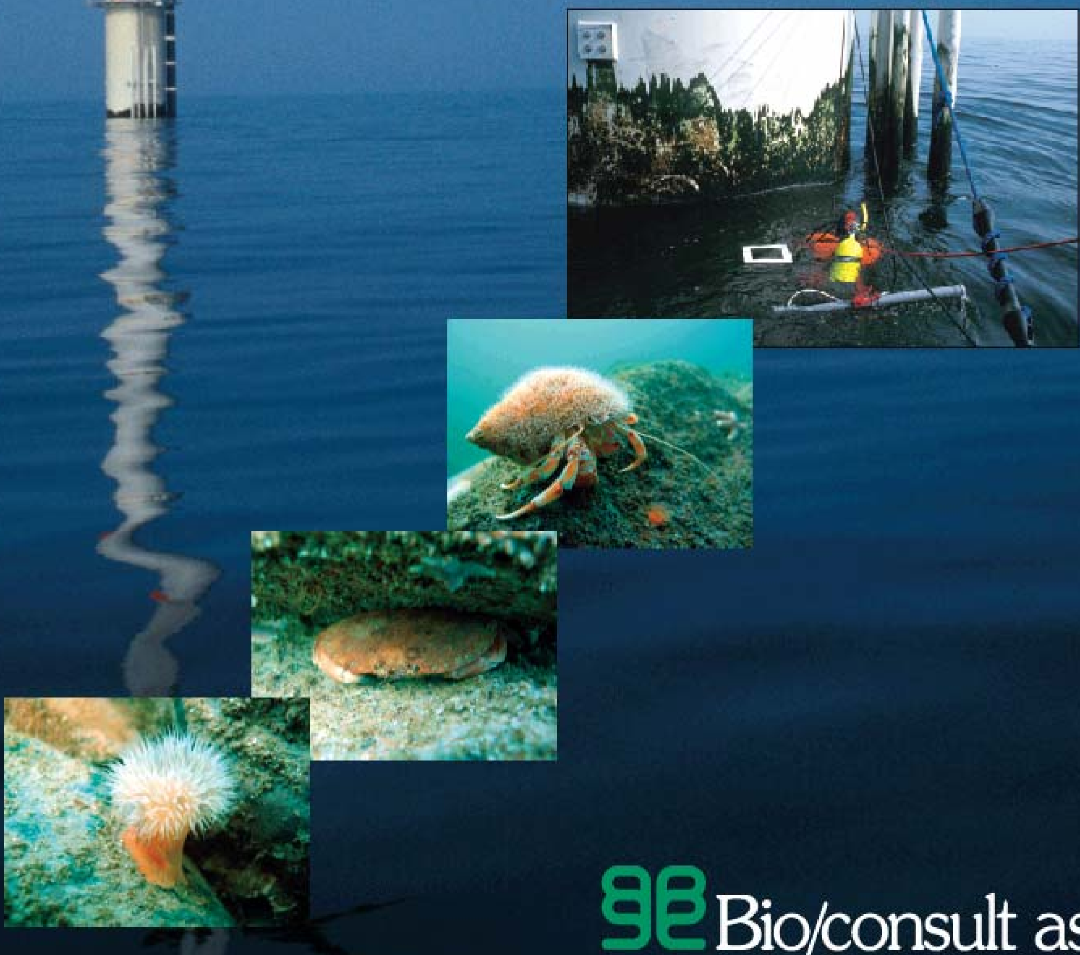
VATTENFALL

Benthic Communities at Horns Rev Before, During and After Construction of Horns Rev Offshore Wind Farm

Final Report
Annual Report 2005



Bio/consult as

Benthic Communities at Horns Rev Before, During and After Construction of Horns Rev Offshore Wind Farm

Final Report
Annual Report 2005

Published:	31. May 2006		
Prepared:	Simon B. Leonhard John Pedersen	Editing:	Gitte Spanggaard
Checked:	Bjarne Moeslund	Artwork:	Kirsten Nygaard
Approved:	Simon B. Leonhard	Cover photos:	Jens Christensen Simon B. Leonhard
		Photos:	Jens Christensen Maks Klaustrup Christian B. Hvidt Simon B. Leonhard
		English review:	Matthew Cochran

Table of contents Page

Summary

In 1997, the Horns Rev area was designated as one of five areas suitable for future off-shore wind farm development pursuant to the Danish Action Plan for Offshore Wind Farms. In 2002, the Horns Rev Offshore Wind Farm was established with a production capacity of 160 MW.

As part of the demonstration project, a monitoring programme was initiated to investigate the effects on the environment before, during and after the completion of the wind farm. The objective of the programme was to ensure that offshore wind power does not have damaging effects on natural ecosystems and to provide a solid basis for decisions for further offshore wind power development. The present study describes the effects on the benthic fauna and flora communities in the area designated for and later developed into the Horns Rev Offshore Wind Farm.

Horns Rev – the site of location

Horns Rev is an extension of Blåvands Huk, which extends more than 40 km to the west into the North Sea. The width of the reef varies between 1 km and 5 km and forms the northern extremity of the European Wadden Sea. Horns Rev was formed by sediment deposited during earlier geological periods. Today these deposits are covered by huge accumulations of marine sand and are subject to continuous sand deposition.

Horns Rev is constantly adjusting to variations in hydrography and sea level changes. It is an area of relatively shallow water, tidally influenced and dominated by waves. The hydrographic conditions are mainly a result of intrusions of Atlantic water into the southern part of the North Sea. The tidal current is mainly in a north south direction with a prevailing current toward NNE and a mean current speed of 0.5-0.7 m/s. The water depth and the prevailing mixing of the water do not favour stratified conditions or oxygen depletion.

The Horns Rev Offshore Wind Farm was established approximately 14 km WSW off Blåvands Huk. A total of 80 turbines were installed with the last turbine set in place in August 2002. The wind turbine foundations are monopiles that are 4 m in diameter. In order to minimise erosion, scour protections that are approximately 25 m in diameter were established using large stones around the foundations.

Within the wind farm area, the water depth varies from 6.5 m to 13.5 m. From the baseline study, the sediment consisted of medium to coarse sand with a great variability in grain size distribution. The seabed was generally characterised by migrating bed forms.

Objectives

The possible and expected effects on benthic communities from the wind farm establishment were outlined in the Environmental Impact Assessment. Loss of pre-existing habitats, the physical presence of the wind turbines and the introduction of hard substrate habitats were considered as the main and most important impacts to the benthic communities.

In compliance with the objectives of the demonstration programme monitoring of effects on the benthic and epifouling communities was required. The monitoring targeted the potential impacts from the introduction of hard substrate to benthic communities and the succession in the epifouling communities. The monitoring was performed from 1999 to 2005, before and after the erection of the wind farm.

Methodology

The sampling methodology for the monitoring programme was designed based on an evaluation of the data from 1999 solely to enable detection of major changes in the community structure of the infauna and to monitor the introduced hard bottom communities which was in compliance with the requirements set by the national authorities.

The monitoring on infauna and sediment included collection of samples by SCUBA divers in the wind farm area and in designated reference areas outside the wind farm. The stations in the wind farm were situated 5, 25 and 100 metres in a leeward direction from the scour protections around six turbine sites.

The hard bottom substrate monitoring of epifouling communities was performed at six turbine sites to investigate the horizontal and vertical distribution on scour protections and monopiles. Quantitative samples were collected from stone blocks at all six turbine scour protection sites; whereas the monopiles were only sampled at three turbine sites. Semi-quantitative (not precisely counted records) observations on the horizontal and vertical distribution of the flora and fauna fouling communities were made at all six turbine sites. The observations were classified according to a modified Braun-Blanquet scale along transects on both the scour protections and the monopiles. Epifouling communities exposed to different current regimes were studied both on the monopiles as well as on the scour protection. Some additional sampling was performed on specific communities in the splash zone. Fish species were observed, in addition to standard gill nets being used for specific test fishing. For documentation, underwater video recordings were made.

Multivariate analysis of the combined input from each species with respect to biomass and abundance was used to enhance the sensitivity of the statistical analysis.

Sediment

The wind farm area and the reference area are characterised by relatively uniform bottom conditions consisting of pure medium-fine to coarse sand with no organic matter. The particle size, measured as median grain size, of the sediment in the wind farm area has increased significantly from 350 µm in 2001 to 509 µm in 2005. A proportional increase was found in the reference areas with no differences being found in sediment parameters between reference and wind farm areas at each survey. In an expanded reference area, great variability in the grain size distribution was found. This variability is likely due to temporal changes and spatial differences in the sediment parameters in the Horns Rev area, which are attributable to natural variations in the seabed sediments.

Infauna

The natural benthic fauna in the Horns Rev area can be characterised as a *Goniadella-Spisula* community named after characteristic species in the community. Character species in the Horns Rev area consist of bristle worms (*Goniadella bobretzkii*, *Ophelia borealis*, *Pisione remota*, and *Orbinia sertulata*) and mussels (*Goodallia triangularis* and *Spisula solida*). The most abundant species were *Goniadella bobretzkii* and *Goodallia triangularis*. Like the fauna at other sublittoral sandbanks in the North Sea, the fauna at Horns Rev was very variable, heterogeneous and difficult to compare with other sandbanks and adjoining deeper waters. Mobile epifauna like the edible crab (*Cancer pagurus*) and the hermit crab (*Pagurus bernhardus*) could often be found on the seabed.

Considerable and statistically significant changes in the community structure were found in the infauna community in the wind farm area from 2001 to 2003 and 2004, although no changes were found in the community structure between 1999 and 2005. In general, no statistical significant changes in abundance and biomass distribution were found from 1999 to 2005 for most of the designated indicator organisms. The changes are considered as natural variations and are not attributable to the wind farm construction. No differences were found in benthic communities between sites at different distances from the wind turbine structures.

Effects from the wind farm

No effect was found on the sediment distribution pattern from the changes in hydrodynamic regimes due to the establishment of the turbine foundations.

No statistically significant differences were found in community structures on the scour protections between the leeward and the current side of the monopiles. At the base of the monopiles, a statistical difference was found in community structures indicating an impact from different hydrodynamic regimes on each side of the monopiles. Differences in community structure on the scour protections between overlapping zones at the leeward side of the monopiles might also reflect the effect of turbulence in the hydrodynamic regimes.

Differences in the distribution pattern of mussels inside and outside the wind farm area might be an effect from differences in the feeding behaviour of sea birds.

The most significant effect attributable to the construction of the offshore wind farm was the loss of pre-existing habitats and the introduction of hard substrate habitats into a community that originally was dominated by infauna in sandy sediments.

Hard bottom structures. Vegetation

The seaweeds introduced on the hard bottom structures displayed a distinct variation in temporal and spatial distribution. The vegetation was more frequently found on the monopiles compared to the scour protections. Only a few species were found on stones on the scour protections and if found these were predominantly at turbine sites in the shallowest sites, but an increase in total coverage was found since 2003.

A typical vertical zonation was found on the monopiles with species of *Ulva (Enteromorpha)* being the most frequent. Considerable changes in the vegetation community were observed since 2003, especially in the splash zone and at the upper part of the monopiles. Apparently the initial vegetation cover of filamentous algae was replaced by more or less permanent vegetation consisting of different species of green algae (*Ulva*). The red algae (*Polysiphonia fibrillose*), the purple laver (*Porphyra umbilicalis*) and the green algae (*Chaetomorpha linum*) were introduced at the latest in 2005. Succession in the vegetation cover of green algae at the monopiles was found with an increased depth distribution since 2003.

Hard bottom structures. Epifauna

Great variations were found in temporal and spatial distribution between species and communities. In general, community structure between turbine sites was statistically different. Differences in abundances of the dominant species of amphipods (*Jassa marmorata* and *Caprella linearis*) were the main factors to the vertical and spatial differences.

The cosmopolitan (*Jassa marmorata*) was most frequently found on the monopiles in densities of more than 1 million ind./m^2.

Distinct vertical zonations and changes in distribution pattern and abundances were observed in the faunal assemblages on the monopiles since the initial colonization in 2003. In the splash zone, the almost monoculture population of the “giant” midge (*Telmatogeton japonicus*) increased markedly since 2003. Dense aggregations of either spat or larger individuals of *Mytilus edulis* were found in the sublittoral zone just beneath the sea surface at the monopiles. Changes in population structure since 2003 clearly demonstrate growth of the common mussels. In 2005, successful establishment of *Mytilus edulis* was found at more turbine sites than previously. Clear discrepancies in the distribution and abundance between the common mussel (*Mytilus edulis*), the barnacle (*Balanus crenatus*) and the predator (*Asterias rubens*) indicated that the starfish was the main keystone predator controlling the vertical and horizontal distribution of its prey species.

At the base of the monopiles, the keelworm (*Pomatoceros triqueter*), an initial colonizer, was more abundant than in the upper zones. This species has decreased in abundance since September 2003. The apparent stagnation in population size of *Pomatoceros triqueter* might be the result of competition for space from other species. Similarly, another primary coloniser, the hydrozoan (*Tubularia indivisa*), displayed a rather fluctuating distribution pattern and was less abundant in 2004 compared to 2003. This could be a result of lack of space or predation from sea slugs (*Facelina bostoniensis*), which among others were new to the Horns Rev fauna in 2004.

Impact from predation, recruitment and competition for space will contribute to a continuously repeating succession process until a relatively stabile community is reached.

Hard substrates were found being used as hatchery or nursery grounds for several species after construction of the wind farm. The new introduced habitat was an especially successful nursery for the edible crab (*Cancer pagurus*). The number and biomass of *Cancer pagurus* juveniles at the turbine sites has increased markedly from 2003 to 2005.

Succession in the epifaunal community was demonstrated but the community will continuously undergo changes due to ecological succession enabling a climax community to be formed. A climax community is not expected within 5-6 years after hard substrate deployment. Occasional disruption of community succession due to effects from storm events and hard winters may even prolong this process until a stable community is attained.

Introduced and designated species
The introduction of more fouling species in the Horns Rev area is directly attributable to the deployment of hard bottom structures. Two species, the initial colonizers *Jassa marmorata* and *Telmatogeton japonicus,* have not previously been recorded in Danish waters. In the material of *Caprella linearis,* some of the specimens were identified as *Caprella mutica* in 2005, which is an alien species introduced from the Japanese Sea. Occasionally some of these species were introduced to the faunal communities on the sanded seabed.

Special attention should be given to the ross worm (*Sabellaria spinulosa*) and the white weed (*Sertularia cupressina*), which in the Wadden Sea area are regarded as threatened or red listed species. Although more common on hard bottom substrates the ross worm can generate biogenic reef structures on mixed sediments or shells.

Fish community
A marked increase in the number of fish and fish species was observed from the March surveys to the September surveys each year. This might be a result of seasonal migrations of fish species to the turbine site for foraging. Bip (pouting) was observed presumably feeding on crustaceans on the scour protection together with schools of cod. The goldsinny-wrasse was often found in numbers at the turbine sites. Individuals of the rock gunnel and the dragonet were commonly found inhabiting caves and crevices between the stones.

It seems that noise and vibrations from the turbine generators have not impacted the fish and other mobile organisms attracted to the hard bottom substrates for foraging, shelter and protection.

By comparing the average biomass of the infauna on the sand bottom between the turbines, it was estimated that the availability of food for fish at the wind turbine sites has increased by a factor of approximately 50 after the introduction of the hard substratum at Horns Rev. Taking the whole wind farm area into account, the estimated increase in biomass is only 38 tonnes or about 7% of the total biomass in the area. An increase in fish production related to the presence of the hard substratum is considered possible.

Results in perspective to the monitoring objectives
The establishment of the wind farm resulted only in insignificant loss of natural seabed, which was replaced by hard bottom structures.

Results from the investigations on the benthic communities showed that only negligible impacts on the native communities are attributable to the wind turbine structures. The effects of the introduced hard substrates increased local biodiversity and increased local food availability. Cumulative effects of reduced trawling activities might be beneficial to local biodiversity by enabling benthic communities to mature and generally improve environmental conditions in areas of more wind farms.

Sammenfatning (in Danish)

Som en følge af den danske handlingsplan for havvindmøller blev området ved Horns Rev i 1997 som et ud af fem områder udpeget som et egnet sted for placeringen af fremtidige havvindmølleparker. I 2002 blev Horns Rev Havvindmøllepark etableret med en produktionskapacitet på 160 MW.

Som en del af demonstrationsprojektet blev der igangsat et overvågningsprogram til undersøgelse af miljøeffekterne før, under og efter etableringen af havmølleparken. Formålet med programmet var at sikre, at havbaseret vindkraft ikke har en skadelig indflydelse på naturlige økosystemer samt at tilvejebringe et solidt grundlag for beslutningerne om fortsat udvikling af havbaseret vindkraft. Nærværende undersøgelse beskriver effekterne på bentiske fauna- og florasamfund i det udpegede og senere etablerede område for Horns Rev Havvindmøllepark.

Horns Rev - områdebeskrivelse

Horns Rev strækker sig mere end 40 km mod vest ud i Nordsøen fra Blåvands Huk. Bredden af revet varierer mellem 1 og 5 km og revet danner den nordlige afgrænsning af Vadehavet. Horn Rev er dannet af sedimentaflejringer i tidligere geologiske perioder. I dag er disse aflejringer igen overlejret af tykke akkumulationer af marint sand. Der foregår stadigvæk pålejringer af sediment.

Horns Rev området er meget dynamisk og underlagt hydrografiske variationer og vandstandsændringer. Det er et forholdsvist lavvandet område som er domineret af bølger og påvirket af tidevand. De hydrografiske forhold i området er primært bestemt af indtrængende Atlantisk vand til den sydlige del af Nordsøen. Tidevandstrømmen er hovedsagelig nord-sydgående med en resulterende strøm gående mod NNØ med en middelstrømhastighed på 0,5-0,7 m/s. Vanddybden og overvejende fuld opblanding af vandmasserne forhindrer lagdeling af vandmasserne og begrænser dermed mulighederne for iltsvind.

Horns Rev havvindmøllepark blev etableret omtrent 14 km VSV ud for Blåvands Huk og består af 80 møller hvoraf den sidste mølle var installeret i august 2002. Møllefundamenterne er såkaldte ”monopiles” med en diameter på 4 m. For at minimere erosionen blev der etableret en erosionsbeskyttelse med en diameter på ca. 25 m omkring fundamenterne. Erosionsbeskyttelsen består af store sten

I mølleområdet varierer dybden fra 6,5 m til 13,5 m. I basisbeskrivelsen blev sedimentet beskrevet som mellemfint til grovkornet sand med en stor variation i kornstørrelsesfordelingen. Havbunden blev generelt karakteriseret ved migrerende bundformer.

Formål

De mulige og forventede påvirkninger af bunddyrsamfundene fra etableringen af havvindmølleparken er beskrevet i VVM-redegørelsen. Påvirkningerne af de bentiske samfund blev vurderet til især at være tab af oprindelige levesteder, den fysiske tilstedeværelse af havvindmøllerne og introduktionen af hårdbundssubstrat på den ellers sandede bund.

I overensstemmelse med formålet af demonstrationsprojektet var det nødvendigt at overvåge effekterne på de bentiske samfund samt effekterne på begroningssamfundet. Overvågningen var målrettet mod at klarlægge effekterne på de bentiske samfund af introduktionen af hårdbundssubstrat og mod at følge udviklingen i begroningssamfundet. Undersøgelserne blev foretaget i perioden fra 1999 til 2005.

Metode
På baggrund af en vurdering af data fra 1999 samt i overensstemmelse med myndighedernes krav blev overvågningsprogrammets prøve indsamling tilrettelagt således, at kun større ændringer i bunddyrenes samfundsstruktur kunne detekteres samt at det introducerede hårdbundssamfund kunne overvåges.

Overvågningen af infauna og sediment inkluderede indsamling af prøver med dykkere i mølleparken og i et udpeget referenceområde uden for mølleparken. Stationerne i mølleområdet blev placeret 5, 25 og 100 meter nedstrøms (i forhold til den fremherskende strømretning) erosionsbeskyttelsen ved 6 møllelokaliteter.

Undersøgelser af henholdsvis den horisontale og den vertikale fordeling af begroningssamfundet blev udført ved 6 møllelokaliteter på henholdsvis erosionsbeskyttelsen og monopælene.

Indsamlingen af prøver blev foretaget af dykkere. Der blev indsamlet kvantitative prøver fra sten på erosionsbeskyttelsen ved alle 6 møllelokaliteter, hvorimod der kun blev indsamlet prøver fra monopæle ved 3 møllelokaliteter. Langs transekter omfattende både monopæle og erosionsbeskyttelsen blev der foretaget semi-kvantitative (ikke numerisk præcise) beskrivelser af begronings-samfundet efter en modificeret Braun-Blanquet skala. Begroningssamfundet blev undersøgt i relation til eventuelle forskelle i strømforhold på både erosionsbeskyttelsen og på monopælene. Der blev foretaget supplerende prøvetagninger i specifikke samfund i sprøjte/bølgeslagszonen. Forekomsten af fiskearter blev registreret og tillige blev der udført et testfiskeri med standard undersøgelsesgarn. Til dokumentation af forholdene blev der optaget undervandsvideo.

Multivariate analyser blev anvendt på det kombinerede datasæt til for hver art at forøge følsomheden af de statistiske analyser med hensyn til såvel biomasse som individtæthed

Sediment
Både i mølleområdet og i referenceområdet kan bundforholdene karakteriseres som ensartede med et sediment bestående af rent, mellemfint til groft sand uden nævneværdigt indhold af organisk stof. I mølleområdet er der sket en signifikant forøgelse af sedimentets mediankornstørrelse fra 345 µm i 2001 til 509 µm i 2005. En tilsvarende forøgelse i kornstørrelsen blev også fundet i referenceområdet, ligesom der ved de enkelte undersøgelser ikke blev fundet forskelle i sedimentparametrene mellem referenceområdet og mølleområdet. Der blev registreret en forholdsvis stor variation med hensyn til kornstørrelsesfordelingen i det udvidede referenceområde. Denne variation skyldes hovedsageligt forskelle i sedimentparametrene med hensyn til tid og sted og kan tilskrives de naturlige variationer i området.

Bundfauna
Bundfaunaen i Horns Rev området kan karakteriseres som et *Goniadella*-*Spisula*-samfund efter de karakteristiske arter. Karakterarterne i Horns Rev området er havbørsteormene (*Goniadella bobretzkii*, *Ophelia borealis*, *Pisione remota* og *Orbinia sertulata*) og muslingerne (*Goodallia triangularis* og *Spisula solida*). De hyppigste arter var, *Goniadella bobretzkii* og *Goodallia triangularis*. Som faunaen på andre sublittorale sandbanker i

Nordsøen er også faunaen på Horns Rev meget variabel og heterogen, og den er derfor vanskelig at sammenligne med faunaen på andre sandbanker og med faunaen i tilstødende, dybereliggende områder. Mobile arter som taskekrabben (*Cancer pagurus)* og eremitkrebsen (*Pagurus bernhardus*) blev ofte observeret på havbunden.

Effekter fra mølleparken
Der blev ikke konstateret nogen effekt på sedimentets fordelingsmønster som følge etableringen af møllefundamenterne og de deraf afledte ændringer af de hydrodynamiske forhold.

På erosionsbeskyttelserne blev der ikke konstateret statistisk signifikante forskelle i samfundsstrukturen mellem læsiden og strømsiden af monopælene. Nederst på selve monopælene var der dog en statistisk signifikant forskel i samfundsstrukturen som kan skyldes de markante forskelle i de hydrodynamiske forhold mellem de to sider af monopælene. Fundne forskelle i samfundsstrukturen mellem zoner, der er overlappende, på erosionsbeskyttelsen skyldes muligvis også effekten af turbulens i læsiden af monopælene.

Konstaterede forskelle i fordelingsmønsteret af muslinger afspejler muligvis effekten af forskelle i havfuglenes fødesøgningsadfærd i og uden for mølleparken.

Den mest markante effekt af anlæggelsen af havmølleparken var tabet af oprindelige levesteder og indførelsen af hårdbundshabitater i samfund, der oprindelig var domineret af infauna tilknyttet sandede sedimenter.

Hårdbundsstrukturer: Vegetation
På hårdbundsstrukturerne blev der fundet en tydelig tidsmæssig og rummelig variation i fordelingsmønsteret af de indvandrede alger. Sammenlignet med erosionsbeskyttelsen blev vegetationen hyppigst observeret på monopælene. Der blev kun fundet få arter på stenene på erosionsbeskyttelsen, og det var karakteristisk, at disse næsten udelukkende var beliggende på møller på steder med de mindste vanddybder; men der blev dog registreret en generel stigning i den totale dækningsgrad efter 2003.

Der blev registreret en tydelig vertikal zonering af algerne på monopælene, hvor arter af slægten Ulva (*Enteromorpha)* var de hyppigst forekommende. Der er konstateret betydelige ændringer i vegetationssamfundet siden 2003, specielt på monopælene i sprøjte/bølgeslagszonen samt i zonen lige under havoverfladen. Tilsyneladende blev det første vegetationsdække bestående af trådformede alger erstattet af en mere permanent vegetation bestående af forskellige arter af grønalger (*Ulva*). Senere (2005) blev rødalgerne (*Polysiphonia fibrillose*) og purpurhinde (*Porphyra umbilicalis*) samt grønalgen (*Chaetomorpha linum*) konstateret. Fra 2003 og frem er der på monopælene konstateret en stigning i dybdegrænsen af vegetationsdækket af grønalger.

Hårdbundsstruktuer: Epifauna
Der blev fundet en stor tidsmæssig og rumlig variation i fordelingsmønstrene mellem arter og samfund. Generelt blev der fundet statistisk signifikante forskelle i samfundene mellem de enkelte møllelokaliteter. Den væsentligste årsag hertil er forskelle i individtæthederne af de dominerende arter - tanglopperne *Jassa marmorata* og *Caprella linearis*. *Jassa marmorata*, der er en kosmopolitisk art, blev hyppigst fundet på selve monopælene med tætheder på op til mere end 1 million individer/m^2.

Der blev registreret tydelige zoneringer samt ændringer i fordelingsmønstrene og individtæthederne i faunasamfundene på monopælene siden den første kolonisation i 2003. I sprøjte/bølgeslagszonen har den næsten monospecifikke forekomst af den store dansemyg *Telmatogeton japonicus* øget individtætheden betydeligt siden 2003. Tætte forekomster af enten yngel eller større individer af blåmuslingen *Mytilus edulis* blev registreret på monopælene lige under havoverfladen. Ændringer i populationsstukturen viser, at der siden 2003 er sket en tydelig vækst af blåmuslingerne. I 2005 blev det konstateret, at *Mytilus eduls* havde haft succes med at etablere sig på flere møllelokaliteter end tidligere. Tydelig adskillelse med hensyn til fordeling og tæthed af blåmuslingen *Mytilus edulis*, (delvis) ruren *Balanus crenatus* og rovdyret *Asterias rubens* indikerer, at søstjernen var ”nøgle”-rovdyret, der kontrollerede både den vertikale og horisontale fordeling af byttedyrene.

Den tidlige indvandrer - trekantsormen *Pomatoceros triqueter* - var generelt mere talrig i den nedre zone af monopælene end i den øvre zone. Denne art er aftaget i tæthed siden september 2003. Nedgangen i bestanden af *Pomatoceros triqueter* kan være et resultat af konkurrencen om plads fra andre arter. Ligeledes var tætheden af en anden tidlig indvandrer polypdyret *Tubularia indivisa*, der udviste et ret varierende udbredelsesmønster, hvilket kan være et resultat af manglende plads eller predation fra nøgensnegle (*Facelina bostoniensis*). Sidstnævnte blev i 2004 registreret som ny art for Horns Rev.

Påvirkninger fra rovdyr samt rekruttering og konkurrencen om pladsen vil bidrage til en fortløbende successionsproces indtil en højere grad af stabilitet i samfundsstrukturen er opnået.

Det blev ved undersøgelserne konstateret, at hårdbundssubstratet blev benyttet som yngle- og opvækstområde for flere arter, og at de menneskeskabte levesteder var specielt gunstige for opvæksten af taskekrabben (*Cancer pagurus*). På møllelokaliteterne steg antallet og biomassen af juvenile *Cancer pagurus* markant fra 2003 til 2005.

Der er blevet påvist en udvikling i epifauna-samfundet; men samfundet vil også fremover være underlagt forandringer, som skyldes den naturlige succession og udviklingen mod et klimaks samfund. Et klimaks samfund er ikke forventeligt inden for de første 5-6 år efter etableringen af hårdbundsubstratet. Dertil kommer, at der vil være periodisk afbrydelse af successionsforløbet i forbindelse med storme og hårde vintre, hvilket muligvis vil kunne forlænge udviklingen af et stabilt samfund i området.

Indførte og udvalgte arter

Introduktionen af flere ”begroningsarter” i Horns Rev området er et direkte resultat af opstillingen af vindmøllefundamenterne. De to tidlige kolonisatorer - *Jassa marmorata* og *Telmatogeton japonicus* - er ikke tidligere registreret i Danmark. I materialet af *Caprella linearis* blev nogle af individerne i 2005 identificeret som *Caprella mutica*, som er en indført art fra det Japanske Hav. Lejlighedsvis blev nogle af disse arter registreret i bundfaunaen på sandbunden.

Børsteormen *Sabellaria spinulosa* og hav-cypressen *Sertularia cupressina* fortjener særlig omtale, idet de begge i vadehavsområdet bliver betragtet som truede og derfor er optaget på rødlisten. Skønt Sabellaria spinulosa er mere almindelig på hårbundsubstrater kan den på blandet bund eller skaller danne biogene rev strukturer.

Fiskesamfund

Der blev i forbindelse med undersøgelserne konstateret en markant stigning i antallet af fisk og fiskearter i perioden fra marts til september. Det skyldes muligvis en sæsonbetonet migration af visse fiskearter til og fra møllefundamenterne. Skægtorsk, som tilsyneladende søgte føde blandt krebsdyrene på erosionsbeskyttelsen, blev ofte observeret sammen med stimer af almindelig torsk. Havkaruds blev ofte observeret i stort antal ved møllelokaliteterne. Tangspræl og fløjfisk blev ofte observeret i hulrum og sprækker mellem stenene.

Støj og vibrationer fra turbinegeneratorerne havde tilsyneladende ingen effekt på fisk og andre mobile organismer, der var blevet tiltrukket til hårdbundssubstratet i jagten på føde, ly eller beskyttelse.

En beregning af den tilgængelige fødemængde for fisk i området viste en indtil 50 ganges forøgelse af biomassen på møllelokaliteterne efter introduktionen af hårdbundssubstratet på Horns Rev i forhold til den normale infauna i området mellem møllerne. Tager man hele mølleområdet i betragtning, er der kun tale om en stigning i biomassen på 38 ton eller omkring 7% i forhold til den totale infauna-biomasse i området.

Resultater perspektiveret i forhold til formål

Etableringen af havmølleparken resulterede i et ubetydeligt tab af naturlig havbund som blev erstattet af hårdbundsstrukturer.

Resultaterne fra undersøgelserne af de bentiske samfund viste at kun ubetydelige påvirkninger af det oprindelige samfund kunne henføres til møllefundamenter. Effekten af introduktionen af hårdbundssubstrat var en lokal stigning i biodiversitet og fødetilgængelighed. Kumulative effekter af en reduceret trawl aktivitet kan lokalt være til fordel for biodiversiteten i et område med flere havmølleparker ved at de bentiske samfund kan opnå fuldstændig udvikling og gennem en generel forbedring af mijøtilstanden.

1. Introduction

1.1. Background

In 1995, the Danish Government formed a committee to define the main areas in Danish waters suitable for establishing offshore wind farms. An area of approximately 1,000 square kilometres has been identified, corresponding to the production of 7,000-8,000 megawatt (MW) of energy. Most of the areas are located 15-30 kilometres from the coast at a water depth of 4-10 metres.

The possibilities for utilizing shallow waters for offshore turbines in Denmark were evaluated some years ago in collaboration between the Danish Utilities and the Danish Energy Authority. An action plan was proposed in which two of the main recommendations were to concentrate offshore development within a few areas and to carry out a large-scale demonstration programme. In 1998, an agreement was reached between the Government and the production companies to establish a large-scale demonstration programme. The objective of the programme was to investigate economic, technical and environmental issues, to hasten offshore development and to open up the selected areas for future wind farms.

Figure 1.1. Map of the main marine areas appointed for the construction of offshore wind farms in Denmark.

In the 1997 Danish action plan for offshore wind farms, five areas (Figure 1.1) were identified as suitable for future offshore wind farms. The selection was based on experiences from the first two small demonstration farms (Vindeby and Tunø) and the recommendations from the 1995 Governmental Committee. The 1995 Governmental Committee work included mapping the water depth, mapping all scenic aspects and interests in the Danish waters including bird sanctuaries, raw material extraction, marine archaeology, fisheries, shipping routes and military areas and visual impact assessments of the coastal landscapes.

Based on the above-mentioned evaluation, five areas were selected as providing the most suitable sites for offshore wind farm extensions (Figure 1.1).

The Danish Government's energy action plan "Energy 21" sets a goal that renewable energy is to cover 12-14% of the total Danish energy consumption. The goal for the period 2005 to 2030 is to achieve an annual increase of 1 percentage-point in the share of renewable energy in the Danish energy system. This means that the total share of renewable energy will be approximately 35% in 2030. In order to achieve this long-term expansion, a significant increase of up to 4,000 MW is expected from offshore wind farms by 2030.

The purpose of increasing the share of renewable energy is to ensure environmental improvements and to improve supply security. The environmental improvements will result in a reduction of the pollution from traditional power stations. The supply security will be improved as dependency on imported fuels is reduced. Development of Horns Rev and Nysted Offshore Wind Farms (Rødsand) are a result of the action plan.

Due to the special status of the demonstration programme, a comprehensive environmental measurement and monitoring programme was initiated to investigate the effects on the environment before, during and after the completion of the wind farms. The purpose is to ensure that offshore wind power does not have damaging effects on the natural ecosystems and to provide a solid basis for decisions about further development of offshore wind power. In addition, the economic and technical aspects are to be evaluated as part of the demonstration programme. A series of studies were initially undertaken in the two wind farm areas. They focussed on the environmental conditions and the possible impact of an offshore wind farm. The studies are important for both the extension of the offshore wind farm at the specific sites and for the establishment of additional large-scale offshore wind farms in Denmark.

The present report presents the results of the environmental studies carried out on benthic communities in connection with the Environmental Impact Assessment (EIA) and the baseline and monitoring programmes at Horns Rev.

This report describes the natural variations in the native benthic communities in the Horns Rev area before the establishment of Horns Rev Offshore Wind Farm, the potential environmental impacts of the introduction of hard bottom substrate in the offshore wind farm area and finally the impact and succession of the introduced epifouling communities at turbine foundations.

1.2. Horns Rev

Horns Rev is an extension of Blåvands Huk extending more than 40 km to the west into the North Sea. Horns Rev is considered to be a stable landform that has not changed position since it was formed (Danish Hydraulic Institute, 1999). The width of the reef varies between 1 km and 5 km.

Blåvands Huk, which is Denmark's most western point, forms the northern extremity of the European Wadden Sea area, which covers the area within the Wadden Sea islands from Den Helder in Holland to Blåvands Huk.

1.2.1. Geology and geomorphology

Horns Rev was formed as deposits of sand and gravel on top of deposits created during the Eem geological period and glacio-fluvial sediment deposited during the Saale glaciation. The constituents of the reef are therefore not the typical mixed sediment of a moraine but rather well sorted sediments in the form of gravel, grit and sand. Huge accumulations of Holocene marine sand deposits, up to 20 m in depth, formed the Horns Rev area that is known today with continuous accumulations (Larsen, 2003). Horns Rev can be characterised as a huge natural blocking sand ridge, which blocks the sand volume transported along the Jutland coast. The yearly transport of sand is in a magnitude of 500,000 m^3 (Danish Hydraulic Institute, 1999).

Horns Rev is constantly subject to variations in hydrography and sea level changes but it is considered a quasi-stable formation that will continue to adjust to minor changes in the local conditions.

In the wind farm area, medium to coarse sediment with mean median particle sizes of approximately 345 µm being found in the baseline surveys (Leonhard & Pedersen, 2002). The sediment consists of almost pure sand with no or very low organic content (<1%) (Leonhard, 2000). Bedforms of small sand ripples are seen all over the area caused by the wave impact on the seabed. Tidal currents create dunes and ripples, showing evidence of sand transport directions both to the north and to the south. All structures in the area apart from those in the tidal channels indicate a prevailing transport direction towards south and southeast. Great variability in the sediment grain size distribution exists with the effects of strong currents being found towards slopes facing greater depths where coarse sand can be found with median particle sizes of 641-961 µm (Figure 1.2) (Leonhard, 2000).

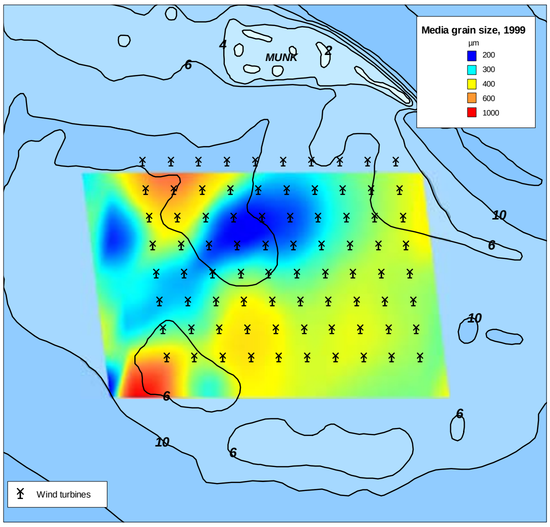


Figure 2.1. Median grain size of surface sediment in the wind farm area at Horns Rev.

Photo 1. Seabed of pure sand.

Along the cable line, the sediment consists of finer particles of silty sand and clay-silt towards the shore and in the deeper areas down to 25m (Leonhard, 2000).

1.2.2. Hydrography

Horns Rev is an area of relatively shallow water, tidally influenced and dominated by waves. The North Sea is a complex resonant tidal system caused by the rectangular form of the basin. The mean tidal range in the wind farm area is about 1.2 m (Danish Hydraulic Institute, 1999). Within the wind farm area, the water depth varies from 6.5 m to 13.5 m. The depth conditions in the area result in the waves breaking in the wind farm area. The average wave-height is about 1-1.5 m.

The hydrographic conditions in the Horns Rev area are mainly a result of the intrusion of Atlantic water into the southern part of the North Sea. The water moves erratically towards the Skagerak. The flow continues north as the Jutland coastal current and follows the Danish west coast towards the Skagerak under the effect of prevailing winds. The tidal current is mainly in a north south direction with a prevailing current at 220º NNE and a mean current speed at 0.5-0.7 m/s (Appendix 1). Current speeds above 0.7 m/s up to 1.5 m/s are not unusual at Horns Rev (Bech et al., 2004; Bech et al., 2005; Leonhard & Pedersen, 2004; Leonhard & Pedersen, 2005; Leonhard & Frederiksen, 2005). Stratified flows do not develop along the North Sea coast, which cause the changing tidal currents and the rough wave environments that favours homogeneous conditions in shallower parts along the coastline. A strong thermocline is present in the centre of the North Sea. Although Horns Rev is situated in the transitional zone between the stratified zone and the well-mixed zone, this does not influence the hydrography at Horns Rev as stratified conditions will not develop at water depth less than 30 m (Danish Hydraulic Institute, 1999). Due to the mixing of the water in the coastal zone by turbulent dynamics, oxygen depletion is not likely to occur at Horns Rev. In rare occasions, oxygen deficiency might develop below the summer thermocline in deeper parts of the North Sea. Impact to the benthic communities was observed near the Danish west coast in the summers 1981-1983 (Dyer et al. 1983; Kröncke and Bergfeld, 2001) due to low oxygen levels below the thermocline.

The salinity in the area is 30-34 psu and is determined by the inflow of freshwater from the German rivers and the relatively high-saline water from the North Sea. Small differences in salinity of 1– 1.5 psu have infrequently been recorded between the surface and bottom layers, especially after long periods of strong southeasterly winds. The differences recorded between surface and bottom layers can better be characterised as a gradient than a discontinuity (Bio/consult, 2000b).

The area around Horns Rev is characterised by relatively high concentrations of inorganic nutrients (Figure 1.2). A decline over the last 15 years has been seen for summer concentrations in Total Phosphorous (TP). Phosphorus is now the controlling factor for phytoplankton growth in the area (Hvas et al., 2005). In the spring and summer, algae blooms of foam algae *Phaeocystis pouchetii* are recorded.

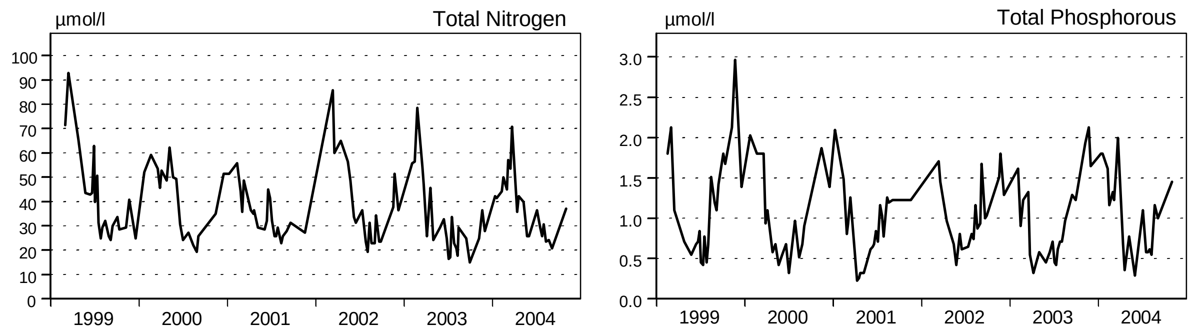


Figure 1.2. Dissolved nutrient concentrations near Horns Rev (Blåvand west) 1999-2004 (NERI, 2006).

Low transparency due to high amounts of re-suspended material in the water column is characteristic for the Horns Rev area. High temporal variability is found in the water transparency, which is influenced by tidal current, wind induced current, current speed and seasonal plankton dynamics. In general, the water transparency is low in spring, 1.8-6.0 in adjusted Secchi depth [Adjusted Secchi depth = estimated Secchi depth x (1+0.4 x wave height] and higher during autumn, 2.5-8.8. Pronounced diel variability in transparency is found within a few hours and is associated with changes in the prevailing current directions from SSW to NNE (Bech et al., 2004; Bech et al., 2005; Leonhard & Pedersen, 2004; Leonhard & Pedersen, 2005).

1.3. Horns Rev Offshore Wind Farm

Horns Rev Wind Farm is situated south of the actual reef approximately 14 km west-south-west of Blåvands Huk (Figure 1.3).

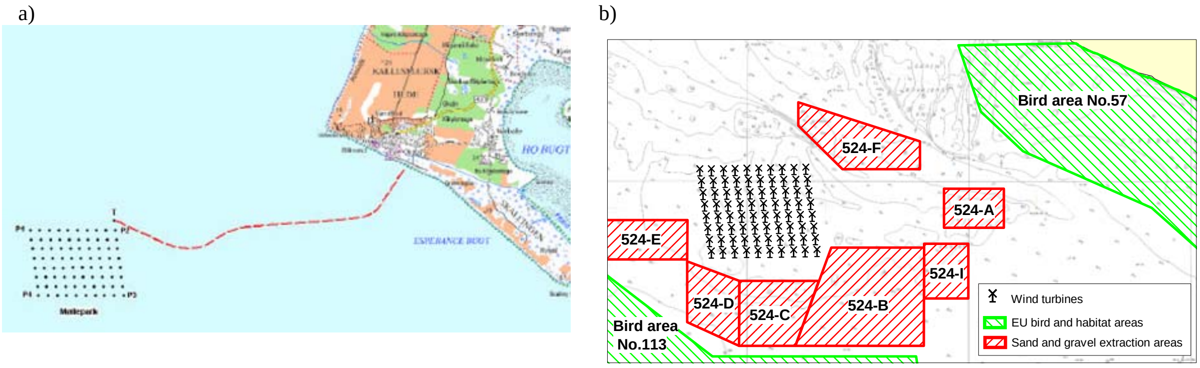


Figure 1.3. The offshore wind farm at Horns Rev and the cable trace to land at Hvidbjerg Strand. T marks the transformer platform (a). Areas for raw material extraction and international protected bird and habitat areas (b).

The coordinates of the outermost wind turbines and the transformer station are shown in Appendix 1.

1.3.1. Construction and layout

The offshore wind farm is comprised of 80 (Vestas V80- 2MV) wind turbines erected in a grid pattern as shown in Figure 1.3. Thus, the total installed energy generating capacity is 160 MW. The distance between the individual wind turbines and rows is 560 m with the wind farm covering an area of 27.5 km^2 including a 200 m exclusion zone around the wind farm.

The wind turbines are interconnected via a 36 kV cable grid that is connected to a transformer platform in the northeastern corner of the wind farm. The transformer platform is connected to land at Hvidbjerg Strand by a 150 kV cable. The cable is embedded into the seabed by water-jetting. The cable trace passes through an internationally protection area and is 19.5 km long.

The wind turbine (WTG) foundations are constructed using the “monopile” concept. The monopile foundation consists of two main components; the pile and the transition piece. The pile is a steel pipe that is rammed into the seabed. The transition piece is also a steel pipe but with a slightly larger diameter than the pile. Pile and transition piece are joined together over a stretch of 6 metres. For the Horns Rev project, the monopile diameter is 4 m. The pile is driven to a depth of up to approx 25 m. The joint between the turbine and the foundation is placed 9 m above mean sea level (MSL). At this level, a platform is placed and the wind turbine tower mounted. The main geometry of the wind turbines is shown in Figure 1.4.

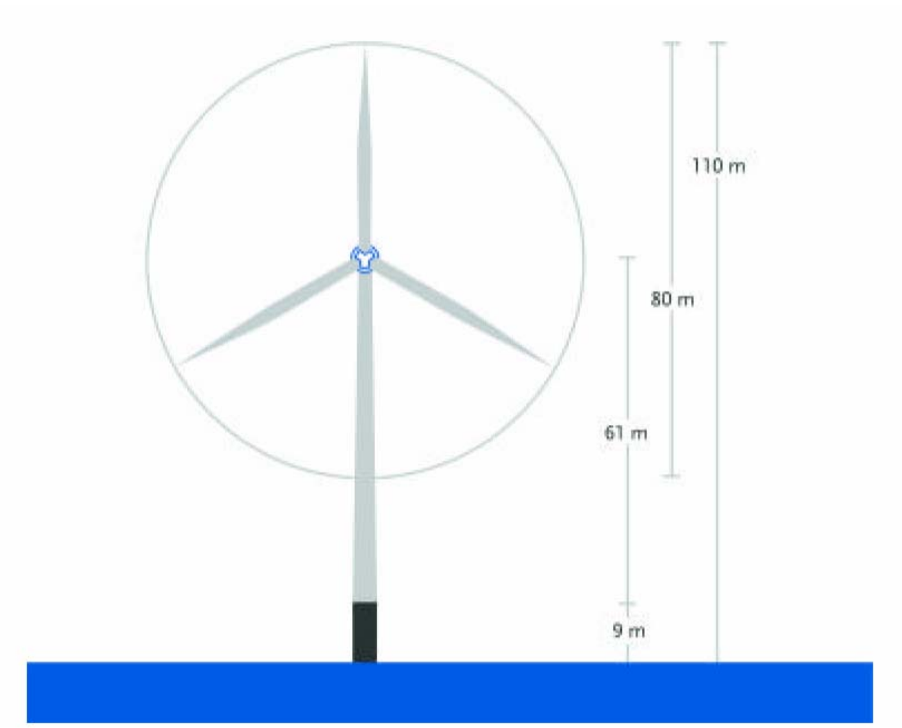


Figure 1.4. Wind turbine dimensions.

On the seabed at Horns Rev, scour protection was necessary around the foundations to minimise erosion due to the strong current at the site (Figure 1.5). The scour protection has a total diameter of approximately 25 m, but it varies between sites. The scour protection is approximately 1.3 m in height above the original seabed and consists of a protective stone mattress, 0.8 m in thickness, of large stones up to 55 cm in diameter at distances of 0–10 m from the towers with a subjacent layer, 0.5m in thickness, of smaller stones 3-20 cm in diameter. At the edge of the large protective stones area, there is an area up to 4 m in width consisting of smaller stones. A rather great variability in the band size with large stones between and at turbine sites exists with large stones being found up to 12-14 metres from the monopiles.

Photo 2. Horns Rev offshore wind farm under construction.

Photo 3. Horns Rev offshore wind farm.

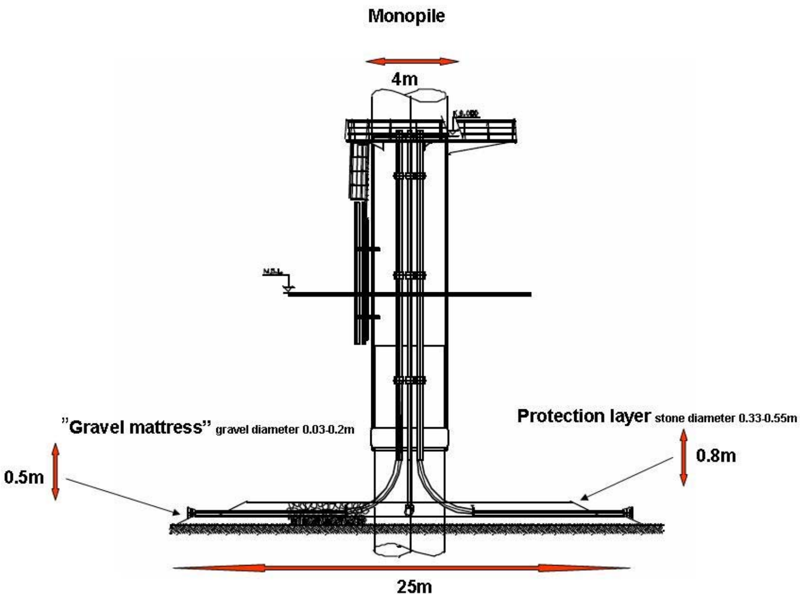


Figure 1.5. Wind turbine foundation and scour protection.

The turbine foundations, including the scour protection, cover approximately 39.500 m^2 of the seabed, which is less than 0.2% of the total area of the wind farm.

The assembly of the wind turbines started in March, 2002 with the last turbine set in place on August 21st, 2002.

1.3.2. Designated areas

Relatively close to the wind farm area (5 nautical miles) are larger areas that are designated for raw material extraction. There has been a decline in the extraction of raw materials over the last few years, but the areas as such are not expected to be affected by the construction of the offshore wind farm (Rambøll, 1999). North of the wind farm area is a military exercise area. Ramsar and EU bird and habitat protected areas are situated in the vicinity of the Horns Rev Offshore Wind Farm (Figure 1.3). The Wadden Sea and neighbouring land areas constitute Ramsar area no. 27. These areas are also designated as Special Protection Areas under the EU Birds Directive (nos. 49, 50, 51, 52, 53, 55, 57, 60, 65 and 67) and as Special Areas for Conservation under the EU Habitats Directive (nos. 73, 78 and 90). Furthermore, the Wadden Sea also has the status of a Game Reserve (no. 48) with regulations concerning nature conservation and public access. The offshore wind farm and the cable trace to land are included in the following international protections: EU-Bird Directive nos. 53, 55 and 57, EU-Habitat Directive area no. 78 and Ramsar area R 27.

1.4. Benthic communities at Horns Rev

1.4.1. Benthic vegetation

Because the main substrate in the area is sand, no native rooted benthic vegetation or loose or attached macro algae has been recorded west of Blåvands Huk (Leonhard, 2000).

1.4.2. Benthic fauna

An extensive amount of general literature exists on benthos surveys covering the North Sea (Kröncke & Bergfeld, 2001). The data sets from the DANA cruises 1932–1955 (Ursin, 1960; Kirkegaard, 1969; Petersen 1977) and the results of Birkett's (Birkett, 1953) survey are valuable historical baselines of the community structure of North Sea benthos but very little data is available from more regional shallow sandbank areas such as Horns Rev.

1.4.3. Population ecology and distribution at Horns Rev

The native fauna composition at Horns Rev is like the fauna found on other sublittoral sandbanks in the North Sea. Like the fauna at other sublittoral sandbanks in the North Sea, the fauna at Horns Rev is very variable, heterogeneous and difficult to compare with other sandbanks and adjoining deeper areas (Vanosmael et al. 1982; Salzwedel et al. 1985; Degraer et al. 1999). The benthos community at Horns Rev has a great similarity with the benthos communities described in other shallow coastal waters of the North Sea where the sediment consists of pure medium–coarse sand. The community in such areas can be described as the *Ophelia borealis* community (Dewarumez et al. 1992) or, more commonly accepted, as the *Goniadella-Spisula* community (Kingston & Rachor 1982; Salzwedel at al. 1985).

In the *Goniadella-Spisula* community, some characteristic species are found including the bristle worms (*Gooniadella bobretzkii* and *Ophelia borealis*) and the thick trough shell (*Spisula solida*). The two last mentioned species are important for the biomass in the community mainly due to their relatively large size.

At Horns Rev, more than 75 different species of marine bottom fauna species were recorded during the baseline surveys in 1999 and 2001 (Appendix 2) (Leonhard, 2000; Leonhard, 2001). The above-mentioned species together with some other species like bristle worms (*Pisione remota* and *Orbinia sertulata*) and the small mussel (*Goodallia triangularis*) was found in relatively uniform in abundance and biomass dominance relations. These species were used as indicator organisms for environmental changes in the wind farm area (Leonhard and Pedersen, 2002).

Table 1.1. Abundance relations of the most dominant species found in the wind farm area from the 1999 and 2001 baseline surveys.

Abundance, number/m²		**1999**		**2001**			
		Spring		**Spring**		**Autumn**	
Species	**Group**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**
Pisione remota	Bristle worm	142.3	20.3	176.2	18.8	411.0	22.0
Goodallia triangularis	Bivalve	262.2	37.5	153.6	16.4	203.3	10.9
Goniadella bobretzkii	Bristle worm	113.8	16.3	128.7	13.8	189.7	10.1
Ophelia borealis	Bristle worm	28.5	4.1	47.4	5.1	72.3	3.9
Spisula solida	Bivalve	2.0	0.3	31.6	3.4	36.1	1.9
Orbinia sertulata	Bristle worm	12.2	1.7	24.8	2.7	0.0	0.0

The dominant species in Tables 1.1 –and 1.2 constitute 49-80% of the total abundance and 26-80% of the total biomass found in the wind farm area.

Table 1.2. Biomass relations (WW) relations of the most dominant species found in the wind farm area from the 1999 and 2001 baseline surveys.

Biomass, wet weight g/m²		**1999**		**2001**			
		Spring		**Spring**		**Autumn**	
Species	**Group**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**
Spisula solida	Bivalve	15.413	7.3	42.1	64.7	231.883	77.4
Ophelia borealis	Bristle worm	27.560	13.0	6.5	10.0	7.405	2.5
Goodallia triangularis	Bivalve	0.904	0.4	0.4	0.6	0.542	0.2
Goniadella bobretzkii	Bivalve	0.245	0.1	0.1	0.1	0.184	0.1
Pisione remota	Bristle worm	0.174	0.1	0.0	0.0	0.035	0.0
Orbinia sertulata	Bristle worm	1.415	4.9	2.8	4.3	0.000	0.0

Significant differences were found in temporal and spatial distribution due to natural variations in populations with respect to reproduction and increase in body masses (Figures 1.6 and 1.7) (Leonhard and Pedersen, 2002). Although, no general differences in community structure was found with respect to seasonal variation (Leonhard and Pedersen, 2002).

a) b)

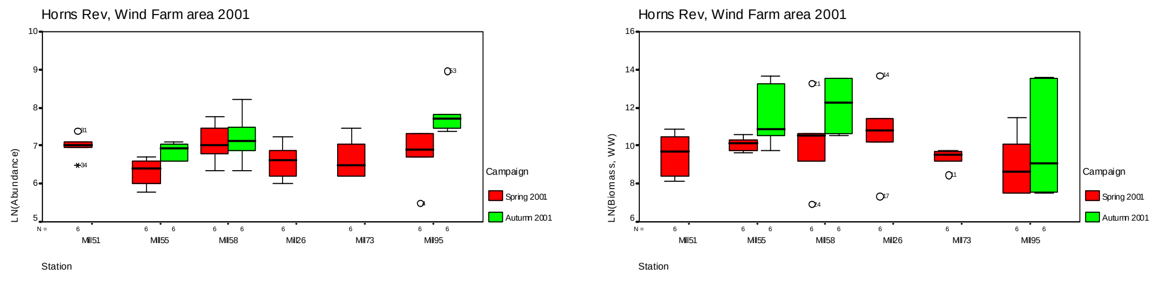


Figure 1.6. Levels of abundance and biomass between surveys in June and September 2001.

As at other sandbanks, Horns Rev has similar sea bottom turbulent conditions and low organic content in the sediment. The benthic community at Horns Rev is generally characterised by lower diversity, abundance and biomass compared to adjacent areas where the bottom conditions are less unstable and the sediment has a higher content of fine sand and organic material (Leonhard, 2000). In comparison, the number of mussels that are important food items for diving ducks, such as the common scoter (*Melanitta nigra*), are far lower in the Horns Rev area than in nearby areas of the North Sea where higher abundances of *Angulus tenuis*, *Fabulina fabula* and *Spisula subtruncata* have been found (Degraer et. al., 1999). In adjacent areas and along the cable line, a *Fabulina fabula* or Venus community was found. This community is characterised by the Venus clam (*Chamelea gallina*), the sea potato (*Echinocardium cordatum*), the bristle worm (*Magelona mirabilis*) and the brittle star (*Ophiura texturata*). In the international protected area close to shore, the sediment is finer and the area can be characterised as a *Lanice conchilega* community named after the sand mason (a bristle worm) (Govaere et al., 1980).

The bivalves (*Spisula solida*, *Spisula subtruncata* and *Angulus tenuis*) are included in the Red List of Wadden Sea species. In areas outside Denmark, they are either sensitive or vulnerable (Petersen et al. 1996). There is no mention of the status in Denmark for these species.

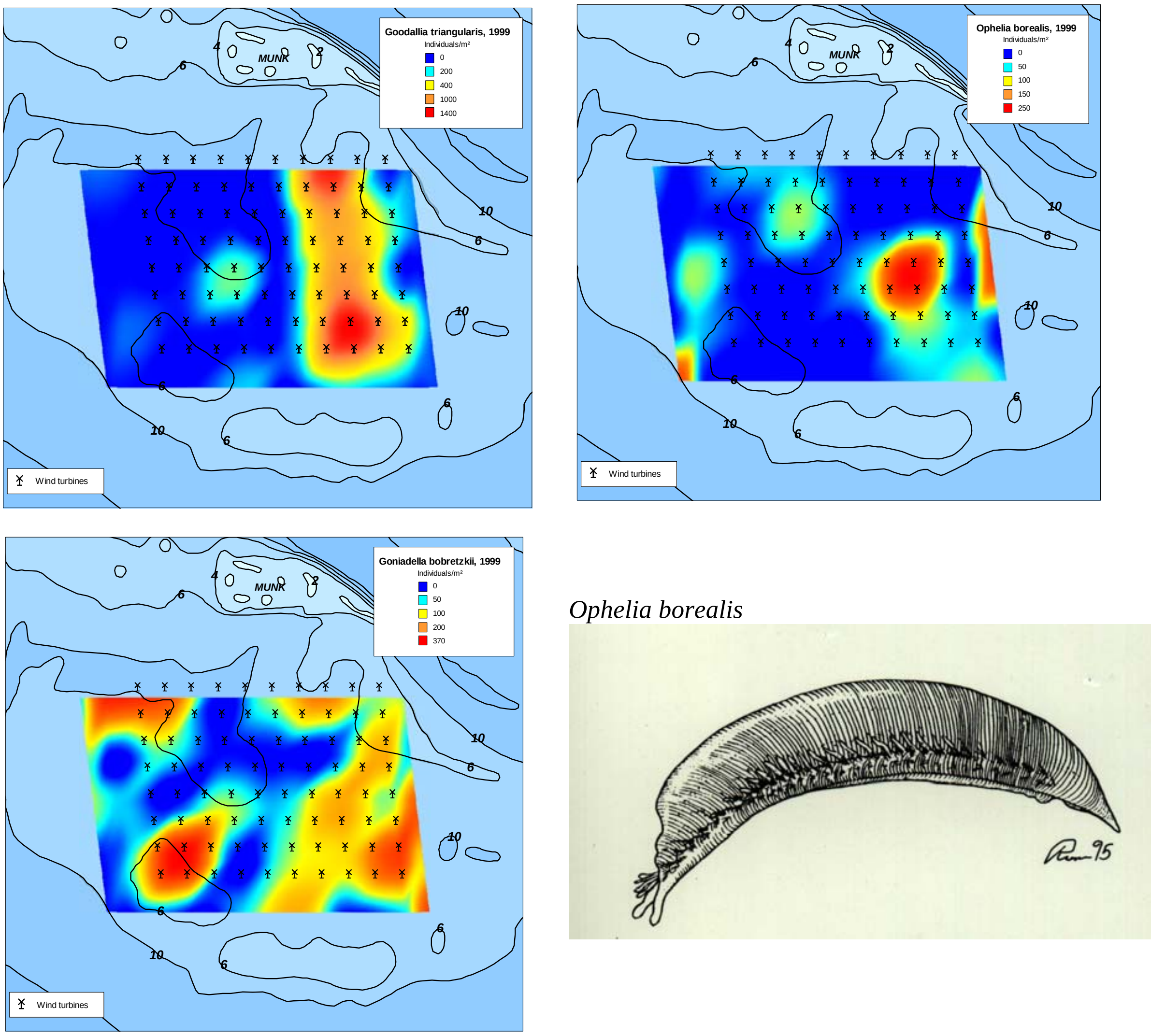


Figure 1.7. Distribution pattern of some of the most abundant species in the wind farm area at Horns Rev, 1999.

Mobile epifauna is often found in the area, which contributes to a high biomass. The hermit crab (*Pagurus bernhardus*), the common shore crab (*Carcinus maenas*), swimming crabs (*Liocarcinus pusillus*, *L. holsatus* and *L. depurator*), the common whelk (*Buccinum undatum*), brown shrimp (*Crangon crangon*), the common starfish (*Asterias rubens*), the

Alder's necklace shell (*Polinices polianus*) and occasionally the edible crab (*Cancer pagurus*) are found on the sand seabed.

The brown shrimp, which often is observed in numbers in the wind farm area, is an important prey species for both sea birds and fish (Hoffmann et al., 2000).

Photo 4. *Hermit crab* Pagurus bernhardus.

Photo 5. *Brown shrimp* Crangon crangon.

1.5. Scope of investigations

1.5.1. Possible and expected effects on benthic communities

The possible impact of an offshore wind farm can be divided into impacts during the construction and impacts during the operation. In the following, the different types of potential impacts are outlined in the Environmental Impact Assessments that were carried out in connection with the wind farm at Horns Rev.

Potential impacts during construction
1. Loss of existing habitats
2. Sediment spills and increased turbidity
3. Noise
4. Disturbances due to construction activities

Potential impacts during operation
1. Noise and vibrations from the turbines
2. Electromagnetic fields
3. The physical presence of the turbines
4. Disturbance due to maintenance operations
5. Introduction of hard substrate from the scour protection areas around the foundations

Of the different types of impacts listed above, the possible and expected impacts on benthic communities are described below. Impacts from noise, disturbances due to construction activities, noise and vibrations from the turbines, electromagnetic fields and disturbances due to maintenance operations on the benthic communities are considered as negligible or non-detectable.

1.5.1.1. Loss of existing habitats

The total seabed affected for establishing the wind turbines and transformer platform foundations including the scour protections is less than 0.2% of the total area of the wind farm. The benthic habitat and the native infauna community in this area will be permanently lost and replaced by fouling communities associated with hard bottom structures.

Temporal impacts and partial destruction of benthic fauna along the cable line will occur. Only a very small part of the seabed will be temporally affected and the impact is therefore considered negligible.

1.5.1.2. Sediment spills and increased turbidity

The construction method using the monopile concept will not result in sediment spills during construction.

Cable jetting activities in the construction phase will result only in limited release of sediment and spill with temporarily increased turbidity of the water. Closer to land the sediment has a higher content of finer particles than within the wind farm area. The increase in turbidity due to spill will be higher closer to land compared to within the wind farm area where the sediment is coarser (Elsam, 2000). Due to relatively high baseline concentrations of suspended materials, 50 mg/l in the most sensitive areas close to land, a slight increase in turbidity during the jetting activities will only result in negligible impacts on benthic communities (Elsam, 2000). Modelling of different plume dispersion scenarios for cable jetting has not been considered. But, a worst-case spill scenario for gravitation foundations showed very local and short-term impact of increased turbidity, more than 2 mg/l, and a total accumulation of spilled sediment not exceeding 2 kg/m^2. This is much lower than the natural variation in the reorganisation and accumulation of resuspended sediment in the area (Elsam, 2000).

In conclusion, only negligible impact to the benthic communities from sediment spill is likely to occur.

1.5.1.3. Physical presence of the wind turbines

The wind turbines are large structures that will change the physical characteristics of the area markedly. Impacts to the benthic communities from the physical presence of the wind turbines, apart from effects of the introduction of hard substrate habitats, will only effect changes in the general current regimes within the wind farm area and changes in the local current regimes close to the wind turbine foundations.

The presence of the wind turbines will cause a reduction in the current velocities inside the wind farm area by a maximum of 2%. There are no expected evolutions in the general seabed characteristics and associated benthic communities (Elsam, 2000).

Close to the wind turbine foundations, changes in seabed and associated benthic communities might be caused by current turbulence. Modelling shows that changes in current velocities will be less than 15% within 5 metres from the monopile foundation (Figure 1.7) (Elsam, 2000).

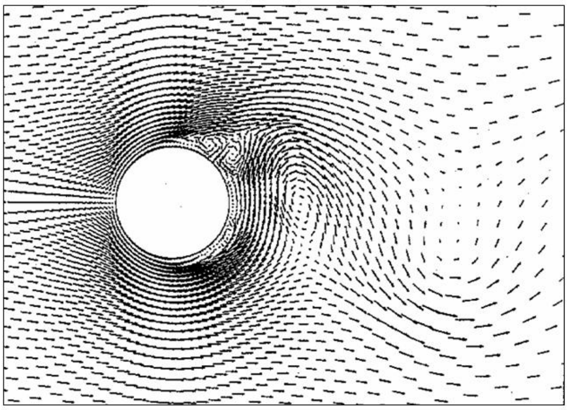


Figure 1.7. Ocean current turbulence around a monopile foundation.

Photo 6. Horns Rev offshore wind farm under construction.

1.5.1.4. Introduction of hard substrate habitats

As a secondary aspect of establishing offshore wind farms, sub-surface sections of turbine towers and the scour protections will introduce new types of sub-littoral structures and increase the heterogeneity in the area. The introduced habitats will be suitable for colonisation by a variety of marine invertebrates and attached algae. The hard bottom structures may act both individually and collectively as an artificial reef.

Structural complexity appears to be a condition for many productive and complex environments such as coral reefs, mangroves and sea grass meadows. These environments are productive, not only because they have a great turnover, but also because they offer a high degree of substrate complexity and an extensive spectrum of niche sizes, which are advantageous for young and juvenile organisms. The size, diversity and density of organisms on and in an artificial reef are conditional on the number and size of niches, but not necessarily on the presence of food. Algal growth on the reef contributes further to increased heterogeneity.

The hard substrate may increase the opportunities for epifauna to settle and may provide a substrate that is more attractive to mobile fauna than the previous ‘pre-wind farm seabed.’ The establishment of epifauna and flora on the hard substrates will increase the food available to fish, which again will lead to an increase in the food available to marine mammals and birds.

The presence of the deployed artificial hard substrate structures will lead to colonisation by many epibenthic organisms, which have not been in the area previously because of a lack of suitable habitat. Predictions of various qualitative or quantitative scenarios for fouling successions are highly dependable on the surrounding environment, the interaction between the different species of the fouling community and the predation or grazing on the fouling community by predatory or herbivorous species like the common star fish, sea urchins, snails, birds and others. Consequently no unambiguous forecast can be made about species composition and community structures in the introduced hard bottom benthic communities at Horns Rev.

