**Final report of the ICES Science fund project "Holistic approach to analyse benthic fauna communities on the whole Baltic Sea (BSW)"**

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## Background

The focus of the initiative is the identification, description and mapping of major benthic macrofauna communities, its distribution and functional features on the Baltic Sea wide scale. A number of works were previously published, describing and mapping the benthic macrofauna communities in different sub-basins of the Baltic Sea. Nevertheless, no synthesis or joint data analyses have been done for the entire Baltic Sea region in the recent time.

## Aims

The project aims to perform the inventory of the recent benthic macrofaunal communities in the entire Baltic Sea, thereby adding to the investigation of living recourses in the ICES region. This development can serve as an evidence based advice for assessment of ecosystem status, be useful for environmental scientists to account for benthic macrofauna in implementation of ecosystem approach and helpful for decision makers in marine spatial planning and fishery management.

This work will set a baseline for future studies for better recognition of links between benthic fauna and ecosystem functioning.

Sampling efforts from all countries around the Baltic Sea are aggregated, harmonized and analyzed to extract ecologically significant groups shaped by pronounced environmental heterogeneity of the Baltic Sea.

Present report describes the results of analysis to delineate 10 major communities inhabiting the Baltic Sea. This is an arbitrary level of classification chosen to provide an overall global picture. The work will continue with further refinement of presented results and description of finer community units in exemplary regions.

## Workshop

The two days' workshop devoted to BSW Baltic Sea (BS) benthic fauna communities took place 27-28 May 2014. It was hosted by the IOW in Warnemünde, Germany. There were 9 attendees representing 7 institutes from Germany, Denmark, Finland, Lithuania, Estonia, Latvia and Poland.
The workshop was aimed to finalize the procedure of joining together the national datasets and summarize the experiences of participants in the community analysis. Following methodological issues were addressed:

- It was agreed that a global picture is desired on the cost of details: therefore inner waters, lagoons and small enclosed bays should be excluded from the data analysis due to high diversity and variability as we are aiming at defining and mapping the distribution of BS "regular/widespread/representative" communities; alternatively they can be treated as separate class of "diverse/patchy/variable" community.
- The relevance ("life span") of the map was discussed – temporal validity is limited by regional variability of benthic communities.

- The reasonable approach for spatially explicit mapping based on point data is to model key species distributions separately and derive communities by overlapping results.
- New round of data inventory, including the submission of all available biomass data (for conversion of wet weight to AFDW regional conversion factors can be used), was considered necessary during the May workshop and completed by the end of August 2014. To increase the coverage and resolution of data Alexey Maximov (Zoological Institute of Russian Academy of Science) was contacted and has contributed data for 25 stations from the eastern part of the Gulf of Finland. These data was included in the dataset.
- The range of sizes of the gridding cell to be considered for the final product (including estimation of variability within cell): EU grid, 1 km, 1nm, 2 km (HELCOM), 5 km.
- If community classification is based on relative dominance of key species, differences in sampling gear, sampling area, number of replicate in combined data set are acceptable, but for absolute abundance/biomass based community classification methodological differences can lead to comparability problems and data should be treated with caution for application of predictive modelling techniques.
- Distribution of oxygen minimum zone can be used in order to map regions with no macrofauna. This is a problematic issue since data from such sampling events/locations rarely enter the databases on benthic macrofauna due to their structure specifications and are therefore poorly documented.
- There are also community changes driven by biological pressure e.g. invasive species whose distribution dynamics can rapidly lead to significant community shifts.
- Taxonomic inconsistencies were discussed: e.g. taxonomic units higher than species level should be removed when one or several species belonging to those units already is present from the same sampling event/spatial cell, all alternatively all aggregated to genus level (as done below).

**Methods**

The data on the distribution of benthic macrofauna is collected together in one GIS database to adequately cover the whole Baltic Sea basin. Most of the data was collected with van Veen grab, mostly 2 to 3 replicates per sampling event, sieved on a 1 mm screen, preserved in 4 % buffered formaldehyde-seawater solution and identified in the laboratory to the lowest taxonomic level possible. More details including specifications and the area covered by each laboratory is provided below and in Appendix 1. All species abundance and biomass data was recalculated to the area of square meters. For biomass data conversion factors available at the IOW were used.

Baltic Sea can be viewed as a gradient system, where species richness increase with salinity towards the southwest and community composition changes, also responding to differences in substrates (generally dominated by fine sand and mud) and oxygen conditions (with seasonal and even permanent oxygen depletion occurring in deeper parts). Therefore, characteristic (dominant) species were first identified separately for each HELCOM sub-basin, accounting for their frequency and relative abundance at location, to extract the list of species feasible for the overall community analysis. Distinct benthic assemblages discriminated by particular species are defined, related to different spatial subarea and characterized by a certain variability of environmental parameters by means of various statistical methods (hierarchical clustering, indicator value, MDS).

As a starting point all available infaunal data was pooled together. For analyses we have used a regular 5 km grid (matching with the EU 10 km grid). Shallow lagoon regions were omitted not to blur the analysis due to high variability of infauna. Average abundance for taxonomic units was calculated accounting for all sampling events within one grid cell.

PRIMER v6 program package (Clarke and Warwick, 2001) was used to perform cluster analysis (group-average linking) and multidimensional scaling for abundance data to reveal similarities between stations. The cluster

analysis on a large number of species including patchy occurring rare species may tend to confuse the picture. The number of species was reduced, retaining only species ranking for up to 90% of cumulative abundance per each sampling event for cluster analysis. Some characteristic Baltic Sea taxa where considered at genus or even higher taxomonic level (*Diastilis, Harmothoe, Exogone, Hidrobidae, Idotea,* Nephtys*, Ophiura, Phoronis, Polydora, Diptera*) to overcome the taxonomic inconsistencies and as the global picture of characteristic communities distribution is of interest at this stage of the analysis. For list of taxa considered see Appendix 2. First abundance data was subject to forth-root transformation. Similarities were calculated using the Bray-Curtis coefficient with a virtual dummy variable being 1 for all objects. Similarity percentage analysis (SIMPER) and Indicator species analysis (De Cáceres and Legendre, 2009) were used to identify the main taxa that were responsible for differences in community structure.

**Results**

*Structure of the dataset.* The gathered and harmonised dataset is comprising over thousand taxa at over 7 thousand locations (17 thousand visit events) sampled in years 2000-2013 for species abundance and partly for biomass (Figures 1-2).

Overall 1176 taxonomic units (accepted in World register of Marine Species WoRMS) are included in the final joint dataset (774, i.e. 53% are unique to individual dataset). Harmonization to the lowest taxonomic level possible was done in order to reduce dimensionality for later statistical processing. Biomass data is limited: fresh weight is only available for 2943 (39%) locations, ash free dry weight - for 2241 (29.7%).

*Resent spatial distribution of characteristic macrofaunal communities.*

Based on cluster analysis of abundance data 10 major communities inhabiting the Baltic Sea were identified (cut off at 23%, clusters with minimum number of 10 cells considered as major communities, see the legend of Fig. 3 for characteristic species). Their distribution is shown in Fig. 4. This is an arbitrary level of classification chosen to provide an overall global picture. Results of Indicator species and SIMPER analyses revealed species primarily contributing to observed pattern and helped determine if the group is distinctly different from other. The outcome was also confirmed by expert knowledge. Characteristics of major communities are listed in Table 1.

Community 1 is the main type in the whole northern area, which isn't surprising when looking at the characteristic species of it (*Monoporeia affinis, Marenzelleria, Macoma balthica*). The Finnish samples are mainly from muddy sediments so that also explains a bit. There are some yellow spots of community 2 as well, those are the sandy areas with characteristic species *Hydrobiidae, Pygospio elegans, Cerastoderma glaucum*. This community is mainly found in sandy habitats in the south-western Baltic Sea. The red spots, group 4, in Gulf of Finland and central Baltic down to Arkona Basin, must be seen as "when not anoxic" communities, as those areas are often anoxic and the motile *Bylgides sarsi* is the one to arrive first when conditions are better. Communities in the southern part are much more diverse. Bay of Mecklenburg in shallower areas is mostly inhabited by sandy community 2 and community 3 (with 3 *Diastylis, Corbula gibba, Dipolydora quadrilobata, Arctica islandica, Aricidea suecica, Abra alba*) in the deeper part. Communities 5 (characterised by *Amphiura, Abra nitida, Galathowenia oculata, Ennucula tenuis, Thyasira flexuosa, Nucula nitidosa, Diplocirrus glaucus*), 7 (with *Phoronis, Tellina fabula, Thracia phaseolina, Ophelia borealis, Spiophanes bombyx, Branchiostoma lanceolatum, Spio arndti*) and 8 (*Angulus tenuis, Ensis directus, Haustorius arenarius, Lamprops fasciatus*) are mostly found in Kattegat region. Community 9 (with *Lagis koreni, Cerastoderma edule, Polydora, Halicryptus spinulosus*) is typical for Flensburg Fjord, whereas community 10 (characterised by *Echinocyamus pusillus, Harmothoe, Bittium reticulatum, Oligochaeta, Alitta virens, Turritella communis, Asterias rubens*) is nearly restricted to the Great Belt region. Results of SIMPER analysis can be found in Appendix 3.

