Strategy of Approach Demersal Fish Fauna

RIKZ

26 May 2003
Final Report
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A COMPANY OF

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ENVIRONMENT

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SUMMARY

The Dutch Government has decided to allow the construction of a Near Shore Wind Farm (NSW) demonstration project under the condition that a monitoring programme on - among other things - the ecological impacts is carried out. The Dutch government is responsible for providing a thorough description of the present ecological situation in order to evaluate future effects of planned wind farms. This report describes the detailed plan of approach to establish the occurrence, density, population structure and migration patterns of demersal fish fauna in the Dutch coastal zone. Sampling stations have been selected such that they cover the planned location of the Near Shore Wind Farm and three reference areas. These areas have been selected such that they are similar to the wind farm area (regarding depth, sediment, distance offshore) and that they overlap reference areas for benthic fauna and/or pelagic fish. Demersal fish will be sampled with two nets at the same time: a 6 m beam trawl with a fine mesh size (20 mm) to sample smaller fish representatively, and a 6 m beam trawl (40 mm mesh size) to sample larger fish representatively. The latter net is also used in a RIVO survey (SNS) that has been carried out in the coastal zone since the 1970s. Length distributions will be assessed for all fish species caught in the trawl, and functional biological data (age, weight, sex and maturity) will be collected for a selection of species. At each station, abiotic data will be collected using a CTD measuring device. Data collected will be delivered in the standard Donar Interface Format. The final report will focus on a detailed description of the demersal fish community in the Dutch coastal zone, on an integration of all results and on a discussion of the possible effects of a wind farm on the demersal fish community.

CONTENTS

1 INTRODUCTION

The Dutch Government has decided to allow the construction of the Near Shore Wind Farm (NSW) demonstration project under the condition that a monitoring programme on - among other things - the ecological impacts is carried out. The most important objective of monitoring is to acquire knowledge and practical experience in the construction and operation of large offshore wind farms in the North Sea . Both the private party that constructs the wind farm and authorities (ministries) need this information for future wind farm projects: for construction as well as for developing policy on this topic. Therefore, the (ecological) knowledge acquired with monitoring programmes for NSW must be made available to all parties involved in the realisation of such large-scale wind farms.

The Dutch government is responsible for providing a thorough description of the present ecological situation, as a reference for evaluation of future effects. In October 2002, the National Institute for Coastal and Marine Management (RIKZ), part of the Directorate-General of Public Works and Water Management, procured a base line study on the North Sea situation for 2003. This study will be on behalf of the Monitoring and Evaluation Programme Near Shore Wind Farm (MEP-NSW) in the North Sea. The baseline study must provide data on the occurrence and density of benthic fauna, demersal fish, pelagic fish, sea mammals, marine birds and non-marine migratory birds. This report presents a detailed strategy of approach for describing the present situation for demersal fish in the Dutch coastal zone.

The baseline study for demersal fish should establish the occurrence, density, population structure and migration patterns of demersal fish in the present situation. Also, the spatial variation of demersal fish in the present situation has to be described. This has to be done in such a way that later on (outside this assignment) quantitative evaluation is possible of the impact of a wind farm on the occurrence, density, population structure and migration patterns of the demersal fish fauna. The design of the monitoring programme is justified to meet these goals. The specific terms of reference for this study are as follows:

- Data obtained from the base line study must be comparable to the relevant data of the RIVO surveys (Grift 2001);
- Description of the present situation must be completed with data from the RIVO surveys;
- Monitoring has to result in at least data on number, density, weight, length-frequency distribution and age-length distribution per species;
- Frequency of monitoring must be sufficient to describe the spatial variation of the present situation;
- The number of stations that need to be sampled must depend on the homogeneity of the seabed morphology in the area (grain size, depth). It is important that enough samples are collected to be able to describe the spatial variation of and population structure (of the demersal fish community) in the area;
- The sample tracks must be registered;
- The sampling programme must be designed in such a way that possible impacts can be shown.

- To be able to select reference areas for the impact study, an area around the wind farm area must be included in the programme. The surface of the area and the number of samples must be large enough to be able to select at least 2 reference areas of the same size as the wind farm area. These reference areas must be similar to the wind farm area on the following points: seabed morphology, water depth, water currents and species community.

