to a particular exposure as well as more integrated indices which describe habitat function and structure, such as trophic index, or successful stages of development in habitats that have a natural cycle of change over time.  There are no known commonly agreed indicators of quality for this habitat, although particular parameters may be set in certain situations, e.g. protected features with Natura 2000 sites, where reference values may have been determined and applied on a location-specific basis. Presence and abundance of the oyster will be a key indicator of this habitat.  Characteristic species:  Dense aggregations of the European oyster and/or the Pacific oyster. The oysters are often encrusted with barnacles and/or bryozoans. Gastropod molluscs such as species of the families Muricidae (e.g the European oyster driller *Ocenebra erinaceus*, the rock-shell *Stramonita haemastoma* ) feed on oysters by drilling them and digesting the oyster flesh. Bryozoans, polychaetes of several genera, and copepods also live in the assemblage. Due to the intensive introduction of non-native oyster species *Crassostrea gigas* for cultivation in the Mediterranean, several invasive species have been introduced. |
| Mediterranean | A5.6x: Infralittoral biogenic habitats in the Mediterranean - corralligenous bioconcretions | Coralligenous habitats are hard bottoms of biogenic origin mainly produced by the accumulation of calcareous encrusting algae growing in dim light conditions. Although more extended in the circalittoral zone, they can also develop in the infralittoral zone, provided that light is dim enough to allow growth of the coralline algae that produce the build-up; therefore, infralittoral coralligenous concretions always develop in almost vertical walls, deep channels, or overhangs, and occupy reduced surfaces.  Coralligenous bioconcretions are always very complex in structure allowing the development of several kinds of communities including those dominated by living algae (on the upper part of the concretions), suspension feeders (upper and lower part of the concretions, wall cavities, and overhangs of the build-up), borers (inside the concretions), and even soft-bottom fauna (in the sediment deposited in cavities and holes).  This is a highly variable habitat that can be subdivided into different sub-habitats with different dominant species. For example coralligenous outcrops dominated;by *Halimeda tuna* and Mesophyllum spp. usually between 15 and 45 meters depth; by *Peyssonnelia rosa-marina*and other Peyssonneliaceae and *Flabellia petiolata,* in places with high sedimentation rates; on walls with *Eunicella cavolini*, in places with strong currents, between 15 and 40 meters depth; by *Alcyonium acaule*, in relatively shallow waters (15 to 45 meters depth) subjected to strong currents; and by *Eunicella verrucosa,*in places with high sedimentation rates.  Indicators of quality:                                                                                                        Several indicators have been proposed to assess the health of coralligenous habitats based on the composition and abundance of species (biotic cover and conspicuous species richness), the percent cover of different benthic assemblages (encrusting calcified Rhodophyta, non-calcified encrusting algae and fauna, turf forming algae, and sediment), boring species marks, percent cover of each species and the percentage of necrosis, bryozoa percent cover, sludge percent cover and the builder species percent cover.  Characteristic species:  Rhodophyta (red algae)- *Mesophyllum expansum, Mesophyllum alternans, Mesophyllum macedonis, Lithophyllum stictaeforme, Lithophyllum cabiochiae, Neogoniolithon mamillosum, Peyssonnelia rosa marina, Peyssonnelia rubra, Peyssonnelia harveyana, Peyssonnelia bornetii, Peyssonnelia squamaria, Amphiroa beauvoisii, Aglaothamnion tripinnatum, Seirospora giraudyi, Gulsonia nodulosa, Balliella cladoderma, Eupogodon planus, Acrosorium ciliolatum, Erythroglossum balearicum, Erythroglossum sandrianum, Myriogramme tristromatica, Osmundaria volubilis, Rodriguezella pinnata, Rodriguezella bornetii, Rodriguezella strafforelloi, Gloiocladia furcata, Gloiocladia microspora, Gloiocladia repens, Leptofauchea coralligena, Lomentaria subdichotoma, Botryocladia chiajeana, Sebdenia monardiana, Sebdenia rodrigueziana, Cryptonemia lomation, Aeodes marginata, Halymenia floresii, Predaea ollivieri, Platoma cyclocolpum, Bonnemaisonia asparagoides, Schmitzia neapolitana, Rhodophyllis divaricata, Neurocaulon foliosum, Kallymenia feldmannii, Kallymenia lacerata, Kallymenia patens, Kallymenia requienii, Phyllophora crispa, Contarinia squamariae, Sphaerococcus rhizophylloides, Ptilophora mediterranea*  Phaeophyta- *Dictyopteris lucida, Dictyota sp., Halopteris filicina, Nereia filiformis, Zanardinia typus, Phyllariopsis brevipes, Laminaria rodriguezii, Cystoseira zosteroides, Dictyopteris polypodioides.*  Chlorophyta (green algae)- *Palmophyllum crassum, Codium coralloides, Halimeda tuna, Flabellia petiolata, Microdictyon tenuius, Valonia macrophysa*  Sponges- *Agelas oroides, Aplysina cavernicola, Axinella cannabina, Axinella damicornis, Axinella polypoides, Axinella verrucosa, Clathrina clathrus, Crella elegans, Dysidea avara, Hemimycale columella, Hexadella topsentii, Petrosia ficiformis, Pleraplysilla spinifera, Raspaciona aculeata, Reniera fulva, Spirastrella cunctatrix, Spongia lamella.*  Echinoderms- *Anseropoda placenta, Hacelia attenuata, Ophiothrix fragilis, Antedon mediterranea, Astropartus mediterraneus, Holothuria forskali, Echinus melo.*  Cnidarians- *Alcyonium acaule, Astroides calycularis, Corallium rubrum, Dendrophyllia ramea, Eunicella cavolini, Eunicella singularis, Eunicella verrucosa, Gerardia savaglia, Leptopsammia pruvoti, Paralcyonium spinulosum, Paramuricea clavata, Parazoanthus axinellae, Phyllangia mouchezii.*  Bryozoans- *Adeonella calveti, Bugula calathus, Cellaria salicornioides, Chartella tenella, Hornera frondiculata, Pentapora fascialis, Smittina cervicornis, Schizomavella linearis, Schizomavella mamillata, Rhynchozoon neapolitanum, Reteporella grimaldii, Reteporella feuerbornii, Turbicellepora avicularis*  Crustaceans- *Homarus gammarus, Scyllarides latus, Palinurus elephas, Galathea strigosa, Pilumnus hirtellus.*  Polychaetes- *Salmacina dysteri, Serpula vermicularis, Protula tubularia, Filograna implexa*  Molluscs- *Bolma rugosa, Simnia spelta, Charonia lampas, Monoplex corrugatus, Felimare picta, Umbraculum umbraculum, Pleurobranchus testudinarius, Peltodoris atromaculata, Platydoris argo, Felimare villafranca, Felimida luteorosea, Felimida krohni, Felimida purpurea, Pteria hirundo, Spondylus gaederopus, Lithophaga lithophaga.*  Tunicates- *Aplidium conicum, Aplidium elegans, Aplydium pseudolobatum, Eudistoma banyulensis, Microcosmus sabatieri, Pseudodistoma cyrnusense, Pycnoclavella communis, Cystodytes dellechiajei.*  Fish- *Anthias anthias, Serranus cabrilla, Epinephelus marginatus, Sciaena umbra, Scyliorhinus canicula, Muraena helena, Conger conger, Phycis phycis, Zeus faber, Scorpaena scrofa, Pagrus pagrus, Coris julis, Labrus mixtus, Lappanella fasciata, Acantholabrus palloni, Gobius vittatus, Gobius kolombatovici.* |
| Mediterranean | A5.6y Circalittoral biogenic habitats in the Mediterranean - corralligenous bioconcretions | This habitat sometimes referred to as 'coral gardens' can be found on a variety of substrates and at depths ranging from 20 to 200 meters. The main characteristic is a relatively dense aggregation of colonies or individuals of one or more coral species but also coralline algae. For example, soft-bottom coral gardens may be dominated by solitary scleractinians and sea pens, whereas hard-bottom coral gardens are often dominated by gorgonians, and red or black corals. Red corals rarely occurs about 30m as they require reduced light levels.  Reef forming hard corals (e.g. Lophelia, Madrepora and Caryophylliidae), if present, occur only as small or scattered colonies and not as a dominating habitat component. The habitat can also include relatively large numbers of sponge species. Other commonly associated fauna include basket stars, brittle stars, crinoids, ascidians, molluscs, crustaceans and fish.  Indicators of quality:  Several indicators have been proposed to assess the health of coralligenous habitats based on the composition and abundance of species (biotic cover and conspicuous species richness), the percent cover of different benthic assemblages (encrusting calcified Rhodophyta, non-calcified encrusting algae and fauna, turf forming algae, and sediment), boring species marks, percent cover of each species and the percentage of necrosis, bryozoa percent cover, sludge percent cover and the builder species percent cover.  Characteristic species:  The biological diversity of coral garden communities is typically high and often contains several species of coral belonging to different taxonomic groups, such as leather corals (Alcyonacea), gorgonians (Gorgonacea like *Paramuricea clavata*, *Eunicella verrucosa*, *Eunicella cavolini, Eunicella singularis*), sea pens (Pennatulacea), black corals (Antipatharia like *Antipathella subpinnata*) and hard corals (Scleractinia like the precious *Corallium rubrum*). |
| Mediterranean | A5.6z Circalittoral biogenic habitats in the Mediterranean - oyster beds | Circalittoral oyster beds on rocky and soft bottoms comprised mainly by the *Neopycnodonte cochlear*. These make large mass aggregations on the bottom and support the development of other life forms such as cnidarians, bryozoans and sponges. In the Mediterranean, two species of the genus Neopycnodonte exists. *Neopycnodonte cochlear* and *Neopycnodonte zibrowii*. *N. cochlear* is found in waters with depths of 40-400 meters while *N. zibrowii* is found in deeper waters and so not included further in this assessment. This habitat  can also be found in underwater caves, in even shallow waters, indicating that the dim light is the modulator of the distribution. In the circallitoral zone, *N. cochlear* can cover large areas of the bottom, both muddy and rocky. Often, shells can be found growing on disgarded fishing gears, when fleets use to fish in areas where deepsea oyster exists. There are three distinct habitat components; the interstices within the oyster matrix; the biodeposits beneath the bed; and the substratum afforded by the oyster shells themselves. A diverse range of epibiota and infauna often exists in these parts of the habitat.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include the presence of particular species, water quality parameters, levels of exposure to a particular exposure as well as more integrated indices which describe habitat function and structure, such as trophic index, or successful stages of development in habitats that have a natural cycle of change over time.  There are no known commonly agreed indicators of quality for this habitat, although particular parameters may be set in certain situations, e.g. protected features with Natura 2000 sites, where reference values may have been determined and applied on a location-specific basis. Presence, density and size range of the oyster *N. cochlear* can be used as an indicator of quality.  Characteristic species:  Oyster *N. cochlear*., Porifera, bryozoans like *Pentapora sp*., *Myriapora sp*., Crustacean and Cnidarian like *Parazoanthus spp*., *Dendrophyllia spp*, *Desmophyllum spp*. etc are some of the characteristic species that can be found in this formations. Molluscs and Decapods also occur. |
| North East Atlantic | A1.11: *Mytilius edulis* and/or barnacle communities on wave-exposed Atlantic littoral rock | This habitat type is found in the mid- to upper eulittoral on shores that are moderately or very exposed to wave action. It is characterised by bedrock and boulders dominated by the mussel *Mytilus edulis*, barnacles *Chthamalus* spp. and/or *Semibalanus balanoides* and limpets *Patella* spp. There is much regional variation in the species and zonation of the barnacles. Amongst the mussels small red algae including *Ceramium shuttleworthianum, Corallina officinalis, Mastocarpus stellatus* and *Aglaothamnion* spp. can be found. Two red algae in particular, *Porphyra umbilicalis* and *Palmaria palmata*, are commonly found on the *Mytilus* itself and can form luxuriant growths.The abundance of the red algae generally increases down the shore and in the lower eulittoral they may form a distinct zone in which mussels or barnacles are scarce. The lichen *Lichina pygmaea* may be prominent, especially in the south, where it can form distinct patches or even a separate zone among the *Chthamalus* spp.  With decreasing wave exposure *F. vesiculosus* is able to survive, gradually replacing the barnacles and *P. vulgata* biotope. On such moderately exposed shores this habitat may occur on steep and vertical faces, while fucoids dominate the flatter areas. In areas of soft rock (e.g. shales), the barnacles may be scarce or absent and the rock dominated by *P. vulgata*.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change overtime.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Indicators which have been developed for the assessment of ecological quality of coastal water bodies for the Water Framework Directive (WFD) that are relevant to this habitat include a consideration of macroalgae species richness, proportions of different taxa of algae present , and the abundace and coverage of the rocky surfaces by typical species.  Characteristic species:  Some shores are characterised by dense bands of the barnacle *Semibalanus balanoides* and the limpet *Patella vulgata*. The barnacles may be covered by *Porphyra umbilicalis* on the upper shore of exposed sites. Cracks and crevices in the rock provide a refuge for small individuals of the mussel *M. edulis*, winkles *Littorina saxatilis* and the whelk *Nucella lapillus*. Red seaweeds also frequently occupy damp crevices, particularly *Ceramium shuttleworthianum, Corallina officinalis, Osmundea pinnatifida* and encrusting coralline algae, but the non-vesiculate form of the wrack *Fucus vesiculosus* might be present. Large numbers of the winkle *Littorina littorea* often dominate fields of large boulders or shores with a more mixed substratum. |
| North East Atlantic | A1.12: Robust fucoid and/or red seaweed communities on wave-exposed Atlantic littoral rock | This habitat occurs on extremely exposed to moderately exposed upper to lower shores with seaweeds that are able to tolerate the extreme conditions of exposure. The physical stresses caused by wave action often results in dwarf forms of the individual seaweeds. The strong holdfasts and short tufts structure of the wracks *Fucus distichus* and *Fucus spiralis f. nana* allow these fucoids to survive on extremely exposed shores. Another seaweed able to tolerate the wave-wash is the red seaweed *Corallina officinalis*, which can form a dense turf on the mid- to lower shore. The olive brown wrack *Pelvetia canaliculata* positioned at the highest points of the intertidal shore, can withstand long periods of exposure. The wrack *Himanthalia elongata* occurs on the lower shore and can extend on to moderately exposed shores. The red seaweed *Mastocarpus stellatus* is common on both exposed and moderately exposed shores, where it may form a dense turf (particularly on vertical or overhanging rock faces. Very exposed to moderately exposed lower eulittoral rock can support a pure stand of the red seaweed *Palmaria palmata*. It is found either as a dense band or in large patches above the main sublittoral fringe.  Two biotopes associated with this habitat are characterised by extensive areas or a distinct band of *Osmundea pinnatifida* in areas exposed to moderately exposed lower eulittoral rock, and outcrops of fossilised peat in the eulittoral that are soft enough to allow a variety of piddocks, such as *Barnea candida* and *Petricola pholadiformis*, to bore into them.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Long term loss of the characteristic fucoids and/or red algae would indicate a deterioration in quality. Indicators which have been developed for the assessment of ecological quality of coastal water bodies for the Water Framework Directive (WFD) that are relevant to this habitat include a consideration of macroalgae species richness, proportions of different taxa of algae present, and the abundance and coverage of the rocky surfaces by typical species.  Characteristic species:  The characteristic species of fucoids and red algae that may be present in this habitat include *Fucus distichus, Fucus spiralis f. nana, Fucus guryii, Corallina officinalis, Himanthalia elongata, Lomentaria articulata, Ceramium*spp., *Mastocarpus stellatus* and *Palmaria palmata* depending of the degree of exposure, latitude and rock orientation. On the lower margins *Laminaria digitata*. The green seaweeds *Enteromorpha intestinalis, Ulva lactuca, Ulva rigida*and*Cladophora rupestris* are occasionally present. The sponge *Halichondria panicea*, the barnacle *Semibalanus balanoides* and *Megabalanus azoricus*, the limpet *Patella vulgata*, the mussel *Mytilus edulis* and the whelk *Nucella lapillus* may present but never dominant. |
| North East Atlantic | A1.13 Macaronesian communities of upper eulittoral rock | This intertidal habitat occurs on rocky shores of bedrock and boulders in areas exposed to wave action during high tides as well as to the swell of large storms. It includes facies characterised by discontinuous belts of the red algae *Bangia atropurpurea*  and  *Porphyra* spp.. The associated fauna  include littorinids (*Littorina striata, Malaraphe neritoides* and *Nodilittorina punctata*), small crustaceans such as hermit crabs (*Dardanus*  and *Pagurus* spp.), acorn barnacle (*Chthamallus stellatus*) and the isopod *Ligia itálica*. In very exposed areas, the Sally Lightfoot crab (*Grapsus adscensionis*) or the Runner crab (*Pachygrapsus marmoratus*) are quite conspicuous.  It has been recorded from both the Azores (San Miguel) and the Canary Islands (Lanzarote, Gran Canaria, Tenerife, Gomera, and La Palma), mainly on northern coasts, and is likely to occur around other Macaronesian islands.  Indicators of Quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Indicators which have been developed for the assessment of ecological quality of coastal water bodies for the Water Framework Directive (WFD) that are relevant to this habitat include a consideration of macroalgae species richness, proportions of different taxa of algae present, and the abundance and coverage of the rocky surfaces by typical species.  Characteristic species:  *Bangia atropurpurea* and *Porphyra* spp. |
| North East Atlantic | A1.14 Macaronesian communities of lower eulittoral rock very exposed to wave action | This intertidal habitat occurs on rocky shores of bedrock and boulders in areas that are very exposed to wave action. Because of this the associated biotopes are characterised by encrusting species such as crustose and calcified red algae (e.g. *Lithophyllum tortuosum* (ex *Tenarea undulosa*), *Lithophyllum lobatum* and *Titanoderma polycephalum)*as well as species that are able to settle and remain attached in wave exposed conditons such as the stalked barnacle  *Pollicipes cornucopiae*.  Indicators of Quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Indicators which have been developed for the assessment of ecological quality of coastal water bodies for the Water Framework Directive (WFD) that are relevant to this habitat include a consideration of macroalgae species richness, proportions of different taxa of algae present, and the abundance and coverage of the rocky surfaces by typical species.  Characteristic species:  *Lithophyllum tortuosum* (ex *Tenarea undulosa*), *Lithophyllum lobatum, Pollicipes cornucopiae,* and*Titanoderma polycephalum* |
| North East Atlantic | A1.15: Fucoids on tide-swept Atlantic littoral rock | This habitat is characterised by fucoid seaweeds in tide-swept conditions on sheltered to extremely sheltered mid-eulittoral to lower eulittoral rocky shores, such as narrow channels in sea lochs and estuaries. It occurs below the band of *Fucus spiralis* and *F. vesiculosus* on the shore but above the kelp dominated zone in the sublittoral fringe. The middle shore can be dominated by the wrack *Ascophyllum nodosum*, while *Fucus serratus* is dominating the lower shore. The high levels of water movement encourages a rich associated fauna including several filter-feeding groups. In the Macaronesian Islands, *Cystoseira* spp. are the dominant fucoid.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Indicators which have been developed for the assessment of ecological quality of coastal water bodies for the Water Framework Directive (WFD) that are relevant to this habitat include a consideration of macroalgae species richness, proportions of different taxa of algae present, and the abundance and coverage of the rocky surfaces by typical species.  Characteristic species:  *Fucus serratus, Fucus vesiculosus, Enteromorpha intestinalis, Ulva lactuca, Ascophyllum nodosum, Cystoseira humilis.* Associated fauna include the sponges *Grantia compressa, Halichondria panicea* and *Hymeniacidon perleve* which frequently occur on steep and overhanging faces of boulders and bedrock. It also includes the sea squirts *Dendrodoa grossularia* and *Ascidiella scabra*, which occur on steep surfaces and beneath boulders. Hydroids such as the pink *Clava multicornis* can form colonies on *A. nodosum* while *Dynamena pumila* is more often found on *Fucus vesiculosus* or *F. serratus.*  Underneath the canopy formed by the brown seaweeds is a diverse community of the red seaweeds *Gelidium pusillum, Chondrus crispus, Lomentaria articulata, Membranoptera alata* and coralline crusts, but the green seaweeds *Enteromorpha intestinalis, Ulva lactuca* and *Cladophora rupestris* can be present. The filamentous red seaweed *Polysiphonia lanosa* can usually be found growing on *A. nodosum*. On the rock beneath are the limpet *Patella vulgata* and the barnacle *Semibalanus balanoides*, while the crab *Carcinus maenas* and a variety of winkles including *Littorina littorea, Littorina mariae* and *Littorina obtusat*a can be found on or among the boulders. The whelk *Nucella lapillus* can be found in cracks and crevices. |
| North East Atlantic | A1.16 Macaronesian communities of exposed eulittoral rock | This intertidal habitat occurs on rocky shores of bedrock and boulders in areas exposed to wave action during high tides as well as to the swell of large storms.   It includes eleven biotopes newly described specific to the Azores A1.1x\_PT01 to A1.1x\_PT11.  In the Canary Islands, these communities are widespread along exposed eulittoral rocks. Crustose as well as turf-forming macroalgae colonise the rock surfaces and faunal communities on the exposed rock surfaces include barnacles and limpets.  Indicators of Quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Among the crustose species, the most abundant are *Nemoderma tingitana*, *Ralfsia verrucosa*, *Pseudolithoderma adriatica* and *Porolithon onkodes*,  whereas among turf-forming macroalgae, the most common species are *Gelidium arbuscula*, *Gelidium canariense*, *Pterocladiella capillaceae*, *Laurencia viridis*, *Osmundea pinnatifida*, *Ceramium spp*, and *Polysiphonia spp.*; The faunal components are mainly diverse gastropod species such as *Patella spp.* and *Osilinus spp.*as well as the rock crab *Grapsus adscensioni.* |
| North East Atlantic | A1.17: Low coverage of fauna and flora of mediolittoral rock and boulders | This habitat can be very extensive. It occurs in very exposed conditions, comprising rocks and boulders in upper, mid- and lower mediolittoral with lichens, barnacles, limpets, mussels and fucoids but not organised in communities. There is a high percentage of bare rock and a low species diversity.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Indicators which have been developed for the assessment of ecological quality of coastal water bodies for the Water Framework Directive (WFD) that are relevant to this habitat include a consideration of macroalgae species richness, proportions of different taxa of algae present, and the abundance and coverage of the rocky surfaces by typical species.  Characteristic species:  In the upper mediolittoral, the habitat is characterised by significant areas of bare rock, the rare presence of barnacles, including *Chthamalus montagui* and *Semibalanus balanoides*, limpets *Patella vulgata* and a few patches of the lichen *Verrucaria maura* and *Lichina pygmaea*. Few scattered patches of *Pelvetia canaliculata* and/or *Fucus spiralis* can also be observed. In the mid and lower mediolittoral zones, bare rock is also dominant and the same species of barnacles and limpets can be observed but lichens and fucoids characteristic of the upper eulittoral zone are replaced by patches of *Fucus vesiculosus, Fucus serratus* and the presence of mixed red algal turf *Mastocarpus stellatus, Caulacanthus ustulatus, Osmundea pinnatifida*. Damp cracks and crevices in the rock may provide a refuge for small individuals of the mussel *Mytilus edulis, Nucella lapillus, Littorina littorea, Littorina saxatilis* and a few individuals of *Actinia equina*. This habitat is characterized by its very low diversity but can cover large rock surfaces. |
