Chapter 8

Benthic assessment of marine areas of particular ecological importance within the German Baltic Sea EEZ

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Abstract

The Habitats Directive is one of the main legal tools of the European Union to preserve biodiversity by maintaining and restoring natural habitats, and establishing a network of protected sites (NATURA 2000). One point of interest is the characterisation of marine habitats to localise the areas that fulfil the protection targets. Of the habitats listed in Annex I of the Habitats Directive, mainly *reefs* and *sandbanks* are relevant in the case of German Baltic offshore waters. Along a strong salinity gradient (5 to 25 psu), four planned offshore Marine Protected Areas (MPAs) within the German Exclusive Economic Zone (EEZ) of the Baltic Sea were thoroughly investigated in this study. More than 250 locations were analysed using a combination of standard sampling methods, underwater video technique, and measurement of abiotic factors (salinity, oxygen, sediment parameters). The areas of interest were the *Odra Bank* (*Oderbank*), *Adler Ground* (*Adlergrund*), *Kadet Trench* (*Kadetrinne*), and *Fehmarn Belt* (*Fehmarnbelt*). The characteristic living communities (macrophytes, such as algae and sea grass, and macrozoobenthos such as worms, bivalves and crustaceans) for the different habitat types in these areas were characterised. Due to different salinity regimes, the benthic colonisation is different as well. In the Baltic Sea, with its decreasing salinity from west to east, the number of marine species declines, too. In the present study, altogether approximately 350 macrozoobenthic species and approximately 20 macrophytes were identified.

1 Introduction

During the last 5 years, extensive studies of the benthic habitat[1] within the proposed marine protected areas of German Baltic offshore waters were done by the authors (IfAÖ 1998, Zettler et al. 2003a, 2003b). In the present paper, four areas are relevant. These are the *Odra Bank* (which belongs to the *Pomeranian Bay* (*Pommersche Bucht*)), the *Adler Ground*, the *Kadet Trench* and the slope region of the *Fehmarn Belt* (figure 1).

In the following, we want to introduce these four important marine areas particularly with regard to benthic habitat characteristics and its colonisation by macrozoobenthos.[2] In terms of benthic biodiversity, it is taken into account that the German Baltic has a strong salinity gradient from the west (approx. 20–25 psu) to the east (app. 5–8 psu) in near-bottom water layers. Due to this gradient, the respective species distribution is limited. The mean species number decreases from about 700 in the *Kiel Bight* (*Kieler Bucht*, Gerlach 2000) to 360 in the *Mecklenburg Bay* (*Mecklenburger Bucht*), to only 50 in the *Pomeranian Bay* (Zettler and Röhner 2004).

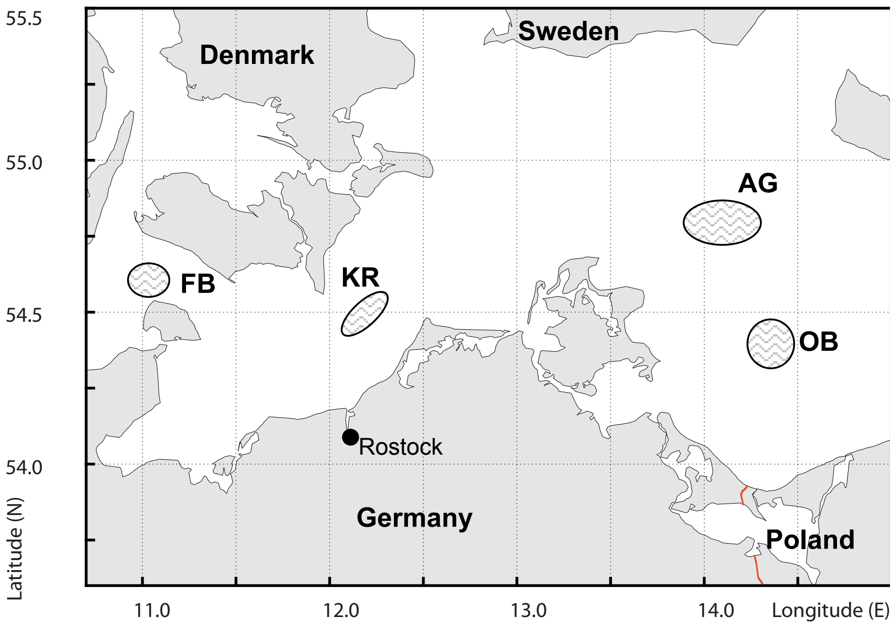

Figure 1. Investigation areas within German Baltic waters (The four areas of interest are indicated by dashed circles (OB=*Odra Bank*, AG=*Adler Ground*, KR=*Kadet Trench*, FB=*Fehmarn Belt*))

[1] Benthic habitat: habitat of organisms living in/on the seafloor.