The sampling programme for this baseline study is designed such that it can be copied to the impact study for the Near Shore Wind Farm (MEP-NSW). Comparable results are guaranteed because RIVO is involved in both this study and the impact study. Similar sampling programmes before and after the creation of the Near Shore Wind Farm provide a unique opportunity to assess the impact of a wind farm on the demersal fish community.

A detailed description of the sampling programme (locations, period and methods) is given in Chapter 2. Chapter 3 describes the data analysis, fieldwork reports, final report and database delivery. In Chapter 4, the planning will be discussed and all activities briefly described.

2 SAMPLING PROGRAMME

2.1 Sampling period and sampling locations

Sampling of demersal fish within the current project will take place in June/ July 2003 (weeks 27 and 28) and January 2004 (weeks 4 and 5). Sampling areas comprise the NSW wind farm area and three reference areas that are similar to the wind farm area regarding distance offshore, water depth and seabed morphology (Figures 2.1 and 2.2).The two reference areas directly north and south of the wind farm site (Ref N and Ref Z) are similar to reference areas for pelagic fish (Lot 3), the most southern reference area (Ref S) and the northern area (Ref N) overlap with the reference areas for benthic fauna (Lot 1, carried out by IECS, Hull, UK). Reference areas have been selected according to their distance from the coast, their depth contours and their sediment characteristics. We do not have information on water currents, but assume that water currents are similar in all areas.
In 2002, we observed a relationship between density of certain demersal fish species and distance to the shore (Grift et al. 2002). Therefore, all three reference areas are selected at a similar distance from the coast as the planned wind farm area.
Water depth varies slightly within the planned wind farm area and reference areas with similar bathymetry have been selected (Figure 2.1).

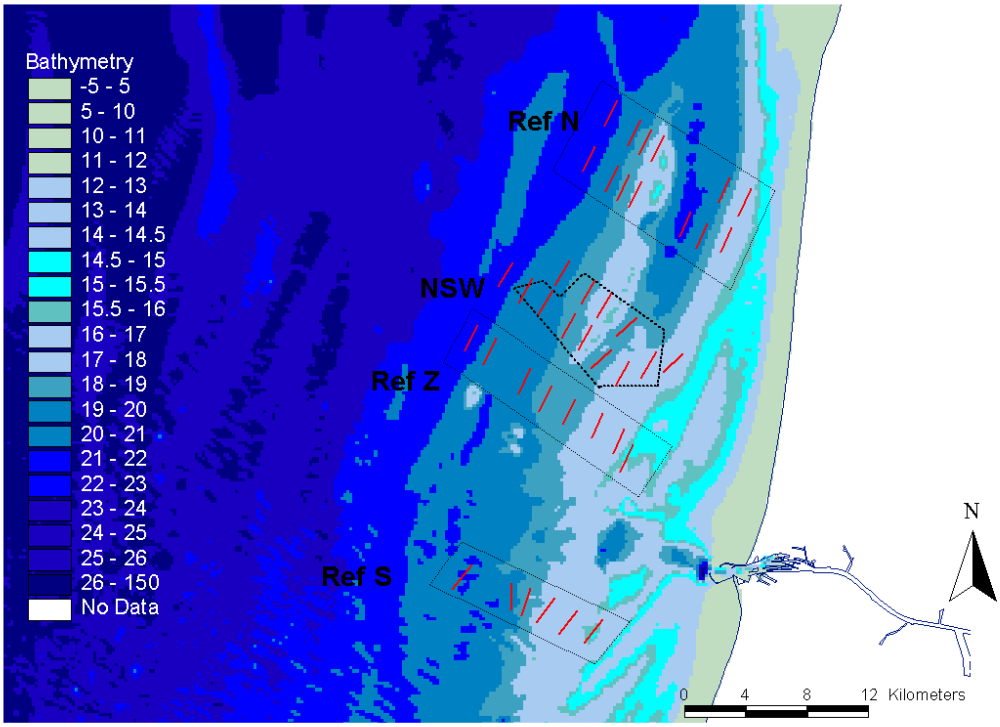

Figure 2.1. Bathymetric map of the Dutch coastal zone with the planned sampling stations (red lines) parallel to the coast in three reference areas (Ref N, Ref Z and Ref S) and the wind farm area (NSW). Ref S and the Ref N area overlap with reference areas for the benthic fauna sampled in Lot 1 of the baseline study, Ref N and Ref Z overlap with reference areas for pelagic fish in Lot 3. Depth in m below sea level.