| North East Atlantic | A1.2\_PT9: Seaweeds on moderately exposed shores | This habitat is a calcareous turf on areas of intertidal rock exposed to wave action. It includes the biotope characterised by *Chondracanthus acicularis* which occurs on horizontal and vertical surfaces where it forms an extremely dense herbaceous stratum together with other species such as *Chondracanthus teedei, Gelidium spinosum, Pterosiphonia complanata, Plocamium cartilagineum* and *Corallina elongata.*These help prevent desiccation during the emersion periods. The fronds of the algae also provide habitat for several polychaetes, amphipods and molluscs.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Indicators which have been developed for the assessment of ecological quality of coastal water bodies for the Water Framework Directive (WFD) that are relevant to this habitat include a consideration of macroalgae species richness, proportions of different taxa of algae present, and the abundance and coverage of the rocky surfaces by typical species.  Characteristic species:  *Corallina elongata,  Chondracanthus acicularis, Ceramium* spp.*, Laurencia* spp., *Haliptilon virgatum.*  Several epibionts occur on *C. acicularis*, such as the bryozoans *Aetea anguina, Scrupocellaria reptans, Celleporella hyalina* and *Walkeria uva*, and the cnidarian *Laomedea flexuosa*. These species are also present on the thalli of *C. teedei*, together with *Fenestrulina malusii, Haplopoma bimucronatum* and *Beania mirabilis. H. bimucronatum* and the foraminifere *Miniacina miniacea* occur on *C. elongata*.  The encrusting stratum as well as the rock are perforated by several organisms while others occupy the existing cavities. These are mainly sponges: *Cliona celata, Pione vastifica* and *Stelletta hispida*, polychaetes: *Dipolydora cf. coeca* and *Dodecaceria concharum*, molluscs: *Lithophaga lithophaga*, *Rocellaria dubia*, and sipunculids: *Phascolosoma (Phascolosoma) granulatum* and *Aspidosiphon (Aspidosiphon) muelleri muelleri*. The fronds of the algae provide habitat for several polychaetes, amphipods and molluscs, from which *Barleeia unifasciata, Hiatella arctica, Musculus costulatus* and juveniles of *Mytilus galloprovincialis* are the commonest ones. The sponge *Hymeniacidon perlevis*, serpulid polychaetes such as *Spirorbis* sp. and *Spirobranchus* spp., and the cirriped *Balanus perforatus*, occur attached on the rock together with *C. acicularis*. |
| North East Atlantic | A1.21: Barnacles and fucoids on moderately wave-exposed Atlantic littoral rock | Rocky shores in the mid- and lower eulittoral zone moderately exposed to wave action, characterised by a mosaic of fucoids and barnacles on bedrock and boulders. The extent of the fucoid cover is typically less than the blanket cover associated with sheltered shores except on the lower shore where there may be dense *Fucus serratus*. There is typically a lichen zone above and a kelp-dominated community below in the sublittoral zone. Where the moderately exposed lower shore rock is sand-influenced it can be characterised by dense mats of *Rhodothamniella floridula*. The presence of boulders and cobbles on the shore can increase the micro-habitat diversity, which often results in a greater species richness (crabs, tube-forming polychaetes such as *Pomatoceros triquiter*, sponges and bryozoans).  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Indicators which have been developed for the assessment of ecological quality of coastal water bodies for the Water Framework Directive (WFD) that are relevant to this habitat include a consideration of macroalgae species richness, proportions of different taxa of algae present, and the abundance and coverage of the rocky surfaces by typical species.  Characteristic species:  In addition to the barnacles and fucoids, other species normally present in this habitat include the winkle *Littorina littorea*, the whelk *Nucella lapillu*s and the red seaweed *Mastocarpus stellatus*. Beneath the band of yellow and grey lichens at the top of the shore is a zone dominated by the wrack *Pelvetia canaliculata*, scattered barnacles, while the black lichen *Verrucaria maura* covers the rock surface. Below, on the mid-shore the wrack *Fucus vesiculosus* generally forms a mosaic with the barnacle *Semibalanus balanoides* and the limpet *Patella vulgata*. Finally, the wrack *Fucus serratus*, dominates the lower shore, while a variety of red seaweeds can be found underneath the *F. serratus* canopy. |
| North East Atlantic | A1.22: *Mytilus edulis* and fucoids on moderately wave-exposed Atlantic littoral rock | Mid- and lower eulittoral bedrock exposed or moderately exposed to wave action, often with nearby sediment, and which may be densely covered by large individuals of the mussel *Mytilus edulis*. Three biotopes have been described associated with this habitat: In the mid eulittoral, the mussels may form a band or large patches with scattered bladder wrack *Fucus vesiculosus*. In the lower eulittoral a range of red seaweeds including *Mastocarpus stellatus* and *Palmaria palmata* occur amongst the mussels (in higher abundance than the mid eulittoral). Clay outcrops in the mid to lower eulittoral may be bored by a variety of piddocks including *Pholas dactylus*, *Barnea* *candida*and *Petricola pholadiformis*, while the surface is characterised by small clumps of the mussel *M. edulis*, the barnacle *Elminius modestus* and the winkle *Littorina littorea*. Ephemeral green seaweeds such as *Ulva intestinalis* and *U. lactuca* commonly occur on the shells of the mussels. Barnacles are common on both the mussel valves and on patches of bare rock, where the limpet *Patella vulgata* is found as well, often at high abundance. The whelk *Nucella lapillus* and a range of littorinids also occur within the mussel bed. A dense *M. edulis* community may be found on more sheltered coasts on mixed substrata  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Indicators which have been developed for the assessment of ecological quality of coastal water bodies for the Water Framework Directive (WFD) that are relevant to this habitat include a consideration of macroalgae species richness, proportions of different taxa of algae present, and the abundance and coverage of the rocky surfaces by typical species. The density and abundance of *Mytilus edulis* is also a potential indicator of habitat quality.  Characteristic species:  *Mytilus edulis* is the most frequently observed and abundant species associated with this habitat. The barnacle *Semibalanus balanoides*, the gastropod molluscs *Patella vulgata, Littorina littorea* and *Nucella lapillus* are also characteristic and the algae *Fucus serratus, Ulva intestinalis, U.lactuca, Palmaria palmata* and Corallinaceae. |
| North East Atlantic | A1.24 Macaronesian communities of eulittoral rock moderately exposed to wave action | This intertidal habitat occurs on rocky shores in areas moderately exposed to wave action. It is found throughout Macaronesia in the Azores, Madeira and the Canary Islands. The associated biotopes develop in response to the combined effects of little wave action, variations in atmospheric pressure, wind and tide and typically include turf forming macroalgae biotopes.  In Azores, this habitat is represented by a proposed new biotope A1.2X\_PT01 *Rhodymenia pseudopalmata* in association with *Gigartina acicularis* on moderately exposed to sheltered lower eulittoral. In the case of the southern Macaronesian archipelagos, a more diverse sub-set of habitats are recognised in the eulittoral platforms.  Indicators of Quality  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  In the southern Macaronesian archipelagos characteristic species include *Littorina spp.*, cyanobacteria colonies, *Chthamalus stellatus*& *Ch. montagnii*, *Fucus guiyri*, *Gelidium pusillum*and *Caulacanthus ustulatus*, *Hincksia mitchelliae* and a mixture of turf-forming macroalgal biotopes composed by *Alsidium corallinum*, *Laurencia spp.*, *Palisada spp.*, *Osmundea spp.*, *Polysiphonia spp.*, *Ceramium spp.* and *Digenea simplex* |
| North East Atlantic | A1.31: Fucoids on sheltered Atlantic littoral rock | Dense blankets of fucoid seaweeds dominating sheltered to extremely sheltered rocky shores and/or in locally sheltered patches of rocky shore that are exposed/moderately exposed to wave action. The habitat is found in sheltered areas such as inlets and bays below the lichen dominated zone and above the kelp dominated zone in the sublittoral. It also occurs in sheltered patches on more wave exposed shores such as the north coast of Spain and Portugal.  Indicators of Quality  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species  Typically, the wrack *Pelvetia canaliculata* occurs on the upper shore, with the wrack *Fucus spiralis* below. The middle shore is dominated by vast areas of the wrack *Ascophyllum nodosum* or the wrack *Fucus vesiculosus* or a mixture of both. The wrack *Fucus serratus* covers lower shore bedrock and boulders. |
| North East Atlantic | A1.32: Fucoids on variable salinity Atlantic littoral rock | Blankets of fucoid seaweeds, dominating sheltered to extremely sheltered rocky shores with variable salinity, such as sea loch or estuaries. The extent of rocky habitat in estuaries can range from a narrow strip restricted to the top of the shore to littoral reef structures extending to the subtidal, particularly in rias. The topography of estuarine rocky shores also varies from flat and gently sloping to rugged reefs and large boulders with many microhabitats.  Rocky habitats in estuaries are typically located in low wave energy environments with reduced salinity, and experience accelerated tidal streams with increased turbidity and siltation. The communities present are adapted to these conditions and consequently their composition and character is different to that found on similar substrata on the open coast.  Estuarine rocky habitats often display a transition of community types down the length of an estuary, reflecting the different environmental conditions, i.e. those at the upper ends of estuaries being specific to ultra sheltered and low salinity to communities similar to open coast rock communities towards the mouth of estuaries.  The wrack *Pelvetia canaliculata* occurs on the upper shore, with  *Fucus spiralis*  below. The middle shore is dominated by vast areas of  *Ascophyllum nodosum*, *Fucus vesiculosus*, or a mixture of both. *Fucus serratus* covers lower shore bedrock and boulders. *Fucus ceranoides* can be found on extremely sheltered shores with variable or low salinity as it is more tolerant of reduced salinity than the other fucoids, so tends to replace *Fucus spiralis, Fucus vesiculosus* and *Ascophyllum nodosum* towards the upper reaches of estuaries and sea lochs. This biotope may, however, still contain other fucoids, although *Fucus ceranoides* always dominates.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations, e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Dominance of fucoids (cover or biomass ratios of fucoids to other macroalgae) or penetration of fucoids along the salinity gradient is used in some countries as a Water Framework Directive parameter for assessing ecological status.  Characteristic species:  The variable salinity communities are species poor compared to those in full salinity or in tide-swept conditions as red seaweeds and sponges are usually absent. Underneath a canopy  of fucoids such as *Pelvetia canaliculata,* *Fucus spiralis*, *Ascophyllum nodosum*, and *Fucus vesiculosus*are a few green seaweeds including *Ulva intestinalis* and *Cladophora* spp. The red seaweed *Polysiphonia lanosa* can be found as an epiphyte on *A.nodosum*. On the rock and among the boulders are the winkles *Littorina littorea* and *Littorina saxatilis*, the crab *Carcinus maenas*, the barnacles *Semibalanus balanoides* and *Elminius modestus* and the occasional mussel *Mytilus edulis.* |
| North East Atlantic | A1.34 Macaronesian communities of lower eulittoral rock sheltered from wave action | This habitat occurs in the sheltered lower horizon of the mediolittoral rock and develops in response to the combined effects of little wave action, variations in atmospheric pressure,  wind and tide. The dominant aspect is the constant humidity of the substratum. It is found throughout Macaronesia in the Azores, Madeira and the Canary Islands and includes a proposed newly described biotope  ‘Association with *Enteromorpha compressa’* which occurs in the Azores.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  One of the associated species, *Padina pavonica*, is affected by and thrives under acidic conditions and may therefore be useful as a bioindicator of ocean acidification  Characteristic species:  In the case of the southern Macaronesian archipelagos, *Padina pavonica*, *Stypocaulon scoparium*, *Dasycladus vermicularis* and *Colpomenia sinuosa*.   Associated fauna include crabs such us *Xantho poressa or* *Dardanus spp*(hermit crabs), molluscs such as*Patella spp* or echinoderms (*Arbacia* spp.). |
| North East Atlantic | A1.41: Communities of Atlantic littoral rockpools | Rockpools occur where the topography of the shore allows seawater to be retained within depressions in the bedrock producing pools on the retreat of the tide. As the associated communities are permanently submerged they are not directly affected by height on the shore and normal rocky shore zonation patterns do not apply. Factors such as pool depth, surface area, volume, orientation to sunlight, shading, internal topography, sediment content and type, together with wave exposure, shore height, and hence flushing rate, and the presence of absence of freshwater runoff, results in large spatial variation in community structure, even between adjacent pools at the same shore height.  Shallow rockpools in the mid to upper shore are characterised by encrusting coralline algae and *Corallina officinalis*. Deeper rockpools on the mid to lower shore can support fucoids and some sublittoral species such as kelp. Those rockpools influenced by the presence of sand are characterised by sand-tolerant seaweed such as *Furcellaria lumbricalis* and *Polyides rotundus*. Where more stable sand occurs in the base of the rockpool sea-grass beds can occur. Shallow rockpools on mixed cobbles, pebbles, gravel and sand may be characterised by hydroids. A very rough guideline to the terms shallow and deep rockpools: shallow rockpools do not support kelp, whereas deep rockpools do. Rockpools on the upper shore which are subject to rainwater influence and wide fluctuations in temperature are not included in this habitat type. This habitat also does not include shallow standing water on compacted sediment or mixed substrata.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  In shallow rockpools *Corallina officinalis* often forms a dense turf. Characteristic algae include *Dumontia contorta, Mastocarpus stellatus, Ceramium virgatum, Cladophora rupestris* and *Ulva* spp. The pools may hold large numbers of grazing molluscs, particularly *Littorina littorea, Patella vulgata* and *Gibbula cineraria.* Within the pools, pits and crevices are often occupied by the anemone *Actinia equina* and small *Mytilus edulis*.  Deep rockpools often contain a community characterized by *Fucus serratus* and *Laminaria digitata.* Other large brown algae, including *Laminaria saccharina, Himanthalia elongata* and *Halidrys siliquosa*, may also occur. Characteristic encrusting filamentous and foliose algae, include *Palmaria palmata, Chondrus crispus, Ceramium* spp.*, Membranoptera alata and Gastroclonium ovatum*. The sponge *Halichondria panicea* and anemones *Actinia equina* may be present on overhangs or algal free vertical surfaces. Grazing molluscs, mobile crustaceans (e.g. *Pagurus bernhardus* and *Carcinus maenas*), brittlestars (Ophiothrix fragilis and *Amphipholis squamata*), and encrusting bryozoans and ascidians are also present.  Rockpools with sediment floors support distinct communities of scour-tolerant algae. Deep pools with sediment are typically dominated by fucoids and kelps (*Fucus serratus, Laminaria digitata, Saccharina latissima* and *Saccorhiza polyschides*). Shallow pools on mixed cobbles, pebbles, gravel and sand may be colonized by hydroids (*Obelia longissima* and *Kirchenpaueria pinnata*), ephemeral green algae (*Ulva* sp.) and the winkle *Littorina littorea. Mytilus edulis*, barnacles (*Semibalanus balanoides* and *Elminius modestus*) and the keel worm *Pomatoceros triqueter*. |
| North East Atlantic | A1.44 Communities of Atlantic littoral caves and overhangs | Where caves and overhangs occur on rocky shores, the shaded nature of the habitat diminishes the amount of desiccation suffered by biota during periods of low tides, allowing certain species to proliferate. In addition, the amount of scour, wave surge, sea spray and penetrating light determines the unique community assemblages found in upper-, mid- and lower-shore caves and overhangs.  Intertidal cave systems may be a few meters long or may extend considerable distances inland, while supporting fully marine biological communities. The flooded lava tube of Cueva de los Verdes – Jameos del on Lanzarote, in the Canary Islands penetrates some 2 km into the island. Biotopes from the surrounding shore or any of the fucoid communities occasionally extend into cave entrances and sometimes some distance beyond. Other open shore biotopes may also be found within caves, such as the that characterised by the green seaweed *Prasiola stipitata* on cave roofs favoured by roosting  birds, and localised patches of green algae where freshwater seepage influences the rock. Rockpools containing encrusting coralline algae, fucoids and kelp and hydroids and littorinid molluscs may occur also on the floor of cave entrances.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within *Natura* 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  In general, the biomass and diversity of algal species found in upper and mid-shore littoral caves decreases with increasing distance into the cave interior as the light levels diminish. Fucoids are usually only found at the entrances to caves, but red algae, and filamentous and encrusting green algae are able to penetrate to lower light intensities towards the back of the cave, and mats of the turf forming red seaweed *Audouinella purpurea* and/or patches of the green seaweed *Cladophora rupestris* may occur on the upper walls. Brownish velvety growths of the brown algae *Pilinia maritima* occurring in mats with the red alga *A. purpurea* on cave walls and upper littoral levels of cliffs  should not be confused with the green  or golden brown algal stains often found above this zone on the ceilings of the caves. On the lower walls is a zone of *Verrucaria mucosa* and/or *Hildenbrandia rubra* on the inner and outer reaches. Fauna usually only occur on the lower and mid walls of the caves and generally comprise barnacles, anemones and tube-forming polychaetes depending on the level of boulder scour or wave surge. Where the floors of caves consist of mobile cobbles and small boulders, few floral or faunal species occur due to the effects of scouring. Vertical or steeply sloping cave walls and overhangs on the mid- and lower-shore, subject to wave-surge but without scour, support a rich biota of sponges, hydroids, ascidians and shade-tolerant red algae.  In extensive cave systems such as the flooded lava tubes in the Canary Islands, the extent of saltwater intrusion, its stratification and the residence time of seawater (which can be from months to years) has resulted in a specialised fauna with pronounced morphological, physiological, biochemical and behavioural adaptations, such as the blind crab *Munidopsis polymorpha.* |
| North East Atlantic | A1.45 Ephemeral green or red seaweeds (freshwater or sand-influenced) on Atlantic littoral non-mobile substrata | This habitat type occurs across the intertidal zone and sometimes in the splash zone, including on cliff faces in such locations. It may also be present on upper shore hard substrata that is relatively unstable (e.g. soft rock), or which is subject to considerable freshwater runoff. A dense mat of green filamentous algae, often together with some red algae, is a characteristic feature.  On moderately exposed shores, the biotopes '*Enteromorpha* spp. on freshwater-influenced or unstable upper shore rock ' or '*P. purpurea* and/or *Enteromorpha* spp. on sand-scoured mid- to lower-eulittoral rock'  may be present, both of which tend to support a low species diversity.  Indicators of Quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Dominant green seaweeds include *Enteromorpha intestinalis*, *Ulva lactuca* and the red seaweeds *Rhodothamniella floridula* and *Porphyra purpurea*. Winkles such as *Littorina littorea* and *Littorina saxatilis*, the limpet *Patella vulgata* and the barnacles *Semibalanus balanoides* can occur, though usually in low abundance. The crab *Carcinus maenas* can be found where boulders are present, while the barnacle *Elminius modestus* is usually present on sites subject to variable salinity. The relatively high number of species in the characterising species list is due to variation in the species composition from site to site, and because of high species richness at individual sites. |
| North East Atlantic | A2.11 Marine Atlantic littoral shingle (pebble) and gravel | Shingle beaches occur on high energy wave dominated coasts where a sediment supply is available for reworking. The shingle (mobile cobbles and pebbles) or coarse gravel, is typically deposited as a result of onshore wave action and long-shore drift and the beach profile tends to be relatively steep. The particle size tends to increase along the shore in the direction of the long-shore drift. As the sediment is very coarse and often quite mobile, it typically supports little marine life, other than opportunist amphipods and oligochaete worms. Summer growths of ephemeral green algae (*Enteromorpha* spp.) may develop.  Indicators of Quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  This habitat tend to support virtually no macrofauna because of the very mobile and freely draining substratum. The few individuals that may be found are those washed into the habitat by the ebbing tide, including the occasional amphipod or small polychaete. Under conditions of moderate exposure there may be dense populations of the amphipod *Pectenogammarus planicrurus*. |
| North East Atlantic | A2.12 Estuarine Atlantic littoral coarse sediment | This habitat occurs on shores of coarse sediments (shingle, gravels and coarse sand) and in the upper reaches of estuaries and other inlets (e.g. sea lochs) which are subject to variable and reduced salinity conditions. The outflow of riverine freshwater at the heads of the inlets results in the washing out of fine particulate matter, leaving coarse sediments.  Indicators of Quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change overtime.  Indices developed to assess the ecological status of coastal waters, including estuaries, according to the Water Framework Directive, include physical indicators, water quality indicators and measures of benthic diversity, species richness and abundance. The latter group, which is particularly relevant to benthic habitats, includes a Benthic Quality Index, an Infaunal Trophic Index, a Marine Biotic index based on ecological groups, and the Benthic Opportunistic Polychaetes/Amphipods index.  Characteristic species:  Associated communities are typically species-poor and characterised by oligochaete worms. |
| North East Atlantic | A2.22: Barren or amphipod-dominated Atlantic littoral mobile sand | This intertidal habitat comprises shores of clean mobile sands (coarse, medium and some fine-grained), with little very fine sand, and no mud present. Shells and stones may occasionally be present on the surface. The sand may be duned or rippled as a result of wave action or tidal currents. The sands are non-cohesive, with low water retention, and thus subject to drying out between tides, especially on the upper shore and where the shore profile is steep. Mobile sand shores are typically situated along open stretches of coastline, with a relatively high degree of wave exposure. Bands of gravel and shingle may be present on the upper shore of exposed beaches. Where the wave exposure is less, and the shore profile more shallow, mobile sand communities may also be present on the upper part of the shore, with more stable fine sand communities present lower down. Mobile sand shores may show significant seasonal changes, with sediment accretion during calm summer periods and beach erosion during more stormy winter months. There may be a change in sediment particle size structure, with finer sediment grains washed out during winter months, leaving behind coarser sediments. Most of these shores support a limited variety of species, ranging from barren, highly mobile sands to more stable clean sands, supporting communities of isopods, amphipods and a limited number of polychaete species.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Species which can characterise mobile sand communities include *Scolelepis squamata, Pontocrates arenarius, Bathyporeia pelagica, B. pilosa, Haustorius arenarius* and *Eurydice pulchra*. A strandline of talitrid amphipods typically develops at the top of the shore where decaying seaweed accumulates. |
| North East Atlantic | A2.23 Polychaete/amphipod-dominated Atlantic littoral fine sand | This intertidal habitat is associated with shores of clean, medium to fine and very fine sand, with no coarse sand, gravel or mud present. Shells and stones may occasionally be present on the surface. The sand may be duned or rippled as a result of wave action or tidal currents. The degree of drying between tides is limited, and the sediment usually remains damp throughout the tidal cycle. Typically, no anoxic layer is present. Fine sand communities may be present throughout the intertidal zone on moderately exposed beaches, or they may be present on the lower parts of the shore with mobile sand communities present along the upper shore. They support a range of species including amphipods and polychaetes. A strandline of talitrid amphipods typically develops at the top of the shore where decaying seaweed accumulates.  Littoral sediment features are generally dynamic, and their  extent will vary on diurnal, lunar and seasonal cycles, driven by tidal regime, prevailing weather conditions, coastal and geomorphological processes. The associated habitats can therefore exhibit considerable natural variation. Fine sand shores may show seasonal changes, with sediment accretion during calm summer periods and beach erosion during more stormy winter months. There may be a change in sediment particle size structure, with finer sediment grains washed out during winter months, leaving behind coarser sediments.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  On the lower shore, and where sediments are stable, bivalves such as *Angulus tenuis* may be present in large numbers. *Arenicola marina* casts may be present on the sediment surface. An exceptionally rich fine sand community has been recorded from very sheltered reduced salinity shores in Poole Harbour, UK. Species recorded include *Anaitides maculata*, *Hediste diversicolor*, *Scoloplos armiger*, *Pygospio elegans*, *Tharyx killariensis*, oligochaetes, *Gammarus locusta*, *Hydrobia ulvae*, *Cerastoderma edule* and *Mya truncata*. |
