East Channel association

EASTERN ENGLISH CHANNEL MONITORING REPORT 2008

Section 4. Epifaunal Communities Derived from 2m Beam Trawl Survey

Volume I (Report)

East Channel Association

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EMU

The East Channel Association (ECA) consists of companies developing marine aggregate extraction applications in the Eastern English Channel. This Regional Environmental Monitoring Report has been produced to fulfil the ECA's commitment to undertake regional environmental monitoring as outlined in the ECA Regional Monitoring Blueprint v0.3 (ECA and Emu Ltd., 2005).

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1.0 INTRODUCTION

1.1 Study Background

The six companies of the East Channel Association (ECA) have all made applications or have been awarded licences to extract marine aggregates (sand and gravel) from a region of the UK continental shelf known as the East Channel Region (ECR) (Chart 2.1).

During the application process for marine aggregate extraction and subsequent Regional Environmental Assessment (REA) the companies made a commitment to undertake assessment and monitoring of their activities using both licence-specific and coordinated regional methods. As part of this approach the REA provided an assessment of the environmental conditions and sensitivities of the region and the likely cumulative and in-combination effects of extraction activities.

The recommendations of the REA included a requirement for the companies of the ECA to collaborate in undertaking a programme of regional monitoring. This monitoring programme was developed in consultation with the relevant regulatory bodies and technical specialists in order to provide data capable of identifying the impacts of extraction activities in the ECR.

The scope of monitoring was developed following extensive discussions with government scientific advisors and was progressively revised during development. The initial monitoring scope was presented in the ECA Regional Monitoring Blueprint v0.3 (ECA and Emu Ltd., 2005). The scope of analysis and reporting has been under continual review since the issue of the Blueprint v0.3 as issues have arisen during the monitoring activities.

1.2 Report Objectives

This report has been produced on behalf of the ECA by Emu Limited to describe the monitoring activities with respect to the epifaunal communities derived from 2m Beam Trawls for the year 2007. The report includes a description of the field methods used, the samples taken during the field work, data analysis and interpretation.

1.3 Survey Array for 2008

The 2008 survey array consisted of 49 trawl locations. At each of the selected trawl sites an initial drop-down camera system was employed to collect both video footage and stills of the seabed to determine if the area was a sensitive habitat or contained large quantities of cobbles and boulders making trawling impossible.

1.4 Reporting of Biological Monitoring

This report is one of eight documents covering the biological monitoring undertaken within 2008. The ECR biological monitoring report schedule is listed in Table 4.1.

Report Title	Report Number
1. Seabed Sediment Characteristics	09/J1031333/0871
2. Benthic Communities and Habitats from Grabbing Surveys	09/J1031333/0872
3. Regional Habitats and Biotopes based on Static Image Analysis	09/J1031333/0873
4. Regional Epifaunal Communities Derived from 2m Beam Trawls	09/J1031333/0874
5. Regional Fish and Associated Epifaunal Communities derived from 4m Beam Trawls	09/J1031333/0875
6. Regional Shellfish Populations derived from Scallop Dredge Surveys and Beam Trawl Surveys	09/J1031333/0876
7. Example Habitat and Biotope Monitoring site Employing Hydrographic and Video Monitoring Methods	09/J1031333/0877
8. Comparative Analysis Including Theoretical Frameworks	09/J1031333/0878

Table 4. 1 ECR Biological Monitoring Report Schedule

2.0 METHODS

The 2m Beam Trawl survey array was designed to target small vagile epibenthic species, the sessile invertebrate epifauna and small fish species within the Active Dredge Zone (ADZ), Primary Impact Zones (PIZ), the Secondary Impact Zones (SIZ) and appropriate reference areas within the ECR (Chart 4.1). New reference sites were introduced in 2007 to replace the reference areas to the north east of the region, which were found to be poorly representative of the regional character. One of the replaced reference sites was retained as a suitable context site.

2.1 Field Methods and Operations Summary

This section includes a summary of the survey operations and field methods employed during the 2m beam trawling survey carried out in August/September 2008, to achieve select objectives of the ECA Regional Monitoring Blueprint v0.3: Section 4 and Annex 3 (2005).

Details of vessels, equipment and navigation are detailed in Table 4.2. Detailed descriptions of the methods employed in the field are documented in full within Sections 3 and 4, and Annex 3 of the ECA Regional Monitoring Blueprint v0.3 (2005). Key points from these are summarised in sections 2.1.1 to 2.1.3 together with details of any deviations from those proposed within the Blueprint v0.3.