Regarding the characteristics of the sediment, only the grain size of the sediment varies in the coastal zone (Figure 2.2) and not the silt content. Within the wind farm, however, grain size does not vary and within the coastal zone it varies only slightly. Two reference areas have been selected which have similar sediment structures to the planned wind farm area (Ref Z and Ref S) and one reference area that has parts with a slightly coarser sediment structure (Ref N). Within all areas, however, sampling stations have been selected which have similar sediment characteristics to the wind farm area.

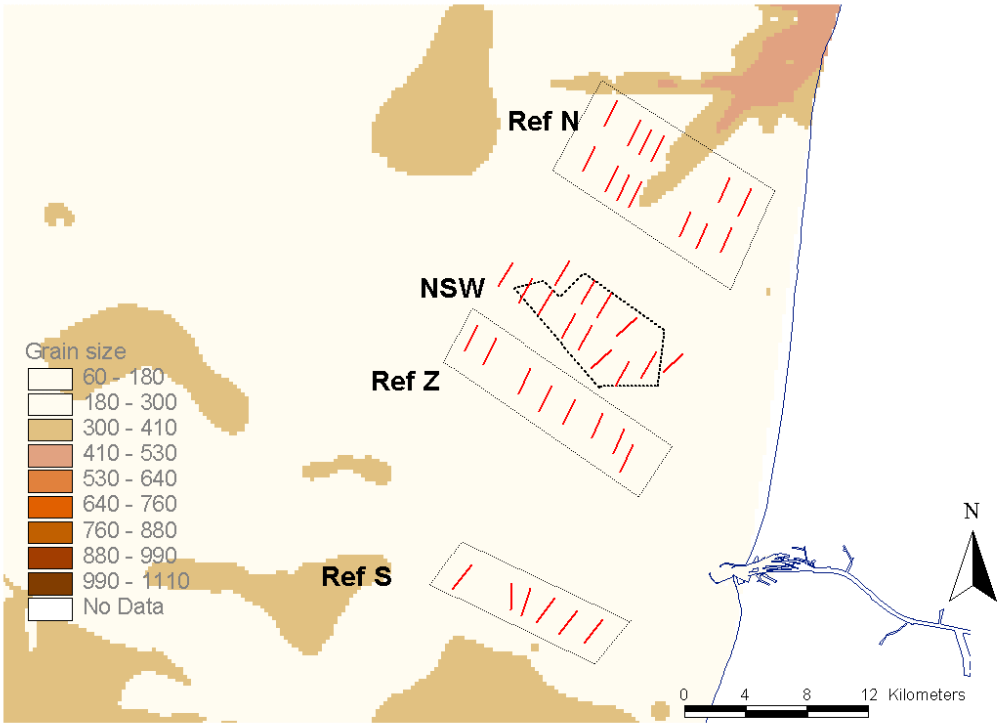

Figure 2.2. Map of the Dutch coastal zone with sediment (grain size) and the planned sampling stations (red lines) parallel to the coast in three reference areas (Ref N, Ref Z and Ref S) and the wind farm area (NSW). Ref S and the Ref N area overlap with reference areas for the benthic fauna sampled in Lot 1 of the baseline study, Ref N and Ref Z overlap with reference areas for pelagic fish in Lot 3. Grain size in micrometers.

The sampling scheme has been designed to sample the variation in depth, grain size and distance offshore within the wind farm representatively and to replicate this scheme in the three reference areas. The sampling scheme foresees 40 stations to be divided among three reference areas and the wind farm area. One third of the samples will be taken in the wind farm area, one third north of the wind farm area and one third south of the wind farm area (Figure 2.1, 2.2). Within the wind farm area, stations are located at a very high spatial resolution. This resolution is required to be able to detect possible effects of the wind farm on the occurrence of fish in the impact study. If these effects occur, they are small scaled and a high-resolution sampling scheme is needed.