| North East Atlantic | A2.24 Polychaete/bivalve-dominated Atlantic littoral muddy sand | This muddy or fine sand habitat often occurs as extensive intertidal flats on open coasts and in marine inlets. It is predominantly a habitat of the mid and lower shore though can span the entire intertidal. Where it occurs in marine inlets, the habitat may be subject to variable salinity conditions. Fine sand or mobile sand communities may be present on the upper shore with muddy sand communities present lower down. The sediment generally remains water-saturated during low water and has a high organic content resulting from settlement of organic detritus and growth of heterotrophic autotrophic micro-organisms. There is also typically a high microbial population and high sediment stability due to cohesion. An anoxic layer may be present below 5 cm of the sediment surface, sometimes seen in the worm casts on the surface.  Muddy sand habitats tend to support a relatively poor diversity of species, which are usually found in high abundances. These are predominately sessile tube-dwelling polychaetes with bivalves also well represented, amphipods and gastropods. Some species characteristic of subtidal areas may also occur. This habitat is also important for wintering and passage birds for feeding and roosting.  Indicators of Quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  The species most typically found in this habitat is the Baltic tellin *Macoma balthica.* Other commonly occurring species include *Cerastoderma edule, Hydrobia ulvae, Pygospio elegans, Hediste diversicolor, Eteone longa, Scoloplos armiger* and *Arenicola marina.* |
| North East Atlantic | A2.31 Polychaete/ bivalve-dominated mid-estuarine Atlantic littoral mud | Mid-estuarine shores of fine sediment, mostly in the silt and clay fraction though sandy mud (mostly very fine and fine sand) can also be a component of the substrate. Littoral mud typically forms extensive mudflats, though dry compacted mud can form steep and even vertical structures, particularly at the top of the shore adjacent to saltmarshes. Little oxygen penetrates these cohesive sediments, and an anoxic layer is often present within millimetres of the sediment surface. Most mid-estuarine muddy shores are subject to some freshwater influence, though at some locations more or less fully marine conditions may prevail. This habitat is mainly found along mid-estuarine shores and supports rich communities characterised by polychaetes, bivalves and oligochaetes. The mid-estuarine communities may also be present in sheltered inlets, straits and embayments which are not part of major estuarine systems, though there is usually some freshwater influence.  Indicators of quality:  Many indicators of quality have been used for this habitat with particular parameters set in certain situations e.g. protected features within *Natura*2000 sites, where reference values have been determined and applied on a location-specific basis. Indicators of quality of this habitat are frequently linked to those for the whole estuarine environment and therefore include morphological and physical characteristics, carrying capacity and water quality parameters. For the mudflat itself benthic indices, contaminant levels and productivity are some of the frequently used measures of quality.  Indices developed to assess the ecological status of coastal waters, including estuaries, according to the Water Framework Directive, include physical indicators, water quality indicators and measures of benthic diversity, species richness and abundance. The latter group, which is particularly relevant to benthic habitats, includes a Benthic Quality Index, an Infaunal Trophic Index, a Marine Biotic index based on ecological groups, and the Benthic Opportunistic Polychaetes/Amphipods index.  Characteristic species:  The infauna is characterised by the polychaetes *Eteone longa, Hediste diversicolor* (ragworm) and *Pygospio elegans*, oligochaetes (mostly *Tubificoides benedii* and *T. pseudogaster*), the crustaceans *Corophium volutator* and *Crangon crangon*, the spire shell *Hydrobia ulvae* and the baltic tellin *Macoma balthica*. The cockle *Cerastoderma edule* may be abundant, and the sand gaper *Mya arenaria* may be superabundant, though these species are not always present, or may be absent in core samples due to their large size. The polychaetes *Arenicola marina, Polydora cornuta* and *Capitella capitata*, the shrimp *Crangon crangon*, and the Mussel *Mytilus edulis* are sometimes present. *Enteromorpha* spp. and *Ulva lactuca* may form mats on the surface of the mud during the summer months, particularly in areas of nutrient enrichment or where there is significant freshwater influence. |
| North East Atlantic | A2.32: Polychaete/ oligochaete-dominated upper estuarine Atlantic littoral mud | Upper estuarine sandy mud and muddy shore communities, in areas with significant freshwater influence. The littoral mud typically forms mudflats, though dry compacted mud can form steep and even vertical structures, particularly at the top of the shore adjacent to saltmarshes. Little oxygen penetrates these cohesive sediments, and an anoxic layer is often present within millimetres of the sediment surface.  The upper estuarine mud communities support few infaunal species and are principally characterised by a restricted range of polychaetes and oligochaetes. There are three oligochaete dominated upper estuarine mud biotopes associated with this habitat. Of these three, the biotope characterised by *Nephtys hombergii* and *Streblospio shrubsolii*  occurs the furthest towards the mid estuary, and possibly lower on the shore than the other two. The biotope characterised by *Tubificoides benedii* and other is the most extreme upper estuarine biotope, occurring at the head of estuaries where there is no strong river flow and hence conditions are very sheltered, and there is a very strong freshwater influence. Further towards the mid estuary, this biotope may occur at the top of the shore.  Indicators of quality:  Many indicators of quality have been used for this habitat with particular parameters set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Indicators of quality of this habitat are frequently linked to those for the whole estuarine environment and therefore include morphological and physical characteristics, carrying capacity and water quality parameters. For the mudflat itself benthic indices, contaminant levels and productivity are some of the frequently used measures of quality.  Indices developed to assess the ecological status of coastal waters, including estuaries, according to the Water Framework Directive, include physical indicators, water quality indicators and measures of benthic diversity, species richness and abundance. The latter group, which is particularly relevant to benthic habitats, includes a Benthic Quality Index, an Infaunal Trophic Index, a Marine Biotic index based on ecological groups, and the Benthic Opportunistic Polychaetes/Amphipods index.  Characteristic species:  These include *Hediste diversicolor, Nephtys hombergii,* and *Streblospio shrubsolii*, the amphipod *Corophium volutator*, and molluscs *Hydrobia ulvae* and *Scrobicularia plana*. *Enteromorpha* spp. and *Ulva lactuca* may form mats on the surface of the mud during the summer months, particularly in areas of nutrient enrichment. |
| North East Atlantic | A2.33: Marine Atlantic littoral mud with associated communities | Intertidal flats along the open coast and near tidal inlets consist mainly of medium to coarse sand. In sheltered areas and near tidal watersheds the sediment is finer and may entirely consist of fine mud. This habitat type can occur in patches or grade into intertidal flats dominated by other soft sediments. Similarly whilst intertidal mudflats in large bays may be considered fully marine, there can still be a river influence and therefore reduced salinities across some of the habitat depending on location and outflow levels. Mudflats in fully marine waters, periodically falling dry at low tide, subject to great amplitudes of temperature, light and salinity, and may be subject to high eutrophication and input of organic substances from rivers and the open sea. Free of vegetation, of higher plants and of macroalgae but mostly covered by thin layers of diatoms and bluegreen algae. In some situations they may be colonised by seagrass. Sediments consist mainly of fine particles, mostly in the silt and clay fraction (particle size less than 0.063 mm in diameter), though sandy mud may contain up to 80% sand (mostly very fine and fine sand), often with a high organic content. Little oxygen penetrates these cohesive sediments, and an anoxic layer is often present within millimetres of the sediment surface. Intertidal mudflats in fully marine open sea (coast) only develop under macrotidal conditions such as those found in the German Bight and Mont Saint Michel, France. Also they form part of a habitat complex on a landscape scale within bays, barrier systems and estuaries. The intertidal mudflats support communities characterised by polychaetes, bivalves, snails and oligochaetes. The species composition of the macrobenthic communities are likely to show zoning from high to lower intertidal levels. In the Dutch, German and Danish Waddens Sea, for example, the high coastal tidal flats are generally characterised by a low number of species with numerous small individuals that are deposit feeders. Typical examples are *Corophium volutator* and *Hydrobia ulvae*. Large-sized species become numerous below mean tide levels and below this the biomass is dominated by the deposit feeding *Arenicola marina.* At mudflats well below mean low water, large filter-feeding bivalves such as *Cerastoderma edule, Mya arenaria, Mytilus edulis* and *Ensis directus* make up a significant proportion of the total biomass.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Species recorded from sampling locations in the Wadden Sea in time-series studies include Polychaetes: *Arenicola marina, Eteone longa, Pygospio elegans, Heteromastus filiformis, Capitella capitata, Lanice conchilega, Nereis diversicolor, Phyllodoce mucosa,* and *Scoloplos armiger, Crustaceans: Bathyporeia sp. Corophium volutator, Crangon crangon and Gammarus locusta*, and Molluscs: *Abra tenuis, Cerastoderma edule, Hydrobia ulvae, Macoma balthica, Mya arenaria* and *Retusa obtusa.* |
| North East Atlantic | A2.41 *Hediste diversicolor* dominated variable salinity Atlantic littoral gravelly sandy mud | Sheltered muddy gravel habitats occur principally in estuaries, rias and sea lochs, in areas protected from wave action and strong tidal streams. The infaunal community is dominated by abundant ragworms *Hediste diversicolor* with bivalves, polychaetes and crustaceans species also present depending on the characateristics of the sediment (mud, sand and gravel component) and position on the shore.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  The infaunal community is dominated by abundant ragworms *Hediste diversicolor*. Other species of infauna vary depending on the associated biotope. They include polychaetes such as *Pygospio elegans, Streblospio shrubsolii*, and *Manayunkia aestuarina*, oligochaetes such as *Heterochaeta costata* and *Tubificoides* spp., the mud shrimp *Corophium volutator*, the spire shell *Hydrobia ulvae*, the baltic tellin *Macoma balthica* and the peppery furrow shell *Scrobicularia plana.* |
| North East Atlantic | A2.42 Species-rich Atlantic littoral mixed sediment | This habitat is characterised by sheltered mixed sediments, usually subject to variable salinity conditions. It is found on the mid- and lower shore and is an extension of a shallow sublittoral habitat. The infauna is very diverse, dominated by a range of polychaetes.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Polychaetes including *Exogone naidina, Sphaerosyllis taylori, Pygospio elegans, Chaetozone gibber, Cirriformia tentaculata, Aphelochaeta marioni, Capitella capitata, Mediomastus fragilis,* and *Melinna palmata*. The oligochaete worms *Tubificoides benedii* and *T. pseudogaster* are abundant, as is the cockle *Cerastoderma edule*. A large range of amphipods may occur, including *Melita palmata, Microprotopus maculatus, Aora gracilis* and *Corophium volutator*. The bivalves *Abra alba* and *A. nitida* may occur. The barnacle *Elminius modestus* may be abundant where the sediment has stones on the surface. |
| North East Atlantic | A2.43: Species-poor Atlantic littoral mixed sediment | This habitat is found in the littoral zone where the substrate is mixed and typically too mobile or disturbed to support a seaweed community. The overall species diversity associated with the habitat is low.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  The characterising species of this habitat are barnacles and winkles (*Littorina* spp.) |
| North East Atlantic | A2.61 Seagrass beds on Atlantic littoral sediments | Mid and upper shore wave-sheltered muddy fine sand or sandy mud can have high densities of *Zostera noltei* (formerly known as *Z.noltii or Z.nana)*and/or *Z.marina*. *Z.noltei*forms stands with a cover of delicate trailing narrow leaves up to about 20 cm long. It survives the winter as rhizomes, therefore the locations remain stable over many years. It may occur monospecific, or with *Z. marina* or *Ruppia* spp*.*and occasional plants of lower salt-marsh species such as annual *Salicornia* spp. or *Spartina anglica,* as stands of *Z. noltei* may not onlypass downshore to *Z. marina* but also to communities of the lower saltmarsh,notably the *Salicornietum europaeae.* Exactly what determines the distribution of *Z. noltei* is not entirely clear. It is most characteristic of situations where the substrate dries out somewhat on exposure and, on flats with a gentle bar/hollow topography where it forms distinctive mosaics with *Z. marina*. It can also occur in shallow standing water and so is often found in small permanently submerged lagoons and pools, and on sediment shores where the muddiness of the sediment retains water and stops the roots from drying out. An anoxic layer is usually present some 5cm below the surface of the sediment.  There may be seasonal variation in the area covered by intertidal seagrass beds, as plants die back in winter. Intertidal seagrass beds may also be subject to heavy grazing by geese, which can reduce the extent of the plant cover significantly. The rhizomes of *Z.noltei* will remain in place within the sediment in both situations and plants towards the lower limit may remain winter-green.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Total area covered, density of the intertidal beds and species composition is, for example, used as a Water Framework Directive parameter for assessing ecological status.  The overall quality and continued occurrence of this habitat is dependent on the presence of *Zostera* spp*.* which creates the biogenic structural complexity on which the characteristic associated species depend. The density and the maintenance of a viable population of *Zostera*is therefore a key indicator of habitat quality, together with the visual evidence of presence or absence of physical damage. OSPAR defines *Zostera* beds as areas where plant densities should provide at least 5% coverage although, more typically they are greater than 30%.  Characteristic species:  *Zostera noltei* in many areas is the dominant species of intertidal seagrass beds, *Zostera marina* also forms dense fields as in the German Wadden Sea and until recently in the Ems estuary. In brackish environments *Ruppia maritima* and/or *R.cirrhosa* can also occur. *Z. angustifolia*, which is often described in older literature is simply an ecotype of *Z. marina* which has narrower leaves and an annual life history strategy reproducing less by vegetative means in favour of seed production. This is an advantage in its less stable intertidal habitat. The subtidal variant of *Z. marina* which has longer and stronger leaves is perennial but was wiped out in nothern Europe by a disease in the 1930's. The intertidal annual form was also affected but able to recover more easily.  The infaunal community of this habitat is characterised by polychaetes *Scoloplos armiger*, *Pygospio elegans* and *Arenicola marina*, oligochaetes, spire shell *Hydrobia ulvae*, and bivalves *Cerastoderma edule* and *Macoma balthica*. The green algae *Ulva* spp. may be present on the sediment surface. |
| North East Atlantic | A2.71: Worm reefs in the Atlantic littoral zone | The sedentary polychaete S*abellaria alveolata* (honeycomb worm) is a sessile, tube-dwelling species which builds its tubes from sand and shell fragments held together with biological cement. Colonies form on fixed and stable substrates where there is a plentiful supply of sediment on the mid to lower shore. The colonies can form relatively quickly and may take the form of sheets, hummocks and reefs as well as evolving from globular formations into reef platforms. In the Bay of Mont Saint-Michel, France, they create irregularly shaped, patchy banks that cover approximately 225ha. These are considered to be the largest reef formation in Europe with worm densities estimated to reach up to 60,000 individuals/m2 and reef structures more than 2m thick. At the other extreme the *S.alveolata* reefs at the edge of its range on the central coast of Portugal and north of the Cumbrian coast in the UK tend to be very scattered and not particularly extensive.  *S.alveolata* reefs can be relatively unstable and undergo a natural cycle of development and decay. As new individuals prefer to settle on active colonies or the remains of old colonies, the age and morphology of reefs are not directly related to the age of individual worms which are typically 4-5 years with a likely maximum of 9 years. The species assemblages found on *S.alveolata* reefs are unique because they are composed of a mixture of species typically found on hard structures, sandy and muddy sediments as well as from subtidal, intertidal and terrestrial habitats (insect larvae).  Indicators of Quality:  The overall quality and continued occurrence of this habitat is largely dependent on the presence of *S. alveolata* which creates the biogenic structural complexity on which the characteristic associated communities depend. The density and the maintenance of a viable population of this species is a key indicator of habitat quality, together with the visual evidence of presence or absence of physical damage. Scientists working on the Mont-Saint-Michel *S. alveolata* reefs defined the vitality status of the reef by integrating the physical characteristic of the reef and its dynamics. This took into account the degree of fragmentation of reef features, cover by species which are known to degrade, smother and break up areas of *S.alveolata* reef (the oyster *Crassostrea gigas* and the mussel *Mytilus galloprovinciallis*) and the prevalence of different structural characteristics within the reef formations. In Morecambe Bay (UK), the health of the reefs was determined with reference to the percentage of newly settled worms, those with crisp apertures, to those with worn apertures and dead worms. A generic and universally applicable health metric has still to be developed.  Characteristic species:  *S. alveolata* reefs are quite distinct from the mosaic of seaweeds and barnacles or red seaweeds generally associated with moderately exposed rocky shores though many of the same species are present (A1.2). These include the anemone *Actinia equina and Cereus pedunculatus*, the barnacles *Semibalanus balanoides* and *Elminius modestus,* the limpet *Patella vulgata*, the top shell *Gibbula cineraria* and the winkle *Littorina littorea*. The whelk *Nucella lapilus* and the mussel *Mytilus edulis* is also present on the boulders. In the surrounding sediment, the tubiculous polychaete *Lanice conchilega* and *Diopatra* spp are routinely found. Scour resistant red seaweeds including *Palmaria palmata, Corallina ifficinalis, Mastocarpus stellatus, Chondrus crispus, Ceramium nodulosum, Osmundea pinnatifida, Polysiphonia* spp. and coralline crusts can also be present where suitable substrata exist. Brown and green seaweeds also present include *Fucus serratus, Fucus vesioculosus, Cladostephus spongiosus, Enteromorpha intestinalis* and *Ulva lactuca*. The colonisation of bioconstruction by epibonts (e.g. green macroalgae) is typically a symptom of a non-healthy state). The richness of the associated infauna varies according to the stage of reef development or degradation. |
| North East Atlantic | A2.72: Mussel beds in the Atlantic littoral zone | Sediment shores characterised by beds of the mussel *Mytilus edulis* occur principally on mid and lower shore mixed substrata (mainly cobbles and pebbles on muddy sediments) but also on sands and muds. In high densities (at least 30% cover) the mussels bind the substratum and provide a habitat for many infaunal and epibiotic species. This habitat is also found in lower shore tide-swept areas, such as in the tidal narrows of sealochs. A fauna of dense juvenile mussels may be found in sheltered firths, attached to algae on shores of pebbles, gravel, sand, mud and shell debris with a strandline of fucoids. Two associated biotopes are *M.edulis* beds on littoral mixed substrata and *M.edulis* beds on littoral sand.  The temporal stability of mussel beds can vary a lot. Some beds are permanent, maintained by recruitment of spat in amongst adults. Other beds are ephemeral, for example in locations where large amounts of spat settle intermittently on a cobble basement. In such situations mussels rapidly build up mud, and are unable to remain attached to the stable cobbles and are then liable to be washed away during gales. A second example of ephemeral mussel dominated biotopes occurs when mussel spat ("mussel crumble") settles on the superficial shell of cockle beds.  ‘Mussel mud’, composed of faeces, pseudofaeces and sediment, accumulates underneath mussel beds. In sheltered habitats, pseudofaeces (undigested, filtered particles) can build up forming a thick layer of anoxic mud. The layer of mud may prevent the attachment of mussels to the underlying substratum, but the silt layer often consolidates and forms a firm clay bank which is very erosion resistant including the mussels embedded into it. ‘Mussel mud’ (that is not anoxic) supports a diverse range of infauna.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integratedindices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  The overall quality and continued occurrence of this habitat is largely dependent on the presence of *Mytilus edulis* which creates the biogenic structural complexity on which the characteristic associated communities depend. The density and the maintenance of a viable population of this species is a key indicator of habitat quality, together with the visual evidence of presence or absence of physical damage. Monitoring programmes may include measures of biomass, coverage, length frequency distribution, a condition index for the mussels (a ratio between biomass versus shell lenght) and descriptions of the structure of a bed including vertical height profile, thickness and type of accumulated sediment, coverage and biomass of macroalgae.  Characteristic species:  Dense aggregations of the mussel *Mytilus edulis*. The wrack *Fucus vesiculosus* (and *Fucus mytili*, currently regarded as a synonym of *F.vesiculosus*) is often found attached to either the mussels or cobbles and it can be abundant. The mussels are often encrusted with the barnacles *Semibalanus balanoides, Elminius modestus* or *Balanus crenatus*. Where boulders are present they can support the limpet *Patella vulgata*. The winkles *Littorina littorea* and *L. saxatilis* and small individuals of the crab *Carcinus maenas* are common amongst the mussels, whilst areas of sediment may contain the lugworm *Arenicola marina*, the sand mason *Lanice conchilega*, the cockle *Cerastoderma edule*, and other infaunal species.  Although a wide range of species are associated with *Mytilus edulis* beds biotopes these characterizing species occur in a range of other biotopes and are therefore not considered to be obligate associates. |
| North East Atlantic | A2.82: Vegetated (ephemeral) Atlantic littoral mixed sediment | This habitat comprises littoral mixed substrata (pebbles and cobbles overlying sand or mud) that are subject to variations in salinity and/or siltation, characterised by dense blankets of ephemeral green and red seaweeds. This habitat is found primarily on enclosed stony shores sheltered from wave action with weak to moderate tidal streams and often subject to variable levels of salinity. It is found predominately in the mid shore zone above, or at the same level as, the biotope dominated by the barnacles *S. balanoides* and/or *E. modestus* and *Littorina* spp. If it is found in the upper shore region it can be backed by saltmarsh species such as *Salicornia* sp. and *Spartina* sp. Below are biotopes dominated by the wracks *Fucus serratus* or *Fucus vesiculosus* or by *M. edulis* or by the polychaete *Hediste diversicolor* and the tellin *Macoma balthica* depending on the substratum.  Eulittoral pebble and boulder beaches in the Macaronesian archipelagos are mainly located at the mouth of steep brook valleys (Barrancos). At depths where wave action is only slight, stable ecosystems can develop with species-rich plant covers, lodging many different animals. In the eulittoral the biota is reduced to a few  small turf green and red seaweeds (usually *Ulva* species and *Gelidium pusillum*), but in the infralittoral, several species of red seaweeds occur, such as *Ellisondia officinalis*, *Halophytis incurva* and members of the family Liagoraceae, also brown seaweeds, like *Stypocaulon scoparium* and *Sargassum* spp. Among the faunal components, limpets (*Patella* spp.), periwinkles (*Osilinus* spp.) and crabs (*Pecnon gibbessi*) are common species.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  The main species present are *Enteromorpha intestinalis*, *Ulva lactuca* and *Porphyra* spp., along with colonial diatoms covering the surface of the substratum. Small numbers of other species such as barnacles *Semibalanus balanoides* and *Elminius modestus* are confined to any larger cobbles and pebbles or on the shells of larger individuals of the mussel *Mytilus edulis*. The crab *Carcinus maenas* and the winkle *Littorina littorea* can be present among the boulders, cobbles and seaweeds, while gammarids can be found in patches underneath the cobbles. In common with the other habitats found on mixed substrata, patches of sediment are typically characterised by infaunal species including bivalves, for example, *Cerastoderma edule* and the polychaete *Arenicola marina* and the polychaete *Lanice conchilega*. This is a habitat with a low species diversity and the number of species in the characterising species list is due to a variation in the species composition from site to site, not to high species richness at individual sites. |