[2] Macrozoobenthos: larger seafloor animals.

2 Methods

The data sets analysed were based on about 250 stations sampled by IfAÖ (1998) and Zettler et al. (2003a, 2003b, and unpublished) during the last 6 years. Benthic samples were taken with a 0.1m^2 van Veen grab. Due to sediment conditions, grabs of different weights were used. Three (or two) replicates of grab samples were carried out at each station. Additionally, a dredge haul (net mesh size 5 mm) was taken in order to obtain mobile or rare species. All samples were sieved through a 1-mm screen and animals were preserved in the field with 4% formaldehyde. For sorting in the laboratory, a stereomicroscope with 10–40x magnification was used. For the characterisation of the habitat (i.e., assessment of sediment structure, current and epibenthos[3]), an underwater video system mounted on a sledge was used.

3 Odra Bank

The *Pommeranian Bay* is a large shallow water area in the southwestern Baltic Sea with the *Odra Bank* located in its central part. The *Odra Bank*, a permanently submerged sandbank (in terms of the definition of the EC interpretation manual, European Commission 2003), with an average depth of 15 metres, rises up to 7–8 metres beneath the surface from the ground of the *Pommeranian Bay*. The north–south extension is about 35 km, and 25 km from the eastern to the western edge. Sediments are mainly constituted by fine sands enriched with a significant amount of shell gravel. Salinity is between 7–8 psu. The *Odra Bank* is assumed to be a submerged dune complex.

3.1 Macrophytes

The development of sea grass beds and the settlement of algae are prevented by substrate dynamics and limited penetration of light. However, drifting algae (e.g., *Cladophora glomerata*, *Ceramium diaphanum*, *C. strictum*, *Polysiphonia violacea*) and loose "sea grass" leaves (*Zostera marina*, *Zannichellia palustris*) can often be found. The coverage with drifting algae varies seasonally and inter-annually and can be significant.

3.2 Macrozoobenthos

The *Odra Bank* is habitat for a typical benthic community of limited species abundance where crustaceans, molluscs and polychaetes predominate.

[3] Epibenthos: organisms living on the seafloor surface.

Only a few species (for example, the bristleworm *Pygospio elegans*, the amphipod *Bathyporeia pilosa*, or the brown shrimp *Crangon crangon*) can cope with the extreme environmental conditions (high exposure, low salinity) and at the same time develop in high densities. Altogether, 21 species were recorded in this area (out of approximately 50 species known in the *Pommeranian Bay*, based on our own observations). Among the 21 species recorded were 4 polychaetes, 3 oligochaetes, and 6 crustaceans. However, only 2 out of the 6 species of crustaceans typically inhabit sandy substrates (*Bathyporeia pilosa*, and *Crangon crangon*). The others can be found among drifting algae and *Mytilus* aggregations. There were also several species of molluscs, the laver spire shell *Hydrobia ulvae*, and 4 bivalves species to be found (blue mussel *Mytilus edulis*, lagoon cockle *Cerastoderma glaucum*, soft-shell clam *Mya arenaria* and Baltic tellin *Macoma balthica*). Hydrozoans, bryozoans, as well as nemertineans were recorded.

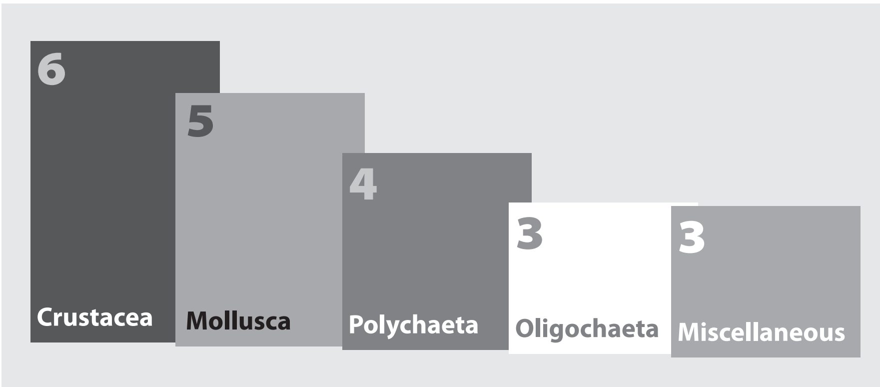

Figure 2. Species composition at the *Odra Bank* area in 1998 (Altogether 21 taxa were found.)

