CENTRE FOR ENVIRONMENT, FISHERIES AND AQUACULTURE SCIENCE
LOWESTOFT LABORATORY, LOWESTOFT, SUFFOLK NR33 0HT

2009 RESEARCH VESSEL PROGRAMME Report

PROGRAMME: RV CEFAS ENDEAVOUR: 05/09

STAFF:

Sven Kupschus
Dave Sivyer
Sarah Walmsley
Ian Holmes
Ruth Parker / Tom Hull
Dave Pearce
Paul Whomersley / Suzanne Ware
Nigel Lyman
Bill Mulligan
Jeroen van der Kooij
Rob Bush
Peter Randall
Joana Silva
Richard Humphreys
James Pettigrew
Tom McGowan / Katy Owen
Andrew Griffith
Elke Neubacher

Marine Mammal and Seabird Observer: Ray Eades
French Observer: Jerome Quinquis

DURATION: 16 March – 4 April.

LOCATION: Western Channel (ICES area VIIE)

AIMS:

1. To carry out a multidisciplinary survey of the Western Channel waters for the purposes of stock assessment monitoring, examining the effectiveness / capabilities of multidisciplinary monitoring on Endeavour, the stratified random survey design and collecting ecosystem level information.

RESULTS: Figure 1 & 2 shows the distribution of samples collected by gear type. Associated station numbers are shown in Figure 3. Other gears were sampled in the same location where it was possible to deploy according to environmental and habitat conditions. The number of stations sampled by each gear and their validity is shown in Table 1.

a) to carry out a beam trawl sampling survey of the Western Channel for stock assessment purposes using standardized 4m beam trawls in order to obtain information on:

- Distribution, size composition and abundance of all fish species caught.
- Age – length distribution of selected species.
- Distribution of fish in relation to their environment.
- Distribution of macrobenthos and anthropogenic debris.
- Length weight & maturity information using individual fish measurements, in support of the EU Data Regulation.
- To collect fisheries acoustic data at two operating frequencies (38 kHz , 120 kHz, 200 kHz) continuously throughout the cruise.

RESULTS:

The aim was completed successfully with all fish measured and benthos counted and ID'ed to the lowest taxonomic group possible at sea. Additional samples were returned to the lab for further identification.

At total of over 21000 fish and invertebrates of commercial importance were sampled during the cruise. A list of numbers and caught and measured is shown in Table 2. With length frequency distributions for the most important commercial species collected displayed in Figures 4. Species distribution maps for the same species are shown in Figure 5-10.

Other invertebrates were enumerated in keeping with current protocols. The catches in weight (including those species measured) are listed in Table 3.

Biological samples were collected for commercially important species. The number of samples taken for age and maturity is shown by sex in Table 4, and includes samples for Gurnards and John Dory in line with new EU data regulations.

Multibeam data was collected on all but one of the fishing stations where the deployment of the drop keel was not possible due to shallow depths. This data has been processed for all stations along with the fisheries acoustic data. Data for the whole cruise track has been collected and will be stored on Cefas servers awaiting funding for processing.

Species composition data as in previous years showed similar classification by area in previous years, although the species determining the classifications appear to have changed relative composition (Figure 11).

b) habitat discrimination will be carried out continuously during the cruise using the EK600 system (QTC-analysis) and the multibeam system. Station data will be correlated to catches and video footage from the Bowtech Explorer Extreme mounted on the beam. In addition on 10 stations the drop camera will be deployed to collect video footage to the MESH standard.

RESULTS:

QTC data has been collected, but requires completion of the cruise to fully analyse the data. As one of the members of the acoustics team had to return to Lowestoft prematurely it was not possible to complete this task on board. All 10 JNCC camera tows were completed on the agreed stations, with one station moved from primary to secondary target to accommodate JNCC requirements (Positions are shown in Figure 1. On beam camera work had to be abandoned after 5 stations as the camera mounting suffered severe damage during a collision under water. The camera was retrieved safely requiring minor repair.

c) sediment and benthos at a station. Five sediment samples will be collected along the trawl transect preferably using the NIOS corer, but at those sites where this is not possible due to the sediment type the mini-hamon grab will be deployed. These samples will be used for collecting the following data.

The benthic macro infauna (5mm sieve)
Sediment Oxygen Profile (NIOZ)
Pore water exchange (NIOZ)

At the first NIOZ site or the last Hamon site
Benthic infauna (1mm sieve), secondary aim
Sediment particle size analysis
Bulk Chlorophyll
Bulk Nutrients
Meiofaunal sample / core (NIOZ) secondary aim

RESULTS:

One hundred and thirty nine sediment samples were collected in triplicate at each station where NIOZ deployment was possible. Collecting five replicates was abandoned early on in the cruise as time constraints and sorting of samples on board was found to be impractical given the size of samples and the lack of small-scale spatial variability. The vast majority of samples were collected in the UK sector where habitats were suitable for coring. In areas where this was not possible, mostly deployment of the Hammond grab would also not have yielded useful samples, video footage was collected using the SPI camera video facility.

d) Sediment redox. Five SPI camera dips with 5 replicates at each dip. This data will be linked to the sediment and benthic samples so should occur at an equivalent site to those samples

RESULTS:

One hundred and sixty five valid SPI camera deployments were made, although on a number of stations the flash was working only intermittently, and on other stations penetration was poor due to hard substrates.

e) Water column sampling. Water column profile and water samples will be collected at each station, providing profile information for chlorophyll, oxygen salinity temperature, nutrient samples and the relevant QAQC samples for

calibration of the equipment. Water samples will be collected and fixed on board for analysis post-hoc. The sonde will also provide a sound velocity profile for calibrating / QAQC of the acoustic information.

RESULTS:

Seventy-one CTD dips were completed yielding temperature, chlorophyll a (chl), suspended load, PAR, and salinity profiles as well as surface and bottom samples for oxygen and nutrient analysis. Oxygen and Chl samples were all processed on board awaiting data entry and QAQC processing back at the lab. Additional salinity samples for quality control were collected for processing later.

f) Collect water samples for tritium and caesium contamination (22 litres) at eleven stations at graduated distances around the nuclear dumping grounds at the western end of the Hurd Deep. These will be mostly collected in transit near the requested sites, though the station at the actual dumping ground will be sampled with greater precision.

RESULTS:

Eleven samples were collected mostly on the requested stations although one had to be changed due to a change in plans. Provisions have been made to collect an additional sample on the return journey to Lowestoft closer to the requested station.

g) Seabird and Marine Mammal. Locations, species and numbers observed will be recorded as encountered by SIC and crew as per the usual fisheries division protocol. In addition, a berth and space on the bridge will be made available to the JNCC or one of its consultants to collect information on seabirds and marine mammals between stations in accordance with the relevant standard practices for this kind of observation (e.g. ESAS).

RESULTS:

The JNCC observer was accommodated on the first half of the cruise. Unfortunately due to the requirements of daylight and speed greater than 4 knots, in conjunction with the long periods on station and the effect of fishing operations on sea birds, the time of effective sampling was extremely limited.

h) Collect ray and smooth hound fin clips for genetic analysis by external cefas partners.