| North East Atlantic | A3.1\_PT14 Faunal communities of high energy Atlantic infralittoral rock | This habitat includes dense populations of *Mytilus galloprovincialis*, on high energy infralittoral rocky seabed, up to 6-8 meters depth. The specimens are strongly attached to each other by the byssus threads, which makes them extremely endurable to rough sea. Several layers of mussels can occur on the rock. Under them the rock is covered by abundant *Balanus perforatus* that can also be attached to the shells of the mussels.  Indicators of Quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species, in this case *Mytilus galloprovincialis*as, well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change overtime.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Charactersitic species:  Where *M.galloprovincialis* communities occur the associated fauna is very diverse, with several sessile and mobile species on the rock occupying the spaces between the mussels. Attached either to the barnacle shells or directly to the rock, abundant populations of the cnidarian *Corynactys viridis* occur, as well as serpulid polychaetes *Spirobranchus* spp., and the bryozoan *Celleporina caliciformis*. The echinoderms *Ophiotrix fragilis* and *Amphipholis squamata* and the polychaetes *Lepidonotus clava* and *Platynereis dumerilii* are common species in this habitat. The flatworms *Stylochus neapolitanus* and *Emprosthopharynx pallida* and the ascidean *Diplosoma listerianum* are frequent and abundant in this habitat. Crustaceans are also abundant, namely P*ilumnus hirtellus, Tanais dulongii, Ischyromene lacazei, Elasmopus brasiliensis, Stenothoe tergestina, Podocerus variegatus* and *Parajassa pelagica.* Regarding the molluscs, the most abundant one, besides *M. galloprovincialis*, is *Patella ulyssiponensis; Hiatella arctica* and the predator *Nucella lapillus* are present but in small numbers. Among echinoderms *Paracentrotus lividus, Amphipholis squamata* and *Ophiotrix fragilis* occur in this habitat, as well as the predator *Marthasterias glacialis*, which can cause periodic destruction of the mussel populations. Algae are not abundant in this habitat, the most frequent one is *Corallina elongata,* whose biotope occurs between the eulittoral and infralittoral populations of *Mytilus galloprovincialis.* |
| North East Atlantic | A3.11 Kelp with cushion fauna and/or foliose red seaweeds on wave-exposed Atlantic infralittoral rock | This is a rocky habitat occurring in the infralittoral zone in areas exposed or extremely exposed wave action and/or strong tidal streams. It typically occurs from low water to depths of up to 45m. The rock supports a community of kelp *Laminaria hyperborea* or further south *Laminaria ochroleuca*, with foliose seaweeds and animals, the latter tending to become more prominent in areas of strongest water movement. In extremely wave exposed conditions, the sublitttoral fringe is characterised by dabberlocks *Alaria esculenta* which, may extends from 5 to 10 m depth, or even replace *L. hyperborea* as the dominant kelp in the infralittoral zone. The depth to which the kelp extends varies according to water clarity, exceptionally (e.g. St Kilda, Scotland) reaching 45 m. The shallowest kelp plants are often short or stunted, while deeper plants are taller with heavily epiphytised stipes with foliose red seaweeds. At some sites the red seaweeds can be virtually mono-specific, while at other sites show considerable variation, containing a dense mixed turf of a large variety of species.  The faunal and floral understorey is generally rich in species due, in part, to the relatively low urchin-grazing pressure in such shallow exposed conditions. As the exposure increases the rock surface is covered by a dense turf of anthozoans such as *Sagartia elegans*, *Phellia gausapata* and *Corynactis viridis*, encrusting sponges and coralline algae. The gastropod *Margarites helicinus* can be found grazing on the kelp fronds, whereas the crab *Cancer pagurus* can be found among the kelp stipes. The bryozoan *Tubularia indivisa* also occurs, but it does not form such a dense turf as in more shallow waters, while the ascidian *Botryllus leachi* is found encrusting the large brown seaweeds. *Cryptopleura ramosa* is the dominant red seaweed on horizontal surfaces. Winter storms may remove patches of kelp, and fast-growing annuals may form a temporary forest  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Laminaria hyperborea*, *Laminaria ochroleuca*, *Alaria esculenta,*foliose red seaweeds such as *Delesseria sanguinea*, *Cryptopleura ramosa*, *Plocamium cartilagineum*,and the brown seaweed *Dictyota dichotoma*. Also found on the stipes, or on the rock below, are *Phycodrys rubens*, *Kallymenia reniformis, Callophyllis laciniata, Caryophyllia smithii*, and *Corallina officinalis*, while encrusting coralline algae can cover any bare patches of rock. The faunal composition of this habitat varies markedly between sites, but commonly occurring are the soft coral *Alcyonium digitatum* and the anthozoans *Sagartia elegans* and *Corynactis viridis*. Sponges form a prominent part of the community with variable amounts of the sponges *Halichondria panicea* and *Pachymatisma johnstonia* and several other species. The crab *Cancer pagurus* and the starfish *Asterias rubens* are normally present in small numbers foraging beneath the canopy, while the sea urchins *Echinus esculentus* and *Urticina felina* graze on the seaweeds. The hydroid *Obelia geniculata*, the ascidian *Botryllus schlosser*i and the bryozoan *Membranipora membranacea* compete for space on the kelp, whereas the bryozoan *Electra pilosa* also can be found on foliose red seaweeds. In more exposed conditions underneath the canopy of *A.esculenta* are red seaweeds such as *Mastocarpus stellatus* and *Palmaria palmata*, while encrusting coralline red algae such as *Lithothamnion graciale* covers the rock surface. The limpet *Patella vulgata* can be found grazing the rock surface, while the whelk *Nucella lapillus* is preying on the limpets, barnacles and mussels. |
| North East Atlantic | A3.12 Kelp and seaweed communities on sediment-affected or disturbed Atlantic infralittoral rock | Infralittoral rock habitat which is subject to disturbance through the mobility of the substratum (boulders or cobbles), abrasion/covering  by nearby coarse sediments, or suspended particulate matter (sand). The associated communities can be quite variable in character, depending on the particular conditions. *Laminaria hyperborea* and red seaweed communities typical of stable open coast rocky habitats are replaced by those which include more ephemeral species or which are tolerant of sand and gravel abrasion. As such *Saccharina latissima*, *Saccorhiza polyschides* or *Halidrys siliquosa* may be prominent components of the associated community. The foliose green seaweed *Ulva* spp. is fast to colonise newly cleared areas of rock and is often present, along with the foliose brown seaweed *Dictyota dichotoma*.  Due to the disturbed nature of this habitat, fauna are generally sparse, being confined to encrusting bryozoans and/or sponges, such as *Halichondria panacea*and the gastropod *Gibbula cineraria*.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Where *Saccorhiza polyschides* and other opportunistic kelps occur, scour-tolerant red seaweeds including *Corallina officinalis, Kallymenia reniformis, Plocamium cartilagineum, Chondrus crispus, Dilsea carnosa* and encrusting coralline algae are often present beneath the kelp. Foliose red seaweeds such as *Callophyllis laciniata, Cryptopleura ramosa* and *Palmaria palmata* also occur in this habitat. *P. palmata* and *Delesseria sanguinea* often occur as epiphytes on the stipes of *L. hyperborea*, when it is present.  Where there are seasonally disturbed unstable boulders and cobbles in very shallow water the brown seaweeds *Chorda filum* and *S.latissima* can dominate with *Desmarestia aculeata* and encrusting coralline algae also typical. Other red seaweeds, which can be found here, include *Chondria dasyphylla*, *Brongniartella byssoides, Polysiphonia elongata, Ceramium nodolosum, Cystoclonium purpureum, Heterosiphonia plumosa, Rhodomela confervoides* and *Plocamium cartilagineum*.The brown seaweeds *Punctaria* sp. and *Cladostephus spongiosus* are generally present.  Where there are dense stands of *Halidrys siliquosa*  it can be mixed with the foliose brown seaweed; *Dictyota dichotoma* and kelp such as *Saccharina latissima* and *Laminaria hyperborea*. Below the canopy is an undergrowth of red seaweeds, that are tolerant of sand-scour such as *Phyllophora crispa, Phyllophora pseudoceranoides, Rhodomela confervoides, Corallina officinalis* and *Chondrus crispus*. Other red seaweeds such as *Plocamium cartilagineum, Calliblepharis ciliata, Cryptopleura ramosa, Delesseria sanguinea, Heterosiphonia plumosa, Dilsea carnosa, Hypoglossum hypoglossoides* and *Brongniartella byssoides* may be locally abundant, particularly in the summer months. There may be a rich epibiota on *H. siliquosa*, including the hydroid *Aglaophenia pluma*, ascidians such as *Botryllus schlosseri*. There is generally a sparse faunal component colonising the boulders and cobbles, comprising the tube-building polychaete *Pomatoceros triqueter*, the crab *Cancer pagurus*, the starfish *Asterias rubens*, the gastropod *Gibbula cineraria* and the sea anthozoan *Urticina felina*.  The faunal component of this biotope is typically sparse - the starfish *Asterias rubens* and the crabs *Pagurus bernhardus* and *Necora puber* are amongst the most conspicuous animals. The bryozoan crust *Electra pilosa* colonise many of the algae along with the ascidian *Botryllus schlosseri*. Occasionally, the polychaete *Lanice conchilega* may occur in the sand between pebbles, and the anthozoan *Urticina felina* may be found amongst pockets of gravel along with the gastropod *Gibbula cineraria*. At some sites the rock beneath the algae can be occupied by the tube-building polychaete *Pomatoceros triqueter*. |
| North East Atlantic | A3.14 Encrusting algal communities on exposed Atlantic infralittoral rock | This habitat comprises a community of crustose algae on rocky substrates. It occurs in locations which are exposed or moderately exposed to wave action. Algal cover is extremely poor, and almost completely restricted to encrusting species. Sessile animals are typically encrusting sponges, bryozoans, barnacles, serpulids and vermetids. Vertical surfaces may be occupied by patches of encrusting sponges and *Corynactis viridis*, while hydroids such as *Aglaophenia* pulma may be locally abundant. In deeper water the colonial coral *Madracis asperula* may be present. The herbivory of the sea-urchins is very important for the maintenance of this habitat.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  In the Azores this community of crustose algae is found in association with *Arbacia lixula* with reported characteristic species of Corallinacea, *Hildenbrandia* sp., *Cutleria* sp. aglaozonia phase, *Peyssonelia* spp., *Nemoderma tingitana*, some tiny polisyphonate Ceramiales, and in some case *Lythophillum tortuosum* amidst the turf. In sheltered notches and crevices, *Percnon gibbesi*, *Sphaerechinus granularis* and the sea-star *Marthasterias glacialis* are commonly found. Sessile associated fauna is composed of giant barnacles *Megabalanus azoricus,* limpets *Patella aspera*, the muricid predator *Stramonita haemastoma* and vermetids. Abandoned vermetid tubes are often inhabited by sedentary individuals of the hermit crab *Calcinus tubularis* while empty giant barnacle fortresses are usually occupied by sponges, serpulids and sea urchins *Paracentrotus lividus*, as well as small blennies (*Parablennius rubber, Parablennius incognitus, Ophioblennius atlanticus* and *Lipophrys trigloides*) which use them as shelters and nesting places. |
| North East Atlantic | A3.15 Frondose algal communities (other than kelp) on exposed Atlantic infralittoral rock | This rocky habitat type is found in the infralittoral zone, in locations exposed or extremely exposed to wave action, or strong tidal streams. Associated biotopes are characterised by foliose red seaweeds, turfs of articulated *Corallinaceae*  and *Cystosiera* spp. at or below the lower limit of the kelp. Most of the red seaweeds which make up the dense turf of foliose red seaweeds are common to the kelp zone above, while the faunal component of the habitat is made up of species that are found either in the kelp zone or the animal-dominated upper circalittoral. Many of the red seaweeds, which occur in this habitat have annual fronds, which tend to die back in the autumn and regenerate again in the spring. This produces a seasonal change in the density of the seaweed cover, which is greatest between April and September, then substantially reduced over winter months. As well as a varied red seaweed component, this habitat may also contain occasional kelp plants and patches of the brown foliose seaweed *Dictyota dichotoma*.  Dense fields of *Cystoseira* cf. *abies-marina*, are an associated biotope but currently only recorded on the Macaronesian archipelagos such as Formigas Bank, Azores and Chinijo Islets, north of Lanzarote, Canary Islands. Encrusting coralline algaefrequently cover the substrate under the *Cystoseira* plants whilst *Ulva rigida* is an occasional epiphyte on the fronds. Around the various nooks and crevices of the irregular bedrock, the more abundant species are encrusting rhodophytes (calcareous and non-calcareous) as well as cartilagineous rhodophytes. Other species present are *Sphaerococcus coronopifolius, Hypoglossum hypoglossoides, Dictyopteris membranacea* and *Cladophora* sp.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Foliose species commonly present include *Dilsea carnosa, Hypoglossum hypoglossoides, Schottera nicaeensis, Cryptopleura ramosa* and *Delesseria sanguinea*. The red seaweed species composition varies considerably; at some sites a single species may dominate (particularly *Plocamium cartilagineum*). Small filamentous red seaweeds can be found here as well. These include *Heterosiphonia plumosa* and *Brongniartella byssoides*. Coralline crusts cover the bedrock beneath the seaweeds. The fauna generally comprises low-encrusting forms such as the tubeworms *Pomatoceros* spp., anthozoans including *Alcyonium digitatum, Urticina felina* and *Caryophyllia smithii*) and occasional sponge crusts such as *Cliona celata, Esperiopsis fucorum, Scypha ciliata* and *Dysidea fragilis*. More mobile fauna include the gastropod *Calliostoma zizyphinum*, the echinoderms *Echinus esculentus* as well as the starfishs *Asterias rubens*,and *Marthasterias glacialis* and the crab *Cancer pagurus*. Bryozoan crusts such as *Electra pilosa* can be found fronds on the foliose red seaweeds while scattered hydroids such as *Nemertesia antennina* form colonies on shells, cobbles and available rock. At some sites erect bryozoans *Crisia* spp. and *Bugula* spp. are present. Ascidians such as *Clavelina lepadiformis* and *Clavelina lepadiformis* may also be common.  The *Cystoseira* beds are used by a multitude of species that feed, take shelter and nest amongst the fronds. *Thalassoma pavo* and *Centrolabrus trutta* are two extremely abundant fish species and the latter species has major breeding grounds in this assemblage. Cryptic fish such as *Conger conger, Muraenidae* spp., *Epinephelus marginatus* and *Phycis phycis* are typically found in the crevices. |
| North East Atlantic | A3.21: Kelp and red seaweeds on moderate energy Atlantic infralittoral rock | This habitat is found on infralittoral rock in areas subject to moderate wave exposure, or on more sheltered coasts in areas subject to moderately strong tidal streams. Kelp forests develop in these situations and both the rock surfaces and kelp holdfasts and stipes are typically colonised by other algae. These are predominantly red algae with  good variety of delicate filamentous types. The most conspicuous sessile fauna include ascidians, bryozoans, echinoderms, crustaceans, and bryozoans.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. The depth limit of kelp and/or red seaweeds is used in some countries as a Water Framework Directive parameter for assessing ecological status.  Characteristic species:  On bedrock and stable boulders there is typically a narrow band of kelp *Laminaria digitata* in the sublittoral fringe which lies above a *Laminaria hyperborea* forest and park. Other seaweeds typically present include *Saccharina latissima*, *Delesseria sanguinea, Plocamium cartilagineum, Phycodrys rubens, Corallinaceae* and *Dictyota dichotoma*. Characteristic fauna include *Halichondria panacea, Urticina felina*, *Pomatoceros triqueter, Gibbula cineraria, Asterias rubens,* and, *Echinus esculentus* as well as bryozoans *Membranipora membranacea* and *Electra pilosa*. |
| North East Atlantic | A3.22 Kelp and seaweed communities in tide-swept sheltered Atlantic infralittoral rock | This is a species-rich, structurally complex habitat that develops in areas of infralittoral rock sheltered from wave action but exposed to strong tidal streams such as the sheltered narrows and sills of Scottish sea lochs or in Norwegian fjords.  In the sublittoral fringe dense *Laminaria digitata* is found together with erect seaweeds, sponges, ascidians and bryozoans. Below this, on bedrock and stable boulders a canopy of mixed kelp (primarily *Laminaria hyperborea* and *Saccharina latissima*) occurs with foliose red seaweeds, sponges and ascidians. In some situations, for examples on mixed substrata of boulders, cobbles, pebbles and gravel, there may be a reduced kelp canopy of *L. hyperborea* and *S. latissima*, but with a rich red seaweed component and maerl at some sites. Where the tide-swept rock occurs in estuarine conditions, the reduced and variable salinity as well as increased turbidity of the water has a significant effect on the biota, limiting the infralittoral zone to very shallow depths. The rock in these situations is characterised by a relatively low abundance of *S. latissima* with foliose red seaweeds, sponges and ascidians. *L. hyperborea* is rarely present.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Tide-swept algal communities dominated by dense stands of kelp, together with a high diversity of red seaweeds, e.g. *Plocamium cartilagineum, Heterospihonia plumose, Cryptopleura ramose, Delesseria sanguinea* and *Phycodrys rubens*. The brown seaweed *Dictyota dichotoma* may also be frequent. The strong water flow supports a wide variety of sessile animals such as anthozoans, sponges, sea squirts and sea mats on both the bedrock and the seaweeds. They include *Urticina felina, Alcyonium digitatum Pachymatisma johnstonia, Clavelina lepadiformis,* and *Botryllus schlosseri*. In the sublittoral fringe, oarweed (*Laminaria digitata*) dominates while on the tide scoured rock of sea loch sills and narrows, dense cuvie (*Laminaria hyperborea*) and sugar kelp (*Saccharina latissima*) forests form. In areas of boulders and gravel, the kelp canopy is less dense but with a greater diversity of red seaweeds and occasionally maerl. Invertebrate species that characterise the habitat include *Cancer pagurus, Calliostoma zizyphinum, Asterias rubens, Echinus esculentus* and *Balanus crenatus.* |
| North East Atlantic | A3.23 Macaronesian communities of infralittoral algae moderately exposed to wave action | This habitat is characterised by the presence of many photophilic algae covering areas of bedrock and boulders. It occurs in the infralittoral zone in areas that are moderately exposed to wave action and currents.  In the case of the Azores  - northern archipelago – four associations are recognized: one of the brown algae *Colpomenia sinuosa*, another one of the red genus *Peyssonnelia*,  with *P. rubra* as most common species. The two other biotopes are mainly associated to brown macroalgae, such as *Zonaria tournefortii – Dictyota spp.* and Turf (calcareous and non calcareous) with *Dictyota spp.* and *Stypocaulon scoparium / Halopteros filicina*.  In the southern archipelagos: Madeira, Selvagem and Canary Islands the diversity of biotopes is much greater as is the variety of associated macroalgae. Where the articulated calcareous algae *Ellisondia* (*Corallina*) *elongate* is the characteristic species, there are also many associated epiphytes and small marine invertebrates. The brown foliose macroalgal biotope is characterised mainly by  *Lobophora variegata*, with other dictyotales such as *Zonaria tournefortii*, *Dictyota spp., Stypopopdium zonale* as major elements.There is also an associated biotope composed by the green algae *Pseudotetraspora marina*), which has been spreading along areas of moderately exposed infralittoral rocks in the Canary Islands. The biotope characterised by *Cymopolia barbata* covers large shallow infralittoral rocks in locations with strong sunlight. In the eastern canarian archipelago, another conspicuous biotope is that of *Padina pavonica,* which issometimes associated with *Cladostephus spongiosus*, *Hypnea* and *Spyridia*.  On horizontal rocky surfaces the red algae *Lophocladia trichoclados* may form nearly monospecific stands. Seasonal red algal of the genera *Galaxaura*, *Dudresnaya*, *Liagora* and *Helminthocladia*, are key elements of another conspicuous biotope, whereas the turf forming articulated calcareous algae *Haliptilon*, *Jania* and *Amphiroa* are widespread biotope in the Selvagem and Canary Islands.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:     *Zonaira tournefortii* can form dense canopies with *Stypopodium zonale, Dictyota (Canistrocarpus*) *spp.* and to a lesser extent *Padina pavonica* also frequent. The green alga *Dasycladus vermicularis* may form mats on horizontal surfaces. Vagile associated form is abundant and diverse including molluscs, crustaceans echinoderms and numerous fish.  In Madeira and in many canarian locations, the algal species typically observed are *Zonaria tournefortii*, *Stypopodium zonale*, *Dictyota bartayresiana*, *Padina pavonica* *Dasycladus vermicularis* *Asparagopsis armata* and *Cottoniella filamentosa*. Associated molluscs may include *Haliotis tuberculat*a, *Charonia lampas lampas*, *Hexaplex trunculus*, *Astraea rugosa*, *Erosaria spurca* and *Octopus vulgaris*. Crustaceans such as *Stenorhynchus lanceolatus* *Maya squinado*,*Percnon gibbese*, and echinoderms such as *Diadema africanum*, *Sphaerechinus graularis*, and *Marthasteria glacialis*. Abundant fish may include *Synodus synodus*, *Muraena augusti*, *Serranus atricauda*, *Diplodus vulgaris*, *D. sargus cadenati*, *D. cervinus cervinus*, *Oblada melanura*, *Pomadais incises*, *Chromis limbatus*, *Abudefduf luridus*, *Thalassoma pav*o, *Centrolabrus trutta*, *Sparisoma cretense*, *Scorpaena maderensis*, *Canthigaster rostrate* and *Sphoeroides marmoratus*.  In the Canary Islands, and within the *Pseudotetraspora marina* biotope is frequent to observe sponges of the genus *Batzella* and/ or *Cinachyrella*, and in the biotope dominated by *L. trichoclado,* another filamentous red alga *Cottoniella filamentosa* is common. |
| North East Atlantic | A3.2x Macaronesian seaweed communities on moderate energy infralittoral rock | This habitat occurs predominantly on moderately wave-exposed bedrock and boulders, that are subject to moderately strong to weak tidal streams. Two associated biotopes have been described in the Azores archipelago. The first is dominated by *Codium elisabethae, Halopteris filicina* and coralline crusts on moderate to sheltered bedrock. The second is characterised by dense patches of the green alga *Caulerpa webbiana*. This species was first reported in the Azores in 2002 and although not considered an invasive species in other parts of Macaronesia or the world it has many characteristics of such a species in the Azores.   In the southern Macaronesian archipelagos, a more diverse sub-set of habitats are recognised, such as that defined by *Stypocaulon scoparium* / *Halopteris filicina*(A3.2X3), more frequent in Azores and Madeira archipelagos and with fewer locations in Selvagem and the Canary Islands.  Other representative biotopes in the Canarian archipelago are barren grounds of the long spined sea urchin *Diadema africanum* (A3.2X4) or those constructed by other sea urchin species *Arbacia lixula*  or *Paracentrotus lividus* on shallower infralittoral volcanic rocks (A3.2X5). *Corynactis viridis* defines another interesting biotope (A.3.2X6) mainly associated with sea urchins whereas different zooantids, such as *Isaurus tuberculatus, Zoanthus spp.* and *Palythoa  spp*  are characteristic elements of another biotope (A3.2X7) in hard bottoms.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  In the barren ground biotope, the associated species are the damselfish *Chromis limbata*, the arrow crab *Stenorhynchus lanceolatus*, the shrimp *Tuleariopsis neglecta* and the parasitic mollusc *Echineulima leucophaes.* The floristic component is very sparse with small specimens of the genera *Dyctiota*, *Lobophora* and *Liagora*.  Other introduced species like the red algae *Asparagopsis* spp. and the ascidean *Distaplia corolla* are the most common associated biota with the *Caulerpa* biotope in Azorean waters.  Associated biota in the *Codium* biotope includes *Zonaria tournefortii, Bryopsis* spp.*,* encrusting brown algae, *Microdictyon calodictyon* and the boring sponge *Cliona celata*. Associated biota in the *Halopteris filicina* biotope are *Padina pavonica*, *Asparagopsis spp.*, *Zonaria tournefortii* and the sea urchin *Arbacia lixula*. |