Although species abundance is low in the *Odra Bank* area, sediments are densely populated. Mean density was above 5,000 individuals per square metre (ind./m^2) (table 1). Only 3 species, *Bathyporeia pilosa*, *Mya arenaria* and *Hydrobia ulvae*, counted for 72% of all individuals. Densities of 200–400 ind./m^2 were observed for the bristleworm *Pygospio elegans* and the ragworm *Hediste diversicolor*, and the bivalves *Cerastoderma glaucum* and *Macoma balthica*. Other species populated the area with less than 100 ind./m^2. Drifting *Mytilus* aggregations occurred in varying densities. Therefore, density of the fauna associated with these aggregations also varied considerably. Both the gammarid shrimps *Gammarus salinus* and *G. zaddachi* and the isopods *Jaera albifrons* and *Idotea balthica* are especially linked to these structures.

Table 1. Dominating species at *Odra Bank* in 1998 (Sandy sediments are characterised by endobenthic species[4]. Epibenthic species (excepting *Mytilus edulis*) are not taken into account. The presence is the percentage of sampling stations where the species was recorded.)

Category	Taxon	Common name	Presence	ind./m²
AMPHIPODA	*Bathyporeia pilosa*	Sand digger shrimp	100%	1,780
BIVALVIA	*Mya arenaria*	Soft-shell clam	94%	1,436
GASTROPODA	*Hydrobia ulvae*	Laver spire shell	82%	594
POLYCHAETA	*Pygospio elegans*	Bristleworm	94%	393
BIVALVIA	*Cerastoderma glaucum*	Lagoon cockle	100%	376
BIVALVIA	*Macoma balthica*	Baltic tellin	100%	309
POLYCHAETA	*Hediste diversicolor*	Ragworm	100%	188
BIVALVIA	*Mytilus edulis*	Blue mussel	100%	85
POLYCHAETA	*Marenzelleria neglecta*	Bristleworm	94%	70
OLIGOCHAETA	*Tubifex costatus*	Sludge-worm	88%	42

The distribution of species that typically inhabit sandy substrates was homogenous. Their presence in the area was high. Ten (10) species were recorded at more than 80% of all stations. The bristleworm *Streblospio dekhuyzeni* and the Enchytraeidae (Oligochaeta) were found at more than 50% of all stations. Apart from the Nemertini and another species of Oligochaeta, remaining taxa can be regarded as fauna associated with drifting algae and *Mytilus* aggregations; these occurrences depend on abiotic conditions (e.g., current, sand ripple marks).

3.3 Ecological evaluation of the Odra Bank area

Sandbanks are feeding grounds for wintering and moulting seabirds, and of various species of fish. Blue mussel (*Mytilus edulis*) and soft-shell clam (*Mya arenaria*) are the main prey for black scooters (*Melanitta nigra*) and long-tailed ducks (*Clangula hyemalis*) (Kube 1996). The sea ducks prefer the shallow sandbanks because of the low-diving depths and they feed on the plentiful juvenile and thin-shelled bivalves of the blue mussel and soft-shell clam.

4 Endobenthic species: species living in bottom sediments.

4 Adler Ground

The *Arkona Basin* (*Arkona Becken*) is regarded as a part of the transitional zone between the Kattegat and the deep basins of the Baltic proper. It covers an area of about 19,000 km^2. About a quarter of this area is deeper than 40 metres (maximum 53 metres). Only the marginal zones (like the *Adler Ground*) are shallower. The *Adler Ground* is a glacial-morphological structure and is a part of the Rönne Bank system. It is situated in the southeastern part of the *Arkona Basin*. It divides this Basin from the more easterly-lying *Bornholm Basin* (*Bornholm Becken*). In 2002 and 2003, the authors investigated the western part of this area between depths of 5 and 45 metres. The *Adler Ground* is a rise from the deepest muddy basin (45 metres) to the shallow stony and boulder grounds (up to 5 metres). The slope with sandy sediments and many bigger stone fields with moderate salinity conditions were especially of interest. In terms of the interpretation manual of the European Commission (2003), it is in and among reefs, submarine rocky substrates, and biogenic concretions (blue mussel banks, cold water coral reefs) – which arise from the seafloor in the sublittoral[5] zone but may extend into the littoral zone[6] – where there is an uninterrupted zonation of plant and animal communities. These reefs generally support a zonation of benthic communities of algae and animals species including concretions and encrustations.