Figure 1. Sampling station in the joint database and data providers

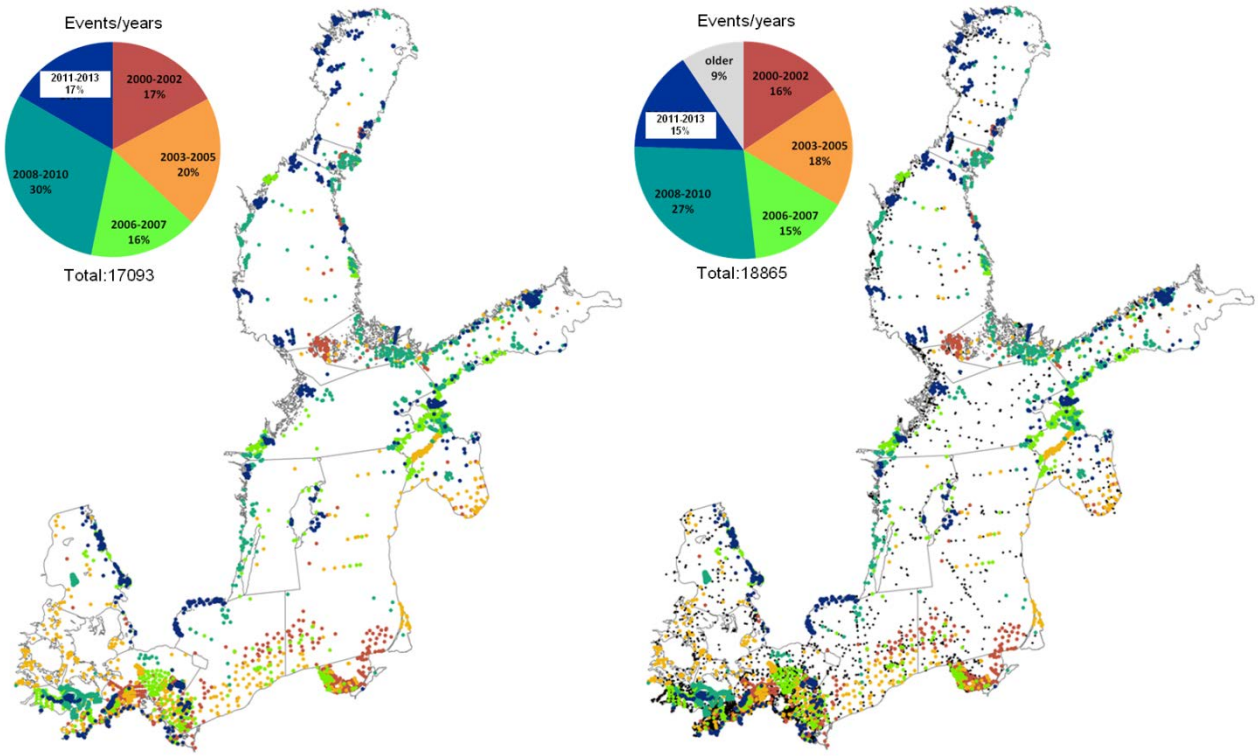



Figure 2. Data from different years

Examples of distribution maps for 5 exemplary bivalve species dominating abundance and biomass are given in Appendix 4.

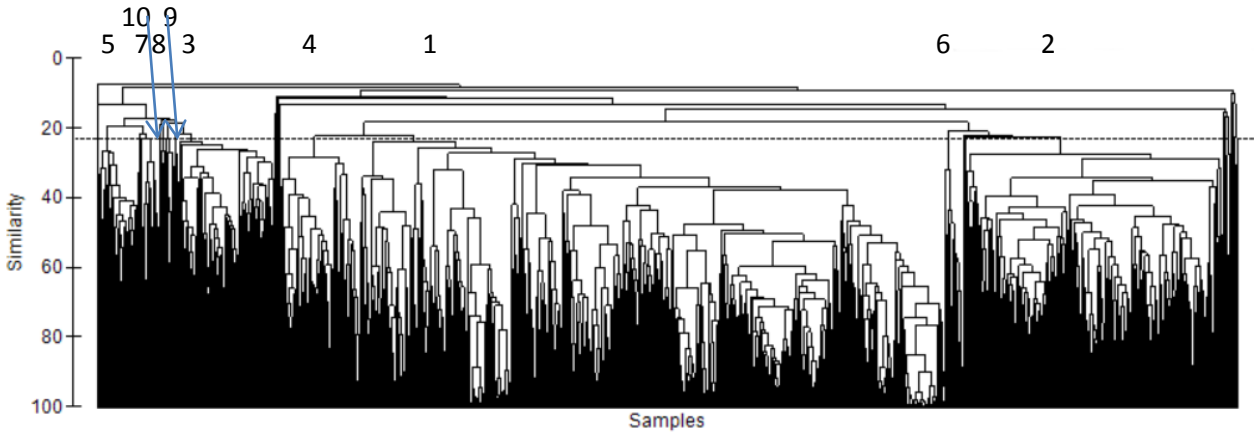



Figure 3. Dendorgam resulting from cluster analysis of benthic samples based on species abundance data. The horizontal dotted line represents the cut off which was at 23%
similarity.

Table 1. Characteristics of major communities

| Community | N cells | N visits | N species/ station | Mean abundance/ station (ind/ $m^2$) | Mean biomass/ station ($g/m^2$) | Depth | Av. salinity (min-max) | | Sediment class (BALANCE) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1415 | 9977 | 5 | 1345 | 83 | 5-65 | 6.1 | (0.9-19.4) | mud to sand |
| 2 | 557 | 3827 | 14 | 4797 | 193 | <30 | 9.5 | (0.1-27.7) | sand |
| 3 | 208 | 1434 | 38 | 3288 | 358 | 10-25 | 20.7 | (13.5-30.8) | sand |
| 4 | 205 | 855 | 7 | 485 | 54 | 20-120 | 12 | (2.4-24.9) | mud |
| 5 | 84 | 600 | 44 | 1903 | 204 | 3-40 | 28.3 | (19.1-34.7) | mud |
| 6 | 39 | 77 | 7 | 2986 | 20 | 2-70 | 7.6 | (4.1-21.4) | hard bottom complex |
| 7 | 38 | 127 | 29 | 1508 | 466 | 8-40 | 30 | (25.4-34.1) | sand |
| 8 | 17 | 22 | 21 | 1542 | 44 | <25 | 26.4 | (20.1-32.8) | sand |
| 9 | 12 | 45 | 11 | 1385 | 41 | <20 | 18.9 | (13-22.3) | sand |
| 10 | 11 | 12 | 29 | 1719 | 16 | 2-20 | 24.2 | (19.4-28.1) | gravelly |
| other | 70 | | | | | | | | |
| No fauna | 50 | | | | | | 11.3 | (5.9-15.4) | mud |

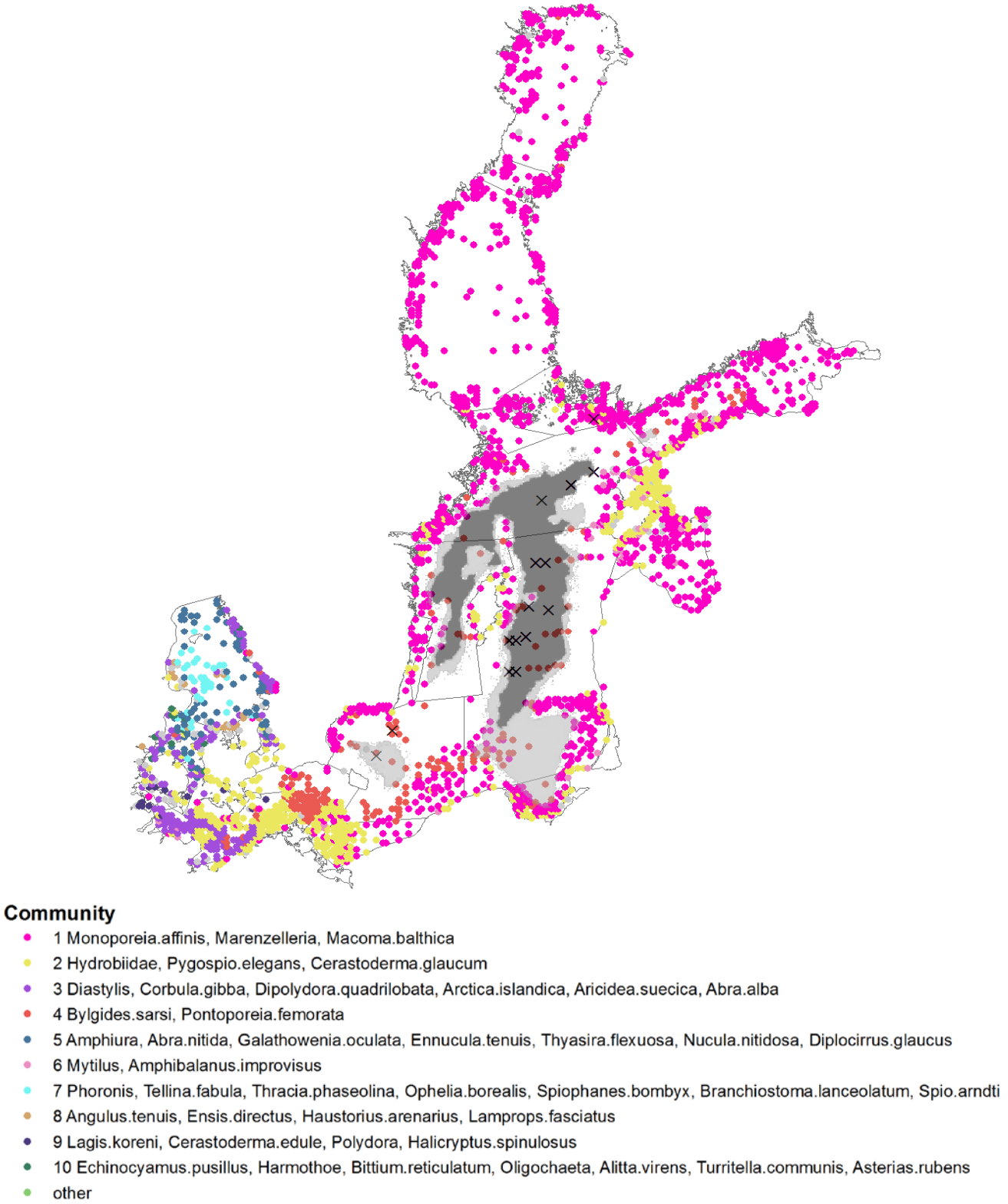



Figure 4. 10 major communities with characteristic species according to hierarchal clustering, SIMPER and Indicator species analysis. Crosses indicate sampled cells with no benthic infauna recorded (mainly dataset PL).

Light gray and dark gray areas mask out the deep water hypoxic and anoxic oxygen conditions, correspondingly (winters 2014 and 2015, after Aranda's monitoring cruise, SYKE) – when oxygen depletion takes place this areas are usually uninhabited by macrofauna.

Among the major outcomes of the project is the gathered and harmonised dataset that can be used as a baseline for multiple analyses of benthic fauna distribution and features. Data harmonisation is a continuous iterative process and often is the most time consuming step, as in this study.

**Outlook and follow up**

Presented results are the big global picture, and of course when going more to detail more groups and species would appear important. The work will continue with further refinement of presented results and description of finer community units in exemplary regions.