Colonisation of the deployed substrates will be a combination of migration from the surrounding substrate and settling of larvae or spat. The recruitment will be governed by the sea currents carrying the larvae and spat to the foundation and by the location of the foundation with respect to depth, distance from recruitment source, etc. The recruitment will also be dependent on the type and heterogeneity of the foundation, which will always be seasonal in Danish waters.

The first species to colonize the foundations will be algae and invertebrates. The colonisation will often have a characteristic succession, starting with diatoms and filamentous algae, followed by barnacles and thereafter by a more diverse community (Falace & Bressan, 2000). The qualitative and quantitative composition of the fouling community will further vary with the water depth. There will be differences in the composition of the fouling community at particular depths on the monopiles and the scour protections.

The wind farm area at Horns Rev and its introduced hard bottom structures might also function as a sanctuary area for more species included in the Red List for threatened or vulnerable Wadden Sea species like the ross worm (*Sabellaria spinulosa*) (Nielsen et al. 1996; Petersen et al. 1996). Although more common on hard bottom structures *Sabellaria spinulosa* can form compact reef-like populations on mixed sediments including shells (Jones et al., 2000). After a heavy decline that started in the 1920s, it has again been seen in increasing numbers in parts of the Wadden Sea area (Nehring, 1999). *Sabellaria* reefs have not been recorded in the Danish part of the Wadden Sea (Nehring, 1999).

The biomass produced on the introduced hard bottom structures might be many times greater than biomass production by the native benthic community at Horns Rev, mainly due to habitats suitable for colonisation of the common mussel (*Mytilus edulis*).

A preliminary study of the development of fouling communities on a meteorological measuring mast at Horns Rev in 1999 showed an established community of algae and invertebrates 5 months after deployment (Bio/consult, 2001). The fouling community consisted of a thick moss-like layer of diatoms, small filamentous algae, barnacles (*Balanus sp.*), colonies of bryozoans (*Bryozoa indet.*), sea anemones (*Urticina felina*, *Actinariidae indet.*), sea-squirts (*Ascidiacea indet.*), common star fish (*Asterias rubens*), the keelworm (*Pomatoceros triqueter*) and few common mussels (*Mytilus edulis*) with lengths up to 4 cm. The preliminary study also showed that the current and the near-bottom transport of sand apparently limited the fouling community. Sand scouring is so extreme in the area that the lowest areas of the foundation were devoid of a fouling community.

The impact from current, wave action and sand scouring might extend to the whole length of the foundation in connection with storms. This was confirmed by the findings of a later study to measure mast following the storm from December 3rd, 1999. The only signs left of a fouling community were the calcium traces from the previously attached barnacles. Predation from the common starfish *Asterias rubens* might also result in a total disruption of attached potential prey from the mast surface. It was noted that the fouling communities on the foundations might be very vulnerable on vertical structures without any scour protections.

1.5.2. Criterion

The main objective of the monitoring programme was to detect if any major changes in the overall community structure and species composition in the infauna community were introduced by the introduction of hard bottom substrates at Horns Rev. This objective was in compliance with the preliminary requirements set by the national authorities but no specific legislative environmental criteria have been established for the impact on infauna communities in relation to the construction of wind farms.

1.5.3. Hypotheses regarding effects

The principal hypotheses regarding effects from the introduction of the hard bottom substrate habitats to be tested are:

- there is no spatial variation in the fouling community between the individual foundations at any given depth,
- there is no variation in the fouling community between foundations at different depths,
- there is no hydrodynamic effect on the fouling community or the benthic infauna community from the monopile or the turbine foundations,
- there is no major change in the infaunal community structure or infauna species composition,
- there is no edge effect related to the wind turbine sites within the wind farm, and
- there is no depth dependence zoning in the fouling community on the monopiles.

Photo 7. Catch of mobile epifauna species.

Photo 8. Shells of Ensis americanus *and tentacle fans of the sand mason Lanice conchilega.*

2. Methods

Based on the results from the EIA screening survey in 1999 (Leonhard, 2000), an environmental monitoring programme for the assessment of impact from construction and operation activities on marine benthos was established (Leonhard, 2003). The methodology and the extend of the sampling programme was adjusted to comply with the hypotheses and the objectives of detecting only major changes in the overall benthic community structure and of monitoring the introduced hard bottom communities.

For infauna and hard bottom surveys, weather, wind conditions and hydrographical data such as current direction, approximate current speed, wave height and transparency were recorded at each sampling site. The Secchi depth was measured by lowering a white Secchi disc (diameter = 30 cm) several times until the disc became invisible. The estimated Secchi depth was adjusted for wave height according to Danish Standard DS 293.

Adjusted Secchi depth = estimated Secchi depth X (1+ 0.4 x wave height).

2.1. Infauna

Baseline surveys were conducted in June and September 2001. In June 2001, samples were collected from a total of 18 stations at 6 wind turbine locations in the wind farm area (Figure 2.1). The 6 wind turbine locations are in areas where the depth is less than 10 metres and thus a representative sample of the entire wind turbine area. In September 2001, samples were collected from 9 stations at 3 wind turbine locations (55, 58 and 95) and at 5 stations in a designated reference area supposed to be used in a sandeel monitoring programme.

a) b)

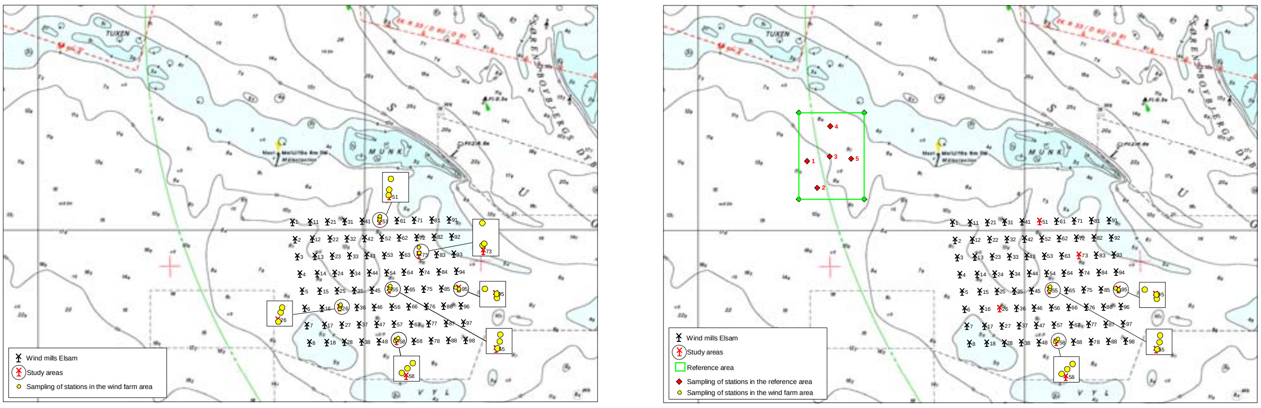


Figure 2.1. Map of locations sampled during the baseline surveys in 2001. a) June 2001, b) September 2001.

During the monitoring period, surveys were conducted in September 2003 and 2004.

In September 2003 and 2004, samples were collected at 3 stations along transects at each of 6 individual turbine locations (Figure 2.2) that were sampled in 2001 and at 6 reference stations that were sampled during the EIA screening survey in 1999 (Leonhard, 2000). At the turbine locations, the transects were placed on the leeward side of the turbine foundations with respect to the prevailing current. In these areas, the maximum possible impact was expected from the changes in currents by the wind turbine foundations. The three stations were located at distances of 5 m, 25 m and 100 m from the edge of the scour protection.

a) b)

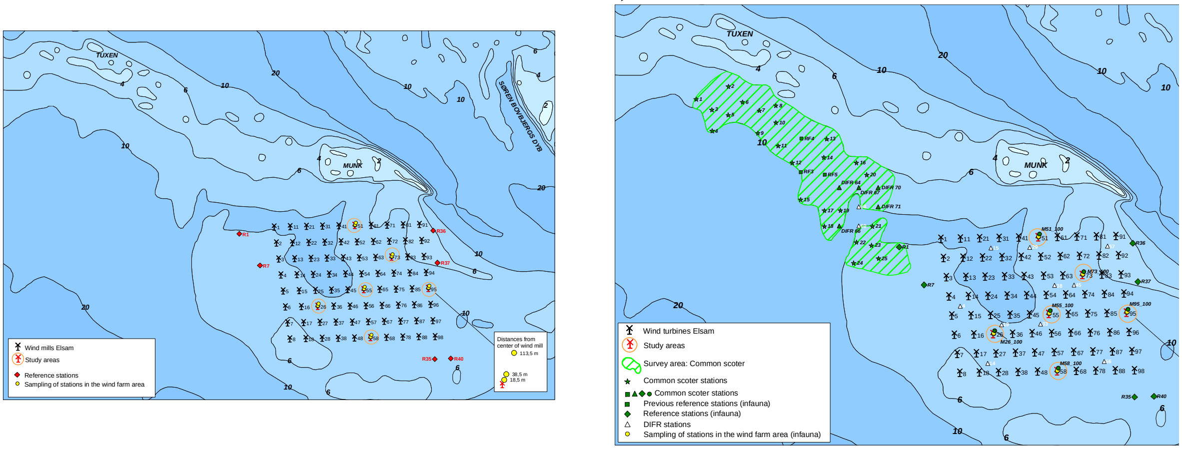


Figure 2.2. Map of locations sampled in September 2003-2004 (a) and in spring 2005 (b).

In spring 2005 (March-April), samples were collected from 5 stations in the wind farm area and at 40 stations outside the wind farm area (Figure 2.2b). Samples were mainly collected from an area northwest of the wind farm area where investigations on bird populations around Horns Rev have shown increased numbers and aggregations of the common scoter *(Melanitta nigra)*. All samples were collected in areas with depths between 6 and 12 metres. Stations R1, R7, R35, R36, R37 and R40 as well as stations with the prefix M were monitored during the monitoring programme for infauna in 2003 and 2004. Stations with the prefix DIFR were analysed for sediment characteristics in the survey for sandeel in 2002 (Jensen et al., 2004) and three stations (RF3, RF4, RF5) were monitored during the baseline description for infauna in September 2001.

2.1.1. Field surveys

At each station, three quantitative HAPS-samples with a surface area of 0.0123 m² were taken by SCUBA divers using polycarbonate tube samplers. The sediment core sample depths were approximately 15 cm. Two replicate samples were collected for analysing infauna and one sample was collected at each station for analysis of sediment characteristics. The choice of sampling technique and the number of samples was based on a statistical power analysis of the abundance and biomass data from the baseline studies.

Samples for identification of species composition, abundance and biomass were carefully sieved through a 1.0 mm laboratory test sieve and the residual was preserved in 96% ethanol, which is equivalent to approximately 80% ethanol when taking the water content of the sample into consideration.

The coordinates of the infauna localities with actual GPS positions (WGS 84) and actual depths at sampling dates are presented in Appendix 1.

2.2. Hard bottom substrate

Monitoring surveys were performed in March and September each year from 2003 to 2005.

Surveys were performed at six turbine sites at the Horns Rev Wind Farm (Figure 2.3). The sites were selected according to differences in depth regimes and turbine site locations. Faunal colonisation patterns might be different between turbine foundations in the centre, along the border of the wind farm area and at the turbine foundations at different depth regimes.

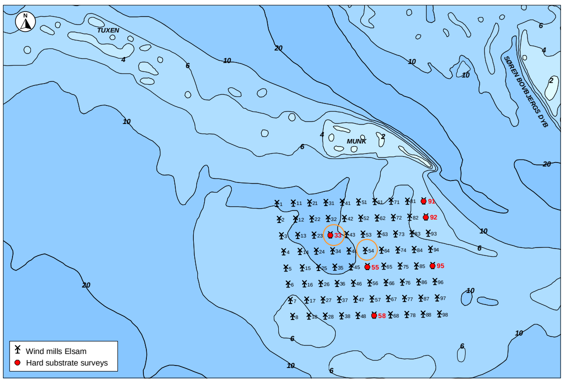


Figure 2.3. Map of locations sampled in March and September 2003-2005. The test fishing was performed at the encircled turbine sites.

Photo 9. Survey vessel.

The coordinates of the six turbine positions are given in Appendix 1.

2.2.1. Field surveys

Depth at the turbine sites was measured with an echo sounder with the depth being from the water surface to the top of the scour protection close to the monopile.

At different individual foundation stations, SCUBA divers collected samples along a line (transect) in the direction of the main current (NNE 20°) in order to cover many zones exposed to different current situations. Three stations at distances 0.5 m, 2 m and 5 m (NNE0.5, NNE2, and NNE5, respectively) from the monopiles were selected along the transects. As a reference, one station (SSW5) was additionally sampled 5 metres upstream (SSW 200°) from the monopile (Figure 2.4).

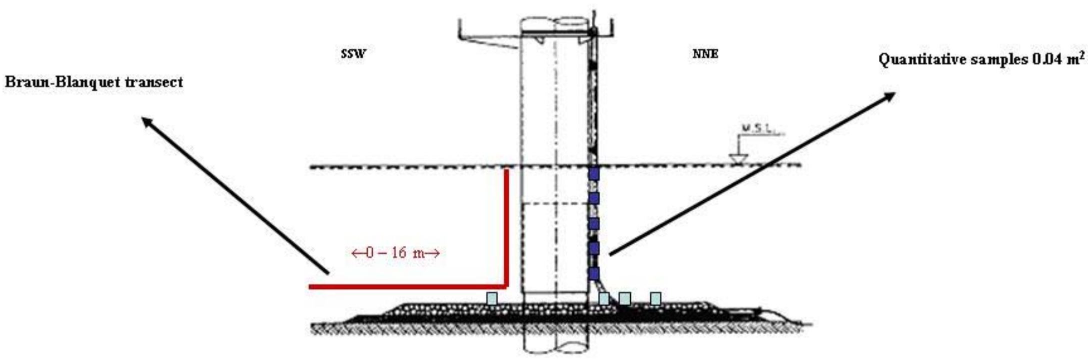


Figure 2.4. Sampling locations at the turbine sites.

At each station, samples of fouling organisms were thoroughly scraped off the stone blocks within a frame of 0.04 m² using a special scraping tool and a special underwater air-lift device. Three replicates of faunal samples were collected in bags with a mesh size of 1 mm. A total of 72 scour protection samples were collected during each survey.

Along each upstream (SSW) and downstream (NNE) foundation transect, a visual determination was performed of the fouling communities and species that could be identified were identified on site by the divers in addition to the quantitative sampling. A semi-quantitative assessment was carried out on the frequency of each group of organism as well as an evaluation of the coverage of species and substrate. The species-specific degree of coverage is the term used to describe the degree of coverage by a single species on a specific substrate based on a suitable adaptation of the Braun-Blanquet scale (Table 2.1) (Leewis and Hallie, 2000). Fish species observed were registered and numbered according to Table 2.1. Underwater video recordings were also made for documentation.

Table 2.1. Braun-Blanquet scores for hard substrate fouling organisms. Code for observations of mobile benthic species and fish species.

Sessile species		**Mobile species**	**Fish species**	
Code	**Degree of coverage %**	**Number of individuals/m²**	**Code**	**Number of individuals**
R	< 0.05	0.5	O	Observed
+	0.05–0.50	2	R	Common
1	0.50–5	5	∞	Numerous
2	5–25	5–50		
3	25–50	50–500		
4	50–75			
5	75–100			

The total degree of coverage for floral and faunal communities on the scour protection and the monopiles is termed the substrate-specific degree of coverage. Certain groups of organisms were collected for species identification in the laboratory. Some green algae in the genus *Ulva,* especially the species in the *Enteromorpha* group, are very difficult to identify during field surveys. Identification of *Ulva intestinalis* and *U. linza* were done in the laboratory. Some species of sea anemones were identified using video recordings.

Sampling also included the monopile at three locations (marked with ** in Table 1.4a). The sampling covered the vertical variation at depth intervals of 0 m, 2 m, 4 m, 6 m and 8 m measured from the bottom of the scour protection (Figure 2.4). The sampling was performed to cover the direction of the principal current on both the currentward (SSW) and leeward sides (NNE) of the monopiles.

In addition to the visual studies and the photographic documentation, the studies on the monopiles included the collection of quantitative samples by divers to determine the composition of species, abundance, and biomass. Two 0.04 m² frame samples were taken within each depth interval on each side of the monopile. Larger algae and shellfish as well as other fouling organisms were scraped off using the same technique used on the scour protection. Dependent on tidal depth variations a total of 54 to 64 samples from the monopiles were collected at the individual surveys.

Additional frame samples concerning the abundance of specific epifauna communities in the splash zone were made at a selected number of monopiles.

2.3. Sample handling

2.3.1. Sediment

Sediment was characterised by analyses for grain size distribution, dry matter content and the amount of organic material measured by combustion loss. Dry matter content was measured as a percentage of the wet weight. The combustion loss was measured as a percentage of the dry weight. Data are presented in Appendices 3 and 4. The samples were treated according to DS 405.11 and DS 204. The sediment was washed in distilled water to remove any remaining salts and dried at 105°C until constant weight was obtained. The sediment was pre-treated with hydrogen peroxide to remove organic material.

Grain size distribution was determined using a combination of sieve analysis and sedigraph technique. Sieve analysis was used for the sand fraction, i.e. all the material retained by a 63 μ sieve according to a modified standard DS 405.9 using a total of 15 sieves.

A sedigraph 5100 was used for analysis of the silt/clay fraction, i.e. all the material passing through a 63 μ sieve. The sediment was pre-treated with a 0.005 molar solution of sodium pyro phosphate and treated with an ultrasound vibrator for 5 minutes.

Cumulative percentage curves of the sieve and the sedigraph analysis data were prepared with their characteristics described by means of median particle diameter and measured as the point at which the 50% abscissa intersects the cumulative percentage curve.

On the basis of sediment statistics, a sorting index was calculated. Sediments with a sorting index less than 0.5 were characterised as well-sorted. A sorting index of 0.5–1 characterises sediments as medium-sorted, while a sorting index of >1 characterises sediments as poorly sorted (modified after Folk & Ward [GEUS, 2002]).

2.3.2. Benthos

In the laboratory, samples for identification of species composition, abundance and biomass were carefully sieved through a 0.5 mm test sieve. All remaining organisms in the collection net bag were carefully removed with use of a pincer.

The fauna samples were sorted under a microscope and the animals were identified to the lowest possible taxon. Due to the large number of individuals in the frame samples, standard sub sampling was practised for both numbering and measurement of biomass. The number of individuals and the ethanol wet weight of each taxon were determined. Abundance (ind. m^{-2}) and biomass (g wet weight [ww] m^{-2}/g; dry weight [dw] m^{-2}) were calculated for the total fauna. Dry weight data exists only for surveys performed from 2003 to 2005.

The shell length of the mussels, i.e. the longest distance between anterior end and posterior end, and the disc diameter of the brittle stars were measured by means of electronic slide gauge.

2.4. Test fishing

As a supplement to the fauna sampling programme, test fishing using standard gill nets was performed at turbine sites 54 and 33. Test fishing was performed at turbine site 54 in September 2003 and in March 2004. From September 2004, turbine site 33 was selected due to the fact that the divers observed more species than at any other sites investigated. Both pelagic gill nets and sinking gill nets were used during day and night.

The standard biological survey gill nets used were 42 m long and 1.5 m high. The nets are composed of 14 different mesh sizes from 6.25 mm to 60 mm in 14 sections. The nets were placed with the southern end close to the monopile in the direction of the main current towards 20º NNE. The pelagic nets were placed in the pelagic zone approximately 1.5-2.5 m above the seabed covering both the scour protection and the seabed outside the scour protection (Figure 2.5).

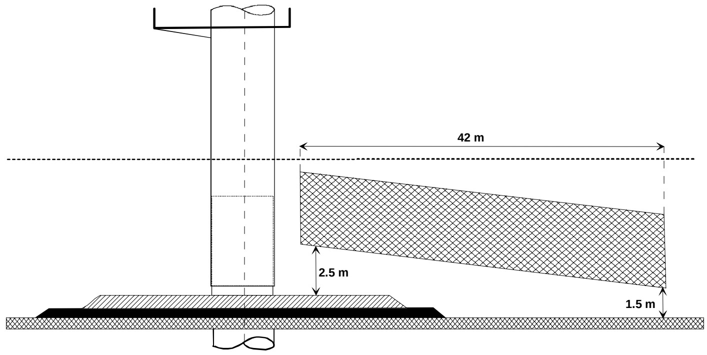


Figure 2.5. Schematic illustration of the placement of the pelagic gill nets at the test fishing sites.

2.4.1. Objective

The objective of the test fishing was to validate the fish species observed during the sampling programme in the evaluation of the fish attraction effect of the introduced hard substrates.

2.5. Data analyses

Differences in infauna datasets between the wind farm and reference areas and between survey campaigns were analysed on the basis of the combined data of sediment characteristics and species composition in terms of abundance and biomass.

Campaign data available for analysis are presented in Table 2.2.

Table 2.2. Campaign data available for infauna community analysis.[1]

		Wind farm area		Reference area	
Campaign	Year	Spring	Autumn	Spring	Autumn
EIA screening	1999	x		x	
Baseline	2001	x	x		
Monitoring	2003		x		x
Monitoring	2004		x		x
Monitoring/extended survey area	2005	x		x	

[1] Only comparable data sets are included in the analysis. Due to high heterogeneity, the benthic community within the designated reference area sampled in autumn 2001 showed to be statistically different from the benthic community in the wind farm area (Leonhard & Pedersen, 2002).

Due to the nature of the sampling layout, where the reference area was moved between 2001 and 2003 to stations identical with stations surveyed in 1999, and the difference in sampling time between 2003/2004 and 2005, the samples were segmented into the following subsets:

1. Wind farm area: 3 campaigns (September 2001, September 2003, September 2004).
2. Reference area: 3 campaigns (spring 1999, September 2003, September 2004).
3. Wind farm area: 2 campaigns (spring 2001 and spring 2005) compared to extended reference areas.

Datasets from autumn 2001 to 2004 and datasets from spring 1999 and 2005 were used for effect analysis and analysis for temporal yearly variations.

Differences in datasets from 2003 to 2005 were analysed for hard bottom substrate communities.

Table 2.3. Campaign data available for hard bottom substrate community analysis.

Campaign	Year	Wind farm area	
		Spring	**Autumn**
Monitoring	2003	x	x
Monitoring	2004	x	x
Monitoring	2005	x	x

2.5.1. Sediment characteristics

For each subset, differences in sediment characteristics were analysed using a series of ANOVA tests. Each variable was checked for normality and homogeneity of variance. In addition, the correlations between characteristics were quantified using Pearson's correlation coefficient, also called *linear* or *product-moment* correlation.

For further explanation, see http://www.statsoft.com/textbook/stbasic.html#Correlations.

2.5.2. Species composition

Differences between the faunal communities at the individual sampling sites, (wind farm area, reference area and wind turbine sites) variation in fauna communities at monopiles according to depth and variation in fauna communities between turbine sites were analysed on the basis of the combined data of species composition in terms of abundance and biomass.

Within each subset, differences in the species compositions between the wind farm area and the reference area and between survey campaigns or between the sampling sites were quantified using the Bray-Curtis dissimilarity index based on root-root transformed data. Root-root transformation reduces the importance of dominating species, which gives a better reflection of the species composition based on presence/absence compared with non-transformed data.

The Bray-Curtis index is calculated as:

$$BC = \frac{\sum_k \left| x_{ik} - x_{jk} \right|}{\sum_k x_{ik} + \sum_k x_{jk}}$$

where i and j are sub-samples and k is the number of species in the sub-samples. Similarity was expressed as 1 - BC. At maximum similarity, BC = 0 and at maximum dissimilarity, BC = 1.

The BC values are used for presenting data in 2-dimensional plots using a non-metric Multidimensional Scaling (MDS) ordination. For further description of the MDS technique, see: http://www.statsoft.com/textbook/stmulsca.html.

In MDS plots, usually a *stress* factor (0-0.5) is displayed as the distortion between the similarity rankings and the corresponding distance rankings in the ordination plot. Low stress 0.1-0.2 corresponds to a good agreement between the calculated similarity rankings and the ordination shown.

A formal test for differences between areas and campaigns was made for each subset using a non-parametric permutation procedure applied to the similarity matrix underlying the ordination. To evaluate the relative importance of the different species, the average contribution to the overall similarity within groups and the average contribution to the overall dissimilarity between groups were calculated for each species. The results are presented listing the most important species first.

To link sediment characteristics to species composition, two different approaches were used. First, a dissimilarity matrix was calculated between samples based on all sediment characteristics using the Euclidean distance as the dissimilarity measure. This matrix was tested for agreement with the dissimilarity matrix based on species composition using the weighted Spearman rank correlation, see:
http://www.statsoft.com/textbook/stnonpar.html#correlations.

Second, the same test for agreement was performed on combinations of sediment characteristics at steadily increasing levels of complexity to find the combination with the highest rank correlation.

No legislative environmental criteria has been established for either the indicators or level of significance for a monitoring programme at Horns Rev. As a consequence, the monitoring programme established for the benthic infauna was reduced to enable only major changes in the community structure of the infauna. The monitoring programme included multivariate analysis of the combined input from each species with respect to biomass and abundance, which have increased the sensitivity of the statistical analysis considerably. A variance test (ANOVA) on logarithm transformed data was used for analysing differences in abundance and biomass for selected dominant and character species between surveys.

The software package PRIMER was used for statistical analysis (Clarke & Warwick, 1994). A formal test for differences between sites was made for each subset using a non-parametric permutation procedure applied to the similarity matrix underlying the ordination. To evaluate the relative importance of the different species, the average contribution to the overall similarity within groups and the average contribution to the overall dissimilarity between groups were calculated for each species.

3. Results

3.1. Sediment

The sediments in the wind farm and reference areas can generally be characterised as homogeneous and medium sorted medium-fine to coarse sand.

The average medium grain size of the sediment in the wind farm area has significantly increased (P<0.01) from 345 µm in 2001 to more than 500 µm in 2003 and 2004 (Table 3.1 and Figure 3.1). The median grain size measured 100 m from a selected number of turbine foundations in spring 2005 showed similar levels than in 2003 and 2004 with a statistically significant change (P<0.01) from 1999 to 2005 (Table 3.2). The sediment characteristics did not change significantly between 2003 and 2004, although higher variations in the grain size distribution was found in 2004. No differences in the median grain size were found between the reference and the wind farm area at each individual survey (Figure 3.2 and Table 3.2). Statistically significant changes (P<0.01) in sediment structure were also found for the reference area between the 1999 survey and the surveys from 2003 to 2005. In the extended reference area at stations RF3-RF5, an increase in average median grain size was found from 327 µm in September 2001 to 401 µm in spring 2005. No differences were found in the sediment structure between the different areas surveyed in 2005 or changes in the areas or between the areas surveyed from 1999 to 2001.

Table 3.1. Average median grain size found in survey campaigns from 1999 to 2005.

Wind farm area					
Campaign	**Spring 1999**	**September 2001**	**September 2003**	**September 2004**	**Spring 2005**
Average median grain size µm	370	345	515	503	494
Range median grain size µm	271-384	228-426	404-699	379-618	347-612
Reference area					
Campaign	**Spring 1999**	**September 2001**	**September 2003**	**September 2004**	**Spring 2005**
Average median grain size µm	347		498	503	509
Range median grain size µm	231-411		345-574	385-591	395-627

*Table 3.2. Level of significance (**P<0.01) in analysis of differences in seabed sediment structure (median grain size) between different spring surveys and sample sites.*

ANOVA analysis	**1999** Wind farm	**1999** Reference	**2001** Wind farm	**2005** Wind farm	**2005** Reference	**2005** Extended reference
1999 Wind farm		0.553	0.541	0.002**	0.001**	< .001**
1999 Reference			0.911	0.009**	0.004**	< .001**
2001 Wind farm				0.002**	0.001**	< .001**
2005 Wind farm					0.814	0.974
2005 Reference						0.736
2005 Extended reference						

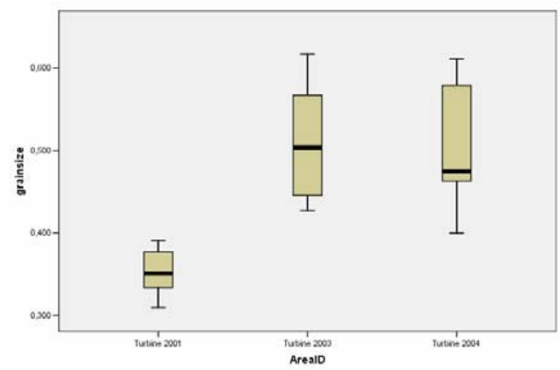


Figure 3.1. A box plot of the median grain size in the wind farm in September 2001, 2003 and 2004.

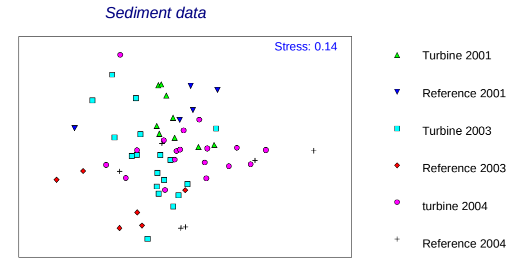


Figure 3.2. A multidimensional scaling (MDS[2]) plot of the sediment characteristics in the wind farm (Turbine) and reference area (Ref) in September 2001, 2003 and 2004.

In the northern part of the wind farm area, the sea bottom generally consisted of slightly finer sediment. In 2004 and 2005, the coarsest sand was found at turbine sites M26 and M58 in the western and southern part of the wind farm area (Figure 3.3).

In general, there was a great spatial variability found in the seabed surface sediment structure in the extended reference area (Figures 3.3 and 3.4). The sediment was generally homogeneous and medium sorted with an average medium grain size of 518 µm but showed a rather heterogeneous grain size distribution varying from 220 µm to 807 µm. The sediment was more poorly sorted with coarser sand only in the northern part of the wind farm toward the Tuxen ground (Figure 3.3).

A statistical analysis revealed a significant ($P<0.01$, $P<0.05$) negative correlation between the depth and the median particle size in the wind farm area and reference area.

No correlation was found between the particle size of sediment and the distance from sampling station to turbine foundation (Figure 3.5) although, a tendency towards more coarse sediments was found at distance from turbine foundations.

[2] A graphic presentation of the similarities as a Multi-Dimensional Scaling plot or MDS-plot is a complex mathematical method to construct a map of the samples in a certain number of dimensions. The purpose of the map is to place the samples on the map in accordance with the calculated distances in similarity. If sample A is more like sample B than C then A should be closer to B than to sample C.

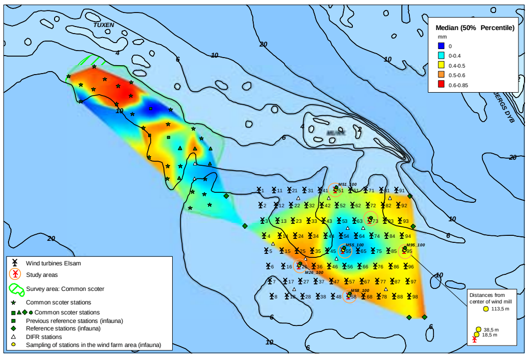


Figure 3.3. Median grain size in wind farm area and extended reference areas in 2005.

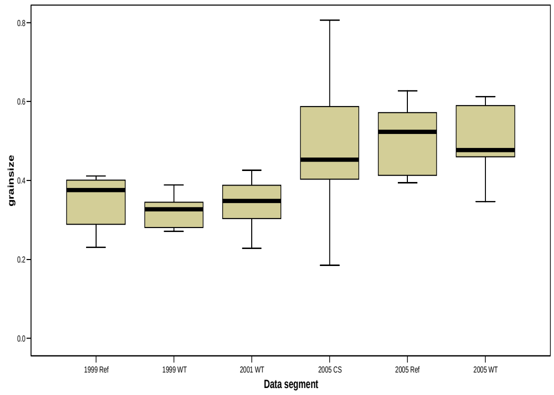


Figure 3.4. A box plot of the median grain size in the wind farm and reference areas in the spring surveys from 1999 to 2005.

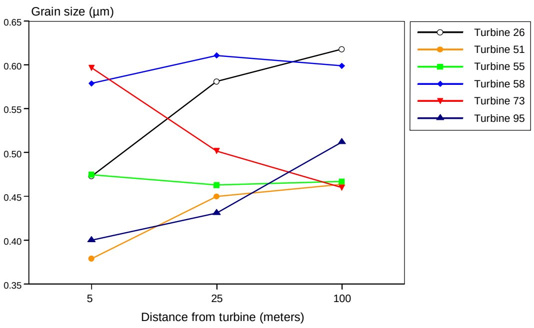


Figure 3.5. Median grain size in the wind farm in relation to distance from the turbines, 2004.

Photo 10. Sediment core samples.

3.2. Infauna

The cumulative percentage abundance of the most common species was high in both the wind farm area and reference area indicating community domination by a few taxa (Tables 3.3 and 3.4).

Considerable changes in abundances and biomass between some of the character and dominant species were found between the individual spring and autumn surveys from 1999 to 2005 (Tables 3.3 to 3.6). Also, considerable differences in total abundance and total biomass were found between the individual surveys (Figures 3.6 and 3.7).

In general, a considerable increase of abundance was found during the monitoring period from 2003 to 2004 and from the screening and baseline surveys in spring up to the 2005 spring survey. A similar increase in abundance was found in the reference area for the spring surveys, whereas a decline of abundance during the monitoring period from 2003 to 2004 was found in the reference area. The highest abundance was found in the wind farm in September 2001. The most dominant species was the small bivalve (*Goodallia triangularis*). The variation in general abundances found was in principal influenced by the temporal and spatial variation of this and the few other dominant species. Further, the bivalve (*Thracia phaseolina*) and the relatively large bristle worm (*Travisia forbesii*) were also often found in relatively high numbers in the wind farm and reference areas contributing with relative biomasses of 32% and 21% in the wind farm area in 2004. In the 2005 spring surveys, these two species often made a considerable contribution to the overall local biomasses.

Especially large species of bivalves and migratory crustaceans like the hermit crab (*Pagurus bernhardus*) but also large specimens of the thick trough shell (*Spisula solida*) and the American razor shell (*Ensis americanus*) were occasionally found in samples contributing with a relatively large biomass (Figure 3.8). The main contribution to the biomass changes in the wind farm area between 2001 and 2004 and between spring 2001 and 2005 were declines in biomasses of *Spisula solida*. The high biomass in the reference area in 2004 was mainly caused by the presence of one large specimen found.

Table 3.3. Abundance of character species and dominants in comparable surveys from September 2001-2004.

Abundance, number/m²		Sampling area									
		Wind Farm area						Reference area			
		2001		2003		2004		2003		2004	
Species	Group	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %
Goodallia triangularis	Bivalve	203.3	10.9	664.0	58.3	862.7	58.7	630.1	53.8	616.5	75.8
Pisione remota	Bristle worm	411.0	22.0	22.6	2.0	85.8	5.8	13.6	1.2	6.8	0.8
Goniadella bobretzkii	Bristle worm	189.7	10.1	146.8	12.9	65.5	4.5	149.1	12.7	33.9	4.2
Spisula solida	Bivalve	36.1	1.9	20.3	1.8	13.6	0.9	27.1	2.3	13.6	1.7
Ophelia borealis	Bristle worm	72.3	3.9	11.3	1.0	9.0	0.6	13.6	1.2	0.0	0.0
Orbinia sertulata	Bristle worm	0.0	0.0	9.0	0.8	15.8	1.1	13.6	1.2	6.8	0.8
Total		**912.4**	**48.8**	**874.0**	**76.8**	**1,052.4**	**71.6**	**846.9**	**72.3**	**677.5**	**83.3**

Table 3.4. Abundance of character species and dominants in comparable surveys from spring 1999-2005.

Abundance, ind./m²		Sampling area											
		Wind Farm area						Reference area				Extended Rreference area	
		1999		2001		2005		1999		2005		2005	
Species	Group	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %
Goodallia triangularis	Bivalve	199.6	31.8	153.6	16.4	474.3	40.7	54.2	10.1	758.8	61.5	197.1	26.8
Pisione remota	Bristle worm	206.9	32.9	176.2	18.8	203.3	17.4	74.5	13.9	108.4	8.8	170.0	23.2
Goniadella bobretzkii	Bristle worm	51.7	8.2	128.7	13.8	108.4	9.3	81.3	15.2	67.8	5.5	51.7	7.0
Travisia forbesii	Bristle worm	14.8	2.4	.	.	81.3	7.0	40.7	7.6	54.2	4.4	9.9	1.3
Thracia phaseolina	Bivalve	.	.	58.7	6.3	54.2	4.7	.	.	.	.	41.9	5.7
Ensis americanus	Bivalve	.	.	.	.	.	.	.	.	40.7	3.3	101.0	13.8
Ophelia borealis	Bristle worm	7.4	1.2	47.4	5.1	.	.	54.2	10.1	13.6	1.1	12.3	1.7
Orbinia sertulata	Bristle worm	7.4	1.2	24.8	2.7	13.6	1.2	40.7	7.6	.	.	.	.
Spisula solida	Bivalve	7.4	1.2	31.6	3.4	.	.	13.6	2.5	.	.	2.5	0.3
Total		**495.2**	**78.8**	**621.0**	**66.4**	**935.0**	**80.2**	**359.1**	**67.1**	**1,043.4**	**84.6**	**586.4**	**79.9**

Table 3.5. Biomass of character species and dominants in comparable surveys from September 2001-2004.

Biomass, wet weight g/m²		Sampling area									
		Wind Farm area						Reference area			
		2001		2003		2004		2003		2004	
Species	Group	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %
Spisula solida	Bivalve	231.883	77.4	62.580	33.7	0.790	3.4	77.699	21.7	97.250	89.3
Goodallia triangularis	Bivalve	0.542	0.2	1.504	0.8	2.170	9.3	1.794	0.5	1.750	1.6
Orbinia sertulata	Bristle worm	0.000	0.0	1.834	1.0	2.370	10.1	0.614	0.2	0.880	0.8
Ophelia borealis	Bristle worm	7.405	2.5	0.299	0.2	0.054	0.2	6.654	1.9	0.000	0.0
Goniadella bobretzkii	Bivalve	0.184	0.1	0.555	0.3	0.049	0.2	0.068	0.0	0.014	0.0
Pisione remota	Bristle worm	0.035	0.0	0.078	0.0	0.018	0.1	0.003	0.0	0.001	0.0
Total		**240.049**	**80.1**	**66.849**	**36.1**	**5.451**	**23.3**	**86.832**	**24.2**	**99.895**	**91.8**

Table 3.6. Biomass of character species and dominants in comparable surveys from spring 1999-2005.

Biomass, wet weight g/m²		Sampling area											
		Wind Farm area						Reference area				Extended Rreference area	
		1999		2001		2005		1999		2005		2005	
Species	**Group**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**
Ensis americanus	Bivalve	.	.	.	.	.	.	.	.	314.45	90.4	525.25	97.6
Spisula solida	Bivalve	2.231	17.7	42.109	64.7	.	.	1.30	1.2	.	.	0.01	0.0
Ophelia borealis	Bristle worm	0.035	0.3	6.505	10.0	.	.	15.01	14.4	0.41	0.1	4.98	0.9
Travisia forbesii	Bristle worm	0.028	0.2	.	.	9.367	43.8	0.79	0.8	7.11	2.0	0.55	0.1
Orbinia sertulata	Bristle worm	1.463	11.6	2.788	4.3	4.707	22.0	4.79	4.6	.	.	.	.
Thracia phaseolina	Bivalve	.	.	7.687	11.8	4.108	19.2	.	.	.	.	0.63	0.1
Goodallia triangularis	Bivalve	0.698	5.5	0.400	0.6	1.321	6.2	0.20	0.2	2.00	0.6	0.47	0.1
Goniadella bobretzkii	Bristle worm	0.052	0.4	0.075	0.1	0.077	0.4	0.07	0.1	0.04	0.0	0.04	0.0
Pisione remota	Bristle worm	0.017	0.1	0.025	0.0	0.054	0.3	0.01	0.0	0.07	0.0	0.15	0.0
Total		**4.508**	**35.8**	**59.565**	**91.5**	**19.581**	**91.6**	**22.165**	**21.2**	**324.009**	**93.1**	**531.935**	**98.8**

For the most dominant and character species, no statistically significant differences were found for *Pisione remota*, *Goodallia triangularis* and *Ophelia borealis* in abundance and biomass between the spring surveys from 1999 to 2005. However, statistical differences were found between two or more surveys for the remaining dominant and characteristic species (Tables 3.7-3.8). The differences found in most cases included the extended reference area. In general, very high variances were found in the distribution pattern of the dominant and character species.

*Table 3.7. Level of significance (**P<0.01; *P<0,05) in analysis of differences in abundance of dominant and character species between different spring surveys and sample sites.*

ANOVA analysis	**1999**	**1999**	**2001**	**2005**	**2005**	**2005**
Goniadella bobretzskii	Wind farm	Reference	Wind farm	Wind farm	Reference	Extended reference
1999 Wind farm		> 0.05	> 0.05	> 0.05	> 0.05	> 0.05
1999 Reference			> 0.05	> 0.05	> 0.05	> 0.05
2001 Wind farm				> 0.05	> 0.05	0.012*
2005 Wind farm					> 0.05	> 0.05
2005 Reference						> 0.05
2005 Extended reference						

ANOVA analysis	**1999**	**1999**	**2001**	**2005**	**2005**	**2005**
Orbinia sertulata	Wind farm	Reference	Wind farm	Wind farm	Reference	Extended reference
1999 Wind farm		> 0.05	> 0.05	> 0.05	> 0.05	> 0.05
1999 Reference			> 0.05	> 0.05	> 0.05	0.007**
2001 Wind farm				> 0.05	> 0.05	0.008**
2005 Wind farm					> 0.05	> 0.05
2005 Reference						> 0.05
2005 Extended reference						

ANOVA analysis	**1999**	**1999**	**2001**	**2005**	**2005**	**2005**
Spisula solida	Wind farm	Reference	Wind farm	Wind farm	Reference	Extended reference
1999 Wind farm		> 0.05	> 0.05	> 0.05	> 0.05	> 0.05
1999 Reference			> 0.05	> 0.05	> 0.05	> 0.05
2001 Wind farm				> 0.05	> 0.05	0.011*
2005 Wind farm					> 0.05	> 0.05
2005 Reference						> 0.05
2005 Extended reference						

ANOVA analysis	**1999**	**1999**	**2001**	**2005**	**2005**	**2005**
Travisia forbesii	Wind farm	Reference	Wind farm	Wind farm	Reference	Extended reference
1999 Wind farm		> 0.05	> 0.05	> 0.05	> 0.05	> 0.05
1999 Reference			> 0.05	> 0.05	> 0.05	> 0.05
2001 Wind farm				0.003**	> 0.05	> 0.05
2005 Wind farm					> 0.05	0.028*
2005 Reference						> 0.05
2005 Extended reference						

ANOVA analysis	**1999**	**1999**	**2001**	**2005**	**2005**	**2005**
Thracia phaseolina	Wind farm	Reference	Wind farm	Wind farm	Reference	Extended reference
1999 Wind farm		> 0.05	0.022*	> 0.05	> 0.05	> 0.05
1999 Reference			0.016*	> 0.05	> 0.05	> 0.05
2001 Wind farm				> 0.05	> 0.05	> 0.05
2005 Wind farm					> 0.05	> 0.05
2005 Reference						> 0.05
2005 Extended reference						

ANOVA analysis	**1999**	**1999**	**2001**	**2005**	**2005**	**2005**
Ensis americanus	Wind farm	Reference	Wind farm	Wind farm	Reference	Extended reference
1999 Wind farm		> 0.05	> 0.05	> 0.05	> 0.05	0.002**
1999 Reference			> 0.05	> 0.05	> 0.05	0.002**
2001 Wind farm				> 0.05	> 0.05	<.001**
2005 Wind farm					> 0.05	0.033*
2005 Reference						> 0.05
2005 Extended reference						

*Table 3.8. Level of significance (**P<0.01; *P<0,05) in analysis of differences in biomass of dominant and character species between different spring surveys and sample sites.*

ANOVA analysis	**1999**	**1999**	**2001**	**2005**	**2005**	**2005**
Goniadella bobretzkii	Wind farm	Reference	Wind farm	Wind farm	Reference	Extended reference
1999 Wind farm		> 0.05	> 0.05	> 0.05	> 0.05	> 0.05
1999 Reference			> 0.05	> 0.05	> 0.05	> 0.05
2001 Wind farm				> 0.05	> 0.05	0.028*
2005 Wind farm					> 0.05	> 0.05
2005 Reference						> 0.05
2005 Extended reference						
ANOVA analysis	**1999**	**1999**	**2001**	**2005**	**2005**	**2005**
Orbinia sertulata	Wind farm	Reference	Wind farm	Wind farm	Reference	Extended reference
1999 Wind farm		> 0.05	> 0.05	> 0.05	> 0.05	> 0.05
1999 Reference			> 0.05	> 0.05	> 0.05	0.008**
2001 Wind farm				> 0.05	> 0.05	0.014*
2005 Wind farm					> 0.05	> 0.05
2005 Reference						> 0.05
2005 Extended reference						
ANOVA analysis	**1999**	**1999**	**2001**	**2005**	**2005**	**2005**
Spisula solida	Wind farm	Reference	Wind farm	Wind farm	Reference	Extended reference
1999 Wind farm		> 0.05	> 0.05	> 0.05	> 0.05	> 0.05
1999 Reference			> 0.05	> 0.05	> 0.05	> 0.05
2001 Wind farm				> 0.05	> 0.05	0.01*
2005 Wind farm					> 0.05	> 0.05
2005 Reference						> 0.05
2005 Extended reference						
ANOVA analysis	**1999**	**1999**	**2001**	**2005**	**2005**	**2005**
Travisia forbesii	Wind farm	Reference	Wind farm	Wind farm	Reference	Extended reference
1999 Wind farm		> 0.05	> 0.05	0.02*	> 0.05	> 0.05
1999 Reference			> 0.05	> 0.05	> 0.05	> 0.05
2001 Wind farm				0.001**	0.049*	> 0.05
2005 Wind farm					> 0.05	0.009**
2005 Reference						> 0.05
2005 Extended reference						
ANOVA analysis	**1999**	**1999**	**2001**	**2005**	**2005**	**2005**
Thracia phaseolina	Wind farm	Reference	Wind farm	Wind farm	Reference	Extended reference
1999 Wind farm		> 0.05	0.007**	> 0.05	> 0.05	> 0.05
1999 Reference			0.005**	> 0.05	> 0.05	> 0.05
2001 Wind farm				> 0.05	> 0.05	> 0.05
2005 Wind farm					> 0.05	> 0.05
2005 Reference						> 0.05
2005 Extended reference						
ANOVA analysis	**1999**	**1999**	**2001**	**2005**	**2005**	**2005**
Ensis americanus	Wind farm	Reference	Wind farm	Wind farm	Reference	Extended reference
1999 Wind farm		> 0.05	> 0.05	> 0.05	> 0.05	0.002**
1999 Reference			> 0.05	> 0.05	> 0.05	0.001**
2001 Wind farm				> 0.05	> 0.05	< 001**
2005 Wind farm					> 0.05	0.027*
2005 Reference						> 0.05
2005 Extended reference						

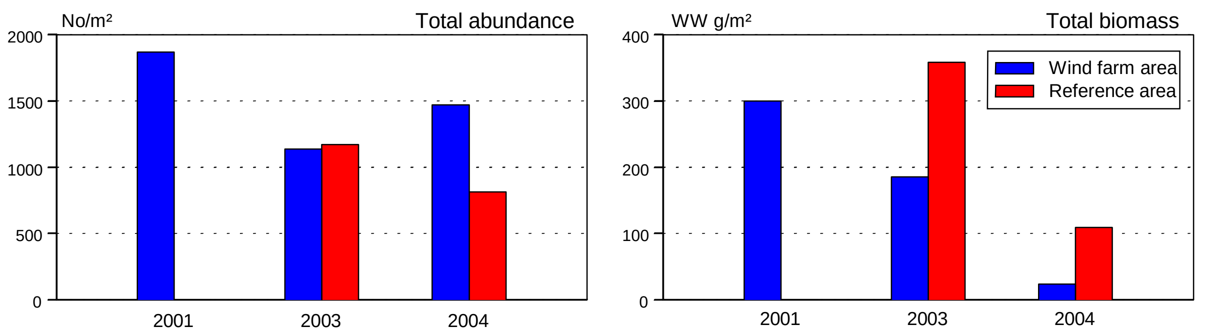


Figure 3.6. Total abundance and total biomass in the wind farm and reference areas from 2001 to 2004. Autumn samples.

A rather heterogeneous spatial distribution pattern was displayed for more of the most dominant and character species in 2005 (Figure 3.8). One of the main differences in the spatial distribution was found for the American razor shell (*Ensis americanus*), which was most abundant in the northwestern part of the extended reference area. The consequence of this was a conspicuously larger biomass in this particular area and in the extended reference area in general compared to the wind farm area and in lesser extent the reference area, where this mussel also was found. The small mussel (*Goodallia triangularis*) was most common in the wind farm area, whereas *Thracia phaseolina* seemed to be more homogeneously distributed even though the biomass of *Goodallia triangularis* was higher in the wind farm area.

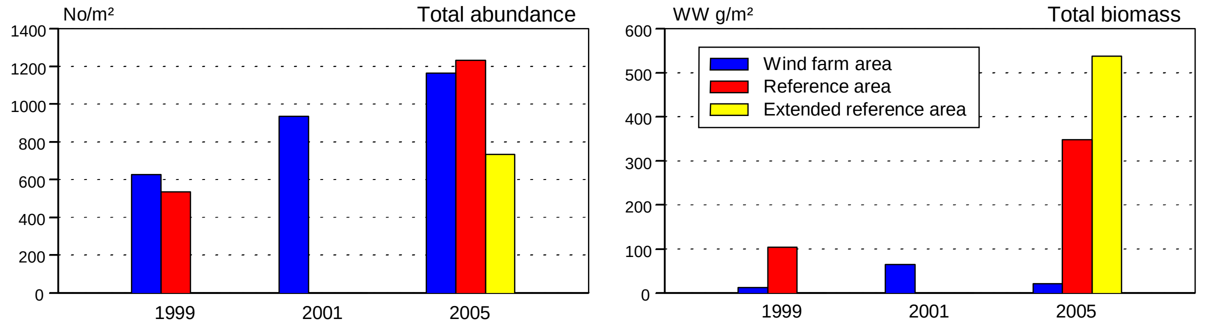


Figure 3.7. Total abundance and total biomass in the wind farm and reference areas from 1999 to 2005. Spring samples.

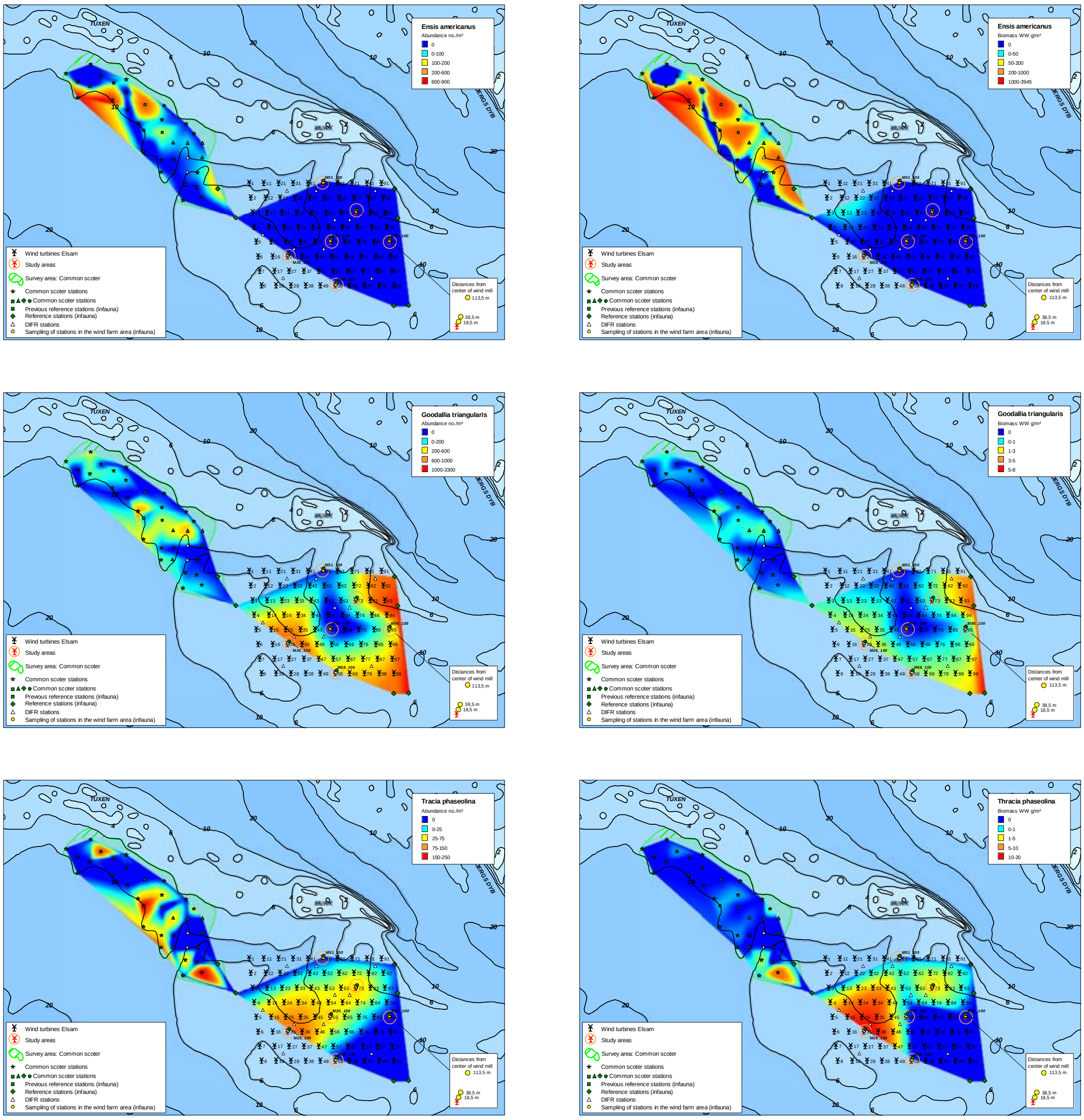


Figure 3.8. Abundance (left) and biomass (right) of the most abundant mussels found in the 2005 survey. Note the differences in colour levels.

3.2.1. *Structure of the community*

When analysing the 2001 to 2004 data from the autumn surveys in terms of abundance, a significant difference in community structure was found between the wind farm area in 2001 and both the reference and wind farm areas in September 2003 and 2004 (P=0.017; P=0.004) (Table 3.9). The most dramatic change was the decline in abundance of *Pisione remota* and *Goniadella bobretzkii* from 2001 to 2004. A significant difference was also found if the same analysis was performed using biomass instead of abundance to express community structure. Significant changes were also found in community structure between the wind farm area in September 2003 and 2004 (P=0.027), but the reference area remained unchanged from 2003 to 2004 (P=0.756). The difference in abundance of the most common species in the wind farm area between 2003 and 2004 was caused by an increase in the most common species of bivalve (*Goodallia triangularis*) (Table 3.2).

Table 3.9. Level of significance (P<0.05, **P<0.01) in analysis of differences in community structure between different autumn surveys and sample sites.*

ANOSIM analysis	**2001**	**2003**	**2003**	**2004**	**2004**
	Wind farm	Reference	Wind farm	Reference	Wind farm
2001. Wind farm		0.001**	0.017*	0.001**	0.004**
2003. Reference			0.152	0.756	0.078
2003. Wind farm				0.027*	0.006**
2004. Reference					0.053
2004. Wind farm					

a) b)

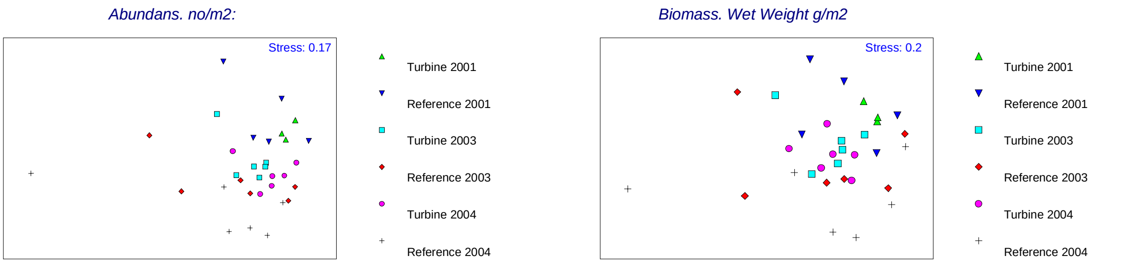


Figure 3.9. Multidimensional scaling (MDS) plots of the abundance (a) and biomass (b) of each species in the wind farm area (Turbine) in September 2001-September 2004 and in the reference area (Ref) in September2001-2004. *The designated reference area in 2001 is not geographically comparable to the reference areas in 2003-2004.*

The graphic presentation (MDS) of the similarities between the wind farm area and the reference area in each of the 3 years clearly shows that the abundance of the organisms in 2003 and 2004 were different from 2001 (Figure 3.9). It also shows that the wind farm area in 2003 was not different from 2004. Furthermore, it is evident that 5 stations (RF1-RF5) in the designated reference area in 2001 were quite different from the other areas.

Table 3.10. Level of significance (P<0.05, **P<0.01) in analysis of differences in community structure between different spring surveys and sample sites.*

ANOSIM analysis	1999 Wind farm	1999 Reference	2001 Wind farm	2005 Wind farm	2005 Reference	2005 Extended reference
1999. Wind farm		0.276	0.002**	0.291	0.419	0.020*
1999. Reference			0.001**	0.153	0.156	0.002**
2001. Wind farm				0.116	0.029*	0.001**
2005. Wind farm					0.238	0.427
2005. Reference						0.573
2005. Extended reference						

Concerning the data from the different spring surveys in terms of abundance, statistically significance changes were found in the community structure in the wind farm area in 2001 compared to the wind farm area and the reference area in 1999 (P=0.002; P=0.001). A decline in the abundance of the small bristle worm (*Pisione remota*) and the small bivalve (*Goodallia triangularis*) was the main reason for the differences found between 1999 and 2001.

Between 2001 and 2005, there was a marked increase in the abundance of *Goodallia triangularis* that was most pronounced in the reference area and an increase in the abundance of the bristle worm (*Travisia forbesii*) (Figure 3.10). However, a marked decrease was found for the bristle worm (*Ophelia borealis*) in the wind farm and reference area (Figure 3.10). Although differences were found, no unambiguous distribution patterns were found for *Pisione remota* and *Goniadella bobretzkii*. No statistically significant differences were found in the community structure in the reference and wind farm areas between 1999 and 2005 or in the wind farm area between 2001 and 2005, whereas a statistically significant difference in community structure was found between the wind farm area in 2001 and the reference area in 2005 (P=0.029) (Figure 3.10). In 2005, the benthic community in the extended reference area was comparable with the benthic communities in both the wind farm area and in the reference area, although considerable differences in abundance were found for most of the dominant species (Table 3.10). Statistically significant differences in the community structure were found between the extended reference area and the wind farm area in 1999 and 2001 and the reference area in 1999. This was partly explained by the abundance of *Ensis americanus* in the expanded reference area.

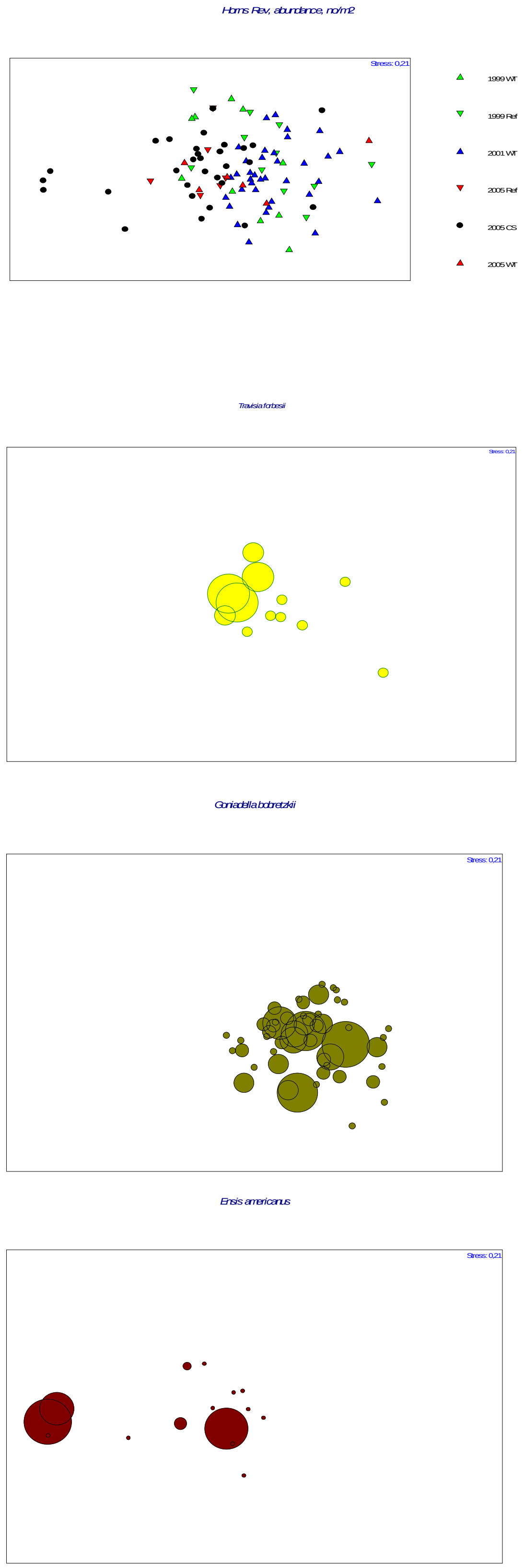


Figure 3.10. Multidimensional scaling (MDS) plots of the abundance of the dominant species in the spring surveyed areas from 1999 to 2005. Photo 11. Ensis americanus.

In 2003 and 2004, no significant differences were found between the benthos communities along the transects 5 m, 25 m and 100 m from the edge of the scour protection related to the possible effect of changes in current regimes from the wind turbine foundations. At each turbine site, similar community structure was present 5 m, 25 m and 100 m from the foundation.

Local differences in community structure within the wind farm area were also found in 2003 and 2004. The community structure at turbine site 51 was statistically significant different from the community structures at the other investigated turbine sites.

Species associated with the hard bottom structures at the wind farm sites like the slipper limpet (*Crepidula fornicata*) and the crustaceans (Jassa *marmorata* and *Caprella lineata*) were occasionally found in the infauna samples.

3.3. Hard bottom substrate

The colonisation and succession of the hard bottom substrate monitored in spring and autumn from 2003-2005 showed rapid colonization of benthic macro algae and sessile and mobile benthic fauna.

3.3.1. Vegetation

3.3.1.1. Species composition

A total of 26 different species/taxa were found during the monitoring period (Appendix 2). Of these species, the red algae from the genus *Hildenbrandia* and the green algae from the genus *Ulva* are difficult to identify in the field surveys, which might reduce the number of species in total.

A succession in the species composition was found from 2003 to 2004 with differences between the individual surveys in spring and autumn (Appendix 2.2).Differences in species composition were also found at sampling sites between monopiles and scour protections. At the monopiles, some species like *Urospora penicilliformis* and *Blidingia minima* were only found in 2003, whereas the red algae (*Polysiphonia fibrillosa* and *Porphyra umbilicalis*) and the green algae (*Chaetomorpha linum*) were only found in 2005. Of these, *Polysiphonia fibrillosa* and *Chaetomorpha linum* were the only species also found on the scour protections. *Polysiphonia fibrillosa* was found with relatively high coverage on the scour protection at more turbine sites.

The filamentous brown algae (*Pilayella littoralis*) was more abundant in the spring surveys compared to the autumn surveys whereas the green laver (*Ulva lactuca*) was more abundant and found in higher coverage in the autumn surveys.

The red algae (*Coccotylus truncatus* and *Corallina officinalis*) were only found on the scour protections and only in low numbers.

3.3.1.2. Structure of the community

Scour protections

On the scour protections, a distinct seasonal variation was found. Differences in the species composition and vegetation cover were related to different depth regimes between the different turbine sites. In general, the vegetation in spring was very sparse and often absent at turbine sites 33, 55, 58 and 95, which are situated in deeper waters compared to turbine sites 91 and 92 (Table 3.11).

The encrusting red algae (*Hildenbrandia rubra* (*Hildenbrandiales*)) was found relatively abundant in 2003 at turbine sites 91 and 92 and scattered on the stones at turbine sites 92 and 95 in spring 2004. It was not observed on the scour protections in 2005.

Although sparse, the most abundant vegetation on the scour protection in spring 2003 was the brown algae (*Pilayella littoralis*). In spring 2004, the green algae *Ulva (Enteromorpha*) was the most dominant but found very sparsely, whereas in spring 2005 the red algae (*Polysiphonia fibrillosa*) was most abundant.

In the 2005 autumn, the *Ulva (Enteromorpha*) and especially *Ulva lactuca* was the most prominent vegetation with local coverage up to 60%. In 2005, the green algae (*Chaetomorpha linum*) was also relatively numerous. The highest average coverage of *Ulva spp.* was found in 2004 (Figure 3.11).

A scattered and a temporal variation in the distribution was found for other algae such as the red algae (*Callithamnion corymbosum*, *Phyllophora pseudoceranoides*, *Coccotylus truncates*), the red coral algae (*Corallina officinalis*) and the brown algae (*Ectocarpus* spp., *Petalonia fascia* and *Desmarestia aculeata*).

Table 3.11. Groups of vegetation registered at the turbine sites in March (S) and September (A)during the surveys from 2003 to 2005.

2003-2005												
Turbine site	**33**		**55**		**58**		**91**		**92**		**95**	
Actual depth m	9.2-10.8		7.9-8.8		6.3-7.3		5.1-6.0		4.5-5.7		7.0-7.8	
Sample time	*S*	*A*	*S*	*A*	*S*	*A*	*S*	*A*	*S*	*A*	*S*	*A*
Red algae	03	03		03	´05	04	03/04/05	03/04/05	04/05	04/05	04/05	
Brown Algae	04	04			03	04/05	03	03/05	03/04	03/05		05
Green algae		03		05		03/04/05	04/05	03/04/05	04/05	03/04/05		04
No vegetation	05	05	03/04/05	04	04						03	03

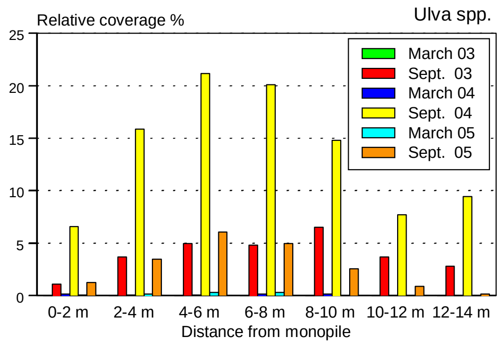


Figure 3.11.The mean relative coverage of Ulva (Enteromorpha*) spp. along transects on scour protections in 2003-2005.Photo 12. The green algae* Ulva lactuca *on the scour protection..*

Monopiles

At the monopiles, a distinct seasonal variation was found and distinct differences in the species composition and vegetation cover were found related to different depth zones.

In the splash zone of the monopiles, a dense cover of the filamentous green algae (*Urospora penicilliformis*) was only observed in spring 2003 whereas *Cladophora* was observed in relatively low coverage in autumn 2003 and autumn 2005. In 2004 and 2005, the vegetation of filamentous algae was generally replaced by a distinct green/brown coating of microscopic green algae and diatoms.

Just beneath the surface to approximately 2 metres below the sea surface, rather dense mats of the filamentous brown algae (*Pilayella littoralis/Ectocarpus*) were found. The coverage of *Pilayella littoralis* was especially high in 2003 and 2005 and this species was almost exclusively found in the spring surveys (Figure 3.12). Species of *Ulva clathrata* and *Ulva prolifera* (Enteromorpha spp.) were relatively dominating in this zone with the highest coverage of these species being generally found in the autumn. The green algae (*Chatomorpha linum*) and the red algae (*Polysiphonia fibrillosa*) were found at most turbine sites in 2005 with small tufts of the common red porphyra algae (*Porphyra umbilicalis*) being found at some turbine sites. The seaweeds (*Petalonia fascia* and *Petalonia zosterifolia*) were also typically found in this depth zone but in relatively low coverage.