RESULTS:

Ninety starry smooth hound and 43 ray samples of various species were collected.

i) collect samples of commercial fish species for ministerial fish ID course

Samples of species collected and frozen

GENERAL CONCLUSIONS:

The multidisciplinary aspect of the cruise represented some serious challenges in terms of logistics and manpower. This cruise demonstrated that it is clearly possible to collect the data necessary to address ecosystem level questions on board. Scientific staff from all divisions worked together extremely well in making this project a success. Special thanks go to the shift deck masters and the second SIC for making this project a success. Despite unexpected staff changes and the constraints of time series protection and partnership requirements.

NARRATIVE:

Provisionally RV CEFAS Endeavour was due to sail from Portland on the 16th of March, but due to the working time directive (on the ships side) it was not possible to start sampling out of Portland. Instead we sailed west to the first station south of Land's End. The first station was completed with all scientific staff on deck to ensure consistency through out the survey. Completion of the station lasted 13 hours in part due to glitches in the gear associated with the set up. This included the first of the JNCC camera tows. Nevertheless some changes needed to be made to the sampling protocol. The number of SPI deployments and cores was reduced to three a station as habitat on a station was found to be much less variable than anticipated. Sampling of infauna could not be carried out effectively at sea so samples were stored instead. As staff familiarised themselves with the sampling over the next couple of days times on station were reduced to under 4 hours. However this left little time for the JNCC observer to collect information since the protocol required speeds of greater than 4 knots.

During the following 3 days we worked our way around the western part of the grid catching considerable numbers of monk and megrim with some very good catches of sole inshore around the area of Mounts Bay in very fine weather. Coring and SPI work indicated course shell and sandy habitats with little indication of an anoxic layer on all but the most inshore stations, uniformly distributed over the tows. The light sensitive camera mounted on the beam to observe habitats was severely damaged by an impact. The camera itself could be repaired, but the mounting was beyond fixing, so will require further development if this type of work is found to be of value.

Heading back out into the middle of the Channel sampling in Stratum 13 continued with the completion of 3 JNCC camera tows at requested stations. One of the primary stations had to be exchanged for a secondary station due to the camera requirements. Good numbers of monk fish and persistent catches of sole were observed on these tows with benthic work continuing along the same vein. The weather was about to turn so we headed back inshore to Falmouth Bay where coring started to produce more variable habitat distributions, though still largely consistent within stations. Moving to the east of the bay we started to see increasing number of plaice and sole in worsening weather, completing a JNCC camera tow off Start Point. At this time two of the scientific staff got news that they would have to return to shore unexpectedly so plans had to be made to replace their expertise and facilitate their evacuation.

Heading around the Start sampling times had been reduced to close to three hours per station putting us ahead of schedule so changes were made to the plan to pick up a couple of stations further off shore in worsening weather including one JNCC camera tow. Although less than ideal, future weather was predicted to be worse. In the afternoon of the 26th March we held station off Brixham to exchange six scientists (four planned, 2 due to emergencies back home) and equipment. Because sampling of in-fauna at sea had been abandoned further equipment had been requested prior to exchange staff departure from Lowestoft. This caused concern to ships staff because of the weight of the cargo and the nature of the material. Having eventually completed the exchange we continued north into Lyme Bay dropping all together 3 stations from

the full sampling program around the densest station distribution (reduced to CTD and beam trawling) due to time constraints and worsening weather. We continued to pick up some sole, but fewer than expected for the area and plaice abundances seemed higher than in the past. Few fishing boats had been observed on the trip prior to sampling the Start area. Here a number of beamers were observed, but fishing activity in the area seemed low given the weather and time of year.

Heading back offshore the weather continued to worsen and it was to the credit of the ships deck crew that we were able to continue sampling with the heavy coring gear and JNCC camera work. As we hit mid Channel all but beam work had to be abandoned for health and safety considerations and even that limit was exceeded for a time. The stations included two that we hoped to sample for the JNCC. The decision was made to leave the last two JNCC tows to possibly pick these up on the return leg to Falmouth instead of waiting for better weather.

Moving into the French sector it soon became clear then infaunal sampling and SPI work was going to be difficult because of the very hard nature of the habitat. The wide variety of epifauna continued to be sampled by the beam trawl with additional camera deployments completed using the video facility attached to the SPI. This with a view to developing a better protocol for sampling these rocky habitats in now improving weather conditions. Relatively few fish were encountered in the western part (Stratum 12). As we headed east we continued to see good number of monk fish, which had not been observed in such densities in this area previously, including a good number of white bellied angler fish. Sole numbers on the other hand were low, and a tow just off a known spawning ground around the Langoustine Bank yielded very poor catches. The ground turned from a hard cobble substrate to bedrock, which produced very different catches of epibenthos and fish. Camera work qualitatively confirmed the change in habitat.

Moving into the most easterly stratum sampling became very difficult due to a large amount of static gear and very hard ground at most stations. Four cores were completed in the most southerly stations in stratum 11 where grounds were somewhat softer. Moving up the coast a number of primary stations had to be dropped and replaced with secondary ones. One of which could not be sampled either so an additional station had to be selected. A substantial number of local trawlers were observed in the area, apparently targeting clams in amongst the rough ground using dredges. Going over rough grounds the beams had held up very well, but our luck ran out off Alderney where during the process of shooting the gear we parted the warp. Roughly 12 hours were spent recovering the gear in very difficult tidal conditions. The large amount of technical equipment and expertise (acoustics and cameras) allowed exact location of the beam and the ships crew did an excellent job recovering the gear by the parted warp using a grapple. Because of the time delay and the state of the tide a further station (in addition to the one we lost the beam on) had to be dropped to make up the time spent on recovery.

The final two stations mid Channel were sampled on the morning of the final day of the survey and the JNCC camera work was completed on the two requested stations which previously been sampled for fish and epifauna only. We came along side in Falmouth on the morning of the 4th of April where scientist departed for Lowestoft.

DISTRIBUTION:
Basic list +

Sven Kupschus
Dave Sivyer
Sarah Walmsley
Ian Holmes
Ruth Parker / Tom Hull
Dave Pearce
Paul Whomersley / Suzanne Ware
Nigel Lyman
Bill Mulligan
Jeroen van der Kooij
Rob Bush
Peter Randall
Joana Silva
Richard Humphreys
James Pettigrew
Tom McGowan / Katy Owen
Andrew Griffith

Edmund McMannus
EmmaVerling

Figure 1: Deployments by environmental gear types.