As an outlook different methodological techniques/possibilities are considered for development of an appropriate approach for spatially explicit delineation of communities. Modelling the abundance of all possible taxonomic groups using Random Forest technique followed by overlay of results using measured and expected averaged abundance and biomass dominance is found to be most promising for delineation of communities. At the moment available environmental predictors are those available from IOW database, HELCOM Baltic Sea Data and Map service and EUSeaMap, including relevant physical and ecological features such as bathymetry, salinity, substrate type data, eutrophication related variables etc. Recently, results of the developed at IOW GETM model with horizontal resolution of the model grid 1x2 nautical miles became available for the project (will be used in the future work), providing data for near bottom temperature, salinity and water speed averaged over the period 2000-2014 (Ulf Gräwe, personal communication).

On this basis further predictions using species distribution modeling will be done in areas where gaps in sampling effort remain. Here several methods will be tested to find the most appropriate for that particular purpose (including random forest, GLM and extensions).

The research paper aims to set a baseline for future studies for better recognition of links between benthic fauna and ecosystem functioning. The ICES Journal of Marine Science can be considered as an appropriate alternative for submission of the manuscript.

As an outlook based on the derived map in the further study the spatial distribution of specific macrozoobenthos functions (e.g. biodeposition and bioturbation) can be estimated. This will help to better understand the possible effects of natural or human-induced changes in macrofaunal communities on the hosting ecosystem.

It is essential to emphasize the unique chance to join all the data on benthic macrofauna around the Baltic Sea to finally create a Baltic Sea Benthic Atlas, first targeted on the community level.

Even though raw data engaged is partly not publicly assessable, all parties involved are willing to contribute to sound, reliable, transparent and credible scientific advice.

**Financial overview**

The total amount of 3524 EUR was spent for travel/workshop organization, leaving the possibility for another meeting at the later stage of the project, with the remaining 2076 EUR left from the initial money received from ICES Science Fund.

Participation in ICES BEWG Meeting to present and consult the results and further steps is planned for two project co-workers – Michael L. Zettler and Mayya Gogina.

**Presentations**

The idea of the project, preliminary joint dataset and first results were presented at the IMBER Future Ocean OSC in Bergen, Norway, 23-27 June 2014. The presentation has shown that there is quite a large interest in the aims of the map project. Major questions were on whether, when and where the data/map will be available, as the work is still in progress this remain open until now.

**Summary of status and challenges:**

The biological data acquisition is completed, showing that full-coverage environmental data is limited.

Methods and algorithms are under development and following issues are to be clarified: linking biomass and abundance based community analysis; interpolation from point to surface is needed for a good quality high-resolution abiotic predictor layers. How to tackle temporal changes of community structure (2000-2013), the causality and how to assess uncertainties should be further addressed.

The manuscript/atlas structure is yet to be established.

**References**

Clarke, K.R., Warwick, R.M., 2001. Change in Marine Communities: An Approach to Statistical Analysis and Interpretation, second ed. PRIMER-E, Plymouth.

De Cáceres, M., Legendre, P., 2009. Associations between species and groups of sites: indices and statistical inference. Ecology 90, 3566-3574.

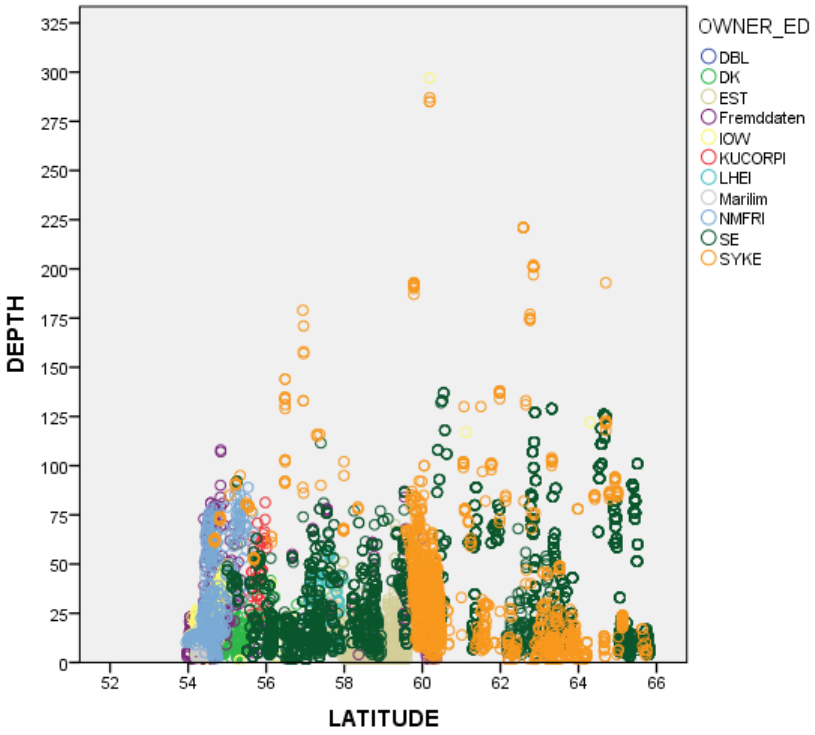
**Appendix 1. Sources of data**

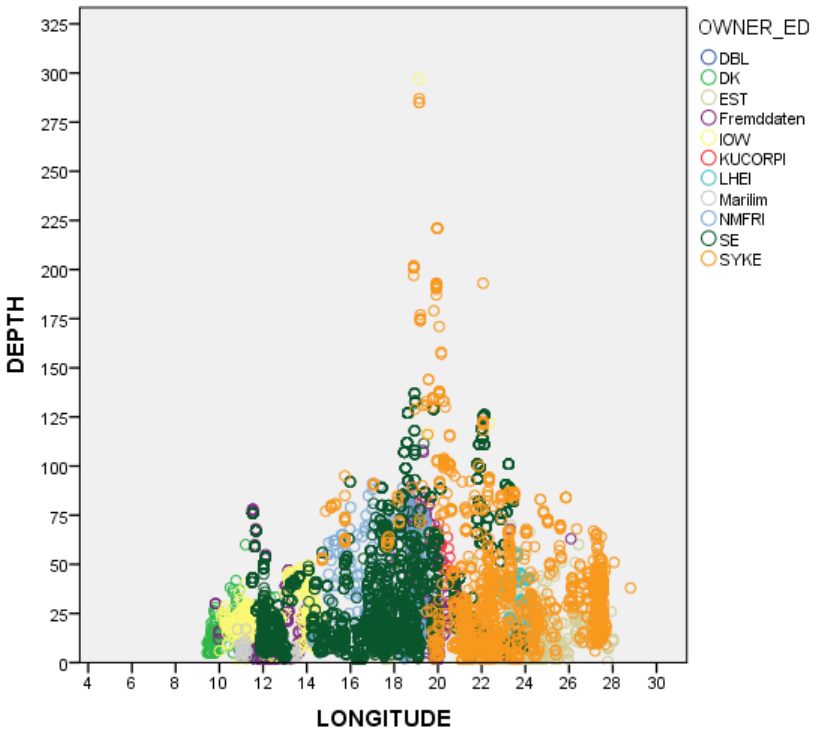
An overview of benthic fauna data considered at the beginning of the project.

| DB | INSTITUTE | CONTACT PERSON | N VISITS | N VISITS PER AREA |
|---|---|---|---|---|
| DK | Department of Bioscience, Aarhus University, Denmark | Alf Bernhard Josefson | 165 | Arkona Basin, 8; Bay of Mecklenburg, 2; Flensburg Fjord, 32; Great Belt, 60; Kattegat, 16; Kiel Bay, 3; Little Belt, 34; The Sound, 10; |
| EST | Estonian Marine Institute, University of Tartu, Estonia | Jonne Kotta | 1108 | Eastern Gotland Basin, 35; Gulf of Finland, 296; Gulf of Riga, 689; Northern Baltic Proper, 87; Western Gotland Basin, 1 |
| IOW | The Leibniz Institute for Baltic Sea Research, Warnemünde, Germany | Michael L. Zettler | 1731 | |
| KUCORPI | Coastal Research and Planning Institute, Klaipeda University, Lithuania | Darius Daunys | 40 | Eastern Gotland Basin, 40 |
| LHEI | Latvian Institute of Aquatic Ecology, Latvia | Vadim Yermakov | 195 | Eastern Gotland Basin, 40; LHEI, 195; Eastern Gotland Basin, 6; Gulf of Riga, 189 |
| NMFRI | National Marine Fisheries Research Institute, Poland | Jan Warzocha | 319 | Bornholm Basin, 114; Eastern Gotland Basin, 36; Gulf of Gdansk, 169 |
| SE | Hafok AB, Sweden | Mats Blomqvist | 4848 | Arkona Basin, 52; Bornholm Basin, 390; Bothnian Bay, 1154; Bothnian Sea, 1544; Eastern Gotland Basin, 101; Kattegat, 533; Northern Baltic Proper, 418; The Quark, 104; The Sound, 70; Western Gotland Basin, 482 |
| SYKE | Finnish Environment Institute SYKE / | Henrik Nygård | 1383 | Aland Sea, 14; Archipelago Sea, 207; Bornholm Basin, 33; Bothnian Bay, 233; Bothnian Sea, 238; |

| | | | | |
|---|---|---|---|---|
| | Marine Research Centre, Finland | | | Eastern Gotland Basin, 43; Gulf of Finland, 496; Northern Baltic Proper, 22; The Quark, 97 |
| Fremddaten | Literature based collection | Michael L. Zettler | 1882 | Aland Sea, 8; Archipelago Sea, 69; Arkona Basin, 408; Bay of Mecklenburg, 498; Bornholm Basin, 125; Bothnian Sea, 5; Darss-Zingst Lagoon, 1; Eastern Gotland Basin, 102; Flensburg Fjord, 6; Greifswald Lagoon, 37; Gulf of Finland, 6; Gulf of Gdansk, 212; Gulf of Riga, 1; Kattegat, 159; Kiel Bay, 10; Kiel Fjord, 20; Little Belt, 24; Northern Baltic Proper, 85; Rugia Lagoons, 3; Szczecin Lagoon, 7; The Sound, 9; Vistula Lagoon, 2; Warnow Estuary, 19; Western Gotland Basin, 31; Wismar Bay, 35; IOW, 1731; Aland Sea, 1; Arkona Basin, 414; Bay of Mecklenburg, 316; Bornholm Basin, 142; Bothnian Bay, 1; Bothnian Sea, 1; Curonian Lagoon, 23; Darss-Zingst Lagoon, 61; Eastern Gotland Basin, 2; Eckernfoerde Bay, 1; Great Belt, 22; Greifswald Lagoon, 21; Gulf of Gdansk, 11; Kattegat, 6; Kiel Bay, 438; Kiel Fjord, 2; Northern Baltic Proper, 1; Rugia Lagoons, 13; Szczecin Lagoon, 114; Trave Estuary, 20; Warnow Estuary, 54; Western Gotland Basin, 2; Wismar Bay, 65 |
| Total | | | 12548 | |

Sampling intensity as function of latitude, longitude and depth is shown (pattern dictated by bathymetry of the Baltic Sea and areas of interest of contributing partners).