Vegetation coverage declined with increasing depth, which was pronounced for the most abundant species, *Pilayella littoralis/Ectocarpus* and *Ulva* (*Enteromorpha*) (Figure 3.12), which were found 4-6 m below the sea surface. In 2005, *Ulva lactuca* was found 6-8 m below the sea surface. *Petalonia fascia* and *Polysiphonia fibrillosa* were occasionally found 4-6 m and 2-4 m below the sea surface.

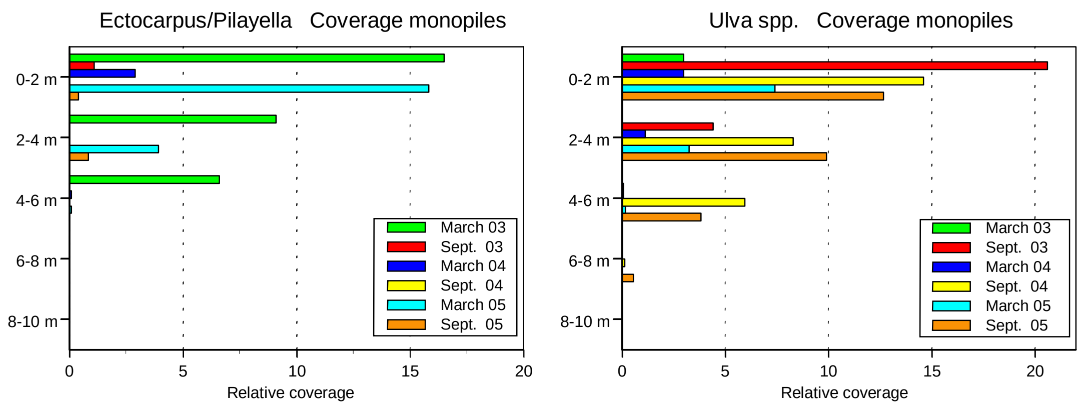


*Figure 3.12.Depth distribution and mean relative coverage of filamentous algae (*Ectocarpus/Pilayella*) and* Ulva *spp. along transects at monopiles in 2003-2005.*

3.3.2. Epifauna

The total number of species associated with the hard bottom structures at Horns Rev has increased gradually from the first surveys in 2003 to the surveys in 2005.

Of the 111 total invertebrate species registered and observed during the monitoring of the hard bottom structures, only 37 species/taxons could be characteristically found as native infauna or mobile fauna in the area before the establishment of the offshore wind farm at Horns Rev. Only 14 species/taxons were not sampled or identified in the quantitative samples. Some of these species were occasionally and only observed by divers during the transect surveys (Appendix 2.1). It was mainly very mobile species such as crabs and larger species like the common whelk. Other very common species, such as the plumose anemone (*Metridium senile*), the Dahlia anemone (*Urticine feline*, *Sargartia elegans* and *Sargartiogeton lacerates*), were often more easily identifiable in the field than in the laboratory and that is why they were only registered in the field surveys. Typical infauna species such as the thick trough shell (*Spisula solida*), the American razor shell (*Ensis americanus*), the sea potato (*Echinocardium cordatum*) and the bristle worm (*Lanice conchilega*) were only observed in the outer periphery of the scour protections.

3.3.2.1. Species composition

Two species of amphipods (*Jassa marmorata* and *Caprella linearis*[3]) constituted the most important species with respect to abundance at all turbine sites during the monitoring campaigns. *Jassa marmorata* was the most numerous species of the 7 dominant species that contributed to more than 99% of the total individuals found on the hard bottom substrate at Horns Rev (Table 3.12). Furthermore, these 7 species generally contributed to more than 90% of the total biomass registered.

Table 3.12. Distribution pattern found for some typical hard bottom substrate dominants between surveys in 2003, 2004 and 2005.

Hard bottom substrate dominants		Abundance ind./m²				Abundance ind./m²				Abundance ind./m²			
		March 2003		September 2003		March 2004		September 2004		March 2005		September 2005	
Species	**Group**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**
Jassa marmorata	Crustacean	56,169	86.5	111,891	90.7	95,563	94.0	228,081	91.0	53,076	91.1	258,051	93.0
Caprella linearis	Crustacean	927	1.4	9,491	7.7	4,743	4.7	19,119	7.6	3,702	6.4	14,549	5.2
Mytilus edulis	Bivalve	4,451	6.9	1,320	1.1	865	0.9	2,206	0.9	869	1.5	3,099	1.1
Balanus crenatus	Crustacean	2,982	4.6	16	0.0	74	0.1	23	0.0	1	0.0	1	0.0
Asterias rubens	Echinoderm	34	0.1	76	0.1	41	0.0	122	0.0	26	0.0	20	0.0
Cancer pagurus	Crustacean	4	0.0	78	0.1	7	0.0	350	0.1	17	0.0	310	0.1
Pomatoceros triqueter	Bristle worm	7	0.0	49	0.0	34	0.0	23	0.0	26	0.0	16	0.0
Total		**64,574**	**99.5**	**122,921**	**99.7**	**101,327**	**99.7**	**249,924**	**99.6**	**57,717**	**99**	**276,047**	**99**
Hard bottom substrate dominants		**Biomass ww g/m²**				**Biomass ww g/m²**				**Biomass ww g/m²**			
		March 2003		**September 2003**		**March 2004**		**September 2004**		**March 2005**		**September 2005**	
Species	**Group**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**
Jassa marmorata	Crustacean	276.903	29.4	87.724	5.9	234.424	11.9	272.507	17.2	52.016	2.8	312.453	8.0
Caprella linearis	Crustacean	6.949	0.7	15.721	1.1	18.326	0.9	42.245	2.7	7.752	0.4	48.044	1.2
Mytilus edulis	Bivalve	41.749	4.4	1,132.353	75.8	1,624.208	82.5	1,134.795	71.8	1,683.255	89.6	3,022.707	77.1
Balanus crenatus	Crustacean	489.612	51.9	0.568	0.0	1.079	0.1	0.670	0.0	0.018	0.0	0.028	0.0
Asterias rubens	Echinoderm	67.679	7.2	101.610	6.8	32.657	1.7	36.657	2.3	41.740	2.2	60.595	1.5
Cancer pagurus	Crustacean	0.166	0.0	0.267	0.0	0.968	0.0	4.221	0.3	3.033	0.2	113.562	2.9
Pomatoceros triqueter	Bristle worm	0.154	0.0	0.913	0.1	1.266	0.1	1.103	0.1	1.392	0.1	0.918	0.0
Total		**883.212**	**93.6**	**1,339.156**	**89.7**	**1,912.928**	**97.2**	**1,492.198**	**94.4**	**1,789.206**	**95.2**	**3,558.307**	**90.7**
Hard bottom substrate dominants		**Biomass dw g/m²**				**Biomass dw g/m²**				**Biomass dw g/m²**			
		March 2003		**September 2003**		**March 2004**		**September 2004**		**March 2005**		**September 2005**	
Species	**Group**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**
Jassa marmorata	Crustacean	59.482	14.8	17.740	1.8	42.129	4.7	56.292	6.8	9.966	1.1	50.447	2.5
Caprella linearis	Crustacean	1.234	0.3	2.526	0.3	3.563	0.4	7.206	0.9	1.513	0.2	7.816	0.4
Mytilus edulis	Bivalve	18.172	4.5	857.701	87.6	815.867	91.5	709.387	85.1	883.713	93.2	1,738.365	87.2
Balanus crenatus	Crustacean	265.786	66.2	0.364	0.0	0.628	0.1	0.411	0.0	0.009	0.0	0.019	0.0
Asterias rubens	Echinoderm	23.774	5.9	29.932	3.1	9.096	1.0	12.744	1.5	10.862	1.1	17.151	0.9
Cancer pagurus	Crustacean	0.057	0.0	0.063	0.0	0.332	0.0	1.112	0.1	1.007	0.1	11.170	0.6
Pomatoceros triqueter	Bristle worm	0.108	0.0	0.599	0.1	0.885	0.1	0.700	0.1	0.880	0.1	0.597	0.0
Total		**368.613**	**91.8**	**908.925**	**92.8**	**872.500**	**97.9**	**787.852**	**94.5**	**907.950**	**95.8**	**1,825.565**	**91.6**

A considerable increase in the total abundance was found from March to September and from 2003 to 2005 that mainly reflects the distribution pattern and increase in the population of *Jassa marmorata* (Figure 3.13). A rather high relative abundance was found in March 2003 for the common mussel (*Mytilus edulis*) and the barnacle (*Balanus crenatus*). The population of *Balanus crenatus* has decreased dramatically whereas the autumn population of *Mytilus edulis* has grown since 2003. This is also partly reflected in the biomass distribution showing a similar increase from 2003 to 2005 (Table 3.12 and Figure 3.13).

The relatively higher abundance of *Mytilus edulis* in March 2003 did not result in a correspondingly higher biomass compared to biomasses found for lesser densities in the rest of the surveys. The biomass in March 2003 was dominated by small specimens of *Mytilus edulis*, larger specimens of *Jassa marmorata*, *Caprella linearis*, *Balanus crenatus* and *Asterias rubens* (Table 3.13). Growth of *Mytilus edulis and Cancer pagurus* individuals was demonstrated by increasing body weights (Figure 3.14). For *Mytilus edulis*, development of different cohorts from different spawning periods was also an indication of growth

[3] A review has shown that some specimens could be identified as *Caprella mutica*, an alien species introduced from northeast Asia.

(Figure 3.14). Lengths in the population of *Mytilus edulis* increased from a maximum of 10 mm in March 2003 to a maximum of 75 mm in September 2005. Differences between spring and autumn surveys and the gradually approximation to steady levels of body size reflects natural breeding and succession in the populations of *Jassa marmorata* and *Caprella linearis*.

Considerable differences were found in the abundance and biomass between the individual turbine sites of the dominant species, which was evident by the distribution pattern of *Mytilus edulis*. Populations of *Mytilus edulis* were basically well established at turbine sites 55, 58 and especially at 95 by the end of the monitoring period. At turbine sites 33, 91 and 92, only very young and newly settled mussels were registered.

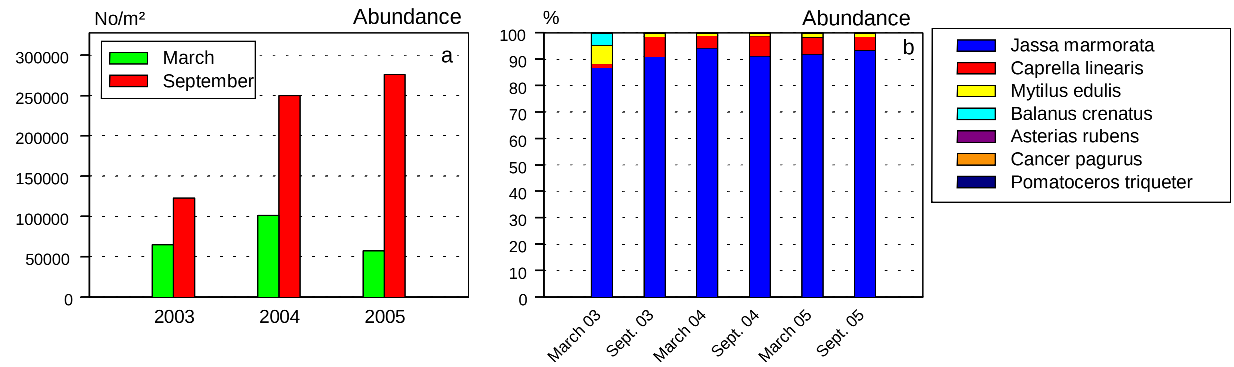


Figure 3.13.Abundance at hard bottom substrate a) Surveys. b) Relative abundance of dominant species.

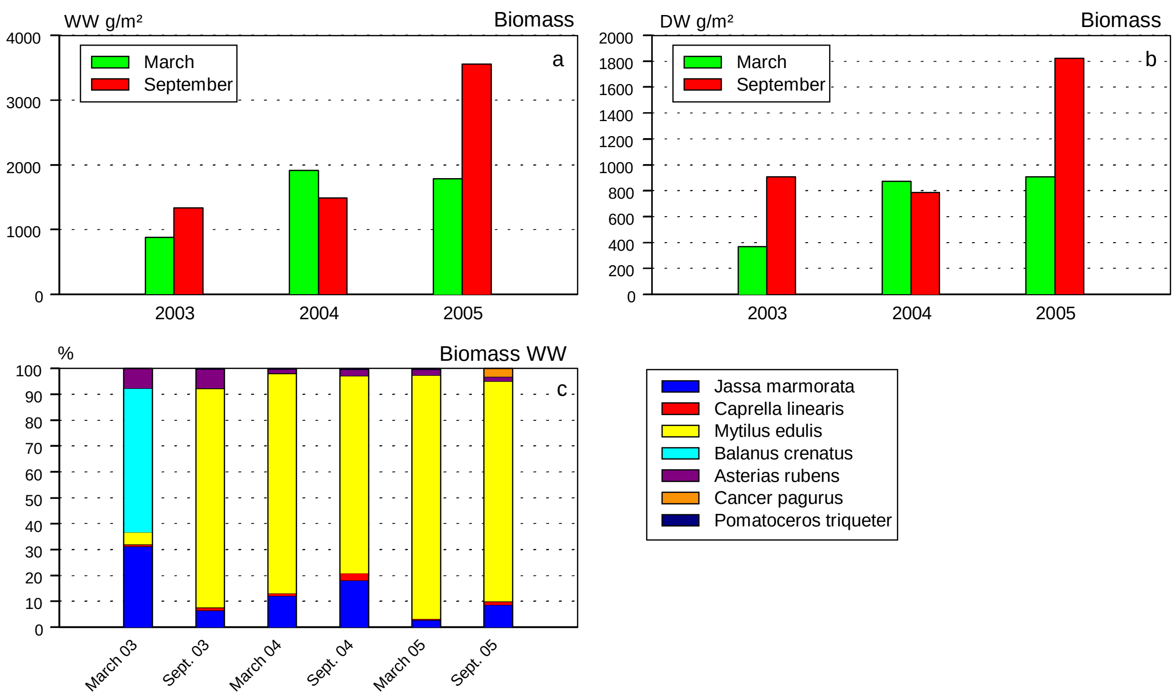
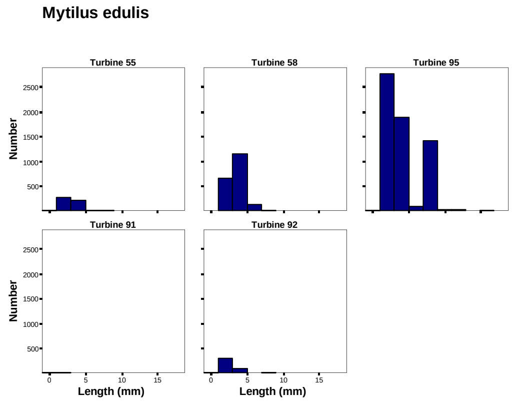


Figure 3.14.Biomass at hard bottom substrate a) Surveys wet weight. b) Surveys dry weight. c) Relative biomass of dominant species. Differences between the wet and dry biomass distribution were mainly caused by the differences in the relative proportion between species with shells (barnacles and mussels) and without shells (amphipods).*

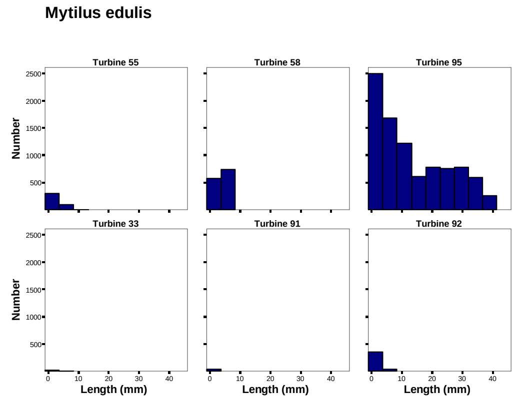
Table 3.13. Development of mean individual body weight (ww) of typical hard bottom substrate dominants.

Hard bottom substrate dominants		Mean individual weight mg (ww)					
		March 2003	September 2003	March 2004	September 2004	March 2005	September 2005
Species	Group	Mean	Mean	Mean	Mean	Mean	Mean
Jassa marmorata	Crustacean	4.9	0.8	2.5	1.2	1.0	1.2
Caprella linearis	Crustacean	7.5	1.7	3.9	2.2	2.1	3.3
Mytilus edulis	Bivalve	9.4	857.8	1,877.7	514.4	1,937.1	975.2
Balanus crenatus	Crustacean	164.2	35.5	14.6	29.1	19.1	29.2
Asterias rubens	Echinoderm	1,990.6	1,337.0	796.5	300.5	1,633.6	3,018.3
Cancer pagurus	Crustacean	41.5	3.4	138.3	12.1	181.3	366.1
Pomatoceros triqueter	Bristle worm	22.0	18.6	37.2	48.0	52.6	56.4

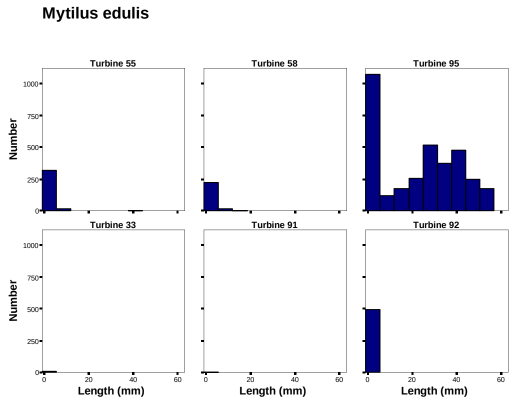
2003 Spring



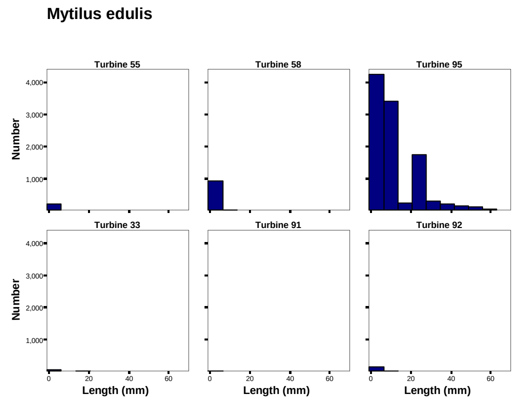
2003 Autumn



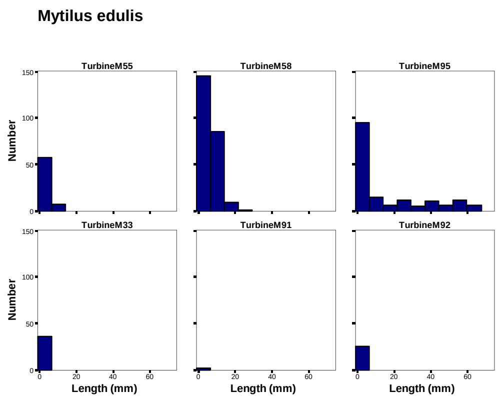
2004 Spring



2004 Autumn



2005 Spring



2005 Autumn

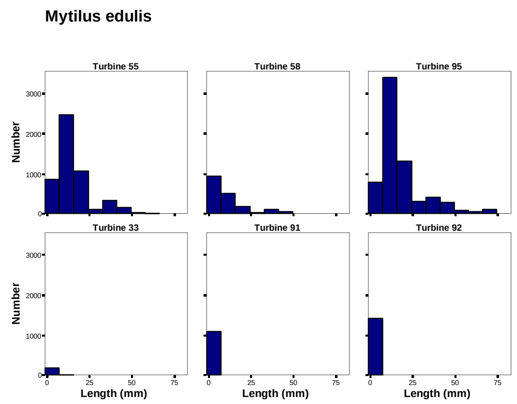


Figure 3.15.Length frequency diagram of the common mussel Mytilus edulis.

3.3.2.2. Structure of the community

Statistically significant differences (P<0,001) were found in the community structure between the monitoring campaigns, both with respect to annual and seasonal variation.

Although some generalisations can be made with respect mainly to the distribution pattern in abundance and biomass of the most dominant species, statistically significant differences in the community structure distribution were also found between different turbine sites (P<0.001), between the community structure at the monopiles and on the scour protections.

Scour protections

Seven dominant species constituted more than 98% of the total abundance and between 46% and 97% of the total biomass registered at all surveys (Table 3.14). From 2003 to 2005, a considerable increase in abundance was found. This was most obvious for the autumn surveys and was largely a consequence of an increase in the abundance of *Jassa marmorata* (Figure 3.16). Locally, *Jassa marmorata* could be found in densities up to 238,000 ind./m^2. Also a drastic increase in biomass was found in the autumn sampling from 2003 to 2005. The average body weight of *Jassa marmorata* on the scour protections increased from 1.0 mg to 1.9 mg from September 2003 to 2005, whereas only newly settled and juvenile specimens of *Mytilus edulis* contributed less than 1% of the total biomass. An aggregated distribution pattern between turbine sites was most often found for *Mytilus edulis* and local densities up to 9,680 ind./m^2 of newly settled spat was found in spring 2003.

At most turbine sites, sea anemones contributed with a substantial biomass. A corresponding increase in the relative biomass contribution of the sea anemones to a decrease in the relative significance of the dominant species was found during the monitoring period (Figure 3.16). The biomass of the sea anemones, in particular *Metridium senile* and *Sargartiogeton lacerates*, was especially high in autumn 2005 at the turbine sites situated at the greatest depths where the different species accounted for more than 50% of the total biomass. The coverage of the sea anemones at these sites on the scour protection was up to 70%, whereas the coverage at the sites with shallower water was less than 25%. Further increasing significance was found in the biomass contribution of dead man's fingers (*Alcyonium digitatum*). *Alcyonium digitatum* was also more frequently represented at turbine sites at deeper waters.

Table 3.14. Abundance and biomass distribution pattern found for typical hard bottom dominants on the scour protections at Horns Rev in 2003-2005.

Abundance ind./m²		2003				2004				2005			
Foundations		March		September		March		September		March		September	
Species	Group	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %
Jassa marmorata	Crustacean	25,663	89.0	31,571	92.4	34,854	96.6	97,911	97.4	48,579	98.4	101,683	94.7
Caprella linearis	Crustacean	591	2.0	1,937	5.7	718	2.0	1,590	1.6	189	0.4	2,794	2.6
Mytilus edulis	Bivalve	1,583	5.5	124	0.4	199	0.6	150	0.1	133	0.3	1,177	1.1
Balanus crenatus	Crustacean	674	2.3	11	0.0	6	0.0	14	0.0	0	0.0	2	0.0
Asterias rubens	Echinoderm	50	0.2	89	0.3	65	0.2	159	0.2	40	0.1	24	0.0
Cancer pagurus	Crustacean	1	0.0	21	0.1	0	0.0	205	0.2	2	0.0	293	0.3
Pomatoceros triqueter	Bristle worm	4	0.0	19	0.1	14	0.0	20	0.0	26	0.1	17	0.0
Total		**28,566**	**99.0**	**33,771**	**98.8**	**35,856**	**99.4**	**100,049**	**99.6**	**48,968**	**99.2**	**105,990**	**98.7**
Biomass ww g/m²		2003				2004				2005			
Foundations		March		September		March		September		March		September	
Species	Group	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %
Jassa marmorata	Crustacean	104.661	32.7	36.344	18.4	134.526	57.7	167.691	61.8	59.774	33.7	187.974	35.9
Caprella linearis	Crustacean	3.345	1.0	5.008	2.5	5.534	2.4	4.507	1.7	2.326	1.3	6.327	1.2
Mytilus edulis	Bivalve	3.296	1.0	1.100	0.6	0.251	0.1	0.313	0.1	0.110	0.1	2.093	0.4
Balanus crenatus	Crustacean	148.528	46.3	0.666	0.3	0.116	0.0	0.922	0.3	0.013	0.0	0.051	0.0
Asterias rubens	Echinoderm	51.485	16.1	71.867	36.4	45.480	19.5	38.091	14.0	47.517	26.8	41.497	7.9
Cancer pagurus	Crustacean	0.036	0.0	0.094	0.0	0.003	0.0	2.326	0.9	0.094	0.1	1.907	0.4
Pomatoceros triqueter	Bristle worm	0.066	0.0	0.285	0.1	0.305	0.1	0.658	0.2	1.056	0.6	0.964	0.2
Total		**311.418**	**97.2**	**115.364**	**58.5**	**186.216**	**79.8**	**214.508**	**79.0**	**110.892**	**62.4**	**240.813**	**46.0**
Biomass dw g/m²		2003				2004				2005			
Foundations		March		September		March		September		March		September	
Species	Group	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %
Jassa marmorata	Crustacean	27.222	16.6	11.247	17.0	33.357	50.7	38.100	53.2	11.676	25.4	32.493	28.6
Caprella linearis	Crustacean	0.722	0.4	1.386	2.1	1.934	2.9	0.768	1.1	0.907	2.0	1.094	1.0
Mytilus edulis	Bivalve	1.450	0.9	0.635	1.0	0.149	0.2	0.165	0.2	0.048	0.1	1.102	1.0
Balanus crenatus	Crustacean	114.570	69.9	0.562	0.8	0.086	0.1	0.635	0.9	0.008	0.0	0.035	0.0
Asterias rubens	Echinoderm	17.202	10.5	29.630	44.8	16.613	25.2	11.981	16.7	13.359	29.0	12.696	11.2
Cancer pagurus	Crustacean	0.015	0.0	0.026	0.0	0.001	0.0	0.616	0.9	0.029	0.1	0.435	0.4
Pomatoceros triqueter	Bristle worm	0.042	0.0	0.205	0.3	0.293	0.4	0.449	0.6	0.727	1.6	0.669	0.6
Total		**161.225**	**98.4**	**43.691**	**66.0**	**52.432**	**79.6**	**52.713**	**73.6**	**26.754**	**58.1**	**48.525**	**42.7**

Statistically significant differences (P<0.001) were found in the community structures on the scour protections and between the individual turbine sites between the surveys from 2003 to 2005 (Figure 3.17). In particular, abundances of *Jassa marmorata* and *Caprella linearis* contributed to the dissimilarities between the turbine sites. But, the distribution and abundance of the common mussel (*Mytilus edulis*), sea anemones (*Actiniaria*) and partly the common starfish (*Asterias rubens*) were of considerable importance. Discrepancy in the abundance distribution between *Mytilus edulis* and *Asterias rubens* should be noticed in Figures 3.17 and 3.18. A high abundance of *Mytilus edulis* at individual sampling sites in 2003 and 2005 was counter balanced by a low abundance of *Asterias rubens*, whereas the opposite relationship was found in 2004.

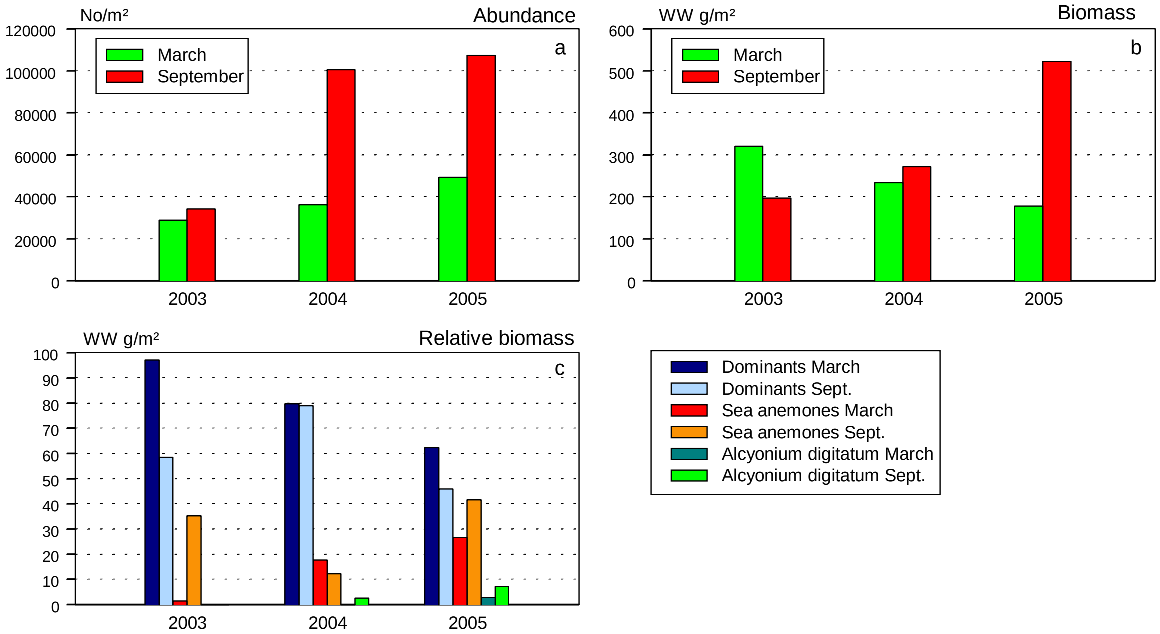
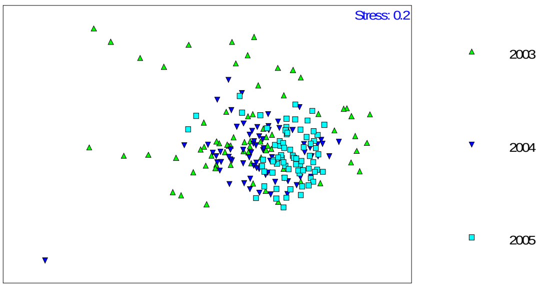


Figure 3.16.Abundance and biomass distribution from 2003-2005. a) Abundance b) biomass and c) relative biomass distribution

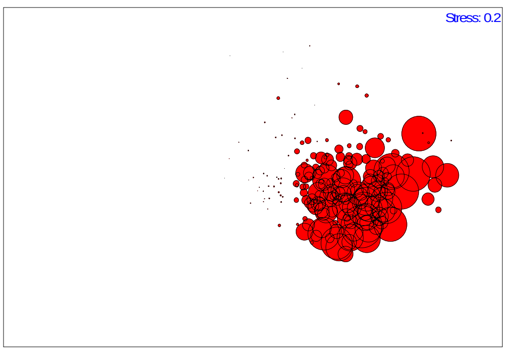
Although no distinct distribution patterns in abundance and biomass could be shown for the any of the most abundant species, statistically significant differences in community structures between different zones on the scour protection at different distances from the monopile were found (Figure 3.18 and Table 3.15). Gradually overlapping zones with similarities in community structures were found within 2 metres of the monopile, whereas the community structure in zone closest to the monopile was statistically significant different from the community structures closer to the periphery of the scour protections. No differences in the community structure were found between the NNE and the SSW sites with respect to current regimes.

In the transect surveys, no significant differences between the NNE and SSW transects were found. In general, as in the quantitative samples, statistical differences were also found between the stations close to the monopile and stations at the edge of the scour protection. Close to the edge of the scour protections, no statistical differences were shown between stations across the zones with different size of stones. Three overlapping zones on the scour protections were identified. One distinct zone covered the distance from the monopiles to 10 m from the piles, the second zone covered the distance from 6 m to 12 m and the last zone covered the distance from 10 m to 16 m from the monopile. The coverage and frequency of *Jassa marmorata*, *Metridium senile* and *Cancer pagurus* decreased towards the edge of the scour protection while the occurrence of the sand dwelling bristle worm (*Lanice conchilega*) at the outer edge of the scour protections contributed to the difference between the zones. The sea anemone (*Sargartiogeton laceratus*) was less frequent close to the monopiles and at the periphery of the scour protections compared to the zone 2-10 metres from the monopiles.

Scour protections, spring

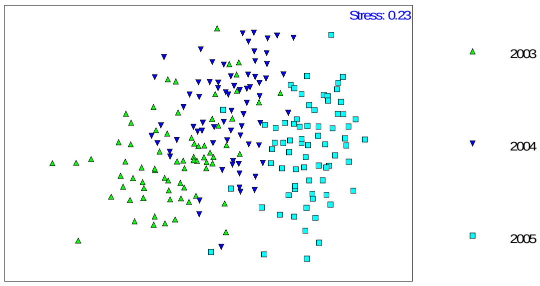


Jassa marmorata

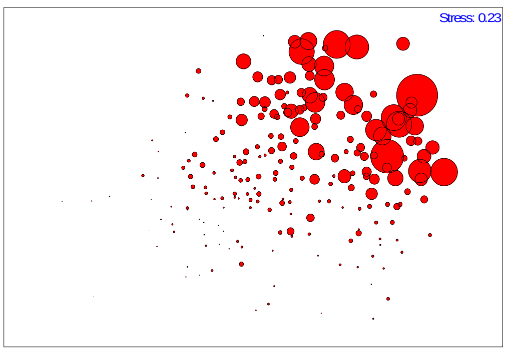


Mytilus edulis

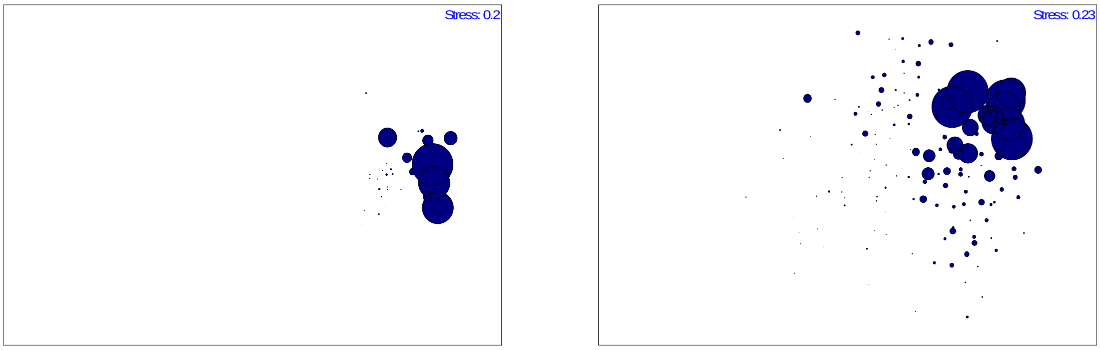
Scour protections, autumn



Jassa marmorata



Mytilus edulis



Asterias rubens *Asterias rubens*

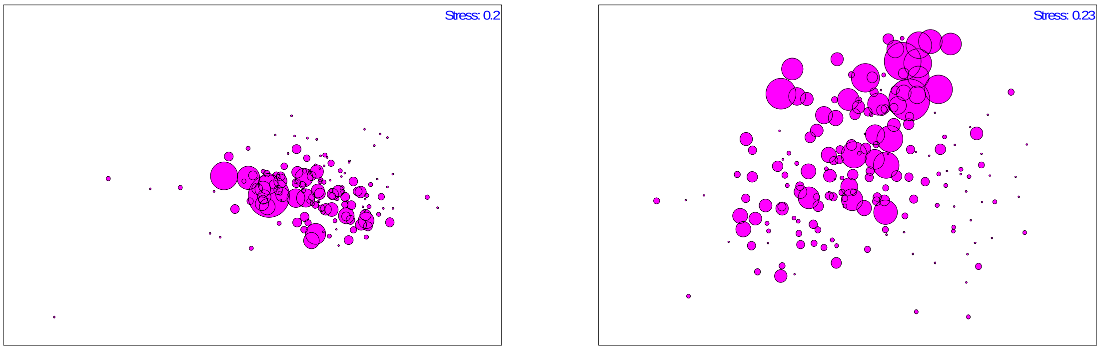


Figure 3.17.MDS plots of relative abundance on scour protections concerning differences between different sampling campaigns.

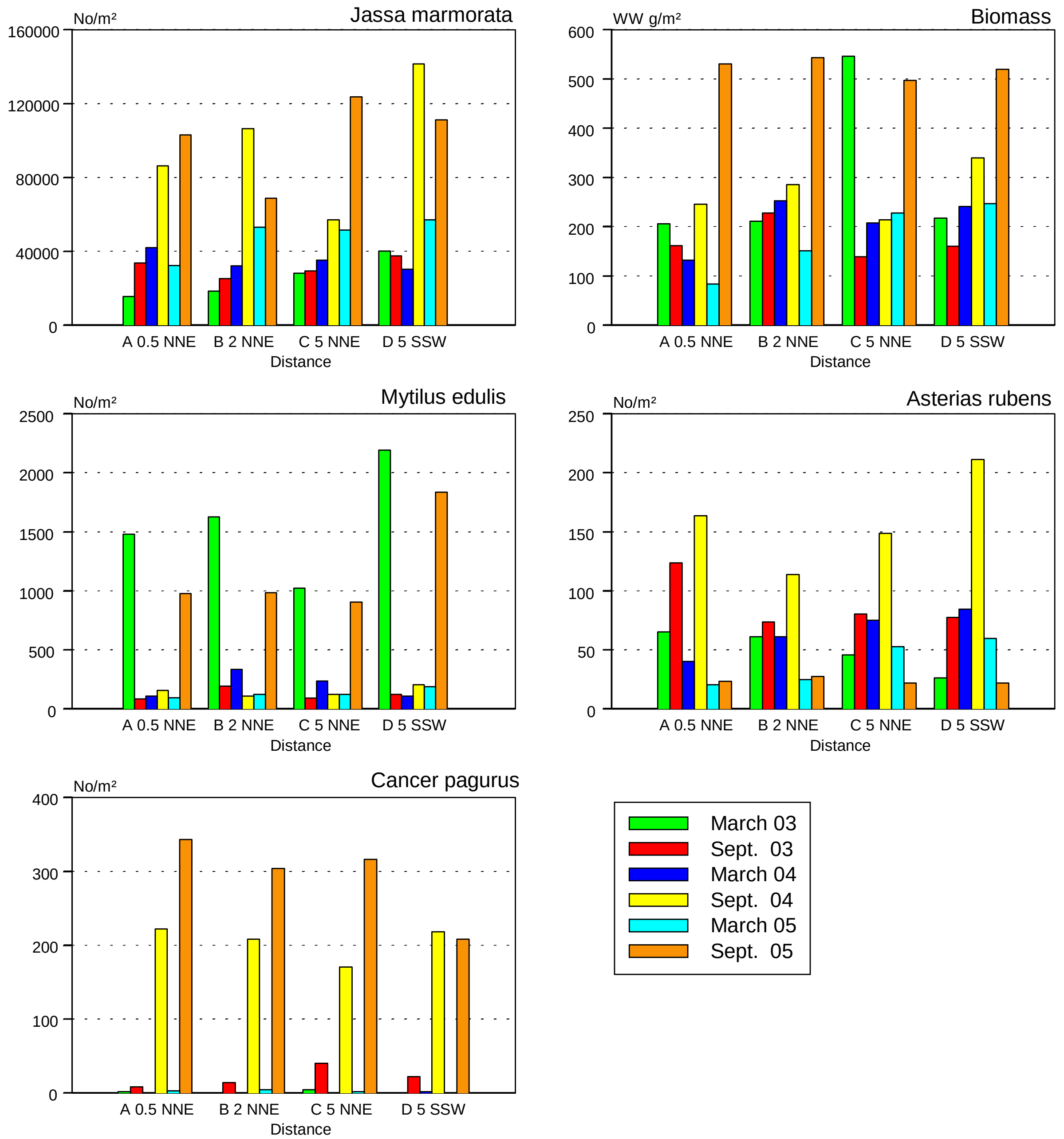


Figure 3.18.Distribution pattern on the scour protections at different distances from the monopiles shown as average abundance and average biomass.

The number of edible juvenile crabs (*Cancer pagurus*) has increased significantly since 2003 with local densities being found up to 700 ind./m^2 in 2005. Small specimens were more abundantly found in autumn than in spring (Figure 3.18). During the transect surveys, mature edible crabs with carapace width up to 18-20 cm could frequently be observed in crevices and holes between the stones on the scour protections.

Besides the dominant species, the oaten pipe hydroid (*Tubularia indivisia*) was frequently found on the scour protections, whereas other typical epifauna species such as the sponge (*Halichondria panicea*) and the broyzoan (*Flustra foliacea*) and the hydrozoan (*Sertularia cupressina*) were less frequently found. *Sertularia cupressina* has become more common in 2005. Records of low numbers of the ross worm (*Sabellaria spinulosa*) were made on the scour protection in 2005.

Juveniles of other more mobile epifauna species such as the long legged spider crab (*Macropodium rostrata*), the common shore crab, the masked crab (*Corystes cassivelaunus*), the bristly crab (*Pilumnus hirtellus*) and the northern sea urchin (*Strongylocentrotus droebachiensis*) were occasionally recorded on the scour protections. Green egg masses of bristle worms (*Phyllodocidae*), probably *Phyllodoce groenlandica*, and eggs of sea slugs attached to stones were frequently recorded on the scour protections in the spring surveys. Adult specimens of the sea slugs (*Facelina bostoniensis, Polycera quadrilineata, Aeolidiae papillosa* and *Onchidoris muricata*) were relatively abundant and frequently recorded feeding on their preys *Tubularia indivisa*, *Electra pilosa*, sea anemones and bryozoans.

*Table 3.15. Level of significance (**P<0.01) in analysis of differences in community structure between zones on the scour protections.*

ANOVA analysis	Distance from mono-pile/direction			
Scour protections	**NNE A 0.5**	**NNE B 2**	**NNE C 5**	**SSW D 5**
NNE A 0.5		0.099	0.006**	0.009**
NNE B 2			0.367	0.084
NNE C 5				0.053
SSW D 5				

Photo 13. The plumose anemone Metridium senile.

Monopiles

Seven dominant species constituted more than 99% of the total abundance and more than 88% of the total biomass registered during all surveys (Table 3.16).

From 2003 to 2005, a considerable increase in abundance was found for the autumn surveys, whereas the abundance found in March 2005 was lower compared to the abundance found in previous years (Figure 3.19). This was mainly a consequence from the variation in the abundance of *Jassa marmorata*, which locally could be found in densities up to 994.775 ind./m^2 in the autumn 2005.

A drastic increase in biomass was also found in the autumn sampling from 2003 to 2005 (Figure 3.19). Although in higher numbers than found during following surveys, the common mussel (*Mytilus edulis*) constituted only 5.3% of the total biomass in spring 2003, whereas this species contributed for more than 80% of the total biomass registered during autumn 2003. A corresponding increase was found in the average body weight from 4.6 mg(dw) in spring 2003 to 550 mg(dw) in autumn 2005 as well as an increase in the biomass of *Mytilus edulis* in the autumn samples from 2003 to 2005.

Table 3.16. Abundance and biomass distribution pattern found for typical hard bottom dominants at the monopiles at Horns Rev in 2003-2005.

Abundance ind./m²		2003				2004				2005			
Mono-piles		March		September		March		September		March		September	
Species	Group	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %
Jassa marmorata	Crustacean	94,113	85.4	208,303	90.4	168,413	93.3	350,029	89.7	51,681	84.8	445,693	92.5
Caprella linearis	Crustacean	1,312	1.2	18,568	8	9,573	5.3	34,527	8.8	6,804	11.2	28,655	5.9
Mytilus edulis	Bivalve	8,497	7.7	2,755	1.2	1,664	0.9	4,017	1.0	1,509	2.5	5,406	1.1
Balanus crenatus	Crustacean	5,469	5.0	23	0.0	155	0.1	30	0.0	2	0.0	0	0.0
Asterias rubens	Echinoderm	14	0.0	63	0.0	13	0.0	71	0.0	9	0.0	15	0.0
Cancer pagurus	Crustacean	8	0.0	146	0.1	14	0.0	456	0.1	30	0.0	331	0.1
Pomatoceros triqueter	Bristle worm	9	0.0	86	0.0	59	0.0	24	0.0	24	0.0	15	0.0
Total		**109,423**	**99.3**	**229,943**	**99.8**	**179,891**	**99.7**	**389,154**	**99.7**	**60,058**	**98.6**	**480,115**	**99.7**
Biomass ww g/m²		**2003**				**2004**				**2005**			
Mono-piles		**March**		**September**		**March**		**September**		**March**		**September**	
Species	**Group**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**
Jassa marmorata	Crustacean	532.775	28.9	147.139	4.8	374.105	9.2	377.889	13.4	38.484	1.1	461.828	5.8
Caprella linearis	Crustacean	11.651	0.6	30.239	1.0	35.567	0.9	75.294	2.7	12.317	0.4	98.105	1.2
Mytilus edulis	Bivalve	96.737	5.3	2,489.926	80.9	3,572.985	87.6	2,143.190	76.2	3,179.371	94.2	6,647.444	83.1
Balanus crenatus	Crustacean	895.916	48.7	0.519	0.0	2.238	0.1	0.343	0.0	0.033	0.0	0.000	0.0
Asterias rubens	Echinoderm	96.158	5.2	154.747	5.0	21.942	0.5	34.643	1.2	31.326	0.9	83.512	1.0
Cancer pagurus	Crustacean	0.390	0.0	0.478	0.0	2.125	0.1	5.647	0.2	5.636	0.2	247.549	3.1
Pomatoceros triqueter	Bristle worm	0.245	0.0	1.784	0.1	2.460	0.1	1.425	0.1	1.572	0.0	0.863	0.0
Total		**1,633.873**	**88.7**	**2,824.831**	**91.8**	**4,011.421**	**98.3**	**2,638.431**	**93.9**	**3,268.739**	**96.9**	**7,539.301**	**94.2**
Biomass dw g/m²		**2003**				**2004**				**2005**			
Mono-piles		**March**		**September**		**March**		**September**		**March**		**September**	
Species	**Group**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**	**Mean**	**Relative %**
Jassa marmorata	Crustacean	105.784	14.5	31.046	1.5	72.464	3.8	73.812	4.8	7.149	0.4	71.991	1.7
Caprella linearis	Crustacean	2.050	0.3	4.742	0.2	6.946	0.4	12.845	0.8	1.951	0.1	15.881	0.4
Mytilus edulis	Bivalve	40.596	5.6	1,886.231	89.6	1,794.776	93.8	1,339.789	86.6	1,669.187	95.6	3,823.081	90.0
Balanus crenatus	Crustacean	441.405	60.4	0.312	0.0	1.284	0.1	0.141	0.0	0.017	0.0	0.000	0.0
Asterias rubens	Echinoderm	35.604	4.9	45.594	2.2	5.488	0.3	12.092	0.8	7.158	0.4	22.497	0.5
Cancer pagurus	Crustacean	0.131	0.0	0.111	0.0	0.730	0.0	1.485	0.1	1.872	0.1	24.052	0.6
Pomatoceros triqueter	Bristle worm	0.177	0.0	1.114	0.1	1.711	0.1	0.874	0.1	0.936	0.1	0.511	0.0
Total		**625.747**	**85.7**	**1,969.150**	**93.5**	**1,883.398**	**98.5**	**1,441.037**	**93.1**	**1,688.271**	**96.7**	**3,958.012**	**93.2**

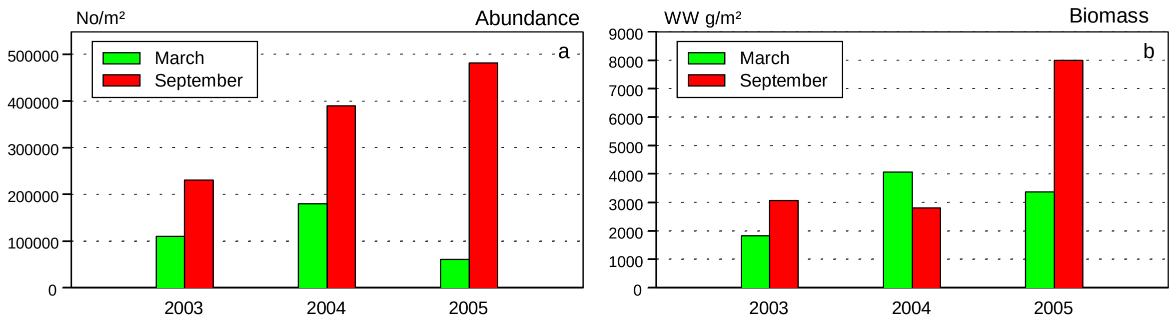


Figure 3.19.Abundance (a) and biomass (b) distribution from 2003-2005.

Statistically significant differences (P<0.001) were found in the community structures at the monopiles between the surveys from 2003 to 2005 (Figure 3.20). Some similarities were found in the community structures in spring at turbine site 55 and 58 (P=0.173) whereas the community structures at the monopiles were statistically different between the wind turbine sites in autumn. In particular, abundances of the crustaceans *Jassa marmorata* and *Caprella linearis* contributed to the dissimilarities between the turbine sites but also the distribution and abundance of the common mussel (*Mytilus edulis*) and the edible crab (*Cancer pagurus*) were of considerable importance. As shown for the foundations, a discrepancy in the abundance distribution between *Mytilus edulis* and *Asterias rubens* could also be found in the abundance distribution at the monopiles (Figure 3.20). A distinct aggregated distribution pattern between turbine sites was found for *Mytilus edulis*. Higher densities and larger mussels were generally found at turbine site 95 compared to the other turbine sites (Figure 3.21). Newly settled spat was found in local densities up to 9,680 ind./m^2 in spring 2003. However, increasing densities of *Mytilus edulis* and larger mussels were found at turbine sites 55 and 58 from 2003 to 2005.

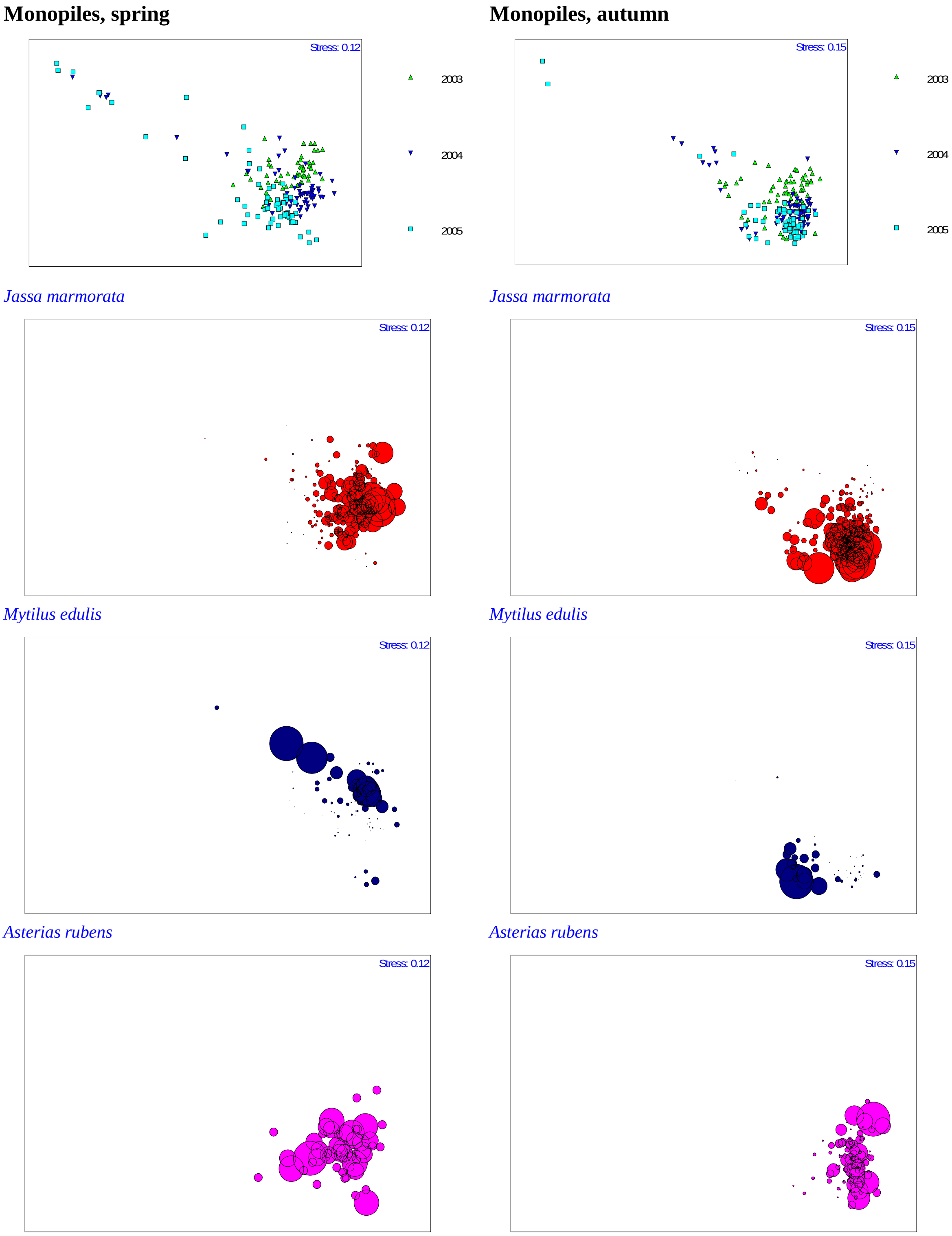


Figure 3.20.MDS plots of relative abundance at monopiles concerning differences between different sampling campaigns.

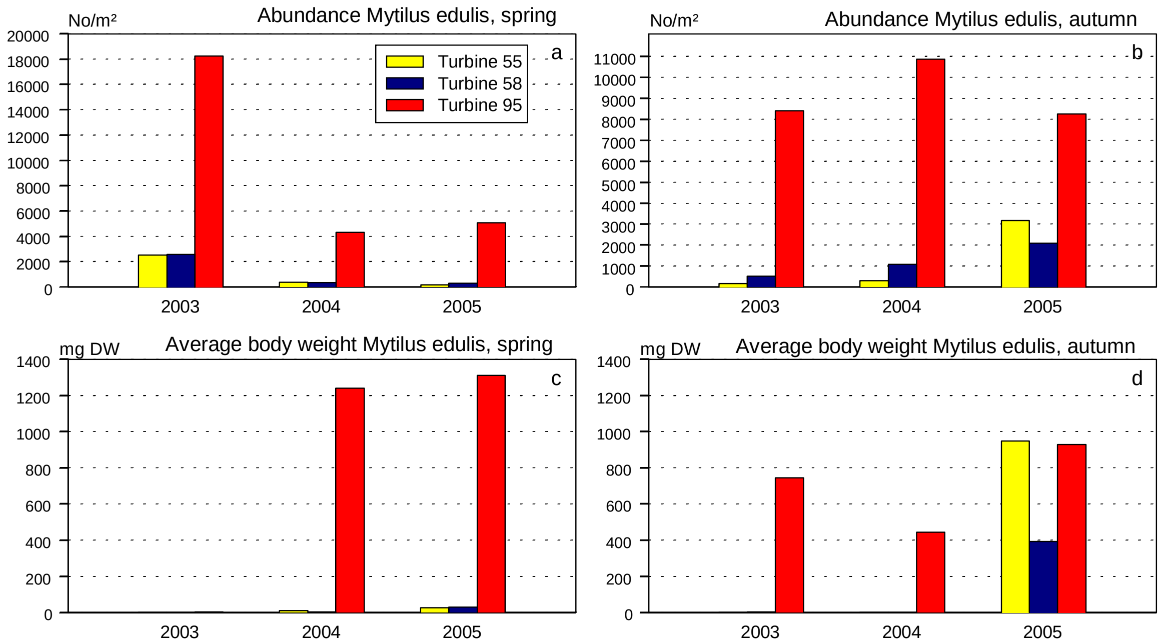


Figure 3.21.Average abundance and average body weight of Mytilus edulis *at monopiles at turbine sites 55, 58 and 95.*

A distinct zonation was observed in the fauna communities in relation to different depth zones. The community structure in two distinct zones, 0-1 metres and 1-3 metres below the sea surface, were significantly different (P<0.05) from the community structure found in any other zone at the monopiles. A general similarity (P>0.05) and an increase was found in the similarity from 2003 to 2005 in the community structure between the zones from 3 metres below the sea surface to the zone at the bottom of the monopiles. The statistical analysis has generally shown no differences (P>0.05) between the sampling at the two sides, NNE and SSW, of the monopiles concerning current regimes, except for 2005 where a significant difference in the community structure at the bottom between each side of the monopile was found.

A distinct distribution pattern of the giant midge (*Telmatogeton japonicus*) was observed in the green algal mats in the splash zone of most of the wind turbines, except wind turbine 95 in March 2003. In March 2003, the abundance of *Telmatogeton japonicus* was estimated at 1,000-2,800 ind./m^2 in the splash zone. In autumn 2005, the density of *Telmatogeton japonicus* in the splash zone was 4,400 ind./m^2. The midge was found in the samples from September 2003 and in all depth zones, although it was significantly more abundant in depth zone 0-1 metres below the sea surface compared to other depth zones. Although low in numbers, it was also registered at turbine 95 in September 2003. Highest average densities were found in September 2004 (Figure 3.22). With an average individual body weight of less than 2.05 mg(dw), this species contributed inconsiderably to the main biomass from the monopile samples.

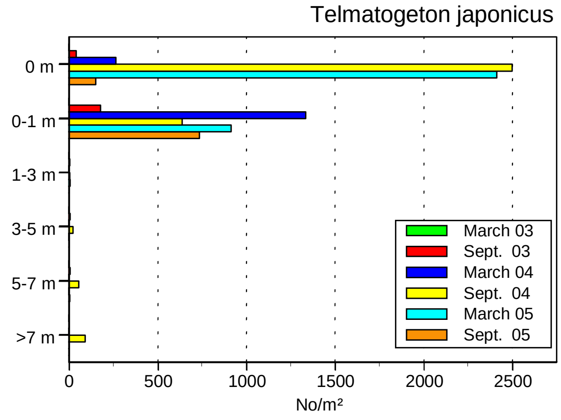


Figure 3.22.Depth distribution of Telmatogeton japonicus *at the monopiles*

Photo 14. Larvae tubes of Telmatogeton japonicus *(green dots inside white spots) in the splash zone at a monopile foundation.*

In spring 2003, a pronounced initial settlement of barnacles (*Balanus crenatus* and *B. balanus*) was found at the monopiles, which almost was restricted to the upper zones just beneath the sea surface (Figure 3.23). A drastic decline in the abundance of barnacles and especially of *Balanus crenatus* was found from 2003 to 2005.

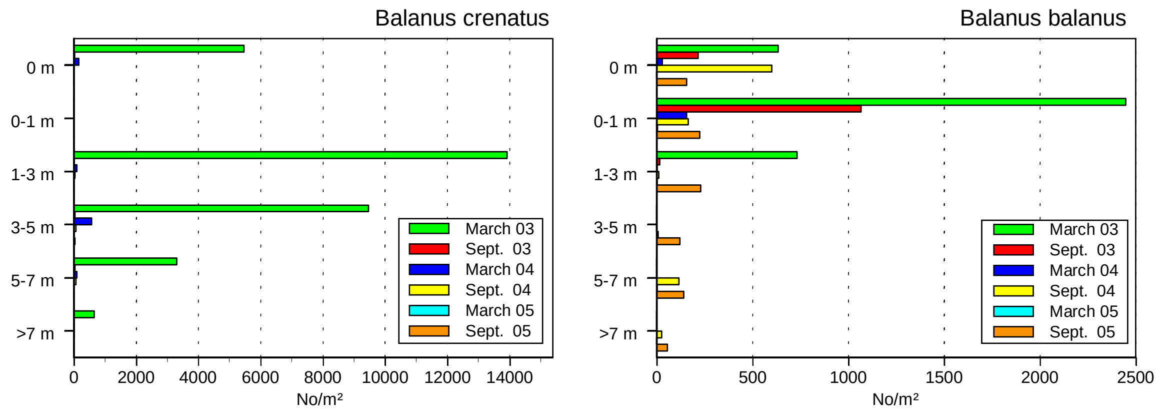


Figure 3.23.Depth distribution of the barnacles Balanus crenatus *and* Balanus balanus *at the monopiles.*

In spring 2003, the settlement of *Mytilus edulis* spat was more or less evenly distributed between the depth zones, whereas the mussels were generally most abundant in the depth zone closest to the sea surface. Compared to this zone coverage, abundance and biomass of mussels were reduced in the lover depth zones (Figure 3.24). Locally at turbine site 95 in 2004, the mussels were found with 100% coverage in very high densities of more than 90,000 ind./m^2 and with a corresponding biomass of more than 22,000 g(dw)/m^2. In 2005, the abundance found at turbine site 95 was less but the biomass had increased locally to more than 32,000 g(dw)/m^2 and to an average of more than 10,000 g(dw)/m^2. This was a result of an increase in the average body weight in this zone from 2003 to 2005 (Figure 3.25). At lower depth zones the average body weight was less than 3.5 mg(dw).

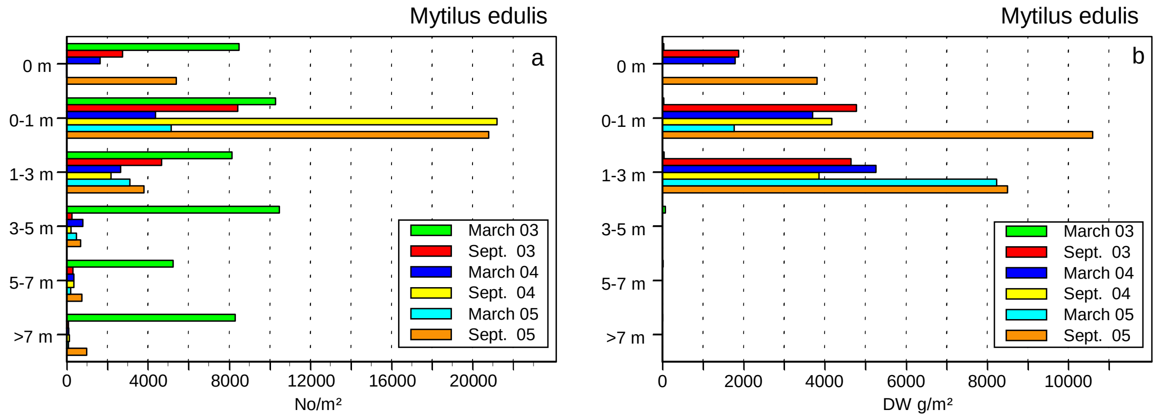


Figure 3.24.Depth distribution of abundance (a) and biomass, dw, (b) of Mytilus edulis *at the monopiles.*

In 2003, numerous species of *Asterias rubens* were observed just underneath the zone with *Mytilus edulis* feeding on the mussels. This was especially characteristic in September, where large *Asterias rubens* were found in the samples dominating the biomass. As a result of the predation of *Asterias rubens*, large numbers of empty shells of *Mytilus edulis* were often observed at the seabed close to the turbine towers.

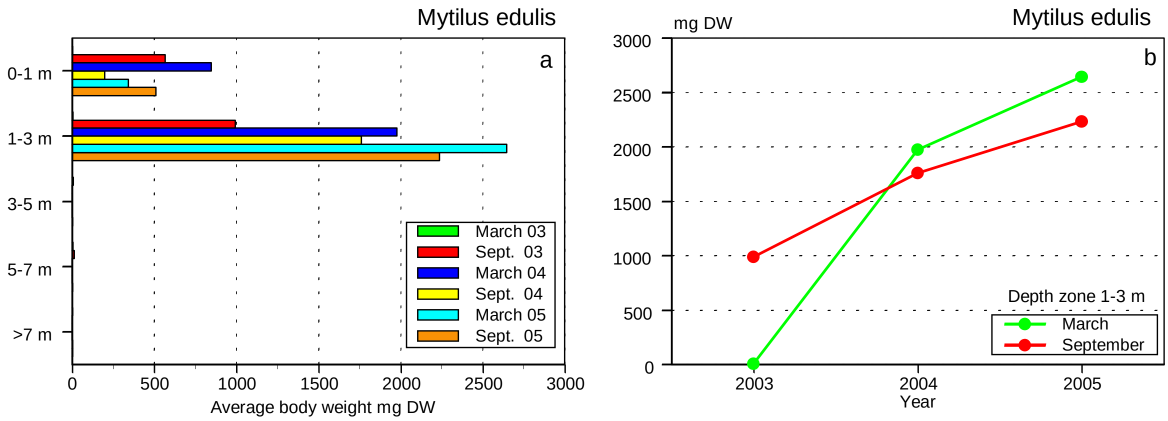
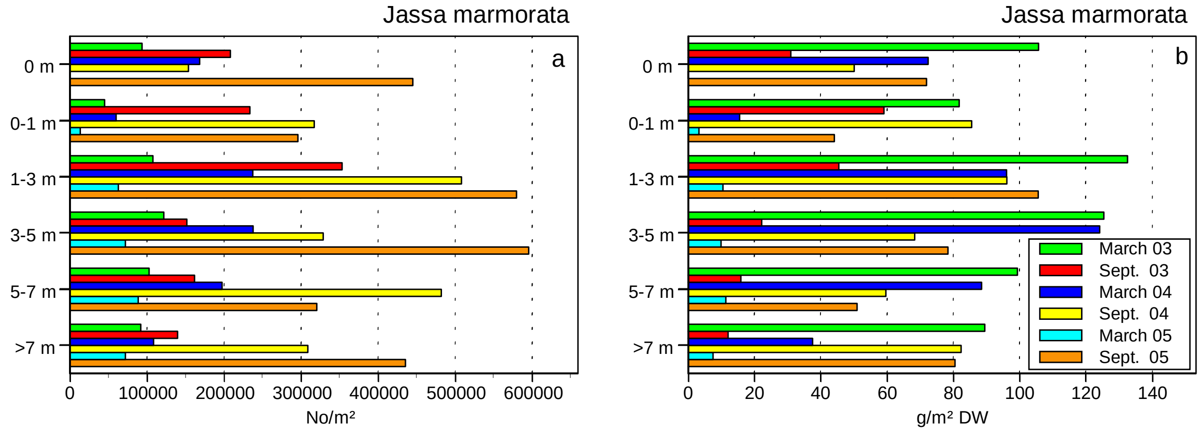
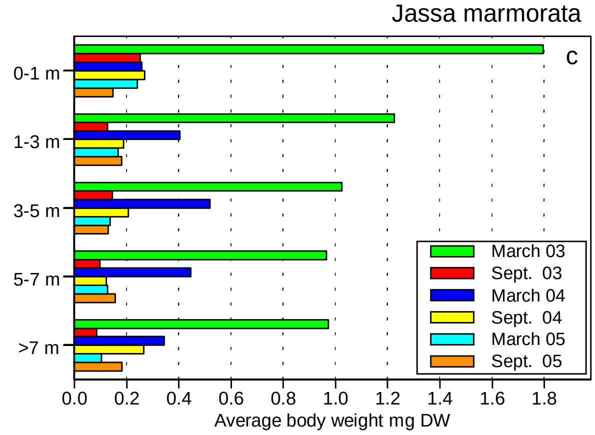


Figure 3.25.Average body weight (dw) of Mytilus edulis *at different depth zones (a) and at depth zone 1-3 metres at different sampling campaigns (b).*

In general, *Jassa marmorata* was more frequently found in the mid zone 1-5 metres with an average coverage of more than 40% (Figure 3.26). Based on the average body weight found in spring 2003, mainly large and mature specimens were found to have colonized the monopiles in 2002/2003. The average body weight for *Jassa marmorata* was 1.2 mg(dw) in spring 2003 compared to 0.40 mg(dw) and 0.16 mg(dw) in spring 2004 and spring 2005, respectively. The depth distribution of the largest specimens follows the main abundance distribution except in the spring 2003 where the largest specimens were found in the upper depth zone.





Jassa marmorata

Figure 3.26.Depth distribution of abundance (a), biomass, dw, (b) and average body weight (dw) of Jassa marmorata *at the monopiles (c)*

the distribution of *Caprella linearis* showed a similar pattern that was found for *Jassa marmorata*, although it was much less frequent with a maximum coverage of 10% (Figure 3.27). Mainly large and mature specimens were also found to have colonized the monopiles in 2002/2003. The average body weight for *Caprella linearis* was 1.47 mg(dw) in spring 2003 compared to 0.87 mg(dw) and 0.34 mg(dw) in spring 2004 and spring 2005, respectively.