Vessel, Equipment and Navigation Information	
Vessel	RV Discovery
Survey Dates	10 Days: 6-8/08/2008, 15/08/2008, 21-22/08/2008, 28-30/08/2008, and 09/09/2008 (Appendix A&B For full details)
Navigation Equipment	CSI Vector dGPS
Digital Video and Stills Imaging	Chalco 12:1 digital zoom hyperdigital video camera Konica Minolta Dimage X1 8MP Stills Camera 3x LED units (90° beam, 120W) Camera umbilical (200m x 11mm diam) Sled-design frame with oblique-view video and stills mounting plate, additional 100kg of ballast. (Plate 1) Topside control unit (LCD monitor, Panasonic 400GB HDD (Plate 2) Sony GV-D1000E PAL MiniDV recorder
Sampling Equipment	2m Scientific beam trawl with a 5mm knotless inner sample net mesh (Plate 3).
Navigation Software	HYDROpro Navigation V2.30 Datum ETRS89 Spheroid WGS 1984 Projection UTM Zone 31N

Table 4. 2 Vessel, Equipment and Navigation Information

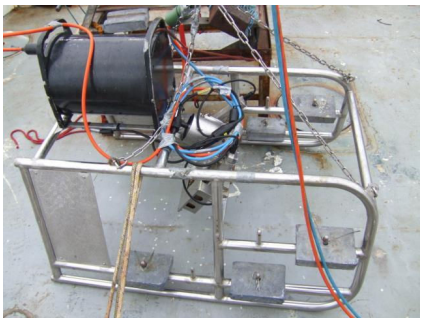	**Plate 1** Steel camera frame with oblique facing video and stills camera. Additional 100kg of lead ballast.

	**Plate 2** Topside control unit (LCD monitor, Panasonic 400GB HDD)

	**Plate 3** Example 2m Beam trawl being deployed

2.1.1 Drop Down Video

To avoid damaging environmentally sensitive habitats prior to sampling and to ensure the seabed was suitable for trawling operations, video images of the seabed were analysed on site. The camera system was deployed via the stern A-frame on the survey vessel *RV Discovery*. The position of the video system was recorded via the HYDROpro software and displayed on the video image. Digital still images with an oblique view of the seabed covering an area of 0.1m^2 (min. 4 Mega Pixel resolution) were also taken to enable review of seabed upon recovery.

2.1.2 2m Beam Trawl

The trawl was fabricated from heavy galvanised steel, with the 5mm mesh net protected by heavy trawl chaffing net at the cod end, and by chain meshing running from the beam. This meant that the trawl was capable of operating on shelly, cobbly seabeds. The cod end liner comprised 5mm knotless mesh. The Beam trawl was towed over a distance of 500 metres. Details of sample positions are detailed in Appendix A. Daily logs of events were recorded and are detailed in Appendix B. Full details of methods can be found in the ECA Regional Monitoring Blueprint v0.3: Section 4 and Annex 3 (ECA and Emu Ltd., 2005).

2.1.3 Field Treatment of Beam Trawl Samples

Upon recovery, the Beam trawl was emptied by releasing the cod end into fish crates. Samples were photographed prior to processing (Appendix C). Fauna were identified on site where accuracy of *in situ* identification techniques could be ensured, and abundance counts were made or estimated using weighing methods. Presence/absence was recorded for most of the colonial species. Subsamples were also collected from all trawls for counts of smaller organisms. Representative examples of some of the fauna were also necessary, where uncertainty over species identity occurred. These samples were retained for subsequent laboratory analysis and confirmation of nomenclature. Beam trawl samples were fixed on site using 4% buffered saline formaldehyde solution. A full species list can be found detailed in Appendix D plus shellfish measurements (Appendix E), *Aequipecten* measurements (Appendix F), fish lengths (Appendix G) and trawl sample details (Appendix H).

2.2 Data Analysis

The data set from the 2m Beam Trawl surveys was investigated with the use of programs from the Plymouth Routine In Multivariate Ecological Research (PRIMER) suite (Clarke & Warwick, 2001 and Clarke & Gorley, 2006) using univariate and multivariate analyses.

2.2.1 Initial data treatment

The source data set of species abundance was subjected to reconciliation with the 2005, 2006 and 2007 data sets to identify any sources of potential difference that might cause inconsistency within the PRIMER analysis. This was undertaken by comparing data sets using Excel spreadsheets to identify simple errors, taxonomic inconsistency and separation of juveniles, etc.

The data set employed for the current report includes counts for the barnacle species and for *Pomatoceros triqueter,* both of which will be analysed on a presence/absence basis for between-year comparison in Section 8 of the report series.

The raw data prior to reconciliation are included in Appendix D. While the 2008 PRIMER ready data, are included in Appendix I.

2.2.2 Multivariate Analysis

Initial data transformation was applied using 4th Root (or Root-Root) conversion. This transformation serves to down-weight the dominant species, taking a much greater account of the less abundant species, and allowing the underlying community structure to be assessed.

Details of each of the multivariate routines (e.g. Bray Curtis % similarity used in faunal data clustering) and univariate measures that have been applied are summarised in Report Section 2, Table 2.3 and 2.4.