4.1 Macrophytes

Down to a 12-metre depth, a more or less dense coverage of brown algae was observed. The bottom consists mainly in bigger stones, boulders, gravel and sand. The algae, principally formed by *Fucus serratus*, are fixed on stony substrates. *Laminaria saccharina* settled in very low numbers, too. Further, some red algae were also observed. Filamentous and drifting algae (*Polysiphonia* spp. and *Ahnfeltia plicata*) settle in depths of up to 20 metres. In some areas (especially between 6- and 11-metre water depth), the seaweeds of *Chorda tomentosa* are noteworthy.

4.2 Macrozoobenthos

The benthic community at the *Adler Ground* depends on the water depth and sediment characteristics. Deeper than 35 metres, the sediment is

[5] Sublittoral zone: zone between the low-tide mark and the edge of the continental shelf.

[6] Littoral zone: zone between the tide marks (also intertidal zone). The Baltic Sea does not have tide; here the littoral zone extends from the shoreline to a few metres deep.

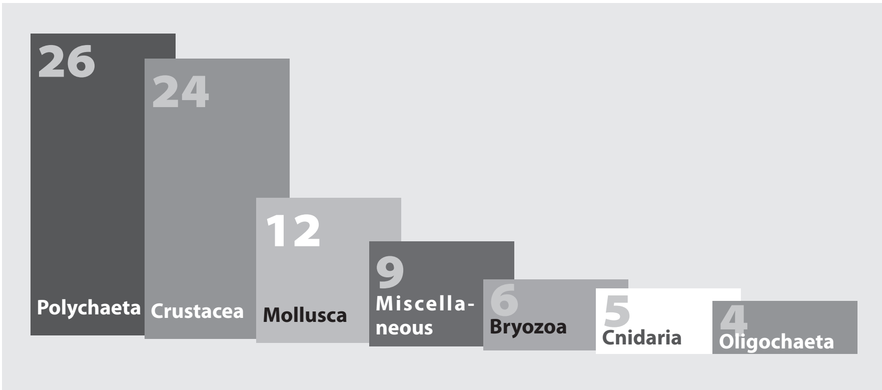

Figure 3. Species composition at the *Adler Ground* area in 2002/2003 (Altogether 86 taxa were found.)

muddy, the temperature is low, and the salinity is quite high in comparison with shallower zones. The salinity regime ranges between 15 and 20 psu. Due to saline submergence,[7] some marine species are able to settle in these deep waters. Some glacial relict species (e.g., the amphipod *Monoporeia affinis*), boreal species (the amphipod *Pontoporeia femorata*, or the bivalves *Astarte borealis*, *A. elliptica*, *Arctica islandica*) and marine species (e.g., the polychaete worms *Harmothoe imbricata*, *Ampharete baltica*, *Phyllodoce mucosa*) are typical for this muddy zone. At the slope and on the top of the rise, completely different substrates (sand, stones, and boulders) and salinity conditions (7–10 psu) were observed. Due to these conditions, a clear and abrupt change in the species community was observed. Endobenthic species dominate the sandy zones between the stones and boulders. The bivalves *Macoma balthica* and *Mya arenaria*, the polychaetes *Pygospio elegans* and *Scoloplos armiger* and the crustaceans *Bathyporeia pilosa* and *Corophium volutator* settled here. Within the stony areas, more or less epibenthic species dominate the community. Here belong the hydrozoan *Clava multicornis*, the cirripedian *Balanus improvisus* (in deeper and more saline waters, *B. crenatus*), the amphipod *Gammarus* spp., the blue mussel *Mytilus edulis*, and the bryozoan *Electra crustulenta*.

7 Saline submergence: more saline water has a higher density, is heavier than the surrounding water and sinks down to the bottom.

The species composition of the reefs (sensu stone fields, boulders and *Mytilus*-mussel beds) is of special interest. Table 2 gives an overview of the most common species within these habitats in the *Adler Ground*.

Table 2. The most common epibenthic species of reefs at the *Adler Ground* (Typical are the widespread stone fields and mussel beds. The dominant endobenthic species of soft bottom are not taken into account.)