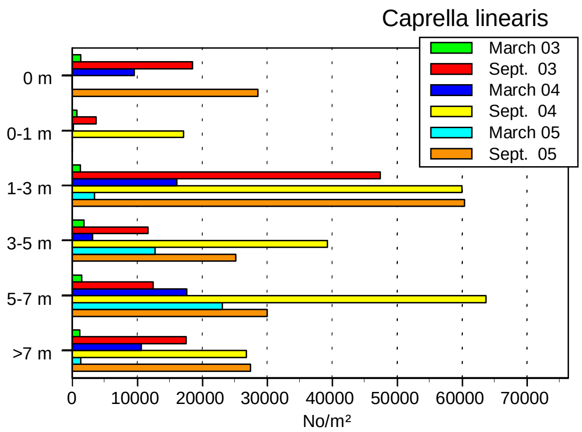


Figure 3.27.Depth distribution of Caprella linearis *at the monopiles.*

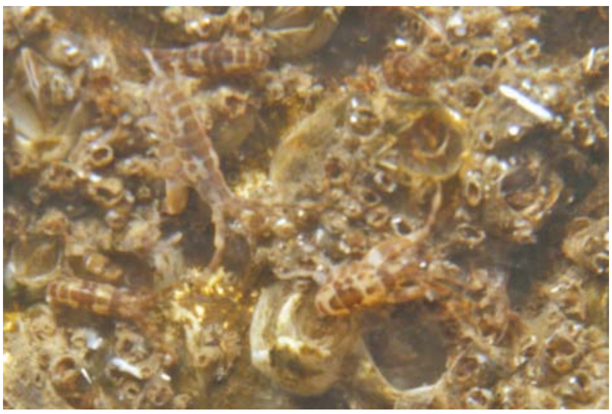


Photo 15. Initial colonization of Jassa marmorata *at a monopile 2003.*

Even though the edible crab (*Cancer pagurus*) only constituted less than 1% of the total abundance, this species showed some interesting characteristics. In March, *Cancer pagurus* generally showed a very scattered distribution; although juveniles were registered in relatively low numbers at all depth zones at the monopiles, larger individuals were less frequently observed by divers along the transect surveys than in the September surveys. In September large numbers of juveniles were found in all depth zones at the monopiles (Figure 3.27). The highest mean abundance of 950 ind./m^2 was found in depth zone 1-3 m in September 2004 and abundances over 1,900 ind./m^2 were registered at turbine site 55. From 2003 to 2005, a considerable increase in total biomass was found for *Cancer pagurus*, which was a result of increasing abundance and an increase in average individual body weight from 1.52 mg(dw) in September 2003 to 44.16 mg(dw) in September 2005. The average individual body weight of the initial population of *Cancer pagurus* at the monopiles in March 2003 was 17.52 mg(dw). In March 2005, three size classes of juvenile crabs were found. One probably representing the 0 group from 5-11 mm, the second representing the 1+ group from 20-23 mm and the third probably representing the 2+ group from approximately 40 mm.

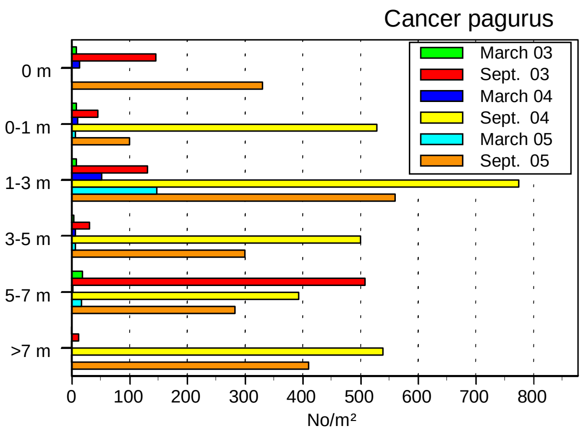


Figure 3.28.Depth distribution of Cancer pagurus *at the monopiles.*

Photo 16. Adult Cancer pagurus *at the scour protection..*

Juveniles of other crab species like the masked crab (*Corystes cassivelaunus*), the long clawed porcelain crab (*Pisidia longicornis*) and the bristly crab (*Pilumnus hirtellus*) were occasionally found on the monopiles. Also juveniles of the northern sea urchin (*Strongylocentrotus droebachiensis*) were found in low numbers.

Only an insignificant contribution to the total biomass of less than 0.5% was made by the sea anemones *Metridium senile*, *Sargartia elegans*, *Sargartiogeton laceratus* and *Urticina feline*, although they all were found on the monopiles. They were locally found in a combined coverage up to 45% with a biomass (dw) contribution of more than 50%. The most common was *Metridium senile* and the combined coverage of the sea anemones increased at the monopiles with increasing depth.

Relatively high coverage in all depth zones at the monopiles, locally up to 50%, were also found for the oaten pipes hydroid (*Tubularia indivisa*). The predator of this species, the sea slug (*Facelina bostoniensis*), together with other sea slugs *Polycera quadrilineata*, *Aeolidiae papillosa* and *Onchidoris muricata* were relatively abundant and frequently recorded.

3.3.3. Fish

Table 3.17. Fish species observed during the surveys in 2003-2005.

Common name	Scientific name	2003		2004		2005	
		Number of sites	Max. Abundance	Number of sites	Max. Abundance	Number of sites	Max. Abundance
European sprat	*Sprattus sprattus*			1	O		
Atlantic cod	*Gadus morhua*	6	R	2	R	5	R
Bib (Pouting)	*Trisopterus luscus*	4	R	3	R	3	R
Whiting	*Merlangus merlangus*					2	O
Pollock (Saithe)	*Pollachius virens*	1	O	1	O	3	R
Broad-nosed pipefish	*Syngnathus typhle*			1	O		
Shorthorn sculpin	*Myoxocephalus scorpius*	5	R	4	R	4	R
Hooknose	*Agonus cataphractus*	5	R	4	O	1	O
Longspined bullhead	*Taurulus bubaris*			2	O	1	O
Horse mackerel	*Trachurus trachurus*	2	R				
Stribed red mullet	*Mullus surmuletus*	1	O				
Ballan wrasse	*Labrus bergylta*			1	O		
Corkwing wrasse	*Symphodus melops*	6	R				
Goldsinny-wrasse	*Ctenolabrus rupestris*	1	R	6	∞	6	∞
Lumpsucker	*Cyclopteus lumpus*			1	O		
Viviparous blenny	*Zoarces viviparous*	2	R	1	O		
Small sandeel	*Ammodytes tobianus*			2	O	1	∞
Rock gunnel	*Pholis gunnellus*	6	R	6	R	6	∞
Dragonet	*Callionymus lyra*	5	O	3	R		
Sand goby	*Pomatoschistus minutus*	4	∞	6	∞	2	O
Painted goby	*Pomatoschistus pictus*			2	R		

A total of 22 species have been registered during the surveys on the hard bottom substrate at the Horns Rev Offshore Wind Farm since the erection of the wind turbines in 2002. Besides the fish observed in the area close to the turbine structures inclusive of the scour protections, as presented in Table 3.17, Atlantic mackerel (*Scomber scombrus*) were observed in the area between the turbines in 2004. Whiting was only caught during in the test fishing in 2003 and not observed by the divers.

Photo 17. Bib (pouting) Trisopterus luscus.

Photo 18. Atlantic cod Gadus morhua.

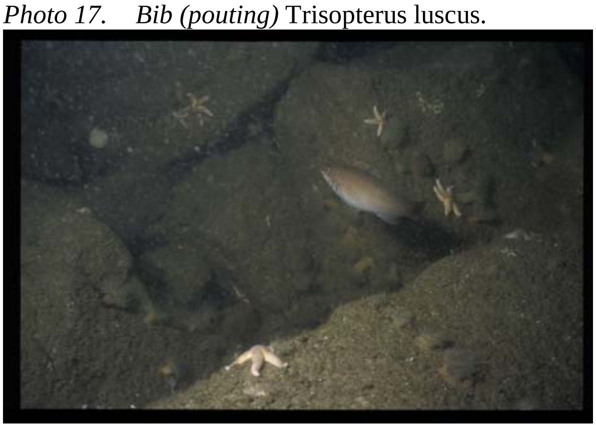


Photo 19. Goldsinny-wrasse Ctenolabrus rupestris.

Photo 20. Goldsinny-wrasse Ctenolabrus rupestris *and the edible crab* Cancer pagurus.

Two species, goldsinny-wrasse and rock gunnel, were often found in numbers at the turbine sites whereas bib and shoals of Atlantic cod were most often occasionally found foraging on the scour protection. In the test fishing, more cod and bib were caught in 2005 compared to 2003 and 2004. The majority of fish and fish species were observed during the autumn surveys.

In 2004, the broad-nosed pipefish (*Syngnathus typhle*) was observed. This species is typically found in areas with vegetation.

4. Discussion

4.1. Natural patterns in distribution and abundance

4.1.1.1. Sediment

The Horns Rev area is naturally a highly dynamic area with respect to hydrography that is influenced by tide, strong currents and dominated by waves. In the rather shallow area at the wind farm site, the sediment dynamics are highly influenced by the hydrographic conditions, migrating bed forms and constantly re-suspension and reworking of the sediment.

Considerable spatial and temporal variations in the sediment characteristics were found. Great variations and a general statistically significant increase in median grain size was found in the wind farm area from 1999, before the establishment of the wind farm, to 2005, after the wind farm had been in operation for three years. No detailed information of sediment variability in local shallow areas of the North Sea exists. Seasonal and spatial changes as well as variations in grain size parameters in the wind farm area were interpreted as natural variations because no statistical differences in grain size distribution between different areas outside and inside the wind farm area were found.

4.1.1.2. Infauna

Due to the highly variable environmental conditions and the high variability in sediment parameters, the community structure within regional shallow sandbank areas, such as Horns Rev, display high spatial and temporal variability and heterogeneity (Vanosmael et al. 1982; Salzwedel et al. 1985; Degraer et al. 1999).

Considerable and statistically significant changes in the community structure were found in the infauna community in the wind farm area from 2001 to 2003 and 2004, although no changes were found in the community structure between 1999 and 2005. In general, no statistically significant changes were found in abundance and biomass distributions from 1999 to 2005 for most of the designated indicator organisms.

The variation in temporal and spatial distribution patterns were interpreted as natural variations as similar distribution patterns were found in reference areas. Great variability in the distribution pattern was also found for the commercially important bivalve *Spisula solida*, which is a common species in the North Sea. Recruitment of *Spisula solida* is often very irregular. This species has a preference for sediments with a grain size of 200-300 µm, which might explain the decline in abundance from 1999 and 2001 (Sabatini, 2004).

4.2. Effects from the wind farm

4.2.1. Construction

4.2.1.1. Pile driving activities

The most immediate impact during construction on benthic communities might have been habitat disturbance arising from pile driving activities resulting in lethal effects, sub lethal effects or increased exposure of infauna species to predators in close vicinity of the wind turbine sites. Highly mobile epibenthic species like the edible crab (*Cancer pagurus*) and the brown shrimp (*Crangon crangon*) might have escaped from the piling sites. A fast colonisation of *Cancer pagurus* to the introduced hard substrates was interpreted negligible impact from the piling activities on the population of *Cancer pagurus*. No investigations were made on the impacts from pile driving activities or from cable laying activities to the benthic communities.

4.2.1.2. Introduction of hard bottom substrates

The most significant effect from the construction of the offshore wind farm was the loss of habitats and the introduction of hard substrate habitats into a community exclusively dominated by infauna in sandy sediments.

The fauna communities on the introduced hard substrates are completely different from the infauna community as existed at the wind turbine sites prior to the erection of the wind turbines and the establishment of the scour protections. At the turbine sites, new habitats were introduced that changed the substrates from pure sand to foundations of steel, gravel and stones. A typical epifaunal community has replaced the native infaunal community that is characteristic of sandbanks in the North Sea.

During the 2003 to 2005 surveys at the introduced hard substrates, all of the larger mobile epifaunal species previously observed were found. Except for the brown shrimp (*Crangon crangon*), the larger species were generally found more frequently and in higher numbers. More members found in the infauna *Goniadella-Spisula* community, typical for the infauna community at the Horns Rev area, were registered at the hard bottom substrate at the turbine foundations.

The hard substrates after construction of the wind farm were used as hatchery or nursery grounds for several species, which was an especially successful nursery for the edible crab (*Cancer pagurus*). The number and biomass of *Cancer pagurus* juveniles at the turbine sites has increased markedly from 2003 to 2005. Juveniles of the edible crab were especially found in large numbers on the monopiles in autumn with larger individuals often observed in caves and crevices among stones on the scour protection. More size classes of *Cancer pagurus* were found in March 2005. The growth of *Cancer pagurus* individuals were demonstrated from September 2003 to September 2005 indicating that juvenile edible crabs utilise the turbine foundations as nursery grounds. It is likely that *Cancer pagurus* larvae and juveniles rapidly invade the hard substrates from the breeding areas. *Cancer pagurus* females normally breed buried in sand in deeper areas of the North Sea and can be buried for months after mating. Juveniles settle in late summer/ early autumn and remain there until they reach a carapace width of 6-7 cm, which takes about 3 years, before they move to subtidal areas (Neal & Wilson, 2005). It is possible that the juveniles in size class 2+ with carapace widths of approximately 4 cm were about 2 years old at Horns Rev . The average body weight of the juveniles found in the initial population in March 2003 were higher than the average body weight of the juveniles found in March 2004 indicating that the hard bottom substrates were initially colonized by at least some young crabs and not only by larvae. Further mature specimens were initially found and studies off the Dutch coast have also shown that mature individuals of *Cancer pagurus* quickly invaded newly established artificial reefs (Leewis & Hallie, 2000).

Photo 21. Cancer pagurus

Photo 22. Egg masses of the bristle worm Phyllodoce groenlandica.

The hard substrate at Horns Rev is probably also an important nursery ground for other crab species like the masked crab (*Corystes cassivelaunus*) and probably also for the northern sea urchin (*Strongylocentrotus droebachiensis*) as both species were found as juveniles. Verification that more species are breeding on the hard substrates was shown as egg masses of the bristle worm (*Phyllodoce groenlandica*), the common whelk (*Buccinum undatum*) and different sea slugs were found frequently in spring.

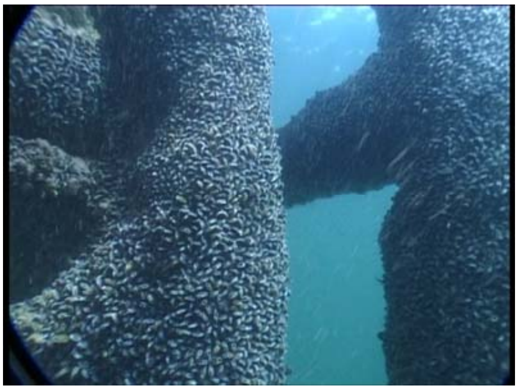


Photo 23. Common mussel Mytilus edulis *at monopile structures.*

Photo 24. Common starfish Asterias rubens.

Within newly established heterogeneous habitats such as the hard substrates structures at Horns Rev, recruitment variability and predation will influence the abundance of individuals and community structure of epibenthic assemblages (Glassier, 1979; Chiba & Noda, 2000: Worm et al., 2002), which often result in statistical differences in abundance and diversity between sites. Mosaics of sessile organisms form the faunal assemblages at each turbine site with the general faunal assemblages at all turbine sites at Horns Rev being highly variable and shown to be different. It was also shown at Horns Rev that predation, especially from the starfish (*Asterias rubens*), was one of the main factors to the dramatic changes in the fouling communities between sites. A discrepancy in the abundance of *Mytilus edulis* and *Asterias rubens* was also shown. This keystone predator controlling the area distribution, vertical distribution, population abundance and size distribution of the prey target *Mytilus edulis* was probably also the main controller of the barnacles. *Mytilus edulis* was only found as juveniles on the scour protections with evident cohorts of more generations of the common mussels. Larger individuals of mussels were mainly found on a few monopiles that often were on banisters outside the reach of the starfish. In 2005, successful establishment of *Mytilus edulis* was found at more turbine sites than previously demonstrated by growth in the population. Other studies have shown that *Asterias rubens* often is the "keystone" predator controlling the vertical distribution and abundance in littoral and sublittoral mussel beds (Saier, 2001). Mature starfish are mainly feeding upon larger mussels whereas smaller starfish are feeding on smaller mussels and barnacles. A considerably higher number of starfish, mainly more juveniles, were found in 2004 compared to 2003 and 2005. In 2004, this resulted in a drastic decline in the abundance of the barnacle *Balanus crenatus* compared to 2003. In 2005, almost no *Balanus crenatus* was found and this species is also known as an initial colonizing species (White, 2004).

Photo 25. Shells of Balanus crenatus *and the northern sea urchin* Strongylocentrotus droebachiensis *at monopile 2003.*

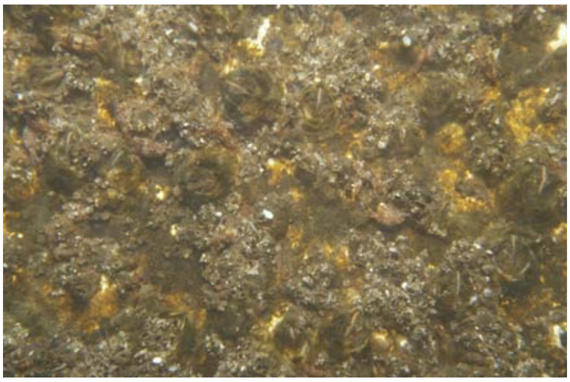


Photo 26. Initial colonization of Balanus crenatus *and* Jassa marmoratus.

Differences were also found in the epibenthic assemblages between vertical structures such as monopiles and horizontal structures such as scour protections. Studies on shipwrecks in the North Sea have also shown some differences between communities on vertical and horizontal structures (Leewis et al., 2000). A distinct zonation and marked change was observed in the epifouling communities at the monopiles. The splash or wash zone was characterised by marked changes in the vegetation cover and species composition. The splash or wash zone was also composed of dense mats of green algae (*Urospora penicilliformis*) in 2003 whereas, in 2004 and 2005, the vegetation cover was replaced by a coating of microscopic green algae and diatoms. The almost monoculture population of the "giant" midge (*Telmatogeton japonicus*) has increased markedly since 2003 by grazing on this coating. *Telmatogeton japonicus*, first recorded at Horns Rev in 2003 (Leonhard and Pedersen, 2004), was hitherto not recorded in Denmark. This midge was probably introduced to Western Europe where it was recorded in 1962 at Kiel (Germany) (Remmert, 1963) and is now known from the Baltic coastal regions of Germany and Poland (Ashe and Cranston, 1990; Murray, 1999). Personal observations of *Telmatogeton japonicus* shows that this species is widely distributed and very numerous on boulders at breakwaters and coast defence structures all over Denmark.

In the upper part of the monopile in the littoral zone, the community was partly characterised by a high number of common mussels (*Mytilus edulis*), the green algae *Ulva (Enteromorpha) spp.*, *Ulva intestinalis, Ulva linza* and *Ulva lactuca* and the brown algae *Petalonia fascia* and *Petalonia zosterifolia.* Also, the barnacle *Balanus balanus* and filamentous brown algae *Pilayella litoralis* and *Ectocarpus* were very common, often dominating in this zone. Compared to 2003, a drastically reduced dominance of *Balanus crenatus* was found at the monopiles in 2004 and 2005. A succession in the vegetation was found introducing new species at the monopiles from 2003. The red algae *Polysiphonia fibrillosa*, the purple laver *Porphyra umbilicalis* and the green algae *Chaetomorpha linum* were introduced at the latest in 2005.

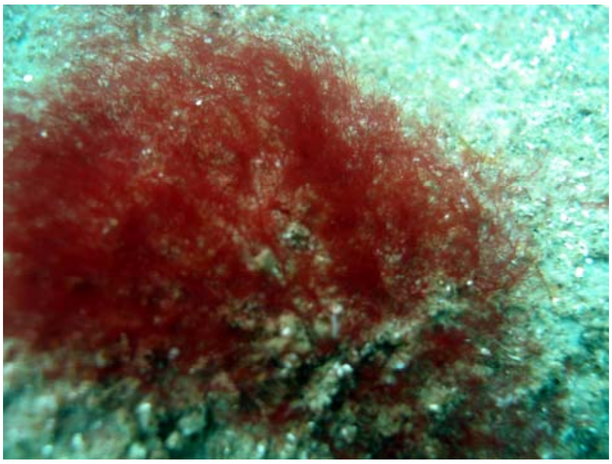


Photo 27. Polysiphonia fibrillose

Photo 28. Chaetomorpha linum.

Apparently a more or less permanent vegetation of different species of green algae (*Ulva spp.*) replaced the initial vegetation cover of filamentous algae . A succession in the vegetation cover of green algae at the monopiles was increasing with depth from 2003.

A dense layer of tube mats was found from the upper sublittoral zone to the scour protection of the tube dwelling amphipod *Jassa marmorata*. *Jassa marmorata*, often covering the total substrate surface completely, was the most significant species recorded on the hard bottom substrate at Horns Rev. The cosmopolitan *Jassa marmorata* was not recorded in Denmark until 2003; although comprehensive studies on stone reefs in the Kattegat and elsewhere in Denmark were conducted (Lundsteen, 2000; Dahl et al., 2004). Tube dwelling amphipods (*Jassa sp.*) were found dominating the epifauna communities at artificially submerged structures in the North Sea (Leewis & Hallie, 2000; Leewis et al., 2000). *Jassa marmorata* was found in numbers on artificial hard substratum in the Mediterranean (Athanasios & Chariton, 2000) and USA (Duffy & Hay, 2000). Although *Jassa marmorata* was found at Horns Rev in very high densities, more than 1 mil./m^2, this species was recorded in even higher densities of up to 8 mil./m^2 in other studies (Tish, 2003).

Due to the large abundance, *Jassa marmorata* might contribute significantly to the diet of a number of other invertebrates and vertebrates including fish and predators such as the edible crab, the common shore crab and the harbour crab. The diet of the bib (*Trisopterus luscus*) consists of small crustaceans (www.fishbase.org[4]). Together with *Jassa marmorata*, the skeleton shrimp (*Caprella linearis*) was found in high numbers. A marked increase in abundance of these two dominant species was shown from 2003 to 2005 with changes in population structures measured by individual body weight, which might be a result of a population regulation process. In the material of *Caprella linearis,* some specimens appears to have been misidentified and evidently belong to *Caprella mutica*

[4] Froese, R. and D. Pauly. Editors. 2006.FishBase.World Wide Web electronic publication. Version (03/2006). Contains information of more than 29,300 Species, 217,200 Common names, 41,500 Pictures and 38,200 References.

(Schurin), an alien species introduced to the Atlantic Ocean from the Siberian coast of the Sea of Japan (Willis et al., 2004).

In the lower zone at the monopiles, the keelworm (*Pomatoceros triqueter*) was more abundant than in the upper zones and has decreased in abundance since September 2003. *Pomatoceros triqueter* is predominately a sublittoral species and considered to be an initial fouling organism making use of available space quickly (Crisp, 1965; Burnell et al., 1991). So the apparent stagnation in population size of *Pomatoceros triqueter* might be the result of competition for space from other species. The initial colonizer, hydrozoan *Tubularia indivisa*, displayed a rather fluctuating distribution pattern and was less abundant in 2004 compared to 2003. This could be a result of lack of space or predation from the sea slugs, among others *Facelina bostoniensis*, which is new to the Horns Rev fauna in 2004. In other studies on artificial reefs, *Tubularia indivisa* could be found on the substrates a few weeks after deployment and together with the hydrozoans *Campanularidae* were considered to be a pioneer community (Leewis & Hallie, 2000; Leewis et al., 2000). More species, such as the plumose anemone (*Metridium senile*), the sea anemones *Sargartia troglodytes* and species of *Sargartiogeton*, the dead man's finger (*Alcyonium digitatum*), the sea slug (*Polycera quadrilineata*) and the bryozoan (*Electra pilosa*), were found colonizing deployed hard substrates in other parts of the North Sea (Leewis & Hallie, 2000) and were also found colonizing the turbine foundations at Horns Rev.

Photo 29. The oaten pipes hydroid Tubularia indivisa.

Photo 30. The sea slug Facelina bostoniensis.

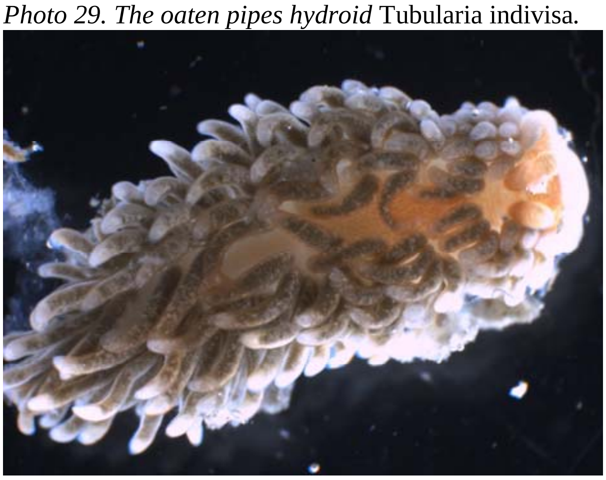


Photo 31. The sea slug Aeolidia papillosa.

Photo 32. The sea slug Polycera quadrilineata.

Due to high current, wave action or sand scouring, the epifouling community will be eliminated from the substrate, leaving place for new settlements, which was observed by divers. More of the species found on the hard substrate at Horn Rev, such as *Sertularia cupressina*, *Flustra foliacea* and *Alcyonium digitatum*, are typical for sand scoured habitats categorised as “slightly scoured circalittoral rock” (Tyler-Walters, 2002). This together with impacts from predation will contribute to a continuously repeating succession process until a more or less stabile community will be reached. Studies have indicated (Leewis et al., 2000; Leewis and Hallie, 2000) that community stability in fouling communities is not attained before 5-6 years after substrate deployment and that occasional events such as heavy storms and severe winters may even prolong this process. Some similarity in the succession of the epifouling community and the species present was found between the epifauna at the foundations at Horns Rev and the epifauna on shipwrecks in other parts of the North Sea (Leewis et al., 2000). More species that are found on wrecks are likely to be found at Horns Rev in the future.

Photo 33. The dead man’s finger Alcyonium digitatum *and the sea anemone* Sargartiogeton laceratus.

Photo 34. The white weed Sertularia cupressina *partly covered by tubes of* Jassa marmorata.

On the scour protection, sea anemones and the soft coral (*Alcyonium digitatum*) contributed with high percentages to the total biomass. The most prominent species of sea anemones were *Metridium senile*, *Sargartia elegans* and *Sargartiogeton laceratus*, which also have been found together with *Alcyonium digitatum* on hard substrates such as shipwrecks in the Dutch area of the North Sea (Leewis et al., 2000). The sea anemones were also found on the monopiles and but less frequent and mostly restricted to the zones near the bottom.

Of the epifaunal species found on the hard bottom fauna and new to the Horns Rev area, special attention should be given to the ross worm (*Sabellaria spinulosa*) and the white weed (*Sertularia cupressina*). Both the ross worm and white weed, in addition to the native oyster (*Ostrea edulis*), which was also found at the turbine sites, are regarded as threatened or red listed species in the Wadden Sea area as a result of habitat loss (Lotze, 2004). The Horns Rev offshore wind farm might function as a sanctuary area for these threatened species. *Sertularia cupressina* is the object of harvesting for decoration purposes in Europe (Gibson et al., 2001; Lotze, 2004), but this species is obviously not uncommon in Denmark as it was found frequently and in high numbers in other studies elsewhere in the Danish part of the North Sea at the Jyske Rev (Dahl et al., 2004; Leonhard, 2005). The ross worm (*Sabellaria spinulosa*) may form thin crusts or large biogenic reefs, up to several metres across, performing important stabilising functions on substratum (Jackson & Hiscock, 2003) but is more common in different hard bottom communities confined to exposed circalittoral rocks (Jones et al., 2000). *Sabellaria spinulosa* was expected to establish on the hard substrate in the wind farm area (Elsam, 2000) because it was also found on deployed hard substrates off the Dutch coast (Lewis & Hallie, 2000).

A marked succession in the number of fish species was observed from the surveys in March to the surveys in September. This might be a result of seasonal migrations of fish species to the turbine site for foraging. Bip (pouting) was observed presumably partly feeding on the crustaceans on the scour protection together with schools of cod. The numbers of cod and the small sandeel seems to have increased since 2003. Studies on fish communities around wrecks off the Dutch coast showed that more species were partly dependent on the wrecks for food (Leewis et al., 2000). Individuals of species like the rock gunnel and the dragonet were commonly found inhabiting caves and crevices between the stones. Similar observations were made in other studies (Leewis & Hallie, 2000).

Taking into account considerable variations in the infauna biomass, including high variations in the presence of larger infauna species, it is estimated that the availability of food for fish and other predatory animals as a consequence of the introduction of the physical hard substrate structures at the wind turbine sites has increased by a factor of approximately 50 to about 483 kg(dw) compared to that of the normal soft seabed fauna at the wind farm sites. Taking the whole wind farm area into account, the estimated increase in biomass is only 38 tonnes or about 7% of the total biomass in the area. However, an increase in fish production related to the presence of the hard substratum is considered possible.

4.2.1.3. Hydrodynamic effect

Changes in hydrodynamic regimes due to deployment of “artificial reefs” in the North Sea have only had a small impact on the infauna community very close to the reef (Leewis & Hallie, 2000). Statistical analysis on the correlation between the various sediment parameters and the abundance of the infauna community in the wind farm area at Horns Rev was not significant. No significant impact on the infauna was detectable concerning distance-related effects, although a tendency was found towards an increase in sediment coarseness with increasing distance from the turbine foundations.

On the scour protections, no statistically significant differences have been found in fouling community structures between the leeward and current side of the monopiles. However, a statistical significant difference was found between the two sides in the zone near the bottom of the monopiles indicating an impact from different hydrodynamic regimes on each side of the monopiles. Differences in community structure on the scour protections between overlapping zones at the leeward side of the monopiles might also reflect the effect of turbulence in the hydrodynamic regimes.

4.2.1.4. Indirect and secondary effects

Indirect and secondary effects on the infauna community inside the wind farm as a consequence of changes in feeding behaviour of sea birds and fish might be a result of the construction of offshore wind farms.

In general, the density of the most abundant bivalves and bristle worms was higher in the wind farm area indicating that the potential predation pressure from sea birds could contribute to increasing differences between the density of their favoured prey inside and outside the wind farm area. The contribution to dissimilarity of the abundance of the 10 most important species between the reference and the wind farm area were consistent with this theory, which indicates that the effect of bird predation might be detected.

The differences found in the distribution pattern of the American razor shell (*Ensis americanus*) between the wind farm area and the extended reference area could be attributed to different predation patterns on this species from the common scoter (*Melanitta nigra*). The common scoter is very common and numerous in the Horns Rev area (Petersen et al., 2004) but it was however observed that common scoters forage in the area outside of the wind farm avoiding the wind farm area (Christensen et al., 2004) in which the American razor shell was observed in significantly lower numbers than in the extended reference area

On the other hand, differences in distribution patterns for the bivalve *Thracia phaseolina* between the wind farm area and the reference area might be explained by differences in the predation pressure from sea birds inside and outside the wind farm area. *Thracia phaseolina*, although not very numerous, seems to have increased in the wind farm area from 1999 to 2005 without a similar increase in the reference area. This species might be found more frequently in more coarse sediments but no differences in the sediment structures have been found between the wind farm area and the reference area. Further differences in abundance and biomass relations of *Thracia phaseolina* between the wind farm area and the extended reference area could possiblly be explained by the predation of common scoter on predominantly larger mussels.

The benthic communities in the Horns Rev area are influenced by bottom trawling for sandeels and brown shrimp (*Crangon crangon*) and dredge-fishing for clams (*Spisula solida*) (Elsam, 2000). An indirect effect of an increased pressure from fish predation due to a ban against fishing inside the wind farm area is however considered negligible and undetectable as the fish attracted to the turbine foundations mainly seem to forage at the turbine foundations (Leonhard and Pedersen, 2005).

In other aspects, the benthic community inside the wind farm area might indirectly be affected by the termination of fishing activities. Besides the reduction in target species populations, repeated and frequent disturbance by fishing gear over an extended period results in alteration of the benthic community. This is characterised by a general reduction in the abundance of long-lived benthic species and an increase in small opportunistic species (Bergman et al., 1996; Kröncke & Bergfeld, 2001; Piersma & Camphuysen, 2001; Chícharo et al., 2002). The interdiction of trawling activities might be beneficial to the benthic communities by enabling the species to mature to their natural sizes and enabling very sensitive species to be established, however no such changes or effects were dectectable and attributable to the termination of fishing activities inside the wind farm area three years after deployment.

4.2.1.5. Introduced species

Besides the epifouling communities associated with the hard bottom structures introduced in the wind farm area, some of these species might also be introduced to the faunal communities on the sanded seabed.

The crustaceans *Jassa marmorata* and *Caprella linearis*, typically associated with hard substrate habitats, were found on the seabed outside the wind turbine sites. Patches of small stones or shell assemblages on the seabed between the wind turbine sites are easily colonised by these epifaunal species that drift from the turbine foundations. It is most likely that *Jassa marmorata* cannot build tubes and establish itself on the sandy bottom. The presence of *Jassa marmorata* and other epifouling species found on the seabed was presumably caused by drifting organisms caught by the current at the foundations or the occurrence of small stones or shells colonised by epifouling species. In 2004, *Jassa marmorata* was even found in the reference area indicating that the "drifting" effect is more distinct than anticipated.

4.2.2. Operation

More of the fish species, including the benthic species such as gobies (*Pomatoschistus* spp.), the long spined bullhead (*Taurulus bubaris*) and the shorthorn sculpin (*Myxocephalus scorpius*), that are found at the turbine sites at Horns Rev are also typically found around wrecks in other parts of the North Sea (Leewis et al., 2000). Very mobile species like the edible crab (*Cancer pagurus*) have also established themselves at the turbine site indicating that noise and vibrations from the turbine generators apparently have no impact on fish and other mobile organisms attracted to the hard bottom substrates for foraging, shelter and protection.

4.2.3. Cumulative effects

Cumulative effects to the benthic communities if more wind farms were placed in rather close vicinity to the Horns Rev offshore wind farm might be changes in community structure in areas between the wind farms and can be attributable to changes in foraging activities of seabirds avoiding areas with wind turbines. Changes attributable to the habitat disruption or changes in hydrodynamic regimes are considered to be of negligible magnitude.

An increase in the colonization rate of epifouling organisms on introduced hard substrates might be expected at newly established wind farms in close vicinity to the Horns Rev wind farm compared to the colonization rates found at Horns Rev. Increased colonisation rates are foreseen, especially for different macro algae and crabs including the edible crab (*Cancer pagurus*).

Interdicting trawling inside the wind farm area and by hampering effective trawling by cutting off trawling routes might be beneficial to the benthic communities at a local scale in areas of more wind farms in relatively close proximity of each other. The overall cumulative effect of extending wind farms and establishing large-scale offshore wind farms within the same area might be beneficial to the local biodiversity and might improve local environmental conditions.

4.3. Methodological considerations for future studies (lessons learned)

Most methods are known and well documented to study the impact on benthic communities and colonization of introduced hard substrates. The statistical power of analysis was adjusted according to the objective and hypotheses and that is why no adjustments to the methodology approach were considered.

5. Conclusion

At the turbine sites in the offshore wind farm area at Horns Rev, the indigenous benthic community characterised by infauna species belonging to the *Goniadella*-*Spisula* community has been changed to an epifouling community associated with hard bottom habitats since the introduction of hard bottom structures in 2002. The small crustacean *Jassa marmorata* has shown to be the most abundant species on the hard bottom substrates.

Introduction of epifouling communities have increased the general biodiversity in the wind farm area and progress succession has been observed in the epifouling community.

High spatial and temporal variability was found in the native infaunal community and sediment parameters but no impact was found due to changes in hydrodynamic regimes caused by the physical wind farm installations.

Changes and differences in the spatial distribution pattern for some mussels might be an indirect effect of changes in foraging pattern for sea birds avoiding wind turbine areas.

Evidence that the hard bottom substrates provide habitat as nursery grounds for larger and more mobile species was shown for the edible crab (*Cancer pagurus*).

Significant spatial and temporal differences have been found in the epifouling communities at the hard bottom substrates. Differences in community structures between monopiles and scour protections were shown mainly due to differences in abundance and biomass of a few epifouling dominant species.

A significant vertical zonation was found in epifouling communities at the monopiles. The splash zone at the monopiles was entirely dominated by the “giant” midge (*Telmatogeton japonicus*) with a pronounced increase in abundance since 2003. The upper investigated zones of the monopiles were characterised by high numbers and high biomass of the common mussel (*Mytilus edulis*) and vegetation cover of green, red and brown algae. No clear distribution pattern was found in the lower zones or near the bottom apart from a general lower abundance of the dominant species and increased coverage of sea anemones.

Zonation in the epifouling community on the scour protections might be attributable to differences in hydrodynamic regimes.

The starfish (*Asterias rubens*) was found to be a keystone predator mainly controlling the distribution of the common mussel and the barnacles at the hard bottom substrates in the wind farm area.

Succession in community structure was demonstrated with a decrease in the abundance of some initial colonizers, which might be a result of predation and competition for space. Stability in fouling communities will not be attained within 5-6 years from the establishment of the wind farm. Heavy storms and severe winters may even prolong this process.

Some species observed on the hard bottom structures at Horns Rev are characteristic for slightly scoured circalittoral rock habitats.

Loss of pre-existing infauna habitats has been replaced by hard bottom habitats providing an estimated 50 times increase in the availability of food for fish and other organisms at the wind farm sites but only a 7% increase in total biomass compared to the native infauna biomass within the wind farm area.

Seasonal variations in fish fauna diversity were found with bib and schools of cod often observed on the scour protections as well as individuals of benthic fish species. Comparing the fish fauna to fish fauna on shipwrecks in other parts of the North Sea showed that there was no indication that noise and vibrations from the turbine generators had any impact on the fish community at Horns Rev.

The wind farm area might function as a sanctuary area for threatened or red listed species in the Wadden Sea area such as the ross worm (*Sabellaria spinulosa*) and the white weed (*Sertularia cupressina*), both of which were found at Horn Rev.

The main objective of the demonstration programme was to investigate the effects of the establishment of offshore wind farms on the environment, to provide a solid basis for decisions about further development of offshore wind power and to ensure that offshore wind power development has no damaging effect on the natural ecosystem. Results from the investigations on the benthic communities showed that only negligible impacts on the native communities were attributable to the wind turbine structures and that effects of the introduced hard substrates were an increase in local biodiversity and an increase in local food availability. Cumulative effects of reduced trawling activities might be beneficial to local biodiversity enabling benthic communities to mature and generally improve environmental conditions in areas of more wind farms.

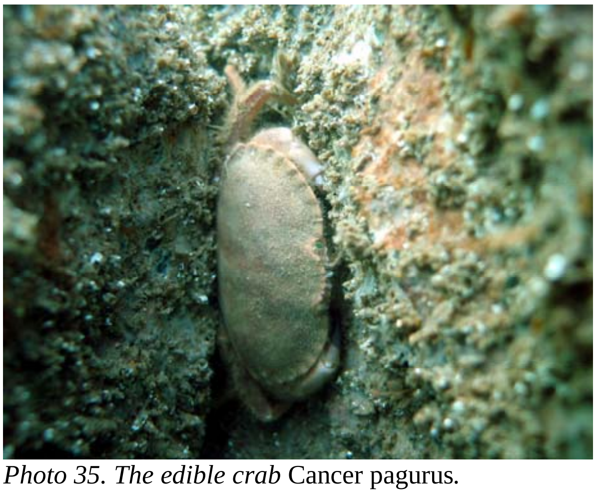


Photo 35. The edible crab Cancer pagurus.

Photo 36. The rock gunnel Pholis gunnellus.

6. Acknowledgements

The work has been financed by the Danish Energy Authorities through the PSO (Public Service Obligations) programmes. The authors would like to thank the tuff field workers and SCUBA divers Jens Christensen, Jens Dedding, Maks Klaustrup and Rune Frederiksen for excellent work and defying the harsh weather and working conditions in a rough environment in the North Sea. We are also grateful to the individual members of the Environmental Project Group and members of the International Expert Panel, with special reference to Professor Anthony Jensen, for constructive comments and inspiration during the project period. A special thanks to Dr. Elizabeth Cook, Scottish Association for Marine Science, for identification and verification of *Caprella mutica.*

7. References

Ashe, P. and P.S. Cranston, 1990. Chironomidae, *In* Soos, A. and L. Papp (Eds). Catalogue of Palaearctic Diptera: Psychodidae-Chironomidae 2. Elsevier, Amsterdam: 113-355.

Athanasios, B. & C. Chariton, 2000. Peracarida crustacean populations of the artificial hard substratum in N. Michaniona (N. Aegean). Belg. J. Zool., 130 (supplement 1): 9-14.

Bech, M., R. Frederiksen, J. Pedersen, S.B. Leonhard, 2004. Infauna monitoring. Horns Rev Wind Farm 2003. Status Report: 1-74. Report request. Commissioned by Elsam Engineering A/S.

Bech, M., R. Frederiksen, J. Pedersen, S.B. Leonhard, 2005. Infauna monitoring. Horns Rev Wind Farm 2004. Status Report. In Prep. Report request. Commissioned by Elsam Engineering A/S.

Bergman, M.J.N., M. Fonds, S.J. de Groot and J.W. van Santbrink, 1996. Direct Effects of Beam Trawl Fishery on bottom Fauna in the Southern North Sea. In Andersen J., H. Karup and U.B. Nielsen (Eds.) Scientific Symposium on the North Sea Quality Status Report 1993, 18-21 April 1994, Ebeltoft, Denmark: 204-209.

Bio/consult, 2001. Bundforhold og begroninger ved målemast. Beskrivelser af flora og fauna 02.04.2001. Note Commissioned by Tech-wise:1-9.

Birkett, L., 1953. Changes in the compositions of the bottom fauna of the Dogger Bank area. Nature 171: 265

Burnell et al., 1991. Ref. Marlin Species Database www. Marlin.ac.uk.

Chiba, S. & T. Noda, 2000. Factors maintaining topography-related mosaic of barnacle and mussel on a rocky shore. J.Mar.Biol.Ass.U.K. 80: 617-622.

Chícharo, L., A. Chícharo, M. Gaspar, F. Alves and J. Regala, 2002. Ecological characterization of dredged and non-dredged bivalve fishing areas off south Portugal. J. Mar. Bio. Ass. U.K. 82 (1): 41-50.

Christensen, T. K.,Hounisen, J. P. Clausager, I. & Petersen, I. K. 2004. Visual and radar observations of birds in relation to collision risk at the offshore wind farm at Horns Rev, 2003. Report request. Commissioned by ELSAM Engineering A/S.

Clarke, K. R. & R.M. Warwick, 1994. Change in marine communities: an approach to statistical analysis and interpretation. Natural Environment Research Council, UK: 1-114.

Connor, D. W, J. Allen, N. Golding, K.L. Howell, L.M. Lieberknecht, K.O. Northern and J.B. Reker, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 JNCC, Peterborough

Crisp, 1965. Ref. Marlin Species Database. www. Marlin.ac.uk.

Dahl, K., J. Nicolaisen, R. Nielsen and O. S. Tindal, 2004. Udvikling og afprøvning af metoder til indsamling af flora og fauna på småstenede hårdbundshabitater. *Faglig rapport fra DMU, nr. 521: 1-85.*

Danish Hydraulic Institute (DHI), 1999. Havvindmøllefundamenter ved Horns Rev – Hydrografiske data. ELSAMPROJEKT A/S.

Degraer, S., M. Vincx, P. Meire & H. Offringa 1999. The macrozoobenthos of an important wintering area of the common scoter (Melanitta nigra). J. Mar. Biol. Ass. U.K. 79: 243-251.

Dewarumez, J.M., D. Devoult, L.E.S. Anorve & S. Frontier, 1992. Is the 'muddy heterogeneous sediment assemblage' an ecotone between the pebbles community and the Abra alba community in the Southern Bight of the North Sea? Netherlands Journal of Sea Research.30: 229–238.

Duffy, J. E. & M.E. Hay, 2000. Strong impact of grazing amphipods on the organization of a benthic community. Ecological Monographs 70 (2): 237-262.

Dyer, M.F., W.G. Fry, P.D. Fry & G.J. Cranmer, 1983. Benthic regions within the North Sea. J. Mar. Biol. Ass. U.K. 63:683-693.

Elsamprojekt, 2000. Havmøller Horns Rev. Vurdering af Virkninger på Miljøet. VVM–redegørelse. Rapport til Elsam I/S og Eltra amba.

Fishbase. www.fishbase.org.

Falace, A. and G. Bressan, 2000. "Periphyton" colonization: Principles, Criteria and Study Methods. *In* A. C. Jensen *et al*. (eds.): Artificial Reefs in European Seas: 435-449.

GEUS, 2002. Personal communication.

Gibson, R., B. Hextall and A. Rogers, 2001. Photographic Guide to the Sea & Shore Life of Britain & North-west Europe. Oxford: 1-436.

Glasser, J.W., 1979. The role of predation in shaping and maintaining the structure of communities. Am. Nat. Vol 113: 631-641.

Govaere, J.C.R., D. Van Damme, C. Heip & A.P. De Coninck 1980. Benthic communities in the Southern Bight of the North Sea and their use in ecological monitoring. Helgoländer Meeresunters. 33: 507-521

Hoffmann, E., J. Astrup, F. Larsen and S. Munch-Petersen, 2000. Effects of marine wind farms on the distribution of fish, shellfish and marine mammals in the Horns Rev area. Danish Institute for Fisheries Research, Department of Marine Fisheries: 1-42. Report request. Commissioned by Elsamproject..

Hvas, E., P.B. Madsen, J. Groos, 2005. Åbne farvande langs vestkysten. Status og udvikling. 1989-2004. Nordjyllands amt, Ringkjøbing amt, Ribe amt, Viborg amt: 1- 47.

Hvidt, C.B., L. Brünner, F.R. Knudsen and B.S. Jensen, 2005. Hydroacoustic monitoring of fish communities in offshore wind farms. Annual Report 2004. Horns Rev Offshore Wind Farm: 1-21. Report request. Commissioned by Elsam Engineering A/S.

Jackson, A. & K. Hiscock, 2003. *Sabellaria spinulosa*. Ross worm. *Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme*. Plymouth: Marine Biological Association of the United Kingdom. Available from: <http://www.marlin.ac.uk/species/Sabellariaspinulosa.htm>.

Jensen, H., P.S. Kristensen and E. Hoffmann, 2004. Sandeels in the wind farm area at Horns Reef. DIFR (Danish Institute for Fisheries Research): 1-26. Report request. Commissioned by Elsam.

Jones, L.A., K. Hiscock and D.W. Connor, 2000 (Revised 2001). Marine habitat reviews. A summary of ecological requirements and sensitivity characteristics of the conservation and management of marine SACs. Joint Nature Conservation Committee: 1-178.

Kingston, P. & E. Rachor, 1982. North Sea level bottom communities. ICES CM 1982/L:41: 1–15.

Kirkegaard, J.B., 1969. A quantitative Investigation of the Central North Sea. Polychaeta. Spolia 29. 1–284.

Kröncke, I., C. Bergfeld, 2001. Synthesis and New Conception of North Sea Research (SYCON) 12. Working group 10. Review of the Current Knowledge on North Sea Benthos. Berichte aus dem Zentrum für Meeres- und Klimaforschung dern Universität Hamburg: 1-138.

Larsen, B., 2003. Blåvands Huk – Horns Rev området – et nyt Skagen?. Temanummer Geologi nyt fra GEUS nr. 4 (2003)

Leewis, R. & F. Hallie, 2000. An Artificial Reef Experiment off the Dutch Coast. – *In* A. C. Jensen *et al*. (eds.): Artificial Reefs in European Seas: 289–305.

Leewis, R. G. van Moorsel and H. Waardenburg, 2000. Shipwrecks on the Dutch Continental Shelf as Artificial Reefs - *In* A. C. Jensen *et al*. (eds.): Artificial Reefs in European Seas: 419–434.

Leonhard, S.B., 2000. Horns Rev Offshore Wind Power Farm. Environmental Impact Assessment of Sea Bottom and Marine Biology: 1-36. Report request. Commissioned by Elsam I/S.

Leonhard, S.B., 2001. Horns Rev Offshore Wind Farm. Introducing hard bottom substrate sea bottom and marine biology. Status report 2001. Report commissioned by ELSAM Engineering A/S: 1-73.

Leonhard, S.B. and J. Pedersen, 2002. Horns Rev. Offshore Wind Farm. Introducing Hard Bottom Substrate. Sea Bottom and marine Biology. Status Report 2001: 1-72. Report request. Commissioned by Elsam Engineering A/S.

Leonhard, S.B., 2003. Horns Rev. Introducing hard substrate habitats. Monitoring programme for benthos communities, flora and fauna. Update autumn 2003. Memorandum request. Commissioned by Elsam Engineering A/S: 1-13.

Leonhard, S.B. 2004. Hard Bottom Substrate Monitoring Horns Rev Wind Farm 2004 Data Report No. 1: 1-85. Report request. Commissioned by Elsam Engineering A/S.

Leonhard, S.B., 2005. Hard Bottom Substrate Monitoring Horns Rev Wind Farm 2004 Data Report No. 2: 1-108. Report request. Commissioned by Elsam Engineering A/S.

Leonhard, S.B., 2005. Application for extraction of raw material at Jyske Rev. (in Danish). Request by Rohde-Nielsen A/S.

Leonhard,, S.B. and R. Frederiksen, 2005. Hard Bottom Substrate Monitoring Horns Rev Offshore Wind Farm 2005. Survey Report No. 2.: 1-18. Report request. Commissioned by Elsam Engineering A/S.

Leonhard, S.B., J. Pedersen, 2004. Hard Bottom Substrate Monitoring Horns Rev Offshore Wind Farm. Annual Status report 2003: 1-62. Report request. Commissioned by Elsam Engineering A/S.

Leonhard, S.B., J. Pedersen, 2005. Hard Bottom Substrate Monitoring Horns Rev Offshore Wind Farm. Annual Status report 2004: 1-79. Report request. Commissioned by Elsam Engineering A/S.

Lotze, H.K., 2004. Ecological History of the Wadden Sea: 2000 Years of Human-induced Change in a Unique Coastal Ecosystem. Wadden Sea Newsletter 2004 – 1: 22-23.

Lundsteen, S., 2000. Faunaen på 26 stenrev i de indre danske farvande i 1991 - 1994. Aquatic Consult og Hedeselskabet ME for Skov- og Naturstyrelsen: 1-104.

Murray, D. A., 1999. Two marine coastal-dwelling chironomidae (Diptera) new to the fauna of Iceland: *Telmatogeton japonicus* Tokunaga (Telmatogetoninae) and *Clunio marinus* Haliday (Orthocladiinae). Bull. Ir. Biogeof. Soc 23, 89–91.

Nehring, S. 1999. Oyster beds and *Sabellaria* reefs. In the Wadden Sea. Quality Status Report.

NERI, 2006. National Environmental Research Institute. MADS database. http://www.dmu.dk/Vand/Havmilj%C3%B8/MADS/Vandkemi/

Neal, K.J. & E. Wilson, 2005. *Cancer pagurus*. Edible crab. *Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme* [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 03/02/2006]. Available from: <http://www.marlin.ac.uk/species/Cancerpagurus.htm>

Nielsen, R., D. Schories, W. Härdtle, K. Reise & W.J Wolff 1996. Red List of Marine Macroalgae of the Wadden Sea. Helgoländer Meeresunters. 50 Suppl., 39–42.

Petersen, G.H., 1977. The Density, Biomass and Origin of the Bivalves of the Central North Sea. Meddr. Danm. Fisk.- og Havunders. N.S Vol. 7: 221–273.

Petersen, G.H., P.B. Madsen, K.T. Jensen, K.H. van Bernem, J. Harms, W. Heiber, I. Kröncke, H. Michaelis, E. Rachor, K. Reise, R. Dekker, G.J.M. Visser & W.J. Wolff, 1996. Red List of Macrofaunal Benthic Invertebrates of the Wadden Sea. Helgoländer Meeresunters. 50 Suppl., 69–76.

Petersen, I.K., I. Clausager and T.K. Christensen, 2004. Bird numbers and distribution in the Horns Rev offshore wind farm area. Annual Status Report 2003. Report commissioned by Elsam Engineering A/S 2003: 1-36.

Piersma, T. and K. Camphuysen, 2001. What can peak mortalities of eiders tell us about the state of the Dutch Wadden Sea ecosystem? Wadden Sea Newsletter 2001-1: 42-45.

Rambøll, 1999. Elsam Havmøller. Havmøllers indvirkning på råstofressourceområderne på Horns Rev Rev. November 1999.

Remmert, H., 1963. *Telmatogeton remanei* n.sp., eine neue marine Chironomide aus der Kieler Förde. Zool. Anz. 171: 165-178.

Sabatini, M., 2004. *Spisula solida*. A surf clam. *Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme*. Plymouth: Marine Biological Association of the United Kingdom. Available from: <http://www.marlin.ac.uk/species/Spisulasolida.htm>

Saier, B., 2001. Direct and indirect effects of seastars *Asterias rubens* on mussel beds (*Mytilus edulis*) in the Wadden Sea. Journal of Sea Research 46: 29-42.

Salzwedel, H., E. Rachor & D. Gerdes, 1985. Benthic macrofauna communities in the German Bight. Veröff. Inst. Meeresforsch. Bremerh. 20: 199–267.

Tish, N. 2003. Community level effects of the amphipod *Jassa marmorata.* Marine Laboratory, Cornell University, www.sml.cornell.edu

Tyler-Walters, H., 2002. *Flustra foliacea* and other hydroid/bryozoan turf species on slightly scoured circalittoral rock or mixed substrata. *Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme* [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 25/02/2005]. Available from: <http://www.marlin.ac.uk>

Ursin, E., 1960. A Quantitative investigation of the Echinoderm Fauna of the central North Sea. Meddr. Danm. Fisk.- og Havunders. N.S Vol. 2 nr. 24: 1–204.

Vanosmael, C., K.A. Willems, D. Claeys, M. Vincx & C. Heip, 1982. Macrobenthos of a sublittoral sandbank in the southern Bight of the North Sea. J. Mar. Biol. Ass. U.K. 62: 521-534

White, N., 2004. *Balanus crenatus*. An acorn barnacle. *Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme* [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 03/02/2006]. Available from: <http://www.marlin.ac.uk/species/Balanuscrenatus.htm>

Willis, K.J., E.J. Cook, M. Lozano-Fernandez and I. Takeuchi, 2004. First record of the alien caprellid amphipod, *Caprella mutica*, for the UK. J.Mar.Biol.Ass. U.K. 84: 1027-1028.

Worm, B.; H.K. Lotze; H. Hillebrand and U. Sommer. 2002. Consumer versus resource control of species diversity and ecosystem functioning. Nature vol. 417: 848-851.

8. Appendixes

8.1. Appendix 1. Coordinates of the wind farm and list of Positions

Table A.1.1. Co-ordinates of the outermost wind turbines and the transformer station. Point positions are shown in Figure 1.3.

Co-ordinates in system UTM32/WGS84		
Point	**Easting (x)**	**Northing (y)**
P1	423.974	6.151.447
P2	429.014	6.151.447
P3	429.492	6.147.556
P4	424.452	6.147.556
T	428.946	6.152.003

Table A1.2. Positions of sampling locations for infauna surveys in 2001 to 2004.

Location	"WGS84_MIN_Y"	WGS84_MIN_X"	2001		2003	2004
			June	September	September	September
			Depth (app. m)	Depth (app. m)	Depth (app. m)	Depth (app. m)
M26_005	07°49.220'	55°28.717'	7.8		7.8	8.4
M26_025	07°49.227'	55°28.727'	7.9		7.8	8.6
M26_100	07°49.251'	55°28.765'	8.3		7.8	8.4
M51_005	07°50.447'	55°30.227'	10		8.9	8.1
M51_025	07°50.454'	55°30.237'	10		8.9	9
M51_100	07°50.478'	55°30.275'	9.7		8.9	8.6
M55_005	07°50.742'	55°29.031'	10.5	10.5	11.1	10,0
M55_025	07°50.748'	55°29.041'	10.2	10.2	11.1	9.2
M55_100	07°50.772'	55°29.079'	10.6	10.6	11.1	9.5
M58_005	07°50.962'	55°28.134'	7.9	7.9	7.8	8.2
M58_025	07°50.969'	55°28.144'	8.1	8.1	7.8	8.6
M58_100	07°50.993'	55°28.182'	8.5	8.5	7.8	8.5
M73_005	07°51.658'	55°29.639'	9.3		8.5	7.9
M73_025	07°51.665'	55°29.649'	9.3		8.5	7.8
M73_100	07°51.689'	55°29.687'	9.2		8.5	8.1
M95_005	07°52.868'	55°29.051'	9.1	9.1	8.7	8.2
M95_025	07°52.874'	55°29.061'	9.2	9.2	8.8	9.2
M95_100	07°52.899'	55°29.099'	8.9	8.9	8.8	8.7
R1	07°46.640'	55°30.070'			10.3	9.4
R7	07°47.320'	55°29.480'			8.8	8.2
R35	07°53.080'	55°27.730'			7.6	8.7
R36	07°53.030'	55°30.130'			6.6	6.1
R37	07°53.170'	55°29.530'			6.6	6.2
R40	07°53.610'	55°27.740'			8.3	9.2
RF1	07°43.252'	55°31.162'		11		
RF2	07°43.568'	55°30.698'		10.5		
RF3	07°43.943'	55°31.241'		10		
RF4	07°43.963'	55°31.767'		8		
RF5	07°44.604'	55°31.202'		9		

Table A1.3. Positions of sampling locations for infauna survey in 2005.

Location	WGS84_MIN_Y	WGS84_MIN_X"	Water depth (m)
1	07°41.082'	55°32.382'	11.2
2	07°41.965'	55°32.578'	9
3	07°41.511'	55°32.215'	10.2
4	07°41.520'	55°31.885'	12
5	07°41.959'	55°32.133'	10.9
6	07°42.351'	55°32.335'	10.4
7	07°42.810'	55°32.204'	10.2
8	07°43.259'	55°32.282'	10.5
9	07°42.770'	55°31.852'	11.3
10	07°43.264'	55°32.017'	11
11	07°43.324'	55°31.653'	11
12	07°43.712'	55°31.389'	9.8
13	07°44.657'	55°31.759'	8.2
14	07°44.578'	55°31.471'	10
15	07°43.941'	55°30.812'	11.1
16	07°45.466'	55°31.389'	10.5
17	07°44.589'	55°30.644'	10.8
18	07°44.589'	55°30.396'	11.9
19	07°45.028'	55°30.644'	10.8
20	07°45.752'	55°31.200'	11.2
21	07°45.905'	55°30.396'	10
22	07°45.466'	55°30.148'	10.1
23	07°45.878'	55°30.098'	9.4
24	07°45.392'	55°29.822'	9.5
25	07°46.072'	55°29.894'	9.2
RF4	07°43.963'	55°31.767'	11.2
RF3	07°43.943'	55°31.241'	10
RF5	07°44.604'	55°31.202'	10.9
DIFR 64	07°45.000'	55°31.000'	10.9
DIFR 67	07°45.532'	55°31.000'	10.5
DIFR 70	07°46.063'	55°31.000'	11.3
DIFR 71	07°46.063'	55°30.701'	11
DIFR 66	07°45.000'	55°30.402'	10.6
M51_100	07°50.478'	55°30.275'	9.6
M73_100	07°51.689'	55°29.687'	9.1
M55_100	07°50.772'	55°29.079'	10.5
M95_100	07°52.899'	55°29.099'	9.1
M26_100	07°49.251'	55°28.765'	8.3
M58_100	07°50.993'	55°28.182'	8.3
R1	07°46.640'	55°30.070'	9.6
R7	07°47.320'	55°29.480'	9.3
R35	07°53.080'	55°27.730'	8.7
R36	07°53.030'	55°30.130'	7.2
R37	07°53.170'	55°29.530'	7.1
R40	07°53.610'	55°27.740'	9.2

*TableA1.4. Turbine positions for hard substrate surveys on scour protections *. Additional sampling of mono-piles marked with **.*

Location	"WGS84_MIN_Y"	WGS84_MIN_X"	Depth (app. m)	Mono-pile in place	Programme
Turbine 33	55°29.609'	07°49.526'	11.0	15-Jul-02	*
Turbine 55	55°29.022'	07°50.736'	10.0	30-Jul-02	**
Turbine 58	55°28.124'	07°50.956'	8.0	02-Aug-02	**
Turbine 91	55°30.237'	07°52.569'	6.0	19-Aug-02	*
Turbine 92	55°29.938'	07°52.642'	6.0	19-Aug-02	*
Turbine 95	55°29.041'	07°52.862'	9.0	22-Aug-02	**

8.2. Appendix 2. Species Lists

8.2.1. *Appendix 2.1. Infauna 1999-2005*

Complete list of species Horns Rev Infauna 1999-2005

Group	Species	Author	1999	2001	2003	2004	2005	Common Danish name	Common name
HYDROZOA								Polypdyr	Hydroids
	Tubularia indivisa				x				
	Hydractinia echinata	Fleming	x	x	x				
	Campanulariidae indet.			x	x	x			
SCYPHOZOA								Gopler	Medusae
	Beroe cucumis	Fabricius	x						
ANTHOZOA								Søanemoner	Sea anemones
	Actiniaria indet.				x	x			
NEMERTINI								Slimbændler	Ribbon worms
	Nemertini indet.		x	x	x	x	x		
NEMATOMORPHA								Hårorme	
	Nematomorpha indet.		x						
NEMATODA									
	Nematoda indet.		x	x	x	x	x	Rundorme	Nematodes
POLYCHAETA									
	Polychaeta indet.			x				Havbørsteorme	Bristleworms
	Pholoe sp.		x						
	Pisione remota	(Southern)	x	x	x	x	x		
	Eteone foliosa	Quatrefages	x						
	Eulalia viridis	(L.)	x	x					
	Nephtys caeca	(Fabricius)	x		x	x			
	Nephtys hombergii	Savigny	x						
	Nephtys longosetosa	Ørsted	x	x					
	Nephtys sp.		x		x		x		
	Glycera alba	(O.F. Müller)		x		x	x		
	Goniadella bobretzkii	(Annenkova)	x	x	x	x	x		
	Dorvilleidae indet.						x		
	Protodorvillea kefersteini	(McIntosh)	x				x		
	Scoloplos armiger	O.F. Müller		x		x	x		
	Orbinia sertulata	(Savigny)	x	x	x	x	x		
	Spionidae indet.		x			x			
	Spio filicornis	(O.F. Müller)	x	x	x	x	x		
	Aonides paucibranchiata	Southern	x	x		x	x		
	Scolelepis bonnieri	Mesnil	x	x		x			
	Magelona mirabilis	(Johnston)	x						
	Cirratulidae indet.						x		
	Euzonus flabelligerus	(Ziegelmeier)			x	x			
	Travisia forbesii	Johnston	x	x	x	x	x		
	Ophelia borealis	Quatrefages	x	x	x	x	x		
	Polygordius appendiculatus	Fraipont			x	x	x		
	Polygordius sp.			x					
	Notomastus latericeus	Sars					x		
	Heteromastus filiformis	Claparede		x					
	Arenicola marina	(L.)			x			Sandorm	Blow lug
	Terebellidae indet.		x						
	Lanice conchilega	(Pallas)			x				
HYDRACARINA								Vandmider	Mites
	Halacaridae indet.			x	x				
COPEPODA								Vandlopper	Copepods
	Copepoda indet.			x			x		
	Cyclopoida indet.			x					
	Harpacticoida indet.		x	x	x	x	x		
	Harpacticus sp.		x						
CUMACEA								Kommakrebs	Cumaceans
	Diastylis sp.			x					
	Pseudocuma longicornis	Bate		x			x		
TANAIDACEA									
	Tanaidacea indet.		x						
CIRRIPEDIA								Rurer	Barnacles
	Balanus sp.			x					
DECAPODA								Tibenede krebsdyr	Shrimps, Crabs & Lobsters
	Crangon crangon	L.	x	x	x	x	x	Hestereje	Brown shrimp
	Carcinus maenas	L.	x					Strandkrabbe	Common shore crab
	Liocarcinus pusillus	(Leach)			x			Svømmekrabbe	Harbour crab
	Pagurus bernhardus	L.	x	x	x			Eremitkrebs	Hermit crap
MYSIDACEA								Mysider	Opossum shrimps
	Mysidacea indet.			x		x			
	Gastrosaccus spinifer	Göes		x		x	x		
	Praunus flexuosus	(O.F.Müller)	x						
AMPHIPODA								Tanglopper	Sand hoppers
	Bathyporeia guilliamsoniana	Bate		x		x			
	Bathyporeia sp.			x		x			
	Haustorius arenarius	Slabber	x	x	x				
	Eurysteus nitida	(Stimpson)	x	x					
	Metopidae indet.		x						
	Metopa sp.			x					
	Stenothoe sp.			x					
	Oedicerotidae indet.		x						
	Perioculodes longimanus	Bate & Westwood		x					
	Pontocratus altamarinus	Bate & Westwood	x	x					
	Pontocrates arenarius	Bate	x	x	x	x	x		
	Pontocrates sp.			x					
	Westwoodilla caecula	Bate	x	x					
	Megaleuropus agilis	Hoek		x					
	Jassa marmorata	Holmes			x	x			
	Atylus swammerdami	Milne-Edwards		x		x			
	Caprella linearis	L.			x				
	Caprella sp.			x					
GASTROPODA								Snegle	Snails
	Hydrobia ulvae	Montagu	x			x			
	Crepidula fornicata	(L.)			x			Tøffelsnegl	Slipper lilmpet
	Polinices polianus	(delle Chiaje)	x	x	x	x	x		
BIVALVIA								Muslinger	Mussels
	Bivalvia indet.			x	x				
	Mytilus edulis	L.		x	x	x		Blåmusling	Common mussel
	Goodallia triangularis	(Montagu	x	x	x	x	x		
	Spisula elliptica	(Brown)	x		x				
	Spisula solida	(L.)		x	x	x	x	Tykskallet trugmusling	Thick trough shell
	Angulus tenuis	(Da Costa)	x		x				
	Fabulina fabula	(Gmelin)	x						
	Arctica islandica	(L.)	x	x					
	Chamelea gallina	(L.)				x			
	Thracia phaseolina	(Lamarck)		x	x	x	x	Papirmusling	
	Ensis americanus	(Gould in Binney)			x		x	Amerikansk knivmusling	Razor shell
BRYOZOA								Mosdyr	Bryozoans
	Bryozoa indet.				x				
	Electra pilosa	(L.)		x		x			
ECHINODERMATA								Pighude	Echinoderms
	Asterias rubens	L.			x	x		Alm. Søstjerne	Common starfish
	Ophiura albida	Forbes				x	x		
	Ophiura ophiura				x				
	Echinocyamus pusillus	O.F. Müller			x	x			
	Echinocardium cordatum	(Pennant)				x			
ASCIDIACEA								Søpunge	Sea squirts
	Ascidia indet.			x					
CHAETOGHNATHA								Pilorme	Arrow worms
	Sagitta sp.			x					
CORDATA								Trævlemunde	Cephalocordata
	Branchiostoma lanceolatum	(Pallas)	x	x	x	x	x		

8.2.2. Appendix2.2. Algae

Complete list of species. Horns Rev 2003-2005										
			2003		2004		2005		Common Names	
Group	Taxon	Author	Mar.	Sept.	Mar.	Sept.	Mar.	Sept.	Danish	English
Red algae										
	Porphyra umbilicalis	(Roth)					x	x	Rød purpurhinde	Purple laver
	Hildenbrandia rubra	(Sommerfelt) Meneghini			x	x	x	x	Hav-hildenbrandia	Balanus-Hildenbrandia-mucosa
	Hildenbrandiales indet. 1			x					Rødskorper, kødede	
	Hildenbrandiales indet. 2			x					Rødkødskorp, tyk	
	Corallina officinalis	L.		x					Koralalge	Coral moss
	Coccotylus truncatus	Phallas		x			x	x	Kile-rødblad	
	Phyllophora pseudoceranoides	(S.G. Gmelin)				x			Fliget rødblad	
	Polysiphonia fibrillosa	(Dillwyn)					x	x	Violet ledtang	
	Callithamnion corymbosum	Lyngbye	x	x	x	x			Tæt rødsky	
Brown algae										
	Pilayella littoralis	Kjellman	x		x	x	x	x	Duntang	
	Ectocarpus sp.			x	x	x			vatalge	
	Petalonia fascia	(O.F. Müller)	x	x	x	x	x	x	Alm. båndtang	Sea petals
	Petalonia zosterifolia	(Reinke) Kuntze			x				Græsbladet båndtang	
	Ralfsia verrucosa	Areschoug		x					Vortet ralfsiaskorpe	
	Ralfsia sp.		x							
	Desmarestia aculeata	L.		x			x	x	Alm. kællingehår	Landlady's wig
Green algae										
	Blidingia minima	Kützing		x					Lille krusrørhinde	
	Chaetomorpha linum	(O.F. Müller)					x	x	Krølhårstang	
	Ulva (Enteromorpha) clathrata	(Roth)					x		Fin rørhinde	
	Ulva (Enteromorpha) intestinalis	L.				x			Tarm-rørhinde	Gut-weed
	Ulva lactuca	L.		x	x	x	x	x	Søsalat	Green laver
c	*Ulva (Enteromorpha) linza*	L.				x			Bred rørhinde	
	Ulva (Enteromorpha) prolifera	(O.F. Müller)					x		Centralgrenet rørhinde	
	Ulva (Enteromorpha) sp.		x	x	x	x	x	x	Rørhinde	
	Urospora penicilliformis	Areschoug	x						Grøn frynsealge	
	Cladophora sp.			x			x	x	Vandhår	Slobán