3.0 RESULTS

3.1 Principal Observations

A total of 310 species and higher taxa were identified from the 48 2m beam trawl samples, including 43 crustaceans, 55 molluscs, 35 fish, 44 bryozoans, 26 cnidarians, 23 poriferans, 22 echinoderms and 20 ascidians. In addition, a small number of other taxa were recorded including 35 species of annelids as well as species of Turbellaria, Sea spiders and Cephalochordata. The phyletic composition of the beam trawls across the entire survey area is presented in Table 4.3. The total abundance of each taxon within the survey area is also presented.

Taxonomic Group	Total Number of Species	Mean Abundance
Porifera (sea sponges)	23	P
Cnidaria (sea firs, sea anemones)	26	P
Turbellaria (flat worms)	1	<1
Nemertea (ribbon worms)	1	<1
Enteroprocta (goblet worms)	1	P
Annelida (bristle worms)	35	1982
Chelicerata (sea spiders)	1	<1
Crustacea (shrimps, prawns, crabs)	43	274
Mollusca (bivalves, chitons)	55	43
Bryozoa (sea mats)	44	P
Echinodermata (sea urchins, brittle stars, starfish)	22	565
Cephalochordata (lancelet)	1	<1
Tunicata (sea squirts)	20	53
Pisces (fish)	35	27
Algae (corallinaceae)	1	P
Total	**310**	**10275***

Table 4. 3 Phyletic Composition of 2m Beam Trawl Samples 2008.
* excludes those colonial species for which abundance estimates have been employed.

The top ten most frequently occurring trawled species are presented in Table 4.4. Several species were ubiquitous and it can also be seen that within the ten most frequently occurring species, six major taxonomic groups were represented.

Species	Phyla	% frequency
Aequipecten opercularis	Mollusca	**100**
Asterias rubens	Echinodermata	**100**
Hydrallmania falcata	Cnidaria	**100**
Macropodia spp.	Crustacea	**100**
Pomatoceros spp.	Polychaeta	**100**
Psammechinus miliaris	Echinodermata	**100**
Balanus sp.	Crustacea	**98**
Schizomavella sp.	Bryozoa	**98**
Pagurus bernhardus	Crustacea	**98**
Pagurus prideaux	Crustacea	**98**

Table 4. 4 Most Frequently Occurring Species from the 2m Beam Trawl survey.

The top ten most abundant species are presented in Table 4.5, below. It is evident that two species in particular were present in very high abundances throughout the area, namely *Alcyonium digitatum* and *Balanus* sp., with the polychaetes *Pomatoceros* spp. and the crustacean *Crangon* spp. also at very high maximum abundances.

Species	Abundance per tow	
	Mean	Max
Balanus sp.	5442	18156
Pomatoceros spp.	1897	14060
Psammechinus miliaris	1230	5547
Aequipecten opercularis	525	1616
Ophiothrix fragilis	282	7790
Asterias rubens	188	1607
Alcyonium digitatum	81	776
Macropodia spp.	59	208
Anomiidae	58	292
Sarcodictyon roseum	45	1116

Table 4. 5 Mean and Peak Abundances of the Dominant Species from the 2m Beam Trawl tows.

Although present at a relatively small number of sites (with a frequency of 21%), the cnidarian *Sarcodictyon roseum* was noted in considerable maximum abundances (1116 individuals).

3.2 Multivariate Analysis

Multivariate analysis was carried out on the trawl samples data set to determine which groups of communities were present within the study area surveyed in 2008. The results of the similarity matrix, following a 4^{th} root transformation are graphically represented in a dendrogram (Figure 4.1) and a multidimensional scaling plot (MDS; Figure 4.2).

Using Figures 4.1 and 4.2, four main groups of sampling sites were identified, although greater within cluster definition is possible, as will be discussed later. It should also be noted that site 1 was not sampled due to the presence of significant beds of *Ophiothrix fragilis*, identified from the preliminary video of the site before sampling.

The groups of samples were subsequently analysed using the Similarity Percentage Analysis (SIMPER), in order to determine which species were characteristic of the groups of the samples. Table 4.6 shows the dominant species within each group, with the characterising species highlighted, (based on those species that contribute >70%, on a cumulative basis, to the cluster similarity). The average abundance of these species is also provided.

The community structure measures were calculated employing the PRIMER DIVERSE routine and the results are also presented in Table 4.6, including number of species, number of individuals, species richness, diversity and evenness.