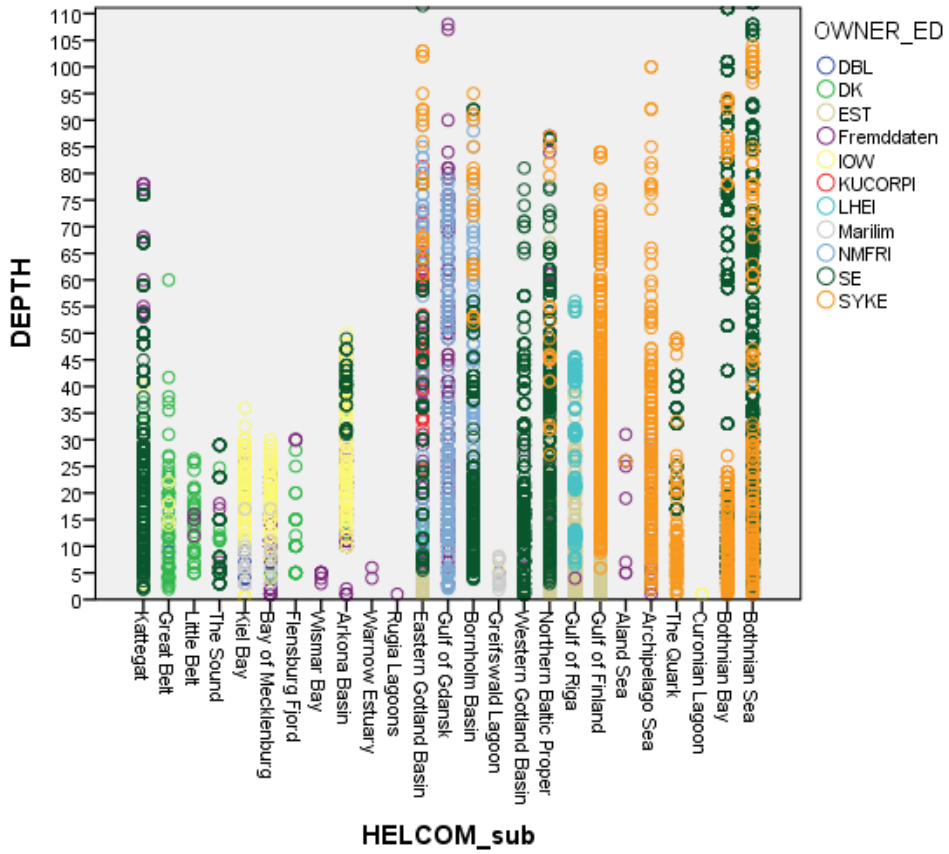


| REGION | N_RECORDS | %TOTAL |
|---|---|---|
| Kiel Bay | 25864 | 17.964 |
| Kattegat | 22728 | 15.786 |
| Bay of Mecklenburg | 22438 | 15.584 |
| Arkona Basin | 14212 | 9.871 |
| Bornholm Basin | 7744 | 5.379 |
| Bothnian Sea | 7446 | 5.172 |
| Gulf of Riga | 7273 | 5.051 |
| Western Gotland Basin | 4399 | 3.055 |
| Northern Baltic Proper | 4172 | 2.898 |
| Bothnian Bay | 3883 | 2.697 |
| Gulf of Finland | 3811 | 2.647 |
| Great Belt | 3235 | 2.247 |
| The Sound | 3193 | 2.218 |
| Gulf of Gdansk | 2708 | 1.881 |
| Eastern Gotland Basin | 2522 | 1.752 |
| Wismar Bay | 1633 | 1.134 |
| Little Belt | 1282 | 0.890 |
| Archipelago Sea | 1264 | 0.878 |
| Greifswald Lagoon | 963 | 0.669 |
| The Quark | 827 | 0.574 |
| Warnow Estuary | 625 | 0.434 |
| Szczecin Lagoon | 514 | 0.357 |
| Darss-Zingst Lagoon | 441 | 0.306 |
| Flensburg Fjord | 308 | 0.214 |
| Trave Estuary | 255 | 0.177 |
| Rugia Lagoons | 119 | 0.083 |
| Aland Sea | 74 | 0.051 |
| Eckernfoerde Bay | 38 | 0.026 |
| Kiel Fjord | 7 | 0.005 |

Sampling equipment used for different datasets included and availability of biomass

| Row Labels | EQUIPMENT | SAMPLERARE | N_VISITS | BIOMASS |
|---|---|---|---|---|
| | Haps | 0.0143 | 191 | To species |
| **DK** | van Veen grab | 0.1 | 313 | |
| **EST** | Birge | 0.021 | 2153 | Dry weight, to species |
| | Boxcore | 0.04 | 19 | |
| | Lenz | 0.021 | 627 | |
| | Petersen | 0.044 | 344 | |
| | van Veen grab | 0.1 | 427 | |
| **Fremddaten** | van Veen grab | 0.1 | 1536 | Partly, to species |
| **IOW** | van Veen grab | 0.1 | 1370 | To species |
| **ICES** | van Veen grab | 0.1 | 40 | - |
| **KUCORPI** | van Veen grab | 0.1 | 313 | Fresh weight |
| **LHEI** | van Veen grab | 0.1 - 0.118 | 195 | - |
| **ZIN** | van Veen grab | 0.1 | 25 | To species |
| **NMFRI** | Reineck | 0.0225 | 48 | To species |
| | van Veen grab | 0.1 | 298 | |
| **SE** | Smith-McIntyre grab | 0.1 | 21 | To species |
| | van Veen grab | 0.0977 - 0.1221 | 6791 | |
| **SYKE** | Boxcore | - | 57 | To species |
| | Ekman | 0.0225 - 0.1445 | 247 | |
| | van Veen grab | 0.1 - 0.1153 | 1425 | |


DEPTH
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Kattegat
Great Belt
Little Belt
The Sound
Kiel Bay
Bay of Mecklenburg
Flensburg Fjord
Wismar Bay
Arkona Basin
Warnow Estuary
Rugia Lagoons
Eastern Gotland Basin
Gulf of Gdansk
Bornholm Basin
Greifswald Lagoon
Western Gotland Basin
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Gulf of Riga
Gulf of Finland
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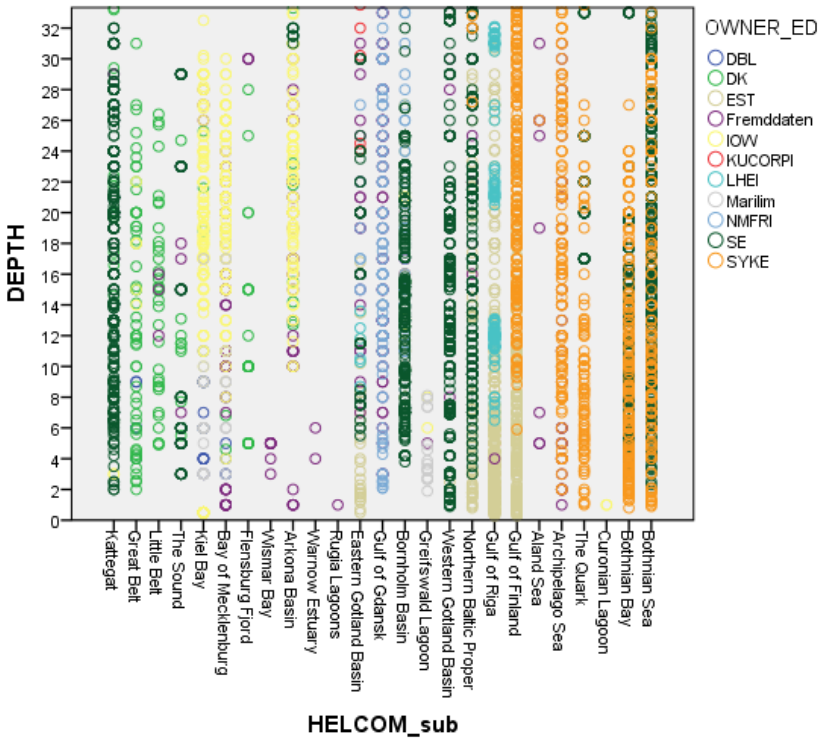
Archipelago Sea
The Quark
Curonian Lagoon
Bothnian Bay
Bothnian Sea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Kattegat
Great Belt
Little Belt
The Sound
Kiel Bay
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Flensburg Fjord
Wismar Bay
Arkona Basin
Warnow Estuary
Rugia Lagoons
Eastern Gotland Basin
Gulf of Gdansk
Bornholm Basin
Greifswald Lagoon
Western Gotland Basin
Northern Baltic Proper
Gulf of Riga
Gulf of Finland
Aland Sea
Archipelago Sea
The Quark
Curonian Lagoon
Bothnian Bay
Bothnian Sea