8.2.3. Appendix 2.3. Fish

Complete list of species. Horns Rev 2003-2005														
				2003			2004			2005			Common Names	
Group	Taxon	Author	Mar.	Sept.	Test	Mar.	Sept.	Test	Mar.	Sept.	Test	Danish	English
Actinopterygii														
	Sprattus sprattus	L.					x					Brislinig	European sprat
	Gadus morhua	L.		x	x		x	x		x		Alm. Torsk	Atlantic cod
	Trisopterus luscus	L.		x	x		x	x		x		Skægtorsk	Bib (Pouting)
	Merlangius merlangus	L.		x	x					x		Hvilling	Whiting
	Pollachius virens	L.		x		x	x			x		Sej	Pollock (Saithe)
	Syngnathus typhle	L.					x					Almindelig tangnål	Broad-nosed pipefish
	Myoxocephalus scorpius	L.		x	x	x	x	x	x	x	x	Alm. Ulk	Shorthorn sculpin
	Agonus cataphractus	L.	x	x		x	x		x			Panserulk	Hooknose
	Taurulus bubaris	Euphrasen				x	x		x			Langtornet ulk	Longspined bullhead
	Trachurus trachurus	L.		x						x		Hestemakrel	Horse mackerel
	Mullus surmuletus	L.		x								Stribet mulle	Striped red mullet
	Labrus bergylta	Ascanius					x					Berggylte	Ballan wrasse
	Symphodus melops	L.		x								Savgylte	Corkwing wrasse
	Ctenolabrus rupestris	L.		x	x		x	x		x		Havkaruds	Goldsinny-wrasse
	Cyclopteus lumpus	L.				x						Stenbider	Lumpsucker
	Zoarces viviparus	L.	x	x		x						Ålekvabbe	Viviparous blenny
	Ammodytes tobianus	L.				x	x	x	x	x		Kysttobis	Small sandeel
	Pholis gunnellus	L.	x	x		x	x			x		Tangspræl	Rock gunnel
	Callionymus lyra	L.		x			x					Fløjfisk	Dragonet
	Pomatoschistus minutus	Pallas		x			x		x	x		Sandkutling	Sand goby
	Pomatoschistus pictus	Malm					x					Spættet kutling	Painted goby
	Scomber scombrus	L.					x					Alm. Makrel	Atlantic mackerel

8.2.4. Appendix 2.4. Hard bottom substrate. Benthos

Complete List of species. Horns Rev 2003-2005			2003				2004				2005				Common names	
Group	*Taxon*	Author	Samples		Transects		Samples		Transects		Samples		Transects		Danish	English
			Mar.	Sept.	Mar.	Sept.	Mar.	Sept.	Mar.	Sept.	Mar.	Sept.	Mar.	Sept.		
PORIFERA																
	Halichondria panicea	Pallas					x		x			x	x	x	Brødkrummesvamp	Breadcrumb sponge
	Porifera indet.							x				x				
HYDROZOA																
	Hydrozoa indet.		x	x	x	x			x	x			x			
	Tubulariidae indet.		x													
	Tubularia indivisa		(x)	x	x	x	x	x	x	x	x	x	x	x	Stor rørpolyp	Oaten pipes hydroid
	Thecata indet.		x													
	Hydractinia echinata	Fleming						x			x	x			Pindsvinepolyp	
	Campanulariidae indet.		x	x			x	x			x	x	x	x	Cyprespolyp	
	Sertularia cupressina	(L.)						x			x	x	x	x	Havcypres	White weed
ANTHOZOA																
	Anthozoa indet.		x													
	Alcyonium digitatum	L.					x	x	x	x	x	x	x	x	Dødningehånd	Dead man's fingers
	Actiniaria indet.		x	x	x	x	x	x	x	x	x	x	x	x		
	Actinaridae indet.											x				
	Urticina feline	L.											x	x	Søgeorgine	Dahlia anemone
	Metridium senile	L.			x	x			x	x			x	x	Sønellike	Plumose anemone
	Sargartia elegans	(Dalyell)											x	x		
	Sargartiogeton laceratus	(Dalyell)											x	x	Knopfodet søanemone	
NEMERTINI																
	Nemertini indet.		x	x	x	x	x	x	x		x	x				
NEMATODA																
	Nematoda indet.			x			x	x			x	x				
POLYCHAETA																
	Lepidonotus squamatus	(L.)									x	x				
	Harmothoe imbricata	(L.)		x			x	x			x	x				
	Harmothoe impar	(Johnston)	x	x			x	x			x	x				
	Phyllodocidea indet.		x	x	x	x			x							
	Phyllodoce groenlandica	Ørsted	x	x			x	x			x	x				
	Eulalia viridis	(L.)	x	x			x	x			x	x				
	Hesionidae indet.										x					
	Ophiodromus flexuosus	(Delle Chiaje)						x			x					
	Syllidae indet.			x			x				x	x				
	Nereididae indet.			x												
	Nereis pelagica	L		x			x	x								
	Neanthes virens	(Sars)		x			x									
	Polydora ciliata	Johnston		x			x	x			x					
	Polydora cornuta	Bosc										x				
	Cirratulidae indet.							x								
	Chaetopterus norvegicus	Sars	x								x	x				
	Capitella capitata	(Fabricius)	x	x			x									
	Arenicola marina	(L.)										x			Sandorm	Lugworm
	Terebellidae indet.							x								
	Lanice conchilega	(Pallas)			x	x		x	x	x	x	x	x	x		Sand mason
	Sabellaria spinulosa	Leukart										x				Ross worm
	Sabellaria sp.							x								
	Pomatoceros triqueter	(L.)	x	x	x	x	x	x	x	x	x	x	x	x	Kalkrørsorm	Keelworm
PYCNOGONIDAE																
	Phoxichilidium femoratum	(Rathke)		x												
COPEPODA																
	Copepoda indet.											x				
	Harpacticoida indet.											x				
CIRRIPEDIA																
	Verruca stroemia	O.F. Müller	x	x			x	x			x	x			Skæv rur	
	Balanus balanus	L.	x	x			x	x	x	x	x	x	x	x	Stor rur	
	Balanus crenatus	Bruguiere	x	x	x	x	x	x	x	x	x	x	x	x	Kølet rur	
	Balanus sp.					x					x					
DECAPODA																
	Caridea indet.			x												
	Crangon crangon	(L.)							x						Alm. Hestereje	Brown shrimp
	Corystes cassivelaunus	Pennant		x			x								Maskekrabbe	Masked crab
	Cancer pagurus	L.	x	x	x	x	x	x	x	x	x	x	x	x	Taskekrabbe	Edible crab
	Carcinus maenas	L.			x	x			x	x			x	x	Strandkrabbe	Common shore crab
	Liocarcinus depurator	(L.)			x	x		x	x	x		x	x	x	Svømmekrabbe	Harbour crab
	Macropodia rostrata	(L.)							x						Stankelbenskrabbe	Long legged spider crab
	Pilumnus hirtellus	(L.)										x				Bristly crab
	Pisidia longicornis	(L.)					x				x	x			Porcelænskrabbe	Long clawed porcelain crab
	Pagurus bernhardus	L.			x	x			x	x		x	x		Eremitkrebs	Hermit crab
AMPHIPODA																
	Corophium crassicorne	Bruzelius	x	x												
	Aoridae indet.		x													
	Stenothoe marina	Bate		x												
	Stenothoe sp.											x				
	Jassa marmorata	Holmes	x	x	x	x	x	x	x	x	x	x	x	x		
	Atylus swammerdami	Milne-Edwards		x							x	x				
	Caprella linearis	L.	x	x	x	x	x	x	x	x	x	x	x	x		
	Hyperia galba	Montagu		x												
CHIRONOMIDAE																
	Chironomidae indet.						x									
	Telmatogeton japonicus	Tokunaga	x	x	x	x	x	x	x	x	x	x	x	x		
GASTROPODA																
	Gastropoda indet.				x	x										
	Rissoidae indet.		x	x			x	x			x	x				
	Crepidula fornicata	(L.)	x	x	x	x	x	x	x	x	x	x	x	x	Tøffelsnegl	Slipper limpet
	Polinices polianus	(delle Chiaje)									x	x			Lille boresnegl	Alder's necklace shell
	Polinices sp.			x												
	Epitonium clathrus	(L.)									x				Alm. Vindeltrappesnegl	Common wentletrap
	Buccinum undatum	L.			x				x	x			x	x	Alm. Konk	Common whelk
	Hinia pygmaea	(Lamarck)						x				x			Lille dværgkonk	Netted dog whelk
	Nudibranchia indet.		x	x	x	x	x	x	x	x		x				
	Onchidoris muricata	(Møller)	x	x	x	x	x	x	x		x	x	x	x	Hvid doride	
	Polycera quadrilineata	(Møller)					x	x	x	x	x	x	x	x	Stribet nøgensnegl	
	Facelina bostoniensis	(Couthouy)								x	x	x	x	x		
	Aeolidacea indet.				x											
	Aeolidia papillosa	Order: NUDIBRANCHIA					x	x	x	x	x	x	x	x	Stor trådsnegl	Grey sea slug

Complete List of species. Horns Rev 2003-2005			2003				2004				2005				Common names	
Group	***Taxon***	**Author**	**Samples**		**Transects**		**Samples**		**Transects**		**Samples**		**Transects**		**Danish**	**English**
			Mar.	**Sept.**	**Mar.**	**Sept.**	**Mar.**	**Sept.**	**Mar.**	**Sept.**	**Mar.**	**Sept.**	**Mar.**	**Sept.**		
BIVALVIA																
	Bivalvia indet.		x													
	Mytilus edulis	L.	x	x	x	x	x	x	x	x	x	x	x	x	Blåmusling	Common mussel
	Modiolarca tumida	(Hanley)						x							Opsvulmet blåmusling	Marbled crenella
	Ostrea edulis	L.		x			x		x						Europæisk østers	Native oysters
	Tridonta borealis	Schumacher										x			Stor astartemusling	
	Heteranomia squamula	(L.)	x	x			x	x			x				Lille sadelmusling	
	Angulus tenuis	(Da Costa)						x				x			Alm. tallerkenmusling	Thin tellin
	Fabulina fabula	(Gmelin)										x			Stribet tallerkenmusling	Bean-like tellin
	Moerella donacina	(L.)	x	x												
	Moerella pygmaea	Lovén						x				x				
	Goodallia triangularis	(Montagu					x									
	Venerupis senegalensis	(Gmelin)		x												
	Spisula solida	(L.)							x						Tykskallet trugmusling	Thick trough shell
	Donax vittatus	(da Costa)										x			Kilemusling	
	Hiatella arctica	(L.)		x			x	x			x	x			Hulemusling	Wrinkled rock borer
	Thracia phaseolina	(Lamarck)	x					x			x	x			Papirmusling	
	Phaxas pellucidus	(Pennant)										x			Lille knivmusling	
	Ensis americanus	(Gould)											x	x	Amerikansk knivmusling	Razor shell
	Polyplacophora indet.									x						
BRYOZOA																
	Bryozoa indet.		x	x	x	x		x		x	x	x				
	Electra pilosa	(L.)	x	x	x	x	x	x			x	x	x	x	Pigget hindemosdyr	
	Flustra foliacea	(L.)							x						Bredt bladmosdyr	Hornwrack
	Alcyonidium sp.	Lamouroux					x	x	x		x	x	x	x		
ECHINODERMATA																
	Asterias rubens	L.	x	x	x	x	x	x	x	x	x	x	x	x	Alm. Søstjerne	Common starfish
	Ophiura albida	Forbes	x					x			x	x				
	Strongylocentrotus droebachiensis	(O.F. Müller)	x	x	x	x	x	x			x	x			Grønt søpindsvin	Northern sea urchin
	Echinocardium cordatum	(Pennant)			x										Sømus	Sea potato
ASCIDIACEA																
	Tunicata indet.											x				

8.3. Appendix 3. Infauna

8.3.1. *Appendix 3.1. Infauna mean abundance 1999-2004*

Abundance - 4 years: Year

		Sampling area											
		Wind Farm area						Reference area					
		2001		2003		2004		1999		2003		2004	
		Campaign		Campaign		Campaign		Campaign		Campaign		Campaign	
		Autumn		Autumn		Autumn		Spring		Autumn		Autumn	
Abundance, number/m²		Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %
HYDROZOA	Hydractinia echinata	225,84	12,1%	2,26	,2%	.	.	13,55	,5%	6,78	,6%	.	.
	Campanulariidae indet.	.	.	4,52	,4%	4,52	,3%	.	.	.	.	.	.
	Tubularia indivisa	.	.	2,26	,2%	.	.	.	.	.	.	.	.
ANTHOZOA	Actiniaria indet.	.	.	2,26	,2%	2,26	,2%	.	.	.	.	.	.
GOPLER	Beroe cucumis	.	.	.	.	.	.	13,55	,5%	.	.	.	.
NEMERTINI	Nemertini indet.	27,10	1,4%	4,52	,4%	9,03	,6%	40,65	1,6%	13,55	1,2%	6,78	,8%
NEMATODA	Nematoda indet.	121,95	6,5%	4,52	,4%	6,78	,5%	40,65	1,6%	.	.	.	.
POLYCHAETA	Protodorvillea kefersteini	.	.	.	.	.	.	440,38	17,0%	.	.	.	.
	Pisione remota	411,02	22,0%	22,58	2,0%	85,82	5,8%	691,06	26,7%	13,55	1,2%	6,78	,8%
	Goniadella bobretzkii	189,70	10,1%	146,79	12,9%	65,49	4,5%	338,75	13,1%	149,05	12,7%	33,88	4,2%
	Travisia forbesii	.	.	9,03	,8%	94,85	6,5%	155,83	6,0%	20,33	1,7%	20,33	2,5%
	Ophelia borealis	72,27	3,9%	11,29	1,0%	9,03	,6%	149,05	5,8%	13,55	1,2%	.	.
	Spio filicornis	90,33	4,8%	20,33	1,8%	27,10	1,8%	27,10	1,0%	40,65	3,5%	13,55	1,7%
	Orbinia sertulata	.	.	9,03	,8%	15,81	1,1%	101,63	3,9%	13,55	1,2%	6,78	,8%
	Nephtys hombergii	.	.	.	.	.	.	20,33	,8%	.	.	.	.
	Nephtys longosetosa	4,52	,2%	.	.	.	.	33,88	1,3%	.	.	.	.
	Scolelepis bonnieri	36,13	1,9%	.	.	2,26	,2%	6,78	,3%	.	.	.	.
	Nephtys sp,	.	.	15,81	1,4%	.	.	6,78	,3%	13,55	1,2%	.	.
	Eulalia viridis	9,03	,5%	.	.	.	.	.	.	.	.	.	.
	Spionidae indet.	.	.	.	.	9,03	,6%	.	.	.	.	.	.
	Polygordius appendiculatus	.	.	13,55	1,2%	6,78	,5%	.	.	6,78	,6%	.	.
	Nephtys caeca	.	.	4,52	,4%	6,78	,5%	.	.	13,55	1,2%	.	.
	Pholoe sp.	.	.	.	.	.	.	6,78	,3%	.	.	.	.
	Magelona mirabilis	.	.	.	.	.	.	6,78	,3%	.	.	.	.
	Euzonus flabelligerus	.	.	.	.	.	.	.	.	6,78	,6%	6,78	,8%
	Lanice conchilega	.	.	.	.	.	.	.	.	6,78	,6%	.	.
	Polychaeta indet.	4,52	,2%	.	.	.	.	.	.	.	.	.	.
	Arenicola marina	.	.	4,52	,4%	.	.	.	.	.	.	.	.
	Scoloplos armiger	4,52	,2%	.	.	2,26	,2%	.	.	.	.	.	.
	Glycera alba	.	.	.	.	2,26	,2%	.	.	.	.	.	.
	Aonides paucibranchiata	.	.	.	.	2,26	,2%	.	.	.	.	.	.
	Glycera sp.	.	.	.	.	.	.	.	.	.	.	.	.
	Polygordius sp.	.	.	.	.	.	.	.	.	.	.	.	.
HYDROCARINA	Halacaridae indet,	.	.	2,26	,2%	.	.	.	.	.	.	.	.
CRUSTACEA	Balanus sp.	135,50	7,2%	.	.	.	.	.	.	.	.	.	.
	Metopidae indet.	.	.	.	.	.	.	40,65	1,6%	.	.	.	.
	Cyclopoida indet.	36,13	1,9%	.	.	.	.	.	.	.	.	.	.
	Jassa marmorata	.	.	40,65	3,6%	40,65	2,8%	.	.	.	.	20,33	2,5%
	Haustorius arenarius	4,52	,2%	2,26	,2%	.	.	47,43	1,8%	.	.	.	.
	Westwoodilla caecula	18,07	1,0%	.	.	.	.	.	.	.	.	.	.
	Pontocrates arenarius	4,52	,2%	6,78	,6%	6,78	,5%	47,43	1,8%	20,33	1,7%	6,78	,8%
	Gastrosaccus spinifer	13,55	,7%	.	.	24,84	1,7%	.	.	.	.	6,78	,8%
	Crangon crangon	.	.	.	.	2,26	,2%	13,55	,5%	6,78	,6%	13,55	1,7%
	Bathyporeia sp.	.	.	.	.	9,03	,6%	.	.	.	.	.	.
	Eurysteus nitida	4,52	,2%	.	.	.	.	13,55	,5%	.	.	.	.
	Pontocrates sp.	9,03	,5%	.	.	.	.	.	.	.	.	.	.
	Caprella linearis	.	.	9,03	,8%	.	.	.	.	.	.	.	.
	Harpacticoida indet.	4,52	,2%	11,29	1,0%	4,52	,3%	13,55	,5%	.	.	.	.
	Carcinus maenas	.	.	.	.	.	.	6,78	,3%	.	.	.	.
	Pagurus bernhardus	4,52	,2%	2,26	,2%	.	.	13,55	,5%	6,78	,6%	.	.
	Bathyporeia guilliamsoniana	4,52	,2%	.	.	9,03	,6%	.	.	.	.	.	.
	Oedicerotidae indet.	.	.	.	.	.	.	6,78	,3%	.	.	.	.
	Mysidacea indet.	9,03	,5%	.	.	2,26	,2%	.	.	.	.	.	.
	Atylus swammerdami	9,03	,5%	.	.	2,26	,2%	.	.	.	.	.	.
	Diastylis sp.	4,52	,2%	.	.	.	.	.	.	.	.	.	.
	Pseudocuma longicornis	4,52	,2%	.	.	.	.	.	.	.	.	.	.
	Metopa sp.	4,52	,2%	.	.	.	.	.	.	.	.	.	.
	Stenothoe sp.	4,52	,2%	.	.	.	.	.	.	.	.	.	.
	Liocarcinus pusillus	.	.	2,26	,2%	.	.	.	.	.	.	.	.
GASTROPODA	Polinices polianus	9,03	,5%	11,29	1,0%	6,78	,5%	6,78	,3%	6,78	,6%	6,78	,8%
	Hydrobia ulvae	.	.	.	.	6,78	,5%	.	.	.	.	6,78	,8%
	Crepidula fornicata	.	.	2,26	,2%	.	.	.	.	.	.	.	.
BIVALVIA	Goodallia triangularis	203,25	10,9%	663,96	58,3%	862,69	58,7%	237,13	9,2%	630,08	53,8%	616,53	75,8%
	Ensis ensis	.	.	.	.	.	.	.	.	60,98	5,2%	.	.
	Thracia phaseolina	45,17	2,4%	36,13	3,2%	58,72	4,0%	.	.	33,88	2,9%	20,33	2,5%
	Arctica islandica	31,62	1,7%	.	.	.	.	.	.	.	.	.	.
	Spisula solida	36,13	1,9%	20,33	1,8%	13,55	,9%	33,88	1,3%	27,10	2,3%	13,55	1,7%
	Mytilus edulis	49,68	2,7%	6,78	,6%	29,36	2,0%	.	.	13,55	1,2%	6,78	,8%
	Bivalvia indet,	4,52	,2%	.	.	.	.	.	.	13,55	1,2%	.	.
	Fabulina fabula	.	.	.	.	.	.	6,78	,3%	.	.	.	.
	Angulus tenuis	.	.	2,26	,2%	.	.	.	.	.	.	.	.
	Chamelea gallina	.	.	.	.	2,26	,2%	.	.	.	.	.	.
	Spisula elliptica	.	.	,00	,0%	.	.	.	.	.	.	.	.
BRYOZOA	Electra pilosa	4,52	,2%	.	.	9,03	,6%	.	.	.	.	.	.
	Bryozoa indet,	.	.	2,26	,2%	.	.	.	.	.	.	.	.
ECHINODERMATA	Ophiura ophiura	.	.	.	.	.	.	.	.	6,78	,6%	.	.
	Asterias rubens	.	.	6,78	,6%	2,26	,2%	.	.	.	.	.	.
	Echinocyamus pusillus	.	.	4,52	,4%	4,52	,3%	.	.	.	.	.	.
	Ophiura albida	.	.	.	.	2,26	,2%	.	.	.	.	.	.
	Echinocardium cordatum	.	.	.	.	2,26	,2%	.	.	.	.	.	.
CHAETOGHNATHA	Sagitta sp.	4,52	,2%	.	.	.	.	.	.	.	.	.	.
CHORDATA	Branchiostoma lanceolatum	9,03	,5%	27,10	2,4%	15,81	1,1%	6,78	,3%	27,10	2,3%	.	.

8.3.2. Appendix 3.2. Infauna mean abundance 1999-2005 (spring)

CS Study area = Extended reference area

Abundance - Spring: Year/Area

Spring		1999				2001		2005						Total	
		Reference		Wind Turbine Area		Wind Turbine Area		Reference		CS Study Area		Wind Turbine Area			
Abundance, number/m²		Mean	Col Sum %	Mean	Col Sum %	Mean	Col Sum %	Mean	Col Sum %	Mean	Col Sum %	Mean	Col Sum %	Mean	Col Sum %
Goodallia triangularis	BIVALVIA	54.20	10.1%	199.56	31.8%	153.57	16.4%	758.81	61.5%	197.09	26.8%	474.25	40.7%	1837.48	35.1%
Pisione remota	POLYCHAETA	74.53	13.9%	206.95	32.9%	176.15	18.8%	108.40	8.8%	169.99	23.2%	203.25	17.4%	939.27	18.0%
Goniadella bobretzkii	POLYCHAETA	81.30	15.2%	51.74	8.2%	128.73	13.8%	67.75	5.5%	51.74	7.0%	108.40	9.3%	489.65	9.4%
Travisia forbesii	POLYCHAETA	40.65	7.6%	14.78	2.4%	.	.	54.20	4.4%	9.85	1.3%	81.30	7.0%	200.79	3.8%
Thracia phaseolina	BIVALVIA	.	.	.	.	58.72	6.3%	.	.	41.88	5.7%	54.20	4.7%	154.80	3.0%
Spio filicornis	POLYCHAETA	6.78	1.3%	14.78	2.4%	94.85	10.1%	13.55	1.1%	.	.	13.55	1.2%	143.51	2.7%
Ensis americanus	BIVALVIA	.	.	.	.	.	.	40.65	3.3%	101.01	13.8%	.	.	141.66	2.7%
Ophelia borealis	POLYCHAETA	54.20	10.1%	7.39	1.2%	47.43	5.1%	13.55	1.1%	12.32	1.7%	.	.	134.89	2.6%
Polygordius appendiculatus	POLYCHAETA	.	.	.	.	.	.	27.10	2.2%	34.49	4.7%	67.75	5.8%	129.34	2.5%
Nemertini indet.	NEMERTINI	6.78	1.3%	.	.	15.81	1.7%	13.55	1.1%	4.93	.7%	81.30	7.0%	122.36	2.3%
Nephtys sp.	POLYCHAETA	.	.	.	.	13.55	1.4%	67.75	5.5%	17.25	2.3%	.	.	98.55	1.9%
Orbinia sertulata	POLYCHAETA	40.65	7.6%	7.39	1.2%	24.84	2.7%	.	.	.	.	13.55	1.2%	86.43	1.7%
Pontocrates arenarius	CRUSTACEA	20.33	3.8%	7.39	1.2%	.	.	13.55	1.1%	2.46	.3%	27.10	2.3%	70.83	1.4%
Spisula solida	BIVALVIA	13.55	2.5%	7.39	1.2%	31.62	3.4%	.	.	2.46	.3%	.	.	55.02	1.1%
Nematoda indet.	NEMATODA	6.78	1.3%	14.78	2.4%	13.55	1.4%	.	.	7.39	1.0%	.	.	42.50	.8%
Metopidae indet.	CRUSTACEA	40.65	7.6%	.	.	.	.	.	.	.	.	.	.	40.65	.8%
Bathyporeia sp.	CRUSTACEA	.	.	.	.	38.39	4.1%	.	.	.	.	.	.	38.39	.7%
Nephtys hombergii	POLYCHAETA	6.78	1.3%	29.56	4.7%	.	.	.	.	.	.	.	.	36.34	.7%
Haustorius arenarius	CRUSTACEA	27.10	5.1%	7.39	1.2%	.	.	.	.	.	.	.	.	34.49	.7%
Polinices polianus	GASTROPODA	.	.	.	.	4.52	.5%	27.10	2.2%	2.46	.3%	.	.	34.08	.7%
Pontocrates altamarinus	CRUSTACEA	.	.	.	.	31.62	3.4%	.	.	.	.	.	.	31.62	.6%
Nephtys longosetosa	POLYCHAETA	13.55	2.5%	14.78	2.4%	2.26	.2%	.	.	.	.	.	.	30.59	.6%
Aonides paucibranchiata	POLYCHAETA	.	.	.	.	.	.	.	.	29.56	4.0%	.	.	29.56	.6%
Copepoda indet.	CRUSTACEA	.	.	.	.	9.03	1.0%	.	.	4.93	.7%	13.55	1.2%	27.51	.5%
Gastrosaccus spinifer	CRUSTACEA	.	.	.	.	9.03	1.0%	13.55	1.1%	2.46	.3%	.	.	25.05	.5%
Harpacticoida indet.	CRUSTACEA	.	.	14.78	2.4%	6.78	.7%	.	.	2.46	.3%	.	.	24.02	.5%
Branchiostoma lanceolatum	CHORDATA	.	.	.	.	.	.	.	.	9.85	1.3%	13.55	1.2%	23.40	.4%
Scoloplos armiger	POLYCHAETA	.	.	.	.	.	.	13.55	1.1%	4.93	.7%	.	.	18.48	.4%
Mytilus edulis	BIVALVIA	.	.	.	.	18.07	1.9%	.	.	.	.	.	.	18.07	.3%
Hydractinia echinata	HYDROZOA	13.55	2.5%	.	.	.	.	.	.	.	.	.	.	13.55	.3%
Notomastus latericeus	POLYCHAETA	.	.	.	.	.	.	.	.	.	.	13.55	1.2%	13.55	.3%
Pagurus bernhardus	CRUSTACEA	13.55	2.5%	.	.	.	.	.	.	.	.	.	.	13.55	.3%
Eurysteus nitida	CRUSTACEA	13.55	2.5%	.	.	.	.	.	.	.	.	.	.	13.55	.3%
Glycera alba	POLYCHAETA	.	.	.	.	6.78	.7%	.	.	4.93	.7%	.	.	11.70	.2%
Hydrobia ulvae	GASTROPODA	.	.	.	.	11.29	1.2%	.	.	.	.	.	.	11.29	.2%
Protodorvillea kefersteini	POLYCHAETA	.	.	7.39	1.2%	.	.	.	.	2.46	.3%	.	.	9.85	.2%
Tanaidacea indet.	CRUSTACEA	.	.	7.39	1.2%	.	.	.	.	.	.	.	.	7.39	.1%
Praunus flexuosus	CRUSTACEA	.	.	7.39	1.2%	.	.	.	.	.	.	.	.	7.39	.1%
Angulus tenuis	BIVALVIA	.	.	7.39	1.2%	.	.	.	.	.	.	.	.	7.39	.1%
Oedicerotidae indet.	CRUSTACEA	6.78	1.3%	.	.	.	.	.	.	.	.	.	.	6.78	.1%
Bathyporeia guilliamsoniana	CRUSTACEA	.	.	.	.	6.78	.7%	.	.	.	.	.	.	6.78	.1%
Electra pilosa	BRYOZOA	.	.	.	.	6.78	.7%	.	.	.	.	.	.	6.78	.1%
Dorvilleidae indet.	POLYCHAETA	.	.	.	.	.	.	.	.	4.93	.7%	.	.	4.93	.1%
Pseudocuma longicornis	CRUSTACEA	.	.	.	.	.	.	.	.	4.93	.7%	.	.	4.93	.1%
Heteromastus filiformis	POLYCHAETA	.	.	.	.	4.52	.5%	.	.	.	.	.	.	4.52	.1%
Megaluropus agilis	CRUSTACEA	.	.	.	.	4.52	.5%	.	.	.	.	.	.	4.52	.1%
Cirratulidae indet.	POLYCHAETA	.	.	.	.	.	.	.	.	2.46	.3%	.	.	2.46	.0%
Crangon crangon	CRUSTACEA	.	.	.	.	.	.	.	.	2.46	.3%	.	.	2.46	.0%
Ophiura albida	ECHINODERMATA	.	.	.	.	.	.	.	.	2.46	.3%	.	.	2.46	.0%
Campanulariidae indet.	HYDROZOA	.	.	.	.	2.26	.2%	.	.	.	.	.	.	2.26	.0%
Actiniaria indet.	ANTHOZOA	.	.	.	.	2.26	.2%	.	.	.	.	.	.	2.26	.0%
Halacaridae indet,	HYDROCARINA	.	.	.	.	2.26	.2%	.	.	.	.	.	.	2.26	.0%
Perioculodes longimanus	CRUSTACEA	.	.	.	.	2.26	.2%	.	.	.	.	.	.	2.26	.0%
Atylus sp.	CRUSTACEA	.	.	.	.	2.26	.2%	.	.	.	.	.	.	2.26	.0%
Caprella sp.	CRUSTACEA	.	.	.	.	2.26	.2%	.	.	.	.	.	.	2.26	.0%
Ascidiacea indet.	ASCIDIACEA	.	.	.	.	2.26	.2%	.	.	.	.	.	.	2.26	.0%
Empty sample	.00	.	.	.	.	.	.	.	.	.00	.0%	.	.	.00	.0%

8.3.3. Appendix 3.3. Infauna mean biomass WW. 1999-2004

Biomass - 4 years: Year

		Sampling area											
		Wind Farm area						Reference area					
		2001		2003		2004		1999		2003		2004	
		Campaign		Campaign		Campaign		Campaign		Campaign		Campaign	
		Autumn		Autumn		Autumn		Spring		Autumn		Autumn	
Biomass, wet weight g/m²		Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %	Mean	Relative %
HYDROZOA	Hydractinia echinata	,000	,0%	,064	,0%	.	.	1,331	,6%	,001	,0%	.	.
	Campanulariidae indet.	.	.	,026	,0%	,240	1,0%	.	.	.	.	.	.
	Tubularia indivisa	.	.	,022	,0%	.	.	.	.	.	.	.	.
ANTHOZOA	Actiniaria indet.	.	.	22,482	12,1%	1,448	6,2%	.	.	.	.	.	.
GOPLER	Beroe cucumis	.	.	.	.	.	.	,265	,1%	.	.	.	.
NEMERTINI	Nemertini indet.	,038	,0%	,002	,0%	,013	,1%	,078	,0%	,019	,0%	,001	,0%
NEMATODA	Nematoda indet.	,007	,0%	,003	,0%	,003	,0%	,003	,0%	.	.	.	.
POLYCHAETA	Ophelia borealis	7,405	2,5%	,299	,2%	,054	,2%	27,560	13,0%	6,654	1,9%	.	.
	Nephtys longosetosa	,940	,3%	.	.	.	.	10,184	4,8%	.	.	.	.
	Travisia forbesii	.	.	,725	,4%	4,876	20,9%	8,249	3,9%	,259	,1%	4,048	3,7%
	Orbinia sertulata	.	.	1,834	1,0%	2,367	10,1%	9,194	4,4%	,614	,2%	,879	,8%
	Nephtys hombergii	.	.	.	.	.	.	,428	,2%	.	.	.	.
	Lanice conchilega	.	.	.	.	.	.	.	.	,387	,1%	.	.
	Protodorvillea kefersteini	.	.	.	.	.	.	,322	,2%	.	.	.	.
	Polychaeta indet.	,298	,1%	.	.	.	.	.	.	.	.	.	.
	Scoloplos armiger	,449	,1%	.	.	,084	,4%	.	.	.	.	.	.
	Nephtys caeca	.	.	,266	,1%	,330	1,4%	.	.	,158	,0%	.	.
	Scolelepis bonnieri	,068	,0%	.	.	,116	,5%	,476	,2%	.	.	.	.
	Arenicola marina	.	.	,218	,1%	.	.	.	.	.	.	.	.
	Goniadella bobretzkii	,184	,1%	,555	,3%	,049	,2%	,245	,1%	,068	,0%	,014	,0%
	Nephtys sp,	.	.	,204	,1%	.	.	,046	,0%	,215	,1%	.	.
	Magelona mirabilis	.	.	.	.	.	.	,137	,1%	.	.	.	.
	Spio filicornis	,208	,1%	,068	,0%	,051	,2%	,234	,1%	,051	,0%	,009	,0%
	Pisione remota	,035	,0%	,078	,0%	,018	,1%	,174	,1%	,003	,0%	,001	,0%
	Spionidae indet.	.	.	.	.	,039	,2%	.	.	.	.	.	.
	Euzonus flabelligerus	.	.	.	.	.	.	.	.	,050	,0%	,027	,0%
	Aonides paucibranchiata	.	.	.	.	,007	,0%	.	.	.	.	.	.
	Polygordius appendiculatus	.	.	,007	,0%	,003	,0%	.	.	,005	,0%	.	.
	Glycera alba	.	.	.	.	,003	,0%	.	.	.	.	.	.
	Pholoe sp.	.	.	.	.	.	.	,001	,0%	.	.	.	.
	Eulalia viridis	,001	,0%	.	.	.	.	.	.	.	.	.	.
	Glycera sp.	.	.	.	.	.	.	.	.	.	.	.	.
	Polygordius sp.	.	.	.	.	.	.	.	.	.	.	.	.
HYDROCARINA	Halacaridae indet,	.	.	,000	,0%	.	.	.	.	.	.	.	.
CRUSTACEA	Pagurus bernhardus	4,503	1,5%	66,644	35,9%	.	.	76,295	36,1%	13,311	3,7%	.	.
	Balanus sp.	37,229	12,4%	.	.	.	.	.	.	.	.	.	.
	Carcinus maenas	.	.	.	.	.	.	28,392	13,4%	.	.	.	.
	Crangon crangon	.	.	.	.	,554	2,4%	24,765	11,7%	1,165	,3%	3,548	3,3%
	Haustorius arenarius	,003	,0%	,482	,3%	.	.	5,044	2,4%	.	.	.	.
	Gastrosaccus spinifer	2,363	,8%	.	.	,175	,7%	.	.	.	.	,014	,0%
	Liocarcinus pusillus	.	.	,177	,1%	.	.	.	.	.	.	.	.
	Mysidacea indet.	,089	,0%	.	.	,028	,1%	.	.	.	.	.	.
	Bathyporeia guilliamsoniana	,003	,0%	.	.	,054	,2%	.	.	.	.	.	.
	Jassa marmorata	.	.	,016	,0%	,052	,2%	.	.	.	.	,013	,0%
	Pontocrates arenarius	,004	,0%	,035	,0%	,006	,0%	,079	,0%	,030	,0%	,005	,0%
	Bathyporeia sp.	.	.	.	.	,017	,1%	.	.	.	.	.	.
	Caprella linearis	.	.	,017	,0%	.	.	.	.	.	.	.	.
	Harpacticoida indet.	,000	,0%	,012	,0%	,002	,0%	,001	,0%	.	.	.	.
	Eurysteus nitida	,000	,0%	.	.	.	.	,007	,0%	.	.	.	.
	Atylus swammerdami	,007	,0%	.	.	,000	,0%	.	.	.	.	.	.
	Metopa sp.	,003	,0%	.	.	.	.	.	.	.	.	.	.
	Oedicerotidae indet.	.	.	.	.	.	.	,003	,0%	.	.	.	.
	Westwoodilla caecula	,002	,0%	.	.	.	.	.	.	.	.	.	.
	Metopidae indet.	.	.	.	.	.	.	,001	,0%	.	.	.	.
	Cyclopoida indet.	,001	,0%	.	.	.	.	.	.	.	.	.	.
	Diastylis sp.	,000	,0%	.	.	.	.	.	.	.	.	.	.
	Pseudocuma longicornis	,000	,0%	.	.	.	.	.	.	.	.	.	.
	Stenothoe sp.	,000	,0%	.	.	.	.	.	.	.	.	.	.
	Pontocrates sp.	,000	,0%	.	.	.	.	.	.	.	.	.	.
GASTROPODA	Polinices polianus	3,210	1,1%	7,881	4,2%	1,047	4,5%	,035	,0%	2,376	,7%	,162	,1%
	Crepidula fornicata	.	.	,069	,0%	.	.	.	.	.	.	.	.
	Hydrobia ulvae	.	.	.	.	,008	,0%	.	.	.	.	,029	,0%
BIVALVIA	Ensis ensis	.	.	.	.	.	.	.	.	240,718	67,1%	.	.
	Spisula solida	231,883	77,4%	62,580	33,7%	,787	3,4%	15,413	7,3%	77,699	21,7%	97,245	89,3%
	Thracia phaseolina	10,004	3,3%	7,203	3,9%	7,466	31,9%	.	.	9,458	2,6%	1,121	1,0%
	Goodallia triangularis	,542	,2%	1,504	,8%	2,169	9,3%	,904	,4%	1,794	,5%	1,749	1,6%
	Fabulina fabula	.	.	.	.	.	.	1,022	,5%	.	.	.	.
	Bivalvia indet,	,001	,0%	.	.	.	.	.	.	,438	,1%	.	.
	Arctica islandica	,055	,0%	.	.	.	.	.	.	.	.	.	.
	Spisula elliptica	.	.	,030	,0%	.	.	.	.	.	.	.	.
	Chamelea gallina	.	.	.	.	,012	,1%	.	.	.	.	.	.
	Angulus tenuis	.	.	,009	,0%	.	.	.	.	.	.	.	.
	Mytilus edulis	,015	,0%	,003	,0%	,003	,0%	.	.	,008	,0%	,001	,0%
BRYOZOA	Electra pilosa	,049	,0%	.	.	,524	2,2%	.	.	.	.	.	.
	Bryozoa indet,	.	.	,018	,0%	.	.	.	.	.	.	.	.
ECHINODERMATA	Asterias rubens	.	.	10,974	5,9%	,453	1,9%	.	.	.	.	.	.
	Ophiura ophiura	.	.	.	.	.	.	.	.	3,169	,9%	.	.
	Echinocardium cordatum	.	.	.	.	,195	,8%	.	.	.	.	.	.
	Echinocyamus pusillus	.	.	,259	,1%	,063	,3%	.	.	.	.	.	.
	Ophiura albida	.	.	.	.	,001	,0%	.	.	.	.	.	.
CHAETOGHNATHA	Sagitta sp.	,000	,0%	.	.	.	.	.	.	.	.	.	.
CHORDATA	Branchiostoma lanceolatum	,080	,0%	,712	,4%	,063	,3%	,348	,2%	,078	,0%	.	.

8.3.4. *Appendix 3.4. Infauna mean biomass WW 1999-2005 (Spring)*

CS Study area = Extended reference area

Biomass - Spring: Year/Area

Spring		1999				2001		2005						Total	
		Reference		Wind Turbine Area		Wind Turbine Area		Reference		CS Study Area		Wind Turbine Area			
Biomass, wet weight g/m²		Mean	Col Sum %	Mean	Col Sum %	Mean	Col Sum %	Mean	Col Sum %	Mean	Col Sum %	Mean	Col Sum %	Mean	Col Sum %
Ensis americanus	BIVALVIA	.	.	.	.	.	.	314.450	90.4%	525.247	97.6%	.	.	839.697	77.1%
Pagurus bernhardus	CRUSTACEA	76.295	73.0%	.	.	.	.	.	.	.	.	.	.	76.295	7.0%
Spisula solida	BIVALVIA	1.299	1.2%	2.231	17.7%	42.109	64.7%	.	.	.007	.0%	.	.	45.647	4.2%
Ophelia borealis	POLYCHAETA	15.006	14.4%	.035	.3%	6.505	10.0%	.409	.1%	4.985	.9%	.	.	26.941	2.5%
Polinices polianus	GASTROPODA	.	.	.	.	1.761	2.7%	15.752	4.5%	.821	.2%	.	.	18.335	1.7%
Travisia forbesii	POLYCHAETA	.791	.8%	.028	.2%	.	.	7.110	2.0%	.549	.1%	9.367	43.8%	17.846	1.6%
Orbinia sertulata	POLYCHAETA	4.794	4.6%	1.463	11.6%	2.788	4.3%	.	.	.	.	4.707	22.0%	13.753	1.3%
Thracia phaseolina	BIVALVIA	.	.	.	.	7.687	11.8%	.	.	.635	.1%	4.108	19.2%	12.431	1.1%
Nephtys longosetosa	POLYCHAETA	1.285	1.2%	4.303	34.2%	2.208	3.4%	.	.	.	.	.	.	7.796	.7%
Scoloplos armiger	POLYCHAETA	.	.	.	.	.	.	6.942	2.0%	.224	.0%	.	.	7.166	.7%
Goodallia triangularis	BIVALVIA	.204	.2%	.698	5.5%	.400	.6%	2.004	.6%	.471	.1%	1.321	6.2%	5.098	.5%
Haustorius arenarius	CRUSTACEA	2.995	2.9%	.898	7.1%	.	.	.	.	.	.	.	.	3.893	.4%
Crangon crangon	CRUSTACEA	.	.	.	.	.	.	.	.	3.805	.7%	.	.	3.805	.3%
Branchiostoma lanceolatum	CHORDATA	.	.	.	.	.	.	.	.	.807	.1%	1.089	5.1%	1.897	.2%
Nephtys sp.	POLYCHAETA	.	.	.	.	.507	.8%	.947	.3%	.321	.1%	.	.	1.776	.2%
Nephtys hombergii	POLYCHAETA	.346	.3%	1.273	10.1%	.	.	.	.	.	.	.	.	1.619	.1%
Hydractinia echinata	HYDROZOA	1.331	1.3%	.	.	.	.	.	.	.	.	.	.	1.331	.1%
Angulus tenuis	BIVALVIA	.	.	1.111	8.8%	.	.	.	.	.	.	.	.	1.111	.1%
Spio filicornis	POLYCHAETA	.087	.1%	.110	.9%	.312	.5%	.022	.0%	.	.	.140	.7%	.670	.1%
Gastrosaccus spinifer	CRUSTACEA	.	.	.	.	.304	.5%	.149	.0%	.012	.0%	.	.	.464	.0%
Notomastus latericeus	POLYCHAETA	.	.	.	.	.	.	.	.	.	.	.438	2.0%	.438	.0%
Praunus flexuosus	CRUSTACEA	.	.	.361	2.9%	.	.	.	.	.	.	.	.	.361	.0%
Goniadella bobretzkii	POLYCHAETA	.071	.1%	.052	.4%	.075	.1%	.037	.0%	.040	.0%	.077	.4%	.353	.0%
Pisione remota	POLYCHAETA	.008	.0%	.017	.1%	.025	.0%	.066	.0%	.146	.0%	.054	.3%	.317	.0%
Nemertini indet.	NEMERTINI	.003	.0%	.	.	.051	.1%	.030	.0%	.004	.0%	.033	.2%	.121	.0%
Bathyporeia sp.	CRUSTACEA	.	.	.	.	.093	.1%	.	.	.	.	.	.	.093	.0%
Pontocrates arenarius	CRUSTACEA	.025	.0%	.004	.0%	.	.	.024	.0%	.007	.0%	.020	.1%	.081	.0%
Pontocrates altamarinus	CRUSTACEA	.	.	.	.	.064	.1%	.	.	.	.	.	.	.064	.0%
Glycera alba	POLYCHAETA	.	.	.	.	.019	.0%	.	.	.033	.0%	.	.	.052	.0%
Aonides paucibranchiata	POLYCHAETA	.	.	.	.	.	.	.	.	.048	.0%	.	.	.048	.0%
Polygordius appendiculatus	POLYCHAETA	.	.	.	.	.	.	.007	.0%	.032	.0%	.005	.0%	.044	.0%
Caprella sp.	CRUSTACEA	.	.	.	.	.043	.1%	.	.	.	.	.	.	.043	.0%
Bathyporeia guilliamsoniana	CRUSTACEA	.	.	.	.	.034	.1%	.	.	.	.	.	.	.034	.0%
Harpacticoida indet.	CRUSTACEA	.	.	.001	.0%	.011	.0%	.	.	.011	.0%	.	.	.023	.0%
Hydrobia ulvae	GASTROPODA	.	.	.	.	.021	.0%	.	.	.	.	.	.	.021	.0%
Dorvilleidae indet.	POLYCHAETA	.	.	.	.	.	.	.	.	.014	.0%	.	.	.014	.0%
Atylus sp.	CRUSTACEA	.	.	.	.	.012	.0%	.	.	.	.	.	.	.012	.0%
Electra pilosa	BRYOZOA	.	.	.	.	.012	.0%	.	.	.	.	.	.	.012	.0%
Copepoda indet.	CRUSTACEA	.	.	.	.	.001	.0%	.	.	.006	.0%	.005	.0%	.012	.0%
Nematoda indet.	NEMATODA	.001	.0%	.001	.0%	.001	.0%	.	.	.006	.0%	.	.	.010	.0%
Ascidiacea indet.	ASCIDIACEA	.	.	.	.	.009	.0%	.	.	.	.	.	.	.009	.0%
Mytilus edulis	BIVALVIA	.	.	.	.	.008	.0%	.	.	.	.	.	.	.008	.0%
Heteromastus filiformis	POLYCHAETA	.	.	.	.	.008	.0%	.	.	.	.	.	.	.008	.0%
Eurysteus nitida	CRUSTACEA	.007	.0%	.	.	.	.	.	.	.	.	.	.	.007	.0%
Megaluropus agilis	CRUSTACEA	.	.	.	.	.004	.0%	.	.	.	.	.	.	.004	.0%
Actiniaria indet.	ANTHOZOA	.	.	.	.	.004	.0%	.	.	.	.	.	.	.004	.0%
Ophiura albida	ECHINODERMATA	.	.	.	.	.	.	.	.	.003	.0%	.	.	.003	.0%
Oedicerotidae indet.	CRUSTACEA	.003	.0%	.	.	.	.	.	.	.	.	.	.	.003	.0%
Protodorvillea kefersteini	POLYCHAETA	.	.	.001	.0%	.	.	.	.	.001	.0%	.	.	.003	.0%
Metopidae indet.	CRUSTACEA	.001	.0%	.	.	.	.	.	.	.	.	.	.	.001	.0%
Perioculodes longimanus	CRUSTACEA	.	.	.	.	.001	.0%	.	.	.	.	.	.	.001	.0%
Tanaidacea indet.	CRUSTACEA	.	.	.001	.0%	.	.	.	.	.	.	.	.	.001	.0%
Halacaridae indet,	HYDROCARINA	.	.	.	.	.001	.0%	.	.	.	.	.	.	.001	.0%
Pseudocuma longicornis	CRUSTACEA	.	.	.	.	.	.	.	.	.000	.0%	.	.	.000	.0%
Campanulariidae indet.	HYDROZOA	.	.	.	.	.000	.0%	.	.	.	.	.	.	.000	.0%
Cirratulidae indet.	POLYCHAETA	.	.	.	.	.	.	.	.	.000	.0%	.	.	.000	.0%
Empty sample	.00	.	.	.	.	.	.	.	.	.000	.0%	.	.	.000	.0%

8.3.5. Appendix 3.4. Infauna mean biomass DW 1999-2005 (Spring)

CS Study area = Extended reference area

Biomass - Spring: Year/Area

Spring Biomass, dry weight g/m²		1999 Reference Mean	1999 Reference Col Sum %	1999 Wind Turbine Area Mean	1999 Wind Turbine Area Col Sum %	2001 Wind Turbine Area Mean	2001 Wind Turbine Area Col Sum %	2005 Reference Mean	2005 Reference Col Sum %	2005 CS Study Area Mean	2005 CS Study Area Col Sum %	2005 Wind Turbine Area Mean	2005 Wind Turbine Area Col Sum %	Total Mean	Total Col Sum %
Ensis americanus	BIVALVIA	.	.	.	.	.	.	150.980	85.7%	407.850	99.1%	.	.	558.830	93.1%
Polinices polianus	GASTROPODA	.	.	.	.	.000	.	14.686	8.3%	.773	.2%	.	.	15.459	2.6%
Travisia forbesii	POLYCHAETA	.000	.	.000	.0%	.	.	4.141	2.4%	.264	.1%	5.297	42.5%	9.702	1.6%
Scoloplos armiger	POLYCHAETA	.	.	.	.	.	.	4.308	2.4%	.051	.0%	.	.	4.358	.7%
Thracia phaseolina	BIVALVIA	.	.	.	.	.000	.	.	.	.412	.1%	2.864	23.0%	3.276	.5%
Goodallia triangularis	BIVALVIA	.000	.	.000	.0%	.000	.	1.576	.9%	.353	.1%	1.056	8.5%	2.985	.5%
Orbinia sertulata	POLYCHAETA	.000	.	.000	.0%	.000	.	.	.	.	.	2.645	21.2%	2.645	.4%
Ophelia borealis	POLYCHAETA	.000	.	.000	.0%	.000	.	.145	.1%	1.029	.3%	.	.	1.174	.2%
Crangon crangon	CRUSTACEA	.	.	.	.	.	.	.	.	.697	.2%	.	.	.697	.1%
Branchiostoma lanceolatum	CHORDATA	.	.	.	.	.	.	.	.	.183	.0%	.312	2.5%	.494	.1%
Nephtys sp.	POLYCHAETA	.	.	.	.	.000	.	.199	.1%	.052	.0%	.	.	.251	.0%
Notomastus latericeus	POLYCHAETA	.	.	.	.	.	.	.	.	.	.	.215	1.7%	.215	.0%
Pisione remota	POLYCHAETA	.000	.	.000	.0%	.000	.	.030	.0%	.009	.0%	.008	.1%	.047	.0%
Nephtys hombergii	POLYCHAETA	.000	.	.035	100.0%	.	.	.	.	.	.	.	.	.035	.0%
Spio filicornis	POLYCHAETA	.000	.	.000	.0%	.000	.	.004	.0%	.	.	.031	.3%	.035	.0%
Goniadella bobretzkii	POLYCHAETA	.000	.	.000	.0%	.000	.	.012	.0%	.004	.0%	.012	.1%	.029	.0%
Nemertini indet.	NEMERTINI	.000	.	.	.	.000	.	.008	.0%	.001	.0%	.016	.1%	.025	.0%
Gastrosaccus spinifer	CRUSTACEA	.	.	.	.	.000	.	.019	.0%	.001	.0%	.	.	.020	.0%
Aonides paucibranchiata	POLYCHAETA	.	.	.	.	.	.	.	.	.008	.0%	.	.	.008	.0%
Spisula solida	BIVALVIA	.000	.	.000	.0%	.000	.	.	.	.005	.0%	.	.	.005	.0%
Glycera alba	POLYCHAETA	.	.	.	.	.000	.	.	.	.005	.0%	.	.	.005	.0%
Copepoda indet.	CRUSTACEA	.	.	.	.	.000	.	.	.	.001	.0%	.003	.0%	.004	.0%
Pontocrates arenarius	CRUSTACEA	.000	.	.000	.0%	.	.	.000	.0%	.000	.0%	.003	.0%	.003	.0%
Polygordius appendiculatus	POLYCHAETA	.	.	.	.	.	.	.000	.0%	.001	.0%	.000	.0%	.001	.0%
Ophiura albida	ECHINODERMATA	.	.	.	.	.	.	.	.	.001	.0%	.	.	.001	.0%
Dorvilleidae indet.	POLYCHAETA	.	.	.	.	.	.	.	.	.001	.0%	.	.	.001	.0%
Cirratulidae indet.	POLYCHAETA	.	.	.	.	.	.	.	.	.000	.0%	.	.	.000	.0%
Empty sample	.00	.	.	.	.	.	.	.	.	.000	.0%	.	.	.000	.0%
Hydractinia echinata	HYDROZOA	.000	.	.	.	.	.	.	.	.	.	.	.	.000	.0%
Campanulariidae indet.	HYDROZOA	.	.	.	.	.000	.	.	.	.	.	.	.	.000	.0%
Actiniaria indet.	ANTHOZOA	.	.	.	.	.000	.	.	.	.	.	.	.	.000	.0%
Nematoda indet.	NEMATODA	.000	.	.000	.0%	.000	.	.	.	.000	.0%	.	.	.000	.0%
Nephtys longosetosa	POLYCHAETA	.000	.	.000	.0%	.000	.	.	.	.	.	.	.	.000	.0%
Protodorvillea kefersteini	POLYCHAETA	.	.	.000	.0%	.	.	.	.	.000	.0%	.	.	.000	.0%
Heteromastus filiformis	POLYCHAETA	.	.	.	.	.000	.	.	.	.	.	.	.	.000	.0%
Halacaridae indet,	HYDROCARINA	.	.	.	.	.000	.	.	.	.	.	.	.	.000	.0%
Harpacticoida indet.	CRUSTACEA	.	.	.000	.0%	.000	.	.	.	.000	.0%	.	.	.000	.0%
Pseudocuma longicornis	CRUSTACEA	.	.	.	.	.	.	.	.	.000	.0%	.	.	.000	.0%
Tanaidacea indet.	CRUSTACEA	.	.	.000	.0%	.	.	.	.	.	.	.	.	.000	.0%
Pagurus bernhardus	CRUSTACEA	.000	.	.	.	.	.	.	.	.	.	.	.	.000	.0%
Praunus flexuosus	CRUSTACEA	.	.	.000	.0%	.	.	.	.	.	.	.	.	.000	.0%
Bathyporeia guilliamsoniana	CRUSTACEA	.	.	.	.	.000	.	.	.	.	.	.	.	.000	.0%
Bathyporeia sp.	CRUSTACEA	.	.	.	.	.000	.	.	.	.	.	.	.	.000	.0%
Haustorius arenarius	CRUSTACEA	.000	.	.000	.0%	.	.	.	.	.	.	.	.	.000	.0%
Eurysteus nitida	CRUSTACEA	.000	.	.	.	.	.	.	.	.	.	.	.	.000	.0%
Metopidae indet.	CRUSTACEA	.000	.	.	.	.	.	.	.	.	.	.	.	.000	.0%
Oedicerotidae indet.	CRUSTACEA	.000	.	.	.	.	.	.	.	.	.	.	.	.000	.0%
Perioculodes longimanus	CRUSTACEA	.	.	.	.	.000	.	.	.	.	.	.	.	.000	.0%
Pontocrates altamarinus	CRUSTACEA	.	.	.	.	.000	.	.	.	.	.	.	.	.000	.0%
Megaluropus agilis	CRUSTACEA	.	.	.	.	.000	.	.	.	.	.	.	.	.000	.0%
Atylus sp.	CRUSTACEA	.	.	.	.	.000	.	.	.	.	.	.	.	.000	.0%
Caprella sp.	CRUSTACEA	.	.	.	.	.000	.	.	.	.	.	.	.	.000	.0%
Hydrobia ulvae	GASTROPODA	.	.	.	.	.000	.	.	.	.	.	.	.	.000	.0%
Mytilus edulis	BIVALVIA	.	.	.	.	.000	.	.	.	.	.	.	.	.000	.0%
Angulus tenuis	BIVALVIA	.	.	.000	.0%	.	.	.	.	.	.	.	.	.000	.0%
Electra pilosa	BRYOZOA	.	.	.	.	.000	.	.	.	.	.	.	.	.000	.0%
Ascidiacea indet.	ASCIDIACEA	.	.	.	.	.000	.	.	.	.	.	.	.	.000	.0%

8.4. Appendix 4. Hard bottom substrate

8.4.1. Appendix 4.1. Relative coverage. Monopiles

		2003										2004														
		Spring					Autumn					Spring					Autumn					Spring				
		Depth interval					Depth interval					Depth interval					Depth interval					Depth interval				
Mean Relative coverage Turbine tower Depth		0 - 2 m	2 - 4 m	4 - 6 m	6 - 8 m	8 - 10 m	0 - 2 m	2 - 4 m	4 - 6 m	6 - 8 m	8 - 10 m	0 - 2 m	2 - 4 m	4 - 6 m	6 - 8 m	8 - 10 m	0 - 2 m	2 - 4 m	4 - 6 m	6 - 8 m	8 - 10 m	0 - 2 m	2 - 4 m	4 - 6 m	6 - [illegible] m	8 - 10 m
Red Algae	Callithamnion corymbosum	.	.	.	.	.	.08	.08	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Hildenbrandia rubra	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.50	.	.	.	.	.	.	.	.	
	Polysiphonia fibrillosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4.58	1.25	.	.	
	Porphyra umbilicalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.83	.	.	.	
Brown Algae	Ectocarpus sp.	.	.	.	.	.	1.13	.	.	.	.	2.92	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Petalonia fascia	3.79	.	.	.	.	.42	.00	.	.	.	3.00	.	.	.	.	2.25	.08	.00	.	.	5.58	6.75	.25	.	
	Petalonia zosterifolia	.	.	.	.	.	.	.	.	.	.	.33	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Pilayella littoralis	16.46	9.08	6.58	.	.	.	.	.	.	.	.	.	.08	.	.	.	.	.	.	.	15.83	3.92	.08	.	
	Ralfsia verrucosa	.	.	.	.	.	1.13	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Green Algae	Blidingia minima	.	.	.	.	.	2.25	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Chaetomorpha linum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.42	.	.	.	
	Cladophora sp.	.	.	.	.	.	.08	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Enteromorpha clathrata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.83	.08	.	.	
	Enteromorpha sp.	3.00	.00	.	.	.	6.58	1.13	.08	.	.	2.92	.00	.00	.	.	14.46	3.71	4.50	.14	.	5.58	2.50	.	.	
	Ulva lactuca	.	.	.	.	.	14.04	3.29	.	.	.	.08	1.13	.08	.	.	.17	4.58	1.46	.	.	1.00	.67	.17	.	
	Urospora penicilliformis	.08	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Benthos	Actiniaria indet.	.17	.33	.50	3.75	10.38	3.29	7.17	11.42	10.90	13.50	.00	1.38	3.71	2.44	3.88	.25	.50	3.00	2.79	4.13	.	.	.	.	
	Aeolidia pappilosa	.	.	.	.	.	.	.	.	.	.	.	.00	.00	.	.00	.	.	.	.	.	.	.08	.08	.	
	Alcyonidium sp.	.	.	.	.	.	.	.	.	.	.	.	.17	.08	.13	.75	.	.	.	.	.	.	.	.	.	
	Alcyonium digitatum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.00	.	.	.	.	.	
	Asterias rubens	1.54	2.75	5.00	4.13	.75	1.63	8.29	15.50	8.50	10.38	.25	1.79	1.00	2.56	3.88	.33	.75	1.00	2.79	1.25	.25	4.00	5.58	6.00	10
	Balanus balanus	.	.	.	.	.	.	.	.	.	.	7.17	.50	.	.	.	4.83	.	.08	.	.	6.75	.92	.50	.29	
	Balanus crenatus	39.67	24.63	18.29	11.19	3.63	1.29	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.14	
	Balanus sp.	.	.	.	.	.	5.79	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Bryozoa indet.	.	.	.	.	.	.	1.21	2.33	.20	.75	.	.	.	.	.	9.00	29.50	22.38	13.21	10.63	.	.	.	.	
	Buccinum undatum	.	.	.	.	.	.	.	.	.	.	.	.	.	.00	.	.	.	.	.	.	.	.	.	.	
	Campanulariidae indet.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Cancer pagurus	.	.	.	.	.	.17	1.29	9.79	.30	.50	.	.	.	.	.00	.00	.00	.00	.00	.00	.	.	.08	.	
	Caprella linearis	1.88	11.33	8.21	8.69	7.25	2.33	5.46	5.46	1.45	.	1.29	6.21	3.88	7.00	1.25	6.04	20.54	16.46	13.50	13.75	.92	4.67	3.50	4.14	
	Carcinus maenas	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.00	.00	.	.	.	.	.	
	Crepidula fornicata	.	.	.	.00	.00	.08	3.88	6.04	5.60	4.13	.08	.00	1.29	.13	.26	.25	.58	4.92	8.00	13.50	.92	3.33	5.67	5.71	7
	Electra pilosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Facelina bostoniensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.14	
	Flabellina lineata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.17	.42	.33	.14	.01	.	.	.	.	
	Halichondria panicea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Hydrozoa indet.	.08	.08	.17	.13	.	.	1.13	1.13	.00	.	.58	11.25	13.42	13.50	13.50	1.54	5.00	9.33	16.79	10.63	.	1.00	5.42	4.14	7
	Jassa marmorata	50.08	43.75	33.50	30.06	31.50	30.46	44.08	42.17	19.45	19.50	29.58	58.33	50.00	46.88	56.25	41.92	52.25	60.42	55.36	71.88	3.33	22.58	36.67	7.14	23
	Liocarcinus depurator	.00	.	.	.	.	.	.	.00	.	.25	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Metridium senile	.	.	.	.	.	.08	4.83	13.42	10.90	13.50	.25	1.79	1.79	.88	.75	.25	.58	1.71	2.79	1.25	.42	1.25	2.58	2.57	4
	Mytilus edulis	.17	.17	.17	.13	.	19.17	6.25	.08	.	3.38	21.33	6.42	.00	.25	.	12.67	6.33	.	.	.	22.92	15.42	.50	.	
	Nemertini Indet.	.	.	.	.	.	.	.08	.	.00	.	.08	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Nudibranchia indet.	.	.	.00	.00	.	.	.	.	.	.	.	.00	.	.	.	.	.00	.	.	.	.	.	.	.	
	Onchidoris muricata	.	.	.	.	.	.	.	.	.	.	.	.00	.08	.00	.	.	.	.	.	.	.92	2.58	1.42	.86	
	Ostrea edulis	.	.	.	.	.	.	.	.	.	.	.	.	.00	.13	.26	.	.	.	.	.	.	.	.	.	
	Phyllodocidae indet.	.	.	.00	.13	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Polycera quadrilineata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.17	1.71	.50	.43	.25	.	.	.08	.	
	Pomatoceros triqueter	.	.	.	.50	.75	.	.17	.33	1.75	1.00	.	.17	.34	.50	.50	.	.	.17	.14	.50	.	.	.08	.86	
	Sagartia elegans	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.17	.67	.86	
	Sagartiogeton laceratus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.42	1.75	4.00	4.57	5
	Sertularia cupressina	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Strongylocentrotus droebachien	.	.00	.17	.13	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Telmatogeton japonicus	.	.	.	.	.	.	.	.	.	.	.92	.	.	.	.	.75	.	.08	.	.	.	.	.	.	
	Telmatogeton sp.	.	.	.	.	.	.17	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Tubularia indivisa	.	.	.	.	.	5.88	19.42	18.46	17.05	19.50	.	.00	.08	.13	.	11.00	11.17	10.29	13.21	16.88	.	2.17	3.58	3.00	3
	Urticina feline	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	

Appendix 4.2. Relative coverage. Scour protections

2003

Mean Relative coverage Scour protection Distance from tower		2003 Spring Distance interval 0 - 2 m	2 - 4 m	4 - 6 m	6 - 8 m	8 - 10 m	10 - 12 m	12 - 14 m	14 -16 m	16 - 18 m
Red Algae	Callithamnion corymbosum	.	.	.	.00	.	.	.	.	.
Brown Algae	Pilayella littoralis	1.29	1.29	4.33	1.29	.25	.08	.00	.	.
	Ralfsia sp.	1.13	1.13	3.13	1.13	.	.	.	.	.
Fish	Agonus cataphractus	.	.	.	.	.00	.	.	.	.
	Pholis gunellus	.	.	.	.	.	.08	.09	.	.
Benthos	Actiniaria indet.	9.08	8.21	9.25	7.08	4.83	.25	.09	.00	.
	Aeolidacea indet.	.	.	.	.00	.	.	.	.	.
	Asterias rubens	7.25	5.00	6.04	8.29	8.13	10.13	8.95	5.17	37.50
	Balanus crenatus	10.75	7.71	7.71	6.67	4.50	.08	.09	.	.
	Buccinum undatum	.00	.00	.00	.00	.	.	.09	.	.
	Buccinum undatum (æg)	.	.	.	.	.00	.	.	.	.
	Cancer pagurus	.00	.	.	.08	.	.	.00	.	.
	Caprella linearis	1.13	.00	.	.	.	.	.	.	.
	Carcinus maenas	.	.	.	.	.08	.	.09	.	.
	Crepidula fornicata	.08	.08	.08	.00	.	.	.	.	.
	Echinocardium cordatum	.	.	.	.	.	.	.00	.	.
	Electra pilosa	.	.	.	.	.	.08	.09	.	.
	Gastropoda indet.	.	.	.	.	.00	.	.	.	.
	Hydrozoa indet.	.17	1.29	1.29	.25	.17	5.21	1.23	.	.
	Jassa marmorata	23.50	28.63	25.50	23.42	11.08	.08	.09	.	.
	Lanice conchilega	.00	.	.	.	.	3.21	1.32	.	.
	Nudibranchia indet.	.00	.00	.00	.00	.08	.	.	.	.
	Nudibranchia indet. (æg).	.00	.08	.00	.00	.00	.	.	.	.
	Onchidoris muricata	.	.	.00	.00	.00	.	.	.	.
	Onchidoris muricata (æg)	.00	.08	.08	.08	.08	.00	.	.	.
	Pagurus bernhardus	.00	.	.	.00	.17	.59	.27	.	.
	Phyllodocidae indet.	.00	.17	.08	.08	.17	1.21	1.32	4.50	.
	Pomatoceros triqueter	.33	.42	.50	.42	.25	.08	.	.	.
	Strongylocentrotus droebachien	.	.	.	.	.	.00	.	.	.