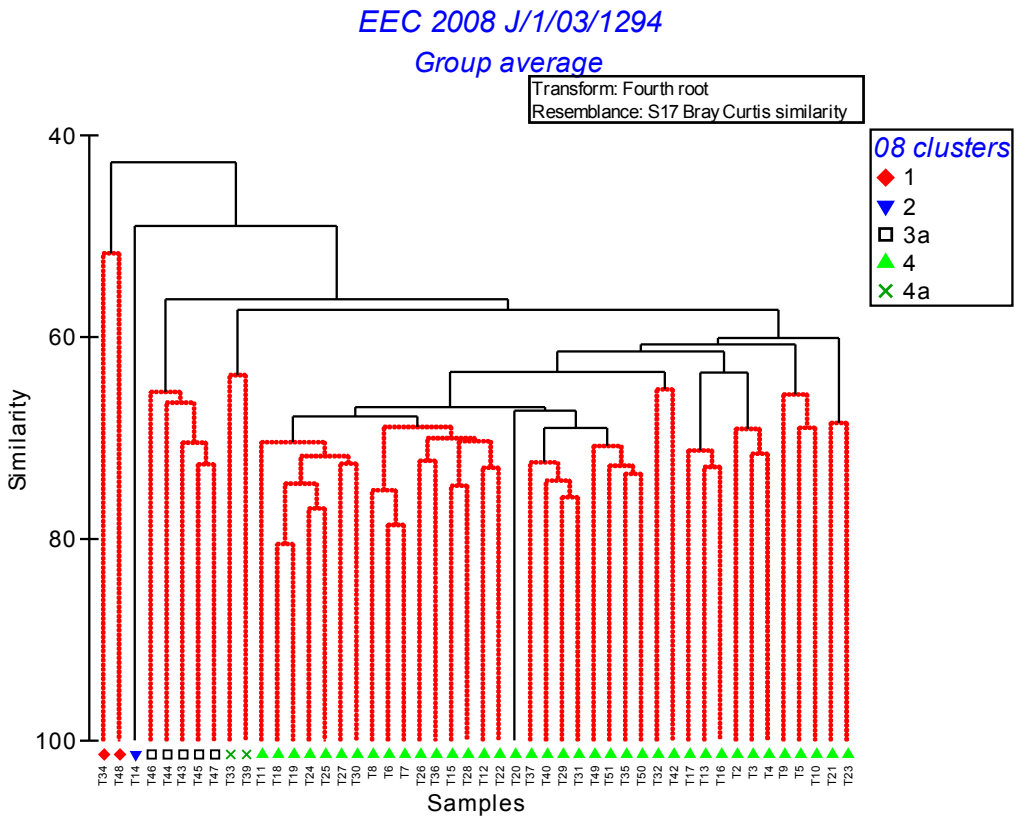

Figure 4. 1. Dendrogram of Bray-Curtis Similarity Index of Epifaunal Communities from 2m Beam Trawl Samples, 2008 survey.