**Appendix 2**

List of taxa considered for communities classification

| | | on at least one sampling event | | |
|---|---|---|---|---|
| **Original taxa** | **Included as** | **Max cumulative abundance** | **Max relative abundance** | **N of stations** |
| Abra alba | Abra alba | 0.90 | 0.86 | 792 |
| Abra nitida | Abra nitida | 0.90 | 0.64 | 292 |
| Abra prismatica | Abra prismatica | 0.88 | 0.10 | 2 |
| Akera bullata | Akera bullata | 0.79 | 0.19 | 5 |
| Alderia modesta | Alderia modesta | 0.88 | 0.05 | 1 |
| Alitta succinea | Alitta succinea | 0.90 | 0.65 | 141 |
| Alitta virens | Alitta virens | 0.90 | 0.14 | 17 |
| Alkmaria romijni | Alkmaria romijni | 0.84 | 0.50 | 6 |
| Ampelisca brevicornis | Ampelisca | 0.90 | 0.71 | 115 |
| Ampelisca diadema | Ampelisca | 0.89 | 0.07 | 11 |
| Ampelisca macrocephala | Ampelisca | 0.79 | 0.14 | 4 |
| Ampelisca sp. | Ampelisca | 0.90 | 0.11 | 6 |
| Ampelisca tenuicornis | Ampelisca | 0.90 | 0.32 | 198 |
| Ampharete acutifrons | Ampharete acutifrons | 0.89 | 0.16 | 10 |
| Ampharete baltica | Ampharete baltica | 0.90 | 0.43 | 393 |
| Ampharete finmarchica | Ampharete finmarchica | 0.90 | 0.50 | 37 |
| Amphibalanus improvisus | Amphibalanus improvisus | 0.90 | 0.88 | 224 |
| Amphictene auricoma | Amphictene auricoma | 0.90 | 0.13 | 123 |
| Amphitrite cirrata | Amphitrite cirrata | 0.90 | 0.07 | 9 |
| Amphiura chiajei | Amphiura | 0.90 | 0.44 | 251 |
| Amphiura filiformis | Amphiura | 0.90 | 0.72 | 555 |
| Amphiura sp. | Amphiura | 0.89 | 0.04 | 8 |
| Ampithoe rubricata | Ampithoe rubricata | 0.90 | 0.36 | 38 |
| Angulus pygmaeus | Angulus pygmaeus | 0.88 | 0.33 | 31 |
| Angulus tenuis | Angulus tenuis | 0.89 | 0.88 | 49 |
| Anobothrus gracilis | Anobothrus gracilis | 0.90 | 0.15 | 111 |
| Aonides paucibranchiata | Aonides paucibranchiata | 0.90 | 0.25 | 13 |
| Aoridae | Aoridae | 0.88 | 0.09 | 10 |
| Apherusa bispinosa | Apherusa bispinosa | 0.90 | 0.29 | 24 |
| Apocorophium lacustre | Apocorophium lacustre | 0.87 | 0.08 | 3 |
| Aporrhais pespelecani | Aporrhais pespelecani | 0.89 | 0.12 | 4 |
| Arctica islandica | Arctica islandica | 0.90 | 0.88 | 635 |
| Arenicola marina | Arenicola marina | 0.90 | 0.30 | 30 |
| Aricidea cerrutii | Aricidea cerrutii | 0.89 | 0.43 | 19 |
| Aricidea minuta | Aricidea minuta | 0.90 | 0.07 | 55 |
| Aricidea suecica | Aricidea suecica | 0.90 | 0.19 | 269 |
| Artacama proboscidea | Artacama proboscidea | 0.90 | 0.09 | 29 |
| Asellus aquaticus | Asellus aquaticus | 0.90 | 0.90 | 69 |
| Astarte | Astarte | 0.90 | 0.81 | 665 |

| | | | | |
|---|---|---|---|---|
| Asterias rubens | Asterias rubens | 0.90 | 0.75 | 155 |
| Autonoe longipes | Autonoe longipes | 0.90 | 0.08 | 5 |
| Balanus crenatus | Balanus crenatus | 0.89 | 0.72 | 65 |
| Bathyporeia | Bathyporeia | 0.90 | 0.88 | 610 |
| Bithynia tentaculata | Bithynia tentaculata | 0.90 | 0.77 | 47 |
| Bittium reticulatum | Bittium reticulatum | 0.90 | 0.88 | 140 |
| Branchiostoma lanceolatum | Branchiostoma lanceolatum | 0.89 | 0.25 | 56 |
| Bylgides elegans | Bylgides elegans | 0.87 | 0.09 | 4 |
| Bylgides sarsi | Bylgides sarsi | 0.90 | 0.90 | 612 |
| Calliopius laeviusculus | Calliopius laeviusculus | 0.89 | 0.30 | 42 |
| Capitella | Capitella | 0.90 | 0.88 | 155 |
| Caprella linearis | Caprella linearis | 0.90 | 0.07 | 27 |
| Caulleriella killariensis | Caulleriella killariensis | 0.90 | 0.15 | 35 |
| Cerastoderma edule | Cerastoderma edule | 0.90 | 0.86 | 48 |
| Cerastoderma glaucum | Cerastoderma glaucum | 0.90 | 0.89 | 906 |
| Ceratopogonidae | Diptera | 0.90 | 0.50 | 7 |
| Chaetoderma nitidulum | Chaetoderma nitidulum | 0.90 | 0.07 | 32 |
| Chaetozone setosa | Chaetozone setosa | 0.90 | 0.46 | 260 |
| Chamelea gallina | Chamelea gallina | 0.90 | 0.06 | 6 |
| Chamelea striatula | Chamelea striatula | 0.90 | 0.06 | 37 |
| Cheirocratus sundevalli | Cheirocratus sundevalli | 0.90 | 0.19 | 53 |
| Chironomidae | Chironomidae | 0.90 | 0.90 | 1514 |
| Ciona intestinalis | Ciona intestinalis | 0.90 | 0.14 | 19 |
| Cochlodesma praetenue | Cochlodesma praetenue | 0.90 | 0.14 | 21 |
| Corbula gibba | Corbula gibba | 0.90 | 0.89 | 703 |
| Corophium volutator | Corophium volutator | 0.90 | 0.89 | 735 |
| Crangon crangon | Crangon crangon | 0.89 | 0.17 | 23 |
| Crassicorophium bonellii | Crassicorophium bonellii | 0.89 | 0.10 | 15 |
| Crassicorophium crassicorne | Crassicorophium crassicorne | 0.90 | 0.47 | 160 |
| Crenella decussata | Crenella decussata | 0.89 | 0.13 | 28 |
| Cyanophthalma obscura | Cyanophthalma obscura | 0.90 | 0.84 | 59 |
| Cyathura carinata | Cyathura carinata | 0.90 | 0.38 | 69 |
| Cylichna cylindracea | Cylichna cylindracea | 0.90 | 0.05 | 89 |
| Dendrodoa grossularia | Dendrodoa grossularia | 0.90 | 0.79 | 159 |
| Diaphana minuta | Diaphana minuta | 0.88 | 0.10 | 4 |
| Diastylis | Diastylis | 0.85 | 0.33 | 3 |
| Diastylis bradyi | Diastylis | 0.75 | 0.03 | 2 |
| Diastylis lucifera | Diastylis | 0.90 | 0.20 | 108 |
| Diastylis rathkei | Diastylis | 0.90 | 0.88 | 1187 |
| Diplocirrus glaucus | Diplocirrus glaucus | 0.90 | 0.12 | 232 |
| Dipolydora caulleryi | Dipolydora caulleryi | 0.90 | 0.03 | 7 |
| Dipolydora coeca | Dipolydora coeca | 0.90 | 0.56 | 43 |
| Dipolydora quadrilobata | Dipolydora quadrilobata | 0.90 | 0.69 | 254 |
| Diptera | Diptera | 0.90 | 0.84 | 81 |

| | | | | |
|---|---|---|---|---|
| Dreissena polymorpha | Dreissena polymorpha | 0.90 | 0.81 | 38 |
| Dyopedos monacantha | Dyopedos monacantha | 0.90 | 0.24 | 28 |
| Echinocardium cordatum | Echinocardium cordatum | 0.90 | 0.42 | 79 |
| Echinocyamus pusillus | Echinocyamus pusillus | 0.90 | 0.41 | 133 |
| Echiurus echiurus | Echiurus echiurus | 0.82 | 0.09 | 4 |
| Ecrobia ventrosa | Hydrobiidae | 0.90 | 0.84 | 145 |
| Edwardsia danica | Edwardsia danica | 0.90 | 0.32 | 352 |
| Einhornia crustulenta | Einhornia crustulenta | 0.89 | 0.25 | 22 |
| Ennucula tenuis | Ennucula tenuis | 0.90 | 0.27 | 130 |
| Ensis directus | Ensis directus | 0.90 | 0.07 | 5 |
| Ephemeroptera | Ephemeroptera | 0.89 | 0.50 | 7 |
| Ericthonius punctatus | Ericthonius punctatus | 0.90 | 0.34 | 22 |
| Eteone longa | Eteone longa | 0.90 | 0.45 | 199 |
| Euchone papillosa | Euchone papillosa | 0.90 | 0.05 | 16 |
| Eudorella emarginata | Eudorella emarginata | 0.90 | 0.06 | 57 |
| Eudorella truncatula | Eudorella truncatula | 0.90 | 0.05 | 23 |
| Eumida | Eumida | 0.64 | 0.06 | 2 |
| Euspira nitida | Euspira nitida | 0.90 | 0.08 | 20 |
| Exogone | Exogone | 0.51 | 0.07 | 1 |
| Exogone hebes | Exogone | 0.90 | 0.11 | 16 |
| Exogone naidina | Exogone | 0.89 | 0.09 | 21 |
| Exogone sp. | Exogone | 0.89 | 0.21 | 6 |
| Fabricia stellaris | Fabricia stellaris | 0.90 | 0.21 | 15 |
| Fabriciola baltica | Fabriciola baltica | 0.90 | 0.14 | 27 |
| Facelina bostoniensis | Facelina bostoniensis | 0.88 | 0.14 | 4 |
| Galathowenia oculata | Galathowenia oculata | 0.90 | 0.42 | 263 |
| Gammarellus homari | Gammarellus homari | 0.89 | 0.08 | 3 |
| Gammaridae | Gammaridae | 0.90 | 0.86 | 949 |
| Gastrosaccus spinifer | Gastrosaccus spinifer | 0.90 | 0.23 | 102 |
| Gattyana cirrhosa | Gattyana cirrhosa | 0.85 | 0.09 | 2 |
| Glycera alba | Glycera alba | 0.90 | 0.07 | 163 |
| Glyphohesione klatti | Glyphohesione klatti | 0.89 | 0.07 | 5 |
| Goniada maculata | Goniada maculata | 0.90 | 0.07 | 175 |
| Halcampa duodecimcirrata | Halcampa duodecimcirrata | 0.90 | 0.08 | 29 |
| Halicryptus spinulosus | Halicryptus spinulosus | 0.90 | 0.85 | 329 |
| Haploops sp. | Haploops sp. | 0.71 | 0.08 | 3 |
| Harmothoe imbricata | Harmothoe | 0.90 | 0.29 | 114 |
| Harmothoe impar | Harmothoe | 0.90 | 0.55 | 129 |
| Harmothoe sp. | Harmothoe | 0.88 | 0.33 | 14 |
| Haustorius arenarius | Haustorius arenarius | 0.88 | 0.08 | 2 |
| Hediste diversicolor | Hediste diversicolor | 0.90 | 0.80 | 945 |
| Heteromastus filiformis | Heteromastus filiformis | 0.90 | 0.84 | 610 |
| Heterotanais oerstedii | Heterotanais oerstedii | 0.90 | 0.33 | 6 |
| Hyala vitrea | Hyala vitrea | 0.90 | 0.32 | 224 |
| Hydrobia acuta | Hydrobiidae | 0.87 | 0.02 | 1 |