At sampling stations, hauls are made along depth contours (more or less parallel to the coast) in order to minimize variation in depth within one haul. The stations cover depths of ca. 15 to 22 m. In case of bad weather conditions, priorities for areas have been set (Table 2.1). Obviously, the wind farm area (NSW) has highest priority because that is the area of interest. Secondly, the reference areas that overlap with the reference area for the benthic fauna (Ref S and Ref N), sampled by IECS, are important, because we expect that the closure of the wind farm area will have an impact on the bottom fauna, and thus on food for demersal fish. Sampling fish and benthic fauna in the same area provides the unique opportunity for future comparison between demersal fish and benthic fauna communities. This comparison is outside the scope of the current project but will be part of the impact study (MEP-NSW) when effects of the closure of the area are measured.

Table 2.1. Priorities for sampling areas.

Priority	Area	Stations
1	NSW	13
2	Reference area Ref N	13
3	Reference area Ref S	6
4	Reference area Ref Z	8
Total number of stations		40

2.2 Methods and equipment

Two 6 m beam trawls will be used with the research vessel ‘Isis’. On one side of the ship, we will use a beam trawl with a 40 mm net that is also used in a coastal survey (SNS) that has been carried out since 1969. Because this gear catches a low number of smaller fish, a fine meshed net (with 20 mm in the bag) will be used on the other side of the ship. This net is used in another survey (DFS) but has to be attached to a heavy beam to keep the ship in balance. Therefore, the catches with the larger mesh-sized net will be fully comparable to the SNS, whereas catches with the fine meshed net are not fully comparable to the DFS. Length frequency distributions from both nets show that they are complementary (Figure 2.3), and will thus provide a good description of the demersal fish population. The same procedure as in the SNS will be followed to make catches from the baseline study comparable to the SNS data. The towing speed is 6.5 km hr^{-1} (3.5 knots) over the ground. Each haul will last 15 minutes.

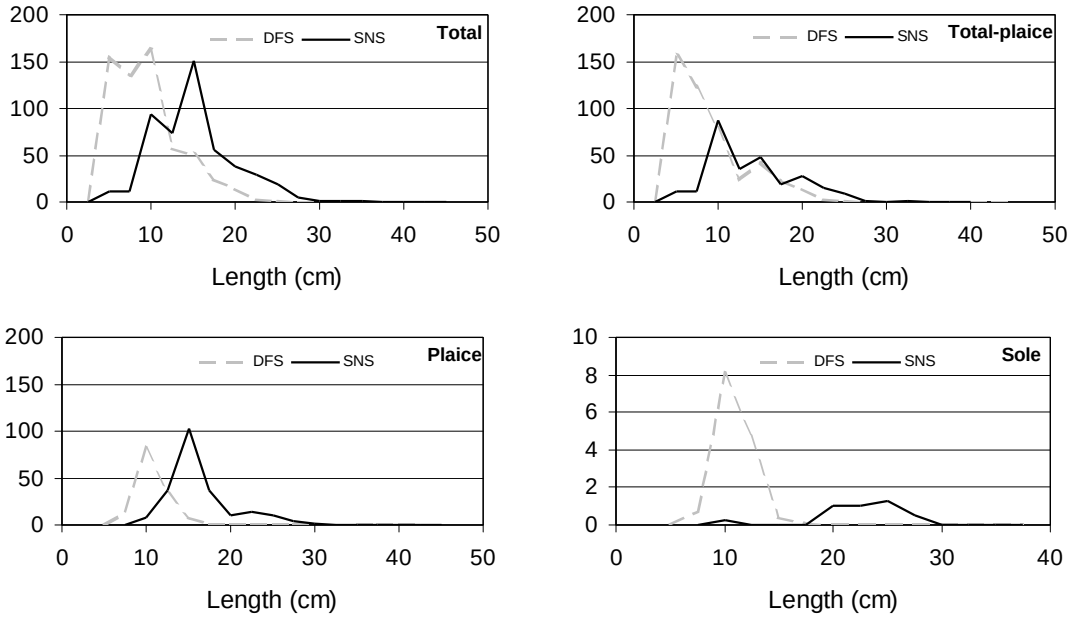

Figure 2.3. Length-frequency distributions of fish caught in the DFS and SNS gear in the Dutch coastal zone (3rd quarter 2001). Catch (numbers per 1000 m² swept area) on the y-axis and fish length (cm) on the x-axis. The upper left panel is the LF distribution of the total catch, the upper right panel of the total catch minus plaice, the lower left of plaice only and the lower right panel of sole only. The distributions clearly show that the DFS gear (20 mm mesh size) catches more smaller fish than the SNS gear (40 mm).