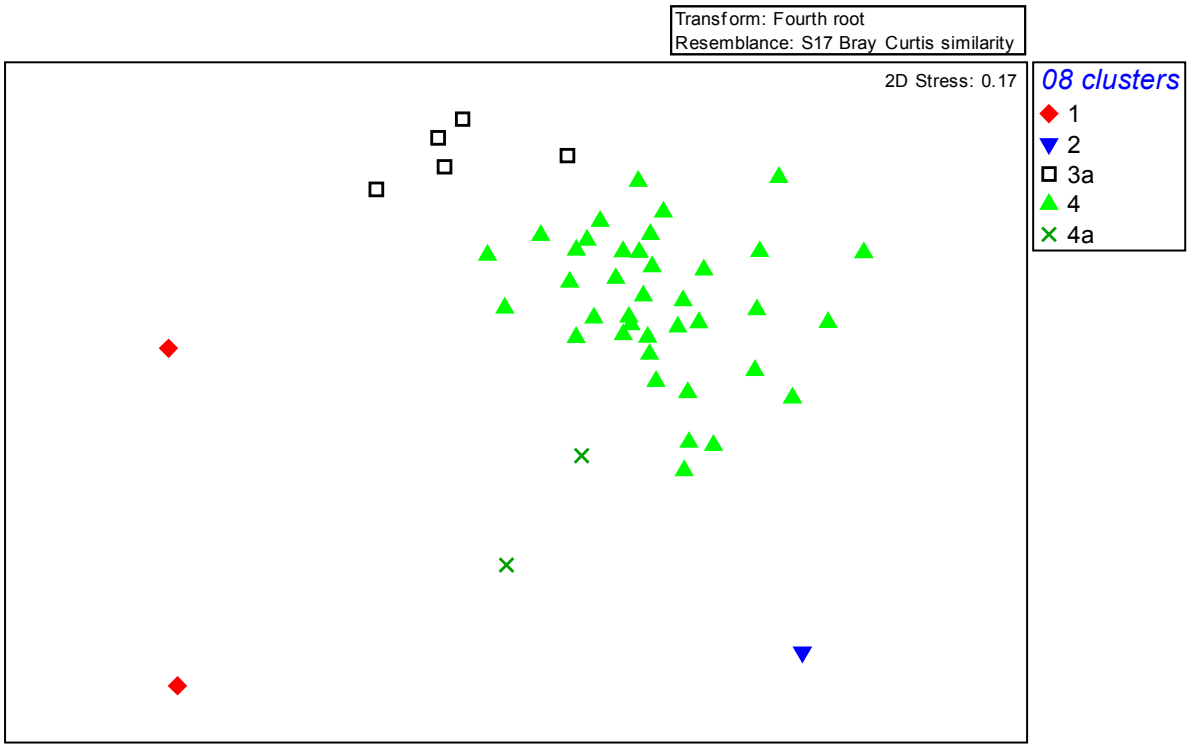

Figure 4. 2. Multi-Dimensional Scaling (MDS) Ordination Plot of Epifaunal Communities from 2m Beam Trawl Samples, 2008 survey

CLUSTERS										
	Group 1 (2 sites) Average similarity = 64.4%		Group 2 (1 site) -		Group 3a (5 sites) Average similarity = 63.8%		Group 3a (2 sites) Average similarity = 51.7%		Group 4 (38 sites) Average similarity = 67.5%	
	Species	**Mean**	**Species**	**#**	**Species**	**Mean**	**Species**	**Mean**	**Species**	**Mean**
	Balanus sp.	80.6	*Ophiothrix fragilis*	7790	*Pomatoceros* spp.	2265.26	*Balanus* sp.	4804.75	*Balanus* sp.	6536.53
	Asterias rubens	68.5			*Psammechinus miliaris*	822.8	*Pomatoceros* spp.	721.15	*Pomatoceros* spp.	2056.31
	Gobiidae	61.5			*Balanus* sp.	610.72	*Psammechinus miliaris*	532	*Psammechinus miliaris*	1402.76
	Epizoanthus couchii	51.2			*Asterias rubens*	185.2	*Aequipecten opercularis*	451	*Aequipecten opercularis*	630.82
	Adamsia carciniopados	49			Anomiidae	84.16	*Asterias rubens*	99	*Asterias rubens*	203.5
	Pagurus prideaux	48.5			ASCIDIACEA	73.2	Gobiidae	85.5	*Ophiothrix fragilis*	150.63
	Pomatoceros spp.	26.3			*Ciona intestinalis*	68.6	*Inachus dorsettensis*	29.5	*Alcyonium digitatum*	96.57
	Macropodia spp.	25.5			*Macropodia* spp.	59	*Trisopterus minutus*	28	*Macropodia* spp.	64.58
	Crangon spp.	22.5			*Pagurus prideaux*	48.8	*Macropodia* spp.	23.5	Anomiidae	60.59
	Inachus dorsettensis	9.5			*Ascidia conchilega*	48.2	*Pandalina brevirostris*	18.5	Gobiidae	24.11
	Aequipecten opercularis	8			*Adamsia carciniopados*	40.4	*Pagurus prideaux*	16.5	*Pagurus bernhardus*	22.79
	Ophiura albida	5			*Alcyonium digitatum*	37.87	*Processa* spp.	15	*Thelepus cincinnatus*	21.88
	Echiichthys vipera	4			*Aequipecten opercularis*	31.8	*Adamsia carciniopados*	13.5	*Ciona intestinalis*	20.08
					Pagurus bernhardus	20	*Callionymus lyra*	9.5	*Ophiura albida*	19.76
					Inachus dorsettensis	19	*Crangon* spp.	8	*Pagurus prideaux*	16.82
					Molgula oculata	8.6	*Galathea* spp.	7.5	*Inachus dorsettensis*	16.42
					Ascidia virginea	6.2	*Aspitrigla cuculus*	6	*Pandalina brevirostris*	15.97
					Liocarcinus spp.	4.8	*Arnoglossus laterna*	4	*Adamsia carciniopados*	15.05
					Galathea spp.	4.4	*Ebalia* spp.	4	*Ascidia conchilega*	8.68
					Aetea sp.	1	*Ophiothrix fragilis*	2	*Galathea* spp.	8.05
					Cliona spp. (agg.)	1			*Gibbula tumida*	7.08
					Schizomavella sp.	1			*Aspitrigla cuculus*	6.82
									Calliostoma sp.	4.32
									Liocarcinus spp.	3.74
									Callionymus lyra	3.45
									Pecten maximus	2.68
									Hydrallmania falcata	1
									Schizomavella sp.	1

COMMUNITY STRUCTURE MEASURES										
	Mean	**sd**	**Mean**	**sd**	**Mean**	**sd**	**Mean**	**sd**	**Mean**	**sd**
S	45	10	52	-	61	12	61	9	82	13
N	558	66	8715	-	4648	2878	7059	1775	11714	6448
d	6.977	1.697	5.621	-	7.192	1.221	6.744	1.233	8.755	1.469
J'	0.668	0.021	0.138	-	0.434	0.052	0.292	0.063	0.316	0.074
H'	2.532	0.067	0.544	-	1.772	0.183	1.193	0.215	1.387	0.327

Table 4. 6. Clusters derived from all sites 2008. Most to least characteristic species are on red to white scale. Species included contribute >70% to cumulative separation of clusters and > 2% individual contribution to cluster similarity.