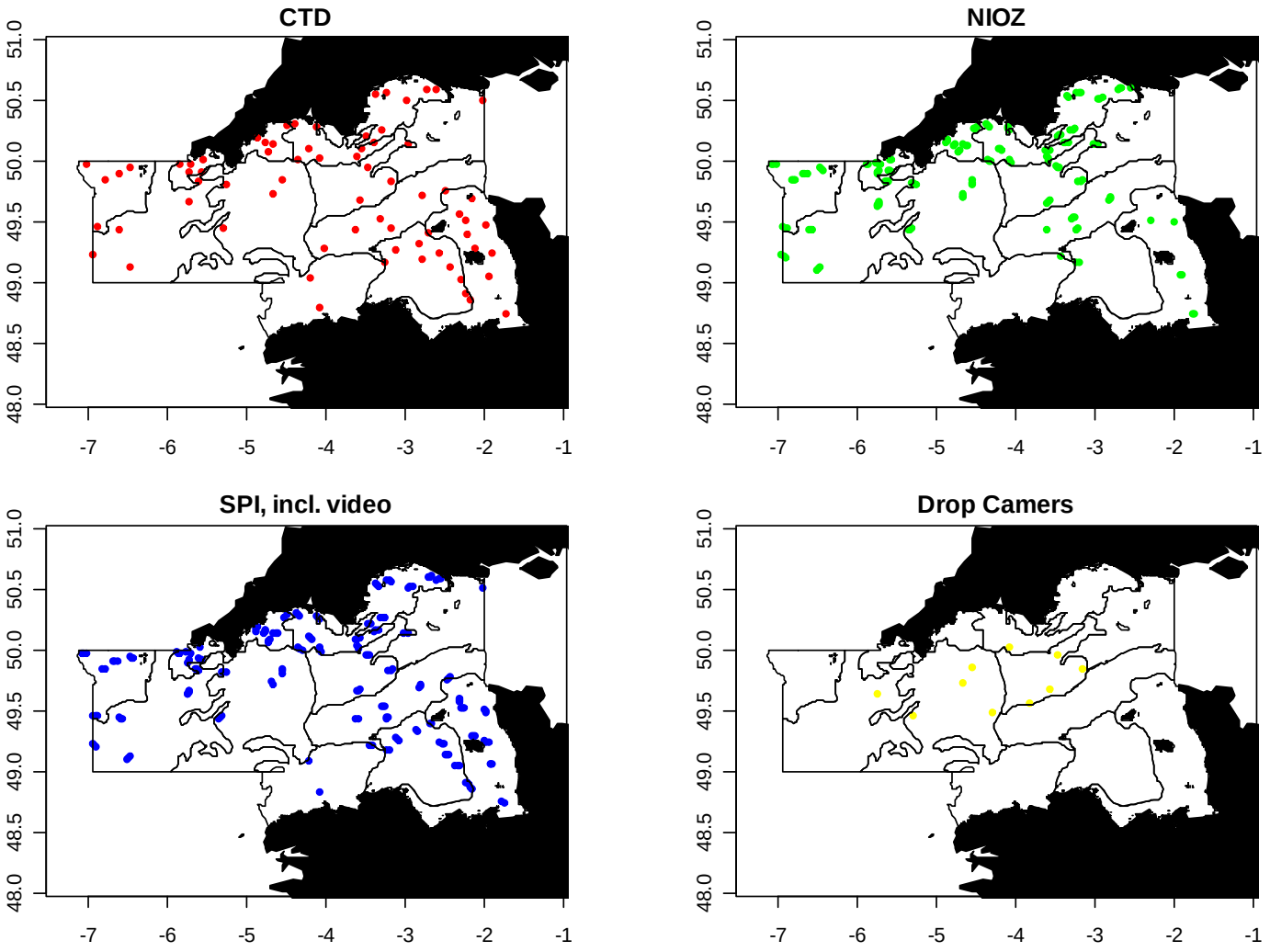

Figure 2: Beam trawl sampling stations positions and cruise track.