Mean Relative coverage Scour protection Distance from tower		2003 Autumn Distance interval 0 - 2 m	2 - 4 m	4 - 6 m	6 - 8 m	8 - 10 m	10 - 12 m	12 - 14 m	14 -16 m
Red Algae	Coccotylus truncatus	.	.	.08	.00	.	.	.	.
	Corallina officinalis	.	.	.	.	.	.08	.	.
	Rødkødskorp, tyk	.	.	1.13	1.13	1.13	1.13	1.23	.
	Rødskorper, kødede	1.13	1.13	1.13	1.13	.	.08	.18	.
Brown Algae	Desmarestia aculeata	.	.	.	.	.00	.	.	.
	Petalonia fascia	.	.17	.08	.	.	.	.	.
Green Algae	Enteromorpha sp.	1.13	2.33	3.54	3.54	5.38	3.54	2.73	.
	Ulva lactuca	.00	1.38	1.46	1.29	1.13	.17	.09	.
Benthos	Actiniaria indet.	16.46	20.54	18.54	16.46	11.25	9.17	8.77	7.25
	Asterias rubens	14.46	11.42	12.46	12.46	11.42	12.46	6.59	6.75
	Balanus crenatus	.	.	.	.08	.17	.08	.18	.
	Balanus sp.	.08	.08	.	.	.	.17	.09	.
	Bryozoa indet.	.33	1.46	.25	1.38	.42	3.63	3.95	.
	Cancer pagurus	7.25	5.17	5.17	6.21	9.33	10.38	4.05	.50
	Caprella linearis	3.38	3.46	3.46	3.46	3.38	2.25	2.45	.
	Carcinus maenas	.	.	.	.08	.08	.08	.27	.00
	Crepidula fornicata	.42	1.29	1.38	1.21	.08	.08	.09	.
	Hydrozoa indet.	2.42	3.71	3.63	5.96	5.96	7.08	6.68	.50
	Jassa marmorata	37.83	51.21	47.13	46.25	35.04	24.63	14.09	6.75
	Lanice conchilega	.	.	.	.	1.21	2.58	8.77	6.75
	Liocarcinus depurator	.	1.21	.00	.08	.25	.25	.36	.50
	Metridium senile	7.17	4.13	6.21	6.04	2.75	1.54	.36	.50
	Mytilus edulis	2.33	.00	.	.	.	.	.	.
	Nudibranchia indet.	.08	.08	.08	.08	.08	.08	.09	.
	Pagurus bernhardus	.	.	.	.00	.08	.17	1.68	6.75
	Pomatoceros triqueter	.50	.50	.50	.50	.42	.42	.27	.
	Tubularia indivisa	11.42	16.38	6.21	10.13	9.00	4.83	1.41	.50

2004

Mean Relative coverage Scour protection Distance from tower		2004 Spring Distance interval 0 - 2 m	2 - 4 m	4 - 6 m	6 - 8 m	8 - 10 m	10 - 12 m	12 - 14 m
Red Algae	Callithamnion corymbosum	.08	.17	.17	.17	.08	.08	.
	Hildenbrandia rubra	.17	.17	.08	.	.	.	.
Brown Algae	Ectocarpus sp.	.	.08	.	.	.	.	.
	Pilayella littoralis	.	.08	.	.	.	.	.08
Green Algae	Enteromorpha sp.	.17	.08	.08	.17	.17	.	.
	Ulva lactuca	.	.	.	.00	.	.	.
Benthos	Actiniaria indet.	8.29	11.33	10.38	9.25	11.25	6.84	2.67
	Aeolidia pappilosa	.	.	.	.	.	.00	.
	Alcyonidium sp.	1.46	.25	.17	.17	.08	.17	.
	Alcyonium digitatum	.09	.25	.33	.33	.25	.17	.00
	Asterias rubens	8.29	9.33	6.13	9.33	7.25	6.21	8.29
	Balanus crenatus	.00	.	.	.00	.	.	.00
	Buccinum undatum	.	.	.	.	.00	.00	.00
	Buccinum undatum (æg)	.	.	.	.	.	.	.00
	Cancer pagurus	.00	.00	.00	.00	.00	.00	.00
	Caprella linearis	.	.	.	.08	.08	.	.
	Carcinus maenas	.	.	.	.	.	.00	.00
	Crangon crangon	.	.	.	.	.00	.	.
	Crepidula fornicata	.09	.08	.	.08	.08	.00	.
	Flustra foliacea	.	.	.	.	.00	.	.
	Halichondria panicea	.	.00	.08	.	.00	.	.
	Hydrozoa indet.	13.50	12.46	10.38	13.50	12.46	15.08	7.96
	Jassa marmorata	26.46	33.58	35.67	41.83	35.75	10.58	2.42
	Lanice conchilega	.	.	.	.	.	.08	.25
	Liocarcinus depurator	.	.	.	.	.	.00	.00
	Macropodia rostrata	.	.	.00	.	.00	.	.00
	Metridium senile	2.83	1.88	1.88	1.88	1.71	1.29	1.21
	Mytilus edulis	.34	.08	.08	.00	.	.00	.00
	Nudibranchia indet. (æg).	.	.	.	.	.	.00	.
	Onchidoris muricata	.00	.00	.00	.00	.	.00	.
	Pagurus bernhardus	.	.	.	.	.	.00	.00
	Phyllodocidae indet.	.	.	.	.	.00	.00	.08
	Phyllodocidae indet. (æg)	.	.	.08	.08	.08	.08	.08
	Polycera quadrilineata	.	.00	.00	.	.	.00	.
	Pomatoceros triqueter	2.92	.84	.84	.75	.67	.50	.42
	Spisula solida	.	.	.	.	.	.08	.08
	Tubularia indivisa	.	.00	.17	.08	.	.	.

Mean Relative coverage Scour protection Distance from tower		2004 Autumn Distance interval 0 - 2 m	2 - 4 m	4 - 6 m	6 - 8 m	8 - 10 m	10 - 12 m	12 - 14 m
Red Algae	Callithamnion corymbosum	.08	.08	.08	.08	.08	.08	.
Brown Algae	Ectocarpus sp.	.	.	.	.	.	.	.09
	Pilayella littoralis	.	.	.	.	.	.	.00
Green Algae	Enteromorpha sp.	6.58	15.88	21.17	20.13	14.83	7.71	9.45
	Ulva lactuca	.	.	.08	.	.	.	.
Benthos	Actiniaria indet.	10.38	14.38	13.42	18.46	19.50	11.25	9.82
	Alcyonium digitatum	.33	.33	.33	1.29	2.33	.17	.
	Asterias rubens	7.25	7.25	6.21	7.25	7.25	6.21	5.55
	Balanus crenatus	1.13	.	.	.	.	.	.
	Bryozoa indet.	1.46	2.50	4.58	2.42	1.38	.17	.27
	Buccinum undatum	.	.	.	.	.	.00	.
	Cancer pagurus	.08	.17	.00	.09	.00	.00	.09
	Caprella linearis	1.29	2.42	1.29	.25	1.29	.17	.
	Carcinus maenas	.	.	.	.	.	.	.09
	Crepidula fornicata	.08	.00	.00	.08	.	.	.09
	Flabellina lineata	.00	.00	.00	.	.00	.	.
	Hydrozoa indet.	19.50	8.21	6.21	4.13	6.21	8.29	15.59
	Jassa marmorata	58.33	62.50	62.50	60.42	56.33	35.58	19.59
	Lanice conchilega	.	.	.	.	.	.25	2.91
	Liocarcinus depurator	.	.	.	.	.	.	.00
	Metridium senile	3.88	.75	1.63	2.92	5.00	2.75	2.64
	Mytilus edulis	.00	.	.	.	.	.	.
	Pagurus bernhardus	.	.	.	.	.	.00	.18
	Polycera quadrilineata	.	.00	.00	.00	.00	.00	.09
	Polyplacophora indet.	.00	.	.	.	.	.	.
	Pomatoceros triqueter	.58	.50	.50	.50	.50	1.46	.36
	Tubularia indivisa	4.83	2.83	2.83	1.63	1.54	1.29	.00

2005

Mean Relative coverage / Scour protection / Distance from tower		2005 Spring 0 - 2 m	2 - 4 m	4 - 6 m	6 - 8 m	8 - 10 m	10 - 12 m	12 - 14 m
Red Algae	Polysiphonia fibrillosa	1.42	3.83	6.08	5.92	2.67	1.33	.17
Green Algae	Chaetomorpha linum	.	.	.17	.08	.	.	.
	Ulva lactuca	.08	.17	.33	.33	.	.	.
Benthos	Aeolidia pappilosa	.	.	.	.	.	.08	.
	Alcyonium digitatum	1.67	2.17	.83	2.08	1.33	1.50	.67
	Asterias rubens	14.17	13.75	12.92	14.17	15.83	15.58	9.58
	Balanus crenatus	.	.	.08	.08	.08	.17	.
	Buccinum undatum	.	.	.	.	.17	.08	.08
	Cancer pagurus	.67	.75	1.25	.83	.50	.33	.42
	Caprella linearis	.17	.25	.25	.17	.17	.	.
	Crepidula fornicata	.25	.17	.58	.33	.25	.33	.08
	Facelina bostoniensis	.08	.25	.08	.	.	.	.
	Hydrozoa indet.	9.83	4.50	5.67	4.83	5.92	2.42	1.17
	Jassa marmorata	52.50	60.83	64.58	60.42	51.25	32.50	11.33
	Lanice conchilega	.	.	.	.	.	.42	.
	Metridium senile	5.08	3.67	3.50	3.33	4.67	4.42	2.67
	Mytilus edulis	.17	.17	.	.08	.08	.	.
	Onchidoris muricata	.17	.08	.42	.42	.	.17	.
	Pagurus bernhardus	.08	.	.	.17	.25	.58	.50
	Polycera quadrilineata	.08	.	.	.	.	.08	.
	Pomatoceros triqueter	2.08	1.25	1.25	1.25	1.92	1.17	.58
	Sagartia elegans	1.67	2.08	2.42	3.08	2.17	1.17	.58
	Sagartiogeton laceratus	8.08	9.17	9.67	10.00	7.50	6.83	4.17
	Sertularia cupressina	.17	.42	.08	.33	.67	.17	.08
	Tubularia indivisa	5.25	3.25	3.00	3.42	2.75	1.00	.83
	Urticina feline	.	.	.	.	.	.08	.08

Mean Relative coverage / Scour protection / Distance from tower		2005 Autumn 0 - 2 m	2 - 4 m	4 - 6 m	6 - 8 m	8 - 10 m	10 - 12 m	12 - 14 m
Red Algae	Coccotylus truncatus	.	.	.	.	.08	.	.
	Polysiphonia fibrillosa	.08	.	.83	.83	.25	.	.
Brown Algae	Desmarestia aculeata	.	.	.	.	.17	.17	.33
Green Algae	Chaetomorpha linum	.	.25	.17	.50	.50	.08	.
	Enteromorpha sp.	1.08	2.25	2.75	2.17	2.75	1.83	.75
	Ulva lactuca	1.25	3.50	6.08	5.00	2.58	.92	.17
Benthos	Actiniaria indet.	.	.	.	.	.17	.42	.
	Aeolidia pappilosa	.	.	.08	.	.08	.08	.
	Alcyonidium sp.	.	.	.08	.17	.	.	.
	Alcyonium digitatum	3.33	4.33	6.50	8.17	6.42	2.17	2.67
	Asterias rubens	16.67	10.00	8.75	11.25	11.83	15.42	8.08
	Balanus crenatus	.	.	.08	.08	.25	.08	.08
	Buccinum undatum	.17	.	.	.	.	.	.
	Campanulariidae indet.	26.25	21.25	13.33	10.00	6.08	4.58	1.83
	Cancer pagurus	4.67	4.08	3.17	5.17	5.42	3.42	2.92
	Caprella linearis	2.25	2.25	2.92	1.75	2.17	1.83	.58
	Carcinus maenas	.	.	.	.	.33	.17	.25
	Crepidula fornicata	.92	.83	1.42	1.00	.67	.25	.
	Electra pilosa	3.08	2.33	1.83	2.92	1.92	3.42	2.25
	Ensis americanus	.	.	.	.	.17	.	1.67
	Facelina bostoniensis	2.83	2.00	3.08	2.08	1.08	2.00	1.58
	Jassa marmorata	51.67	60.42	63.75	68.33	62.08	49.17	30.42
	Lanice conchilega	.	.	.	.42	3.00	3.33	4.33
	Liocarcinus depurator	.17	.	.	.08	.75	.50	.58
	Metridium senile	22.50	20.00	17.17	16.75	16.08	13.33	6.00
	Mytilus edulis	.58	.08	.08	.	.	.	.08
	Onchidoris muricata	.	.	.	.	.08	.	.
	Pagurus bernhardus	.	.	.	.08	.17	.25	.50
	Pomatoceros triqueter	.67	.83	.58	.58	.58	.75	.58
	Sagartia elegans	.83	1.25	1.33	1.67	1.08	1.00	1.00
	Sagartiogeton laceratus	5.92	10.83	11.75	11.92	13.25	10.50	10.83
	Sertularia cupressina	.50	.83	2.00	1.92	2.42	2.75	2.08
	Tubularia indivisa	11.83	11.17	13.00	12.50	8.25	6.42	10.83

8.4.2. *Appendix 4.3. Mean abundance. Monopiles 2003-2005*

2003-Spring

		Transect																			
		Turbine tower, vertical																			
		NNE 02		NNE 04		NNE 06		NNE 08		NNE Bottom		SSW 02		SSW 04		SSW 06		SSW 08		SSW Bottom	
		no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %
HYDROZOA	Tubulariidae indet.	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.
	Campanulariidae indet.	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	4.2	.0%
ANTHOZOA	Anthozoa indet.	.	.	12.5	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	12.5	.0%
	Actiniaria indet.	.	.	.	.	.	.	.	.	41.7	.0%	8.3	.0%	4.2	.0%	.	.	.	.	4.2	.0%
NEMERTINI	Nemertini indet.	58.3	.1%	25.0	.0%	29.2	.0%	6.3	.0%	.	.	33.3	.0%	45.8	.0%	100.0	.1%	.	.	8.3	.0%
POLYCHAETA	Harmothoe impar	29.2	.0%	41.7	.0%	12.5	.0%	.	.	33.3	.0%	16.7	.0%	37.5	.0%	8.3	.0%	.	.	20.8	.0%
	Phyllodoce groenlandica	25.0	.0%	16.7	.0%	8.3	.0%	.	.	8.3	.0%	20.8	.0%	20.8	.0%	.	.	.	.	8.3	.0%
	Eulalia viridis	4.2	.0%	8.3	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	12.5	.0%
	Capitella capitata	8.3	.0%	20.8	.0%	8.3	.0%	.	.	.	.	.	.	4.2	.0%	4.2	.0%	.	.	.	.
	Pomatoceros triqueter	8.3	.0%	.	.	8.3	.0%	.	.	20.8	.0%	16.7	.0%	16.7	.0%	.	.	.	.	20.8	.0%
CRUSTACEA	Verruca stroemia	4.2	.0%	.	.	4.2	.0%	.	.	12.5	.0%	8.3	.0%	.	.	4.2	.0%	.	.	16.7	.0%
	Balanus balanus	.	.	.	.	854.2	.5%	2400.0	4.8%	.	.	.	.	.	.	612.5	.6%	2550.0	3.3%	.	.
	Balanus crenatus	4554.2	5.5%	13558.3	10.0%	18162.5	11.3%	.	.	404.2	.3%	2062.5	1.4%	5362.5	3.5%	9683.3	9.3%	.	.	904.2	1.1%
	Cancer pagurus	20.8	.0%	4.2	.0%	4.2	.0%	12.5	.0%	.	.	16.7	.0%	4.2	.0%	12.5	.0%	.	.	.	.
	Aoridae indet.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.
	Jassa marmorata	71487.5	86.0%	111400.0	82.5%	128737.5	80.4%	45218.8	89.9%	111533.3	93.7%	134025.0	93.8%	133079.2	86.7%	87537.5	83.7%	46137.5	60.3%	72283.3	84.6%
	Caprella linearis	1945.8	2.3%	2441.7	1.8%	1854.2	1.2%	1068.8	2.1%	1975.0	1.7%	1079.2	.8%	1208.3	.8%	750.0	.7%	100.0	.1%	375.0	.4%
GASTROPODA	Rissoidae indet.	8.3	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4.2	.0%
	Crepidula fornicata	12.5	.0%	8.3	.0%	.	.	.	.	29.2	.0%	16.7	.0%	20.8	.0%	.	.	.	.	.	.
	Nudibranchia indet.	.	.	4.2	.0%	.	.	.	.	4.2	.0%	.	.	8.3	.0%	.	.	.	.	4.2	.0%
	Onchidoris muricata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4.2	.0%
BIVALVIA	Mytilus edulis	4900.0	5.9%	7383.3	5.5%	10370.8	6.5%	1568.8	3.1%	4937.5	4.1%	5600.0	3.9%	13591.7	8.9%	5895.8	5.6%	27787.5	36.3%	11675.0	13.7%
BRYOZOA	Bryozoa indet.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.
	Electra pilosa	25.0	.0%	20.8	.0%	25.0	.0%	25.0	.0%	25.0	.0%	25.0	.0%	25.0	.0%	20.8	.0%	.	.	25.0	.0%
ECHINODERMATA	Asterias rubens	.	.	8.3	.0%	8.3	.0%	25.0	.0%	33.3	.0%	20.8	.0%	.	.	.	.	.	.	37.5	.0%
	Strongylocentrotus droebachiensis	.	.	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.
Total		83091.7	100.0%	134954.2	100.0%	160087.5	100.0%	50325.0	100.0%	119062.5	100.0%	142958.3	100.0%	153433.3	100.0%	104633.3	100.0%	76575.0	100.0%	85420.8	100.0%

2003-Autumn

		Transect																			
		Turbine tower, vertical																			
		NNE 02		NNE 04		NNE 06		NNE 08		NNE Bottom		SSW 02		SSW 04		SSW 06		SSW 08		SSW Bottom	
		no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %
HYDROZOA	Tubularia indivisa	25.0	.0%	25.0	.0%	25.0	.0%	.	.	25.0	.0%	25.0	.0%	25.0	.0%	25.0	.0%	12.5	.0%	25.0	.0%
	Campanulariidae indet.	16.7	.0%	20.8	.0%	8.3	.0%	.	.	20.8	.0%	16.7	.0%	20.8	.0%	8.3	.0%	8.3	.0%	16.7	.0%
ANTHOZOA	Actiniaria indet.	79.2	.0%	58.3	.0%	120.8	.0%	.	.	4.2	.0%	70.8	.0%	66.7	.0%	33.3	.0%	4.2	.0%	16.7	.0%
NEMERTINI	Nemertini indet.	4.2	.0%	.	.	79.2	.0%	129.2	.0%	4.2	.0%	8.3	.0%	8.3	.0%	41.7	.0%	62.5	.0%	8.3	.0%
NEMATODA	Nematoda indet.	.	.	4.2	.0%	.	.	.	.	.	.	12.5	.0%	.	.	4.2	.0%	.	.	.	.
POLYCHAETA	Harmothoe imbricata	.	.	.	.	12.5	.0%	.	.	.	.	.	.	.	.	25.0	.0%	.	.	.	.
	Harmothoe impar	.	.	.	.	20.8	.0%	.	.	.	.	.	.	.	.	25.0	.0%	12.5	.0%	.	.
	Phyllodoce groenlandica	.	.	20.8	.0%	62.5	.0%	4.2	.0%	4.2	.0%	8.3	.0%	25.0	.0%	37.5	.0%	58.3	.0%	16.7	.0%
	Eulalia viridis	16.7	.0%	.	.	.	.	.	.	4.2	.0%	12.5	.0%	4.2	.0%	33.3	.0%	4.2	.0%	8.3	.0%
	Nereididae indet.	.	.	.	.	4.2	.0%	12.5	.0%	.	.	.	.	.	.	20.8	.0%	.	.	.	.
	Nereis pelagica	.	.	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	12.5	.0%	.	.
	Neanthes virens	.	.	.	.	29.2	.0%	16.7	.0%	.	.	.	.	.	.	4.2	.0%	16.7	.0%	.	.
	Capitella capitata	.	.	.	.	8.3	.0%	.	.	.	.	.	.	4.2	.0%	.	.	.	.	4.2	.0%
	Pomatoceros triqueter	137.5	.1%	66.7	.0%	20.8	.0%	.	.	104.2	.0%	75.0	.0%	170.8	.1%	104.2	.0%	12.5	.0%	166.7	.2%
PYCNOGONIDA	Phoxichilidium femoratum	.	.	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.
CRUSTACEA	Verruca stroemia	.	.	.	.	4.2	.0%	.	.	.	.	4.2	.0%	8.3	.0%	.	.	.	.	12.5	.0%
	Balanus balanus	.	.	.	.	25.0	.0%	1650.0	.6%	.	.	.	.	.	.	8.3	.0%	487.5	.2%	.	.
	Balanus crenatus	29.2	.0%	33.3	.0%	.	.	.	.	4.2	.0%	66.7	.0%	45.8	.0%	29.2	.0%	.	.	20.8	.0%
	Caridea indet.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.
	Corystes cassivelaunus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4.2	.0%
	Cancer pagurus	991.7	.6%	29.2	.0%	125.0	.0%	54.2	.0%	12.5	.0%	25.0	.0%	33.3	.0%	137.5	.0%	37.5	.0%	12.5	.0%
	Corophium crassicorne	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Jassa marmorata	153554.2	90.3%	153620.8	93.3%	329191.7	86.8%	251100.0	96.0%	183141.7	86.7%	170766.7	93.9%	150637.5	91.6%	377758.3	87.2%	216533.3	92.8%	96725.0	92.3%
	Caprella linearis	14829.2	8.7%	10400.0	6.3%	42516.7	11.2%	150.0	.1%	27658.3	13.1%	10200.0	5.6%	13016.7	7.9%	52375.0	12.1%	7179.2	3.1%	7358.3	7.0%
CHIRONOMIDAE	Telmatogeton japonicus	.	.	16.7	.0%	8.3	.0%	283.3	.1%	4.2	.0%	12.5	.0%	.	.	.	.	75.0	.0%	.	.
GASTROPODA	Rissoidae indet.	12.5	.0%	8.3	.0%	29.2	.0%	4.2	.0%	20.8	.0%	12.5	.0%	12.5	.0%	145.8	.0%	100.0	.0%	20.8	.0%
	Crepidula fornicata	16.7	.0%	25.0	.0%	12.5	.0%	.	.	8.3	.0%	33.3	.0%	25.0	.0%	12.5	.0%	4.2	.0%	16.7	.0%
	Nudibranchia indet.	25.0	.0%	8.3	.0%	12.5	.0%	.	.	29.2	.0%	4.2	.0%	4.2	.0%	.	.	.	.	16.7	.0%
	Onchidoris muricata	.	.	.	.	8.3	.0%	.	.	16.7	.0%	.	.	12.5	.0%	4.2	.0%	.	.	4.2	.0%
BIVALVIA	Mytilus edulis	245.8	.1%	216.7	.1%	6916.7	1.8%	8137.5	3.1%	91.7	.0%	375.0	.2%	329.2	.2%	2450.0	.6%	8716.7	3.7%	66.7	.1%
	Ostrea edulis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.
	Heteranomia squamula	.	.	12.5	.0%	12.5	.0%	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.
	Moerella pygmaea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.
	Venerupis senegalensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.
	Hiatella arctica	8.3	.0%	8.3	.0%	.	.	.	.	.	.	.	.	12.5	.0%	12.5	.0%	8.3	.0%	.	.
BRYOZOA	Bryozoa indet.	12.5	.0%	4.2	.0%	.	.	.	.	4.2	.0%	.	.	12.5	.0%	.	.	.	.	.	.
	Electra pilosa	25.0	.0%	25.0	.0%	25.0	.0%	12.5	.0%	25.0	.0%	20.8	.0%	25.0	.0%	25.0	.0%	16.7	.0%	25.0	.0%
ECHINODERMATA	Asterias rubens	79.2	.0%	41.7	.0%	37.5	.0%	.	.	141.7	.1%	41.7	.0%	12.5	.0%	37.5	.0%	16.7	.0%	220.8	.2%
	Strongylocentrotus droebachiensis	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	8.3	.0%	.	.	4.2	.0%
Total		170108.3	100.0%	164650.0	100.0%	379320.8	100.0%	261554.2	100.0%	211329.2	100.0%	181791.7	100.0%	164525.0	100.0%	433379.2	100.0%	233379.2	100.0%	104770.8	100.0%

2004-Spring

		Transect																			
		Turbine tower, vertical																			
		NNE 02		NNE 04		NNE 06		NNE 08		NNE Bottom		SSW 02		SSW 04		SSW 06		SSW 08		SSW Bottom	
		no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %
HYDROZOA	Tubularia indivisa	.	.	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	8.3	.0%
	Campanulariidae indet.	.	.	4.2	.0%	.	.	.	.	4.2	.0%	.	.	4.2	.0%	.	.	.	.	.	.
ANTHOZOA	Actiniaria indet.	8.3	.0%	8.3	.0%	29.2	.0%	.	.	8.3	.0%	12.5	.0%	20.8	.0%	29.2	.0%	.	.	4.2	.0%
NEMERTINI	Nemertini indet.	12.5	.0%	25.0	.0%	112.5	.0%	25.0	.0%	12.5	.0%	29.2	.0%	8.3	.0%	41.7	.0%	20.8	.0%	12.5	.0%
NEMATODA	Nematoda indet.	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.
POLYCHAETA	Harmothoe imbricata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.
	Harmothoe impar	8.3	.0%	12.5	.0%	58.3	.0%	29.2	.1%	8.3	.0%	25.0	.0%	8.3	.0%	25.0	.0%	20.8	.0%	.	.
	Phyllodoce groenlandica	.	.	8.3	.0%	4.2	.0%	12.5	.0%	.	.	4.2	.0%	4.2	.0%	.	.	4.2	.0%	.	.
	Eulalia viridis	4.2	.0%	.	.	8.3	.0%	4.2	.0%	.	.	4.2	.0%	4.2	.0%	.	.	4.2	.0%	8.3	.0%
	Syllidae indet.	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	4.2	.0%
	Nereis pelagica	.	.	.	.	16.7	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Neanthes virens	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	.
	Pomatoceros triqueter	58.3	.0%	58.3	.0%	4.2	.0%	.	.	112.5	.1%	175.0	.1%	125.0	.0%	12.5	.0%	.	.	45.8	.0%
CRUSTACEA	Verruca stroemia	.	.	.	.	4.2	.0%	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.
	Balanus balanus	.	.	.	.	.	.	250.0	.4%	.	.	.	.	.	.	4.2	.0%	62.5	.1%	.	.
	Balanus crenatus	37.5	.0%	416.7	.2%	112.5	.0%	.	.	20.8	.0%	166.7	.1%	716.7	.3%	70.8	.0%	.	.	12.5	.0%
	Brachyura indet.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cancer pagurus	4.2	.0%	8.3	.0%	45.8	.0%	.	.	.	.	.	.	4.2	.0%	58.3	.0%	20.8	.0%	.	.
	Pisidia longicornis	.	.	.	.	12.5	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Jassa marmorata	191441.7	93.6%	215075.0	97.7%	221529.2	86.6%	50375.0	87.3%	98529.2	94.9%	204037.5	89.5%	260800.0	98.1%	253762.5	98.3%	69912.5	93.4%	118666.7	87.6%
	Caprella linearis	12579.2	6.1%	3550.0	1.6%	30600.0	12.0%	320.8	.6%	4829.2	4.7%	22775.0	10.0%	2766.7	1.0%	1687.5	.7%	83.3	.1%	16533.3	12.2%
CHIRONOMIDAE	Chironomidae indet.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	4.2	.0%	.	.
	Telmatogeton japonicus	.	.	.	.	.	.	1154.2	2.0%	.	.	.	.	.	.	.	.	1516.7	2.0%	.	.
GASTROPODA	Rissoidae indet.	.	.	.	.	.	.	4.2	.0%	4.2	.0%	8.3	.0%	.	.	.	.	4.2	.0%	.	.
	Crepidula fornicata	33.3	.0%	16.7	.0%	.	.	.	.	4.2	.0%	25.0	.0%	62.5	.0%	12.5	.0%	.	.	4.2	.0%
	Nudibranchia indet.	29.2	.0%	45.8	.0%	4.2	.0%	.	.	.	.	.	.	4.2	.0%	8.3	.0%	.	.	4.2	.0%
	Onchidoris muricata	33.3	.0%	29.2	.0%	4.2	.0%	.	.	4.2	.0%	12.5	.0%	4.2	.0%	.	.	.	.	.	.
	Polycera quadrilineata	45.8	.0%	37.5	.0%	29.2	.0%	.	.	12.5	.0%	95.8	.0%	41.7	.0%	4.2	.0%	.	.	8.3	.0%
	Aeolidia papillosa	75.0	.0%	104.2	.0%	37.5	.0%	.	.	20.8	.0%	116.7	.1%	258.3	.1%	141.7	.1%	.	.	.	.
BIVALVIA	Mytilus edulis	183.3	.1%	729.2	.3%	3058.3	1.2%	5537.5	9.6%	145.8	.1%	525.0	.2%	887.5	.3%	2270.8	.9%	3208.3	4.3%	91.7	.1%
	Ostrea edulis	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Heteranomia squamula	4.2	.0%	16.7	.0%	.	.	.	.	.	.	.	.	12.5	.0%	.	.	.	.	.	.
	Hiatella arctica	8.3	.0%	.	.	12.5	.0%	4.2	.0%	.	.	8.3	.0%	4.2	.0%	8.3	.0%	4.2	.0%	.	.
BRYOZOA	Electra pilosa	25.0	.0%	25.0	.0%	20.8	.0%	4.2	.0%	25.0	.0%	25.0	.0%	25.0	.0%	16.7	.0%	8.3	.0%	20.8	.0%
	Alcyonidium sp.	12.5	.0%	12.5	.0%	8.3	.0%	.	.	16.7	.0%	16.7	.0%	.	.	.	.	.	.	12.5	.0%
ECHINODERMATA	Asterias rubens	25.0	.0%	20.8	.0%	.	.	.	.	29.2	.0%	8.3	.0%	4.2	.0%	.	.	.	.	41.7	.0%
	Strongylocentrotus droebachiensis	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	8.3	.0%	.	.	.	.
Total		204629.2	100.0%	220204.2	100.0%	255725.0	100.0%	57729.2	100.0%	103787.5	100.0%	228079.2	100.0%	265775.0	100.0%	258166.7	100.0%	74875.0	100.0%	135479.2	100.0%

2004-Autumn

		Transect																							
		Turbine tower, vertical																							
		NNE 02		NNE 04		NNE 06		NNE 08		NNE 10		NNE Bottom		SSW 02		SSW 04		SSW 06		SSW 08		SSW 10		SSW Bottom	
		no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	./m²	Kol Su
HYDROZOA	Tubularia indivisa	4.2	.0%	12.5	.0%	20.8	.0%	.	.	.	.	12.5	.0%	20.8	.0%	8.3	.0%	4.2	.0%	4.2	.0%	.	.	12.5	
	Hydractinia echinata	.	.	4.2	.0%	8.3	.0%	.	.	.	.	8.3	.0%	.	.	.	.	.	.	.	.	.	.	.	
	Campanulariidae indet.	8.3	.0%	12.5	.0%	4.2	.0%	.	.	.	.	8.3	.0%	4.2	.0%	.	.	8.3	.0%	.	.	.	.	8.3	
ANTHOZOA	Actiniaria indet.	25.0	.0%	20.8	.0%	16.7	.0%	8.3	.0%	.	.	29.2	.0%	29.2	.0%	8.3	.0%	25.0	.0%	.	.	.	.	50.0	
NEMERTINI	Nemertini indet.	.	.	.	.	.	.	12.5	.0%	.	.	.	.	.	.	.	.	33.3	.0%	33.3	.0%	.	.	.	
NEMATODA	Nematoda indet.	45.8	.0%	45.8	.0%	8.3	.0%	.	.	.	.	16.7	.0%	4.2	.0%	12.5	.0%	29.2	.0%	.	.	.	.	12.5	
POLYCHAETA	Harmothoe imbricata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	33.3	.0%	.	.	.	.	.	
	Harmothoe impar	4.2	.0%	8.3	.0%	4.2	.0%	.	.	.	.	4.2	.0%	4.2	.0%	.	.	29.2	.0%	.	.	.	.	.	
	Phyllodoce groenlandica	.	.	.	.	4.2	.0%	.	.	.	.	.	.	4.2	.0%	.	.	8.3	.0%	.	.	.	.	.	
	Eulalia viridis	150.0	.0%	108.3	.0%	91.7	.0%	54.2	.0%	.	.	141.7	.0%	70.8	.0%	108.3	.0%	120.8	.0%	20.8	.0%	.	.	112.5	
	Ophiodromus flexuosus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	
	Nereis pelagica	.	.	.	.	.	.	33.3	.0%	.	.	.	.	.	.	.	.	.	.	12.5	.0%	.	.	.	
	Cirratulidae indet.	4.2	.0%	.	.	.	.	4.2	.0%	.	.	.	.	.	.	4.2	.0%	.	.	4.2	.0%	.	.	4.2	
	Terebellidae indet.	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	
	Pomatoceros triqueter	33.3	.0%	54.2	.0%	12.5	.0%	.	.	.	.	62.5	.0%	37.5	.0%	33.3	.0%	12.5	.0%	.	.	.	.	41.7	
CRUSTACEA	Verruca stroemia	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4.2	
	Balanus balanus	.	.	.	.	20.8	.0%	266.7	.1%	450.0	5.3%	.	.	233.3	.1%	.	.	4.2	.0%	62.5	.0%	750.0	.2%	50.0	
	Balanus crenatus	50.0	.0%	20.8	.0%	33.3	.0%	.	.	.	.	12.5	.0%	83.3	.0%	112.5	.0%	41.7	.0%	.	.	.	.	8.3	
	Cancer pagurus	337.5	.0%	520.8	.1%	950.0	.2%	750.0	.2%	.	.	520.8	.1%	450.0	.1%	479.2	.1%	600.0	.1%	308.3	.1%	.	.	558.3	
	Jassa marmorata	664066.7	87.5%	320720.8	89.5%	566629.2	90.4%	273937.5	84.2%	6837.5	80.3%	409666.7	90.6%	300904.2	89.4%	336850.0	88.5%	450304.2	87.0%	360658.3	92.5%	301350.0	98.5%	2 3425.0	9
	Caprella linearis	93420.8	12.3%	36454.2	10.2%	57383.3	9.2%	18345.8	5.6%	25.0	.3%	40937.5	9.1%	33970.8	10.1%	42170.8	11.1%	62687.5	12.1%	16070.8	4.1%	25.0	.0%	2829.2	
CHIRONOMIDAE	Telmatogeton japonicus	112.5	.0%	45.8	.0%	4.2	.0%	462.5	.1%	1187.5	14.0%	179.2	.0%	.	.	.	.	4.2	.0%	816.7	.2%	3812.5	1.2%	4.2	
GASTROPODA	Rissoidae indet.	20.8	.0%	45.8	.0%	233.3	.0%	416.7	.1%	.	.	95.8	.0%	104.2	.0%	120.8	.0%	229.2	.0%	345.8	.1%	.	.	191.7	
	Crepidula fornicata	16.7	.0%	20.8	.0%	4.2	.0%	16.7	.0%	.	.	25.0	.0%	37.5	.0%	41.7	.0%	20.8	.0%	8.3	.0%	.	.	16.7	
	Hinia pygmaea	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Nudibranchia indet.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	41.7	.0%	.	.	.	.	.	.	.	
	Onchidoris muricata	8.3	.0%	4.2	.0%	16.7	.0%	.	.	.	.	4.2	.0%	12.5	.0%	8.3	.0%	.	.	.	.	.	.	8.3	
	Polycera quadrilineata	83.3	.0%	75.0	.0%	104.2	.0%	8.3	.0%	.	.	29.2	.0%	45.8	.0%	50.0	.0%	50.0	.0%	8.3	.0%	.	.	37.5	
	Aeolidia papillosa	33.3	.0%	45.8	.0%	25.0	.0%	66.7	.0%	.	.	41.7	.0%	29.2	.0%	66.7	.0%	120.8	.0%	4.2	.0%	.	.	.	
BIVALVIA	Mytilus edulis	391.7	.1%	112.5	.0%	1154.2	.2%	30829.2	9.5%	12.5	.1%	120.8	.0%	300.0	.1%	350.0	.1%	3233.3	.6%	11570.8	3.0%	.	.	129.2	
	Modiolarca tumida	.	.	.	.	.	.	4.2	.0%	.	.	4.2	.0%	.	.	.	.	.	.	4.2	.0%	.	.	.	
	Heteranomia squamula	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Thracia phaseolina	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
BRYOZOA	Bryozoa indet.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Electra pilosa	20.8	.0%	20.8	.0%	25.0	.0%	8.3	.0%	.	.	20.8	.0%	25.0	.0%	20.8	.0%	25.0	.0%	12.5	.0%	.	.	25.0	
	Alcyonidium sp.	4.2	.0%	16.7	.0%	4.2	.0%	.	.	.	.	8.3	.0%	25.0	.0%	8.3	.0%	4.2	.0%	4.2	.0%	.	.	8.3	
ECHINODERMATA	Asterias rubens	175.0	.0%	50.0	.0%	45.8	.0%	16.7	.0%	.	.	133.3	.0%	70.8	.0%	91.7	.0%	120.8	.0%	12.5	.0%	.	.	133.3	
	Ophiura albida	.	.	12.5	.0%	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	4.2	
	Strongylocentrotus droebachiensis	.	.	.	.	8.3	.0%	.	.	.	.	.	.	.	.	8.3	.0%	.	.	.	.	.	.	.	
Total		759020.8	100.0%	358433.3	100.0%	626816.7	100.0%	325254.2	100.0%	8512.5	100.0%	452091.7	100.0%	336466.7	100.0%	380595.8	100.0%	517754.2	100.0%	389962.5	100.0%	305937.5	100.0%	2 2675.0	10

2005-Spring

		Transect																							
		Turbine tower, vertical																							
		NNE 02		NNE 04		NNE 06		NNE 08		NNE 10		NNE Bottom		SSW 02		SSW 04		SSW 06		SSW 08		SSW 10		SSW Bottom	
		no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %
HYDROZOA	Tubularia indivisa	20.8	.0%	12.5	.0%	12.5	.0%	.	.	.	.	16.7	.0%	16.7	.0%	4.2	.0%	4.2	.0%	.	.	.	.	16.7	
	Hydractinia echinata	4.2	.0%	4.2	.0%	.	.	.	.	.	.	.	.	4.2	.0%	4.2	.0%	.	.	.	.	.	.	4.2	
	Campanulariidae indet.	.	.	.	.	8.3	.0%	.	.	.	.	.	.	4.2	.0%	.	.	4.2	.0%	4.2	.0%	.	.	8.3	
ANTHOZOA	Actiniaria indet.	12.5	.0%	8.3	.0%	16.7	.0%	.	.	.	.	20.8	.0%	16.7	.0%	12.5	.0%	8.3	.0%	.	.	.	.	16.7	
NEMERTINI	Nemertini indet.	.	.	4.2	.0%	104.2	.1%	.	.	.	.	.	.	.	.	.	.	25.0	.0%	.	.	.	.	.	
NEMATODA	Nematoda indet.	95.8	.1%	41.7	.1%	700.0	1.0%	12.5	.1%	12.5	.5%	262.5	.2%	66.7	.1%	225.0	.2%	333.3	.5%	25.0	.1%	.	.	12.5	
POLYCHAETA	Lepidonotus squamatus	.	.	.	.	8.3	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Harmothoe imbricata	.	.	.	.	20.8	.0%	.	.	.	.	.	.	.	.	.	.	16.7	.0%	.	.	.	.	.	
	Harmothoe impar	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	20.8	.0%	.	.	.	.	.	
	Eulalia viridis	79.2	.1%	62.5	.1%	112.5	.2%	.	.	.	.	120.8	.1%	79.2	.1%	87.5	.1%	37.5	.1%	4.2	.0%	.	.	37.5	
	Hesionidae indet.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Ophiodromus flexuosus	8.3	.0%	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	
	Syllidae indet.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Chaetopterus norvegicus	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Pomatoceros triqueter	25.0	.0%	16.7	.0%	20.8	.0%	.	.	.	.	41.7	.0%	70.8	.1%	79.2	.1%	25.0	.0%	.	.	.	.	12.5	
CRUSTACEA	Verruca stroemia	.	.	4.2	.0%	.	.	.	.	.	.	12.5	.0%	.	.	8.3	.0%	4.2	.0%	4.2	.0%	.	.	.	
	Balanus balanus	4.2	.0%	8.3	.0%	4.2	.0%	.	.	.	.	.	.	.	.	8.3	.0%	.	.	8.3	.0%	.	.	.	
	Balanus crenatus	.	.	12.5	.0%	4.2	.0%	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	
	Cancer pagurus	20.8	.0%	12.5	.0%	191.7	.3%	.	.	.	.	.	.	12.5	.0%	.	.	104.2	.2%	12.5	.1%	.	.	.	
	Pisidia longicornis	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	
	Jassa marmorata	101370.8	76.9%	70237.5	88.4%	64583.3	87.7%	18741.7	94.6%	12.5	.5%	113141.7	98.0%	76270.8	81.8%	74800.0	80.5%	61345.8	90.8%	8537.5	42.9%	100.0	4.1%	1033.3	[illegible]
	Atylus swammerdami	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	
	Caprella linearis	29929.2	22.7%	8529.2	10.7%	3750.0	5.1%	58.3	.3%	.	.	1612.5	1.4%	16429.2	17.6%	16987.5	18.3%	3195.8	4.7%	79.2	.4%	.	.	1079.2	
CHIRONOMIDAE	Telmatogeton japonicus	.	.	.	.	8.3	.0%	791.7	4.0%	2475.0	99.0%	4.2	.0%	.	.	.	.	4.2	.0%	1037.5	5.2%	2350.0	95.9%	.	
GASTROPODA	Tectura testudinalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	4.2	
	Rissoidae indet.	.	.	.	.	104.2	.1%	.	.	.	.	8.3	.0%	.	.	.	.	29.2	.0%	20.8	.1%	.	.	8.3	
	Crepidula fornicata	29.2	.0%	25.0	.0%	4.2	.0%	4.2	.0%	.	.	.	.	37.5	.0%	29.2	.0%	16.7	.0%	.	.	.	.	4.2	
	Polinices polianus	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
	Onchidoris muricata	4.2	.0%	20.8	.0%	20.8	.0%	.	.	.	.	12.5	.0%	4.2	.0%	.	.	25.0	.0%	.	.	.	.	4.2	
	Polycera quadrilineata	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	8.3	.0%	.	.	.	.	.	.	.	
	Facelina bostoniensis	.	.	.	.	4.2	.0%	.	.	.	.	4.2	.0%	.	.	20.8	.0%	8.3	.0%	4.2	.0%	.	.	4.2	
	Aeolidia papillosa	.	.	.	.	.	.	.	.	.	.	.	.	8.3	.0%	.	.	4.2	.0%	.	.	.	.	.	
BIVALVIA	Mytilus edulis	166.7	.1%	437.5	.6%	3912.5	5.3%	187.5	.9%	.	.	129.2	.1%	220.8	.2%	545.8	.6%	2316.7	3.4%	10150.0	51.0%	.	.	37.5	
	Heteranomia squamula	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	
	Hiatella arctica	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
BRYOZOA	Bryozoa indet.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4.2	
	Electra pilosa	25.0	.0%	25.0	.0%	16.7	.0%	8.3	.0%	.	.	16.7	.0%	20.8	.0%	25.0	.0%	25.0	.0%	12.5	.1%	.	.	12.5	
	Alcyonidium sp.	20.8	.0%	12.5	.0%	16.7	.0%	.	.	.	.	4.2	.0%	25.0	.0%	16.7	.0%	8.3	.0%	.	.	.	.	12.5	
ECHINODERMATA	Asterias rubens	4.2	.0%	8.3	.0%	12.5	.0%	4.2	.0%	.	.	16.7	.0%	4.2	.0%	16.7	.0%	12.5	.0%	.	.	.	.	25.0	
	Strongylocentrotus droebachiensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	
Total		131825.0	100.0%	79487.5	100.0%	73658.3	100.0%	19812.5	100.0%	2500.0	100.0%	115441.7	100.0%	93291.7	100.0%	92883.3	100.0%	67583.3	100.0%	19900.0	100.0%	2450.0	100.0%	2337.5	[illegible]

2005-Autumn

		Transect																			
		Turbine tower, vertical																			
		NNE 02		NNE 04		NNE 06		NNE 08		NNE Bottom		SSW 02		SSW 04		SSW 06		SSW 08		SSW Bottom	
		no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %
PORIFERA	Porifera indet.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Halichondria panicea	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.
HYDROZOA	Tubularia indivisa	25.0	.0%	20.8	.0%	25.0	.0%	12.5	.0%	25.0	.0%	25.0	.0%	25.0	.0%	25.0	.0%	16.7	.0%	25.0	.0%
	Hydractinia echinata	4.2	.0%	8.3	.0%	.	.	.	.	8.3	.0%	4.2	.0%	4.2	.0%	.	.	.	.	4.2	.0%
	Campanulariidae indet.	8.3	.0%	12.5	.0%	12.5	.0%	.	.	4.2	.0%	16.7	.0%	16.7	.0%	.	.	.	.	12.5	.0%
	Sertularia cupressina	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.
ANTHOZOA	Alcyonium digitatum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4.2	.0%
	Actiniaria indet.	45.8	.0%	91.7	.0%	25.0	.0%	29.2	.0%	50.0	.0%	104.2	.0%	37.5	.0%	116.7	.0%	70.8	.0%	83.3	.0%
NEMERTINI	Nemertini indet.	79.2	.0%	16.7	.0%	175.0	.0%	216.7	.1%	4.2	.0%	54.2	.0%	287.5	.1%	479.2	.1%	75.0	.0%	4.2	.0%
NEMATODA	Nematoda indet.	125.0	.0%	958.3	.1%	2095.8	.3%	158.3	.0%	112.5	.0%	79.2	.0%	70.8	.0%	304.2	.0%	104.2	.0%	237.5	.1%
POLYCHAETA	Lepidonotus squamatus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	16.7	.0%	.	.	.	.
	Harmothoe imbricata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.
	Harmothoe impar	20.8	.0%	4.2	.0%	70.8	.0%	25.0	.0%	12.5	.0%	4.2	.0%	8.3	.0%	20.8	.0%	4.2	.0%	12.5	.0%
	Phyllodoce groenlandica	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Eulalia viridis	187.5	.1%	341.7	.0%	504.2	.1%	187.5	.0%	408.3	.1%	458.3	.1%	279.2	.1%	404.2	.1%	141.7	.1%	387.5	.1%
	Polydora cornuta	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.
	Chaetopterus norvegicus	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	4.2	.0%	.	.	4.2	.0%
	Pomatoceros triqueter	12.5	.0%	4.2	.0%	.	.	.	.	62.5	.0%	37.5	.0%	8.3	.0%	4.2	.0%	.	.	20.8	.0%
CRUSTACEA	Harpacticoida indet.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.
	Verruca stroemia	33.3	.0%	29.2	.0%	4.2	.0%	.	.	100.0	.0%	58.3	.0%	37.5	.0%	8.3	.0%	.	.	95.8	.0%
	Balanus balanus	191.7	.1%	104.2	.0%	375.0	.1%	450.0	.1%	62.5	.0%	91.7	.0%	137.5	.0%	87.5	.0%	4.2	.0%	50.0	.0%
	Cancer pagurus	237.5	.1%	320.8	.0%	545.8	.1%	150.0	.0%	291.7	.0%	329.2	.1%	279.2	.1%	575.0	.1%	50.0	.0%	529.2	.2%
	Pilumnus hirtellus	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.
	Pisidia longicornis	.	.	4.2	.0%	4.2	.0%	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.
	Stenothoe sp.	.	.	.	.	.	.	.	.	.	.	16.7	.0%	.	.	.	.	.	.	8.3	.0%
	Jassa marmorata	240929.2	90.3%	664700.0	94.7%	576208.3	89.2%	411145.8	95.9%	598879.2	93.5%	400270.8	91.2%	526920.8	96.7%	583154.2	89.9%	182100.0	86.9%	272616.7	93.6%
	Atylus swammerdami	12.5	.0%	12.5	.0%	12.5	.0%	.	.	16.7	.0%	54.2	.0%	12.5	.0%	4.2	.0%	.	.	70.8	.0%
	Caprella linearis	23900.0	9.0%	34470.8	4.9%	60766.7	9.4%	175.0	.0%	39470.8	6.2%	36220.8	8.3%	15958.3	2.9%	60058.3	9.3%	8.3	.0%	15516.7	5.3%
CHIRONOMIDAE	Telmatogeton japonicus	4.2	.0%	.	.	.	.	987.5	.2%	4.2	.0%	4.2	.0%	4.2	.0%	4.2	.0%	487.5	.2%	.	.
GASTROPODA	Rissoidae indet.	12.5	.0%	4.2	.0%	8.3	.0%	33.3	.0%	50.0	.0%	25.0	.0%	4.2	.0%	16.7	.0%	20.8	.0%	100.0	.0%
	Crepidula fornicata	41.7	.0%	25.0	.0%	16.7	.0%	.	.	45.8	.0%	79.2	.0%	50.0	.0%	41.7	.0%	4.2	.0%	83.3	.0%
	Polinices polianus	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Nudibranchia indet.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.
	Onchidoris muricata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	4.2	.0%
	Polycera quadrilineata	54.2	.0%	75.0	.0%	116.7	.0%	4.2	.0%	50.0	.0%	29.2	.0%	41.7	.0%	158.3	.0%	.	.	50.0	.0%
	Facelina bostoniensis	120.8	.0%	33.3	.0%	33.3	.0%	.	.	62.5	.0%	66.7	.0%	100.0	.0%	8.3	.0%	4.2	.0%	54.2	.0%
	Aeolidia papillosa	.	.	.	.	.	.	.	.	.	.	4.2	.0%	16.7	.0%	4.2	.0%	.	.	.	.
BIVALVIA	Mytilus edulis	650.0	.2%	695.8	.1%	4762.5	.7%	15120.8	3.5%	887.5	.1%	854.2	.2%	700.0	.1%	2845.8	.4%	26462.5	12.6%	1083.3	.4%
	Tridonta borealis	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.
	Angulus tenuis	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.
	Fabulina fabula	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.
	Moerella pygmaea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	8.3	.0%	.	.	4.2	.0%
	Donax vittatus	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.	.	.	.	.
	Hiatella arctica	.	.	4.2	.0%	4.2	.0%	12.5	.0%	4.2	.0%	4.2	.0%	4.2	.0%	4.2	.0%	4.2	.0%	.	.
	Phaxas pellucidus	.	.	.	.	.	.	.	.	.	.	4.2	.0%	.	.	.	.	.	.	.	.
BRYOZOA	Electra pilosa	25.0	.0%	20.8	.0%	20.8	.0%	12.5	.0%	25.0	.0%	25.0	.0%	20.8	.0%	25.0	.0%	16.7	.0%	25.0	.0%
	Alcyonidium sp.	25.0	.0%	16.7	.0%	16.7	.0%	4.2	.0%	16.7	.0%	12.5	.0%	.	.	8.3	.0%	.	.	12.5	.0%
ECHINODERMATA	Asterias rubens	8.3	.0%	4.2	.0%	41.7	.0%	.	.	37.5	.0%	25.0	.0%	.	.	16.7	.0%	.	.	20.8	.0%
	Strongylocentrotus droebachiensis	.	.	.	.	.	.	.	.	8.3	.0%	.	.	.	.	4.2	.0%	.	.	8.3	.0%
Total		266754.2	100.0%	701987.5	100.0%	645854.2	100.0%	428729.2	100.0%	640720.8	100.0%	438979.2	100.0%	545025.0	100.0%	648420.8	100.0%	209575.0	100.0%	291129.2	100.0%

8.4.3. *Appendix 4.4. Mean abundance. Scour protections 2003-2005*

2003

Spring

		Transect							
		Foundations, horizontal							
		A 0.5 NNE		B 02 NNE		C 05 NNE		D 05 SSW	
		no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %
HYDROZOA	Hydrozoa indet.	.	.	1.4	.0%	.	.	.	.
	Thecata indet.	.	.	.	.	1.4	.0%	.	.
	Campanulariidae indet.	.	.	1.4	.0%	2.8	.0%	.	.
ANTHOZOA	Anthozoa indet.	5.6	.0%	56.9	.3%	.	.	5.6	.0%
	Actiniaria indet.	66.7	.4%	108.3	.5%	201.4	.6%	97.2	.2%
NEMERTINI	Nemertini indet.	2.8	.0%	1.4	.0%	.	.	1.4	.0%
POLYCHAETA	Harmothoe impar	8.3	.0%	22.2	.1%	29.2	.1%	15.3	.0%
	Phyllodoce groenlandica	2.8	.0%	18.1	.1%	62.5	.2%	45.8	.1%
	Eulalia viridis	1.4	.0%	1.4	.0%	5.6	.0%	.	.
	Chaetopterus norvegicus	.	.	1.4	.0%	2.8	.0%	.	.
	Pomatoceros triqueter	1.4	.0%	6.9	.0%	5.6	.0%	2.8	.0%
CRUSTACEA	Verruca stroemia	4.2	.0%	1.4	.0%	.	.	2.8	.0%
	Balanus crenatus	325.0	1.8%	176.4	.8%	1940.3	6.1%	251.4	.6%
	Cancer pagurus	1.4	.0%	.	.	4.2	.0%	.	.
	Corophium crassicorne	.	.	.	.	2.8	.0%	.	.
	Jassa marmorata	15551.4	85.9%	18606.9	83.0%	28136.1	88.5%	40273.6	93.7%
	Caprella linearis	543.1	3.0%	1643.1	7.3%	133.3	.4%	43.1	.1%
GASTROPODA	Rissoidae indet.	1.4	.0%	9.7	.0%	36.1	.1%	2.8	.0%
	Crepidula fornicata	6.9	.0%	26.4	.1%	83.3	.3%	12.5	.0%
	Nudibranchia indet.	.	.	.	.	1.4	.0%	6.9	.0%
	Onchidoris muricata	5.6	.0%	.	.	1.4	.0%	.	.
BIVALVIA	Bivalvia indet.	.	.	1.4	.0%	.	.	.	.
	Mytilus edulis	1479.2	8.2%	1627.8	7.3%	1023.6	3.2%	2191.7	5.1%
	Heteranomia squamula	.	.	1.4	.0%	1.4	.0%	.	.
	Moerella pygmaea	8.3	.0%	18.1	.1%	48.6	.2%	.	.
	Thracia phaseolina	.	.	.	.	2.8	.0%	.	.
BRYOZOA	Bryozoa indet.	.	.	1.4	.0%	1.4	.0%	.	.
	Electra pilosa	15.3	.1%	20.8	.1%	11.1	.0%	15.3	.0%
ECHINODERMATA	Asterias rubens	65.3	.4%	61.1	.3%	45.8	.1%	26.4	.1%
	Ophiura albida	.	.	1.4	.0%	4.2	.0%	1.4	.0%
	Strongylocentrotus droebachiensis	.	.	.	.	.	.	1.4	.0%
Total		18095.8	100.0%	22416.7	100.0%	31788.9	100.0%	42997.2	100.0%

Autumn

		Transect							
		Foundations, horizontal							
		A 0.5 NNE		B 02 NNE		C 05 NNE		D 05 SSW	
		no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %
PORIFERA	Porifera indet.	.	.	.	.	1.4	.0%	.	.
HYDROZOA	Tubularia indivisa	25.0	.1%	23.6	.1%	25.0	.1%	22.2	.1%
	Campanulariidae indet.	16.7	.0%	15.3	.1%	18.1	.1%	13.9	.0%
ANTHOZOA	Actiniaria indet.	34.7	.1%	98.6	.4%	129.2	.4%	65.3	.2%
NEMERTINI	Nemertini indet.	1.4	.0%	.	.	1.4	.0%	1.4	.0%
NEMATODA	Nematoda indet.	1.4	.0%	6.9	.0%	8.3	.0%	2.8	.0%
POLYCHAETA	Harmothoe impar	.	.	.	.	1.4	.0%	.	.
	Phyllodocidae indet.	.	.	1.4	.0%	.	.	.	.
	Phyllodoce groenlandica	18.1	.0%	16.7	.1%	11.1	.0%	11.1	.0%
	Eulalia viridis	2.8	.0%	4.2	.0%	.	.	.	.
	Syllidae indet.	.	.	.	.	.	.	1.4	.0%
	Nereididae indet.	1.4	.0%	.	.	.	.	.	.
	Polydora ciliata	.	.	.	.	2.8	.0%	.	.
	Capitella capitata	.	.	1.4	.0%	1.4	.0%	.	.
	Pomatoceros triqueter	12.5	.0%	22.2	.1%	11.1	.0%	29.2	.1%
PYCNOGONIDA	Phoxichilidium femoratum	1.4	.0%	.	.	.	.	.	.
CRUSTACEA	Verruca stroemia	1.4	.0%	12.5	.0%	12.5	.0%	1.4	.0%
	Balanus crenatus	9.7	.0%	8.3	.0%	8.3	.0%	16.7	.0%
	Cancer pagurus	8.3	.0%	13.9	.1%	40.3	.1%	22.2	.1%
	Stenothoe marina	1.4	.0%	.	.	.	.	.	.
	Jassa marmorata	33765.3	89.8%	25275.0	91.7%	29565.3	95.3%	37587.5	92.9%
	Atylus swammerdami	.	.	1.4	.0%	.	.	.	.
	Caprella linearis	3220.8	8.6%	1531.9	5.6%	805.6	2.6%	2179.2	5.4%
	Hyperia galba	1.4	.0%	.	.	.	.	.	.
CHIRONOMIDAE	Telmatogeton japonicus	1.4	.0%	.	.	.	.	.	.
GASTROPODA	Rissoidae indet.	190.3	.5%	190.3	.7%	123.6	.4%	143.1	.4%
	Crepidula fornicata	23.6	.1%	33.3	.1%	16.7	.1%	27.8	.1%
	Polinices sp.	.	.	.	.	2.8	.0%	.	.
	Nudibranchia indet.	4.2	.0%	11.1	.0%	12.5	.0%	29.2	.1%
	Onchidoris muricata	6.9	.0%	12.5	.0%	19.4	.1%	70.8	.2%
BIVALVIA	Mytilus edulis	84.7	.2%	194.4	.7%	93.1	.3%	125.0	.3%
	Moerella pygmaea	.	.	.	.	1.4	.0%	1.4	.0%
	Hiatella arctica	.	.	1.4	.0%	2.8	.0%	5.6	.0%
BRYOZOA	Bryozoa indet.	1.4	.0%	2.8	.0%	1.4	.0%	.	.
	Electra pilosa	20.8	.1%	19.4	.1%	22.2	.1%	22.2	.1%
ECHINODERMATA	Asterias rubens	123.6	.3%	73.6	.3%	80.6	.3%	77.8	.2%
	Strongylocentrotus droebachiensis	1.4	.0%	1.4	.0%	1.4	.0%	.	.
Total		37581.9	100.0%	27573.6	100.0%	31020.8	100.0%	40456.9	100.0%

2004

Spring

		Transect							
		Foundations, horizontal							
		A 0.5 NNE		B 02 NNE		C 05 NNE		D 05 SSW	
		no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %
PORIFERA	Halichondria panicea	.	.	1.4	.0%	1.4	.0%	.	.
HYDROZOA	Tubularia indivisa	6.9	.0%	1.4	.0%	.	.	4.2	.0%
	Campanulariidae indet.	4.2	.0%	2.8	.0%	4.2	.0%	5.6	.0%
ANTHOZOA	Alcyonium digitatum	.	.	1.4	.0%	4.2	.0%	.	.
	Actiniaria indet.	25.0	.1%	59.7	.2%	108.3	.3%	56.9	.2%
NEMERTINI	Nemertini indet.	11.1	.0%	6.9	.0%	6.9	.0%	5.6	.0%
POLYCHAETA	Phyllodoce groenlandica	1.4	.0%	6.9	.0%	8.3	.0%	5.6	.0%
	Eulalia viridis	1.4	.0%	.	.	1.4	.0%	.	.
	Syllidae indet.	.	.	1.4	.0%	1.4	.0%	.	.
	Polydora ciliata	.	.	1.4	.0%	.	.	.	.
	Capitella capitata	1.4	.0%	2.8	.0%	.	.	.	.
	Pomatoceros triqueter	15.3	.0%	16.7	.0%	11.1	.0%	11.1	.0%
CRUSTACEA	Verruca stroemia	.	.	.	.	2.8	.0%	1.4	.0%
	Balanus crenatus	2.8	.0%	5.6	.0%	8.3	.0%	6.9	.0%
	Corystes cassivelaunus	.	.	1.4	.0%	1.4	.0%	.	.
	Cancer pagurus	.	.	.	.	.	.	1.4	.0%
	Jassa marmorata	41859.7	96.0%	32056.9	95.2%	35236.1	97.3%	30263.9	98.0%
	Caprella linearis	1423.6	3.3%	943.1	2.8%	297.2	.8%	206.9	.7%
GASTROPODA	Rissoidae indet.	19.4	.0%	108.3	.3%	95.8	.3%	11.1	.0%
	Crepidula fornicata	1.4	.0%	2.8	.0%	1.4	.0%	5.6	.0%
	Nudibranchia indet.	19.4	.0%	.	.	1.4	.0%	11.1	.0%
	Onchidoris muricata	4.2	.0%	1.4	.0%	1.4	.0%	.	.
	Polycera quadrilineata	5.6	.0%	25.0	.1%	50.0	.1%	31.9	.1%
	Aeolidia papillosa	1.4	.0%	9.7	.0%	18.1	.0%	25.0	.1%
BIVALVIA	Mytilus edulis	111.1	.3%	336.1	1.0%	238.9	.7%	108.3	.4%
	Goodallia triangularis	1.4	.0%	.	.	.	.	.	.
	Hiatella arctica	.	.	.	.	1.4	.0%	2.8	.0%
BRYOZOA	Electra pilosa	22.2	.1%	19.4	.1%	20.8	.1%	19.4	.1%
	Alcyonidium sp.	2.8	.0%	1.4	.0%	.	.	.	.
ECHINODERMATA	Asterias rubens	40.3	.1%	61.1	.2%	75.0	.2%	84.7	.3%
Total		43581.9	100.0%	33675.0	100.0%	36197.2	100.0%	30869.4	100.0%

Autumn

		Transect							
		Foundations, horizontal							
		A 0.5 NNE		B 02 NNE		C 05 NNE		D 05 SSW	
		no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %
PORIFERA	Porifera indet.	.	.	.	.	.	.	1.4	.0%
HYDROZOA	Tubularia indivisa	15.3	.0%	5.6	.0%	11.1	.0%	11.1	.0%
	Campanulariidae indet.	4.2	.0%	4.2	.0%	5.6	.0%	2.8	.0%
	Sertularia cupressina	2.8	.0%	.	.	.	.	2.8	.0%
ANTHOZOA	Alcyonium digitatum	2.8	.0%	4.2	.0%	4.2	.0%	5.6	.0%
	Actiniaria indet.	65.3	.1%	68.1	.1%	134.7	.2%	43.1	.0%
NEMERTINI	Nemertini indet.	.	.	.	.	.	.	2.8	.0%
NEMATODA	Nematoda indet.	13.9	.0%	13.9	.0%	36.1	.1%	8.3	.0%
POLYCHAETA	Phyllodoce groenlandica	6.9	.0%	6.9	.0%	16.7	.0%	6.9	.0%
	Eulalia viridis	27.8	.0%	12.5	.0%	30.6	.1%	36.1	.0%
	Nereis pelagica	.	.	.	.	.	.	1.4	.0%
	Polydora ciliata	.	.	.	.	.	.	1.4	.0%
	Cirratulidae indet.	.	.	1.4	.0%	.	.	.	.
	Terebellidae indet.	.	.	.	.	.	.	2.8	.0%
	Lanice conchilega	.	.	.	.	1.4	.0%	.	.
	Sabellaria sp.	.	.	.	.	1.4	.0%	.	.
	Pomatoceros triqueter	13.9	.0%	16.7	.0%	29.2	.0%	19.4	.0%
CRUSTACEA	Verruca stroemia	5.6	.0%	12.5	.0%	22.2	.0%	23.6	.0%
	Balanus crenatus	12.5	.0%	6.9	.0%	11.1	.0%	23.6	.0%
	Cancer pagurus	222.2	.3%	208.3	.2%	170.8	.3%	218.1	.1%
	Liocarcinus depurator	1.4	.0%	.	.	.	.	.	.
	Jassa marmorata	86323.6	97.9%	106500.0	97.5%	57236.1	97.4%	141586.1	97.1%
	Caprella linearis	966.7	1.1%	1902.8	1.7%	573.6	1.0%	2915.3	2.0%
GASTROPODA	Rissoidae indet.	93.1	.1%	129.2	.1%	102.8	.2%	281.9	.2%
	Crepidula fornicata	6.9	.0%	54.2	.0%	18.1	.0%	23.6	.0%
	Hinia pygmaea	4.2	.0%	5.6	.0%	19.4	.0%	13.9	.0%
	Nudibranchia indet.	6.9	.0%	.	.	.	.	12.5	.0%
	Onchidoris muricata	2.8	.0%	.	.	1.4	.0%	2.8	.0%
	Polycera quadrilineata	19.4	.0%	.	.	6.9	.0%	9.7	.0%
	Aeolidia papillosa	8.3	.0%	5.6	.0%	2.8	.0%	.	.
BIVALVIA	Mytilus edulis	159.7	.2%	111.1	.1%	122.2	.2%	206.9	.1%
	Angulus tenuis	1.4	.0%	5.6	.0%	1.4	.0%	2.8	.0%
	Moerella pygmaea	4.2	.0%	.	.	.	.	.	.
	Hiatella arctica	.	.	1.4	.0%	.	.	.	.
BRYOZOA	Bryozoa indet.	.	.	.	.	1.4	.0%	.	.
	Electra pilosa	22.2	.0%	15.3	.0%	19.4	.0%	23.6	.0%
	Alcyonidium sp.	1.4	.0%	1.4	.0%	2.8	.0%	.	.
ECHINODERMATA	Asterias rubens	163.9	.2%	113.9	.1%	148.6	.3%	211.1	.1%
	Ophiura albida	18.1	.0%	18.1	.0%	18.1	.0%	45.8	.0%
	Strongylocentrotus droebachiensis	5.6	.0%	1.4	.0%	4.2	.0%	.	.
Total		88202.8	100.0%	109226.4	100.0%	58754.2	100.0%	145747.2	100.0%

2005

Spring

		Transect							
		Foundations, horizontal							
		A 0.5 NNE		B 02 NNE		C 05 NNE		D 05 SSW	
		no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %
HYDROZOA	Tubularia indivisa	13.9	.0%	16.7	.0%	12.5	.0%	11.1	.0%
	Hydractinia echinata	.	.	1.4	.0%	1.4	.0%	.	.
	Campanulariidae indet.	8.3	.0%	6.9	.0%	1.4	.0%	6.9	.0%
	Sertularia cupressina	.	.	1.4	.0%	.	.	.	.
ANTHOZOA	Alcyonium digitatum	1.4	.0%	2.8	.0%	2.8	.0%	2.8	.0%
	Actiniaria indet.	33.3	.1%	51.4	.1%	111.1	.2%	69.4	.1%
NEMERTINI	Nemertini indet.	.	.	.	.	.	.	1.4	.0%
NEMATODA	Nematoda indet.	50.0	.2%	55.6	.1%	56.9	.1%	233.3	.4%
POLYCHAETA	Harmothoe impar	1.4	.0%	.	.	1.4	.0%	1.4	.0%
	Phyllodoce groenlandica	.	.	.	.	2.8	.0%	6.9	.0%
	Eulalia viridis	30.6	.1%	13.9	.0%	29.2	.1%	33.3	.1%
	Hesionidae indet.	.	.	.	.	.	.	1.4	.0%
	Ophiodromus flexuosus	.	.	5.6	.0%	1.4	.0%	4.2	.0%
	Polydora ciliata	.	.	1.4	.0%	1.4	.0%	.	.
	Pomatoceros triqueter	31.9	.1%	26.4	.0%	16.7	.0%	27.8	.0%
CRUSTACEA	Verruca stroemia	19.4	.1%	26.4	.0%	26.4	.1%	37.5	.1%
	Balanus balanus	.	.	4.2	.0%	.	.	.	.
	Balanus sp.	.	.	.	.	.	.	1.4	.0%
	Cancer pagurus	2.8	.0%	4.2	.0%	1.4	.0%	.	.
	Jassa marmorata	32430.6	98.5%	53061.1	98.7%	51666.7	98.8%	57158.3	97.7%
	Caprella linearis	83.3	.3%	127.8	.2%	115.3	.2%	429.2	.7%
CHIRONOMIDAE	Telmatogeton japonicus	2.8	.0%	.	.	.	.	2.8	.0%
GASTROPODA	Tectura testudinalis	.	.	.	.	.	.	1.4	.0%
	Rissoidae indet.	55.6	.2%	168.1	.3%	55.6	.1%	173.6	.3%
	Crepidula fornicata	2.8	.0%	1.4	.0%	1.4	.0%	11.1	.0%
	Epitonium clathrus	.	.	1.4	.0%	.	.	.	.
	Onchidoris muricata	.	.	2.8	.0%	1.4	.0%	.	.
	Polycera quadrilineata	.	.	2.8	.0%	4.2	.0%	8.3	.0%
	Facelina bostoniensis	1.4	.0%	1.4	.0%	6.9	.0%	2.8	.0%
BIVALVIA	Mytilus edulis	94.4	.3%	122.2	.2%	125.0	.2%	188.9	.3%
	Thracia phaseolina	.	.	.	.	1.4	.0%	.	.
BRYOZOA	Bryozoa indet.	2.8	.0%	.	.	.	.	.	.
	Electra pilosa	20.8	.1%	18.1	.0%	19.4	.0%	20.8	.0%
	Alcyonidium sp.	1.4	.0%	1.4	.0%	1.4	.0%	.	.
ECHINODERMATA	Asterias rubens	20.8	.1%	25.0	.0%	52.8	.1%	59.7	.1%
	Ophiura albida	1.4	.0%	.	.	.	.	.	.
Total		32911.1	100.0%	53751.4	100.0%	52318.1	100.0%	58495.8	100.0%