Group 4 comprised the majority of the trawl samples and was characterised by the highest mean number of species and individuals. The abundance was dominated by *Balanus* sp. which accounted by far for the largest percentage of the group abundance (63%) and was primarily responsible for the separation of this group of samples (Figure 4.3). Other species which were characteristic of this cluster and which also occurred in considerable abundance included *Psammechinus miliaris* and *Aequipecten opercularis*. Additional lower abundance species also charcaterised this highly diverse cluster including *Alcyonium digitatum*, *Thelepus cincinnatus* and *Ophiura albida.*

Group 3a comprised five trawl samples which were dominated by high numbers of *Pomatoceros* spp, which accounted for over 51% of the group abundance. This cluster was characterised as also being dominated by Ascideans (i.e. *Ciona intestinalis*, *Ascidia conchilega*, *A. virginea*, *Molgula oculata* and Ascidiacea spp.; see for example Figure 4.4) and Anomiid bivalves.

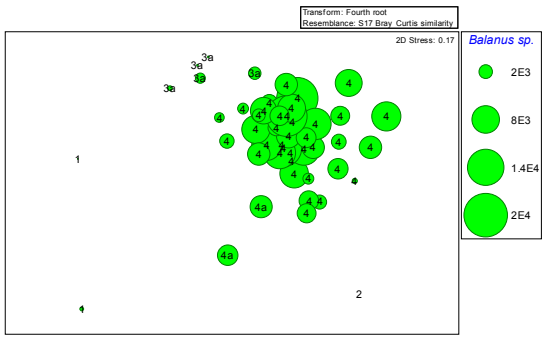

Figure 4. 3 Abundance of *Balanus* sp.

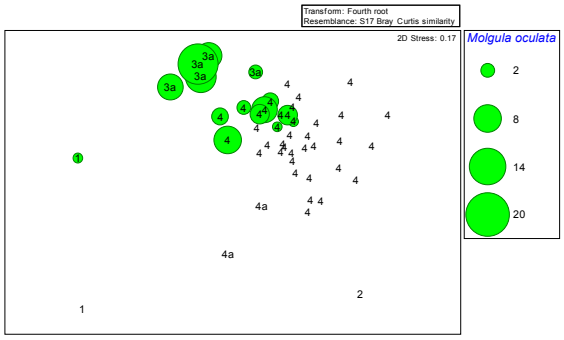

Figure 4. 4 Abundance of *Molgula oculata*

Group 4a comprised two trawl samples which were characterised by high numbers of *Balanus* sp. The top 5 species (ranked in terms of mean abundance) were the same as those found in Group 4. However, the abundance of these species was considerably lower (see table 4.6). The lower abundances of these dominant species, in combination with several characteristic species including the fish, Bib, (*Trisopterus minutus*) and the European flounder (*Arnoglossus laterna*) and the Caridean prawns (*Processa* spp.) resulted in the separation of these two clusters.

Group 1 comprised two trawl samples. It hosted the lowest mean number of species and by far the lowest mean number of individuals. Hence, this group showed the highest values for the evenness and diversity indices (Table 4.6). The group was characterised by the colonial sea anemone *Epizoanthus couchii*, the brown shrimp *Crangon* spp. and the lesser weever fish, *Echiichthys vipera.* These species were not exclusive to this group, but were found in consistently greater numbers (see for example Figure 4.5).