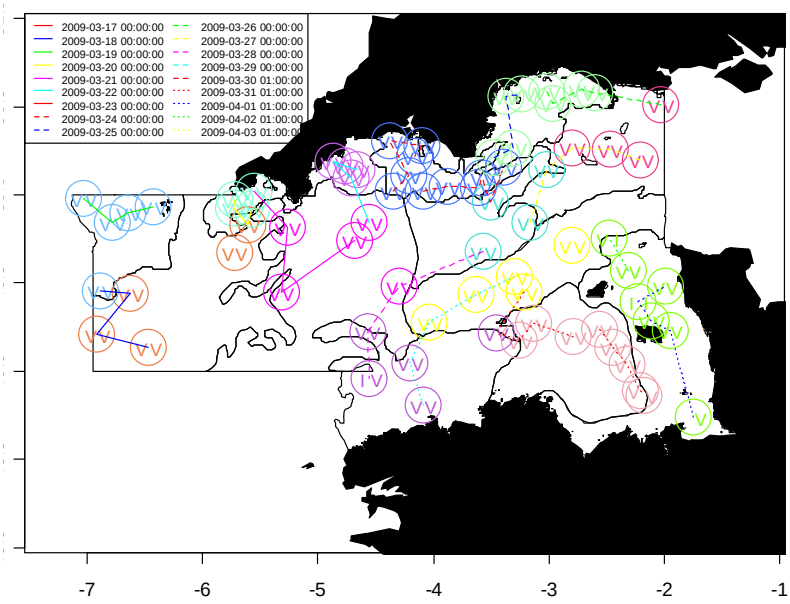

Figure 3: Station numbers associated with each position samples

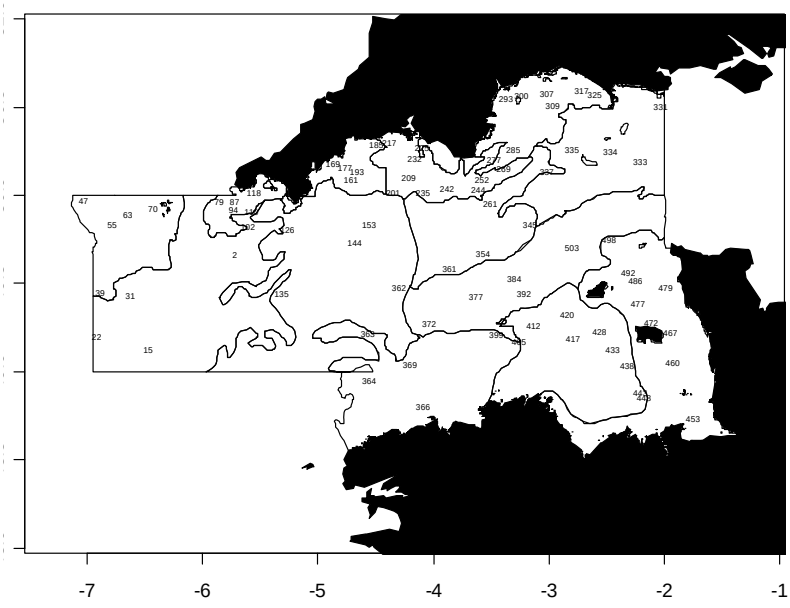

Figure 4: Length frequencies and catch numbers of commercially important species

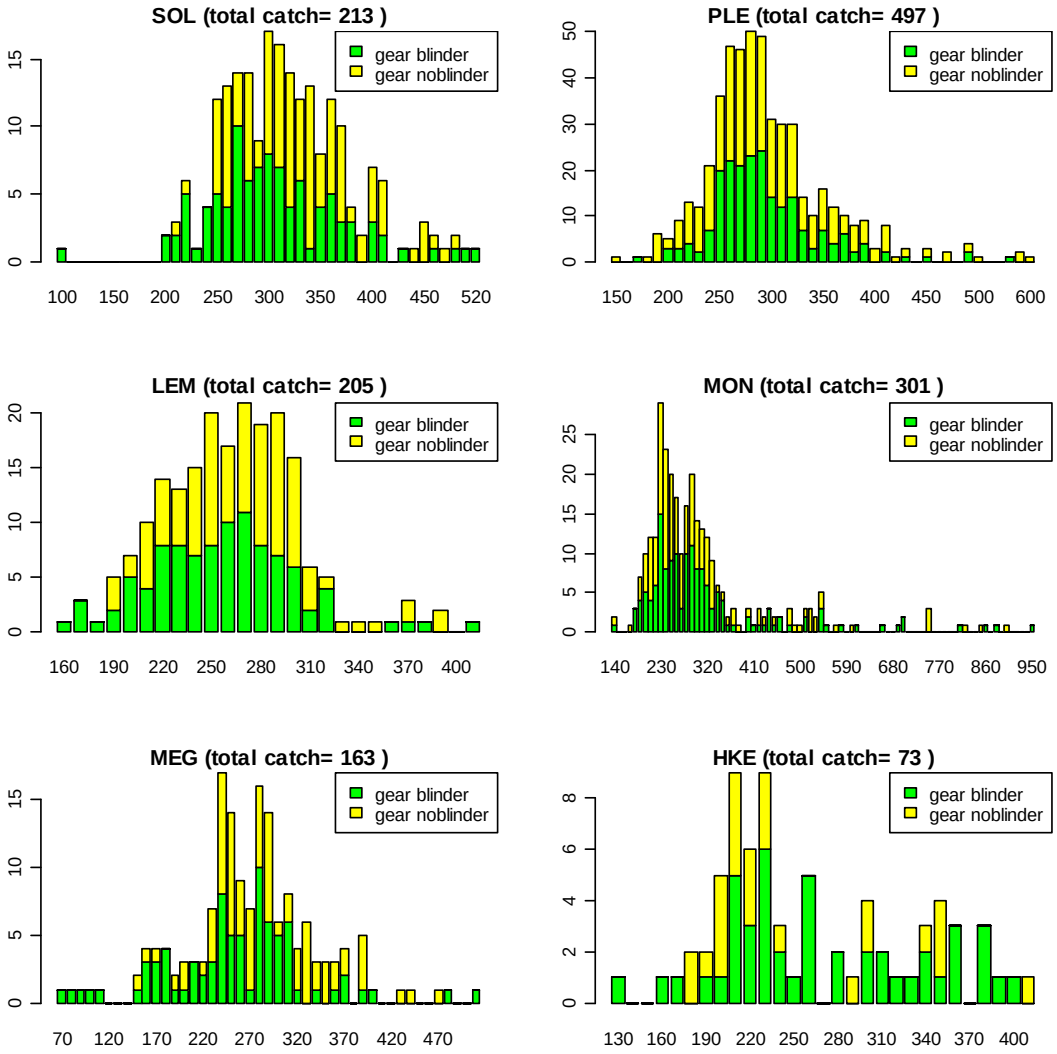

Figure 5: Sole distribution

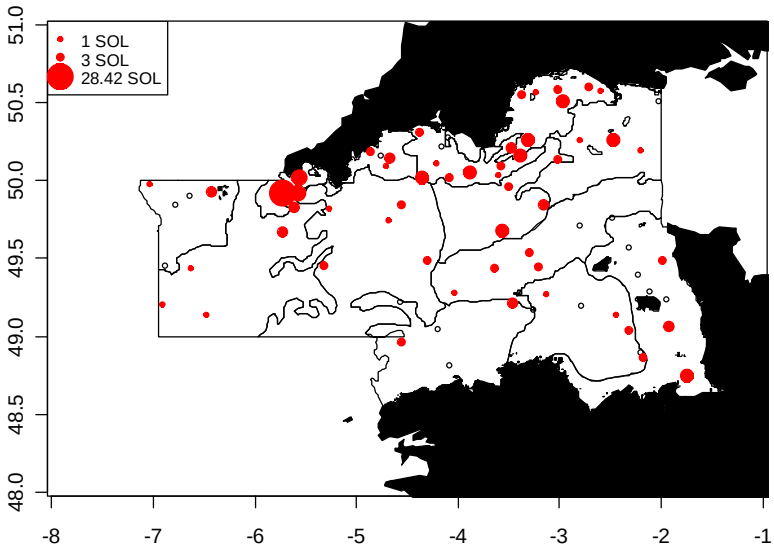

Figure 6:Plaice distribution

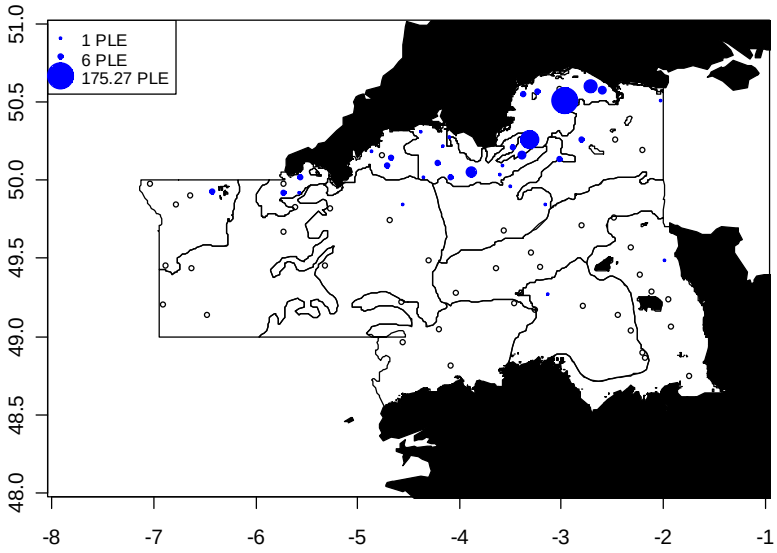

Figure 7: Lemon Sole distribution

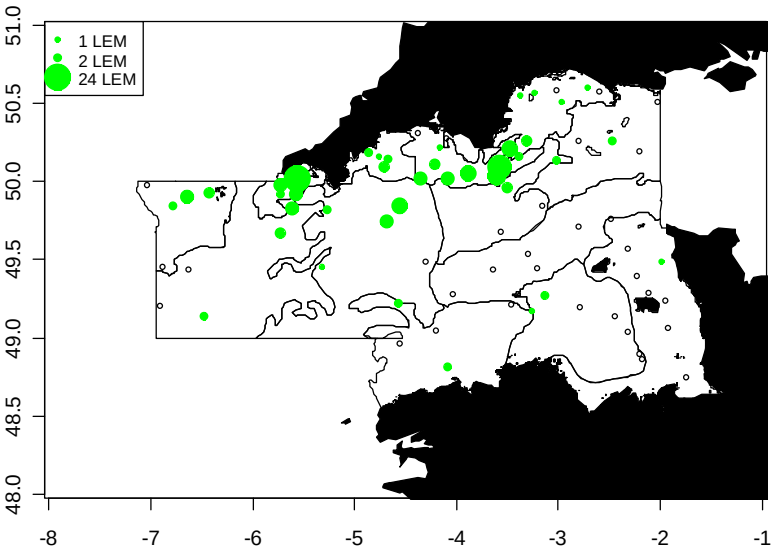

Figure 8: Monk distributions

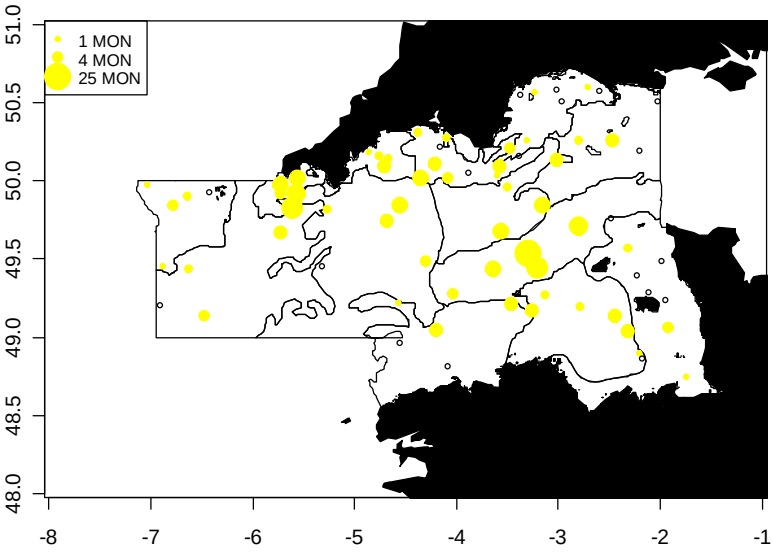

Figure 9: Megrim distributions

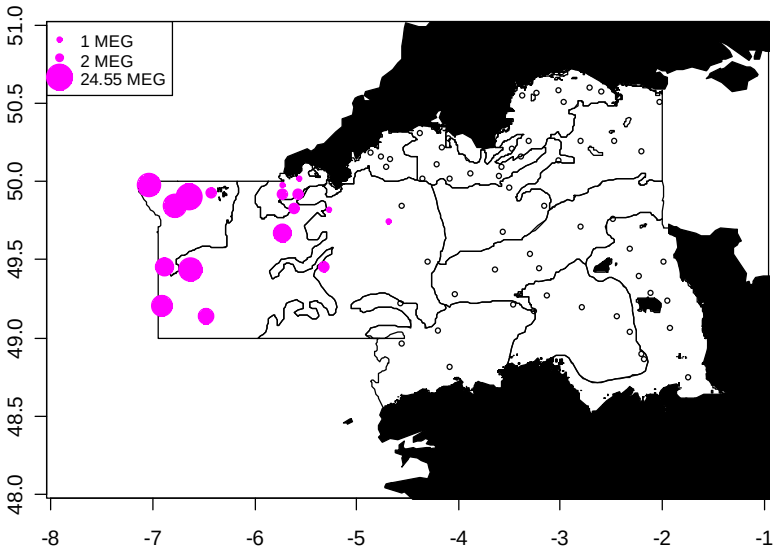

Figure 10: Species composition by number

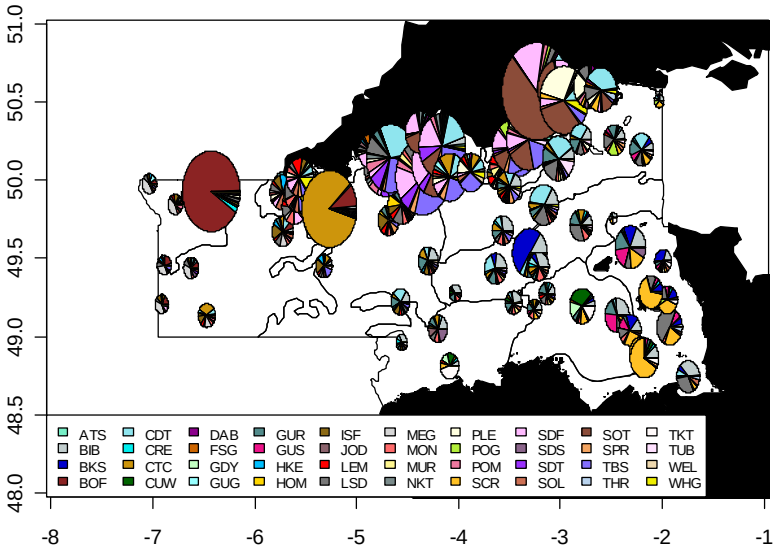

Table 1: Number of gear deployments

Gear	Validity	Numbers
Starboard beam	I	2
	V	78
Port beam	I	2
	V	78
CTD	V	71
NIOZ	I	5
	V	140
SPI	I	24
	V	165