HYDROZOA	*Clava multicornis* (Forskal, 1775)	*Hartlaubella gelatinosa* (Pallas, 1766)
MOLLUSCA	*Mytilus edulis* Linnaeus, 1758	*Theodoxus fluviatilis* (Linnaeus, 1758)
CRUSTACEA	*Balanus improvisus* Darwin, 1854	*Jaera albifrons* Leach, 1814
	Saduria entomon (Linnaeus, 1758)	*Gammarus oceanicus* Segerstrale, 1947
	Gammarus salinus Spooner, 1947	*Gammarus zaddachi* Sexton, 1912
	Palaemon elegans (Linnaeus, 1758)	*Rhithropanopeus harrisii* (Gould, 1841)
BRYOZOA	*Callopora lineata* (Linnaeus, 1767)	*Electra crustulenta* (Pallas, 1766)

4.3 Ecological evaluation of the Adler Ground area

From the macrozoobenthic point of view, the stone fields, boulder grounds, and mussel beds are particularly valuable. These epibenthic structures form suitable habitat conditions for many species. The three-dimensional living space is compartmentalised into countless small holes and caves. Due to these opportunities, the benthic biodiversity in this area increased in comparison with more homogeneous sandy or muddy substrates. These stone fields, boulder grounds and mussel beds are in shallow waters and go to a depth of 30 metres. Due to saline submergence, higher saline conditions were found in this deeper zone of the slope. The combination of waters that are more saline and optimal substrates allow some marine species to settle here. The *Adler Ground* is a conglomerate of many rocky reefs and mussel beds and it builds an island of high biodiversity in a region of depleted invertebrate community. About 90 macrozoobenthic species live in the *Adler Ground* area. Twelve species belong to the German red list (Gosselck et al. 1996, Zettler et al. 2003a, 2003b).

5 Kadet Trench

The *Kadet Trench* lies in the transition zone between the *Mecklenburg Bay* and the *Arkona Basin*. The depth ranges between 15 and 32 metres. The mean salinity at the bottom varies from 11 to 20 psu. The strait is the main gateway for Baltic water exchange. It connects two basins where fine-grained sediments accumulate, i.e., the *Mecklenburg Bay* to the southwest and the *Arkona Basin* to the northeast. Owing to the indrift of larvae, the diversity of the fauna is particularly high here. The strong current prevents the siltation of the deep channel. Typical substrates are residual sediments like blocks, stones and boulders exposed in the bottom. In some years, though rarely, oxygen-depleted water from the *Kiel Bight* penetrates into the *Kadet Trench*. After these strong events, a mass mortality of most macrozoobenthic taxa could be observed. Only a few species, e.g., bigger bivalves (*Arctica islandica*, *Astarte* spp.) could survive. Under suitable conditions, the community is regenerated only few months later, consisting of the same species composition (though not the same age structure since the community lacks older individuals.)

5.1 Macrophytes

Only a few macrophytes find suitable living conditions in the *Kadet Trench*. The rocky substrates are in fact good for the settlement of brown algae, but due to the quite deep range (25–30 metres), there are insufficient light conditions. The sugar kelp *Laminaria saccharina* was observed only in some parts of the slope. The sea beech *Delesseria sanguinea* (very sparse) finds here its eastern-most distribution within the Baltic.

5.2 Macrozoobenthos

Within the *Kadet Trench*, the benthic community varies as a consequence of patchy substrate conditions. Rocky substrates (stones, boulders, gravel) dominate at the bottom and at the slope of the channel. Therefore, a hard-bottom community is characteristic for this habitat. Typical species are sponges (e.g., *Halichondria panicea*), the anemone *Metridium senile*, the blue mussel *Mytilus edulis* and ascidians (e.g., *Dendrodoa grossularia*) (see table 3).

Table 3. The most common epibenthic species of reefs at the *Kadet Trench* area (The widespread stone fields and boulders are typical. The dominant endobenthic species of soft bottom are not taken into account.)

PORIFERA	*Halichondria panicea* (Pallas, 1766)	*Haliclona limbata* (Pallas, 1766)
CNIDARIA	*Metridium senile* (Linnaeus, 1761)	*Opercularella lacerata* (Johnston,1847)
MOLLUSCA	*Hiatella arctica* (Linnaeus, 1767)	*Mytilus edulis* Linnaeus, 1758
	Acanthodoris pilosa (Abildgaard, 1789)	*Retusa truncatula* (Bruguiere, 1792)
POLYCHAETA	*Nepthys caeca* (Fabricius, 1780)	*Nereimyra punctata* (O.F. Müller, 1788)
	Phyllodoce mucosa Oersted, 1843	*Polydora ciliata* (Johnston, 1838)
CRUSTACEA	*Balanus crenatus* Bruguiere, 1789	*Idotea balthica* (Pallas, 1772)
	Corophium crassicorne Bruzelius, 1859	*Gammarus oceanicus* Segerstrale, 1947
	Gammarus salinus Spooner, 1947	*Gammarus zaddachi* Sexton, 1912
PYCNOGONIDA	*Nymphon brevirostre* Hodge, 1863	
BRYOZOA	*Callopora lineata* (Linnaeus, 1767)	*Electra pilosa* (Linnaeus, 1767)
	Eucratea loricata (Linnaeus, 1758)	*Valkeria uva* (Linnaeus, 1758)
ECHINODERMATA	*Asterias rubens* Linnaeus, 1758	*Dendrodoa grossularia* (Van Beneden, 1846)