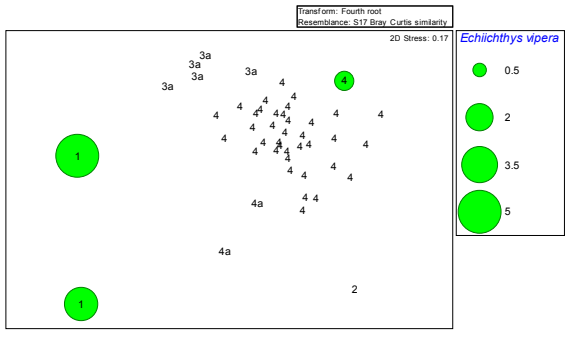

Figure 4. 5 Abundance of *Echiichthys vipera*

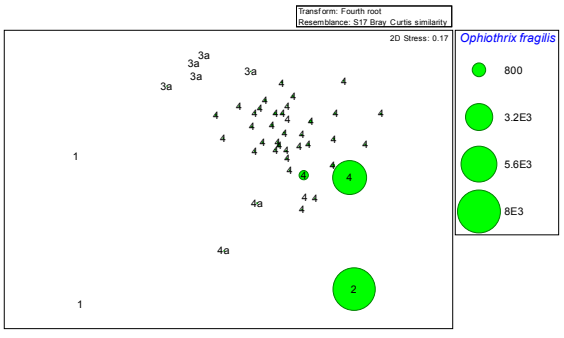

Figure 4. 6 Abundance of *Ophiothrix fragilis*

Group 2 comprised a single trawl (T14) within Aggregate License Area 461, and was considerably different from the other trawl samples. It hosted the second lowest numbers of species but second highest number of individuals. The large number of individuals was accounted for by, *Ophiothrix fragilis*, which comprised over 89% of the total faunal abundance and was primarily responsible for the separation of this sample (Figure 4.6). This group was also characterised by the fish *Agonus*

cataphractus and *Trigloporus lastoviza*, the molluscs *Buccinum undatum, Trivia monacha* and *Tapes rhomboides*, the common sun star *Crossaster papposus,* the Bryozoan *Diplosolen obelia,* the sponges *Dysidea fragilis, Halichondria panacea,* and *Haliclona spp.,* and the crab *Pisa armata,* although all at a relatively small percentage of the epibenthic abundance.

3.3 Cluster Distribution

Chart 4.2 illustrates the distribution of the groups of sites defined through the PRIMER analysis. It is apparent that the majority of the area falls within one community type, comprising the species from Group 4 in considerable abundance. Some distributional differences are evident with a group of sites grouped together from cluster 3 in the north east of the array, with the outlier (cluster 2) in Area 461 to the south, and a further pair of sites (34 and 48) located to the extreme north east. In 2007, these distributions have conformed to the gradient of increasing quantities of sand that had been shown to influence all other distributions in the area (See Section 1 report).

3.4 Epibenthic composition within the ADA, PIZ, SIZ, Reference areas and Context sites.

An ANOSIM analysis of the different impact areas (ADZ, PIZ, SIZ), reference areas (Ref) and context sites (Contx) revealed that a difference, significant at 1.3% with a global R value of 0.145, was evident within the data set. The pair-wise comparison of the data revealed that this difference was almost entirely due to the context sites, along with the comparison of the PIZ and reference sites. All other comparisons were found to have R values of less than 0.2, with several below 0.1.

	PIZ	SIZ	Ref	Contx
ADZ	-0.085	-0.105	-0.099	**0.375**
PIZ		0.06	0.112	**0.553**
SIZ			0.01	**0.690**
Ref				**0.737**

Table 4. 7 ANOSIM Results for the Different Impact Zones.

Summaries of the epibenthic communities collected by the beam trawl samples within the different collective impact zones (ADZ, PIZ and SIZ) as well as the individual reference areas and the context sites are presented in Fig. 4.7 and Table 4.8.

The epibenthic communities within each area showed a similar composition, with **mobile epibenthic** species accounting for the highest number of species, followed by the colonial epifaunal species and the solitary epifauna. The most mobile species was recorded in reference area 2, to the north of the survey area, whereas reference area 6 to the east and the context sites hosted the lowest number of mobile epibenthic species.

The highest **colonial epifaunal** species diversity was recorded within the primary impact zone. The highest overall mean number of species were recorded from reference area 5 to the south-east. Reference area 7 to the central eastern section of the survey area comprised the second highest colonial species diversity, whereas the context sites hosted the lowest number of colonial species. Overall, these samples hosted the lowest mean species diversity.

The **solitary epifaunal** species accounted for consistently lower species diversity in all areas, with the lowest value recorded within the context sites, and the highest within reference areas 6 and 7.