Environmental conditions at sampling locations will be measured using a CTD measuring device. This device, attached to the net, continuously records water temperature, depth, conductivity and turbidity. Positions of all tracks sampled with the CTD will be recorded with a dGPS device. The use of the CTD data will contribute to the explanation of the spatial distribution of different species. Hence, variation in species distribution and -composition in the impact study can be explained better and the possible influences of a wind farm on fish can be better detected. In addition, these abiotic data can be combined with abiotic data collected in other lots, such as grain size in Lot 1. By combining these data, variation in, for example, turbidity may be explained by factors such as grain size. In this project, the effect of these factors on the abundance of fish will be explored. A detailed analysis of this relationship is, however, outside the scope of this project.

2.3 Processing of the trawl catches

On board, the whole catch will be sorted out per net and all fish species except gobids will be identified. Identification of gobids is difficult and very time consuming. Therefore, a representative sample (50 individuals) of gobids of each area will be taken to the laboratory to be identified to the species level. All other fish that cannot be identified unambiguously will also be taken to the laboratory. Catches will be processed and recorded per net.

Length frequency distributions of shrimps *Crangon crangon* will also be measured and counted. Only shrimps caught in the 20 mm net will be processed because only this net

samples the shrimp population well. Other epi benthic fauna caught will not be processed because this will be part of the benthic study.

For all fish species caught in the trawl, length distributions will be assessed and of a selection of species, biological data will be collected. Selection criteria to collect biological data are species abundance and the existence of biological data of a species from other sampling programmes (RIVO surveys, market sampling programme). With data from a similar beam trawl survey carried out in 2002 we can predict the abundance of species in the catch (Table 2.2) and plan the collection of biological data.

Table 2.2 Composition of the catch in the Dutch coastal zone in rounded numbers per 1000 m^2 swept area per species. Data averaged over five sampling periods in 2002, based on the catch with one net (Flyland project). Each haul, this net sweeps 5000-8000 m^2. The last column indicates whether biological data (age, length, weight, sex and maturity) are collected in other programmes (+) or will be collected in this project (Ñ).

	Species	Scientific name	Dutch name	Catch (nrs / 1000 m^2)	Biological data collected
1.	Plaice	*Pleuronectes platessa*	Schol	244	+
2.	Dab	*Limanda limanda*	Schar	201	+
3.	Solenette	*Buglossidium luteum*	Dwergtong	138	∇
4.	Lesser weever	*Echiichthys vipera*	Kleine pieterman	51	∇
5.	Whiting	*Merlangius merlangus*	Wijting	52	+
6.	Gobids	Pomatoschistus sp.	Grondel	43	
7.	Lesser sand-eel	*Ammodytes tobianus*	Kleine zandspiering	32	+
8.	Dragonet	*Callionymus lyra*	Pitvis	26	∇
9.	Sole	*Solea vulgaris*	Tong	27	+
10.	Corbin's sandeel	*Hyperoplus immaculatus*	Effen smelt	14	+
11.	Scaldfish	*Arnoglossus laterna*	Schurftvis	10	∇
12.	Flounder	*Platichthys flesus*	Bot	6	+
13.	Sand-eels	Ammodytes sp.	Ammodytes	7	+
14.	Cod	*Gadus morhua*	Kabeljauw	6	+
15.	Hooknose	*Agonus cataphractus*	Harnasmannetje	4	∇
16.	Bull-rout	*Myoxocephalus scorpius*	Zeedonderpad	3	
17.	Grey gurnard	*Eutrigla gurnardus*	Grauwe poon	2	
18.	Reticulated dragonet	*Callionymus reticulatus*	Rasterpitvis	2	
19.	Herring	*Clupea harengus*	Haring	1	+
20.	Brill	*Scophthalmus rhombus*	Griet	1	∇
21.	Horse mackerel	*Trachurus trachurus*	Horsmakreel	1	
22.	Tub gurnard	*Trigla lucerna*	Rode poon	1	
23.	Turbot	*Psetta maxima*	Tarbot	0	∇
	Other			0	