Drop Camera	V	10

Table 2: Number measured by species:

SCIENTIFIC	SpTotal	MAFF
Symphodus bailloni	3	BLW
Gobiidae	238	POM
SEPIA OFFICINALIS	307	CTC
LOLIGO FORBESI	6	NSQ
LOLIGO VULGARIS	1	LLV
ALLOTEUTHIS SUBULATA	69	ATS
OMMASTREPHES (TODAROPSIS) EBLANAE	12	OME
HOMARUS GAMMARUS	4	LBE
PALINURUS ELEPHAS/PALINURUS-VULGARIS	1	SLO
MAIA SQUINADO	109	SCR
CANCER PAGURUS	111	CRE
SCYLIORHINUS CANICULA	671	LSD
SCYLIORHINUS STELLARIS	1	DGN
MUSTELUS ASTERIAS	58	SDS
SQUALUS ACANTHIAS	1	DGS
TORPEDO MARMORATA	4	MER
RAJA BRACHYURA	8	BLR
RAJA MONTAGUI	17	SDR
RAJA BATIS	1	SKT
RAJA NAEVUS	35	CUR
RAJA UNDULATA	3	UNR
RAJA CLAVATA	43	THR
CONGER CONGER	3	COE
CLUPEA HARENGUS	3	HER
SPRATTUS (CLUPEA) SPRATTUS	229	SPR
SARDINA (CLUPEA) PILCHARDUS	3	PIL
ENGRAULIS ENCRASICOLUS	2	ANE
ARGENTINIDAE	10	ARG
MAUROLICUS MUELLERI	1	PLS
DIPLECOGASTER BIMACULATA	5	TSC
LOPHIUS PISCATORIUS	263	MON