| North East Atlantic | A3.31: Atlantic silted kelp on marine low energy infralittoral rock | This habitat can be found in wave and tide-sheltered conditions with *Laminaria hyperborea* and/or *Saccharina latissima* on infralittoral bedrock and boulders.  It is typically subject to weak tidal streams and rather silty conditions. The associated seaweeds are silt-tolerant and include a high proportion of delicate filamentous types. Beneath the kelp canopy, the faunal component is generally less diverse than in kelp forests that develop in more exposed locations. Some areas, particularly in the lower infralittoral zone, are subject to intense grazing by urchins and chitons and subsequently may have poorly developed seaweed communities. In very sheltered conditions *S.latissima* may grow as a ‘cape form’ where there are often few associated seaweeds due to siltation, grazing or shading from the dense kelp canopy.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  *Laminaria hyperborea*, *Saccharina latissima.*Beneath the kelp is an associated under-storey flora of foliose red seaweeds including *Plocamium cartilagineum, Cryptopleura ramosa* and *Callophyllis laciniata* as well as the brown seaweeds *Dictyota dichotoma, Cutleria multifidi* and *Desmarestia aculeata*. The stipes of *L. hyperborea* may be densely covered with red seaweeds such as *Phycodrys rubens* and *Delesseria sanguinea* as well as the solitary ascidian *Clavelina lepadiformis* and the featherstar *Antedon bifida*. The fronds are often epiphytised by the hydroid *Obelia geniculata* and the bryozoan *Membranipora membranacea*. In addition to the kelp, the brown seaweed *Chorda filum* and *Ectocarpaceae* are often present.  A depauperate assemblage of animals is present predominantly consisting of the encrusting polychaetes *Pomatoceros triqueter*, the crabs *Carcinus maenas* and *Pagurus bernhardus* and the ubiquitous gastropod *Gibbula cineraria*. The echinoderms *Antedon bifida*, starfish *A. rubens,* brittlestar *O. fragilis* and urchin *Echinus esculentus* occur in low abundance. Ascidians are commonly found but the large solitary ascidian *Ascidia mentula* are most prolific in very sheltered conditions of *S.latissima* forests. |
| North East Atlantic | A3.32 Kelp in variable salinity low energy Atlantic infralittoral rock | This is a structurally complex habitat that develops in areas of very wave-sheltered infralittoral bedrock, boulders and cobbles subject to only weak tidal streams in the sublittoral fringe and infralittoral zone, with variable/reduced salinity typical for estuaries. The variabile salinity and increased turbidity have a signficiant effect on the biota, limiting species richness of seaweeds and the occurance to shallower parts of the infralittoral zone. The kelp canopy is characterised by *Saccharina latissima* only with accompanying foliose red seaweeds and coralline crusts. *Laminaria hyperborea* is generally missing due to the low salinity and weak tidal currents.  The associated biotopes may support dense stands of silted filamentous green seaweeds and red seaweeds,   depauperate coralline-encrusted rock with few foliose seaweeds but many grazing urchins and, in very shallow, heavily-silted situations, dense stands of *Codium* spp., together with silt-tolerant red seaweeds, the green seaweed *Ulva* spp. and often only a sparse covering of the kelp *Saccharina latissima*.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. The depth limit of kelp and/or red seaweeds is used in some countries as a Water Framework Directive parameter for assessing ecological status.  Characteristic species:  This habitat type is characterised by the kelp *Saccharina latissima* and coralline crusts such as *Lithothamnion glaciale*. Red algal communities are composed primarily of *Phycodrys rubens*. Grazers such as the urchins *Psammechinus miliaris* and *Echinus esculentus*, and the gastropods *Gibbula cineraria* and *Buccinum undatum* may be present. The tube-dwelling polychaete *Pomatoceros triqueter*, the ascidians *Ciona intestinalis, Corella parallelogramma* and *Ascidiella scabra*, the barnacle *Balanus crenatus*, the starfish *Asterias rubens* and the brittlestar *Ophiothrix fragilis* may also be present. The crabs *Carcinus maenas* and *Pagurus bernhardus*, and the bivalve *Modiolus modiolus* may also be observed. |
| North East Atlantic | A3.34 Submerged fucoids, green or red seaweeds on low salinity Atlantic infralittoral rock | Very shallow submerged rocky habitats in bays, inlets or estuaries subject to permanently reduced salinity conditions. These particular conditions lead to a variety of seaweed-dominated communities, which include fucoids, green and red macroalgae species. The fucoids, more typical of intertidal Atlantic habitats, penetrate into the subtidal under the reduced salinity conditions which are not tolerated by kelps. This habitat may also includes dense stands of *Ascophyllum nodosum* if salinities are high enough (>20psu).  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations, e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Dominance of fucoids (cover or biomass ratios of fucoids to other macroalgae) or penetration of fucoids along the salinity gradient is used in some countries as a Water Framework Directive parameter for assessing ecological status.  Characteristic species:  The main species are the wracks *Fucus serratus* and *Fucus vesiculosus*, but there may also be dense stands of *Ascophyllum nodosum*, and presence of the brown seaweeds *Chorda filum*, and Ectocarpaceae. One sub-habitat is characterised by the wrack *Fucus ceranoides* and the green seaweed *Ulva*spp. (A3.344). Perennial red seaweeds are normally present often under the fucoid canopy and include *Furcellaria lumbricalis, Mastocarpus stellatus, Polyides rotundus, Chondrus crispus, Ceramium* spp. and coralline crusts. A variety of green seaweeds is also present and include *Ulva*spp., while dense patches of *Cladophora rupestris* may occur on vertical rock faces. Associated with these seaweeds are a variety of ascidians including *Clavelina lepadiformis, Ascidiella aspersa, Ascidiella scabra* and *Ciona intestinalis* as well as the anemones *Anemonia viridis and Actinia equina* and the sponge *Halichondria panacea*. The faunal component is restricted to the mussel *Mytilus edulis,* the polychaete *Arenicola marina*, the starfish *Asterias rubens*, the hermit crab *Pagurus bernhardus* and the crab *Carcinus maenas*. Opossum shrimps Mysidae can be present as well. Part of this diversity is due to large differences between sites. |
| North East Atlantic | A3.35: Faunal communities on low energy marine Atlantic infralittoral rock | This habitat is found in tide-sheltered conditions, supporting silty communities with *Laminaria hyperborea* and/or *Saccharina latissima.* It is distinguished by the presence of an abundance of turf-forming species, often animal-dominated, but can sometimes be characterised by algal turf  with species such as *Codium elisabethae* and *Halopteris filicina a*nd coralline crusts.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  This habitat has yet to be fully defined, so the characterising species, beyond those indicated above, have not been fully determined. |
| North East Atlantic | A3.36 Faunal communities on variable or reduced salinity Atlantic infralittoral rock | The extent of rocky habitat in rias, sea-lochs and estuaries can range from a narrow strip restricted to the top of the shore to littoral reef structures extending to the subtidal. Rocky habitats in these sheltered inlets are typically located in low wave energy environments with reduced salinity, subjected to accelerated tidal streams with increased turbidity and siltation. The associated communities are adapted to these conditions and consequently their composition and character is different to that found on similar substrata on the open coast. Estuarine rocky habitats often display a transition of community types down the length of an estuary, reflecting the different environmental conditions i.e. those at the upper ends of estuaries being specific to ultra-sheltered and low salinity, grading to communities similar to open coast rock communities towards the mouth of estuaries.  At the most diverse end of the scale this habitat may support a rich and exceptionally abundant sessile epibiota of anemones (e.g. *Metridium senile* and *Diadumene sincta)*, filter feeding sponges (e.g. *Halichondria panacea, Hymeniacidon perleve, Haliclona oculata, Raspalia spp., Suberties spp. and Stelligera* spp.), bryozoans (e,g, *Alcyonidium digitata, Bugula* spp.), hydroids (e.g. S*ertularella gaudichaudi, Tubularia* spp.) and ascidians (e.g. *Ascidiella aspersa* and *Dendrodoa grossularia*). Seaweed dominated biotopes are generally poorly developed or absent. In some sea lochs dense mussel *Mytilus edulis* beds develop in tide-swept channels, whilst upper estuarine rocky habitats in the rias may support particular brackish-water tolerant faunas.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species  Where the habitat is dominated by *Mytilus edulis*, a wide variety of epifaunal colonisers on the mussel valves, including seaweeds, hydroids and bryozoans can be present including, *Balanus crenatus, Halichondira panacea, Metridium senile, Ascidiella aspersa* and Ectocarpaceae. The crab *Carcinus maenas* and starfish *Asterias rubens* may also be present. In locations with a high turbidity such as upper estuaries, the brackish-water hydroid *Cordylophora caspia* and small colonies of the encrusting bryozoan *Electra crustulenta* and a few *Balanus crenatus* may be present. The hydroid *Hartlaubella gelatinosa* and bryozoans *Conopeum reticulum* and *Bowerbankia imbricata* have been recorded in other locations where this habitat occurs. There are considerable differences in species composition between sites, but all occur in brackish turbid-water conditions. |
| North East Atlantic | A3.3X/3.33 Macaronesian submerged fucoids, green or red seaweeds on full salinity infralittoral rock | This habitat is found throughout the Macaronesian islands in rocky infralittoral areas and is characterised by the presence of many photophilic algae.  In shallow waters 2-3m around the Azores the habitat is dominated by *Codium fragile* although in places the invasive species *C*. *fragile* spp. *tomentosoides* has also become established.  In the southern Macaronesian archipelagos of Madeira, Selvagen and the Canaries other *Codium  spp*. are characteristic elements of this habitat either as conspicuous narrow belt of crustose species (*C. intertextum, C. adhaerens*) in the infralittoral fringe, globlose to subglobose, somewhat flattened specimens of *C. elisabethiae* / *C. bursa,*or frondose and large specimens in crevices and overhangs (*C. taylorii*) or attached to pebbles (*C. decorticatum*).  In shallow sublittoral rocks, it is also possible to find the biotope of the green macroalgae *Dasycladus vermicularis* - *Halimeda discoidea* -*Acetabularia acetabulum*  with the gasteropod *Elysia timida*.  Where there is some organic matter sedimentation the red algae *Halopithys incurva*, *Digenea simplex*, *Rytiphlaea tinctoria* and *Alsidium corallinum* are more common.  The fucoids *Cystoseira mauritanica*, *C. tamariscifolia*  and sometimes, *C. abies-marina* and *c. foeniculacea, Sargassum vulgare* - *S. desfontainesii* - *S. furcatum* are the main elements of other biotopes, with many marine invertebrates associated (copepods, amphipods, hydrozoans, etc.). A seasonal biotope during spring – summer months is characterized by *Sporochnus* spp.  In deeper waters with low light intensity the associated biotopes include those characterised by the red macroalgae *Botryocladia, Halymenia, Sebdenia* and less frequently *Kallymenia.*In some detritic sediments, the introduced tropical green seaweed *Caulerpa racemosa  var. cylindracea*  could be observed between 10 - 50 m. depth. Associated species are the polychaete *Ditrupa arietina*, decapods such as *Paromola cuvieri* and *Cancer bellianus*, bryozoans of the genus *Cupuladria* and the sea urchins *Cidaris cidaris* and *Genocidaris maculata.*  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  In the Canary Islands, common associated species are the anthozoan *Palythoa canariensis* and the bivalve *Spondylus senegalensis* as well as the red macroalgae *Nemastoma canariensis* and the esponges *Aplysina aerophoba* e *Ircinia spp*. The Azores archipelago is the southwestern limit of distribution of *Codium fragile ssp. atlanticum* but the invasive species *C. fragile ssp. tomentosoides* has also established successful populations in the archipelago.  The biodiversity of these biotopes is high, with the dominant macroalgal species associated with other macroalgae, such as the perennial species *Halopteris scoparia*  *Cladostephus spongiosus* and *Padina pavonica* or the annual  green macroalgae *Acetabularia acetabulum*. Among these species it is possible to observe turf species, such as *Ellisondia elongata*  *Jania rubens, Jania corniculata* or *Haliptilon virgatum*, *Amphiroa rigida, erect species such as Liagora distenta, Hypnea musciformis, H. cervicornis*, or epiphytes as *Falkenbergia rufolanosa*. Among gastropod molluscs, *Haliotis tuberculata*, *Gibbula  spp*., *Rissoa  spp*., *Aplysia  spp*., *Elysia timida*, *Ocenebra erinacea*, *Ocinebrina edwardsi*, *Stramonita haemastoma* and *Nassarius incrassatus* are observed. The most common echinoderms are *Sphaerechinus granularis,* *Paracentrotus lividus* and *Arbacia lixula* (sometimes also the long spined sea urchin *Diadema africanum*) and the seastar *Echinaster sepositus*. The icthyofauna is diverse and common species are *Sparus aurata, Sciaena umbra, Ephinephelus marginatus* and *Hippocampus hipppocampus*. |
| North East Atlantic | A3.71: Robust faunal cushions and crusts in Atlantic infralittoral surge gullies and caves | Infralittoral rocky habitats subject to strong wave surge conditions, as found in surge gullies and shallow caves, on open rocky coasts with moderate or greater wave action. This habitat is typically colonised by faunal communities of encrusting or cushion sponges, colonial ascidians, short turf-forming bryozoans, anthozoans, barnacles and, where there is sufficient light, by red seaweeds.  The surge gullies and caves usually consist of vertical bedrock walls, occasionally with overhanging faces, and support communities which reflect the degree of wave surge they are subject to, and any scour from mobile substrata on the cave/gully floors. The larger cave and gully systems typically show a marked zonation from the entrance to the rear of the gully/cave as wave surge increases and light reduces. This is reflected in communities of anthozoans, ascidians, bryozoans and red seaweeds near the entrance, leading to sponge crust-dominated communities and finally barnacle and spirobid worm communities in the most severe surge conditions. Gully/cave floors usually have mobile boulders, cobbles, pebbles or coarse sediment. The mobile nature of the gully/cave floors leads to communities of encrusting species, tolerant of scour and abrasion or fast summer-growing ephemeral species. The lower zone of the gully side walls are also often scoured, and typically colonised by coralline crusts and barnacles. Winter storms may result in scouring on gully/cave walls whilst some ephemeral growth may occur in calmer summer months.  Indicators of Quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change overtime.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Frequently recorded species in this habitat include *Clathrina coriacea, Halichondria paicea, Metridium senile, Corynactis viridis, Balanus crenatus, Polyclium aurantium*, Didemnidae and Corallinaceae. Occasionally recorded are *Pachymatisma johnstonia, esperipsis fucorum, Myxilla incrustans, Tubularia indivisa, Alcyonium digitatum, Urticina feline, Sargatia elegans, Pomatoceros triqueter, Cancer pagurus, Calliostoma zizyphinum, Asterias rubens, Echinus esculentus* and *Botryllus schlosseri.* |
| North East Atlantic | A4.11. Faunal communities on very tide-swept Atlantic upper circalittoral rock | This habitat develops in extremely wave-exposed to exposed conditions where circalittoral bedrock and boulders are subject to strong or very strong tidal streams. It is typically found in tidal straits and narrows and is characterised by species that are capable of maintaining a foothold under these conditions. They either form a flat, adherent crust, as in the case of the barnacle *Balanus crenatus*, or have strong attachment points and are flexible, bending with the tide, such as the turf of the hydroid *Tubularia indivisa*.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  The characteristic species are determined by tidal stream strength. In strongly tide-swept wave exposed, situations there can be high abundance of the robust hydroid *Tubularia indivisa* and barnacle *Balanus crenatus*, the cushion sponges *Halichondria panicea* and *Myxilla incrustans* and *Alcyonium digitatum*. The anemones *Sagartia elegans, Actinothoe sphyrodeta, Urticina felina, Corynactis viridis* and *Metridium senile* are all found within this complex. Other species present in this high-energy complex are the sponges *Esperiopsis fucorum* and *Pachymatisma johnstonia,* the bryozoans *Alcyonidium diaphanum* and *Flustra foliacea*, and the hydroid *Sertularia argentea*. Where turbidity levels are high sponges such as *Esperiopsis fucorum, Pachymatisma johnstonia, Hemimycale columella, Dysidea fragilis* and *Clathrina coriacea* may be present. Mobile species include the starfish *Asterias rubens* and *Henricia oculata*, the crab *Cancer pagurus* and the whelk *Nucella lapillus* may also be present. |
| North East Atlantic | A4.12 Sponge communities on Atlantic lower circalittoral rock | This habitat type typically occurs on circalittoral rock (commonly  below 30m depth) in areas subject to negligible tidal streams. The sponge component is the most striking feature, and can be present in large aggregations. The sponges are important structure components; they contribute to bioerosion, consolidate sediment and stabilise habitats thereby reducing physical disturbance, and through aggressive competitive growth and seasonal retraction maintain space for new recruits and species thus maintaining biodiversity.  A species rich hydroid/bryozoan turf may develop in the understorey of this diverse sponge assemblage. Sponge fields also support various ophiuroids, which use the sponges as elevated perches. The prominent mobile species of the associated community consist mainly of decapod crustaceans, gastropod molluscs and echinoderms. A diverse 'cryptofauna' of nemerteans, polychaetes and amphipods also exists, living within and between the larger sessile organisms, acting as grazers, predators and detritivores. Fish  may also be present, but they are not considered characteristic members of the community.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreedindicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Indicators of 'naturalness' have been described for this habitat and may be used to make some assessment of habitat quality. These are; community composition including the presence of older, larger individuals within the community, presence of intact (undamaged) fragile sponges and other fragile epifauna, low levels of silt, filter feeders unsmothered, no increases of silt tolerant species, and presence of typical species.  Characteristic species:  The sponges *Phakellia ventilabrum, Axinella infundibuliformis, Axinella dissimilis* and *Stelligera stuposa* dominate. Other sponge species frequently found on exposed rocky coasts are also present in low to moderate abundance. These include *Cliona celata*, *Polymastia boletiformis, Haliclona viscosa, Pachymatisma johnstonia, Dysidea fragilis, Suberites carnosus, Stelligera rigida, Hemimycale columella* and *Tethya aurantium*. The cup coral *Caryophyllia smithii* and the anemone *Corynactis virdis* may be locally abundant in some areas, along with the holothurian *Holothuria forskali*. In deeper waters there may be dense aggregations of *Artemisina transiens*. The soft corals *Alcyonium digitatum* and *Alcyonium glomeratum* are frequently observed. The bryozoans *Pentapora foliacea* and *Porella compressa* are also more frequently found in this deep-water habitat type. Bryozoan crusts such as *Parasmittina trispinosa* are also occasionally recorded. Isolated clumps of large hydroids such as *Nemertesia antennina*, *Nemertesia ramose*, *Sertularella gayi* as *Aglaophenia pluma*, erect bryozoans including *Cellaria sinuosa*, *Bugula flabellata*, *Bugula plumose*, *Bugula turbinata*, *P. foliacea*, *A. diaphanum* may be seen on the tops of boulders and rocky outcrops. Large echinoderms such as *Echinus esculentus*, *Luidia ciliaris*, *Marthasterias glacialis*, *Strichastrella rosea*, *Henricia oculata* and *Aslia lefevrei* may also be present. The sea fan *Eunicella verucosa* may be locally common and the snail *Calliostoma zizyphinum* is often recorded as present. |
| North East Atlantic | A4.13 Mixed faunal turf communities on high energy Atlantic upper circalittoral rock | This habitat type occurs on wave-exposed circalittoral bedrock and boulders, sometimes on vertical or steep slopes, subject to tidal streams ranging from strong (3-6 kn) to moderately strong (1-3 kn). The rocky outcrops may be surrounded by coarse sediment, for example shelly gravel or muddy gravel. The majority of the organisms are filter feeders, depending on suspended material in the water column and providing important water quality regulation and nutrient cycling services. Amongst others, sponges, bryozoans, hydroids, ascidians and sea-anemones, whose functional roles are of high importance, form these communities. Slow-growing complex biogenic structures created by hydroids, bryozoans and sponges modify the flow of currents, consolidate sediments and provide a three-dimensional habitat to a multitude of associated species.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  This habitat is characterised by a diverse range of hydroids (*Halecium halecinum*, *Nemertesia antennina* and *Nemertesia ramosa*), bryozoans (*Alcyonidium diaphanum*, *Flustra foliacea*, *Bugula flabellata* and *Bugula plumosa*) and sponges (*Scypha ciliata*, *Pachymatisma johnstonia*, *Cliona celeta*, *Raspailia ramosa*, *Esperiopsis fucorum*, *Hemimycale columella* and *Dysidea fragilis*) forming an often dense, mixed faunal turf. Other species found within this complex are *Alcyonium digitatum*, *Urticina felina*, *Sagartia elegans*, *Actinothoe sphyrodeta*, *Caryophyllia smithii*, *Corynactis viridis*, *Pomatoceros triqueter*, *Balanus crenatus*, *Cancer pagurus*, *Necora puber*, *Asterias rubens*, *Echinus esculentus* and *Clavelina lepadiformis*. |
| North East Atlantic | A4.21 Echinoderms and crustose communities on moderate energy Atlantic upper circalittoral rock | This habitat occurs on wave-exposed, moderately strong to weakly tide-swept, circalittoral bedrock and boulders. Echinoderms, faunal and algal crusts (red encrusting algae) dominate, giving a sparse appearance. It occurs from depths, where the light becomes insufficient for macroalgae down to about 100 meters although occasionally also encountered in deeper water.  On vertical faces there may be dense aggregations of the cup coral *Caryophyllia smithii*, large expanses of encrusting red algae or, in conditions of moderate exposure, the soft coral *Alcyonium digitatum*. The sea fan *Swiftia pallida* can be present on silty substratum and the anemone *Urticina feline* and the sponge *Ciocalypta penicillus* at the sand-rock interface. The polychaete *Pomatoceros triqueter* can be locally abundant, and may in some cases cover far more rock surface than *A. digitatum*, especially on vertical faces. Clumps of robust hydroids such as *Abietinaria abietina* and *Nemertesia antennina* occur occasionally.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Echinoderms *Echinus esculentus*, *Asterias rubens*, *Henricia sanguinolenta*, *Ophiothrix fragilis, Antedon bifida*, the anemones, *Cortynactis viridis, Metridium senile* and *Sagartia elegans*, the ascidians *Clavelina lepadiformis, Ciona intestinalis* and *Ascidia mentula,*the soft coral *Alcyonium digitatum.* Also the cup coral *Caryophyllia smithii,* mollusc*Calliostoma zizyphinum,*the edible crab *Cancer pagurus* and occasional hydroids such as *Abietinaria abietina* and *Nemertesia antennina*. At the sand/rock interface *Urticina feline*, *Ciocalypta penicillus* and the polychaete *Pomatoceros triqueter.* |
| North East Atlantic | A4.22 *Sabellaria* reefs on moderate energy Atlantic circalittoral rock | This habitat occurs on moderately wave-exposed, circalittoral bedrock, boulders and cobbles subject to moderately strong tidal streams and is characterised by dense crusts on the upper faces of the hard surfaces formed by the sandy tubes of the polychaete worm *Sabellaria spinulosa*. In some cases the *S.spinulosa* may completely cover the rock, binding gravel and pebbles together. A diverse fauna may be found attached to and sometimes obscuring the crust, often reflecting the character of surrounding biotopes. There is usually no significant raised reef area.  Indicators of quality:  The condition of *S. spinulosa* reefs can be judged in different ways. For instance: the areal extent of the reef, its spatial patchiness, temporal stability, or number of associated species. Categorisation of condition may also consider a combination of these parameters. At present there is no consensus of approach or accepted yardstick against which to compare condition of individual reefs. Further to this, evidence suggests that *S. spinulosa* reefs may repeatedly develop and decline in a regular succession, through resettlement and demise of successive generations. An apparent deterioration in condition may therefore be natural and not necessarily reflective of an anthropogenic impact. The apparently ephemeral nature of *S. spinulosa* reefs is such that the condition of *S. spinulosa* reef habitat should be considered at a wider scale than individual reefs.  Characteristic species:  *S.spinulosa*. Other fauna present in many cases reflects the biotopes found on nearby rock, Infauna typically comprises polychaete species such as *Protodorvillea kefersteini, Scoloplos armiger, Harmothoe spp., Mediomastus fragilis, Lanice conchilega* and cirratulids together with the bivalves *Abra alba* and *Nucula* spp. and tube-building amphipods such as *Ampelisca* spp. Epifauna comprise calcareous tubeworms, pycnogonids, hermit crabs, amphipods, hydroids, bryozoans, sponges and ascidians. Species typically present include the bryozoans *Flustra foliacea, Alcyonidium diaphanum* and *Pentapora foliacea*, the hydroid *Nemertesia antennina*, the sponges *Tethya aurantium* and *Phorbas fictitius*, the anemones *Urticina felina* and *Sagartia elegans*, and the ascidians *Distomus variolosus, Polycarpa pomaria* and *Polycarpa scuba*. The barnacle *Balanus crenatus*, the polychaetes *Pomatoceros triqueter* and *Salmacina dysteri*, the starfish *Crossaster papposus,* and *Alcyonium digitatum* may also be recorded. The porcelain crab *Pisidia longicornis* can be very dominant on *S.spinulosa* reefs. |