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|---|---|---|---|---|
| Hydrobiidae | Hydrobiidae | 0.90 | 0.83 | 360 |
| Idotea balthica | Idotea | 0.90 | 0.43 | 97 |
| Idotea chelipes | Idotea | 0.90 | 0.53 | 72 |
| Idotea granulosa | Idotea | 0.88 | 0.12 | 9 |
| Idotea sp. | Idotea | 0.90 | 0.38 | 20 |
| Ischyrocerus anguipes | Ischyrocerus anguipes | 0.89 | 0.08 | 5 |
| Jaera sp. | Jaera sp. | 0.90 | 0.63 | 110 |
| Kurtiella bidentata | Kurtiella bidentata | 0.90 | 0.73 | 1183 |
| Labidoplax buskii | Labidoplax buskii | 0.90 | 0.10 | 54 |
| Laeospira corallinae | Laeospira corallinae | 0.89 | 0.35 | 8 |
| Lagis koreni | Lagis koreni | 0.90 | 0.85 | 509 |
| Lamprops fasciatus | Lamprops fasciatus | 0.89 | 0.09 | 3 |
| Lanice conchilega | Lanice conchilega | 0.90 | 0.12 | 27 |
| Laonome kroyeri | Laonome kroyeri | 0.90 | 0.54 | 31 |
| Lekanesphaera hookeri | Lekanesphaera hookeri | 0.89 | 0.10 | 12 |
| Lepidonotus squamatus | Lepidonotus squamatus | 0.89 | 0.11 | 5 |
| Lepidoptera | Lepidoptera | 0.90 | 0.37 | 4 |
| Leptocheirus hirsutimanus | Leptocheirus hirsutimanus | 0.89 | 0.40 | 26 |
| Leptocheirus pilosus | Leptocheirus pilosus | 0.89 | 0.66 | 16 |
| Leptochiton asellus | Leptochiton asellus | 0.89 | 0.18 | 33 |
| Leucon nasica | Leucon nasica | 0.89 | 0.35 | 103 |
| Levinsenia gracilis | Levinsenia gracilis | 0.90 | 0.57 | 130 |
| Lineus ruber | Lineus ruber | 0.90 | 0.19 | 27 |
| Littorina littorea | Littorina littorea | 0.90 | 0.70 | 40 |
| Littorina saxatilis | Littorina saxatilis | 0.90 | 0.22 | 46 |
| Lymnaea stagnalis | Lymnaea stagnalis | 0.81 | 0.07 | 1 |
| Lysilla loveni | Lysilla loveni | 0.90 | 0.12 | 24 |
| Macoma balthica | Macoma balthica | 0.90 | 0.90 | 6113 |
| Macoma calcarea | Macoma calcarea | 0.90 | 0.50 | 80 |
| Magelona alleni | Magelona alleni | 0.90 | 0.13 | 35 |
| Magelona mirabilis | Magelona mirabilis | 0.89 | 0.08 | 11 |
| Maldane sarsi | Maldane sarsi | 0.90 | 0.64 | 147 |
| Manayunkia aestuarina | Manayunkia aestuarina | 0.90 | 0.38 | 31 |
| Mangelia attenuata | Mangelia attenuata | 0.42 | 0.42 | 2 |
| Marenzelleria | Marenzelleria | 0.90 | 0.90 | 2482 |
| Medicorophium affine | Medicorophium affine | 0.89 | 0.08 | 12 |
| Megamphopus cornutus | Megamphopus cornutus | 0.89 | 0.11 | 28 |
| Melita palmata | Melita palmata | 0.89 | 0.10 | 12 |
| Metridium senile | Metridium senile | 0.89 | 0.18 | 10 |
| Microdeutopus anomalus | Microdeutopus anomalus | 0.89 | 0.07 | 7 |
| Microdeutopus gryllotalpa | Microdeutopus gryllotalpa | 0.90 | 0.46 | 284 |
| Modiolus modiolus | Modiolus modiolus | 0.89 | 0.14 | 16 |
| Molgula manhattensis | Molgula manhattensis | 0.90 | 0.22 | 20 |
| Monocorophium insidiosum | Monocorophium insidiosum | 0.90 | 0.50 | 162 |
| Monoporeia affinis | Monoporeia affinis | 0.90 | 0.90 | 2202 |

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|---|---|---|---|---|
| Musculus discors | Musculus discors | 0.90 | 0.34 | 50 |
| Musculus niger | Musculus niger | 0.90 | 0.14 | 51 |
| Musculus subpictus | Musculus subpictus | 0.90 | 0.12 | 77 |
| Mya arenaria | Mya arenaria | 0.90 | 0.79 | 897 |
| Mya truncata | Mya truncata | 0.90 | 0.50 | 30 |
| Mytilus | Mytilus | 0.90 | 0.90 | 2206 |
| Nassarius | Nassarius | 0.90 | 0.28 | 71 |
| Nemertea | Nemertea | 0.90 | 0.20 | 450 |
| Neoamphitrite figulus | Neoamphitrite figulus | 0.88 | 0.49 | 8 |
| Nephtys caeca | Nephtys | 0.90 | 0.24 | 256 |
| Nephtys ciliata | Nephtys | 0.90 | 0.47 | 216 |
| Nephtys hombergii | Nephtys | 0.90 | 0.53 | 508 |
| Nephtys incisa | Nephtys | 0.90 | 0.39 | 134 |
| Nephtys longosetosa | Nephtys | 0.90 | 0.17 | 51 |
| Nephtys paradoxa | Nephtys | 0.88 | 0.02 | 1 |
| Nephtys pente | Nephtys | 0.86 | 0.02 | 8 |
| Nephtys sp. | Nephtys | 0.90 | 0.17 | 12 |
| Neptunea antiqua | Neptunea antiqua | 0.44 | 0.18 | 1 |
| Nereididae | Nereididae | 0.90 | 0.46 | 24 |
| Nereimyra punctata | Nereimyra punctata | 0.90 | 0.29 | 74 |
| Nereis pelagica | Nereis pelagica | 0.88 | 0.22 | 5 |
| Nicolea zostericola | Nicolea zostericola | 0.90 | 0.07 | 36 |
| Nicomache minor | Nicomache minor | 0.87 | 0.14 | 10 |
| Notomastus latericeus | Notomastus latericeus | 0.90 | 0.08 | 37 |
| Nucula nitidosa | Nucula nitidosa | 0.90 | 0.68 | 225 |
| Nucula sulcata | Nucula sulcata | 0.90 | 0.45 | 44 |
| Nymphon brevirostre | Nymphon brevirostre | 0.89 | 0.07 | 11 |
| Odostomia scalaris | Odostomia scalaris | 0.90 | 0.38 | 38 |
| Oligochaeta | Oligochaeta | 0.90 | 0.90 | 3015 |
| Onchidoris muricata | Onchidoris muricata | 0.56 | 0.14 | 3 |
| Onoba semicostata | Onoba semicostata | 0.90 | 0.28 | 114 |
| Ophelia borealis | Ophelia borealis | 0.89 | 0.47 | 106 |
| Ophelia limacina | Ophelia limacina | 0.89 | 0.25 | 18 |
| Ophelia rathkei | Ophelia rathkei | 0.90 | 0.70 | 39 |
| Ophelina acuminata | Ophelina acuminata | 0.90 | 0.09 | 23 |
| Ophiodromus flexuosus | Ophiodromus flexuosus | 0.90 | 0.04 | 11 |
| Ophiura albida | Ophiura | 0.90 | 0.50 | 226 |
| Ophiura ophiura | Ophiura | 0.80 | 0.02 | 2 |
| Ophiura sp. | Ophiura | 0.90 | 0.17 | 88 |
| Orbinia sertulata | Orbinia sertulata | 0.84 | 0.06 | 3 |
| Owenia fusiformis | Owenia fusiformis | 0.89 | 0.79 | 49 |
| Palaemon adspersus | Palaemon adspersus | 0.61 | 0.07 | 4 |
| Pallaseopsis quadrispinosa | Pallaseopsis quadrispinosa | 0.86 | 0.26 | 11 |
| Paraonis fulgens | Paraonis fulgens | 0.90 | 0.39 | 28 |
| Parvicardium hauniense | Parvicardium hauniense | 0.90 | 0.06 | 6 |