LOPHIUS BUDEGASSA	20	WAF
GADUS MORHUA	3	COD
POLLACHIUS POLLACHIUS	1	POL
MELANOGRAMMUS AEGLEFINUS	58	HAD
ENCHELYOPUS CIMBRIUS	7	FRR
PHYCIS BLENNOIDES	7	GFB
TRISOPTERUS MINUTUS	7448.132	POD
TRISOPTERUS LUSCUS	576	BIB
TRISOPTERUS ESMARKI	2	NOP
MERLANGIUS MERLANGUS	235	WHG
MOLVA MOLVA	5	LIN
GAIDROPSARUS VULGARIS	3	TBR
GADICULUS ARGENTEUS	1	SYP
MICROMESISTIUS POUTASSOU	21	WHB
RANICEPS RANINUS	2	LFB
CILIATA MUSTELA	4	FVR
CILIATA SEPTENTRIONALIS	1	NNR
MERLUCCIUS MERLUCCIUS	72	HKE
ZEUS FABER	75	JOD
CAPROS APER	1016.269	BOF
SYNGNATHUS ACUS	37	GPF
ENTELURUS AEQUOREUS	1	SKP
TRIGLA LUCERNA	112	TUB
EUTRIGLA GURNARDUS	122	GUG
TRIGLOPORUS LASTOVIZA	57	GUS
ASPITRIGLA CUCULUS	486	GUR
TAURULUS BUBALIS	1	SSN
AGONUS CATAPHRACTUS	85	POG
LIPARIS LIPARIS	1	SSL
TRACHURUS TRACHURUS	48	HOM
SPONDYLIOSOMA CANTHARUS	187	BKS
MULLUS SURMULETUS	137	MUR
CEPOLA RUBESCENS	1	RPF
DICENTRARCHUS (MORONE) LABRAX	4	ESB
CTENOLABRUS RUPESTRIS	48	GDY
LABRUS BERGYLTA	2	BNW
LABRUS MIXTUS	46	CUW
TRACHINUS (ECHIICHTHYS) VIPERA	42	WEL
TRACHINUS DRACO	1	WEG
BLENNIUS OCELLARIS	43	BBY
BLENNIUS(PARABLENNIUS)GATTORUGINE	4	TBY
PHOLIS GUNNELLUS	2	BTF
AMMODYTES TOBIANUS	3	TSE
HYPEROPLUS LANCEEOLATUS	5	GSE
CALLIONYMUS LYRA	1816	CDT
CALLIONYMUS MACULATUS	229	SDT
GOBIUS NIGER	19	BLG
GOBIUS GASTEVENI	3	GSV
LESUEURIGOBIUS FRIESII	139	FSG
BUENIA JEFFREYSII	6	JYG

SCOMBER SCOMBRUS	15	MAC
SCOPHTHALMUS MAXIMUS	1	TUR
SCOPHTHALMUS RHOMBUS	11	BLL
ARNOGLOSSUS LATERNA	1012	SDF
ARNOGLOSSUS IMPERIALIS	231	ISF
ZEUGOPTERUS PUNCTATUS	86	TKT
PHRYNORHOMBUS NORVEGIUS	109	NKT
PHRYNORHOMBUS REGIUS	3	EKT
LEPIDORHOMBUS WHIFFIAGONIS	162	MEG
GLYPTOCEPHALUS CYNOGLOSSUS	6	WIT
HIPPOGLOSSOIDES PLATESSOIDES	12	PLA
LIMANDA LIMANDA	91	DAB
MICROSTOMUS KITT	202	LEM
PLATICHTHYS FLESUS	4	FLE
PLEURONECTES PLATESSA	495	PLE
SOLEA SOLEA (S.VULGARIS)	195	SOL
PEGUSA (SOLEA) LASCARIS	14	SOS
BUGLOSSIDIUM LUTEUM	1646.215	SOT
MICROCHIRUS VARIEGATUS	1448.495	TBS

Table 3: Catches in kg by species:

SCIENTIFIC	SampledCatch	TotalCatch	MAFF
ASSORTED ROCKS	4869.55	4869.55	ROK
EPIBENTHIC MIXTURE	2645.33	2645.33	BEN
CHLOROPHYCEAE	0.01	0.01	CHZ
ULVA LACTUCA	0.028	0.028	ULL
ALPHEUS GLABER	0.193	0.193	ALP
BOTRYLLUS SCHLOSSERI	0.884	0.884	BIS
Symphodus bailloni	1.535	1.535	BLW
CELLARIA SPP	0.045	0.045	CEL
CHAETOPTERUS TUBES	28.942	28.942	CVT
Eunicella verrucosa	0.174	0.174	EUV
HALICLONA OCULATA	7.891	7.891	HAO
Meiosquilla desmaresti	0.05	0.05	MED
NATICA EGGS	0.172	0.172	NAE
NEMERTESIA SPP	37.336	37.336	NEM
PHALLUSIA MAMMILLATA	65.988	65.988	PAM
PENTAPORA SPP	7.562	7.562	PET
PISIDIA LONGGICORNIS	0.194	0.194	PIS
Gobiidae	0.304	0.304	POM
RAJA EGG CASES	0.03	0.03	RES
STYELA CLAVA	3.602	3.602	SAA
SQUID EGGS	1.165	1.165	SQS
SUBERITES SPP	1.219	1.219	SUB
LAMINARIA SPP	9.243	9.243	LMX
FUCUS SPP	0.456	0.456	FUX
FUCUS VESICULOSUS	422.007	422.007	WRB
FUCUS SPIRALIS	0.02	0.02	WRE

FUCUS SERRATUS	0.207	0.207	WRS
RHODOPHYCEAE	0.638	0.638	SWR
PORIFERA	58.473	58.473	PFZ
SUBERITES DOMUNCULA	0.872	0.872	SUD
TETHYA AURANTIA	1.79	1.79	TAA
HYDROIDA (order)	10.363	10.363	HYD
ALCYONIUM DIGITATUM	141.524	141.524	DMF
VIRGULARIA MIRABILIS	0.001	0.001	VAM
TEALIA FELINA	1.945	1.945	DHA
BOLOCERA TUEDIAE	5.51	5.51	BCT
ADAMSIA PALLIATA	0.144	0.144	AMP
METRIDIUM SENILE	7.576	7.576	PMA
CARYOPHYLLIA SMITHI	0.003	0.003	DCC
LOPHELIA PERTUSA	0.005	0.005	LPP
APHRODITE ACULEATA	19.662	19.662	AAC
NEREIS SPP	0.023	0.023	NEX
HYALINOECIA TUBICOLA	1.51	1.51	HYT
SABELLARIA	0.075	0.075	RCL
SERPULA VERMICULARIS	0.003	0.003	SAV
PATINA PELLUCIDA (HELIION P)	0.006	0.006	PPA
TURRITELLA COMMUNIS	0.186	0.186	TUC
CREPIDULA FORNICATA	1.678	1.678	ASL
BUCCINUM UNDATUM	2.614	2.614	WHE
WHELK EGGS	43.28	43.28	WES
NEPTUNEA ANTIQUA	0.09	0.09	RWK
SCAPHANDER LIGNARIUS	1.794	1.794	SDL
PHILINE APERTA	0.141	0.141	PHP
APLYSIA PUNCTATA	0.005	0.005	AYP
NUDIBRANCHIA	0.045	0.045	NBX
ARCHIDORIS PSEUDARGUS	27.969	27.969	ADP
TRITONIA HOMBERGII	0.264	0.264	TNH
AEOLIDIA PAPILLOSA	0.002	0.002	AIP
POLYPLACOPHORA	3.752	3.752	PLX
GLYCYMERIS GLYCYMERIS	0.256	0.256	GLG
CHLAMYS OPERCULARIS	82.182	82.182	QSC
CHLAMYS VARIA	0.001	0.001	CHV
PECTEN MAXIMUS	59.076	59.076	SCE
LIMIDAE	0.001	0.001	LIZ
ASTARTE SULCATA	0.011	0.011	AES
DOSINIA EXOLETA	0.005	0.005	DSE
ROSSIA MACROSOMA	0.116	0.116	ROM
SEPIOLA ATLANTICA	0.013	0.013	SPA
SEPIETTA OWENIANA	0.004	0.004	STO
SEPIA ELEGANS	0.491	0.491	SEE
SEPIA OFFICINALIS	96.978	171.914	CTC
CUTTLE EGGS	0.015	0.015	CEG
LOLIGO FORBESI	3.654	3.654	NSQ
LOLIGO VULGARIS	0.35	0.35	LLV
ALLOTEUTHIS SUBULATA	0.553	0.568	ATS
OMMASTREPHES (TODAROPSIS) EBLANAE	0.566	0.566	OME