A total of 38 fish species was observed in the demersal survey in the Dutch coastal zone in 2002. The flatfishes plaice, dab and solenette were the most abundant species. Of the 18 most abundant species, biological data have been collected in other programmes for eight species; for five species in routine programmes and for sandeels and smelt in the baseline study wind farm for pelagic fish. As mentioned, additional biological data will not be collected for these species within the current project. Species for which biological

data will be collected are solenette, lesser weever, dragonet, scaldfish, hooknose, brill and turbot. We expect that gobids are too small to collect biological data from.

Age-length keys and weight of fish will be determined in the laboratory. The age of fish will be determined by counting growth zones in the otoliths. After the first sampling period, we will set up the ageing of these species in cooperation with experts from other research institutes. After the second sampling period when all otoliths have been collected, all selected otoliths will be processed. The collection of all data is summarized in Tables 2.3 and 2.4.

Table 2.3. Summary of data planned to collect. Planning based on catches in similar surveys in the Dutch coastal zone in 2002. Symbols: 'Ñ indicates the data that will be collected in the current project; '-' indicates data that will be retrieved from other sampling programmes.

	Species	Length	Weight	Sex	Maturity	Age
1	Plaice	∇	-	-	-	-
2	Dab	∇	-	-	-	-
3	Solenette	∇	∇	∇	∇	∇
4	Lesser weever	∇	∇	∇	∇	∇
5	Whiting	∇	-	-	-	-
6	Lesser sand-eel	∇	-	-	-	-
7	Dragonet	∇	∇	∇	∇	∇
8	Sole	∇	-	-	-	-
9	Corbin's sandeel	∇	-	-	-	-
10	Scaldfish	∇	∇	∇	∇	∇
11	Flounder	∇	-	-	-	-
12	Sandeels	∇	-	-	-	-
13	Cod	∇	-	-	-	-
14	Hooknose	∇	∇	∇	∇	∇
15	Brill	∇	∇	∇	∇	∇
16	Turbot	∇	∇	∇	∇	∇

Table 2.4 Sampling protocol for demersal fish in the baseline study wind farm. Weight, sex, maturity and age are assessed for 5 individuals per cm class.

Group	Species	Handling/ data collection
Fish	All	Measure Length-frequency distribution
	Solenette	Weight, sex, maturity, age (otoliths)
	Lesser weever	Weight, sex, maturity, age (otoliths)
	Dragonet	Weight, sex, maturity, age (otoliths)
	Scaldfish	Weight, sex, maturity, age (otoliths)
	Hooknose	Weight, sex, maturity, age (otoliths)
	Brill	Weight, sex, maturity, age (otoliths)
	Turbot	Weight, sex, maturity, age (otoliths)
Epi benthic fauna	Shrimps	Measure Length-frequency distribution from 20 mm net
	Other	No processing, processed in lot 1 'benthic fauna'

2.4 Quality assurance

Royal Haskoning has a well-defined and robust Quality Management System (QMS). Royal Haskoning is accredited by Lloyd's Register Quality Assurance Limited as operating a Quality Management System conformable to NEN-ISO 9001. Also RIVO, who is conducting the surveys, is ISO 9001 certified and its internal procedures and quality system are checked annually by Det Norske Veritas. Within this quality system, procedures for all aspects of the project, from management to report writing are described. The project leaders from Royal Haskoning and RIVO are responsible for managing the project in accordance with these quality systems. The input from the senior scientist of consortium partner TNO will fall under the quality system of Royal Haskoning.