| North East Atlantic | A4.23 Communities on Atlantic soft circalittoral rock | This habitat occurs on moderately wave-exposed, circalittoral soft rock such as soft chalk, clay or peat exposures, in areas subject to moderately strong tidal streams. As it is found in highly turbid water conditions it can be present in shallow water and sometimes even around the low water mark. The associated biotopes may therefore sometimes be present in the infralittoral and even the littoral zone. Soft chalk and firm clay are often too soft for sessile filter-feeding animals to attach and thrive in large numbers, so there is generally an extremely impoverished epifauna, particularly on upward-facing surfaces. The vertical rock faces may be somewhat richer. The rock is sufficiently soft to be bored by bivalves such as *Pholas dactylus,*and by polychaete worms *Polydora* sp. which may form a complete cover in highly turbid conditions. Carbonate cemented structures formed by methane seeps ('bubbling reefs') are also examples of this habitat. These have been reported from the northern Kattegat and the Skagerrak where they are present as slabs or pillars up to 4m high and are colonised by anthozoans *Metridium senile, Alcyonium digitatum* and *Tealia felina* as well as species which bore into the surfaces such as the sponge *Cliona celata,* the polychaete *Dodocaceria concharum* and the bivalve *Hiatella* sp. The three dimensional structures also provides shelter for mobile species such as crabs and lobster, cod and pollack.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have beendetermined and applied on a location-specific basis.  Characteristic species:  This habitat is dominated by the piddock *Pholas dactylus*. Other typical species include the polychaete *Polydora* and *Bispira volutacornis*, the sponges *Cliona celata* and *Suberites ficus,* the bryozoan *Flustra foliacea, Alcyonium digitatum*, hydroids such as *Sertularia cupressina*, and *Hydrallmania falcata*, the starfish *Asterias rubens*, the mussel *Mytilus edulis* and the crab *Necora puber* and *Cancer pagurus*. Foliose red algae may also be present on the harder more stable areas of rock. |
| North East Atlantic | A4.24 Mussel beds on moderate energy Atlantic circalittoral rock | This habitat occurs on moderately wave-exposed upper circalittoral bedrock subject to strong or moderately strong tidal streams. Mussels *Mytilus edulis* or *Musculus discors* can form dense beds, to the exclusion of other species, on the upper faces of bedrock, boulders and mixed substrata. The *Musculus* biotope occurs in much more wave sheltered and silted situations. There may also be an associated layer of pseudofaeces, forming a thick, silty matrix.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within *Natura* 2000 sites, where reference values have been determined and applied on a location-specific basis. The overall quality and continued occurrence of this habitat is, however, largely dependent on the presence of *Mytilus edulis* or *Musculus discors* which creates the biogenic structural complexity on which the characteristic associated communities depend. The density and the maintenance of a viable population of this species is a key indicator of habitat quality, together with the visual evidence of presence or absence of physical damage. However, beds of *Mytilus edulis* at least may disappear (most likely because of predation by starfish) but are likely to re-colonise at some time in the future (which may be several years) dependent on larval recruitment.  Characteristic species:  This complex is characterised by dense aggregations of the mussels *Mytilus edulis* or *Musculus discors* carpeting the underlying substrata. Sponges that may be recorded in this complex are *Scypha ciliata, Tethya aurantium,* *Pachymatisma johnstonia, Dysidea fragilis* and *Cliona celata*. A sparse hydroid/bryozoan turf composed primarily of *Nemertesia antennina, Alcyonidium diaphanum* and *Flustra foliacea* is often recorded. Anemones present are *Urticina felina* and *Sagartia elegans*. Other species recorded are the crabs *Cancer pagurus, Carcinus maenas* and *Necora puber*, the starfish *Crossaster papposus* and *Asterias rubens*, and *Alcyonium digitatum* and in this upper circalittoral complex, algae species such as *Dictyota dichotoma, Cryptopleura ramosa* and *Plocamium cartilagineum*. The barnacle *Balanus crenatus* may be seen attached to the mussels themselves. |
| North East Atlantic | A4.25 Faunal communities on variable salinity Atlantic circalittoral rock | This habitat type occurs on wave-sheltered, variable/reduced salinity bedrock and boulders, subject to moderately strong to weak tidal streams. There may be large growths of the brackish-tolerant sponge *Halichondria bowerbanki*. It is characterised by sponges tolerant of variable salinity, barnacles and a sparse hydroid and bryozoan turf. Especially where low salinity is frequently present, ‘groves’ of the peacock worm *Sabella pavonina* may be present. Beds of mussels, *Mytilus edulis*, may also be present but may be ephemeral.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within*Natura* 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  This habitat supports a suite of sponge species able to tolerate the variable salinity conditions such as *Hymeniacidon perleve, Suberites ficus, Halichondria panicea, Halichondria bowerbanki, Cliona celata* and *Leucosolenia botryoides*. The tasselated form of the sponge *Amphilectus fucorum* and the filigree worm *Salmacina dysteri* are frequently present. The barnacle *Balanus crenatus* is frequently recorded in this complex. A sparse hydroid/bryozoan turf composed primarily of *Nemertesia antennina, Nemertesia ramosa, Plumularia setacea, Alcyonidium diaphanum* and *Bugula plumosa* is often recorded with seasonal occurrence of often dense *Tubularia indivisa*. Other species recorded are the ascidians *Clavelina lepadiformis, Morchellium argus Distomus variolosus* and *Dendrodoa grossularia*, the anemones *Metridium senile* and *Sagartia troglodytes*, the starfish *Asterias rubens* and the crab *Carcinus maenas.* |
| North East Atlantic | A4.31 Ascidian/Brachiopod communities on Atlantic sheltered upper circalittoral rock | This habitat type occurs on the wave-sheltered, circalittoral bedrock and boulders subject to weak tidal streams. The biotopes within this complex are characterised by brachiopod and ascidian communities.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. for protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.    Characteristic species:  Ascidians often recorded in this complex are *Ciona intestinalis*, *Ascidia mentula*, *Ascidia virginea*, *Clavelina lepadiformis* and, occasionally, the football seasquirt *Diazona violacea*. The brachiopods *Neocrania anomala* and often *Terebratulina retusa* are also characteristic of the sub-biotopes within this complex as recorded in Scottish sea lochs. The polychaete *Pomatoceros triqueter*, the saddle oyster *Pododesmus patelliformis*, the cup coral *Caryophyllia smithii* and encrusting red algae are frequently recorded on the rocky substrata. Echinoderms such as the brittlestars *Ophiothrix fragilis*, *Ophiocomina nigra* and *Ophiura albida*, the starfish *Asterias rubens*, *Crossaster papposus* and *Henricia oculata*, the crinoid *Antedon bifida* and the urchin *Echinus esculentus* are all found in this complex. Other species present include the squat lobster *Munida rugosa*, the hermit crab *Pagurus bernhardus*, the soft coral *Alcyonium digitatum*, the anemone *Protanthea simplex* and the hydroid *Kirchenpaueria pinnata*. Off the coast of Portugal this habitat is characterised by the brachiopod *Megerlia truncata*. Colonies of sponges *Geodia barretti*, *Geodia* cf. *macandrewii*, *Petrosia ficiformis*, *Phakellia* sp., colonies of zooids *Parazoanthus anguicomus*, Polychaeta Serpulidae, sea urchins *Echinus acutus*, *Echinus melo*, *Echinus esculentus* and *Sphaerochinus granularis* and the crinoid *Antedon bifida* have all been recorded within and among the brachiopod. Mobile species present include the fishes *Serranus cabrilla*, *Diplodus cervinus* and *Pollachius pollachius*. |
| North East Atlantic | A4.71: Communities of Atlantic circalittoral caves and overhangs | Caves and overhanging rock in the circalittoral zone, away from significant influence of strong wave action. This habitat generally occurs in open coast waters or on wave sheltered coasts with moderate tidal flow. Caves and overhangs display a wide range of structural and ecological variation, depending on the prevailing physical and geological conditions. Those which have extensive areas of vertical and overhanging rock, and those that extend deeply into the rock, generally support the widest range and highest diversity of species. In the circalittoral zone these are characterised by sponges and anthozoans. Resident, seasonal and occasional species of fish are also present in sublittoral caves. Extensive cave systems, such as the flooded lava tubes in the Canary Islands, may become anchialine at their innermost extents because of the long residence time (months to years) of seawater. In such systems, the extent of saltwater intrusion, its stratification and the residence time of seawater (which can be from months to years) has resulted in a specialised fauna with pronounced morphological, physiological, biochemical and behavioural adaptations, such as the blind crab *Munidopsis polymorpha.*  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat ma yface; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change overtime.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Cave biotopes can be broadly divided into those characterised by long lived species and those characterised by ephemeral and scour tolerant species. Long lived species such as cup corals and sponges may be targeted as indicators that a cave system has remained undisturbed. Individuals or individual colonies of such species might represent suitable for monitoring change.  Characteristic species:  Characteristic species include sponges (*Stryphnus ponderosus, Dercitus bucklandi, Chelonaplysilla noevus, Pseudosuberites* spp.and *Spongosorites* spp.,)*;* tunicates (*Clavelina lepadiformis),* anemones and anthozoans*(Parazoanthus* spp.*, Corynactis viridis*, *Parerythropodium* *coralloides,* *Caryophyllia smithii, Caryophyllia inornatus, and Hoplangia durotrix)*. |
| North East Atlantic | A5.12 Faunal communities in estuarine Atlantic sublittoral coarse sediment | This habitat comprises clean gravels that occur in the upper reaches of marine inlets, especially estuaries, where water movement is sufficiently strong to remove the silt content of the sediment. It is one of the rarer habitat types to occur in estuaries. The gravel may be moved and reworked depending on tidal and river currents and may be infilled palaeo-river channels. The habitat typically lacks a significant seaweed component and is characterised by a sparse but very robust brackish water tolerant fauna. The epifauna of this habitat tends to be dominated by mobile predatory species.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  Indices developed to assess the ecological status of coastal waters, including estuaries, according to the Water Framework Directive, include physical indicators, water quality indicators and measures of benthic diversity, species richness and abundance. The latter group, which is particularly relevant to benthic habitats, includes a Benthic Quality Index, an Infaunal Trophic Index, a Marine Biotic index based on ecological groups, and the Benthic Opportunistic Polychaetes/Amphipods Index.  Characteristic species:  Robust, free-living fauna specific to the habitat are small polychaetes and small or rapidly burrowing bivalves and amphipods. The epifauna in these habitats tends to be dominated by mobile predatory species such as the crab *Carcinus maenas.* Gobies and *Pomatoschistus* spp. arerecorded as occasional. |
| North East Atlantic | A5.13 Faunal communities in marine Atlantic infralittoral coarse sediment | This is a moderately exposed habitat with coarse sand, gravelly sand, shingle and gravel in the infralittoral, subject to disturbance by tidal steams and wave action. Such habitats found on the open coast or in tide-swept marine inlets. The faunal communities can be very abundant. In the case of the Dutch Borkum Reef Ground, for example, *Lanice conchilega* beds with estimated densities of >1500 individuals/m2 have been recorded.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  A robust fauna of infaunal polychaetes such as *Chaetozone setosa* and *Lanice conchilega,* cumacean crustacea such as *Iphinoe trispinosa* and *Diastylis bradyi*, and venerid bivalves. Habitats with the lancelet *Branchiostoma lanceolatum* may also occur. This habitat includes the following biotopes characterised by particular species. Sparse fauna on highly mobile sublittoral shingle (cobbles and pebbles); characterised by *Halcampa chrysanthellum* and *Edwardsia timida* on sublittoral clean stone gravel; *Moerella* spp with venerid bivalves in infralittoral gravelly sand; *Hesionura elongata* and *Microphthalmus similis* with other interstitial polychaetes in infralittoral mobile coarse sand; *Glycera lapidum* in impoverished infralittoral mobile gravel and sand; *Cumaceans* and *Chaetozone setosa* in infralittoral gravelly sand. |
| North East Atlantic | A5.14 Atlantic upper circalittoral coarse sediment | This habitat comprises tide-swept circalittoral coarse sand, gravel, pebbles, shingle and cobbles which are often unstable due to tidal currents and/or wave action. It is typically found in depths of over 15-20m and is present in tidal channels of marine inlets and along exposed coasts and offshore. The associated biotopes are characterised by robust infaunal polychaetes, mobile crustacea and bivalves. Certain species of sea cucumber (e.g. *Neopentadactyla*) may also be prevalent, along with the lancelet *Branchiostoma lanceolatum*. Where the sediment is mobile or unstable, the epibenthic fauna may limited to the keel worm *Pomatoceros triqueter* with barnacles and bryozoan crusts as these species have some resistance to abrasion and can rapidly colonise areas after successful spatfalls. In locations with weak or no current the fauna is dominated by polychaetes. Scallops may occur on the sediment surface in areas of shell gravel that are subject to some sand scour.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  These include: *Pomatoceros triqueter, Mediomastus fragilis, Lumbrineris* spp. and *venerid* bivalves. *Protodorvillea kefersteini, Neopentadactyla mixta*, *Echinocyamus pusillus, Ampelisca spinipes, Asterias rubens, Spiophanes bombyx, Abra alba*, *Branchiostoma lanceolatum*  *Polygordius appendiculatus, Pisione remota, Sphaerosyllis bulbosa, Goniadella gracilis, Mediomastus fragilis, Glycera lapidum, Protodrilus*; ophiuroid *Amphipholis squamata*, *Ophiura albida*, oligochaete *Grania;* Nematoda and *Nemertina.* |
| North East Atlantic | A5.15 Atlantic lower circalittoral coarse sediment | This habitat is present in offshore circalittoral coarse sands and gravel or shell gravel, typically in depths of over 20m. There are relatively little quantitative data available, but it is thought to cover large areas of the offshore continental shelf. It is generally characterised by robust infaunal polychaete and bivalve species and is relatively diverse. The characteristic species depend on the fraction of coarse and finder sediments. In some areas settlement of *Modiolus modiolus* larvae may occur and consequently these habitats may occasionally have large numbers of juvenile *M. modiolus*. In areas where the mussels reach maturity their byssus threads bind the sediment together, increasing stability and allowing an increased deposition of silt.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  These include *Modiolus modiolus*, *Glycera lapidum, Thyasira* spp. and *Amythasides macroglossus* in offshore gravelly sand; and  *Hesionura elongata* and *Protodorvillea kefersteini* in offshore coarse sand. |
| North East Atlantic | A5.22 Estuarine Atlantic sublittoral sand | This habitat is characterised by clean sands that occur in the upper reaches of marine inlets, especially estuaries, where water movement is moderately strong, allowing the deposition of sand, but not the finer silt fraction. The habitat typically lacks a significant seaweed component and is characterised by brackish-water tolerant fauna, particularly amphipods, polychaetes and mysid shrimps.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  Many indicators of quality have been used for this habitat with particular parameters set in certain situations e.g. protected features within *Natura*2000 sites, where reference values have been determined and applied on a location-specific basis. Indicators of quality of this habitat are frequently linked to those for the whole estuarine environment and therefore include morphological and physical characteristics, carrying capacity and water quality parameters. For the mudflat itself benthic indices, contaminant levels and productivity are some of the frequently used measures of quality.  Indices developed to assess the ecological status of coastal waters, including estuaries, according to the Water Framework Directive, include physical indicators, water quality indicators and measures of benthic diversity, species richness and abundance. The latter group, which is particularly relevant to benthic habitats, includes a Benthic Quality Index, an Infaunal Trophic Index, a Marine Biotic index based on ecological groups, and the Benthic Opportunistic Polychaetes/Amphipods Index.  Characteristic species:  *Nephtys cirrosa* and *Macoma balthica* in variable salinity infralittoral mobile sand; *Neomysis integer* and *Gammarus spp*. in fluctuating low salinity infralittoral mobile sand. Also *Crangon crangon*, *Macoma calcarea, Mya truncata, Astarte* spp. *Spisula* spp. *Capitella capitata*and*Eurydice pulchra.* |
| North East Atlantic | A5.23 Marine Atlantic infralittoral fine sand | This habitat is found in clean sands which occur in the shallow sublittoral to at least 30m depth either on the open coast or in tide-swept channels of marine inlets. The substratum may be formed into dunes on exposed or tide-swept coasts, and may be interspersed with cobbles and pebbles in some situations. The habitat includes areas of well-sorted medium and find sands subject to physical disturbance as a result of wave action and occasionally strong tidal streams. It can extend over large areas, for example being found in a wide stretch adjacent to the coast of the Netherlands to depths of 15-20m. The epifauna are necessarily tolerant to scour by sand. The habitat is characterised by a range of taxa including polychaetes, bivalve molluscs and amphipods.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  The habitat typically lacks a significant seaweed component and is characterised by robust fauna, particularly amphipods (*Bathyporeia*) and robust polychaetes including *Nephtys cirrosa* and *Lanice  conchilega*. Where there are cobbles and pebbles there may be conspicuous colonies of hydroids particularly *Hydrallmania falcta* and to a lesser extent *Sertularia cupressina* and *S.argentea*. The magelonid polychaete *Magelona mirabilis* may be frequent in more sheltered, less tides-wept areas, whilst in coarser sediments the opportunistic polychaete *Chaetozone setosa* may be commonly found. In locations with large populations of semi-permanent tube-building amphipods and polychaetes such as in moderately exposed or sheltered inlets and voes in shallow water, the fauna is typically dominated by *Corophium crassicorne* and other amphipods such as *Ampelisca* spp. can be common. Mobile species which may be present include *Pagurus bernhardus, Cancer pagurus*, sand eels *Ammodytes* sp. |
| North East Atlantic | A5.24 Marine Atlantic infralittoral muddy sand | This habitat is typically on a substrate of non-cohesive muddy sand (with 5% to 20% silt/clay). It occurs in the infralittoral zone, extending from the extreme lower shore down to more stable circalittoral zone at about 15-20 m. The habitat develops on sheltered shores in fully marine conditions, or occasionally in areas subject to variable salinity. The habitat supports a variety of animal-dominated communities, particularly polychaetes,  bivalves and the urchin *Echinocardium cordatum* depending on the sediment characteristics and the degree of shelter. In stable, fine, compacted sands and slightly muddy sands in the infralittoral and littoral fringe, communities occur that are dominated by venerid bivalves.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Polychaetes (*Magelona mirabilis, Spiophanes bombyx* and *Chaetozone setosa*), bivalves (*Fabulina fibula* and *Chamelea gallina*) and the urchin *Echinocardium cordatum*. In sheltered areas that support populations of *E.cordatum* and the razor shell *Ensis silique* or *E.ensis* other notable taxa within the biotope include occasional *Lanice conchilega, Pagurus* and *Liocarcinus* spp. and *Asterias rubens,*venerid bivalves such as *Chamelea gallina* and depending on the biotopes a prevalence of *Fabulina fabula* and *Magelona* mirabilis or other species of *Magelona* (e.g. *M. filiformis*). Other taxa, including the amphipod *Bathyporeia* spp. and polychaetes such as *Chaetozone setosa, Spiophanes bombyx* and *Nephtys* spp. are also commonly recorded and low numbers of the bivalve *Spisula elliptica*. Also the polychaete *Arenicola marina*, *Spisula subtruncata* and *Nephtys hombergii*, *Turritella* or *Ervillia castanea.* |
| North East Atlantic | A5.25 Atlantic upper circalittoral fine sand | This habitat consists of clean fine sands with less than 5% silt/clay in deeper water in tide-swept channels of marine inlets or on the open coast, extending offshore in depths of over 15-20 m. Off the coast of Portugal it has been reported in depths of 20-37m in areas of moderately strong current. It is characterised by a wide range of echinoderms as well as polychaetes and bivalves. Frequently occurring species include the brittlestar *Amphiura filiformis*, *Ophiura albida* and *O.ophiura,*the anemone *Cerianthus lloydii,* and polychaete worms such as *Lanice conchilega.*  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Examples of indicators of "naturalness" that are potential indicators for quality identified for offshore sands are; typical populations of bivalves and epifaunal brittlestars; maintained presence of substratum; lack of smothering; typically diverse communities with no increase in hardy or opportunistic species; and maintenance of sediment characteristics with typical levels of diversity.  Characteristic species:  *Echinocardium cordatum* and in deeper water the pea urchin *Echinocyamus pusillus*, the brittlestar *Amphiura filiformis*, *Ophiura albida* and *O.ophiura,*the anemone *Cerianthus lloydii,* and polychaete worms such as *Lanice conchilega*. In some locations the community is characterised by the bivalve *Abra prismatica*, the amphipod *Bathyporeia elegans* and polychaetes such as *Scoloplos armiger, Spiophanes bombyx, Aonides paucibranchiata, Chaetozone setosa, Ophelia borealis* and *Nephtys longosetosa*. Off the coast of mainland Portugal characteristic species are the sea urchin *Echinocardium cordatum*, bivalve *Mactra stultorum*, polychaetes *Magelona johnstoni, Mediomastus fragilis, Owenia fusiformis* and *Spiophanes bombyx*. More mobile species reported from this habitat are *Pagurus bernhardus* and *Asterias rubens*. |
| North East Atlantic | A5.26 Atlantic upper circalittoral muddy sand | This habitat comprises circalittoral non-cohesive muddy sands with the silt content of the substratum typically ranging from 5% to 20%. It is generally found in water depths of over 15-20 m. These circalittoral habitats tend to be more stable than their infralittoral counterparts and as such support a richer infaunal community. This habitat supports animal-dominated communities characterised by a wide variety of polychaetes, bivalves and echinoderms.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Bivalves such as *Abra alba* and *Nucula nitidosa*, echinoderms such as *Amphiura* spp. (e.g. *A.brachiata*), Ophiura spp. (e.g. *O.albida, O.ophiura*), and *Astropecten irregularis*. Other common or frequently occurring species include *Cerianthus lloydii, Nephtys hombregii, Scoloplos armiger, Spiophanes bombyx, Ghaetozone setosa, Pagurus bernhardus, Nucula nitidosa, Fabulina fabula, and Asterias rubens*. Off the coast of Portugal this habitat is characterised by polychaetes *Chaetozone gibber, Galathowenia oculata, Spiophanes bombyx, Prionospio fallax, Spiophanes kroyeri, Pectinaria koreni, Myriochele danielsseni, Lumbrineris lusitanica, Nephtys hombergii, Paradoneis ilvana, Phyllodoce rosea* and the amphipod *Harpinia antennaria*. |
| North East Atlantic | A5.27 Atlantic lower circalittoral sand | This habitat occurs in offshore circalittoral habitats with fine sands or non-cohesive muddy sands. They include areas in the Celtic Sea and areas of the Irish Sea, north of the Isle of Man, in Liverpool Bay and Cardigan Bay and also in St. George’s Channel.  The sediments are likely to be more stable than similar shallower counterparts and the associated communities are characterised by a diverse range of polychaetes, crustaceans, bivalves and echinoderms. In deep offshore sand or non-cohesive muddy sand dense populations of maldanid polychaetes such as *Maldane sarsi* as well as the cumacean *Eudorellopsis deformis* may be found.  Accompanying these species are abundant ophiuroids, the amphipod *Harpinia antennaria* and the bivalves *Nuculoma tenuis* and *Parvicardium minimum*. Areas of slightly muddy sand may be characterised by high numbers of the tube building polychaete *Owenia fusiformis* often with the brittlestar *Amphiura filiformis.*  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  Examples of indicators of "naturalness" that are potential indicators of quality for offshore sand habitats such as this are; typical populations of bivalves and epifaunal brittlestars; maintained presence of substratum; lack of smothering; typically diverse communities with no increase in hardy or opportunistic species; and maintenance of sediment characteristics with typical levels of diversity.  Characteristic species:  *Maldane sarsi,* *Eudorellopsis deformis*, *Amphiura filiformis,* polychaetes such as *Terebellidae* sp*., Chaetozone setosa, Levinsenia gracilis, Scoloplos armiger*, the amphipod *Harpinia antennaria* and the bivalves *Nuculoma tenuis* and *Parvicardium minimum,*the tube building polychaete *Owenia fusiformis* often with the brittlestar *Amphiura filiformis,*the polychaetes *Goniada maculata, Pholoe inornata, Diplocirrus glaucus, Chaetozone setosa* and *Spiophanes kroyeri* with occasional bivalves such as *Timoclea ovata* and *Thyasira equalis*, the sea cucumber *Labidoplax buski* and the cumacean *Eudorella truncatula.*  In the Kattegat infaunal bivalves achieve the highest biomass, with infaunal polychaetes, crustaceans and insect larvae less dominant. Characteristic species are *Macoma balthica Arctica islandica, Cerastoderma* spp., *Mya arenaria*, *Astarte borealis, Macoma calcarea, Mya truncata,* *Astarte* spp., *Spisula* spp, *Chamelea gallina*. |