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|---|---|---|---|---|
| Parvicardium minimum | Parvicardium minimum | 0.90 | 0.06 | 17 |
| Parvicardium pinnulatum | Parvicardium pinnulatum | 0.90 | 0.68 | 370 |
| Parvicardium scabrum | Parvicardium scabrum | 0.89 | 0.08 | 33 |
| Pectinaria auricoma | Pectinaria auricoma | 0.90 | 0.06 | 12 |
| Peringia ulvae | Hydrobiidae | 0.90 | 0.90 | 2423 |
| Perioculodes longimanus | Perioculodes longimanus | 0.89 | 0.05 | 6 |
| Phaxas pellucidus | Phaxas pellucidus | 0.90 | 0.38 | 86 |
| Pherusa plumosa | Pherusa plumosa | 0.90 | 0.11 | 65 |
| Philine aperta | Philine aperta | 0.90 | 0.17 | 53 |
| Pholoe assimilis | Pholoe assimilis | 0.90 | 0.09 | 110 |
| Pholoe baltica | Pholoe baltica | 0.90 | 0.25 | 451 |
| Pholoe inornata | Pholoe inornata | 0.90 | 0.21 | 142 |
| Phoronis muelleri | Phoronis | 0.90 | 0.53 | 362 |
| Phoronis sp. | Phoronis | 0.90 | 0.33 | 100 |
| Phoxocephalus holbolli | Phoxocephalus holbolli | 0.90 | 0.30 | 181 |
| Phtisica marina | Phtisica marina | 0.90 | 0.03 | 16 |
| Phyllodoce groenlandica | Phyllodoce groenlandica | 0.89 | 0.12 | 23 |
| Phyllodoce maculata | Phyllodoce maculata | 0.86 | 0.06 | 2 |
| Phyllodoce mucosa | Phyllodoce mucosa | 0.90 | 0.10 | 63 |
| Physa fontinalis | Physa fontinalis | 0.89 | 0.07 | 1 |
| Pisidium sp. | Pisidium sp. | 0.90 | 0.90 | 76 |
| Platynereis dumerilii | Platynereis dumerilii | 0.90 | 0.06 | 9 |
| Podocoryna carnea | Podocoryna carnea | 0.87 | 0.59 | 12 |
| Polycirrus medusa | Polycirrus medusa | 0.90 | 0.29 | 122 |
| Polydora ciliata | Polydora | 0.90 | 0.82 | 78 |
| Polydora cornuta | Polydora | 0.90 | 0.20 | 55 |
| Polydora sp. | Polydora | 0.89 | 0.43 | 5 |
| Polynoidae | Polynoidae | 0.83 | 0.06 | 4 |
| Pontocrates arenarius | Pontocrates arenarius | 0.89 | 0.09 | 29 |
| Pontoporeia femorata | Pontoporeia femorata | 0.90 | 0.90 | 441 |
| Potamopyrgus antipodarum | Potamopyrgus antipodarum | 0.90 | 0.89 | 282 |
| Priapulus caudatus | Priapulus caudatus | 0.90 | 0.17 | 31 |
| Prionospio fallax | Prionospio fallax | 0.90 | 0.43 | 270 |
| Prionospio steenstrupi | Prionospio steenstrupi | 0.66 | 0.14 | 2 |
| Protomedeia fasciata | Protomedeia fasciata | 0.90 | 0.23 | 46 |
| Psammechinus miliaris | Psammechinus miliaris | 0.90 | 0.08 | 5 |
| Psolus phantapus | Psolus phantapus | 0.87 | 0.06 | 4 |
| Pusillina inconspicua | Pusillina inconspicua | 0.90 | 0.25 | 38 |
| Pusillina sarsii | Pusillina sarsii | 0.90 | 0.34 | 14 |
| Pygospio elegans | Pygospio elegans | 0.90 | 0.87 | 1904 |
| Radix balthica | Radix balthica | 0.90 | 0.82 | 71 |
| Retusa obtusa | Retusa obtusa | 0.90 | 0.07 | 12 |
| Retusa truncatula | Retusa truncatula | 0.90 | 0.26 | 101 |
| Rhodine gracilior | Rhodine gracilior | 0.90 | 0.39 | 99 |
| Rhodine loveni | Rhodine loveni | 0.90 | 0.06 | 22 |

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|---|---|---|---|---|
| Rissoa membranacea | Rissoa membranacea | 0.89 | 0.06 | 14 |
| Sabellidae | Sabellidae | 0.85 | 0.06 | 2 |
| Saduria entomon | Saduria entomon | 0.90 | 0.84 | 301 |
| Saxicavella jeffreysi | Saxicavella jeffreysi | 0.90 | 0.13 | 10 |
| Scalibregma inflatum | Scalibregma inflatum | 0.90 | 0.72 | 243 |
| Scolelepis foliosa | Scolelepis foliosa | 0.89 | 0.02 | 3 |
| Scoloplos armiger | Scoloplos armiger | 0.90 | 0.90 | 1680 |
| Scrobicularia plana | Scrobicularia plana | 0.81 | 0.15 | 4 |
| Seraphsidae | Seraphsidae | 0.84 | 0.06 | 5 |
| Sphaerodorum gracilis | Sphaerodorum gracilis | 0.90 | 0.12 | 103 |
| Spio arndti | Spio arndti | 0.90 | 0.11 | 48 |
| Spio filicornis | Spio arndti | 0.90 | 0.76 | 38 |
| Spio goniocephala | Spio goniocephala | 0.90 | 0.24 | 201 |
| Spio martinensis | Spio martinensis | 0.88 | 0.12 | 6 |
| Spiophanes bombyx | Spiophanes bombyx | 0.90 | 0.44 | 113 |
| Spiophanes kroyeri | Spiophanes kroyeri | 0.90 | 0.08 | 63 |
| Spirorbis spirorbis | Spirorbis spirorbis | 0.89 | 0.34 | 9 |
| Spisula subtruncata | Spisula subtruncata | 0.90 | 0.19 | 32 |
| Stenothoe monoculoides | Stenothoe monoculoides | 0.82 | 0.37 | 6 |
| Streblospio shrubsolii | Streblospio shrubsolii | 0.90 | 0.16 | 9 |
| Streptosyllis websteri | Streptosyllis websteri | 0.90 | 0.21 | 33 |
| Syllidae | Syllidae | 0.88 | 0.10 | 8 |
| Tanaissus lilljeborgi | Tanaissus lilljeborgi | 0.90 | 0.27 | 51 |
| Tellimya ferruginosa | Tellimya ferruginosa | 0.90 | 0.13 | 25 |
| Tellimya tenella | Tellimya tenella | 0.90 | 0.14 | 46 |
| Tellina fabula | Tellina fabula | 0.90 | 0.86 | 91 |
| Tenellia adspersa | Tenellia adspersa | 0.88 | 0.08 | 1 |
| Terebellides stroemii | Terebellides stroemii | 0.90 | 0.65 | 586 |
| Theodoxus fluviatilis | Theodoxus fluviatilis | 0.90 | 0.83 | 367 |
| Thracia phaseolina | Thracia phaseolina | 0.90 | 0.48 | 79 |
| Thyasira flexuosa | Thyasira flexuosa | 0.90 | 0.65 | 123 |
| Thysanocardia procera | Thysanocardia procera | 0.74 | 0.06 | 1 |
| Travisia forbesii | Travisia forbesii | 0.90 | 0.24 | 64 |
| Trichoptera | Trichoptera | 0.90 | 0.17 | 11 |
| Trochochaeta multisetosa | Trochochaeta multisetosa | 0.90 | 0.67 | 106 |
| Turbellaria | Turbellaria | 0.90 | 0.05 | 16 |
| Turritella communis | Turritella communis | 0.90 | 0.22 | 92 |
| Urothoe elegans | Urothoe elegans | 0.89 | 0.10 | 13 |
| Urothoe grimaldii | Urothoe grimaldii | 0.78 | 0.15 | 5 |
| Urothoe poseidonis | Urothoe poseidonis | 0.90 | 0.14 | 7 |
| Valvata macrostoma | Valvata macrostoma | 0.80 | 0.40 | 4 |
| Valvata piscinalis | Valvata piscinalis | 0.88 | 0.39 | 9 |
| Virgularia mirabilis | Virgularia mirabilis | 0.89 | 0.05 | 5 |

**Appendix 3**

Results of SIMPER analysis for 10 major communities

*Group 2*
Average similarity: 36.33

| Species | Av.Abund | Av.Sim | Sim/SD | Contrib% | Cum.% |
|---|---|---|---|---|---|
| Hydrobiidae | 5.07 | 13.86 | 1.59 | 38.16 | 38.16 |
| Mytilus | 2.89 | 4.62 | 0.67 | 12.71 | 50.87 |
| Pygospio elegans | 2.47 | 3.69 | 0.56 | 10.15 | 61.02 |
| Macoma balthica | 2.17 | 3.54 | 0.66 | 9.73 | 70.75 |
| Oligochaeta | 1.81 | 2.20 | 0.53 | 6.07 | 76.82 |
| Mya arenaria | 1.73 | 2.10 | 0.49 | 5.79 | 82.61 |
| Cerastoderma glaucum | 1.55 | 1.68 | 0.40 | 4.61 | 87.22 |
| Hediste diversicolor | 1.25 | 1.25 | 0.39 | 3.44 | 90.66 |

*Group 3*
Average similarity: 29.52

| Species | Av.Abund | Av.Sim | Sim/SD | Contrib% | Cum.% |
|---|---|---|---|---|---|
| Scoloplos armiger | 2.70 | 3.72 | 1.02 | 12.62 | 12.62 |
| Nephtys | 1.97 | 2.94 | 1.00 | 9.96 | 22.58 |
| Abra alba | 2.45 | 2.78 | 0.77 | 9.42 | 31.99 |
| Kurtiella bidentata | 2.48 | 2.75 | 0.97 | 9.32 | 41.32 |
| Diastylis | 2.39 | 2.75 | 0.76 | 9.30 | 50.62 |
| Corbula gibba | 2.14 | 2.69 | 0.79 | 9.11 | 59.74 |
| Lagis koreni | 1.73 | 1.34 | 0.55 | 4.52 | 64.26 |
| Arctica islandica | 1.43 | 1.16 | 0.53 | 3.93 | 68.19 |
| Hydrobiidae | 1.50 | 1.02 | 0.44 | 3.46 | 71.65 |
| Pygospio elegans | 1.36 | 0.70 | 0.41 | 2.38 | 74.03 |
| Heteromastus filiformis | 1.02 | 0.64 | 0.41 | 2.18 | 76.21 |
| Macoma balthica | 1.14 | 0.60 | 0.39 | 2.05 | 78.26 |
| Mytilus | 1.41 | 0.60 | 0.40 | 2.04 | 80.30 |
| Terebellides stroemii | 1.16 | 0.54 | 0.34 | 1.84 | 82.14 |
| Ampharete baltica | 0.86 | 0.41 | 0.39 | 1.39 | 83.53 |
| Parvicardium pinnulatum | 1.04 | 0.37 | 0.34 | 1.25 | 84.78 |
| Oligochaeta | 0.83 | 0.31 | 0.31 | 1.04 | 85.82 |
| Dipolydora quadrilobata | 0.87 | 0.29 | 0.31 | 0.99 | 86.81 |
| Bylgides sarsi | 0.58 | 0.28 | 0.27 | 0.96 | 87.77 |
| Astarte | 0.91 | 0.28 | 0.30 | 0.93 | 88.70 |
| Aricidea suecica | 0.74 | 0.27 | 0.30 | 0.91 | 89.61 |
| Scalibregma inflatum | 0.65 | 0.22 | 0.17 | 0.74 | 90.35 |