In spaces between bigger stones and in areas of fewer current, soft substrates accumulate. In these zones, endobenthic species reach quite high abundance. Due to the good salinity conditions (11–20 psu), the *Kadet Trench* constitutes for many marine species their eastern-most distribution. Typical species living at the edge of their range are the bivalves *Abra alba*, *Musculus discors*, *Mysella bidentata* and *Hiatella arctica*; the polychaetes *Lepidonotus squamatus*, *Nereimyra punctata*, *Pherusa plumosa* and *Scalibregma inflatum*; and the crustaceans *Balanus crenatus* and *Dyopedos monacanthus*. Further, some “exotic species” like *Nymphon brevirostre* and *Ophiura albida* were found. With regard to presence and

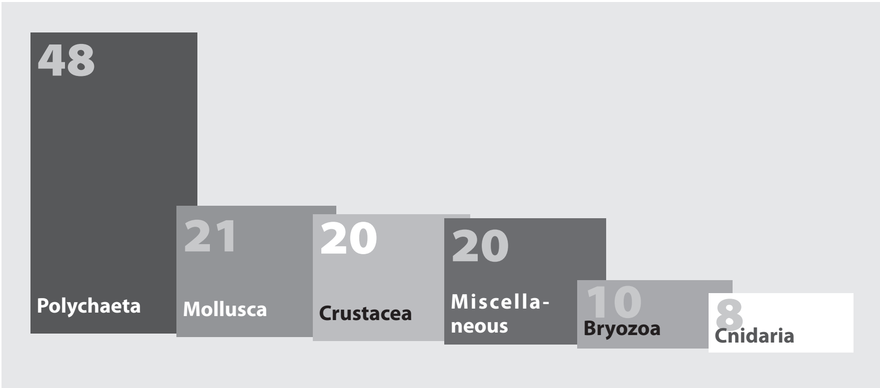

Figure 4. Species composition at the *Kadet Trench* area in 2000 (Altogether 127 taxa were found.)

abundance, the bivalve *Macoma balthica* and the polychaetes *Bylgides sarsi*, *Scoloplos armiger* and *Heteromastus filiformis* are the most dominant species. Further, the ocean quahog (*Arctica islandica*) and the cumacean *Diastylis rathkei* reach quite high abundance and biomass. Altogether, 127 species were found in 2000 (figure 4).

The dominant groups are the polychaetes, followed by molluscs and crustaceans. From the literature and own studies, about 170 species for the *Kadet Trench* area are known with similar relations (Zettler and Röhner 2004).

5.3 Ecological evaluation of the Kadet Trench area

From the macrozoobenthic point of view and with respect to conservation strategies, the areas of the slope and furrow are especially valuable. These zones are characterised by aggregates of stones and boulders with a rich epibenthic fauna. The combination of soft bottoms and rocky substrates and the moderate salinity regime allow a high benthic biodiversity. Typically, many marine species find its eastern distribution limit within the *Kadet Trench*. In 2000, altogether 127 species were found (Zettler unpublished). Twenty-three belong to the German red list (Gosselck et al. 1996).

6 Fehmarn Belt

The *Fehmarn Belt* is the connection between the *Kiel Bight* in the west and the *Mecklenburg Bay* in the east. As part of the Belt Sea (area between

Denmark, Sweden and Germany), this area represents a relatively dynamic habitat with highly variable environmental conditions. The biggest amount of salt water inflow from the Kattegat enters the Baltic Sea via the *Great Belt* (*Großer Belt*) and the *Fehmarn Belt*. Strong currents cause high fluctuation of temperature, salinity and oxygen. Long-term monitoring shows a high variability in the presence, abundance, and biomass of macrozoobenthic species in the deepest parts (30 metres) of the Belt (Wasmund et al. 2003). Only species which tolerate constantly varying living conditions (such as continuous inhabitants) are found. In the present study, only the shallower slope, sandy rises, and the plateau with diversified sediment qualities (sand, stones, boulders) northeast off Fehmarn are of interest (figure 1). The sandwave field in the *Fehmarn Belt* is generated by intermittent currents. Due to the good salinity condition (15–23 psu) caused by salt-rich water from the *Great Belt*, and the stable oxygen supply in the medium water depth zone (15–25 metres), many marine and euryhaline species (e.g., the common whelk *Buccinum undatum*, the hermit crab *Pagurus bernhardus*, the green sea urchin *Psammechinus miliaris*) find suitable living conditions here.