Autumn

		Transect							
		Foundations, horizontal							
		A 0.5 NNE		B 02 NNE		C 05 NNE		D 05 SSW	
		no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %	no./m²	Kol Sum %
PORIFERA	Porifera indet.	1.4	.0%	.	.	.	.	.	.
HYDROZOA	Tubularia indivisa	22.2	.0%	25.0	.0%	19.4	.0%	13.9	.0%
	Hydractinia echinata	.	.	.	.	1.4	.0%	13.9	.0%
	Campanulariidae indet.	12.5	.0%	12.5	.0%	11.1	.0%	12.5	.0%
	Sertularia cupressina	4.2	.0%	.	.	1.4	.0%	2.8	.0%
ANTHOZOA	Alcyonium digitatum	8.3	.0%	19.4	.0%	22.2	.0%	31.9	.0%
	Actiniaria indet.	200.0	.2%	204.2	.3%	163.9	.1%	223.6	.2%
	Actinaridae indet.	.	.	.	.	12.5	.0%	.	.
NEMERTINI	Nemertini indet.	6.9	.0%	36.1	.0%	4.2	.0%	41.7	.0%
NEMATODA	Nematoda indet.	208.3	.2%	897.2	1.2%	554.2	.4%	1090.3	.9%
POLYCHAETA	Harmothoe impar	4.2	.0%	1.4	.0%	4.2	.0%	6.9	.0%
	Phyllodoce groenlandica	8.3	.0%	.	.	.	.	1.4	.0%
	Eulalia viridis	55.6	.1%	51.4	.1%	36.1	.0%	33.3	.0%
	Syllidae indet.	.	.	.	.	.	.	1.4	.0%
	Polydora cornuta	.	.	.	.	1.4	.0%	.	.
	Chaetopterus norvegicus	4.2	.0%	.	.	1.4	.0%	2.8	.0%
	Arenicola marina	.	.	1.4	.0%	.	.	.	.
	Lanice conchilega	.	.	.	.	1.4	.0%	1.4	.0%
	Sabellaria spinulosa	.	.	.	.	1.4	.0%	.	.
	Pomatoceros triqueter	20.8	.0%	20.8	.0%	13.9	.0%	13.9	.0%
CRUSTACEA	Copepoda indet.	.	.	1.4	.0%	1.4	.0%	.	.
	Verruca stroemia	40.3	.0%	123.6	.2%	118.1	.1%	80.6	.1%
	Balanus balanus	8.3	.0%	6.9	.0%	.	.	5.6	.0%
	Balanus crenatus	.	.	.	.	1.4	.0%	5.6	.0%
	Cancer pagurus	343.1	.3%	304.2	.4%	316.7	.2%	208.3	.2%
	Liocarcinus depurator	.	.	1.4	.0%	8.3	.0%	1.4	.0%
	Pisidia longicornis	.	.	.	.	2.8	.0%	1.4	.0%
	Pagurus bernhardus	.	.	1.4	.0%	.	.	.	.
	Stenothoe sp.	6.9	.0%	.	.	.	.	.	.
	Jassa marmorata	103165.3	96.2%	68754.2	93.1%	123579.2	94.4%	111233.3	94.5%
	Atylus swammerdami	56.9	.1%	76.4	.1%	77.8	.1%	76.4	.1%
	Caprella linearis	1772.2	1.7%	2023.6	2.7%	4833.3	3.7%	2547.2	2.2%
CHIRONOMIDAE	Telmatogeton japonicus	1.4	.0%	.	.	1.4	.0%	.	.
GASTROPODA	Rissoidae indet.	144.4	.1%	91.7	.1%	37.5	.0%	43.1	.0%
	Crepidula fornicata	23.6	.0%	41.7	.1%	41.7	.0%	16.7	.0%
	Polinices polianus	.	.	.	.	.	.	1.4	.0%
	Hinia pygmaea	8.3	.0%	5.6	.0%	8.3	.0%	.	.
	Onchidoris muricata	.	.	.	.	5.6	.0%	1.4	.0%
	Polycera quadrilineata	43.1	.0%	18.1	.0%	25.0	.0%	41.7	.0%
	Facelina bostoniensis	27.8	.0%	40.3	.1%	16.7	.0%	13.9	.0%
	Aeolidia papillosa	.	.	22.2	.0%	15.3	.0%	9.7	.0%
BIVALVIA	Mytilus edulis	979.2	.9%	986.1	1.3%	905.6	.7%	1837.5	1.6%
	Angulus tenuis	.	.	1.4	.0%	.	.	1.4	.0%
	Moerella pygmaea	9.7	.0%	9.7	.0%	9.7	.0%	6.9	.0%
	Hiatella arctica	1.4	.0%	.	.	4.2	.0%	2.8	.0%
	Thracia phaseolina	1.4	.0%	.	.	.	.	.	.
BRYOZOA	Bryozoa indet.	.	.	.	.	.	.	1.4	.0%
	Electra pilosa	25.0	.0%	23.6	.0%	23.6	.0%	20.8	.0%
	Alcyonidium sp.	6.9	.0%	4.2	.0%	1.4	.0%	2.8	.0%
ECHINODERMATA	Asterias rubens	23.6	.0%	27.8	.0%	22.2	.0%	22.2	.0%
	Ophiura albida	.	.	.	.	4.2	.0%	1.4	.0%
	Strongylocentrotus droebachiensis	.	.	1.4	.0%	.	.	.	.
ASCIDIACEA	Tunicata indet.	.	.	.	.	4.2	.0%	1.4	.0%
Total		107245.8	100.0%	73836.1	100.0%	130915.3	100.0%	117677.8	100.0%

8.4.4. *Appendix 4.5. Mean biomass WW. Monopiles 2003-2005*

2003-Spring

		Transect																			
		Turbine tower, vertical																			
		NNE 02		NNE 04		NNE 06		NNE 08		NNE Bottom		SSW 02		SSW 04		SSW 06		SSW 08		SSW Bottom	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
HYDROZOA	Tubulariidae indet.	.	.	.	.	.	.	.	.	.	.	.025	.0%	.	.	.	.	.	.	.	.
	Campanulariidae indet.	.	.	.	.	.	.	.	.	.	.	.019	.0%	.	.	.	.	.	.	.007	.0%
ANTHOZOA	Anthozoa indet.	.	.	2.760	.1%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.235	.1%
	Actiniaria indet.	.	.	.	.	.	.	.	.	6.736	.7%	.012	.0%	.004	.0%	.	.	.	.	.073	.0%
NEMERTINI	Nemertini indet.	16.003	1.3%	2.327	.1%	2.504	.1%	.860	.1%	.	.	3.660	.2%	4.520	.3%	8.773	.4%	.	.	.337	.0%
POLYCHAETA	Harmothoe impar	.465	.0%	.548	.0%	.474	.0%	.	.	1.553	.1%	.312	.0%	.658	.0%	.183	.0%	.	.	.650	.1%
	Phyllodoce groenlandica	.571	.0%	.226	.0%	.047	.0%	.	.	.158	.0%	1.021	.1%	.295	.0%	.	.	.	.	.129	.0%
	Eulalia viridis	.012	.0%	.049	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.114	.0%
	Capitella capitata	.021	.0%	.052	.0%	.013	.0%	.	.	.	.	.	.	.002	.0%	.005	.0%	.	.	.	.
	Pomatoceros triqueter	.356	.0%	.	.	.190	.0%	.	.	.482	.0%	.535	.0%	.343	.0%	.	.	.	.	.548	.1%
CRUSTACEA	Verruca stroemia	.052	.0%	.	.	.076	.0%	.	.	.147	.0%	.085	.0%	.	.	.063	.0%	.	.	.108	.0%
	Balanus balanus	.	.	.	.	174.242	5.7%	827.259	65.8%	.	.	.	.	.	.	276.446	11.8%	645.328	38.3%	.	.
	Balanus crenatus	722.158	57.1%	3024.561	78.0%	1827.500	60.0%	.	.	162.188	15.7%	831.235	47.9%	621.063	44.4%	1430.783	61.0%	.	.	339.675	37.4%
	Cancer pagurus	.494	.0%	.181	.0%	.209	.0%	1.184	.1%	.	.	.657	.0%	.039	.0%	.741	.0%	.	.	.	.
	Aoridae indet.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.045	.0%	.	.	.	.
	Jassa marmorata	449.821	35.6%	640.879	16.5%	778.979	25.6%	233.212	18.5%	446.121	43.1%	756.217	43.6%	552.090	39.4%	538.175	22.9%	838.700	49.8%	295.390	32.5%
	Caprella linearis	17.698	1.4%	19.550	.5%	21.791	.7%	4.830	.4%	7.545	.7%	15.150	.9%	16.391	1.2%	6.293	.3%	.805	.0%	5.115	.6%
GASTROPODA	Rissoidae indet.	.027	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.011	.0%
	Crepidula fornicata	2.287	.2%	2.753	.1%	.	.	.	.	.246	.0%	4.016	.2%	.183	.0%	.	.	.	.	.	.
	Nudibranchia indet.	.	.	.015	.0%	.	.	.	.	.224	.0%	.	.	.003	.0%	.	.	.	.	.014	.0%
	Onchidoris muricata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.089	.0%
BIVALVIA	Mytilus edulis	53.323	4.2%	146.528	3.8%	161.438	5.3%	22.813	1.8%	14.694	1.4%	91.841	5.3%	203.588	14.5%	82.380	3.5%	199.438	11.8%	50.205	5.5%
BRYOZOA	Bryozoa indet.	.	.	.	.	.	.	.	.	.006	.0%	.	.	.	.	.	.	.	.	.	.
	Electra pilosa	1.686	.1%	.837	.0%	13.563	.4%	.187	.0%	.879	.1%	2.826	.2%	1.074	.1%	1.242	.1%	.	.	1.017	.1%
ECHINODERMATA	Asterias rubens	.	.	36.063	.9%	64.428	2.1%	167.840	13.3%	394.842	38.1%	27.791	1.6%	.	.	.	.	.	.	214.666	23.6%
	Strongylocentrotus droebachiensis	.	.	.	.	.	.	.	.	.	.	.	.	.003	.0%	.	.	.	.	.	.
Total		1264.974	100.0%	3877.328	100.0%	3045.455	100.0%	1258.186	100.0%	1035.820	100.0%	1735.400	100.0%	1400.255	100.0%	2345.128	100.0%	1684.270	100.0%	909.383	100.0%

2003-Autumn

		Transect																			
		Turbine tower, vertical																			
		NNE 02		NNE 04		NNE 06		NNE 08		NNE Bottom		SSW 02		SSW 04		SSW 06		SSW 08		SSW Bottom	
		g/m^2	Kol Sum %	g/m^2	Kol Sum %	g/m^2	Kol Sum %	g/m^2	Kol Sum %	g/m^2	Kol Sum %	g/m^2	Kol Sum %	g/m^2	Kol Sum %	g/m^2	Kol Sum %	g/m^2	Kol Sum %	g/m^2	Kol Sum %
HYDROZOA	Tubularia indivisa	121.527	27.3%	16.653	5.6%	21.135	.2%	.	.	9.936	2.6%	17.930	8.3%	63.777	28.0%	25.388	.5%	2.137	.0%	6.482	.5%
	Campanulariidae indet.	.760	.2%	.061	.0%	.106	.0%	.	.	.697	.2%	.108	.0%	.333	.1%	.042	.0%	.182	.0%	.064	.0%
ANTHOZOA	Actiniaria indet.	58.962	13.2%	34.448	11.6%	23.799	.3%	.	.	.005	.0%	48.729	22.6%	7.315	3.2%	5.960	.1%	4.720	.1%	24.718	2.1%
NEMERTINI	Nemertini indet.	.015	.0%	.	.	11.341	.1%	42.138	.9%	.037	.0%	.801	.4%	.355	.2%	9.412	.2%	8.729	.1%	.009	.0%
NEMATODA	Nematoda indet.	.	.	.013	.0%	.	.	.	.	.	.	.219	.1%	.	.	.002	.0%	.	.	.	.
POLYCHAETA	Harmothoe imbricata	.	.	.	.	1.080	.0%	.	.	.	.	.	.	.	.	2.935	.1%	.	.	.	.
	Harmothoe impar	.	.	.	.	.836	.0%	.	.	.	.	.	.	.	.	.442	.0%	.230	.0%	.	.
	Phyllodoce groenlandica	.	.	.029	.0%	.173	.0%	.023	.0%	.016	.0%	.011	.0%	.042	.0%	.188	.0%	.283	.0%	.103	.0%
	Eulalia viridis	.419	.1%	.	.	.	.	.	.	.001	.0%	.008	.0%	.002	.0%	.475	.0%	.006	.0%	.008	.0%
	Nereididae indet.	.	.	.	.	.034	.0%	.748	.0%	.	.	.	.	.	.	.232	.0%	.	.	.	.
	Nereis pelagica	.	.	.	.	.	.	.	.	.	.	.	.	.008	.0%	.	.	.562	.0%	.	.
	Neanthes virens	.	.	.	.	.391	.0%	.884	.0%	.	.	.	.	.	.	.087	.0%	.453	.0%	.	.
	Capitella capitata	.	.	.	.	.007	.0%	.	.	.	.	.	.	.002	.0%	.	.	.	.	.140	.0%
	Pomatoceros triqueter	2.965	.7%	1.360	.5%	.408	.0%	.	.	3.969	1.0%	1.110	.5%	2.342	1.0%	2.221	.0%	.045	.0%	3.420	.3%
PYCNOGONIDA	Phoxichilidium femoratum	.	.	.	.	.	.	.	.	.	.	.	.	.001	.0%	.	.	.	.	.	.
CRUSTACEA	Verruca stroemia	.	.	.	.	.040	.0%	.	.	.	.	.051	.0%	.030	.0%	.	.	.	.	.083	.0%
	Balanus balanus	.	.	.	.	1.431	.0%	1229.006	25.0%	.	.	.	.	.	.	1.848	.0%	403.500	4.4%	.	.
	Balanus crenatus	.238	.1%	.450	.2%	.	.	.	.	.027	.0%	2.060	1.0%	.173	.1%	1.845	.0%	.	.	.400	.0%
	Caridea indet.	.	.	.	.	.	.	.	.	.003	.0%	.	.	.	.	.	.	.	.	.	.
	Corystes cassivelaunus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.008	.0%
	Cancer pagurus	.420	.1%	.057	.0%	.850	.0%	.595	.0%	.016	.0%	.444	.2%	.370	.2%	1.438	.0%	.285	.0%	.307	.0%
	Corophium crassicorne	.	.	.	.	.002	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Jassa marmorata	101.173	22.7%	106.318	35.8%	182.488	2.1%	298.591	6.1%	65.744	17.2%	65.822	30.5%	87.678	38.6%	232.053	4.4%	288.960	3.2%	42.563	3.6%
	Caprella linearis	21.983	4.9%	53.172	17.9%	62.299	.7%	.108	.0%	36.317	9.5%	11.108	5.1%	15.909	7.0%	81.303	1.5%	15.243	.2%	4.945	.4%
CHIRONOMIDAE	Telmatogeton japonicus	.	.	.025	.0%	.022	.0%	2.820	.1%	.014	.0%	.280	.1%	.	.	.	.	.085	.0%	.	.
GASTROPODA	Rissoidae indet.	.124	.0%	.004	.0%	.040	.0%	.004	.0%	.017	.0%	.023	.0%	.014	.0%	.326	.0%	.156	.0%	.018	.0%
	Crepidula fornicata	16.698	3.8%	13.438	4.5%	.078	.0%	.	.	5.790	1.5%	23.626	10.9%	5.388	2.4%	4.131	.1%	5.180	.1%	.404	.0%
	Nudibranchia indet.	.140	.0%	.059	.0%	.033	.0%	.	.	.054	.0%	.061	.0%	.007	.0%	.	.	.	.	.078	.0%
	Onchidoris muricata	.	.	.	.	.021	.0%	.	.	.041	.0%	.	.	.017	.0%	.007	.0%	.	.	.020	.0%
BIVALVIA	Mytilus edulis	.998	.2%	.262	.1%	8335.253	96.0%	3344.036	68.0%	.042	.0%	14.250	6.6%	.537	.2%	4867.761	91.5%	8335.884	91.7%	.233	.0%
	Ostrea edulis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.806	.0%	.	.	.	.
	Heteranomia squamula	.	.	.130	.0%	.034	.0%	.	.	.	.	.	.	.041	.0%	.	.	.	.	.	.
	Moerella pygmaea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.008	.0%	.	.	.	.
	Venerupis senegalensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.180	.0%	.	.	.	.
	Hiatella arctica	.018	.0%	.021	.0%	.	.	.	.	.	.	.	.	.015	.0%	.017	.0%	.005	.0%	.	.
BRYOZOA	Bryozoa indet.	2.027	.5%	.957	.3%	.	.	.	.	.044	.0%	.	.	.224	.1%	.	.	.	.	.	.
	Electra pilosa	37.250	8.4%	38.389	12.9%	24.744	.3%	.071	.0%	12.735	3.3%	1.286	.6%	27.843	12.2%	42.506	.8%	12.808	.1%	24.192	2.0%
ECHINODERMATA	Asterias rubens	79.313	17.8%	31.112	10.5%	20.232	.2%	.	.	246.060	64.5%	27.949	12.9%	14.967	6.6%	38.652	.7%	6.792	.1%	1082.390	90.9%
	Strongylocentrotus droebachiensis	.	.	.010	.0%	.	.	.	.	.	.	.	.	.	.	.472	.0%	.	.	.007	.0%
Total		445.027	100.0%	296.967	100.0%	8686.874	100.0%	4919.025	100.0%	381.566	100.0%	215.876	100.0%	227.390	100.0%	5320.736	100.0%	9086.243	100.0%	1190.592	100.0%

2004-Spring

		Transect																			
		Turbine tower, vertical																			
		NNE 02		NNE 04		NNE 06		NNE 08		NNE Bottom		SSW 02		SSW 04		SSW 06		SSW 08		SSW Bottom	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
HYDROZOA	Tubularia indivisa	.	.	.	.	.	.	.	.	.	.	.	.	.011	.0%	.	.	.	.	.725	.2%
	Campanulariidae indet.	.	.	.006	.0%	.	.	.	.	.147	.1%	.	.	.003	.0%	.	.	.	.	.	.
ANTHOZOA	Actiniaria indet.	6.165	1.1%	17.056	2.4%	19.213	.2%	.	.	12.773	4.8%	16.472	1.5%	5.494	.9%	10.344	.1%	.	.	5.669	1.6%
NEMERTINI	Nemertini indet.	.050	.0%	.185	.0%	15.806	.2%	1.448	.0%	.055	.0%	.127	.0%	.047	.0%	4.115	.0%	3.270	.1%	.100	.0%
NEMATODA	Nematoda indet.	.	.	.	.	.	.	.	.	.	.	.005	.0%	.	.	.	.	.	.	.	.
POLYCHAETA	Harmothoe imbricata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.565	.0%	.	.	.	.
	Harmothoe impar	.015	.0%	.018	.0%	2.929	.0%	.216	.0%	.010	.0%	.121	.0%	.013	.0%	.214	.0%	.202	.0%	.	.
	Phyllodoce groenlandica	.	.	.197	.0%	.073	.0%	.369	.0%	.	.	.110	.0%	.328	.1%	.	.	.101	.0%	.	.
	Eulalia viridis	.206	.0%	.	.	.183	.0%	.331	.0%	.	.	.027	.0%	.122	.0%	.	.	.295	.0%	.023	.0%
	Syllidae indet.	.	.	.	.	.	.	.	.	.	.	.018	.0%	.	.	.	.	.	.	.008	.0%
	Nereis pelagica	.	.	.	.	7.695	.1%	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Neanthes virens	.	.	.	.	.	.	.372	.0%	.	.	.	.	.	.	.	.	.	.	.	.
	Pomatoceros triqueter	4.004	.7%	2.246	.3%	.007	.0%	.	.	3.785	1.4%	7.047	.6%	5.063	.8%	.580	.0%	.	.	1.865	.5%
CRUSTACEA	Verruca stroemia	.	.	.	.	.120	.0%	.	.	.	.	.	.	.100	.0%	.	.	.	.	.	.
	Balanus balanus	.	.	.	.	.	.	78.429	.8%	.	.	.	.	.	.	.683	.0%	49.984	.8%	.	.
	Balanus crenatus	2.180	.4%	3.203	.5%	3.475	.0%	.	.	.046	.0%	1.786	.2%	6.839	1.1%	4.818	.0%	.	.	.028	.0%
	Brachyura indet.	.	.	.	.	.803	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cancer pagurus	.036	.0%	.132	.0%	11.735	.1%	.	.	.	.	.	.	.038	.0%	8.301	.1%	1.007	.0%	.	.
	Pisidia longicornis	.	.	.	.	.293	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Jassa marmorata	417.598	73.6%	530.581	75.0%	307.335	3.2%	71.042	.8%	155.147	57.9%	898.530	79.5%	532.073	84.9%	551.103	4.5%	70.042	1.1%	207.605	58.9%
	Caprella linearis	76.515	13.5%	32.743	4.6%	101.426	1.1%	1.688	.0%	13.720	5.1%	43.493	3.8%	26.505	4.2%	13.330	.1%	.428	.0%	45.824	13.0%
CHIRONOMIDAE	Chironomidae indet.	.	.	.	.	.	.	.013	.0%	.	.	.	.	.	.	.	.	.010	.0%	.	.
	Telmatogeton japonicus	.	.	.	.	.	.	4.904	.1%	.	.	.	.	.	.	.	.	8.432	.1%	.	.
GASTROPODA	Rissoidae indet.	.	.	.	.	.	.	.012	.0%	.008	.0%	.009	.0%	.	.	.	.	.005	.0%	.	.
	Crepidula fornicata	13.920	2.5%	28.114	4.0%	.	.	.	.	9.432	3.5%	105.176	9.3%	36.683	5.9%	11.324	.1%	.	.	8.607	2.4%
	Nudibranchia indet.	.214	.0%	.250	.0%	.009	.0%	.	.	.	.	.	.	.273	.0%	.057	.0%	.	.	.019	.0%
	Onchidoris muricata	1.824	.3%	.724	.1%	.128	.0%	.	.	.094	.0%	.213	.0%	.007	.0%	.	.	.	.	.	.
	Polycera quadrilineata	.230	.0%	.131	.0%	.087	.0%	.	.	.030	.0%	.666	.1%	.156	.0%	.012	.0%	.	.	.067	.0%
	Aeolidia papillosa	.205	.0%	5.992	.8%	.097	.0%	.	.	.149	.1%	.374	.0%	.504	.1%	.302	.0%	.	.	.	.
BIVALVIA	Mytilus edulis	.081	.0%	1.473	.2%	9033.851	94.8%	9118.379	98.3%	.100	.0%	.575	.1%	1.366	.2%	11503.015	94.8%	6070.800	97.8%	.210	.1%
	Ostrea edulis	.	.	.	.	.803	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Heteranomia squamula	.181	.0%	.635	.1%	.	.	.	.	.	.	.	.	.287	.0%	.	.	.	.	.	.
	Hiatella arctica	.043	.0%	.	.	.173	.0%	.052	.0%	.	.	.040	.0%	.019	.0%	.024	.0%	.055	.0%	.	.
BRYOZOA	Electra pilosa	11.895	2.1%	29.016	4.1%	18.971	.2%	.008	.0%	10.032	3.7%	45.049	4.0%	4.379	.7%	18.397	.2%	.694	.0%	1.515	.4%
	Alcyonidium sp.	3.946	.7%	.665	.1%	.678	.0%	.	.	7.183	2.7%	2.633	.2%	.	.	.	.	.	.	12.375	3.5%
ECHINODERMATA	Asterias rubens	28.108	5.0%	53.712	7.6%	.	.	.	.	55.226	20.6%	7.953	.7%	6.727	1.1%	.	.	.	.	67.693	19.2%
	Strongylocentrotus droebachiensis	.	.	.	.	.070	.0%	.	.	.	.	.	.	.	.	.398	.0%	.	.	.	.
Total		567.416	100.0%	707.078	100.0%	9525.958	100.0%	9277.261	100.0%	267.938	100.0%	1130.424	100.0%	627.032	100.0%	12128.582	100.0%	6205.323	100.0%	352.334	100.0%

2004-Autumn

		Transect																							
		Turbine tower, vertical																							
		NNE 02		NNE 04		NNE 06		NNE 08		NNE 10		NNE Bottom		SSW 02		SSW 04		SSW 06		SSW 08		SSW 10		SSW Bottom	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
HYDROZOA	Tubularia indivisa	.041	.0%	.527	.1%	.819	.1%	.	.	.	.	.526	.1%	1.307	.2%	.145	.0%	.060	.0%	.010	.0%	.	.	.348	.1%
	Hydractinia echinata	.	.	.370	.1%	.180	.0%	.	.	.	.	.095	.0%	.	.	.	.	.	.	.	.	.	.	.	.
	Campanulariidae indet.	.062	.0%	.042	.0%	.013	.0%	.	.	.	.	.063	.0%	.006	.0%	.	.	.031	.0%	.	.	.	.	.043	.0%
ANTHOZOA	Actiniaria indet.	5.772	1.0%	3.167	.5%	37.181	2.8%	21.416	.2%	.	.	.759	.1%	7.358	1.1%	.196	.0%	16.547	.1%	.	.	.	.	1.600	.3%
NEMERTINI	Nemertini indet.	.	.	.	.	.	.	.175	.0%	.	.	.	.	.	.	.	.	1.610	.0%	3.326	.1%	.	.	.	.
NEMATODA	Nematoda indet.	.015	.0%	.002	.0%	.004	.0%	.	.	.	.	.012	.0%	.009	.0%	.006	.0%	.012	.0%	.	.	.	.	.003	.0%
POLYCHAETA	Harmothoe imbricata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3.436	.0%	.	.	.	.	.	.
	Harmothoe impar	.010	.0%	.095	.0%	.064	.0%	.	.	.	.	.027	.0%	.036	.0%	.	.	1.478	.0%	.	.	.	.	.	.
	Phyllodoce groenlandica	.	.	.	.	.026	.0%	.	.	.	.	.	.	.006	.0%	.	.	.054	.0%	.	.	.	.	.	.
	Eulalia viridis	.341	.1%	.208	.0%	.213	.0%	.105	.0%	.	.	.292	.0%	.126	.0%	.625	.1%	.452	.0%	.056	.0%	.	.	.235	.0%
	Ophiodromus flexuosus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.007	.0%	.	.	.	.	.	.
	Nereis pelagica	.	.	.	.	.	.	.422	.0%	.	.	.	.	.	.	.	.	.	.	.118	.0%	.	.	.	.
	Cirratulidae indet.	.000	.0%	.	.	.	.	.002	.0%	.	.	.	.	.	.	.007	.0%	.	.	.003	.0%	.	.	.000	.0%
	Terebellidae indet.	.	.	.	.	.	.	.	.	.	.	.013	.0%	.	.	.	.	.	.	.	.	.	.	.	.
	Pomatoceros triqueter	2.511	.4%	1.713	.3%	.471	.0%	.	.	.	.	3.043	.5%	2.662	.4%	3.020	.5%	.667	.0%	.	.	.	.	3.015	.6%
CRUSTACEA	Verruca stroemia	.064	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.021	.0%
	Balanus balanus	.	.	.	.	73.143	5.5%	106.738	1.1%	373.678	97.5%	.	.	90.407	13.5%	.	.	.009	.0%	34.463	.6%	643.368	60.6%	14.254	2.6%
	Balanus crenatus	1.040	.2%	.295	.1%	.232	.0%	.	.	.	.	.025	.0%	.621	.1%	.815	.1%	1.010	.0%	.	.	.	.	.081	.0%
	Cancer pagurus	2.710	.5%	5.451	.9%	9.117	.7%	8.089	.1%	.	.	10.329	1.6%	4.359	.7%	4.823	.7%	10.740	.1%	4.805	.1%	.	.	7.340	1.3%
	Jassa marmorata	333.247	59.6%	306.401	52.7%	769.336	58.1%	410.862	4.3%	6.194	1.6%	423.737	63.7%	291.334	43.5%	388.019	60.2%	436.709	3.7%	417.348	7.0%	411.700	38.7%	39.778	62.2%
	Caprella linearis	161.965	29.0%	119.938	20.6%	86.020	6.5%	63.945	.7%	.083	.0%	76.624	11.5%	81.251	12.1%	93.085	14.4%	120.829	1.0%	72.985	1.2%	.015	.0%	26.786	4.9%
CHIRONOMIDAE	Telmatogeton japonicus	.293	.1%	.143	.0%	.003	.0%	.994	.0%	3.391	.9%	.495	.1%	.	.	.	.	.005	.0%	2.170	.0%	7.381	.7%	.009	.0%
GASTROPODA	Rissoidae indet.	.012	.0%	.041	.0%	.166	.0%	.385	.0%	.	.	.069	.0%	.077	.0%	.089	.0%	.195	.0%	.351	.0%	.	.	.100	.0%
	Crepidula fornicata	23.038	4.1%	114.809	19.7%	.005	.0%	97.531	1.0%	.	.	.033	.0%	130.174	19.4%	108.071	16.8%	26.125	.2%	.030	.0%	.	.	10.755	2.0%
	Hinia pygmaea	.	.	.	.	.	.	.006	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Nudibranchia indet.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.294	.0%	.	.	.	.	.	.	.	.
	Onchidoris muricata	.019	.0%	.006	.0%	.021	.0%	.	.	.	.	.007	.0%	.021	.0%	.018	.0%	.	.	.	.	.	.	.012	.0%
	Polycera quadrilineata	.755	.1%	1.327	.2%	1.491	.1%	.375	.0%	.	.	.205	.0%	.304	.0%	1.132	.2%	.625	.0%	.150	.0%	.	.	.171	.0%
	Aeolidia papillosa	.344	.1%	1.032	.2%	.325	.0%	1.287	.0%	.	.	.339	.1%	.202	.0%	.975	.2%	2.011	.0%	.050	.0%	.	.	.	.
BIVALVIA	Mytilus edulis	1.145	.2%	.190	.0%	314.058	23.7%	8743.565	92.4%	.010	.0%	.138	.0%	.246	.0%	.776	.1%	11246.523	94.7%	5411.395	90.9%	.	.	.239	.0%
	Modiolarca tumida	.	.	.	.	.	.	.014	.0%	.	.	.019	.0%	.	.	.	.	.	.	.004	.0%	.	.	.	.
	Heteranomia squamula	.	.	.	.	.031	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Thracia phaseolina	.	.	.	.	.	.	.152	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BRYOZOA	Bryozoa indet.	.	.	.	.	.	.	.145	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Electra pilosa	3.331	.6%	5.825	1.0%	13.138	1.0%	1.248	.0%	.	.	7.370	1.1%	6.265	.9%	6.542	1.0%	3.860	.0%	3.493	.1%	.	.	1.992	.4%
	Alcyonidium sp.	.967	.2%	3.035	.5%	2.420	.2%	.	.	.	.	.518	.1%	18.778	2.8%	.399	.1%	.014	.0%	.167	.0%	.	.	1.467	.3%
ECHINODERMATA	Asterias rubens	21.532	3.9%	16.949	2.9%	16.149	1.2%	5.523	.1%	.	.	140.033	21.1%	33.895	5.1%	35.541	5.5%	7.020	.1%	.665	.0%	.	.	38.406	25.3%
	Ophiura albida	.	.	.006	.0%	.	.	.	.	.	.	.003	.0%	.	.	.	.	.	.	.	.	.	.	.004	.0%
	Strongylocentrotus droebachiensis	.	.	.	.	.114	.0%	.	.	.	.	.	.	.	.	.234	.0%	.	.	.	.	.	.	.	.
Total		559.214	100.0%	581.573	100.0%	1324.740	100.0%	9462.980	100.0%	383.355	100.0%	664.771	100.0%	669.443	100.0%	644.814	100.0%	11880.028	100.0%	5951.591	100.0%	1062.464	100.0%	46.658	100.0%

2005-Spring

		Transect																							
		Turbine tower, vertical																							
		NNE 02		NNE 04		NNE 06		NNE 08		NNE 10		NNE Bottom		SSW 02		SSW 04		SSW 06		SSW 08		SSW 10		SSW Bottom	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
HYDROZOA	Tubularia indivisa	1.994	.5%	.335	.1%	.839	.0%	.	.	.	.	1.366	.5%	.171	.0%	.397	.1%	.136	.0%	.	.	.	.	1.806	1.1%
	Hydractinia echinata	.180	.0%	.407	.1%	.	.	.	.	.	.	.	.	.001	.0%	.915	.3%	.	.	.	.	.	.	.419	.3%
	Campanulariidae indet.	.	.	.	.	.125	.0%	.	.	.	.	.	.	.002	.0%	.	.	.043	.0%	.043	.0%	.	.	.851	.5%
ANTHOZOA	Actiniaria indet.	.951	.2%	40.472	13.2%	22.680	.1%	.	.	.	.	1.697	.6%	1.506	.4%	.719	.2%	.077	.0%	.	.	.	.	61.583	39.0%
NEMERTINI	Nemertini indet.	.	.	.003	.0%	3.998	.0%	.	.	.	.	.	.	.	.	.	.	.428	.0%	.	.	.	.	.	.
NEMATODA	Nematoda indet.	.030	.0%	.014	.0%	.368	.0%	.026	.1%	.003	.0%	.012	.0%	.027	.0%	.172	.1%	.040	.0%	.005	.0%	.	.	.015	.0%
POLYCHAETA	Lepidonotus squamatus	.	.	.	.	4.949	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Harmothoe imbricata	.	.	.	.	8.260	.1%	.	.	.	.	.	.	.	.	.	.	4.161	.0%	.	.	.	.	.	.
	Harmothoe impar	.	.	.	.	.061	.0%	.	.	.	.	.	.	.	.	.	.	1.727	.0%	.	.	.	.	.	.
	Eulalia viridis	.900	.2%	.584	.2%	2.985	.0%	.	.	.	.	1.424	.5%	2.298	.6%	1.901	.6%	.500	.0%	.003	.0%	.	.	.706	.4%
	Hesionidae indet.	.	.	.025	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Ophiodromus flexuosus	.069	.0%	.	.	.	.	.	.	.	.	.021	.0%	.	.	.	.	.	.	.	.	.	.	.	.
	Syllidae indet.	.	.	.	.	.012	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Chaetopterus norvegicus	.017	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Pomatoceros triqueter	1.743	.4%	.945	.3%	.672	.0%	.	.	.	.	1.930	.7%	5.103	1.4%	3.843	1.2%	3.598	.0%	.	.	.	.	1.036	.7%
CRUSTACEA	Verruca stroemia	.	.	.048	.0%	.	.	.	.	.	.	.180	.1%	.	.	.035	.0%	.011	.0%	.006	.0%	.	.	.	.
	Balanus balanus	9.074	2.2%	.055	.0%	1.763	.0%	.	.	.	.	.	.	.	.	44.498	13.9%	.	.	15.738	.2%	.	.	.	.
	Balanus crenatus	.	.	.278	.1%	.095	.0%	.	.	.	.	.027	.0%	.	.	.	.	.	.	.	.	.	.	.	.
	Cancer pagurus	1.391	.3%	.532	.2%	29.154	.2%	.	.	.	.	.	.	.743	.2%	.	.	34.985	.2%	.827	.0%	.	.	.	.
	Pisidia longicornis	.	.	.	.	.544	.0%	.	.	.	.	.	.	.	.	.	.	.053	.0%	.	.	.	.	.	.
	Jassa marmorata	60.635	14.8%	63.083	20.6%	47.948	.3%	22.736	56.3%	.035	.2%	50.692	17.7%	59.421	16.2%	52.659	16.5%	57.004	.4%	15.390	.2%	.089	.3%	32.119	20.3%
	Atylus swammerdami	.	.	.	.	.	.	.	.	.	.	.020	.0%	.	.	.	.	.	.	.	.	.	.	.	.
	Caprella linearis	41.031	10.0%	24.277	7.9%	11.840	.1%	.006	.0%	.	.	5.803	2.0%	24.638	6.7%	29.057	9.1%	8.921	.1%	.138	.0%	.	.	2.089	1.3%
CHIRONOMIDAE	Telmatogeton japonicus	.	.	.	.	.011	.0%	7.028	17.4%	18.389	99.8%	.032	.0%	.	.	.	.	.020	.0%	8.378	.1%	25.634	99.7%	.	.
GASTROPODA	Tectura testudinalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.058	.0%	.	.	.	.	.	.	.004	.0%
	Rissoidae indet.	.	.	.	.	.183	.0%	.	.	.	.	.012	.0%	.	.	.	.	.058	.0%	.016	.0%	.	.	.060	.0%
	Crepidula fornicata	187.998	45.8%	153.344	50.1%	11.215	.1%	7.034	17.4%	.	.	.	.	231.547	63.1%	162.205	50.7%	39.175	.2%	.	.	.	.	.011	.0%
	Polinices polianus	.	.	.	.	.	.	.009	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Onchidoris muricata	.234	.1%	1.218	.4%	1.138	.0%	.	.	.	.	.439	.2%	.203	.1%	.	.	1.158	.0%	.	.	.	.	.191	.1%
	Polycera quadrilineata	.	.	.	.	.178	.0%	.	.	.	.	.	.	.	.	.085	.0%	.	.	.	.	.	.	.	.
	Facelina bostoniensis	.	.	.	.	.034	.0%	.	.	.	.	.013	.0%	.	.	.028	.0%	.027	.0%	.012	.0%	.	.	.014	.0%
	Aeolidia papillosa	.	.	.	.	.	.	.	.	.	.	.	.	.055	.0%	.	.	.009	.0%	.	.	.	.	.	.
BIVALVIA	Mytilus edulis	.313	.1%	.676	.2%	15604.052	98.8%	1.484	3.7%	.	.	.348	.1%	.229	.1%	.403	.1%	15785.122	98.9%	6759.733	99.4%	.	.	.097	.1%
	Heteranomia squamula	.	.	.	.	.	.	.	.	.	.	.278	.1%	.	.	.	.	.	.	.	.	.	.	.	.
	Hiatella arctica	.	.	.	.	.957	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BRYOZOA	Bryozoa indet.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.060	.0%
	Electra pilosa	1.020	.2%	.297	.1%	1.147	.0%	.127	.3%	.	.	.685	.2%	3.748	1.0%	4.415	1.4%	1.615	.0%	.139	.0%	.	.	.130	.1%
	Alcyonidium sp.	87.967	21.4%	1.390	.5%	3.713	.0%	.	.	.	.	1.033	.4%	35.089	9.6%	9.911	3.1%	1.178	.0%	.	.	.	.	10.078	6.4%
ECHINODERMATA	Asterias rubens	14.735	3.6%	17.820	5.8%	42.333	.3%	1.912	4.7%	.	.	220.610	77.0%	1.928	.5%	8.620	2.7%	21.319	.1%	.	.	.	.	46.631	29.5%
	Strongylocentrotus droebachiensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3.586	.0%	.	.	.	.	.	.
Total		410.280	100.0%	305.803	100.0%	15801.253	100.0%	40.361	100.0%	18.426	100.0%	286.618	100.0%	366.709	100.0%	319.922	100.0%	15964.949	100.0%	6800.427	100.0%	25.723	100.0%	57.900	100.0%

2005-Autumn

		Transect																			
		Turbine tower, vertical																			
		NNE 02		NNE 04		NNE 06		NNE 08		NNE Bottom		SSW 02		SSW 04		SSW 06		SSW 08		SSW Bottom	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
PORIFERA	Porifera indet.	.	.	.006	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Halichondria panicea	.	.	.	.	.	.	.	.	1.002	.1%	.	.	.	.	.	.	.	.	.	.
HYDROZOA	Tubularia indivisa	6.127	.8%	6.307	.7%	1.769	.0%	.306	.0%	.838	.1%	.954	.1%	8.294	.9%	5.063	.0%	1.480	.0%	1.310	.2%
	Hydractinia echinata	.398	.1%	.259	.0%	.	.	.	.	.345	.0%	.020	.0%	.152	.0%	.	.	.	.	2.300	.3%
	Campanulariidae indet.	.102	.0%	.116	.0%	.062	.0%	.	.	.047	.0%	.448	.0%	.235	.0%	.	.	.	.	.076	.0%
	Sertularia cupressina	.	.	.	.	.	.	.	.	.040	.0%	.	.	.	.	.	.	.	.	.	.
ANTHOZOA	Alcyonium digitatum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.321	.0%
	Actiniaria indet.	44.017	5.6%	213.790	22.6%	32.782	.2%	.338	.0%	12.392	1.6%	98.267	7.2%	16.914	1.9%	54.258	.2%	1.819	.0%	22.368	2.9%
NEMERTINI	Nemertini indet.	.131	.0%	.163	.0%	14.752	.1%	45.985	.4%	.011	.0%	.085	.0%	.253	.0%	.711	.0%	7.071	.0%	.005	.0%
NEMATODA	Nematoda indet.	.015	.0%	.121	.0%	.059	.0%	.280	.0%	.034	.0%	.025	.0%	.018	.0%	.036	.0%	.022	.0%	.057	.0%
POLYCHAETA	Lepidonotus squamatus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2.785	.0%	.	.	.	.
	Harmothoe imbricata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.755	.0%	.	.	.	.
	Harmothoe impar	.050	.0%	.003	.0%	.600	.0%	.124	.0%	.035	.0%	.011	.0%	.012	.0%	.532	.0%	.111	.0%	.073	.0%
	Phyllodoce groenlandica	.	.	.	.	.005	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Eulalia viridis	.696	.1%	1.873	.2%	4.755	.0%	1.153	.0%	1.173	.2%	2.218	.2%	1.411	.2%	3.021	.0%	.693	.0%	1.258	.2%
	Polydora cornuta	.	.	.	.	.	.	.	.	.	.	.006	.0%	.	.	.	.	.	.	.	.
	Chaetopterus norvegicus	.	.	.	.	.	.	.	.	.	.	.020	.0%	.	.	.012	.0%	.	.	.030	.0%
	Pomatoceros triqueter	.469	.1%	.018	.0%	.	.	.	.	3.522	.5%	2.438	.2%	.410	.0%	.271	.0%	.	.	1.506	.2%
CRUSTACEA	Harpacticoida indet.	.	.	.	.	.	.	.	.	.022	.0%	.	.	.	.	.	.	.	.	.	.
	Verruca stroemia	.434	.1%	.629	.1%	1.948	.0%	.	.	.807	.1%	.347	.0%	.485	.1%	.091	.0%	.	.	.643	.1%
	Balanus balanus	3.947	.5%	2.133	.2%	804.978	5.8%	1413.793	11.4%	1.016	.1%	110.592	8.1%	47.449	5.3%	15.573	.1%	.035	.0%	1.006	.1%
	Cancer pagurus	1.608	.2%	2.571	.3%	17.716	.1%	3.195	.0%	1.715	.2%	2.052	.2%	1.641	.2%	2438.138	10.8%	1.758	.0%	5.094	.7%
	Pilumnus hirtellus	.	.	.	.	2.800	.0%	.	.	.	.	.	.	.	.	2.595	.0%	.	.	.	.
	Pisidia longicornis	.	.	.015	.0%	.012	.0%	.	.	.005	.0%	.	.	.	.	.	.	.	.	.	.
	Stenothoe sp.	.	.	.	.	.	.	.	.	.	.	.075	.0%	.	.	.	.	.	.	.019	.0%
	Jassa marmorata	430.705	55.2%	512.295	54.2%	673.978	4.9%	291.013	2.3%	486.679	64.3%	386.455	28.3%	513.972	57.4%	617.987	2.7%	361.787	1.4%	343.405	44.7%
	Atylus swammerdami	.016	.0%	.020	.0%	.022	.0%	.	.	.047	.0%	.076	.0%	.030	.0%	.008	.0%	.	.	.123	.0%
	Caprella linearis	81.174	10.4%	139.383	14.8%	251.230	1.8%	.622	.0%	107.478	14.2%	121.974	8.9%	91.686	10.2%	127.818	.6%	.046	.0%	59.644	7.8%
CHIRONOMIDAE	Telmatogeton japonicus	.018	.0%	.	.	.	.	1.852	.0%	.037	.0%	.022	.0%	.036	.0%	.005	.0%	1.680	.0%	.	.
GASTROPODA	Rissoidae indet.	.029	.0%	.012	.0%	.017	.0%	.083	.0%	.107	.0%	.053	.0%	.005	.0%	.031	.0%	.070	.0%	.167	.0%
	Crepidula fornicata	127.853	16.4%	34.806	3.7%	37.086	.3%	.	.	1.850	.2%	408.838	30.0%	202.651	22.6%	132.199	.6%	.004	.0%	224.607	29.3%
	Polinices polianus	.	.	.041	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Nudibranchia indet.	.	.	.	.	.	.	.	.	.019	.0%	.	.	.	.	.	.	.	.	.	.
	Onchidoris muricata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.015	.0%	.	.	.027	.0%
	Polycera quadrilineata	.656	.1%	.823	.1%	1.708	.0%	.234	.0%	.226	.0%	.491	.0%	.566	.1%	4.624	.0%	.	.	.169	.0%
	Facelina bostoniensis	2.077	.3%	1.153	.1%	.651	.0%	.	.	.558	.1%	.637	.0%	.971	.1%	.612	.0%	.050	.0%	.365	.0%
	Aeolidia papillosa	.	.	.	.	.	.	.	.	.	.	.040	.0%	.837	.1%	.017	.0%	.	.	.	.
BIVALVIA	Mytilus edulis	2.032	.3%	4.358	.5%	11538.779	83.6%	10623.984	85.8%	1.804	.2%	2.705	.2%	3.290	.4%	19000.936	83.8%	25293.875	98.5%	2.674	.3%
	Tridonta borealis	.	.	.	.	.	.	.	.	.	.	.007	.0%	.	.	.	.	.	.	.	.
	Angulus tenuis	.	.	.	.	.	.	.	.	.	.	.001	.0%	.	.	.	.	.	.	.	.
	Fabulina fabula	.	.	.	.	.	.	.	.	.	.	.027	.0%	.	.	.	.	.	.	.	.
	Moerella pygmaea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.016	.0%	.	.	.008	.0%
	Donax vittatus	.	.	.	.	.	.	.013	.0%	.	.	.	.	.	.	.	.	.	.	.	.
	Hiatella arctica	.	.	.007	.0%	.024	.0%	.141	.0%	.020	.0%	.012	.0%	.013	.0%	.026	.0%	.009	.0%	.	.
	Phaxas pellucidus	.	.	.	.	.	.	.	.	.	.	.007	.0%	.	.	.	.	.	.	.	.
BRYOZOA	Electra pilosa	3.988	.5%	5.423	.6%	2.753	.0%	.263	.0%	4.761	.6%	5.111	.4%	4.332	.5%	3.073	.0%	.269	.0%	1.549	.2%
	Alcyonidium sp.	63.075	8.1%	17.993	1.9%	7.470	.1%	.406	.0%	32.330	4.3%	197.876	14.5%	.	.	13.347	.1%	.	.	32.238	4.2%
ECHINODERMATA	Asterias rubens	10.010	1.3%	.012	.0%	402.442	2.9%	.	.	97.797	12.9%	22.045	1.6%	.	.	236.283	1.0%	.	.	66.535	8.7%
	Strongylocentrotus droebachiensis	.	.	.	.	.	.	.	.	.035	.0%	.	.	.	.	.011	.0%	.	.	.049	.0%
Total		779.627	100.0%	944.328	100.0%	13798.398	100.0%	12383.781	100.0%	756.750	100.0%	1363.935	100.0%	895.665	100.0%	22660.848	100.0%	25670.779	100.0%	767.626	100.0%

8.4.5. *Appendix 4.6. Mean biomass WW. Scour protections 2003-2005*

2003

Spring

		Transect							
		Foundations, horizontal							
		A 0.5 NNE		B 02 NNE		C 05 NNE		D 05 SSW	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
HYDROZOA	Hydrozoa indet.	.	.	.004	.0%	.	.	.	.
	Thecata indet.	.	.	.	.	.003	.0%	.	.
	Campanulariidae indet.	.	.	.010	.0%	.004	.0%	.	.
ANTHOZOA	Anthozoa indet.	.622	.3%	4.929	2.3%	.	.	.278	.1%
	Actiniaria indet.	4.022	1.9%	3.373	1.6%	7.379	1.3%	2.272	1.0%
NEMERTINI	Nemertini indet.	.023	.0%	.002	.0%	.	.	.002	.0%
POLYCHAETA	Harmothoe impar	.136	.1%	.634	.3%	1.128	.2%	.353	.2%
	Phyllodoce groenlandica	.038	.0%	.278	.1%	.999	.2%	.898	.4%
	Eulalia viridis	.001	.0%	.003	.0%	.025	.0%	.	.
	Chaetopterus norvegicus	.	.	.075	.0%	.054	.0%	.	.
	Pomatoceros triqueter	.003	.0%	.141	.1%	.095	.0%	.024	.0%
CRUSTACEA	Verruca stroemia	.025	.0%	.005	.0%	.	.	.020	.0%
	Balanus crenatus	93.304	45.2%	79.611	37.7%	360.297	65.9%	15.682	7.2%
	Cancer pagurus	.033	.0%	.	.	.096	.0%	.	.
	Corophium crassicorne	.	.	.	.	.003	.0%	.	.
	Jassa marmorata	70.065	34.0%	56.164	26.6%	111.123	20.3%	147.338	67.7%
	Caprella linearis	3.730	1.8%	6.435	3.0%	1.189	.2%	.219	.1%
GASTROPODA	Rissoidae indet.	.003	.0%	.019	.0%	.069	.0%	.006	.0%
	Crepidula fornicata	.053	.0%	.276	.1%	.929	.2%	.060	.0%
	Nudibranchia indet.	.	.	.	.	.269	.0%	.015	.0%
	Onchidoris muricata	.342	.2%	.	.	.045	.0%	.	.
BIVALVIA	Bivalvia indet.	.	.	.006	.0%	.	.	.	.
	Mytilus edulis	2.383	1.2%	3.978	1.9%	1.354	.2%	4.313	2.0%
	Heteranomia squamula	.	.	.010	.0%	.017	.0%	.	.
	Moerella pygmaea	.016	.0%	.045	.0%	.099	.0%	.	.
	Thracia phaseolina	.	.	.	.	.006	.0%	.	.
BRYOZOA	Bryozoa indet.	.	.	.099	.0%	.017	.0%	.	.
	Electra pilosa	.290	.1%	1.372	.6%	1.680	.3%	.411	.2%
ECHINODERMATA	Asterias rubens	31.253	15.1%	53.760	25.5%	60.071	11.0%	45.712	21.0%
	Ophiura albida	.	.	.002	.0%	.004	.0%	.002	.0%
	Strongylocentrotus droebachiensis	.	.	.	.	.	.	.004	.0%
Total		206.342	100.0%	211.231	100.0%	546.955	100.0%	217.608	100.0%

Autumn

		Transect							
		Foundations, horizontal							
		A 0.5 NNE		B 02 NNE		C 05 NNE		D 05 SSW	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
PORIFERA	Porifera indet.	.	.	.	.	.492	.4%	.	.
HYDROZOA	Tubularia indivisa	4.765	2.9%	5.688	2.5%	2.173	1.6%	6.586	4.1%
	Campanulariidae indet.	.142	.1%	.133	.1%	.088	.1%	.098	.1%
ANTHOZOA	Actiniaria indet.	43.808	27.1%	97.761	42.9%	68.143	49.1%	41.939	26.1%
NEMERTINI	Nemertini indet.	.003	.0%	.	.	.009	.0%	.004	.0%
NEMATODA	Nematoda indet.	.003	.0%	.002	.0%	.002	.0%	.002	.0%
POLYCHAETA	Harmothoe impar	.	.	.	.	.002	.0%	.	.
	Phyllodocidae indet.	.	.	.000	.0%	.	.	.	.
	Phyllodoce groenlandica	.050	.0%	.032	.0%	.045	.0%	.026	.0%
	Eulalia viridis	.003	.0%	.003	.0%	.	.	.	.
	Syllidae indet.	.	.	.	.	.	.	.002	.0%
	Nereididae indet.	.001	.0%	.	.	.	.	.	.
	Polydora ciliata	.	.	.	.	.000	.0%	.	.
	Capitella capitata	.	.	.007	.0%	.000	.0%	.	.
	Pomatoceros triqueter	.081	.1%	.270	.1%	.224	.2%	.514	.3%
PYCNOGONIDA	Phoxichilidium femoratum	.001	.0%	.	.	.	.	.	.
CRUSTACEA	Verruca stroemia	.006	.0%	.036	.0%	.054	.0%	.013	.0%
	Balanus crenatus	.310	.2%	.432	.2%	.230	.2%	1.499	.9%
	Cancer pagurus	.017	.0%	.079	.0%	.183	.1%	.087	.1%
	Stenothoe marina	.002	.0%	.	.	.	.	.	.
	Jassa marmorata	32.758	20.3%	27.546	12.1%	22.944	16.5%	41.846	26.0%
	Atylus swammerdami	.	.	.001	.0%	.	.	.	.
	Caprella linearis	6.387	4.0%	3.619	1.6%	1.596	1.1%	4.478	2.8%
	Hyperia galba	.004	.0%	.	.	.	.	.	.
CHIRONOMIDAE	Telmatogeton japonicus	.002	.0%	.	.	.	.	.	.
GASTROPODA	Rissoidae indet.	.233	.1%	.217	.1%	.847	.6%	.154	.1%
	Crepidula fornicata	.433	.3%	5.341	2.3%	1.125	.8%	7.195	4.5%
	Polinices sp.	.	.	.	.	.021	.0%	.	.
	Nudibranchia indet.	.018	.0%	.063	.0%	.023	.0%	.057	.0%
	Onchidoris muricata	.017	.0%	.023	.0%	.024	.0%	.279	.2%
BIVALVIA	Mytilus edulis	.099	.1%	.263	.1%	.124	.1%	3.854	2.4%
	Moerella pygmaea	.	.	.	.	.001	.0%	.001	.0%
	Hiatella arctica	.	.	.001	.0%	.006	.0%	.004	.0%
BRYOZOA	Bryozoa indet.	.019	.0%	.122	.1%	.210	.2%	.	.
	Electra pilosa	2.148	1.3%	1.411	.6%	1.225	.9%	2.279	1.4%
ECHINODERMATA	Asterias rubens	70.229	43.5%	84.703	37.2%	39.036	28.1%	50.027	31.1%
	Strongylocentrotus droebachiensis	.002	.0%	.002	.0%	.002	.0%	.	.
Total		161.538	100.0%	227.756	100.0%	138.832	100.0%	160.945	100.0%

2004

Spring

		Transect							
		Foundations, horizontal							
		A 0.5 NNE		B 02 NNE		C 05 NNE		D 05 SSW	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
PORIFERA	Halichondria panicea	.	.	.009	.0%	.181	.1%	.	.
HYDROZOA	Tubularia indivisa	.712	.5%	.001	.0%	.	.	.089	.0%
	Campanulariidae indet.	.026	.0%	.010	.0%	.016	.0%	.020	.0%
ANTHOZOA	Alcyonium digitatum	.	.	.496	.2%	.244	.1%	.	.
	Actiniaria indet.	12.831	9.7%	40.262	15.9%	80.245	38.6%	21.714	9.0%
NEMERTINI	Nemertini indet.	.034	.0%	.024	.0%	.067	.0%	.031	.0%
POLYCHAETA	Phyllodoce groenlandica	.011	.0%	.140	.1%	.140	.1%	.128	.1%
	Eulalia viridis	.002	.0%	.	.	.001	.0%	.	.
	Syllidae indet.	.	.	.001	.0%	.007	.0%	.	.
	Polydora ciliata	.	.	.003	.0%	.	.	.	.
	Capitella capitata	.001	.0%	.009	.0%	.	.	.	.
	Pomatoceros triqueter	.173	.1%	.081	.0%	.461	.2%	.374	.2%
CRUSTACEA	Verruca stroemia	.	.	.	.	.013	.0%	.012	.0%
	Balanus crenatus	.008	.0%	.015	.0%	.424	.2%	.009	.0%
	Corystes cassivelaunus	.	.	.002	.0%	.003	.0%	.	.
	Cancer pagurus	.	.	.	.	.	.	.013	.0%
	Jassa marmorata	87.032	66.0%	159.154	63.0%	70.668	34.0%	155.237	64.5%
	Caprella linearis	8.311	6.3%	4.268	1.7%	1.564	.8%	1.690	.7%
GASTROPODA	Rissoidae indet.	.025	.0%	.143	.1%	.145	.1%	.016	.0%
	Crepidula fornicata	.001	.0%	1.124	.4%	3.448	1.7%	5.776	2.4%
	Nudibranchia indet.	.054	.0%	.	.	.024	.0%	.068	.0%
	Onchidoris muricata	.119	.1%	.003	.0%	.003	.0%	.	.
	Polycera quadrilineata	.006	.0%	.199	.1%	.263	.1%	.069	.0%
	Aeolidia papillosa	.004	.0%	.105	.0%	.113	.1%	.032	.0%
BIVALVIA	Mytilus edulis	.111	.1%	.479	.2%	.243	.1%	.085	.0%
	Goodallia triangularis	.002	.0%	.	.	.	.	.	.
	Hiatella arctica	.	.	.	.	.032	.0%	.018	.0%
BRYOZOA	Electra pilosa	1.813	1.4%	2.376	.9%	1.541	.7%	1.331	.6%
	Alcyonidium sp.	.027	.0%	.070	.0%	.	.	.	.
ECHINODERMATA	Asterias rubens	20.539	15.6%	43.715	17.3%	48.022	23.1%	54.067	22.5%
Total		131.840	100.0%	252.688	100.0%	207.868	100.0%	240.779	100.0%

Autumn

		Transect							
		Foundations, horizontal							
		A 0.5 NNE		B 02 NNE		C 05 NNE		D 05 SSW	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
PORIFERA	Porifera indet.	.	.	.	.	.	.	.044	.0%
HYDROZOA	Tubularia indivisa	1.313	.5%	.227	.1%	.859	.4%	.101	.0%
	Campanulariidae indet.	.013	.0%	.048	.0%	.111	.1%	.010	.0%
	Sertularia cupressina	.009	.0%	.	.	.	.	.232	.1%
ANTHOZOA	Alcyonium digitatum	11.878	4.8%	2.880	1.0%	7.471	3.5%	5.708	1.7%
	Actiniaria indet.	19.497	7.9%	34.011	11.9%	70.886	33.1%	9.443	2.8%
NEMERTINI	Nemertini indet.	.	.	.	.	.	.	.006	.0%
NEMATODA	Nematoda indet.	.009	.0%	.005	.0%	.005	.0%	.005	.0%
POLYCHAETA	Phyllodoce groenlandica	.063	.0%	.018	.0%	.130	.1%	.061	.0%
	Eulalia viridis	.060	.0%	.011	.0%	.069	.0%	.123	.0%
	Nereis pelagica	.	.	.	.	.	.	.021	.0%
	Polydora ciliata	.	.	.	.	.	.	.001	.0%
	Cirratulidae indet.	.	.	.000	.0%	.	.	.	.
	Terebellidae indet.	.	.	.	.	.	.	.025	.0%
	Lanice conchilega	.	.	.	.	.009	.0%	.	.
	Sabellaria sp.	.	.	.	.	.005	.0%	.	.
	Pomatoceros triqueter	.539	.2%	.689	.2%	.922	.4%	.484	.1%
CRUSTACEA	Verruca stroemia	.063	.0%	.059	.0%	.344	.2%	.343	.1%
	Balanus crenatus	2.626	1.1%	.093	.0%	.444	.2%	.525	.2%
	Cancer pagurus	2.767	1.1%	2.348	.8%	2.053	1.0%	2.137	.6%
	Liocarcinus depurator	.045	.0%	.	.	.	.	.	.
	Jassa marmorata	150.580	61.2%	181.910	63.8%	79.928	37.3%	258.346	76.0%
	Caprella linearis	3.384	1.4%	1.746	.6%	2.574	1.2%	10.324	3.0%
GASTROPODA	Rissoidae indet.	.058	.0%	.085	.0%	.047	.0%	.172	.1%
	Crepidula fornicata	8.577	3.5%	20.774	7.3%	16.432	7.7%	5.670	1.7%
	Hinia pygmaea	.010	.0%	.012	.0%	.055	.0%	.042	.0%
	Nudibranchia indet.	.077	.0%	.	.	.	.	.115	.0%
	Onchidoris muricata	.005	.0%	.	.	.002	.0%	.006	.0%
	Polycera quadrilineata	.094	.0%	.	.	.020	.0%	.085	.0%
	Aeolidia papillosa	.161	.1%	.039	.0%	.276	.1%	.	.
BIVALVIA	Mytilus edulis	.332	.1%	.590	.2%	.144	.1%	.184	.1%
	Angulus tenuis	.001	.0%	.001	.0%	.000	.0%	.003	.0%
	Moerella pygmaea	.009	.0%	.	.	.	.	.	.
	Hiatella arctica	.	.	.003	.0%	.	.	.	.
BRYOZOA	Bryozoa indet.	.	.	.	.	.065	.0%	.	.
	Electra pilosa	2.549	1.0%	.658	.2%	1.308	.6%	3.656	1.1%
	Alcyonidium sp.	.037	.0%	.082	.0%	.096	.0%	.	.
ECHINODERMATA	Asterias rubens	41.289	16.8%	38.867	13.6%	29.984	14.0%	42.226	12.4%
	Ophiura albida	.007	.0%	.011	.0%	.015	.0%	.023	.0%
	Strongylocentrotus droebachiensis	.025	.0%	.002	.0%	.065	.0%	.	.
Total		246.076	100.0%	285.169	100.0%	214.317	100.0%	340.120	100.0%

2005

Spring

		Transect							
		Foundations, horizontal							
		A 0.5 NNE		B 02 NNE		C 05 NNE		D 05 SSW	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
HYDROZOA	Tubularia indivisa	1.802	2.1%	8.305	5.5%	.598	.3%	.586	.2%
	Hydractinia echinata	.	.	.017	.0%	.012	.0%	.	.
	Campanulariidae indet.	.059	.1%	.020	.0%	.000	.0%	.019	.0%
	Sertularia cupressina	.	.	.010	.0%	.	.	.	.
ANTHOZOA	Alcyonium digitatum	1.406	1.7%	.093	.1%	14.089	6.2%	4.832	2.0%
	Actiniaria indet.	24.576	29.3%	38.158	25.1%	74.191	32.6%	52.080	21.1%
NEMERTINI	Nemertini indet.	.	.	.	.	.	.	.004	.0%
NEMATODA	Nematoda indet.	.023	.0%	.033	.0%	.040	.0%	.102	.0%
POLYCHAETA	Harmothoe impar	.053	.1%	.	.	.129	.1%	.003	.0%
	Phyllodoce groenlandica	.	.	.	.	.076	.0%	.071	.0%
	Eulalia viridis	.216	.3%	.065	.0%	.149	.1%	.230	.1%
	Hesionidae indet.	.	.	.	.	.	.	.001	.0%
	Ophiodromus flexuosus	.	.	.017	.0%	.001	.0%	.011	.0%
	Polydora ciliata	.	.	.001	.0%	.002	.0%	.	.
	Pomatoceros triqueter	.966	1.2%	.912	.6%	1.310	.6%	1.038	.4%
CRUSTACEA	Verruca stroemia	.082	.1%	.114	.1%	.317	.1%	.385	.2%
	Balanus balanus	.	.	2.960	2.0%	.	.	.	.
	Balanus sp.	.	.	.	.	.	.	.053	.0%
	Cancer pagurus	.107	.1%	.234	.2%	.035	.0%	.	.
	Jassa marmorata	30.466	36.3%	62.579	41.2%	66.616	29.2%	79.437	32.2%
	Caprella linearis	.387	.5%	.885	.6%	.650	.3%	7.381	3.0%
CHIRONOMIDAE	Telmatogeton japonicus	.011	.0%	.	.	.	.	.015	.0%
GASTROPODA	Tectura testudinalis	.	.	.	.	.	.	.019	.0%
	Rissoidae indet.	.054	.1%	.153	.1%	.049	.0%	.166	.1%
	Crepidula fornicata	.010	.0%	.845	.6%	2.276	1.0%	34.188	13.8%
	Epitonium clathrus	.	.	.001	.0%	.	.	.	.
	Onchidoris muricata	.	.	.099	.1%	.028	.0%	.	.
	Polycera quadrilineata	.	.	.048	.0%	.032	.0%	.085	.0%
	Facelina bostoniensis	.001	.0%	.007	.0%	.016	.0%	.076	.0%
BIVALVIA	Mytilus edulis	.080	.1%	.110	.1%	.097	.0%	.154	.1%
	Thracia phaseolina	.	.	.	.	.002	.0%	.	.
BRYOZOA	Bryozoa indet.	.140	.2%	.	.	.	.	.	.
	Electra pilosa	.396	.5%	.521	.3%	.850	.4%	.710	.3%
	Alcyonidium sp.	.039	.0%	.005	.0%	.137	.1%	.	.
ECHINODERMATA	Asterias rubens	23.055	27.5%	35.575	23.4%	66.185	29.0%	65.255	26.4%
	Ophiura albida	.001	.0%	.	.	.	.	.	.
Total		83.930	100.0%	151.765	100.0%	227.890	100.0%	246.902	100.0%

Autumn

		Transect							
		Foundations, horizontal							
		A 0.5 NNE		B 02 NNE		C 05 NNE		D 05 SSW	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
PORIFERA	Porifera indet.	.000	.0%	.	.	.	.	.	.
HYDROZOA	Tubularia indivisa	1.955	.4%	1.190	.2%	1.612	.3%	1.070	.2%
	Hydractinia echinata	.	.	.	.	.012	.0%	.010	.0%
	Campanulariidae indet.	.072	.0%	.111	.0%	.731	.1%	.181	.0%
	Sertularia cupressina	.322	.1%	.	.	.001	.0%	.009	.0%
ANTHOZOA	Alcyonium digitatum	6.353	1.2%	61.437	11.3%	25.853	5.2%	55.503	10.7%
	Actiniaria indet.	220.763	41.6%	272.300	50.1%	175.496	35.3%	202.466	38.9%
	Actinaridae indet.	.	.	.	.	13.775	2.8%	.	.
NEMERTINI	Nemertini indet.	.006	.0%	.101	.0%	.013	.0%	.016	.0%
NEMATODA	Nematoda indet.	.035	.0%	.129	.0%	.087	.0%	.239	.0%
POLYCHAETA	Harmothoe impar	.042	.0%	.000	.0%	.017	.0%	.014	.0%
	Phyllodoce groenlandica	.017	.0%	.	.	.	.	.004	.0%
	Eulalia viridis	.161	.0%	.156	.0%	.092	.0%	.099	.0%
	Syllidae indet.	.	.	.	.	.	.	.002	.0%
	Polydora cornuta	.	.	.	.	.022	.0%	.	.
	Chaetopterus norvegicus	.014	.0%	.	.	.036	.0%	.025	.0%
	Arenicola marina	.	.	.000	.0%	.	.	.	.
	Lanice conchilega	.	.	.	.	.046	.0%	.006	.0%
	Sabellaria spinulosa	.	.	.	.	.013	.0%	.	.
	Pomatoceros triqueter	1.747	.3%	.843	.2%	.891	.2%	.376	.1%
CRUSTACEA	Copepoda indet.	.	.	.003	.0%	.000	.0%	.	.
	Verruca stroemia	.386	.1%	1.305	.2%	1.239	.2%	.884	.2%
	Balanus balanus	1.632	.3%	.652	.1%	.	.	3.443	.7%
	Balanus crenatus	.	.	.	.	.014	.0%	.189	.0%
	Cancer pagurus	2.609	.5%	1.858	.3%	1.735	.3%	1.424	.3%
	Liocarcinus depurator	.	.	.008	.0%	.132	.0%	.010	.0%
	Pisidia longicornis	.	.	.	.	.002	.0%	.009	.0%
	Pagurus bernhardus	.	.	.005	.0%	.	.	.	.
	Stenothoe sp.	.039	.0%	.	.	.	.	.	.
	Jassa marmorata	226.354	42.6%	140.248	25.8%	208.714	42.0%	176.580	33.9%
	Atylus swammerdami	.101	.0%	.125	.0%	.101	.0%	.103	.0%
	Caprella linearis	11.296	2.1%	7.076	1.3%	3.285	.7%	3.651	.7%
CHIRONOMIDAE	Telmatogeton japonicus	.002	.0%	.	.	.001	.0%	.	.
GASTROPODA	Rissoidae indet.	.260	.0%	.144	.0%	.065	.0%	.080	.0%
	Crepidula fornicata	.289	.1%	8.572	1.6%	18.697	3.8%	33.523	6.4%
	Polinices polianus	.	.	.	.	.	.	.004	.0%
	Hinia pygmaea	.023	.0%	.014	.0%	.015	.0%	.	.
	Onchidoris muricata	.	.	.	.	.030	.0%	.003	.0%
	Polycera quadrilineata	.214	.0%	.090	.0%	.229	.0%	.300	.1%
	Facelina bostoniensis	.252	.0%	.348	.1%	.129	.0%	.129	.0%
	Aeolidia papillosa	.	.	.331	.1%	.184	.0%	.186	.0%
BIVALVIA	Mytilus edulis	2.042	.4%	1.894	.3%	1.164	.2%	3.273	.6%
	Angulus tenuis	.	.	.000	.0%	.	.	.001	.0%
	Moerella pygmaea	.020	.0%	.014	.0%	.023	.0%	.017	.0%
	Hiatella arctica	.003	.0%	.	.	.007	.0%	.010	.0%
	Thracia phaseolina	.006	.0%	.	.	.	.	.	.
BRYOZOA	Bryozoa indet.	.	.	.	.	.	.	.004	.0%
	Electra pilosa	1.127	.2%	1.560	.3%	1.510	.3%	1.493	.3%
	Alcyonidium sp.	2.687	.5%	1.501	.3%	.026	.0%	.284	.1%
ECHINODERMATA	Asterias rubens	50.305	9.5%	39.807	7.3%	41.281	8.3%	34.594	6.6%
	Ophiura albida	.	.	.	.	.003	.0%	.002	.0%
	Strongylocentrotus droebachiensis	.	.	1.238	.2%	.	.	.	.
ASCIDIACEA	Tunicata indet.	.	.	.	.	.070	.0%	.015	.0%
Total		531.136	100.0%	543.061	100.0%	497.356	100.0%	520.230	100.0%