OCTOPODIDAE	0.8	0.8	OCT
ELEDONE CIRROSA	52.028	52.028	EDC
PYCNOGONUM LITTORALE	0.001	0.001	PGL
LEPADIDAE	0.001	0.001	GOZ
AMPHIPODA	0.001	0.001	AAZ
PALAEMON SERRATUS	0.15	0.15	CPR
PROCESSA CANALICULATA	0.272	0.272	PCC
PANDALUS BOREALIS	0.01	0.01	PRA
PANDALUS MONTAGUI	0.568	0.568	PRM
CRANGON ALLMANNI	0.473	0.473	CGA
PONTOPHILUS SPINOSUS	0.015	0.015	PPS
HOMARUS GAMMARUS	3.99	3.99	LBE
PALINURUS ELEPHAS/PALINURUS-VULGARIS	1.79	1.79	SLO
PAGURIDAE	0.055	0.055	PAY
EUPAGURUS / PAGURUS IN SUBERITES	0.504	0.504	HIS
EUPAGURUS / PAGURUS IN BUCCINUM	0.512	0.512	HIW
EUPAGURUS / PAGURUS IN ADAMSIA	31.089	31.089	HIA
ANAPAGURUS IN EPIZOANTHUS	0.002	0.002	HIE
GALATHEA SPP	0.291	0.291	GLX
GALATHEA DISPERSA	0.071	0.071	GLD
GALATHEA STRIGOSA	0.08	0.08	GLT
PORCELLANIDAE	0.268	0.268	PLY
DROMIA PERSONATA	1.105	1.105	DRP
HYAS COARCTATUSS	0.606	0.606	HYC
HYAS ARANEUS	0.64	0.64	HYA
EURYNOME SPINOSA	0.001	0.001	EUS
INACHUS DORSETTENSIS	173.232	173.232	IND
MACROPODIA ROSTRATA	0.041	0.041	MCR
MACROPODIA TENUIROSTRIS	38.569	38.569	MCT
PISA ARMATA	0.278	0.278	PAA
MAIA SQUINADO	173.975	173.975	SCR
CORYSTES CASSIVELAUNUS	0.356	0.356	CCV
ATELYCYCLUS ROTUNDATUS	1.552	1.552	ALR
CANCER PAGURUS	63.664	63.664	CRE
MACROPIPUS (LIOCARCINUS) DEPURATOR	38.835	38.835	LMD
MACROPIPUS (LIOCARCINUS) HOLSATUS	6.608	6.608	LMH
MACROPIPUS (LIOCARCINUS) PUSILLUS	0.171	0.171	LPU
MACROPIPUS TUBERCULATUS	0.028	0.028	MPT
MACROPIPUS (LIOCARCINUS) PUBER	20.285	20.285	MLP
MACROPIPUS (LIOCARCINUS) MARMOREUS	0.298	0.298	LMM
XANTHO PILIPES	0.115	0.115	XAP
GONEPLAX RHOMBOIDES	0.005	0.005	GOR
GOLFINGIIDAE	0.105	0.105	GFX
ALCYONIDIIDAE	0.01	0.01	ALX
ALCYONIDIUM GELATINOSUM	8.644	8.644	ALG
FLUSTRIDAE	0.024	0.024	FAX
FLUSTRA FOLIACEA	271.733	271.733	FAF
LUIDIA SARSI	10.269	10.269	LUS
LUIDIA CILIARIS	39.771	39.771	LDC

ASTROPECTEN IRREGULARIS	7.386	7.386	API
CROSSASTER PAPPOSUS	9.38	9.38	CTP
ANSEROPODA PLACENTA	67.54	67.54	PLM
PORANIOMORPHA HISPIDA	1.76	1.76	PMH
PORANIA PULVILLUS	3.486	3.486	PPV
HENRICIA OCULATA	2.79	2.79	HEO
ASTERIAS RUBENS	184.327	184.327	STH
MARTHASTERIAS GLACIALIS	414.063	414.063	MAG
STICHASTRELLA ROSEA	0.37	0.37	SLR
OPHIUROIDEA	0.011	0.011	BSY
OPHIURIDAE	0.017	0.017	BTZ
OPHIURA ALBIDA	0.011	0.011	OHA
OPHIURA TEXTURATA	2.022	2.022	OHT
OPHIOCOMINA NIGRA	0.639	0.639	OPN
OPHIOTHRIX FRAGILIS	129.965	129.965	OPF
ECHINUS ACUTUS	5.643	5.643	URA
ECHINUS ESCULENTUS	112.809	112.809	URS
PSAMECHINUS MILIARIS	4.159	4.159	PMM
SPATANGIDAE	0.392	0.392	STY
SPATANGUS PURPUREUS	17.055	17.055	SPG
ECHINOCARDIUM CORDATUM	1.02	1.02	ECC
HOLOTHUROIDEA	0.035	0.035	HTZ
THYONE FUSUS	0.03	0.03	THH
ANTEDON BIFIDA	0.101	0.101	ADB
ASCIDIACEA	37.259	37.259	SSX
POLYCLINIDAE	2.901	2.901	PCZ
CIONA INTESTINALIS	0.439	0.439	CNI
DIAZONA VIOLACEA	3.405	3.405	DIV
ASCIDIIDAE	1.378	1.378	ASY
ASCIDIA MENTULA	0.004	0.004	ASM
ASCIDIA VIRGINEA	0.372	0.372	ASV
ASCIDIELLA SCABRA	1.107	1.107	ASS
DENDRODA GROSSULARIA	11.042	11.042	DDG
ALOPIAS VULPINUS	105.563	105.563	ATH
CETORHINUS MAXIMUS	163.947	163.947	BSK
DOGFISH EGG CASES	0.409	0.409	DEG
SCYLIORHINUS CANICULA	378.541	378.541	LSD
SCYLIORHINUS STELLARIS	0.58	0.58	DGN
MUSTELUS ASTERIAS	139.078	139.078	SDS
SQUALUS ACANTHIAS	0.076	0.076	DGS
TORPEDO MARMORATA	8.255	8.255	MER
RAJA BRACHYURA	13.804	13.804	BLR
RAJA MONTAGUI	9.232	9.232	SDR
RAJA BATIS	0.035	0.035	SKT
RAJA NAEVUS	29.532	29.532	CUR
RAJA UNDULATA	16.607	16.607	UNR
RAJA CLAVATA	24.276	24.276	THR
CONGER CONGER	10	10	COE
ALOSA ALOSA	0.233	0.233	AAS
CLUPEA HARENGUS	0.211	0.211	HER