6.1 Macrophytes

Widespread colonies of bigger algae like *Laminaria saccharina* and *Delesseria sanguinea* (figure 5) are found especially on stable sandfields and on stones and boulder areas. In some regions, these plants cover about 80% of the surface. The rocky substrates build suitable settlement conditions for the rhizomes. The higher plant *Zostera marina* was found sparsely in the shallower sandy zones. Further, many species of drifting red algae and some filamentous green algae were observed.

Figure 5. Very common on bigger stones in water depths beween 15 and 25 meters in the *Fehmarn Belt* area is the sea beech *Delesseria sanguinea*

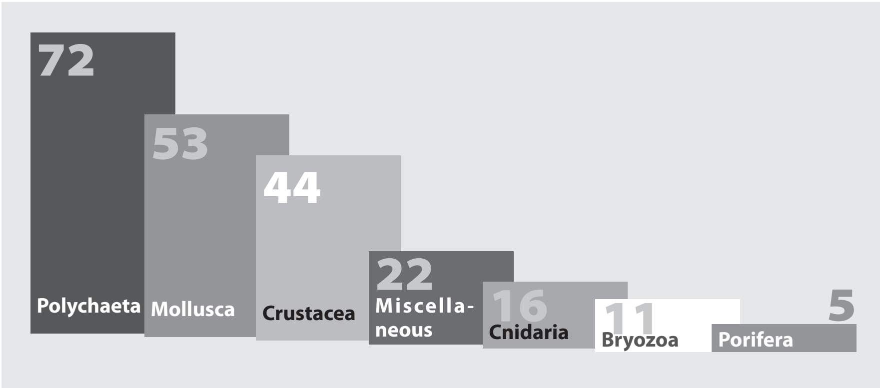

Figure 6. Species composition at the *Fehmarn Belt* area in 2003 (Altogether 223 taxa were found.)

6.2 Macrozoobenthos

During the investigations in 2003, the *Fehmarn Belt* proved to be highly biodiversed. About 223 taxa were observed (figure 6). The polychaetes were the largest category, with 72 species. In the soft bottom, the endobenthic *Ampharete baltica*, *Aricidea suecica*, *Heteromastus filiformis*, *Polydora quadrilobata*, *Scoloplos armiger* and *Spio goniocephala* showed highest presence and abundance. More linked to rocky substrates or plants, the bristleworms *Flabelligera affinis*, *Lepidonotus squamatus*, *Eulalia bilineata* and *Nereimyra punctata* were found. The second largest category were the molluscs. Endobenthic bivalves dominated (mainly the biomass) in sandy substrates. Some examples are *Abra alba*, *Arctica islandica*, *Astarte borealis*, *Corbula gibba*, *Macoma calcarea*, *Mya arenaria* and *Parvicardium ovale*. Hard bottom or plants were frequently colonised by epibenthic bivalves and gastropods like *Buccinum undatum*, *Facelina bostoniensis*, *Hiatella arctica*, *Lacuna pallidula*, *Mytilus edulis*, *Modiolus modiolus*, *Onoba semicostata* and *Retusa truncatula*. Within sponges and ascidians, bivalves of the genus *Musculus* (*M. discors* and *M. marmoratus*) were ingrown. In addition, the introduced North American bivalve species *Ensis americanus* has stable populations in the coarse-sand sediments here. In the *Fehmarn Belt* area, the species lives at the margin of its salinity tolerance.

The third largest category were the crustaceans (figure 6). Forty-four (44) species were verified for the *Fehmarn Belt* area. Most of them are vagile (i.e., are able to move about) and epibenthic. With 25 species, the amphipods composed the main part of this group. *Apherusa bispinosa*, *Caprella septemtrionalis*, *Corophium insidiosum*, *Gammarellus homari* and *Microdeutopus gryllotalpa* were characteristic among the well-structured phytal and rocky substrates. In exposed and well-sorted sandy sediments, the amphipods *Phoxocephalus holbolli*, *Bathyporeia pilosa*, *B. guilliamsoniana*, the mysid *Gastrosaccus spinifer* and the decapod *Crangon crangon* were common. Other groups at the *Fehmarn Belt* area were the mostly epibenthic sponges, hydrozoans, bryozoans, echinoderms and ascidians (see figure 6 and table 4).