| North East Atlantic | A5.32 Estuarine Atlantic sublittoral mud | This habitat comprises shallow sublittoral muds, extending from the extreme lower shore into the subtidal in variable salinity (estuarine) conditions, typically in the range of 18-35ppt and extending to a depth of 10 m. The habitat is found within estuaries which are naturally highly dynamic and rapidly changing systems, forming a complex mixture of many different habitat types.  These habitats do not exist in isolation, but rather have physical, chemical and biological links between them, for example in their hydrology, in sediment transport, in the transfer of nutrients and in the way mobile species move between them both seasonally and during single tidal cycles.  Turbidity and the mobility of the sediment are important influences on the associated marine communities which may be impoverished where this is high. There are typically fewer macrobenthic speices than in fully marine areas but potentially with a high abundance and biomass. Such habitats typically support communities characterised by oligochaetes, and polychaetes and have a  dominance of deposit feeders*.* In lowered salinity conditions the sediments may include a proportion of coarser material, where the silt content is sufficient to yield a similar community to that found in more heterogeneous muds. Migratory flatfish such as plaice, dab and sole move in to estuaries to feed in these habtiats.  Indicators of Quality:  Long term studies of many estuaries typically focusing on the physical, biological and chemical characteristics.  Indicators of quality of this habitat are frequently linked to those for the whole estuarine environment and therefore include morphological and physical characteristics, carrying capacity and water quality parameters. For the specific habitat, benthic indices, contaminant levels and productivity are some of the frequently used measures of quality.  Indices developed to assess the ecological status of coastal waters, including estuaries, according to the Water Framework Directive, include physical indicators, water quality indicators and measures of benthic diversity, species richness and abundance. The latter group, which is particularly relevant to benthic habitats, includes a Benthic Quality Index, an Infaunal Trophic Index, a Marine Biotic index based on ecological groups, and the Benthic Opportunistic Polychaetes/Amphipods Index.  Characteristic species:  Species that are typically found in this habitat vary depending on sediment characteristics. For example in locations where there is firm mud or clay *Polydora ciliata* and *Corophium volutator*, in muddy sediment *Aphelochaeta marioni, Nephtys hombergii, Capitella capitata* and *Tubificoides* spp.. Salinity is also a factor with *Limnodrilus hoffmeisteri, Tubifex tubifex* and *Gammarus* spp. present in low salinity infralittoral muddy sediment and oligochaetes in variable or reduced salinity. |
| North East Atlantic | A5.33 Marine Atlantic infralittoral sandy mud | Infralittoral, cohesive sandy mud, typically with over 20% silt/clay, in depths of less than 15-20 m. This habitat is generally found in sheltered bays or marine inlets and along sheltered areas of open coast. Tidal streams can vary from negligible to moderately strong (1-3kn). Six associated biotopes have been identified dominated by different species.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of characteristic species (especially those which are sensitive to the pressures the habitat may face), water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Key driving influences and output processes of shallow sublittoral mud habitats that are likely to be sensitive to pressures and may be useful for monitoring to identify anthropogenic causes of change include habitat structure changes, removal of particular species such as those which are key in bioturbation and biodeposition, or nutrient and biogeochemical cycling, changes in siltation rates and organic enrichment.  Characteristic species:  Typical species include a rich variety of polychaetes including *Melinna palmate*, tube building amphipods (*Ampelisca*spp.) and deposit feeding bivalves such as *Macoma balthica* and *Mysella bidentata.* Sea pens such as *Virgularia mirabilis* and brittlestars such as *Amphiura* spp. may be present but not in the same abundances as found in deeper circalittoral waters. Other species which may be abundant or frequent include *Scoloplos armiger, Chaetozone gibber, Capitella capitata, Euclyene oerstedii, Melinna palmate, Ampelisca brevicornis, A.teuicornis,* and *Ascidiella aspersa*. Mobile species include *Pagurus bernhardus, Liocarcinus depurator, Carcinus maenas, and Nucula nitidosa*. |
| North East Atlantic | A5.34: Marine Atlantic infralittoral fine mud | Shallow sublittoral muds, extending from the extreme lower shore to about 15-20 m depth in fully marine or near marine conditions, predominantly in extremely sheltered areas with very weak tidal currents. Such habitats are found in sealochs and some rias and harbours. In very shallow extremely sheltered very soft muds the lugworm *Arenicola marina* may form very conspicuous mounds and casts. At such sites, high densities of synaptid holothurians such as *Labidoplax* media and *Leptosynapta bergensis* occur. The sediment surfaces may become covered by a diatom film at certain times of the year. Mobile species are opportunistic scavengers and predators and include starfish (e.g. *Asterias rubens*), crabs and hermit crabs (e.g. *Carcinus maenas* and *Pagurus bernhardus*), flatfish and gobies (e.g. *Pomatoschistus minutus*).  Sheltered sediments such as these are characterized by fine grain size, low porosity, generally low permeability (and hence high water content), high sediment stability (due to cohesion), a low oxygen content and highly reducing conditions. The mud surface is oxygenated. However, in fine muds, the anoxic reducing layer is likely to be very close to the surface, often less than 1cm. Bioturbation by burrowing species, results in mobilisation of the sediment and nutrients from deeper sediment to the surface, making nutrients available to surface dwelling organisms. In addition, continued irrigation of their burrows by *Arenicola marina* and *Leptosynata* sp. transports oxygenated water into the sediment, resulting in oxygenated micro-environments in the vicinity of their burrows.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indiceswhich describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Key driving influences and output processes of shallow sublittoral mud habitats that are likely to be sensitive to pressures and may be useful for monitoring to identify anthropogenic causes of change include habitat structure changes, removal of particular species such as those which are key in bioturbation and biodeposition, or nutrient and biogeochemical cycling, changes in siltation rates and organic enrichment.  Characteristic species:  Populations of the lugworm *Arenicola marina* may be dense, with anemones, the opisthobranch *Philine aperta* and synaptid holothurians also characteristic in some areas. Other species which may frequently occur include *Ophiodromus flexuosus, Aphelochaeta marioni, Caulleriella caputesocis, Hydrobia ulvae, Cerastoderma edule, Abra nitida , Asterias rubens*, as well as the crustaceans *Pagurus bernhardus, Liocarcinus depurator,* and *Carcinus maenas*.The extent of the oxidised layer may be shallow with some areas being periodically or permanently anoxic. In these areas bacterial mats may develop on the sediment surface. In areas of soft stable mud *Philine aperta* and *Virgularia mirabilis* are characteristic whereas *Ocnus planci* aggregations may be present on sheltered sublittoral muddy sediment and oligochaetes in mobile mud. |
| North East Atlantic | A5.35 Atlantic upper circalittoral sandy mud | The substrate of this benthic habitat is predominantly cohesive sandy mud, typically with over 20% silt/clay content. It usually occurs in water depths of over 10 m, in areas with weak or very weak tidal streams. It is also present in deeper areas of bays and marine inlets or offshore from less wave exposed coasts. The epifauna may be sparse and scattered  characterised by Sea pens such as *Virgularia mirabilis* and brittlestars such as *Amphiura* spp. (e.g. *Amphiura filiformis*). Mounds, burrows, and tubes indicate the presence of infauna.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Examples of indicators of "naturalness" that are potential indicators for quality identified for offshore sands are; typical populations of bivalves and epifaunal brittlestars; maintained presence of substratum; lack of smothering; typically diverse communities with no increase in hardy or opportunistic species; and maintenance of sediment characteristics with typical levels of diversity.  Characteristic species:  Sea pens such as *Virgularia mirabilis* and brittlestars such as *Amphiura* spp. (e.g. *Amphiura filiformis*) are particularly characteristic for this habitat associated by infaunal species including the tube building polychaetes *Lagis koreni* and *Owenia fusiformis*, and deposit feeding bivalves such as *Mysella bidentata* and *Abra* spp. (e.g. *Abra nitida)*. Other species which may frequently be present and/or in moderate abundance include *Cerianthus lloydii, Nephtys inicisa, Diplocirrus glaucus, Pagurus bernhardus, Liocarcinus depurator, Asterias rubens, Ophiura albida, O.ophiura, Pholoe inornata, Pariambus typicus and Nuculoma tenuis*. Where this habitat occurs off the coast of mainland Portugal it may be dominated by the polychaetes *Galathowenia oculata, Terebellides stroemii, Monticellina* spp. e.g. *M.dorsobranchialis, Ampharete finmarchica, Maldane glebifex, Chaetozone cf. setosa, Scoloplos armiger, Abyssoninoe hibernica, Mediomastus fragilis, Gallardoneris iberica, Ninoe armoricana*; the bivalve *Thyasira flexuosa*, the amphipod *Ampelisca tenuicornis*; the cumacean *Iphinoe serrata* and Nemertina. |
| North East Atlantic | A5.36: Atlantic upper circalittoral fine mud | Sublittoral muds, typically occurring in moderate depths of (10-50m), either on the open coast or in marine inlets such as sealochs. These may be in fully saline conditions or variability salinity (18-35ppt), moderately to extremely sheltered from wave exposure, and where there are weak or negligible tidal streams. The epifauna may be sparse and scattered with mounds, burrows, and tubes indicating the presence of infauna.  Associated biotopes are characterised by seapens and burrowing megafauna, burrowing megafauna and *Maxmuelleria lankesteri,*and by the heart urchin *Brissopsis lyrifera* and brittlestar *Amphiura chiajei*.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Examples of indicators of damage and naturalness have been proposed for offshore deep sea muds include; the presence of typical benthic invertebrate communities and other large burrowing megafauna, the sediment composition or sedimentation rates/disturbance, the presence of the climax community including crustacean and polychaetes populations, and an absence of Beggiatoa mats. A reduction in the abundance of less sessile and fragile species and an increase in more carnivorous and scavenging species are potential indicators of disturbance.  Characteristic species:  The seapens *Virgularia mirabilis* and *Pennatula phosphorea* are characteristic of this habitat type together with the burrowing anemone *Cerianthus lloydii* and the ophiuroid *Amphiura* spp. (e.g. *A.chiajei* & *A.filiformis*). The relatively stable conditions often lead to the establishment of communities of burrowing megafaunal species, such as *Nephrops norvegicus*. Other species which may frequently be present and/or in moderate abundance include *Funiculina quadrangularis, Nephtys hystericis, Chaetozone setosa, Pagurus bernhardus, Liocarcinus depurator, Munida rugosa* and *Asterias rubens.* |
| North East Atlantic | A5.37 Atlantic lower circalittoral mud | In mud and cohesive sandy mud in the offshore circalittoral zone, typically below 50-70m, a variety of faunal communities may develop, depending upon the level of silt/clay and organic matter in the sediment. The relatively stable conditions associated with deep mud habitats often lead to the establishment of communities of burrowing megafaunal species where bathyal species may occur together with coastal species. The burrowing megafaunal species include burrowing crustaceans such as *Nephrops norvegicus* and *Callianassa subterranea*. The mud habitats in deep water can also support seapen populations and communities with *Amphiura* spp. The bioturbating activities of the infauna present in these biotopes are particularly important in controlling chemical, physical and biological processes, especially when the influences of physical disturbances such as wave action or strong currents are minimised (owing to their depth). The presence of burrowing fauna such as polychaetes significantly influence nutrient fluxes of nitrogen and phosphorus at the sediment-water interface, as their burrowing activity promotes oxygenation of the substrata. The organisms in these biotopes, particularly polychaetes and foraminiferans, are an important food source for higher trophic levels, particularly demersal fish and other benthic macrofauna. As such, the species characteristic of this habitat represent an important bentho-pelagic link increasing the overall biodiversity and ecological value of the habitat.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Examples of indicators of damage and naturalness have been proposed for offshore deep sea muds include; the presence of typical benthic invertebrate communities and other large burrowing megafauna, the sediment composition or sedimentation rates/disturbance, the presence of the climax community including crustacean and polychaetes populations, and an absence of *Beggiatoa* mats. A reduction in the abundance of less sessile and fragile species and an increase in more carnivorous and scavenging species are potential indicators of disturbance.  Characteristic species:  Communities are typically dominated by polychaetes but often with high numbers of bivalves such as *Thyasira* spp., echinoderms and foraminifera. Offshore mud habitats can be characterised by the burrowing urchin *Brissopsis lyrifera*, the brittlestar *Amphiura chiajei* and the Norway lobster *N. norvegicus*. In water deeper than 100 m, the soft muds are dominated by a community of foraminiferans (e.g. Saccammina, Psammosphaera, Haplophragmoides, Crithionina and Astorhiza) and hatchet shells *Thyasira* spp. with polychaete worms such as *Paraonis gracilis, Myriochele heeri, Spiophanes kroyeri, Tharyx* sp., *Lumbrineris tetraura*. There can be thousands of dead foraminiferan tests per square metre. Seven associated biotopes have been described for this habitat the rarest being the deep mud biotope which is notable for the very high density of the rare sea squirt *Styela gelatinosa*. |
| North East Atlantic | A5.42 Estuarine Atlantic sublittoral mixed sediment | This habitat comprises shallow sublittoral mixed sediments in estuarine conditions (18-35ppt), often with surface shells or stones, enabling the development of diverse epifaunal communities. There may be moderately strong (1-3kn) to negligible tidal streams. Wave exposure can vary from sheltered to extremely sheltered. This habitat typically occurs to depths of 10m. This habitat type is quite species rich, compared with more homogeneous sediments.  Indicators of quality:  Long term studies of many estuaries typically focus on the physical, biological and chemical characteristics. Indicators of quality of this habitat are frequently linked to those for the whole estuarine environment and therefore include morphological and physical characteristics, carrying capacity and water quality parameters. For the specific habitat, benthic indices, contaminant levels and productivity are some of the frequently used measures of quality.  Indices developed to assess the ecological status of coastal waters, including estuaries, according to the Water Framework Directive, include physical indicators, water quality indicators and measures of benthic diversity, species richness and abundance. The latter group, which is particularly relevant to benthic habitats, includes a Benthic Quality Index, an Infaunal Trophic Index, a Marine Biotic index based on ecological groups, and the Benthic Opportunistic Polychaetes/Amphipods Index.  Characteristic species:  Species which may frequently be present in moderate abundance, include *Crepidula fornicata, Nephtys hombergii, Aphelochaeta marioni, Mediomastus fragilis, Exogone naidina, Polydora ciliate, Caulleriella zetlandica, Capitella capitata, Melinna palmate, Tubificoides benedii, T.swirencoides, Abra alba* and *A.nitida.* |
| North East Atlantic | A5.43 Marine Atlantic infralittoral mixed sediments | This habitat comprises mixed (heterogeneous) sediments in fully marine or near fully marine conditions, supporting various animal-dominated communities, with relatively low proportions of seaweeds even though it is an infralittoral habitat. The sediment  may include well-mixed muddy gravelly sands or very poorly sorted mosaics of shell, cobbles and pebbles embedded in mud, sand or gravel. Due to the range of the sediment types that support this habitat, the  communities may vary considerably, including those characterised by bivalves, polychaetes and file shells. The very varied sediment composition also means  that the species diversity and biomass can be high. This has resulted in many species being described as characteristic of this habitat type, but most, in general contribute only a small proportion of the overall similarity.  Where the sediment is unstable, most of the fauna are mobile such as hermit crabs, netted dogwhelks and gobies. However, there may also be the dahlia anemones partially buried in the sediments  as well as cobbles or pebble with encrustations of keelworrns.  Indicators of Quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include; the presence of particular species, water quality parameters, levels of exposure to particular pressure as well as and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within *Natura* 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Common and abundant species reported from this habitat include: *Anaitides mucosa, Syllidia armata, Aphelochaeta marioni, Mediomastus fragilis, Notomastus latericeus, Melinna palmate, Tubificoides benedii, Gammarella fucicola, Gammarella fucicola, Corophium sextonae, Janira maculosa,  Apseudes latreillii ,Calyptraea chinensis, Tellimya ferruginosa* and *Venerupis senegalensis.* |
| North East Atlantic | A5.44 Atlantic upper circalittoral mixed sediments | This habitat comprises mixed (heterogeneous) sediment  in the circalittoral zone (generally below 15-20 m). These include areas of well mixed muddy gravelly sands, or very poorly sorted mosaics of shell, cobbles and pebbles, embedded in, or lying upon mud, sand, or gravel. It is fully saline with tidal streams ranging from moderately strong (1-3kn) to negligible.  A wide range of infaunal polychaetes, bivalves, echinoderms and burrowing anemones, are often present in this habitat and the hard substrata (shells and stones) on the surface enables epifaunal species to become established, particularly hydroids. The combination of epifauna and infauna can lead to species-rich communities.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat mayface; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change overtime.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  Characteristic species:  Polychaetes, bivalves, echinoderms and burrowing anemones, such as *Cerianthus lloydii:*hydroids, such as *Nemertesia* spp and *Hydrallmania falcata*. Echinoderms such as *Asterias rubens, Amphiura filiformis,* and *Ophiocomina nigra,* may also be common. |
| North East Atlantic | A5.45 Atlantic lower circalittoral mixed sediment | This habitat comprises offshore (deep) fully saline circalittoral habitats with slightly muddy, mixed gravelly sand and stones or shell. It may cover large areas of the offshore continental shelf in depths ranging from 20-150m although there are relatively little data available on its precise extent. This and similar habitats are known to often be highly diverse supporting large numbers of infaunal polychaete and bivalve species. Epibenthos include sea anemones, sponges and sea urchins.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change overtime.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.    Characteristic species:  Animal communities in this habitat are closely related to those found in offshore gravels and coarse sands and in some areas populations of the horse mussel *Modiolus modiolus* may develop (A5.622). Species which occur at a high frequency and/or are abundant or common in this habitat include *Pseudomystides limbata, Eumida sanguinea, Nereiphylla lutea, Glycera lapidum Sphaerosyllis tetralix, Lumbrineris gracilis, Aonides paucibranchiata, Lanonice bahusinesis, Polydora caulleryi, Mediomastus fragilis, Hydroides norvegica, Anoplodactylus petiolatus, Leptochiton asellus, Glycymeris glycymeris*, and *Timoclea ovate*. Characteristic species of epibenthos include *Echinus acutus, Spatangus purpureus, Parazoanthus* and *Phakellia*. |
| North East Atlantic | A5.51 Atlantic maerl beds | Maerl is a collective term for various species of non-jointed coralline red algae (*Corallinophycidae*) that live unattached to the seabed. These species can form extensive beds, mostly on coarse clean gravel and clean sand or on muddy mixed sediments, either on the open coast, in tide-swept channels or in sheltered areas of marine inlets with weak current. Wave and current-exposed maerl beds, where thicker depths of maerl accumulate, frequently appear as waves and ridge-and-furrows arrangements. As maerl requires light to photosynthesize, the depth of live beds is determined by water turbidity, being recorded from the lower shore to depths of 40 m or more. Water movement also appears to be a key physical environmental factor affecting the distribution of maerl and hence the formation of maerl beds.  North East Atlantic maerl beds are typically composed of both living and dead maerl of varying proportions. Extensive maerl beds formed during the late Holocene sea level rise on the west facing Atlantic coastlines of the British Isles, Scandinavia, France and Spain. Some are believed to have been tens of kilometres across and several meters in thick. Maerl is slow growing with growth rates for presently existing free living maerl in northwest Spain and western Ireland have been calculated to vary from 0.10- 1.00 mm/yr and in Norway from 0.05 - 0.15 mm/yr or up to 1.0 mm/yr.  The fauna and flora associated with maerl beds often constitute highly diverse communities, which may be attached to the surface of the maerl, on areas of exposed sediment, between the interstices of both living and dead maerl, and within the underlying sediment. They include foliose and filamentous seaweeds, hydroids, bryozoans, gastropod and bivalve molluscs, anemones, echinoderms and polychaete worms. Beds typically support high numbers of macroalgal species, with 349 species recorded, representing around 30% of the total seaweed diversity of the NE Atlantic. Similarly, over 2,500 macrobenthic species have been found associated with NE Atlantic maerl beds which coincidentally constitute around 30% of the total number of coastal invertebrate species in the area.  The structural complexity of maerl beds are known to provide important nursery areas for fish and shellfish species such as cod and edible crustaceans at a critical phase in their life histories, as well as a refuge and feeding area for commercially important shellfish brood stock (e.g. *Ensis*spp, *Pecten maximus* and *Venus verrucosa*). There is some evidence to suggest that coralline algae produce physical and chemical cues that encourage the settlement and recruitment of planktonic juvenile stages of many invertebrate species, while providing the prospect of higher growth potential.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within *Natura*2000 sites, where reference values have been determined and applied on a location-specific basis. The overall quality and continued occurrence of this habitat is, however, largely dependent on the presence of coralline red algae which creates the biogenic structural complexity on which the characteristic associated communities depend. In the UK and France the proportion (%) of live maerl coverage is routinely used as a quality indicator for selected beds. The density and the maintenance of a viable population of maerl-forming species is a key indicator of habitat quality, together with the visual evidence of presence or absence of physical damage.  Other quality indicators currently being developed specifically for maerl beds include the detection of community shifts associated with quality decline (e.g. from clean maerl gravel with low silt and abundant suspension-feeding bivalves, to muddy sand dominated by deposit feeders and omnivores), the reduction in the thickness of live maerl cover, opportunist species dominance and overgrowth by the slipper limpet *Crepidula fornicata*.  Characteristic species:  Different maerl species dominate, depending on the conditions. In fully marine conditions the dominant maerl is typically *Phymatolithon calcareum*, under variable salinity conditions, such as in some sea lochs, it can be *Lithothamnion glaciale,* while under sheltered silty conditions *Lithothamnion corallioides* may dominate. In more muddy, sheltered and shallow conditions rare *Lithophyllum* spp*.* beds may form. An even rarer bed-forming occurrence of *Mesophyllum sphaericum* has been recorded in a single location in Galicia.  A number of species are known to form maerl (or rhodoliths) in the Macaronesian region. *Neogoniolithon brassica-florida* is present in sparse aggregations, but may constitute the dominant maerl species in current-swept coarse sands and fine gravels in the Azores, while *Lithophyllum crouaniorum* can be foundon shallow infralittoral sands between 2 m and 5 m depth. Beds of *Lithothamnion corallioides* are present in the Canary Islands and Madeira from 20m down to 60 m and 50 m respectively, with the Madeira beds also characterized by the presence of *Spongites fruticulosa*.   The particular mix of species present will be influenced by the sediment characteristics and degree of shelter of the maerl bed. A particular characteristic of maerl is the presence of a mixture of hard- and soft substrata-associated assemblages including shells and gravels or varous anchored algal species such as *Gelidiella calcicola, Cruoria cruoriaeformis* (mostly excusive to maerl)*, Dictyota dichotoma*, *Halarachnion ligulatum*, *Ulva* spp. *Callophyllis laciniata*, *Cryptopleura ramosa*, *Brongniartella byssoides*, *Phycodrys rubens* and *Plocamium cartilagineum*. Other organisms such as the anemones (*Anemonia viridis* and *Cerianthus lloydii)*; the polychaetes, (*Chaetopterus variopedatus*, *Lanice conchilega*, *Kefersteinia cirrata*, *Hesione pantherina*, *Pilargis verrucosa*, *Psammolyce arenosa*, *Mediomastus fragilis*, C*hone duneri*, *Parametaphoxus fultoni*, *Notomastus latericeus*, *Caulleriella alata* and *Grania)*; the gastropods (*Gibbula cineraria*, *Gibbula magus*, *Calyptraea chinensis, Alvania beani, Alvania cimicoides, Dikoleps pusilla* and *Onoba aculeus)*; and crustaceans (*Liocarcinus depurator* and *Liocarcinus corrugatus)*may be present together with numerous melitid amphipod species and often large numbers of *Galathea intermedia* and/or *Pisidia longicornis*. A diverse assemblage of crustaceans are also commonly present.  In tide-swept conditions with variability salinity, the associated fauna and flora may also include species that reflect the slightly reduced salinity conditions. For example *Psammechinus miliaris* is often present in high numbers along with other grazers such as chitons and *Tectura* spp. *Hyas araneus*, *Ophiothrix fragilis* and *Ophiocomina nigra* In more sheltered conditions, anemones typical of sheltered conditions may be found in close association with maerl, these may include; *Anthopleura ballii*, *Cereus pedunculatus* and *Sagartiogeton undatus*. Polychaetes such as *Myxicola infundibulum* and terebellids, also characteristic of sheltered conditions, may be present as may hydroids such as *Kirchenpaueria pinnata*. Occasional *Chlamys varia* and *Thyone fusus* are present in many habitat records together with red seaweeds such as *Plocamium cartilagineum*, *Calliblepharis jubata* and *Chylocladia verticillata*. In the Kattegat, fauna associated with maerl beds include crustaceans such as *Corystes cassivelaunus* and *Thia scutellata*, and echinoderms such as *Ophiothrix fragilis* and *Ophiocomina nigra*. |