8.4.6. Appendix 4.7. Mean biomass DW. Monopiles 2003-2005

2003-Spring

		Transect																			
		Turbine tower, vertical																			
		NNE 02		NNE 04		NNE 06		NNE 08		NNE Bottom		SSW 02		SSW 04		SSW 06		SSW 08		SSW Bottom	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
HYDROZOA	Tubulariidae indet.	.	.	.	.	.	.	.	.	.	.	.008	.0%	.	.	.	.	.	.	.	.
	Campanulariidae indet.	.	.	.	.	.	.	.	.	.	.	.007	.0%	.	.	.	.	.	.	.004	.0%
ANTHOZOA	Anthozoa indet.	.	.	.490	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.329	.1%
	Actiniaria indet.	.	.	.	.	.	.	.	.	1.548	.4%	.005	.0%	.003	.0%	.	.	.	.	.021	.0%
NEMERTINI	Nemertini indet.	2.899	.8%	.681	.0%	.495	.0%	.111	.0%	.	.	.668	.1%	.795	.1%	1.328	.1%	.	.	.082	.0%
POLYCHAETA	Harmothoe impar	.099	.0%	.100	.0%	.066	.0%	.	.	.341	.1%	.053	.0%	.137	.0%	.035	.0%	.	.	.126	.0%
	Phyllodoce groenlandica	.108	.0%	.056	.0%	.013	.0%	.	.	.032	.0%	.179	.0%	.064	.0%	.	.	.	.	.040	.0%
	Eulalia viridis	.005	.0%	.023	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.017	.0%
	Capitella capitata	.007	.0%	.017	.0%	.004	.0%	.	.	.	.	.	.	.000	.0%	.003	.0%	.	.	.	.
	Pomatoceros triqueter	.254	.1%	.	.	.130	.0%	.	.	.404	.1%	.331	.1%	.207	.0%	.	.	.	.	.444	.1%
CRUSTACEA	Verruca stroemia	.031	.0%	.	.	.039	.0%	.	.	.100	.0%	.065	.0%	.	.	.044	.0%	.	.	.073	.0%
	Balanus balanus	.	.	.	.	81.875	6.6%	411.053	78.4%	.	.	.	.	.	.	181.845	17.1%	325.159	57.4%	.	.
	Balanus crenatus	277.618	76.4%	1458.095	87.6%	896.704	72.5%	.	.	89.722	21.3%	393.773	69.4%	341.599	60.4%	750.148	70.4%	.	.	206.394	59.9%
	Cancer pagurus	.182	.0%	.056	.0%	.070	.0%	.391	.1%	.	.	.207	.0%	.020	.0%	.252	.0%	.	.	.	.
	Aoridae indet.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.019	.0%	.	.	.	.
	Jassa marmorata	75.641	20.8%	125.477	7.5%	165.433	13.4%	49.713	9.5%	122.537	29.1%	123.274	21.7%	125.535	22.2%	99.710	9.4%	146.189	25.8%	56.494	16.4%
	Caprella linearis	2.406	.7%	3.290	.2%	3.198	.3%	.852	.2%	2.218	.5%	2.295	.4%	3.875	.7%	1.015	.1%	.394	.1%	.807	.2%
GASTROPODA	Rissoidae indet.	.026	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.008	.0%
	Crepidula fornicata	1.356	.4%	1.771	.1%	.	.	.	.	.134	.0%	.599	.1%	.087	.0%	.	.	.	.	.	.
	Nudibranchia indet.	.	.	.010	.0%	.	.	.	.	.035	.0%	.	.	.000	.0%	.	.	.	.	.004	.0%
	Onchidoris muricata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.021	.0%
BIVALVIA	Mytilus edulis	2.325	.6%	65.397	3.9%	72.725	5.9%	9.821	1.9%	6.612	1.6%	38.863	6.9%	92.752	16.4%	30.006	2.8%	94.543	16.7%	21.154	6.1%
BRYOZOA	Bryozoa indet.	.	.	.	.	.	.	.	.	.001	.0%	.	.	.	.	.	.	.	.	.	.
	Electra pilosa	.587	.2%	.280	.0%	.408	.0%	.143	.0%	.323	.1%	.429	.1%	.413	.1%	.391	.0%	.	.	.202	.1%
ECHINODERMATA	Asterias rubens	.	.	8.763	.5%	15.096	1.2%	52.347	10.0%	197.751	46.9%	6.470	1.1%	.	.	.	.	.	.	58.163	16.9%
	Strongylocentrotus droebachiensis	.	.	.	.	.	.	.	.	.	.	.	.	.002	.0%	.	.	.	.	.	.
Total		363.545	100.0%	1664.505	100.0%	1236.256	100.0%	524.430	100.0%	421.759	100.0%	567.225	100.0%	565.489	100.0%	1064.797	100.0%	566.284	100.0%	344.383	100.0%

2003-Autumn

		Transect																			
		Turbine tower, vertical																			
		NNE 02		NNE 04		NNE 06		NNE 08		NNE Bottom		SSW 02		SSW 04		SSW 06		SSW 08		SSW Bottom	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
HYDROZOA	Tubularia indivisa	15.574	16.3%	2.142	3.0%	4.346	.1%	.	.	1.570	1.7%	1.909	3.2%	10.973	20.3%	4.540	.1%	.161	.0%	1.247	.3%
	Campanulariidae indet.	.035	.0%	.027	.0%	.033	.0%	.	.	.172	.2%	.022	.0%	.115	.2%	.012	.0%	.009	.0%	.023	.0%
ANTHOZOA	Actiniaria indet.	10.388	10.9%	5.672	8.0%	3.852	.1%	.	.	.003	.0%	9.164	15.2%	1.525	2.8%	1.114	.0%	.953	.0%	4.587	1.3%
NEMERTINI	Nemertini indet.	.007	.0%	.	.	2.834	.0%	11.273	.4%	.008	.0%	.085	.1%	.119	.2%	2.551	.1%	1.470	.0%	.003	.0%
NEMATODA	Nematoda indet.	.	.	.012	.0%	.	.	.	.	.	.	.042	.1%	.	.	.001	.0%	.	.	.	.
POLYCHAETA	Harmothoe imbricata	.	.	.	.	.238	.0%	.	.	.	.	.	.	.	.	.098	.0%	.	.	.	.
	Harmothoe impar	.	.	.	.	.160	.0%	.	.	.	.	.	.	.	.	.153	.0%	.046	.0%	.	.
	Phyllodoce groenlandica	.	.	.015	.0%	.049	.0%	.013	.0%	.005	.0%	.005	.0%	.012	.0%	.038	.0%	.054	.0%	.012	.0%
	Eulalia viridis	.111	.1%	.	.	.	.	.	.	.000	.0%	.003	.0%	.002	.0%	.091	.0%	.005	.0%	.003	.0%
	Nereididae indet.	.	.	.	.	.007	.0%	.149	.0%	.	.	.	.	.	.	.031	.0%	.	.	.	.
	Nereis pelagica	.	.	.	.	.	.	.	.	.	.	.	.	.005	.0%	.	.	.112	.0%	.	.
	Neanthes virens	.	.	.	.	.071	.0%	.109	.0%	.	.	.	.	.	.	.015	.0%	.092	.0%	.	.
	Capitella capitata	.	.	.	.	.004	.0%	.	.	.	.	.	.	.001	.0%	.	.	.	.	.007	.0%
	Pomatoceros triqueter	1.600	1.7%	.928	1.3%	.308	.0%	.	.	2.518	2.7%	.760	1.3%	1.454	2.7%	1.477	.0%	.034	.0%	2.060	.6%
PYCNOGONIDA	Phoxichilidium femoratum	.	.	.	.	.	.	.	.	.	.	.	.	.000	.0%	.	.	.	.	.	.
CRUSTACEA	Verruca stroemia	.	.	.	.	.026	.0%	.	.	.	.	.044	.1%	.029	.1%	.	.	.	.	.059	.0%
	Balanus balanus	.	.	.	.	.828	.0%	858.400	29.6%	.	.	.	.	.	.	.927	.0%	281.693	3.5%	.	.
	Balanus crenatus	.221	.2%	.230	.3%	.	.	.	.	.019	.0%	1.013	1.7%	.129	.2%	1.200	.0%	.	.	.304	.1%
	Caridea indet.	.	.	.	.	.	.	.	.	.001	.0%	.	.	.	.	.	.	.	.	.	.
	Corystes cassivelaunus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.004	.0%
	Cancer pagurus	.079	.1%	.021	.0%	.202	.0%	.162	.0%	.008	.0%	.100	.2%	.071	.1%	.365	.0%	.081	.0%	.020	.0%
	Corophium crassicorne	.	.	.	.	.001	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Jassa marmorata	19.546	20.4%	24.727	34.9%	43.821	.7%	59.498	2.1%	14.309	15.1%	12.589	20.8%	19.884	36.7%	47.109	1.3%	58.952	.7%	10.028	2.8%
	Caprella linearis	3.758	3.9%	8.716	12.3%	7.954	.1%	.059	.0%	5.949	6.3%	2.091	3.5%	2.722	5.0%	13.017	.4%	2.065	.0%	1.094	.3%
CHIRONOMIDAE	Telmatogeton japonicus	.	.	.010	.0%	.006	.0%	.065	.0%	.003	.0%	.001	.0%	.	.	.	.	.024	.0%	.	.
GASTROPODA	Rissoidae indet.	.009	.0%	.003	.0%	.030	.0%	.004	.0%	.014	.0%	.021	.0%	.008	.0%	.228	.0%	.103	.0%	.015	.0%
	Crepidula fornicata	10.904	11.4%	8.423	11.9%	.053	.0%	.	.	3.845	4.1%	17.083	28.3%	3.329	6.1%	2.661	.1%	3.549	.0%	.084	.0%
	Nudibranchia indet.	.027	.0%	.011	.0%	.008	.0%	.	.	.016	.0%	.012	.0%	.001	.0%	.	.	.	.	.027	.0%
	Onchidoris muricata	.	.	.	.	.013	.0%	.	.	.014	.0%	.	.	.009	.0%	.005	.0%	.	.	.008	.0%
BIVALVIA	Mytilus edulis	.529	.6%	.149	.2%	5839.220	98.6%	1970.145	67.9%	.025	.0%	7.302	12.1%	.327	.6%	3460.745	97.1%	7583.838	95.5%	.034	.0%
	Ostrea edulis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.670	.0%	.	.	.	.
	Heteranomia squamula	.	.	.065	.1%	.026	.0%	.	.	.	.	.	.	.024	.0%	.	.	.	.	.	.
	Moerella pygmaea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.005	.0%	.	.	.	.
	Venerupis senegalensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.105	.0%	.	.	.	.
	Hiatella arctica	.012	.0%	.014	.0%	.	.	.	.	.	.	.	.	.012	.0%	.011	.0%	.001	.0%	.	.
BRYOZOA	Bryozoa indet.	.445	.5%	.580	.8%	.	.	.	.	.022	.0%	.	.	.074	.1%	.	.	.	.	.	.
	Electra pilosa	12.273	12.8%	10.979	15.5%	12.241	.2%	.020	.0%	4.085	4.3%	.389	.6%	7.450	13.8%	11.819	.3%	4.202	.1%	5.747	1.6%
ECHINODERMATA	Asterias rubens	20.150	21.1%	8.044	11.4%	5.314	.1%	.	.	62.169	65.6%	7.807	12.9%	5.886	10.9%	15.259	.4%	.248	.0%	331.061	92.9%
	Strongylocentrotus droebachiensis	.	.	.006	.0%	.	.	.	.	.	.	.	.	.	.	.220	.0%	.	.	.003	.0%
Total		95.666	100.0%	70.776	100.0%	5921.644	100.0%	2899.897	100.0%	94.755	100.0%	60.444	100.0%	54.161	100.0%	3564.465	100.0%	7937.692	100.0%	356.429	100.0%

2004-Spring

		Transect																			
		Turbine tower, vertical																			
		NNE 02		NNE 04		NNE 06		NNE 08		NNE Bottom		SSW 02		SSW 04		SSW 06		SSW 08		SSW Bottom	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
HYDROZOA	Tubularia indivisa	.	.	.	.	.	.	.	.	.	.	.	.	.001	.0%	.	.	.	.	.141	.2%
	Campanulariidae indet.	.	.	.001	.0%	.	.	.	.	.038	.1%	.	.	.002	.0%	.	.	.	.	.	.
ANTHOZOA	Actiniaria indet.	1.292	1.0%	3.193	1.5%	3.864	.1%	.	.	2.307	3.7%	2.613	1.3%	1.010	.7%	2.067	.0%	.	.	1.101	1.3%
NEMERTINI	Nemertini indet.	.020	.0%	.060	.0%	3.187	.1%	.273	.0%	.014	.0%	.051	.0%	.010	.0%	.920	.0%	.824	.0%	.029	.0%
NEMATODA	Nematoda indet.	.	.	.	.	.	.	.	.	.	.	.002	.0%	.	.	.	.	.	.	.	.
POLYCHAETA	Harmothoe imbricata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.165	.0%	.	.	.	.
	Harmothoe impar	.010	.0%	.004	.0%	.580	.0%	.057	.0%	.004	.0%	.030	.0%	.003	.0%	.051	.0%	.045	.0%	.	.
	Phyllodoce groenlandica	.	.	.036	.0%	.020	.0%	.087	.0%	.	.	.039	.0%	.055	.0%	.	.	.019	.0%	.	.
	Eulalia viridis	.011	.0%	.	.	.039	.0%	.060	.0%	.	.	.010	.0%	.022	.0%	.	.	.060	.0%	.006	.0%
	Syllidae indet.	.	.	.	.	.	.	.	.	.	.	.007	.0%	.	.	.	.	.	.	.003	.0%
	Nereis pelagica	.	.	.	.	1.443	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Neanthes virens	.	.	.	.	.	.	.096	.0%	.	.	.	.	.	.	.	.	.	.	.	.
	Pomatoceros triqueter	2.895	2.3%	1.560	.7%	.005	.0%	.	.	2.296	3.7%	4.895	2.4%	3.693	2.7%	.438	.0%	.	.	1.325	1.6%
CRUSTACEA	Verruca stroemia	.	.	.	.	.070	.0%	.	.	.	.	.	.	.064	.0%	.	.	.	.	.	.
	Balanus balanus	.	.	.	.	.	.	41.725	1.0%	.	.	.	.	.	.	.358	.0%	32.127	1.0%	.	.
	Balanus crenatus	1.491	1.2%	1.548	.7%	1.927	.0%	.	.	.013	.0%	.997	.5%	3.706	2.7%	3.141	.1%	.	.	.013	.0%
	Brachyura indet.	.	.	.	.	.037	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cancer pagurus	.009	.0%	.046	.0%	4.064	.1%	.	.	.	.	.	.	.010	.0%	2.811	.0%	.358	.0%	.	.
	Pisidia longicornis	.	.	.	.	.111	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Jassa marmorata	81.997	65.9%	150.450	72.2%	67.718	1.4%	16.191	.4%	32.091	51.5%	95.260	47.7%	97.931	70.8%	124.689	2.1%	15.011	.5%	43.296	52.4%
	Caprella linearis	15.242	12.2%	8.106	3.9%	16.715	.4%	.134	.0%	3.264	5.2%	10.259	5.1%	4.488	3.2%	2.521	.0%	.065	.0%	8.663	10.5%
CHIRONOMIDAE	Chironomidae indet.	.	.	.	.	.	.	.005	.0%	.	.	.	.	.	.	.	.	.002	.0%	.	.
	Telmatogeton japonicus	.	.	.	.	.	.	1.364	.0%	.	.	.	.	.	.	.	.	1.793	.1%	.	.
GASTROPODA	Rissoidae indet.	.	.	.	.	.	.	.009	.0%	.006	.0%	.007	.0%	.	.	.	.	.003	.0%	.	.
	Crepidula fornicata	9.554	7.7%	19.098	9.2%	.	.	.	.	6.591	10.6%	74.396	37.2%	23.887	17.3%	8.217	.1%	.	.	6.035	7.3%
	Nudibranchia indet.	.040	.0%	.050	.0%	.007	.0%	.	.	.	.	.	.	.040	.0%	.014	.0%	.	.	.002	.0%
	Onchidoris muricata	.624	.5%	.184	.1%	.028	.0%	.	.	.028	.0%	.049	.0%	.004	.0%	.	.	.	.	.	.
	Polycera quadrilineata	.040	.0%	.033	.0%	.021	.0%	.	.	.013	.0%	.163	.1%	.038	.0%	.003	.0%	.	.	.014	.0%
	Aeolidia papillosa	.033	.0%	1.118	.5%	.026	.0%	.	.	.031	.1%	.115	.1%	.109	.1%	.075	.0%	.	.	.	.
BIVALVIA	Mytilus edulis	.035	.0%	.625	.3%	4642.448	97.8%	4329.058	98.6%	.034	.1%	.292	.1%	.623	.5%	5897.030	97.5%	3077.527	98.4%	.090	.1%
	Ostrea edulis	.	.	.	.	.529	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Heteranomia squamula	.102	.1%	.353	.2%	.	.	.	.	.	.	.	.	.159	.1%	.	.	.	.	.	.
	Hiatella arctica	.027	.0%	.	.	.101	.0%	.032	.0%	.	.	.016	.0%	.010	.0%	.017	.0%	.034	.0%	.	.
BRYOZOA	Electra pilosa	1.930	1.6%	6.883	3.3%	2.587	.1%	.005	.0%	2.406	3.9%	7.687	3.8%	.917	.7%	4.506	.1%	.446	.0%	.347	.4%
	Alcyonidium sp.	1.041	.8%	.335	.2%	.131	.0%	.	.	2.287	3.7%	.631	.3%	.	.	.	.	.	.	4.150	5.0%
ECHINODERMATA	Asterias rubens	8.058	6.5%	14.638	7.0%	.	.	.	.	10.860	17.4%	2.364	1.2%	1.620	1.2%	.	.	.	.	17.341	21.0%
	Strongylocentrotus droebachiensis	.	.	.	.	.047	.0%	.	.	.	.	.	.	.	.	.277	.0%	.	.	.	.
Total		124.450	100.0%	208.321	100.0%	4745.704	100.0%	4389.098	100.0%	62.282	100.0%	199.885	100.0%	138.402	100.0%	6047.300	100.0%	3128.315	100.0%	82.557	100.0%

2004-Autumn

		Transect																							
		Turbine tower, vertical																							
		NNE 02		NNE 04		NNE 06		NNE 08		NNE 10		NNE Bottom		SSW 02		SSW 04		SSW 06		SSW 08		SSW 10		SSW Bottom	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	/m²	Kol Sum %
HYDROZOA	Tubularia indivisa	.006	.0%	.087	.1%	.115	.0%	.	.	.	.	.097	.1%	.199	.1%	.021	.0%	.008	.0%	.002	.0%	.	.	.068	.0%
	Hydractinia echinata	.	.	.090	.1%	.034	.0%	.	.	.	.	.028	.0%	.	.	.	.	.	.	.	.	.	.	.	.
	Campanulariidae indet.	.011	.0%	.010	.0%	.006	.0%	.	.	.	.	.013	.0%	.002	.0%	.	.	.010	.0%	.	.	.	.	.014	.0%
ANTHOZOA	Actiniaria indet.	1.121	.9%	.603	.4%	6.837	1.9%	3.713	.1%	.	.	.150	.1%	1.414	.6%	.036	.0%	2.712	.0%	.	.	.	.	.455	.3%
NEMERTINI	Nemertini indet.	.	.	.	.	.	.	.047	.0%	.	.	.	.	.	.	.	.	.353	.0%	.915	.0%	.	.	.	.
NEMATODA	Nematoda indet.	.005	.0%	.001	.0%	.003	.0%	.	.	.	.	.002	.0%	.000	.0%	.004	.0%	.002	.0%	.	.	.	.	.002	.0%
POLYCHAETA	Harmothoe imbricata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.670	.0%	.	.	.	.	.	.
	Harmothoe impar	.005	.0%	.014	.0%	.010	.0%	.	.	.	.	.006	.0%	.012	.0%	.	.	.258	.0%	.	.	.	.	.	.
	Phyllodoce groenlandica	.	.	.	.	.002	.0%	.	.	.	.	.	.	.001	.0%	.	.	.015	.0%	.	.	.	.	.	.
	Eulalia viridis	.062	.1%	.043	.0%	.045	.0%	.028	.0%	.	.	.080	.0%	.031	.0%	.225	.1%	.090	.0%	.022	.0%	.	.	.051	.0%
	Ophiodromus flexuosus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.001	.0%	.	.	.	.	.	.
	Nereis pelagica	.	.	.	.	.	.	.076	.0%	.	.	.	.	.	.	.	.	.	.	.031	.0%	.	.	.	.
	Cirratulidae indet.	.000	.0%	.	.	.	.	.001	.0%	.	.	.	.	.	.	.001	.0%	.	.	.000	.0%	.	.	.000	.0%
	Terebellidae indet.	.	.	.	.	.	.	.	.	.	.	.007	.0%	.	.	.	.	.	.	.	.	.	.	.	.
	Pomatoceros triqueter	1.634	1.3%	.903	.6%	.303	.1%	.	.	.	.	1.900	1.1%	1.813	.8%	1.703	.9%	.340	.0%	.	.	.	.	1.897	1.3%
CRUSTACEA	Verruca stroemia	.034	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.012	.0%
	Balanus balanus	.	.	.	.	39.555	11.3%	69.603	1.3%	274.015	99.2%	.	.	63.389	26.2%	.	.	.007	.0%	24.983	.8%	411.878	80.4%	10.180	7.2%
	Balanus crenatus	.395	.3%	.121	.1%	.108	.0%	.	.	.	.	.012	.0%	.235	.1%	.295	.2%	.491	.0%	.	.	.	.	.037	.0%
	Cancer pagurus	.766	.6%	1.422	.9%	2.253	.6%	2.073	.0%	.	.	2.927	1.7%	1.090	.5%	1.193	.7%	2.790	.0%	1.179	.0%	.	.	2.123	1.5%
	Jassa marmorata	65.592	54.1%	58.361	36.1%	112.513	32.1%	89.272	1.6%	1.445	.5%	85.875	48.6%	53.985	22.3%	78.682	43.6%	79.963	1.0%	82.019	2.6%	99.053	19.3%	78.985	55.7%
	Caprella linearis	27.495	22.7%	17.946	11.1%	14.768	4.2%	10.894	.2%	.020	.0%	14.321	8.1%	14.402	6.0%	16.805	9.3%	20.092	.3%	13.233	.4%	.006	.0%	4.155	2.9%
CHIRONOMIDAE	Telmatogeton japonicus	.058	.0%	.028	.0%	.002	.0%	.210	.0%	.755	.3%	.102	.1%	.	.	.	.	.003	.0%	.507	.0%	1.496	.3%	.004	.0%
GASTROPODA	Rissoidae indet.	.009	.0%	.032	.0%	.113	.0%	.273	.0%	.	.	.047	.0%	.053	.0%	.058	.0%	.132	.0%	.256	.0%	.	.	.072	.1%
	Crepidula fornicata	16.398	13.5%	75.429	46.7%	.001	.0%	64.967	1.2%	.	.	.018	.0%	90.566	37.5%	68.867	38.2%	16.994	.2%	.022	.0%	.	.	6.617	4.7%
	Hinia pygmaea	.	.	.	.	.	.	.004	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Nudibranchia indet.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.159	.1%	.	.	.	.	.	.	.	.
	Onchidoris muricata	.009	.0%	.003	.0%	.008	.0%	.	.	.	.	.002	.0%	.010	.0%	.011	.0%	.	.	.	.	.	.	.006	.0%
	Polycera quadrilineata	.160	.1%	.252	.2%	.271	.1%	.068	.0%	.	.	.045	.0%	.071	.0%	.175	.1%	.117	.0%	.031	.0%	.	.	.043	.0%
	Aeolidia papillosa	.070	.1%	.173	.1%	.058	.0%	.226	.0%	.	.	.078	.0%	.048	.0%	.165	.1%	.317	.0%	.008	.0%	.	.	.	.
BIVALVIA	Mytilus edulis	.517	.4%	.101	.1%	167.030	47.6%	5304.660	95.6%	.006	.0%	.077	.0%	.123	.1%	.339	.2%	7557.190	98.3%	3047.285	96.1%	.	.	.133	.1%
	Modiolarca tumida	.	.	.	.	.	.	.005	.0%	.	.	.010	.0%	.	.	.	.	.	.	.004	.0%	.	.	.	.
	Heteranomia squamula	.	.	.	.	.014	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Thracia phaseolina	.	.	.	.	.	.	.090	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BRYOZOA	Bryozoa indet.	.	.	.	.	.	.	.109	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Electra pilosa	.496	.4%	.975	.6%	2.121	.6%	.206	.0%	.	.	1.524	.9%	.963	.4%	1.034	.6%	.638	.0%	.781	.0%	.	.	.569	.4%
	Alcyonidium sp.	.125	.1%	.418	.3%	.371	.1%	.	.	.	.	.075	.0%	3.258	1.3%	.062	.0%	.001	.0%	.084	.0%	.	.	.213	.2%
ECHINODERMATA	Asterias rubens	6.181	5.1%	4.491	2.8%	4.377	1.2%	1.553	.0%	.	.	69.323	39.2%	9.965	4.1%	10.587	5.9%	2.318	.0%	.231	.0%	.	.	36.075	25.5%
	Ophiura albida	.	.	.003	.0%	.	.	.	.	.	.	.001	.0%	.	.	.	.	.	.	.	.	.	.	.001	.0%
	Strongylocentrotus droebachiensis	.	.	.	.	.041	.0%	.	.	.	.	.	.	.	.	.075	.0%	.	.	.	.	.	.	.	.
Total		121.150	100.0%	161.506	100.0%	350.960	100.0%	5548.076	100.0%	276.241	100.0%	176.721	100.0%	241.631	100.0%	180.497	100.0%	7685.512	100.0%	3171.592	100.0%	512.433	100.0%	41.711	100.0%

2005-Spring

		Transect											
		Turbine tower, vertical											
		NNE 02		NNE 04		NNE 06		NNE 08		NNE 10		NNE Bottom	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
HYDROZOA	Tubularia indivisa	.312	.2%	.060	.0%	.085	.0%	.	.	.	.	.308	.5%
	Hydractinia echinata	.050	.0%	.143	.1%	.	.	.	.	.	.	.	.
	Campanulariidae indet.	.	.	.	.	.018	.0%	.	.	.	.	.	.
ANTHOZOA	Actiniaria indet.	.214	.1%	6.799	4.9%	4.400	.1%	.	.	.	.	.474	.8%
NEMERTINI	Nemertini indet.	.	.	.000	.0%	.743	.0%	.	.	.	.	.	.
NEMATODA	Nematoda indet.	.002	.0%	.000	.0%	.035	.0%	.000	.0%	.001	.0%	.002	.0%
POLYCHAETA	Lepidonotus squamatus	.	.	.	.	.732	.0%	.	.	.	.	.	.
	Harmothoe imbricata	.	.	.	.	.960	.0%	.	.	.	.	.	.
	Harmothoe impar	.	.	.	.	.008	.0%	.	.	.	.	.	.
	Eulalia viridis	.141	.1%	.156	.1%	.447	.0%	.	.	.	.	.275	.5%
	Hesionidae indet.	.	.	.005	.0%	.	.	.	.	.	.	.	.
	Ophiodromus flexuosus	.011	.0%	.	.	.	.	.	.	.	.	.009	.0%
	Syllidae indet.	.	.	.	.	.001	.0%	.	.	.	.	.	.
	Chaetopterus norvegicus	.003	.0%	.	.	.	.	.	.	.	.	.	.
	Pomatoceros triqueter	.943	.5%	.565	.4%	.396	.0%	.	.	.	.	1.241	2.2%
CRUSTACEA	Verruca stroemia	.	.	.024	.0%	.	.	.	.	.	.	.113	.2%
	Balanus balanus	7.970	4.5%	.016	.0%	.918	.0%	.	.	.	.	.	.
	Balanus crenatus	.	.	.137	.1%	.057	.0%	.	.	.	.	.013	.0%
	Cancer pagurus	.528	.3%	.178	.1%	9.335	.1%	.	.	.	.	.	.
	Pisidia longicornis	.	.	.	.	.155	.0%	.	.	.	.	.	.
	Jassa marmorata	13.418	7.6%	11.027	7.9%	8.398	.1%	4.178	31.2%	.006	.2%	9.072	15.8%
	Atylus swammerdami	.	.	.	.	.	.	.	.	.	.	.005	.0%
	Caprella linearis	7.023	4.0%	3.233	2.3%	1.936	.0%	.001	.0%	.	.	1.045	1.8%
CHIRONOMIDAE	Telmatogeton japonicus	.	.	.	.	.001	.0%	1.671	12.5%	3.600	99.8%	.000	.0%
GASTROPODA	Tectura testudinalis	.	.	.	.	.	.	.	.	.	.	.	.
	Rissoidae indet.	.	.	.	.	.117	.0%	.	.	.	.	.007	.0%
	Crepidula fornicata	130.888	74.1%	110.337	79.5%	7.352	.1%	6.161	46.1%	.	.	.	.
	Polinices polianus	.	.	.	.	.	.	.003	.0%	.	.	.	.
	Onchidoris muricata	.068	.0%	.384	.3%	.343	.0%	.	.	.	.	.159	.3%
	Polycera quadrilineata	.	.	.	.	.022	.0%	.	.	.	.	.	.
	Facelina bostoniensis	.	.	.	.	.005	.0%	.	.	.	.	.003	.0%
	Aeolidia papillosa	.	.	.	.	.	.	.	.	.	.	.	.
BIVALVIA	Mytilus edulis	.114	.1%	.274	.2%	8141.941	99.4%	.740	5.5%	.	.	.169	.3%
	Heteranomia squamula	.	.	.	.	.	.	.	.	.	.	.172	.3%
	Hiatella arctica	.	.	.	.	.571	.0%	.	.	.	.	.	.
BRYOZOA	Bryozoa indet.	.	.	.	.	.	.	.	.	.	.	.	.
	Electra pilosa	.167	.1%	.086	.1%	.284	.0%	.032	.2%	.	.	.178	.3%
	Alcyonidium sp.	10.348	5.9%	.265	.2%	.459	.0%	.	.	.	.	.130	.2%
ECHINODERMATA	Asterias rubens	4.434	2.5%	5.059	3.6%	10.247	.1%	.584	4.4%	.	.	44.139	76.7%
	Strongylocentrotus droebachiensis	.	.	.	.	.	.	.	.	.	.	.	.
Total		176.633	100.0%	138.747	100.0%	8189.963	100.0%	13.371	100.0%	3.608	100.0%	57.514	100.0%

		Transect											
		Turbine tower, vertical											
		SSW 02		SSW 04		SSW 06		SSW 08		SSW 10		SSW Bottom	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
HYDROZOA	Tubularia indivisa	.028	.0%	.051	.0%	.010	.0%	.	.	.	.	.363	1.1%
	Hydractinia echinata	.000	.0%	.253	.2%	.	.	.	.	.	.	.004	.0%
	Campanulariidae indet.	.000	.0%	.	.	.008	.0%	.000	.0%	.	.	.093	.3%
ANTHOZOA	Actiniaria indet.	.302	.2%	.151	.1%	.017	.0%	.	.	.	.	12.065	35.9%
NEMERTINI	Nemertini indet.	.	.	.	.	.085	.0%	.	.	.	.	.	.
NEMATODA	Nematoda indet.	.005	.0%	.004	.0%	.010	.0%	.001	.0%	.	.	.003	.0%
POLYCHAETA	Lepidonotus squamatus	.	.	.	.	.	.	.	.	.	.	.	.
	Harmothoe imbricata	.	.	.	.	.761	.0%	.	.	.	.	.	.
	Harmothoe impar	.	.	.	.	.266	.0%	.	.	.	.	.	.
	Eulalia viridis	.507	.3%	.299	.2%	.099	.0%	.000	.0%	.	.	.146	.4%
	Hesionidae indet.	.	.	.	.	.	.	.	.	.	.	.	.
	Ophiodromus flexuosus	.	.	.	.	.	.	.	.	.	.	.	.
	Syllidae indet.	.	.	.	.	.	.	.	.	.	.	.	.
	Chaetopterus norvegicus	.	.	.	.	.	.	.	.	.	.	.	.
	Pomatoceros triqueter	2.876	1.5%	2.223	1.4%	2.424	.0%	.	.	.	.	.559	1.7%
CRUSTACEA	Verruca stroemia	.	.	.011	.0%	.007	.0%	.002	.0%	.	.	.	.
	Balanus balanus	.	.	28.132	17.3%	.	.	10.534	.3%	.	.	.	.
	Balanus crenatus	.	.	.	.	.	.	.	.	.	.	.	.
	Cancer pagurus	.286	.1%	.	.	11.809	.1%	.333	.0%	.	.	.	.
	Pisidia longicornis	.	.	.	.	.012	.0%	.	.	.	.	.	.
	Jassa marmorata	9.462	4.8%	8.947	5.5%	12.836	.2%	2.445	.1%	.006	.1%	5.993	17.8%
	Atylus swammerdami	.	.	.	.	.	.	.	.	.	.	.	.
	Caprella linearis	4.120	2.1%	4.285	2.6%	1.387	.0%	.023	.0%	.	.	.359	1.1%
CHIRONOMIDAE	Telmatogeton japonicus	.	.	.	.	.001	.0%	1.828	.1%	5.653	99.9%	.	.
GASTROPODA	Tectura testudinalis	.	.	.025	.0%	.	.	.	.	.	.	.000	.0%
	Rissoidae indet.	.	.	.	.	.038	.0%	.011	.0%	.	.	.009	.0%
	Crepidula fornicata	170.915	87.4%	113.642	69.8%	27.638	.3%	.	.	.	.	.005	.0%
	Polinices polianus	.	.	.	.	.	.	.	.	.	.	.	.
	Onchidoris muricata	.044	.0%	.	.	.383	.0%	.	.	.	.	.061	.2%
	Polycera quadrilineata	.	.	.017	.0%	.	.	.	.	.	.	.	.
	Facelina bostoniensis	.	.	.002	.0%	.005	.0%	.000	.0%	.	.	.001	.0%
	Aeolidia papillosa	.013	.0%	.	.	.001	.0%	.	.	.	.	.	.
BIVALVIA	Mytilus edulis	.092	.0%	.190	.1%	8332.859	99.2%	3553.848	99.6%	.	.	.018	.1%
	Heteranomia squamula	.	.	.	.	.	.	.	.	.	.	.	.
	Hiatella arctica	.	.	.	.	.	.	.	.	.	.	.	.
BRYOZOA	Bryozoa indet.	.	.	.	.	.	.	.	.	.	.	.025	.1%
	Electra pilosa	.683	.3%	.743	.5%	.423	.0%	.058	.0%	.	.	.030	.1%
	Alcyonidium sp.	5.500	2.8%	1.466	.9%	.720	.0%	.	.	.	.	1.166	3.5%
ECHINODERMATA	Asterias rubens	.740	.4%	2.406	1.5%	5.553	.1%	.	.	.	.	12.735	37.9%
	Strongylocentrotus droebachiensis	.	.	.	.	1.770	.0%	.	.	.	.	.	.
Total		195.573	100.0%	162.847	100.0%	8399.123	100.0%	3569.084	100.0%	5.659	100.0%	33.634	100.0%

2005-Autumn

		Transect																			
		Turbine tower, vertical																			
		NNE 02		NNE 04		NNE 06		NNE 08		NNE Bottom		SSW 02		SSW 04		SSW 06		SSW 08		SSW Bottom	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
PORIFERA	Porifera indet.	.	.	.001	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Halichondria panicea	.	.	.	.	.	.	.	.	.160	.1%	.	.	.	.	.	.	.	.	.	.
HYDROZOA	Tubularia indivisa	.629	.4%	.671	.4%	.222	.0%	.045	.0%	.102	.1%	.125	.0%	.733	.3%	.657	.0%	.145	.0%	.215	.1%
	Hydractinia echinata	.162	.1%	.088	.0%	.	.	.	.	.070	.0%	.005	.0%	.093	.0%	.	.	.	.	.333	.1%
	Campanulariidae indet.	.027	.0%	.017	.0%	.018	.0%	.	.	.005	.0%	.049	.0%	.054	.0%	.	.	.	.	.018	.0%
	Sertularia cupressina	.	.	.	.	.	.	.	.	.005	.0%	.	.	.	.	.	.	.	.	.	.
ANTHOZOA	Alcyonium digitatum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.106	.0%
	Actiniaria indet.	13.521	7.9%	43.431	23.5%	4.807	.1%	.063	.0%	2.697	1.8%	52.085	9.8%	2.627	1.0%	9.294	.1%	.290	.0%	4.483	1.8%
NEMERTINI	Nemertini indet.	.031	.0%	.040	.0%	3.175	.0%	11.325	.1%	.002	.0%	.020	.0%	.048	.0%	.146	.0%	1.784	.0%	.000	.0%
NEMATODA	Nematoda indet.	.004	.0%	.021	.0%	.014	.0%	.049	.0%	.004	.0%	.002	.0%	.007	.0%	.013	.0%	.008	.0%	.014	.0%
POLYCHAETA	Lepidonotus squamatus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.687	.0%	.	.	.	.
	Harmothoe imbricata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.130	.0%	.	.	.	.
	Harmothoe impar	.018	.0%	.001	.0%	.079	.0%	.028	.0%	.006	.0%	.000	.0%	.006	.0%	.107	.0%	.016	.0%	.016	.0%
	Phyllodoce groenlandica	.	.	.	.	.000	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Eulalia viridis	.116	.1%	.246	.1%	.677	.0%	.191	.0%	.179	.1%	.303	.1%	.203	.1%	.415	.0%	.117	.0%	.218	.1%
	Polydora cornuta	.	.	.	.	.	.	.	.	.	.	.005	.0%	.	.	.	.	.	.	.	.
	Chaetopterus norvegicus	.	.	.	.	.	.	.	.	.	.	.003	.0%	.	.	.003	.0%	.	.	.008	.0%
	Pomatoceros triqueter	.272	.2%	.003	.0%	.	.	.	.	1.894	1.2%	1.605	.3%	.284	.1%	.191	.0%	.	.	.857	.3%
CRUSTACEA	Harpacticoida indet.	.	.	.	.	.	.	.	.	.001	.0%	.	.	.	.	.	.	.	.	.	.
	Verruca stroemia	.270	.2%	.349	.2%	.126	.0%	.	.	.469	.3%	.186	.0%	.270	.1%	.055	.0%	.	.	.407	.2%
	Balanus balanus	1.613	.9%	1.115	.6%	596.981	8.4%	1165.937	13.0%	.618	.4%	64.273	12.1%	33.187	12.7%	3.554	.0%	.005	.0%	.411	.2%
	Cancer pagurus	.380	.2%	.458	.2%	2.673	.0%	.717	.0%	.408	.3%	.485	.1%	.386	.1%	233.313	2.1%	.313	.0%	1.385	.6%
	Pilumnus hirtellus	.	.	.	.	.663	.0%	.	.	.	.	.	.	.	.	.557	.0%	.	.	.	.
	Pisidia longicornis	.	.	.001	.0%	.004	.0%	.	.	.000	.0%	.	.	.	.	.	.	.	.	.	.
	Stenothoe sp.	.	.	.	.	.	.	.	.	.	.	.007	.0%	.	.	.	.	.	.	.007	.0%
	Jassa marmorata	43.552	25.6%	88.963	48.2%	93.848	1.3%	51.235	.6%	104.763	68.6%	58.593	11.1%	67.921	26.0%	117.427	1.0%	37.220	.3%	56.387	22.5%
	Atylus swammerdami	.005	.0%	.008	.0%	.003	.0%	.	.	.004	.0%	.008	.0%	.007	.0%	.002	.0%	.	.	.029	.0%
	Caprella linearis	13.994	8.2%	19.416	10.5%	44.969	.6%	.085	.0%	11.185	7.3%	16.258	3.1%	11.135	4.3%	31.919	.3%	.006	.0%	9.844	3.9%
CHIRONOMIDAE	Telmatogeton japonicus	.003	.0%	.	.	.	.	.369	.0%	.015	.0%	.008	.0%	.016	.0%	.004	.0%	.346	.0%	.	.
GASTROPODA	Rissoidae indet.	.024	.0%	.008	.0%	.011	.0%	.063	.0%	.068	.0%	.032	.0%	.003	.0%	.021	.0%	.050	.0%	.110	.0%
	Crepidula fornicata	83.133	48.9%	24.071	13.0%	21.898	.3%	.	.	1.019	.7%	274.696	51.8%	141.126	54.1%	87.810	.8%	.003	.0%	150.608	60.0%
	Polinices polianus	.	.	.001	.0%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Nudibranchia indet.	.	.	.	.	.	.	.	.	.003	.0%	.	.	.	.	.	.	.	.	.	.
	Onchidoris muricata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.004	.0%	.	.	.008	.0%
	Polycera quadrilineata	.132	.1%	.136	.1%	.305	.0%	.045	.0%	.045	.0%	.070	.0%	.086	.0%	.782	.0%	.	.	.031	.0%
	Facelina bostoniensis	.326	.2%	.159	.1%	.100	.0%	.	.	.096	.1%	.100	.0%	.131	.1%	.105	.0%	.008	.0%	.070	.0%
	Aeolidia papillosa	.	.	.	.	.	.	.	.	.	.	.008	.0%	.125	.0%	.003	.0%	.	.	.	.
BIVALVIA	Mytilus edulis	1.023	.6%	1.976	1.1%	6212.836	87.5%	7762.355	86.3%	.919	.6%	1.332	.3%	1.742	.7%	10808.119	95.2%	13439.083	99.7%	1.423	.6%
	Tridonta borealis	.	.	.	.	.	.	.	.	.	.	.005	.0%	.	.	.	.	.	.	.	.
	Angulus tenuis	.	.	.	.	.	.	.	.	.	.	.000	.0%	.	.	.	.	.	.	.	.
	Fabulina fabula	.	.	.	.	.	.	.	.	.	.	.001	.0%	.	.	.	.	.	.	.	.
	Moerella pygmaea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.009	.0%	.	.	.001	.0%
	Donax vittatus	.	.	.	.	.	.	.008	.0%	.	.	.	.	.	.	.	.	.	.	.	.
	Hiatella arctica	.	.	.003	.0%	.017	.0%	.078	.0%	.011	.0%	.005	.0%	.000	.0%	.019	.0%	.008	.0%	.	.
	Phaxas pellucidus	.	.	.	.	.	.	.	.	.	.	.005	.0%	.	.	.	.	.	.	.	.
BRYOZOA	Electra pilosa	.847	.5%	.820	.4%	.461	.0%	.057	.0%	.755	.5%	.841	.2%	.711	.3%	.476	.0%	.049	.0%	.284	.1%
	Alcyonidium sp.	6.982	4.1%	2.604	1.4%	1.134	.0%	.033	.0%	3.702	2.4%	52.255	9.9%	.	.	2.217	.0%	.	.	4.506	1.8%
ECHINODERMATA	Asterias rubens	3.107	1.8%	.005	.0%	114.630	1.6%	.	.	23.545	15.4%	6.762	1.3%	.	.	57.663	.5%	.	.	19.263	7.7%
	Strongylocentrotus droebachiensis	.	.	.	.	.	.	.	.	.006	.0%	.	.	.	.	.007	.0%	.	.	.020	.0%
Total		170.169	100.0%	184.612	100.0%	7099.651	100.0%	8992.683	100.0%	152.756	100.0%	530.131	100.0%	260.901	100.0%	11355.707	100.0%	13479.452	100.0%	251.060	100.0%

8.4.7. *Appendix 4.8. mean biomass DW. Scour protections 2003-2005*

2003

Spring

		Transect							
		Foundations, horizontal							
		A 0.5 NNE		B 02 NNE		C 05 NNE		D 05 SSW	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
HYDROZOA	Hydrozoa indet.	.	.	.003	.0%	.	.	.	.
	Thecata indet.	.	.	.	.	.001	.0%	.	.
	Campanulariidae indet.	.	.	.002	.0%	.003	.0%	.	.
ANTHOZOA	Anthozoa indet.	.160	.2%	1.200	1.2%	.	.	.100	.2%
	Actiniaria indet.	.841	1.0%	.881	.9%	1.802	.6%	.687	1.1%
NEMERTINI	Nemertini indet.	.007	.0%	.001	.0%	.	.	.000	.0%
POLYCHAETA	Harmothoe impar	.028	.0%	.109	.1%	.231	.1%	.060	.1%
	Phyllodoce groenlandica	.012	.0%	.051	.1%	.164	.1%	.196	.3%
	Eulalia viridis	.001	.0%	.002	.0%	.006	.0%	.	.
	Chaetopterus norvegicus	.	.	.011	.0%	.010	.0%	.	.
	Pomatoceros triqueter	.002	.0%	.094	.1%	.054	.0%	.017	.0%
CRUSTACEA	Verruca stroemia	.018	.0%	.004	.0%	.	.	.013	.0%
	Balanus crenatus	60.233	69.1%	64.811	64.5%	254.586	82.8%	9.523	15.8%
	Cancer pagurus	.012	.0%	.	.	.034	.0%	.	.
	Corophium crassicorne	.	.	.	.	.002	.0%	.	.
	Jassa marmorata	15.544	17.8%	16.138	16.1%	22.963	7.5%	36.402	60.3%
	Caprella linearis	.739	.8%	1.032	1.0%	.215	.1%	.053	.1%
GASTROPODA	Rissoidae indet.	.001	.0%	.011	.0%	.048	.0%	.005	.0%
	Crepidula fornicata	.036	.0%	.092	.1%	.482	.2%	.044	.1%
	Nudibranchia indet.	.	.	.	.	.090	.0%	.004	.0%
	Onchidoris muricata	.099	.1%	.	.	.015	.0%	.	.
BIVALVIA	Bivalvia indet.	.	.	.006	.0%	.	.	.	.
	Mytilus edulis	1.070	1.2%	1.292	1.3%	.593	.2%	1.618	2.7%
	Heteranomia squamula	.	.	.006	.0%	.016	.0%	.	.
	Moerella pygmaea	.012	.0%	.022	.0%	.049	.0%	.	.
	Thracia phaseolina	.	.	.	.	.006	.0%	.	.
BRYOZOA	Bryozoa indet.	.	.	.086	.1%	.014	.0%	.	.
	Electra pilosa	.092	.1%	.590	.6%	.737	.2%	.112	.2%
ECHINODERMATA	Asterias rubens	8.222	9.4%	14.085	14.0%	25.490	8.3%	11.575	19.2%
	Ophiura albida	.	.	.001	.0%	.002	.0%	.001	.0%
	Strongylocentrotus droebachiensis	.	.	.	.	.	.	.003	.0%
Total		87.131	100.0%	100.532	100.0%	307.614	100.0%	60.414	100.0%

Autumn

		Transect							
		Foundations, horizontal							
		A 0.5 NNE		B 02 NNE		C 05 NNE		D 05 SSW	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
PORIFERA	Porifera indet.	.	.	.	.	.001	.0%	.	.
HYDROZOA	Tubularia indivisa	.712	1.9%	.848	1.7%	.439	1.2%	.926	2.3%
	Campanulariidae indet.	.023	.1%	.027	.1%	.029	.1%	.026	.1%
ANTHOZOA	Actiniaria indet.	8.175	21.6%	15.602	31.9%	16.031	42.8%	7.703	19.0%
NEMERTINI	Nemertini indet.	.002	.0%	.	.	.008	.0%	.003	.0%
NEMATODA	Nematoda indet.	.001	.0%	.001	.0%	.001	.0%	.001	.0%
POLYCHAETA	Harmothoe impar	.	.	.	.	.002	.0%	.	.
	Phyllodocidae indet.	.	.	.000	.0%	.	.	.	.
	Phyllodoce groenlandica	.011	.0%	.005	.0%	.020	.1%	.009	.0%
	Eulalia viridis	.001	.0%	.001	.0%	.	.	.	.
	Syllidae indet.	.	.	.	.	.	.	.001	.0%
	Nereididae indet.	.000	.0%	.	.	.	.	.	.
	Polydora ciliata	.	.	.	.	.000	.0%	.	.
	Capitella capitata	.	.	.003	.0%	.000	.0%	.	.
	Pomatoceros triqueter	.055	.1%	.198	.4%	.159	.4%	.264	.7%
PYCNOGONIDA	Phoxichilidium femoratum	.001	.0%	.	.	.	.	.	.
CRUSTACEA	Verruca stroemia	.005	.0%	.029	.1%	.046	.1%	.008	.0%
	Balanus crenatus	.233	.6%	.268	.5%	.165	.4%	.963	2.4%
	Cancer pagurus	.005	.0%	.009	.0%	.053	.1%	.024	.1%
	Stenothoe marina	.001	.0%	.	.	.	.	.	.
	Jassa marmorata	6.957	18.4%	5.683	11.6%	5.025	13.4%	8.939	22.1%
	Atylus swammerdami	.	.	.001	.0%	.	.	.	.
	Caprella linearis	1.070	2.8%	.585	1.2%	.278	.7%	.786	1.9%
	Hyperia galba	.001	.0%	.	.	.	.	.	.
CHIRONOMIDAE	Telmatogeton japonicus	.002	.0%	.	.	.	.	.	.
GASTROPODA	Rissoidae indet.	.165	.4%	.154	.3%	.117	.3%	.116	.3%
	Crepidula fornicata	.228	.6%	3.439	7.0%	.779	2.1%	4.558	11.3%
	Polinices sp.	.	.	.	.	.001	.0%	.	.
	Nudibranchia indet.	.005	.0%	.012	.0%	.008	.0%	.017	.0%
	Onchidoris muricata	.009	.0%	.010	.0%	.010	.0%	.058	.1%
BIVALVIA	Mytilus edulis	.063	.2%	.125	.3%	.078	.2%	2.106	5.2%
	Moerella pygmaea	.	.	.	.	.001	.0%	.001	.0%
	Hiatella arctica	.	.	.000	.0%	.004	.0%	.001	.0%
BRYOZOA	Bryozoa indet.	.013	.0%	.066	.1%	.156	.4%	.	.
	Electra pilosa	.804	2.1%	.436	.9%	.515	1.4%	.792	2.0%
ECHINODERMATA	Asterias rubens	19.299	51.0%	21.475	43.8%	13.560	36.2%	13.189	32.6%
	Strongylocentrotus droebachiensis	.002	.0%	.000	.0%	.002	.0%	.	.
Total		37.844	100.0%	48.977	100.0%	37.489	100.0%	40.490	100.0%

2004

Spring

		Transect							
		Foundations, horizontal							
		A 0.5 NNE		B 02 NNE		C 05 NNE		D 05 SSW	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
PORIFERA	Halichondria panicea	.	.	.003	.0%	.033	.1%	.	.
HYDROZOA	Tubularia indivisa	.097	.3%	.000	.0%	.	.	.016	.0%
	Campanulariidae indet.	.008	.0%	.004	.0%	.002	.0%	.009	.0%
ANTHOZOA	Alcyonium digitatum	.	.	.126	.3%	.079	.2%	.	.
	Actiniaria indet.	2.712	8.2%	7.981	20.3%	17.445	34.4%	4.558	11.3%
NEMERTINI	Nemertini indet.	.014	.0%	.008	.0%	.015	.0%	.011	.0%
POLYCHAETA	Phyllodoce groenlandica	.002	.0%	.027	.1%	.029	.1%	.028	.1%
	Eulalia viridis	.001	.0%	.	.	.001	.0%	.	.
	Syllidae indet.	.	.	.001	.0%	.002	.0%	.	.
	Polydora ciliata	.	.	.001	.0%	.	.	.	.
	Capitella capitata	.001	.0%	.003	.0%	.	.	.	.
	Pomatoceros triqueter	.125	.4%	.046	.1%	.350	.7%	.270	.7%
CRUSTACEA	Verruca stroemia	.	.	.	.	.007	.0%	.009	.0%
	Balanus crenatus	.005	.0%	.009	.0%	.309	.6%	.005	.0%
	Corystes cassivelaunus	.	.	.001	.0%	.002	.0%	.	.
	Cancer pagurus	.	.	.	.	.	.	.003	.0%
	Jassa marmorata	21.801	66.0%	15.577	39.6%	14.949	29.5%	15.071	37.4%
	Caprella linearis	1.573	4.8%	.812	2.1%	.282	.6%	.307	.8%
GASTROPODA	Rissoidae indet.	.018	.1%	.103	.3%	.103	.2%	.013	.0%
	Crepidula fornicata	.001	.0%	.807	2.0%	2.486	4.9%	4.196	10.4%
	Nudibranchia indet.	.013	.0%	.	.	.006	.0%	.020	.1%
	Onchidoris muricata	.044	.1%	.001	.0%	.001	.0%	.	.
	Polycera quadrilineata	.002	.0%	.044	.1%	.063	.1%	.019	.0%
	Aeolidia papillosa	.002	.0%	.020	.1%	.059	.1%	.009	.0%
BIVALVIA	Mytilus edulis	.052	.2%	.221	.6%	.123	.2%	.044	.1%
	Goodallia triangularis	.002	.0%	.	.	.	.	.	.
	Hiatella arctica	.	.	.	.	.019	.0%	.011	.0%
BRYOZOA	Electra pilosa	.576	1.7%	.571	1.5%	.252	.5%	.263	.7%
	Alcyonidium sp.	.013	.0%	.014	.0%	.	.	.	.
ECHINODERMATA	Asterias rubens	5.958	18.0%	12.985	33.0%	14.078	27.8%	15.386	38.2%
Total		33.019	100.0%	39.365	100.0%	50.694	100.0%	40.250	100.0%

Autumn

		Transect							
		Foundations, horizontal							
		A 0.5 NNE		B 02 NNE		C 05 NNE		D 05 SSW	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
PORIFERA	Porifera indet.	.	.	.	.	.	.	.016	.0%
HYDROZOA	Tubularia indivisa	.317	.5%	.052	.1%	.138	.2%	.033	.0%
	Campanulariidae indet.	.003	.0%	.011	.0%	.017	.0%	.001	.0%
	Sertularia cupressina	.004	.0%	.	.	.	.	.024	.0%
ANTHOZOA	Alcyonium digitatum	2.388	3.7%	.743	1.0%	2.023	3.5%	1.320	1.5%
	Actiniaria indet.	5.036	7.7%	8.270	10.8%	15.237	26.3%	2.004	2.3%
NEMERTINI	Nemertini indet.	.	.	.	.	.	.	.004	.0%
NEMATODA	Nematoda indet.	.002	.0%	.003	.0%	.001	.0%	.001	.0%
POLYCHAETA	Phyllodoce groenlandica	.018	.0%	.003	.0%	.020	.0%	.015	.0%
	Eulalia viridis	.012	.0%	.003	.0%	.015	.0%	.029	.0%
	Nereis pelagica	.	.	.	.	.	.	.004	.0%
	Polydora ciliata	.	.	.	.	.	.	.000	.0%
	Cirratulidae indet.	.	.	.000	.0%	.	.	.	.
	Terebellidae indet.	.	.	.	.	.	.	.014	.0%
	Lanice conchilega	.	.	.	.	.003	.0%	.	.
	Sabellaria sp.	.	.	.	.	.003	.0%	.	.
	Pomatoceros triqueter	.374	.6%	.418	.5%	.658	1.1%	.346	.4%
CRUSTACEA	Verruca stroemia	.043	.1%	.034	.0%	.207	.4%	.210	.2%
	Balanus crenatus	1.875	2.9%	.051	.1%	.267	.5%	.345	.4%
	Cancer pagurus	.733	1.1%	.644	.8%	.555	1.0%	.532	.6%
	Liocarcinus depurator	.011	.0%	.	.	.	.	.	.
	Jassa marmorata	32.984	50.6%	39.311	51.5%	16.855	29.1%	63.250	72.6%
	Caprella linearis	.608	.9%	.324	.4%	.488	.8%	1.650	1.9%
GASTROPODA	Rissoidae indet.	.036	.1%	.056	.1%	.030	.1%	.112	.1%
	Crepidula fornicata	6.200	9.5%	13.524	17.7%	11.434	19.7%	3.553	4.1%
	Hinia pygmaea	.005	.0%	.008	.0%	.036	.1%	.025	.0%
	Nudibranchia indet.	.017	.0%	.	.	.	.	.018	.0%
	Onchidoris muricata	.002	.0%	.	.	.000	.0%	.003	.0%
	Polycera quadrilineata	.022	.0%	.	.	.007	.0%	.018	.0%
	Aeolidia papillosa	.048	.1%	.007	.0%	.110	.2%	.	.
BIVALVIA	Mytilus edulis	.194	.3%	.284	.4%	.078	.1%	.102	.1%
	Angulus tenuis	.000	.0%	.001	.0%	.000	.0%	.001	.0%
	Moerella pygmaea	.004	.0%	.	.	.	.	.	.
	Hiatella arctica	.	.	.000	.0%	.	.	.	.
BRYOZOA	Bryozoa indet.	.	.	.	.	.040	.1%	.	.
	Electra pilosa	.713	1.1%	.177	.2%	.329	.6%	.754	.9%
	Alcyonidium sp.	.005	.0%	.026	.0%	.042	.1%	.	.
ECHINODERMATA	Asterias rubens	13.473	20.7%	12.374	16.2%	9.324	16.1%	12.752	14.6%
	Ophiura albida	.005	.0%	.005	.0%	.007	.0%	.013	.0%
	Strongylocentrotus droebachiensis	.013	.0%	.001	.0%	.031	.1%	.	.
Total		65.145	100.0%	76.331	100.0%	57.956	100.0%	87.151	100.0%

2005

Spring

		Transect							
		Foundations, horizontal							
		A 0.5 NNE		B 02 NNE		C 05 NNE		D 05 SSW	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
HYDROZOA	Tubularia indivisa	.111	.5%	.852	2.3%	.085	.2%	.059	.1%
	Hydractinia echinata	.	.	.006	.0%	.009	.0%	.	.
	Campanulariidae indet.	.010	.0%	.003	.0%	.000	.0%	.004	.0%
	Sertularia cupressina	.	.	.001	.0%	.	.	.	.
ANTHOZOA	Alcyonium digitatum	.377	1.8%	.021	.1%	2.533	4.8%	1.028	1.4%
	Actiniaria indet.	5.191	25.2%	9.322	25.3%	15.809	30.1%	10.914	14.7%
NEMERTINI	Nemertini indet.	.	.	.	.	.	.	.001	.0%
NEMATODA	Nematoda indet.	.008	.0%	.005	.0%	.006	.0%	.012	.0%
POLYCHAETA	Harmothoe impar	.009	.0%	.	.	.023	.0%	.001	.0%
	Phyllodoce groenlandica	.	.	.	.	.009	.0%	.009	.0%
	Eulalia viridis	.029	.1%	.012	.0%	.027	.1%	.033	.0%
	Hesionidae indet.	.	.	.	.	.	.	.000	.0%
	Ophiodromus flexuosus	.	.	.004	.0%	.001	.0%	.003	.0%
	Polydora ciliata	.	.	.000	.0%	.001	.0%	.	.
	Pomatoceros triqueter	.628	3.0%	.527	1.4%	1.031	2.0%	.724	1.0%
CRUSTACEA	Verruca stroemia	.044	.2%	.072	.2%	.178	.3%	.199	.3%
	Balanus balanus	.	.	2.158	5.9%	.	.	.	.
	Balanus sp.	.	.	.	.	.	.	.031	.0%
	Cancer pagurus	.032	.2%	.073	.2%	.012	.0%	.	.
	Jassa marmorata	7.431	36.0%	12.094	32.8%	12.829	24.4%	14.348	19.4%
	Caprella linearis	.067	.3%	.129	.3%	.105	.2%	3.328	4.5%
CHIRONOMIDAE	Telmatogeton japonicus	.003	.0%	.	.	.	.	.003	.0%
GASTROPODA	Tectura testudinalis	.	.	.	.	.	.	.012	.0%
	Rissoidae indet.	.030	.1%	.092	.3%	.030	.1%	.094	.1%
	Crepidula fornicata	.005	.0%	.533	1.4%	1.440	2.7%	24.799	33.5%
	Epitonium clathrus	.	.	.001	.0%	.	.	.	.
	Onchidoris muricata	.	.	.036	.1%	.005	.0%	.	.
	Polycera quadrilineata	.	.	.013	.0%	.007	.0%	.018	.0%
	Facelina bostoniensis	.000	.0%	.002	.0%	.003	.0%	.013	.0%
BIVALVIA	Mytilus edulis	.035	.2%	.050	.1%	.044	.1%	.062	.1%
	Thracia phaseolina	.	.	.	.	.000	.0%	.	.
BRYOZOA	Bryozoa indet.	.055	.3%	.	.	.	.	.	.
	Electra pilosa	.127	.6%	.208	.6%	.268	.5%	.144	.2%
	Alcyonidium sp.	.003	.0%	.001	.0%	.025	.0%	.	.
ECHINODERMATA	Asterias rubens	6.437	31.2%	10.658	28.9%	18.092	34.4%	18.247	24.6%
	Ophiura albida	.000	.0%	.	.	.	.	.	.
Total		20.633	100.0%	36.871	100.0%	52.571	100.0%	74.086	100.0%

Autumn

		Transect							
		Foundations, horizontal							
		A 0.5 NNE		B 02 NNE		C 05 NNE		D 05 SSW	
		g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %	g/m²	Kol Sum %
PORIFERA	Porifera indet.	.000	.0%	.	.	.	.	.	.
HYDROZOA	Tubularia indivisa	.316	.3%	.218	.2%	.208	.2%	.163	.1%
	Hydractinia echinata	.	.	.	.	.004	.0%	.004	.0%
	Campanulariidae indet.	.017	.0%	.019	.0%	.074	.1%	.021	.0%
	Sertularia cupressina	.045	.0%	.	.	.000	.0%	.004	.0%
ANTHOZOA	Alcyonium digitatum	1.325	1.2%	9.422	8.3%	5.607	5.1%	9.177	7.4%
	Actiniaria indet.	43.885	40.6%	57.497	50.6%	33.931	31.1%	42.188	34.0%
	Actinaridae indet.	.	.	.	.	2.488	2.3%	.	.
NEMERTINI	Nemertini indet.	.002	.0%	.022	.0%	.003	.0%	.002	.0%
NEMATODA	Nematoda indet.	.009	.0%	.027	.0%	.008	.0%	.041	.0%
POLYCHAETA	Harmothoe impar	.008	.0%	.000	.0%	.003	.0%	.003	.0%
	Phyllodoce groenlandica	.005	.0%	.	.	.	.	.000	.0%
	Eulalia viridis	.036	.0%	.027	.0%	.014	.0%	.011	.0%
	Syllidae indet.	.	.	.	.	.	.	.001	.0%
	Polydora cornuta	.	.	.	.	.000	.0%	.	.
	Chaetopterus norvegicus	.002	.0%	.	.	.029	.0%	.003	.0%
	Arenicola marina	.	.	.000	.0%	.	.	.	.
	Lanice conchilega	.	.	.	.	.024	.0%	.000	.0%
	Sabellaria spinulosa	.	.	.	.	.000	.0%	.	.
	Pomatoceros triqueter	1.236	1.1%	.598	.5%	.608	.6%	.233	.2%
CRUSTACEA	Copepoda indet.	.	.	.000	.0%	.000	.0%	.	.
	Verruca stroemia	.219	.2%	.783	.7%	.715	.7%	.547	.4%
	Balanus balanus	1.049	1.0%	.427	.4%	.	.	2.283	1.8%
	Balanus crenatus	.	.	.	.	.010	.0%	.132	.1%
	Cancer pagurus	.639	.6%	.427	.4%	.360	.3%	.314	.3%
	Liocarcinus depurator	.	.	.001	.0%	.019	.0%	.001	.0%
	Pisidia longicornis	.	.	.	.	.000	.0%	.001	.0%
	Pagurus bernhardus	.	.	.001	.0%	.	.	.	.
	Stenothoe sp.	.009	.0%	.	.	.	.	.	.
	Jassa marmorata	40.101	37.1%	21.915	19.3%	37.729	34.6%	30.229	24.3%
	Atylus swammerdami	.026	.0%	.026	.0%	.021	.0%	.021	.0%
	Caprella linearis	1.699	1.6%	.982	.9%	1.159	1.1%	.536	.4%
CHIRONOMIDAE	Telmatogeton japonicus	.001	.0%	.	.	.001	.0%	.	.
GASTROPODA	Rissoidae indet.	.188	.2%	.106	.1%	.045	.0%	.050	.0%
	Crepidula fornicata	.131	.1%	5.668	5.0%	12.654	11.6%	25.207	20.3%
	Polinices polianus	.	.	.	.	.	.	.002	.0%
	Hinia pygmaea	.016	.0%	.009	.0%	.009	.0%	.	.
	Onchidoris muricata	.	.	.	.	.004	.0%	.000	.0%
	Polycera quadrilineata	.053	.0%	.018	.0%	.040	.0%	.068	.1%
	Facelina bostoniensis	.051	.0%	.061	.1%	.021	.0%	.026	.0%
	Aeolidia papillosa	.	.	.068	.1%	.029	.0%	.029	.0%
BIVALVIA	Mytilus edulis	1.166	1.1%	1.035	.9%	.588	.5%	1.618	1.3%
	Angulus tenuis	.	.	.000	.0%	.	.	.001	.0%
	Moerella pygmaea	.010	.0%	.009	.0%	.011	.0%	.004	.0%
	Hiatella arctica	.002	.0%	.	.	.004	.0%	.005	.0%
	Thracia phaseolina	.001	.0%	.	.	.	.	.	.
BRYOZOA	Bryozoa indet.	.	.	.	.	.	.	.002	.0%
	Electra pilosa	.273	.3%	.364	.3%	.311	.3%	.298	.2%
	Alcyonidium sp.	.421	.4%	.166	.1%	.016	.0%	.091	.1%
ECHINODERMATA	Asterias rubens	15.198	14.1%	12.419	10.9%	12.290	11.3%	10.878	8.8%
	Ophiura albida	.	.	.	.	.002	.0%	.000	.0%
	Strongylocentrotus droebachiensis	.	.	1.237	1.1%	.	.	.	.
ASCIDIACEA	Tunicata indet.	.	.	.	.	.035	.0%	.004	.0%
Total		108.139	100.0%	113.553	100.0%	109.075	100.0%	124.200	100.0%