Table 4. The most common epibenthic species of reefs at the *Fehmarn Belt* area (Typical are the widespread *Laminaria* fields and stones. The dominant endobenthic species of soft bottom are not taken into account.)

PORIFERA	*Halichondria panicea* (Pallas, 1766)	*Haliclona limbata* (Pallas, 1766)
	Halisarca dujardini Johnston, 1842	*Leucosolenia* sp.
CNIDARIA	*Metridium senile* (Linnaeus, 1761)	*Hartlaubella gelatinosa* (Pallas, 1766)
	Opercularella lacerata (Johnston, 1847)	*Sertularia cupressina* Linnaeus, 1758
MOLLUSCA	*Hiatella arctica* (Linnaeus, 1767)	*Musculus discors* (Linnaeus, 1767)
	Musculus marmoratus (Forbes, 1838)	*Acanthodoris pilosa* Abildgaard, 1789)
	Amauropsis islandica (Gmelin, 1791)	*Bittium reticulatum* (Da Costa, 1778)
	Buccinum undatum (Linnaeus, 1758)	*Facellina bostoniensis* (Couthouy, 1838)
	Lacuna pallidula (Da Costa, 1779)	*Neptunea antiqua* (Linnaeus, 1758)
	Onoba semicostata (Montagu, 1803)	*Retusa truncatula* (Bruguiere, 1792)
POLYCHAETA	*Flabelligera affinis* M. Sars, 1829	*Harmothoe imbricata* (Linnaeus, 1767)
	Harmothoe impar (Johnston, 1839)	*Lepidonotus squamatus* (Linnaeus, 1758)
	Nepthys caeca (Fabricius, 1780)	*Microphthalmus aberrans* (Linnaeus, 1758)
	Nereimyra punctata (O.F. Müller, 1788)	*Nereis pelagica* Linnaeus, 1758
	Nicolea zostericola (Oersted, 1844)	*Phyllodoce mucosa* Oersted, 1843
	Polydora ciliata (Johnston, 1838)	*Streptosyllis websteri* Southern, 1914

Table 4. continued

CRUSTACEA	*Balanus crenatus* Bruguiere, 1789	*Praunus inermis* (Rathke, 1843)
	Idotea balthica (Pallas, 1772)	*Idotea granulosa* Rathke, 1843
	Apherusa bispinosa (Bate, 1856)	*Caprella linearis* (Linnaeus, 1767)
	Caprella sepentrionalis Kröyer, 1838	*Cheirocratus sundevalli* (Rathke, 1843)
	Corophium crassicorne Bruzelius, 1859	*Dexamine spinosa* (Montagu, 1813)
	Gammarellus homari (Fabricius, 1779)	*Microdeutopus gryllotalpa* Da Costa, 1853
	Phtisica marina Slabber, 1769	*Carcinus maenas* (Linnaeus, 1758)
PYCNOGONIDA	*Callipalene brevirostris* (Johnston, 1837)	*Nymphon brevirostre* Hodge, 1863
BRYOZOA	*Callopora lineata* (Linnaeus, 1767)	*Cribrilina punctata* (Hassall, 1841)
	Electra pilosa (Linnaeus, 1767)	*Eucratea loricata* (Linnaeus, 1758)
	Flustra foliacea Linnaeus, 1758	*Mucronella immersa* (Fleming, 1882)
ECHINODERMATA	*Asterias rubens* Linnaeus, 1758	*Psammechinus miliaris* (P.L.S. Müller, 1766)
ASCIDIACEA	*Ciona intestinalis* (Linnaeus, 1767)	*Dendrodoa grossularia* (Van Beneden, 1846)

6.3 Ecological evaluation of the Fehmarn Belt area

Due to the good salinity conditions (15–23 psu), the *Fehmarn Belt* area constitutes for many marine species the only distribution in the Baltic Sea area. Literature data (e.g., Kock 2001, Zettler et al. 2000, and in preparation) and own results show that the *Fehmarn Belt* area has a potential macrozoobenthic inventory of about 300 species. The *Fehmarn Belt* area builds a refuge for highly biodiversed macrozoobenthic and macrophytobenthic communities. Several species (approx. 40) belong to the red list. The rocky habitats and the field of red and brown algae especially form suitable living conditions for many sensitive species. The closeness of the *Great Belt* and its inflow from the Kattegat area cause a relatively regular supply of salt-rich water and oxygen.

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