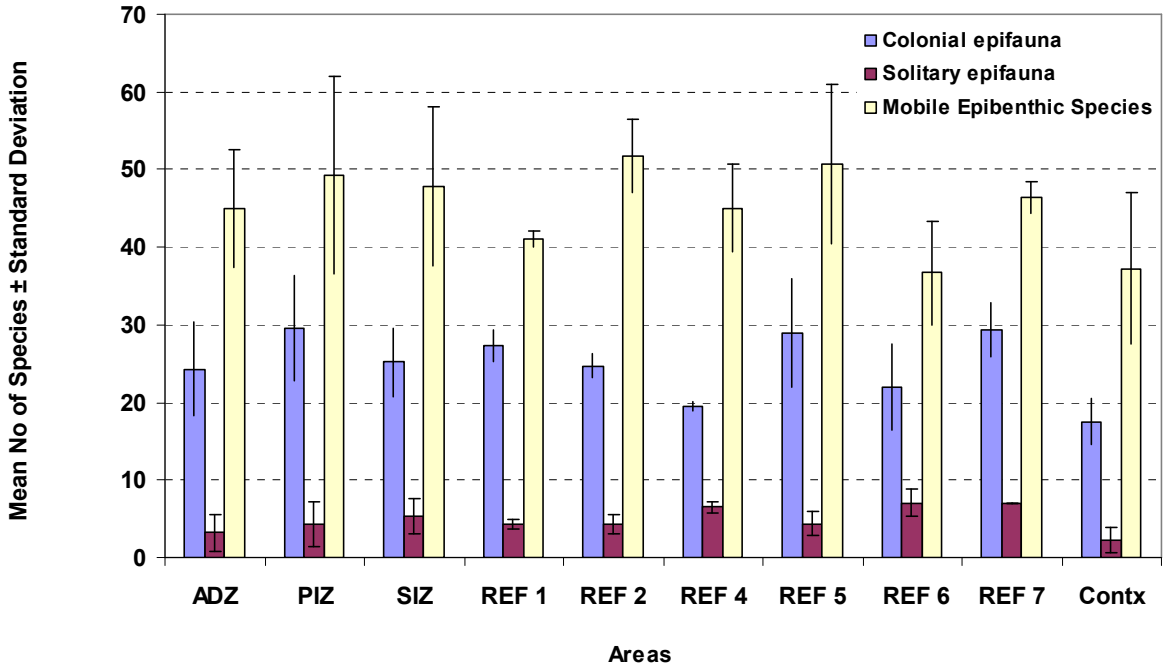

Figure 4. 7. Numbers of Species in Main Epibenthic Faunal Groups from Beam Trawl Samples within Different Impact Zones, 2008.

	ADZ	PIZ	SIZ	REF 1	REF 2	REF 4	REF 5	REF 6	REF 7	Contx
Porifera	4.8	6.7	6.0	5.3	5.7	4	7.3	5.7	7.0	4.5
Cnidaria	6.0	7.3	8.3	6.7	7.0	8	8.7	9.3	8.0	4.3
Crustacea	11.5	12.9	12.5	11.7	14.7	12	12.3	11.7	11.0	10.0
Mollusca	12.3	12.1	12.1	10.0	11.7	13.5	11.7	6.0	13.0	9.5
Bryozoa	13.3	14.7	11.8	13.7	13.7	9	13.7	9.0	15.3	8.5
Echinodermata	7.5	6.9	8.4	7.7	7.7	5	7.7	5.7	6.7	5.5
Tunicata	3.3	5.6	4.8	6.0	4.3	5.5	4.0	6.0	5.3	2.0
Pisces	7.8	7.6	7.6	5.3	8.3	8	8.7	5.0	8.0	7.0
Others	6.3	10.0	7.8	6.3	9.3	6.5	10.3	8.7	9.0	6.3
Mean Total	72.5	83.7	79.2	72.7	82.3	71.5	84.3	67.0	83.3	57.5

Table 4. 8 Numbers of Major Epibenthic Faunal Taxa from Beam Trawl Samples within Impact Zones, EEC 2008 survey

The crustaceans and bryozoans dominated the species diversity in most areas, with the mollusca dominant in the reference 4 area. Molluscs and crustaceans also frequently contributed the second largest number of species (Table 4.8).

3.5 Summary Conclusions

The fauna described from the 2m Beam Trawls were generally uniform in nature across the ECR. Some variation occurred in the north east of the region, as the sediments became more sandy and mobile in character, with an increase in the abundance of a characteristic group of species including brown shrimp *Crangon* spp., fish such as *Trisopterus minutus*, *Arnoglossus laterna* and *Echiichthys vipera*. The ascidians such as *Ascidia conchilega* and *Molgula oculata* were evident in areas where some stability appears to exist, also potentially including areas of shell deposits. The majority of the ECR was characterised by a high diversity mixture of taxonomic groups dominated by *Balanus* spp., *Pomatoceros* spp., *Psammechinus miliaris* and *Aequipecten opercularis.* What appeared to be a transitional community existed between these two community types, also restricted to the north east of

the area. Some subsidiary communities may also exist, of which the *Ophiothrix fragilis* based community located across the central-southern parts of the region was the most evident.

The assessment of the different impact zones indicates that no clear dredging impacts have been currently identified, with only small difference evident being between the PIZ and reference areas based on the ANOSIM analysis. Negligible difference was evident between the ADZ, SIZ and reference areas, and ADZ, SIZ and PIZ. This is confirmed to some extent through the consideration of the epibenthic faunal groupings, which demonstrate a good degree of similarity over most of the impact types and reference areas. Some differences were evident however, with respect to specific species groups, including low numbers of Mollusca in Ref area 6, Bryozoa in Ref areas 4, 6 and the context sites and Tunicata in the ADZ and context sites. These differences appear to fall with the range of natural variability across the survey area.

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4.0 AUDIT INFORMATION

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