| North East Atlantic | A5.52 Kelp and seaweed communities on Atlantic infralittoral mixed sediment | Shallow sublittoral mixed sediments consisting of hard substrate components (cobbles, pebbles, gravel and shells) in various densities which support seaweed communities, typically including the kelp *Saccharina latissima* the bootlace weed *Chorda filum* and various red and brown seaweeds, particularly filamentous types. The environmental conditions also dictate the typical seaweed communities present. In areas where winter storms are common, seaweed cover will be more ephemeral and fragmented, due to high mortality rates from damage and detachment; whilst in more sheltered areas, long term attachment to smaller cobbles/pebbles is possible. Loose mats may be present in the most sheltered environments. The strength of tidal flow and type of substrate also influence the community type.  A diverse array of animals is associated with these kelps and seaweeds, including burrowing polychaete worms and bivalves, scavenging hermit crabs, crabs, starfish, fish and grazing top shells. Kelps and seaweeds growing on sediment greatly increase the primary production of an area and create a more diverse habitat. Gastropods, amphipods, sea urchins and fish graze the seaweeds; starfish, urchins, hermit crabs and crabs are scavengers; crabs and fish are opportunistic predators; and a mixed infauna of deposit feeders and suspension feeders develops, depending on sediment type. Various biotopes have been described associated with this habitat characteristised by *Saccharina.latissima, Chorda.filum*and red seaweedson sheltered muddy sediments as well as mats of  *Trailliella* on muddy gravel  and  loose-lying mats of *Phyllophora crispa*on muddy sediment.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. The depth limit of kelp and/or red seaweeds is used in some countries as a Water Framework Directive parameter for assessing ecological status.  Characteristic species:  *Saccharina* *latissima*, *Chorda filum* various red seaweeds like *Phycodrys rubens*. Zoobenthos reported at a high frequency and/or abundance include *Mediomastus fragilis, Ampelisca brevicornis, Capitella capitata, Heterochaeta costata, Tubificoides benedii, Mysella bidentata, Pagurus bernhardus, Liocarcinus depurator, Asterias rubens,* |
| North East Atlantic | A5.53 Seagrass beds on Atlantic infralittoral sand (Macaronesian) | This habitat consists of beds of submerged marine angiosperms in the genera *Cymodocea, Halophila, Ruppia, Thalassia* and *Zostera* in the southern islands of Macaronesia (it does not occur in the Azores). Seagrass beds are present mainly off the sheltered eastern coasts of the Canary Islands (Spain), on the wide subtidal platforms with sandy substrata and gently sloping coastlines which are sheltered from the Trade Winds. They may occur in patches or form extensive meadows reaching depths of over 30m where light levels are sufficient to support growth. *C. nodosa* has also been reported in scattered locations along the southern coast of Madeira Island (Portugal). In the Canary Islands, *C.nodosa* can be found forming unispecific meadows, but also mixed with *Halophila decipiens* on muddy bottoms or with the green macroalga *Caulerpa prolifera* on sandy bottoms.  Marine seagrass meadows are very important in providing several ecological services, such as primary production, habitats, nurseries and coastal protection. Primary productivity may vary, depending on many factors such as the density of the meadow, geographic area or hydrologic factors. These ecosystems are one of the most important habitats for several marine organisms, which depend on them in different phases of their life cycle, not only to feed but also to take shelter from predators.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time. There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis. Total area covered, density of the intertidal beds and species composition is, for example, used as a Water Framework Directive parameter for assessing ecological status.  The overall quality and continued occurrence of this habitat is dependent on the presence of seagrass species which create the biogenic structural complexity on which the characteristic associated species depend. The density and the maintenance of a viable population of seagrass is therefore a key indicator of habitat quality, together with the visual evidence of presence or absence of physical damage. Shoot density and leaf length have both been examined as potential indicators of quality of this habitat.  Characteristic species:  *C.nodosa,* and *H. decipiens* are the most common seagrass species. *Zostera marina* is present and *Z. noltei* occurs but is rare and intertidal. |
| North East Atlantic | A5.53 Seagrass beds on Atlantic infralittoral sand (non-Macaronesian) | This habitat type covers beds of submerged marine angiosperms in the genera *Zostera*, *Ruppia*, and *Cymodocea*, adjacent to mainland coasts of the North East Atlantic region. The Iberian coast is a transitional zone where *Zostera* dominated seagrass beds reach their southern limit and *Cymodocea* dominated seagrass beds reach their northern and western limits. *Ruppia* beds are restricted to brackish environments, where *Zostera* may be interspersed. Seagrass beds play an important role in the trophic status of marine and estuarine waters, acting in sediment stabilization as well as an important conduit or sink for nutrients and consequently some examples of *Zostera* *marina* beds have markedly anoxic sediments associated with them.  It is a spawning area and it harbours increased densities of juvenile and medium sized fish species.  This habitat occurs in shallow sublittoral sediments, generally in sheltered embayments, marine inlets, estuaries and lagoons, with weak tidal currents and under conditoins of low, variable and full salinity. Whilst generally found on muds and muddy sands, particularly marine examples of *Zostera* communities may also occur in coarser sediments. Whilst the seagrass may be considered an epibiotic overlay of established sedimentary communities it is likely that its presence will modify the community offering living space and feeding ground for epibionts and phytal specialists. For example, *Zostera* beds in the south-west of Britain may contain conspicuous and distinctive assemblages of Lusitanian fauna such as *Laomedea angulata*, *Hippocampus* spp. and Stauromedusae. These subtidal beds of *Zostera* contain the specific perennial variant of *Zostera marina*. *Cymodocea nodosa* forms large and dense patches with green leaves that can reach 100 cm long and 8 mm wide in well shorted fine sands or on superficial muddy sands in sheltered waters and depths of 1-30 meters. Frequently it is mixed with other habitat forming phanerogams *Zostera noltei* (formerly known as *Z.noltii or Z.nana)*and *Zostera marina* on muddy sands rich in organic nutrients. Shallow meadows of *Cymodocea* and *Zostera* are usually found in sheltered bays close to harbours or in areas subject to human impact.  Indicators of Quality  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  The overall quality and continued occurrence of this habitat is, largely dependent on the presence of *Zostera marina,* which creates the biogenic structural complexity on which the characteristic associated communities depend. The density and the maintenance of a viable population of this species is a key indicator of habitat quality, together with the visual evidence of presence or absence of physical damage. Seasonal and annual variations in shoot densities and canopy height can be used to evaluate habitat quality as well as acting as a proxy measure of habitat complexity and refuge capability. The vertical depth limit of submerged seagrass is used in several countries as a Water Framework Directive parameter for assessing ecological status. Other countries use area indices and/or density indices. Seagrass tissue nutrients have also been used as indicators of environmental change in these important ecosystems.  Characteristic species  For the genus *Zostera*, *Zostera marina* is the dominating species for submersed beds. It is current consensus that *Z. angustifolia*, which is often described in older literature is simply an ecotype of *Z. marina*; following recent genetic studies, *Z. angustifolia* is no longer accepted as a separate species and is represented as *Z. marina* L. (WoRMS, 2014). Other biota present are grazing snails, hydrozoans, infaunal species such as *Ensis* spp., *Cerastoderma* spp. and *Echinocardium* *cordatum*. For *Ruppia* either *Ruppia* *maritima* or *Ruppia cirrhosa* may occur. In submerged beds of brackish seas, sea inlets, estuaries, permanent pools of mud or sand flats, and coastal lagoons of Atlantic, North Sea and Baltic coasts of boreal and temperate Europe *Zannichellia palustris*, *Chara* spp., *Lamprothamnium papulosum* and *Tolypella nidifica* can be associated with *Ruppia* and/or *Zostera*. These beds may be populated by fish such as *Gasterosteus aculeatus,* which is less common on filamentous algal-dominated sediments. Seaweeds such as *Chaetomorpha* spp., *Enteromorpha* spp., *Cladophora* spp., and *Chorda filum* are often present in addition to occasional fucoids. Infaunal and epifaunal species may include mysid crustacea, the polychaete *Arenicola marina*, the gastropod *Hydrobia ulvae*, the amphipod *Corophium volutator* and oligochaetes such as *Heterochaeta costata*.  For *Cymodocea* beds, *Cymodocea* *nodosa* is the only species represented. |
| North East Atlantic | A5.6\_PT01  *Neopycnodonte cochlear* beds on exposed and tide-swept circalittoral rocks and cobbles | This habitat occurs in the circalittoral zone on both hard and mixed substrates. It has been recorded in exposed and tide-swept sites at depths of 60 - 150m in the Faial-Pico channel and the Formigas Bank in the Azores and in deeper waters on the upper slope of the Bay of Biscay between 200-500m. Sessile macrofauna is dominated by the oyster *Neopycnodonte cochlear* and the clam *Chama circinata*.  Some variance has been observed in the abundance of the two species although in shallower zones it may be exclusively *Neopycnodonte* . On hard substrates the two species growing together may build up to form a calcareous bioherm. The habitat has also been observed on mixed carbonate-volcanoclastic sediment plains where the two species form cobble to small-boulder sized clumps. *N. cochlear* is able to create thick mantles, serving as hard substrate for other species including foraminifera, bryozoan, ascidians, coral and sponges.  Indicators of quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  The overall quality and continued occurrence of this habitat is dependent on the presence of the predominate structural species, the oyster *Neopycnodonte cochlear* and the clam *Chama circinata* species which create the biogenic structural complexity on which the associated species depend. The density and the maintenance of viable populations of these species are therefore likely to be a key indicator of habitat quality, together with the visual evidence of presence or absence of physical damage.  Characteristic species:  Species reported to be present on clumps  formed by *N. cochlear* and *C.circinata* include the serpulids *Spirobranchus polytrema*, *Hydroides azoricus* and a variety of bryozoans (*Crisia* sp.*, Omalosecosa* sp., *Hippothoa* sp. and *Reteporella* sp.). In its deepest reaches (150m) the assemblage shows a higher abundance of associated sponges and hydrozoans. Other species of serpulids (*Filograna gracilis and Hyalopomatus* cf. *marenzelleri*) and bryozoans (*Puellina* sp. and *Celleporina* sp.) have been recorded in the assemblage. Other associated fauna includes various clams, holothurians and echinoids (*Centrostephanus longispinus*). |
| North East Atlantic | A5.61 Polychaete worm reefs on Atlantic sublittoral sediment | Sublittoral reefs of polychaete worms in mixed sediments are found in a variety of hydrographic conditions. Such habitats may range from extensive structures of tightly packed tubes to loose agglomerations of tubes. Patchiness can be a feature of this habitat with the reef structures interspersed with areas of sediment.They often play an important role in the structural composition or stability of the seabed and provide a wide range of niches for other species to inhabit. Consequently polychaete worm reefs often support a diverse flora and fauna. Three biotopes associated with this habitat have been described with different species of polychaete dominating: *Sabellaria spinulosa* on stable circalittoral mixed sediment,  *Sabellaria alveolata* on variable salinity sublittoral mixed sediment and *Serpula vermicularis* reefs on very sheltered circalittoral muddy sand.  Indicators of Quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  The overall quality and continued occurrence of this habitat is, largely dependent on the presence of tubeworms which creates the biogenic structural complexity on which the characteristic associated communities depend. The density and the maintenance of a viable population of this species is a key indicator of habitat quality, together with the visual evidence of presence or absence of physical damage.  Characteristic species:  Reef forming polychaetes: *Sabellaria spinulosa* *Sabellaria alveolata* and *Serpula vermicularis. Nemertesia antennina, Harmothoe impar, Eulalia tripunctata, Eumida sanguinea,Nereis longissima, Scoloplos armiger,Mediomastus fragilis, Lanice conchilega, Pomatocerostriqueter,  Pagurus bernhardus, Gibbula cineraria, Buccinum undatum, Abra alba, Flustra foliacea, Asterias rubens, Ophiothrix fragilis, Psammechinus miliaris, Ascidia mentula,* and *Dendrodoa grossularis.* |
| North East Atlantic | A5.62 Mussel beds (*Mytilis edulis*) on Atlantic sublittoral sediment | Sublittoral mussel beds of the common mussel *Mytilus edulis* may be sublittoral extensions of littoral reefs or exist independently. They beds are found in a variety of situations ranging from sheltered estuaries and marine inlets to open coasts and offshore areas, in fully marine or sometimes variable salinity conditions in the outer regions of estuaries. They may occupy a range of substrata, although due to the accumulating and stabilising effect such communities have on the substratum muddy mixed sediments are typical. There are three distinct  habitat components: the interstices withn the mussel matrix; the biodeposits beneath the bed; and the substratum afforded by the mussel shells themselves.  All three components often contain a diverse range of epibiota and infauna. The mussel matrix may support sea cucumbers, anemones, boring clionid sponges, ascidians, crabs, nemerteans, errant polychaetes and flatworms. The biodeposits attract infauna such as sediment dwelling sipunculids, oligochaetes, and polychaetes while epizoans may use the mussels shells themselves as substrata.  Indicators of Quality:  Both biotic and abiotic indicators have been used to describe marine habitat quality. These include: the presence of characteristic species as well as those which are sensitive to the pressures the habitat may face; water quality parameters; levels of exposure to particular pressure, and more integrated indices which describe habitat structure and function, such as trophic index, or successional stages of development in habitats that have a natural cycle of change over time.  There are no commonly agreed indicators of quality for this habitat, although particular parameters may have been set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.  The overall quality and continued occurrence of this habitat is, however, largely dependent on the presence of *Mytilus edulis* which creates the biogenic structural complexity on which the characteristic associated communities depend. The density and the maintenance of a viable population of this species is a key indicator of habitat quality, together with the visual evidence of presence or absence of physical damage. Monitoring programmes may include measures of biomass, coverage, length frequency distribution, a condition index for the mussels (a ratio between biomass versus shell length) and descriptions of the structure of a bed including vertical height profile, thickness and type of accumulated sediment, coverage and biomass of macroalgae.  Characteristic species:  Characterised by *Mytilus edulis*. In the subtidal, dense mussel beds can form on the upper faces of tide-swept sediment dominated substrates, to the exclusion of almost all other species compared to the surrounding sediments. The common starfish *Asterias rubens* is often locally abundant as it feeds on mussels, along with other predators such as the crabs *Necora puber*, *Carcinus maenas*, *Maja squinado* and *Cancer pagurus*. Anemones such as *Sagartiogeton undatus*, the dahlia anemone *Urticina equine* and the daisy anemone *Cereus pedunculatus* can be found on gravel patches and amongst the mussels themselves. The hydroid *Kirchenpaueria pinnata* and others characteristic of strong tides and a little scour, such as *Sertularia argentea* and *Tubularia indivisa*, may also be present. Ascidians such as *Molgula manhattensis* and *Polycarpa* spp. can also feature on subtidal mussel beds, particularly in silty conditions. Other characterising infaunal species may include the amphipod *Gammarus salinus* and oligochaetes of the genus *Tubificoides*. The polychaetes *Harmothoe* spp., *Kefersteinia cirrata* and *Heteromastus filiformis* are also important. Epifaunal species in addition to the *M. edulis* include the whelks *Nucella lapillus* and *Buccinum undatum,* the common starfish *Asterias rubens* the spider crab *Maja squinado* and the anemone *Urticina felina*. |
| North East Atlantic | A5.62: Mussel beds *Modiolus modiolus* on Atlantic sublittoral sediment | *Modiolus modiolus* is an Arctic-Boreal species, with a distribution ranging from the seas around Scandinavia (including Skagerrak & Kattegat) and Iceland south to the Bay of Biscay. Beds of *M. modiolus* occur with a patchy distribution in the colder waters of the North-East Atlantic, with a range that extends from Russia in the southern parts of the Barents and White Seas, off Norway and down to Sweden (the Sound and Kattegat) and off the UK, in the southern North Sea and Irish Sea. Beds are also known to occur around Iceland and the Faeroes.  *Modiolus* beds form when horse mussels (*Modiolus modiolus*) aggregate together by attaching to each other and the substratum with byssal threads. The degree of aggregation at which individuals are considered to be sufficiently dense to constitute a “bed” has been determined to be >30% cover. The depth range over which *M.modiolus* forms beds is unknown, but they typically occur from the lower shore to about 70 m, with clumps found below 100 m in the Irish Sea. Off the Faeroes, they occur to about 200m depth, being most dense between 65-95 m. The majority of beds are located in current- swept fully-saline locations, although some can be found in sheltered bays, fjords or lochs, with some beds restricted to depths below haloclines.  *Modiolus* beds occur on a range of substrata, most often on cobbles through to muddy gravels but have also been found on bedrock. Beds are often persistent features which build up through accumulating faecal pellets, shell and trapped sand, so that they may become de-coupled from the substratum on which they were originally founded. They can be self-sustaining to the extent that spat survival is greatest in the crevices amongst the byssal threads of the mature clumps. A diverse range of epibiota and infauna often exists in these communities including hydroids, red seaweeds, solitary ascidians and bivalves such as *Aequipecten opercularis*and *Chlamys varia*. The clumping of the byssus threads of the *M. modiolus* creates a stable habitat that also attracts a very rich infaunal community including areas with a high density of polychaete species.    Indicators of quality:  The condition of *Modiolus*beds may be judged in several different ways:  - Spatial integrity, such as whether fishing gear tracks cut across a bed.  - Topographic integrity, such as the continued presence of ridges, mounds and other biogenic relief.  - The size distributions of the mussels and whether the populations are being adequately renewed by successful spat settlement and juvenile survival through the first years when they are most vulnerable to predation.  - The abundance, composition, condition and diversity of the associated biota.  For physical disturbance impacts, changes in soft epifauna are more likely. Some of the vagile epifauna, such as brittlestars (e.g. *Ophiothrix fragilis*) are known to fluctuate markedly in abundance, so caution is needed when interpreting change. Damage also leads to increased abundance of scavengers, which are attracted to disturbed areas.  Characteristic species:  The dominant species and main components vary depending on the associated biotope, four of which have been described for this habitat: In areas of open coast and tide-swept channels an abundance of hydroids and red seaweeds characterises a biotope with *Ophiothrix fragilis* often common, along with the calcareous tubes of *Spirobranchus triqueter*, anemones such as *Alcyonium digitatum* and *Urticina felina* and hydroids such as *Abietinaria abietina* and *Sertularia argentea*. *Buccinum undatum* may also be important and in some areas the clam *Chlamys varia* may be frequent. Where there is a rich infaunal community this can comprise a high density of polychaete species including *Glycera lapidum*, *Paradoneis lyra*, *Aonides paucibranchiata*, *Laonice bahusiensis*, *Protomystides bidentata*, *Lumbrineris* spp., *Mediomastus fragilis* and syllids such as *Exogone* spp. and *Sphaerosyllis* spp. Bivalves such as *Spisula elliptica*, *Timoclea ovata* and other venerid species are also common and brittlestars such as *Amphipholis squamata.*  Where the conditions are very sheltered brittlestars *Ophiothrix fragilis* and *Ophiocomina nigra*, as well as *Ophiopholis aculeata* are often frequent, sometimes forming a dense bed. The queen scallop *Aequipecten opercularis* is often present in moderate abundances. Large solitary ascidians (*Ascidiella aspersa*, *Corella parallelogramma*, *Dendrodoa grossularia*) and fine hydroids *(*e.g. *Kirchenpaueria pinnata*) are present, attached to the mussel shells. Decapods such as hermit crabs (*Pagurus bernhardus*) and spider crabs (*Hyas araneus*) are typically present. Coralline algal crusts may be found on the mussel shells, with some red seaweeds in shallower water such as *Phycodrys rubens.*  In a biotope that develops in tide swept sheltered conditions, the variable scallop (*Chlamys varia*) may be present in large numbers amongst the *Modiolus* shells. Hydroids such as *Halecium* spp. and *Kirchenpaueria pinnata* and ascidians such as *Ascidiella aspersa*, *Corella parallelogramma* and *Ciona intestinalis* may be found attached to pebbles or mussel shells. The echinoderms *Ophiothrix fragilis* and *Antedon bifida* are often frequent in this biotope as is the encrusting polychaete *Spirobranchus triqueter*. |