*Group 1*
Average similarity: 27.01

| Species | Av.Abund | Av.Sim | Sim/SD | Contrib% | Cum.% |
|---|---|---|---|---|---|
| Macoma balthica | 2.66 | 12.51 | 0.79 | 46.31 | 46.31 |
| Monoporeia affinis | 1.67 | 5.39 | 0.46 | 19.94 | 66.25 |
| Marenzelleria | 1.70 | 4.80 | 0.45 | 17.78 | 84.03 |
| Oligochaeta | 1.06 | 1.97 | 0.31 | 7.29 | 91.32 |

*Group 4*
Average similarity: 32.29

| Species | Av.Abund | Av.Sim | Sim/SD | Contrib% | Cum.% |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Macoma balthica | 2.60 | 9.98 | 1.00 | 30.91 | 30.91 |
| Bylgides sarsi | 1.77 | 9.85 | 0.82 | 30.51 | 61.42 |
| Diastylis | 1.84 | 4.13 | 0.59 | 12.78 | 74.19 |
| Scoloplos armiger | 1.55 | 3.67 | 0.46 | 11.36 | 85.56 |
| Pontoporeia femorata | 0.97 | 1.77 | 0.39 | 5.49 | 91.04 |

*Group 6*
Average similarity: 46.31

| Species | Av.Abund | Av.Sim | Sim/SD | Contrib% | Cum.% |
|---|---|---|---|---|---|
| Mytilus | 5.26 | 43.47 | 2.40 | 93.87 | 93.87 |

*Group 9*
Average similarity: 31.46

| Species | Av.Abund | Av.Sim | Sim/SD | Contrib% | Cum.% |
|---|---|---|---|---|---|
| Lagis koreni | 3.87 | 16.62 | 1.41 | 52.83 | 52.83 |
| Abra alba | 1.94 | 3.28 | 0.57 | 10.43 | 63.26 |
| Nephtys | 1.25 | 2.50 | 0.65 | 7.94 | 71.20 |
| Corbula gibba | 0.95 | 1.67 | 0.47 | 5.30 | 76.50 |
| Harmothoe | 1.01 | 1.66 | 0.51 | 5.27 | 81.77 |
| Halicryptus spinulosus | 0.90 | 1.27 | 0.40 | 4.05 | 85.82 |
| Mytilus | 1.23 | 0.77 | 0.30 | 2.43 | 88.25 |
| Kurtiella bidentata | 0.76 | 0.63 | 0.28 | 2.01 | 90.26 |

*Group 5*
Average similarity: 34.17

| Species | Av.Abund | Av.Sim | Sim/SD | Contrib% | Cum.% |
|---|---|---|---|---|---|
| Amphiura | 3.77 | 5.14 | 1.10 | 15.06 | 15.06 |
| Kurtiella bidentata | 2.84 | 3.94 | 1.48 | 11.54 | 26.59 |
| Nephtys | 1.63 | 1.93 | 0.83 | 5.64 | 32.23 |
| Phoronis | 1.92 | 1.89 | 0.77 | 5.54 | 37.77 |
| Abra nitida | 1.68 | 1.52 | 0.75 | 4.46 | 42.23 |
| Ophiura | 1.47 | 1.32 | 0.62 | 3.87 | 46.10 |
| Abra alba | 1.50 | 1.27 | 0.57 | 3.73 | 49.83 |
| Prionospio fallax | 1.57 | 1.27 | 0.67 | 3.71 | 53.54 |
| Pholoe baltica | 1.34 | 1.18 | 0.61 | 3.45 | 56.99 |
| Ampelisca | 1.21 | 1.01 | 0.68 | 2.94 | 59.93 |
| Thyasira flexuosa | 1.34 | 0.99 | 0.53 | 2.90 | 62.83 |
| Galathowenia oculata | 1.41 | 0.98 | 0.58 | 2.87 | 65.70 |
| Scalibregma inflatum | 1.39 | 0.93 | 0.55 | 2.73 | 68.43 |
| Ennucula tenuis | 1.21 | 0.86 | 0.45 | 2.52 | 70.95 |
| Nucula nitidosa | 1.28 | 0.86 | 0.49 | 2.52 | 73.47 |
| Pholoe inornata | 1.25 | 0.83 | 0.49 | 2.43 | 75.90 |
| Corbula gibba | 1.02 | 0.77 | 0.49 | 2.24 | 78.14 |
| Nemertea | 0.93 | 0.68 | 0.51 | 1.99 | 80.14 |
| Heteromastus filiformis | 0.96 | 0.54 | 0.40 | 1.57 | 81.71 |
| Hyala vitrea | 0.89 | 0.50 | 0.29 | 1.45 | 83.17 |
| Diplocirrus glaucus | 0.83 | 0.46 | 0.39 | 1.35 | 84.51 |
| Glycera alba | 0.72 | 0.42 | 0.39 | 1.22 | 85.73 |
| Arctica islandica | 0.68 | 0.39 | 0.32 | 1.14 | 86.87 |
| Rhodine gracilior | 0.81 | 0.36 | 0.32 | 1.04 | 87.92 |
| Goniada maculata | 0.63 | 0.34 | 0.37 | 1.00 | 88.92 |
| Chaetozone setosa | 0.65 | 0.33 | 0.36 | 0.98 | 89.90 |
| Maldane sarsi | 0.84 | 0.32 | 0.30 | 0.95 | 90.85 |

*Group 10*
Average similarity: 31.92

| Species | Av.Abund | Av.Sim | Sim/SD | Contrib% | Cum.% |
|---|---|---|---|---|---|
| Oligochaeta | 2.73 | 5.98 | 1.27 | 18.73 | 18.73 |
| Scoloplos armiger | 2.24 | 5.73 | 1.28 | 17.96 | 36.68 |
| Kurtiella bidentata | 2.78 | 4.59 | 0.96 | 14.38 | 51.06 |
| Mytilus | 2.35 | 4.06 | 0.74 | 12.71 | 63.77 |
| Harmothoe | 1.98 | 2.89 | 0.76 | 9.06 | 72.83 |
| Bittium reticulatum | 1.62 | 1.79 | 0.46 | 5.62 | 78.45 |
| Echinocyamus pusillus | 1.91 | 1.79 | 0.45 | 5.62 | 84.07 |
| Microdeutopus gryllotalpa | 1.07 | 0.68 | 0.35 | 2.13 | 86.20 |
| Asterias rubens | 1.03 | 0.68 | 0.34 | 2.12 | 88.31 |
| Alitta succinea | 0.86 | 0.62 | 0.24 | 1.93 | 90.25 |

*Group 7*
Average similarity: 35.30

| Species | Av.Abund | Av.Sim | Sim/SD | Contrib% | Cum.% |
|---|---|---|---|---|---|
| Phoronis | 2.95 | 3.60 | 1.14 | 10.19 | 10.19 |
| Spiophanes bombyx | 2.55 | 3.42 | 1.24 | 9.68 | 19.87 |
| Scoloplos armiger | 2.43 | 3.31 | 1.28 | 9.38 | 29.24 |
| Tellina fabula | 2.39 | 2.53 | 0.78 | 7.17 | 36.41 |
| Nephtys | 1.77 | 2.19 | 0.96 | 6.20 | 42.62 |
| Ophelia borealis | 1.72 | 1.74 | 0.65 | 4.93 | 47.54 |
| Bathyporeia | 1.80 | 1.70 | 0.63 | 4.80 | 52.35 |
| Ampelisca | 1.78 | 1.55 | 0.67 | 4.39 | 56.74 |
| Kurtiella bidentata | 1.72 | 1.55 | 0.69 | 4.38 | 61.12 |
| Edwardsia danica | 1.54 | 1.52 | 0.73 | 4.31 | 65.43 |
| Echinocyamus pusillus | 1.58 | 1.38 | 0.59 | 3.90 | 69.34 |
| Spio arndti | 1.48 | 1.31 | 0.71 | 3.72 | 73.06 |
| Arctica islandica | 1.32 | 1.04 | 0.62 | 2.94 | 76.00 |
| Thracia phaseolina | 1.30 | 0.91 | 0.51 | 2.57 | 78.57 |
| Nemertea | 1.07 | 0.87 | 0.57 | 2.47 | 81.03 |
| Chaetozone setosa | 0.99 | 0.71 | 0.48 | 2.01 | 83.05 |
| Amphiura | 0.96 | 0.53 | 0.46 | 1.52 | 84.56 |
| Branchiostoma lanceolatum | 0.85 | 0.47 | 0.37 | 1.32 | 85.89 |
| Lanice conchilega | 0.85 | 0.39 | 0.28 | 1.11 | 87.00 |
| Corbula gibba | 0.83 | 0.38 | 0.25 | 1.08 | 88.07 |
| Ophiura | 0.75 | 0.37 | 0.28 | 1.04 | 89.11 |
| Pholoe baltica | 0.77 | 0.32 | 0.34 | 0.89 | 90.00 |

*Group 8*
Average similarity: 34.11

| Species | Av.Abund | Av.Sim | Sim/SD | Contrib% | Cum.% |
|---|---|---|---|---|---|
| Angulus tenuis | 4.57 | 16.78 | 1.75 | 49.20 | 49.20 |
| Scoloplos armiger | 1.87 | 4.85 | 0.90 | 14.23 | 63.43 |
| Kurtiella bidentata | 1.94 | 3.54 | 0.65 | 10.38 | 73.81 |
| Corbula gibba | 1.52 | 2.57 | 0.62 | 7.53 | 81.34 |
| Pygospio elegans | 1.15 | 1.38 | 0.40 | 4.03 | 85.37 |
| Bathyporeia | 1.15 | 1.26 | 0.32 | 3.69 | 89.06 |
| Nephtys | 0.93 | 1.05 | 0.41 | 3.08 | 92.14 |

**Appendix 4**

**Abundance (ind/m$^2$)** **Biomass fresh weight (g/m$^2$)**

*Abra alba*

*Arctica islandica*

*Mya arenaria*

*Cerastoderma glaucum*

*Macoma balthica*