SPRATTUS (CLUPEA) SPRATTUS	3.143	3.143	SPR
SARDINA (CLUPEA) PILCHARDUS	0.231	0.231	PIL
ENGRAULIS ENCRASICOLUS	0.02	0.02	ANE
ARGENTINIDAE	0.159	0.159	ARG
MAUROLICUS MUELLERI	0.001	0.001	PLS
CARASSIUS CARASSIUS	0.02	0.02	FCC
DIPLECOGASTER BIMACULATA	0.005	0.005	TSC
LOPHIUS PISCATORIUS	282.343	282.343	MON
LOPHIUS BUDEGASSA	9.983	9.983	WAF
CERATIAS HOLBOELLI	3.326	3.326	DAH
GADUS MORHUA	9.23	9.23	COD
POLLACHIUS POLLACHIUS	3.795	3.795	POL
MELANOGRAMMUS AEGLEFINUS	18.73	18.73	HAD
ENCHELYOPUS CIMBRIUS	0.021	0.021	FRR
PHYCIS BLENNOIDES	1.74	1.74	GFB
TRISOPTERUS MINUTUS	209.146	239.731	POD
TRISOPTERUS LUSCUS	213.959	226.299	BIB
TRISOPTERUS ESMARKI	0.025	0.025	NOP
MERLANGIUS MERLANGUS	47.508	47.508	WHG
MOLVA MOLVA	27.195	27.195	LIN
GAIDROPSARUS VULGARIS	2.165	2.165	TBR
GADICULUS ARGENTEUS	0.01	0.01	SYP
MICROMESISTIUS POUTASSOU	2.863	2.863	WHB
RANICEPS RANINUS	0.265	0.265	LFB
CILIATA MUSTELA	0.043	0.043	FVR
CILIATA SEPTENTRIONALIS	0.051	0.051	NNR
MERLUCCIUS MERLUCCIUS	12.21	12.21	HKE
ZEUS FABER	14.25	14.25	JOD
CAPROS APER	16.974	36.069	BOF
SYNGNATHUS ACUS	0.723	0.723	GPF
HIPPOCAMPUS RAMULOSUS	0.005	0.005	SHE
ENTELURUS AEQUOREUS	0.005	0.005	SKP
TRIGLA LUCERNA	30.03	30.03	TUB
EUTRIGLA GURNARDUS	5.888	5.888	GUG
TRIGLOPORUS LASTOVIZA	35.234	35.234	GUS
ASPITRIGLA CUCULUS	68.339	68.339	GUR
TAURULUS BUBALIS	0.002	0.002	SSN
AGONUS CATAPHRACTUS	1.303	1.303	POG
LIPARIS LIPARIS	0.012	0.012	SSL
TRACHURUS TRACHURUS	2.734	2.734	HOM
SPONDYLIOSOMA CANTHARUS	60.368	60.368	BKS
MULLUS SURMULETUS	14.435	14.435	MUR
CEPOLA RUBESCENS	0.075	0.075	RPF
DICENTRARCHUS (MORONE) LABRAX	7.96	7.96	ESB
CTENOLABRUS RUPESTRIS	1.097	1.097	GDY
LABRUS BERGYLTA	6.69	6.69	BNW
LABRUS MIXTUS	7.785	7.785	CUW
TRACHINUS (ECHIICHTHYS) VIPERA	0.983	0.983	WEL
TRACHINUS DRACO	0.295	0.295	WEG
BLENNIUS OCELLARIS	0.731	0.731	BBY

BLENNIUS(PARABLENNIUS)GATTORUGINE	0.16	0.16	TBY
PHOLIS GUNNELLUS	0.015	0.015	BTF
AMMODYTES TOBIANUS	0.118	0.118	TSE
HYPEROPLUS LANCEEOLATUS	0.4	0.4	GSE
CALLIONYMUS LYRA	81.273	81.273	CDT
CALLIONYMUS MACULATUS	1.085	1.085	SDT
GOBIUS NIGER	0.23	0.23	BLG
GOBIUS GASTEVENI	0.02	0.02	GSV
LESUEURIGOBIUS FRIESII	1.568	1.568	FSG
BUENIA JEFFREYSII	0.004	0.004	JYG
SCOMBER SCOMBRUS	0.856	0.856	MAC
SCOPHTHALMUS MAXIMUS	2.02	2.02	TUR
SCOPHTHALMUS RHOMBUS	19.935	19.935	BLL
ARNOGLOSSUS LATERNA	14.267	14.267	SDF
ARNOGLOSSUS IMPERIALIS	10.703	10.703	ISF
ZEUGOPTERUS PUNCTATUS	4.801	4.801	TKT
PHRYNORHOMBUS NORVEGIUS	0.954	0.954	NKT
PHRYNORHOMBUS REGIUS	0.085	0.085	EKT
LEPIDORHOMBUS WHIFFIAGONIS	30.532	30.532	MEG
GLYPTOCEPHALUS CYNOGLOSSUS	0.94	0.94	WIT
HIPPOGLOSSOIDES PLATESSOIDES	0.349	0.349	PLA
LIMANDA LIMANDA	6.913	6.913	DAB
MICROSTOMUS KITT	51.294	51.294	LEM
PLATICHTHYS FLESUS	1.233	1.233	FLE
PLEURONECTES PLATESSA	154.418	154.418	PLE
SOLEA SOLEA (S.VULGARIS)	79.586	79.586	SOL
PEGUSA (SOLEA) LASCARIS	3.51	3.51	SOS
BUGLOSSIDIUM LUTEUM	15.827	24.293	SOT
MICROCHIRUS VARIEGATUS	47.107	51.295	TBS
tubeworms	0.041	0.041	TBX
	0.176	0.176	ABI
	15.501	15.501	AXI
	0.01	0.01	CHA
	0.26	0.26	CLI
	4.171	4.171	COT
	1.565	1.565	DIP
	2.101	2.101	HYH
	0.054	0.054	HYL
	0.118	0.118	LIC
	0.049	0.049	LIM
	0.03	0.03	NEA
	0.005	0.005	NER
	0.444	0.444	PAW
	2.576	2.576	PHA
	32.382	32.382	PMJ
	31.535	31.535	PMX
	77.003	77.003	RAS
	0.013	0.013	SAG
	0.025	0.025	SAM
	0.005	0.005	SCA

		0.001	0.001 SIM

Table 4: Biological Samples collected

Species	Sex	NumberSampled
BLL	F	7
BLL	M	6
BLR	F	4
BLR	M	5
COD	F	2
COD	M	1
CUR	F	15
CUR	M	20
ESB	M	5
GUG	F	59
GUG	M	28
GUG	U	8
GUR	F	231
GUR	M	101
GUR	U	20
GUS	F	108
GUS	M	76
GUS	U	9
HAD	F	29
HAD	M	17
HKE	F	40
HKE	M	28
HKE	U	2
JOD	F	30
JOD	M	17
JOD	U	7
LEM	F	79
LEM	M	109
MEG	F	125
MEG	M	32
MON	F	143
MON	M	122
MON	U	1
MUR	F	27
MUR	M	35
MUR	U	1
PLE	F	200
PLE	M	132
SDR	F	10
SDR	M	8
SKT	F	1
SOL	F	110
SOL	M	99
THR	F	21

THR	M	26
TUB	F	44
TUB	M	45
TUB	U	2
TUR	M	1
UNR	F	4
UNR	M	3
WAF	F	7
WAF	M	9
WAF	U	4
WHG	F	106
WHG	M	63