A senior scientist from RIVO, who is also involved in the survey design and the analysis of the data, will review all scientific contents of the reports internally. The project team of RIVO (Table 2.4) will have at least three plenary meetings, at the beginning, half way and at the end of the project. In addition, meetings with a selection of team members will be organised to discuss specific topics. Meetings between RIVO, Royal Haskoning and TNO shall be organised as necessary.

Because we only have limited experience with ageing the demersal fish species which will be selected for this project, we will ask colleagues from other fisheries institutes abroad to check the ageing of fish. Development of expertise on these 'new' species will be done by a person who has ample experience on other species such as sole and plaice.

Audits by independent persons can be carried out to check the collection or the analysis of data. The client (RIKZ) will appoint the auditors.

Table 2.4. Members and roles of the project team.

	Member	Institute	Role
1	Dr Lisanne Aerts	Royal Haskoning	Project co-ordinator, ecologist, contract procedures, quality assurance
2	Jonathan Lewis Msc	Posford Haskoning UK	Ecologist, wind farms expert; writing report
3	Jan van Dalfsen Msc	MEP-TNO	Senior scientist benthic ecology, report writing
4	Dr. Rob Grift	RIVO	Project manager within RIVO, report writing
5	Dr. Adriaan Rijnsdorp	RIVO	Senior scientist, quality assurance
6	Nicola Tiën Msc	RIVO	Ecologist, data analysis, report writing
7	Ronald Bol	RIVO	Cruise leader
8	Betty van Os	RIVO	Cruise assistant
9	Kees Bakker	RIVO	Technician, preparation of cruises
10	Peter Groot	RIVO	Otolith readings, development otolith expertise.
11	Wouter Patberg Msc.	RIVO	Database manager, export to DIF.
12	Rieneke de Jager Bsc.	RIVO	Database management, quality control of data.

3 DATA ANALYSIS, REPORT WRITING AND DATABASE DELIVERY

3.1 Data analysis

Of all species, numbers caught will be converted to numbers caught per 1000 m^2 swept area. From the biological data, length-weight relationships will be assessed to translate numbers into biomass (kg per 1000 m^2 swept area). The biological data will be put in easy to read tables.

Because long-term data from RIVO surveys outside the baseline study are available, and the similar gear type will be used, data collected in 2003 and 2004 can be judged against the background of the strong interannual variation in abundance and size distribution of the fish community that is known from these RIVO surveys (Figure 3.1). Locations of these ongoing surveys and the wind farm area are depicted in Figure 3.2.

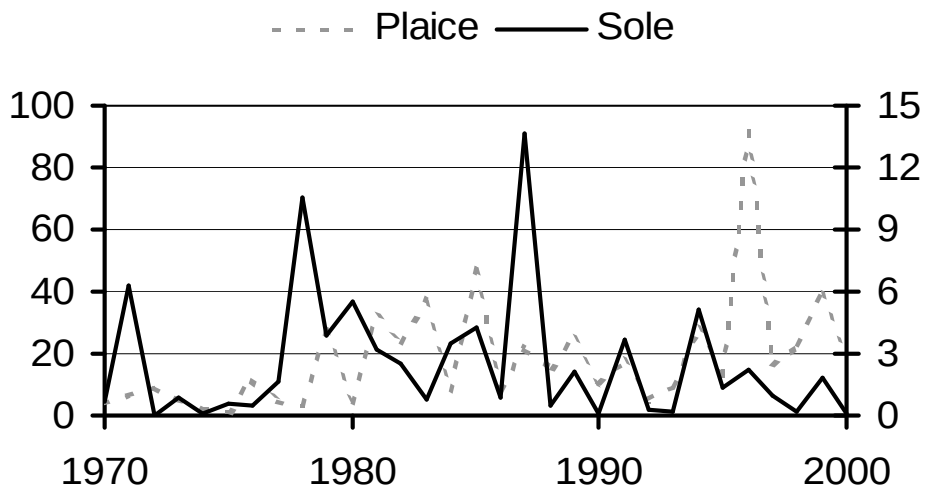

Figure 3.1. Yearly indices of the abundance of 0-group (fish that were born in the year of sampling) plaice (grey hatched line, left y-axis) and sole (black solid line, right y-axis). The index is an average abundance of plaice and sole along the coast from the Netherlands up to Denmark. Data from the Sole Net Survey.

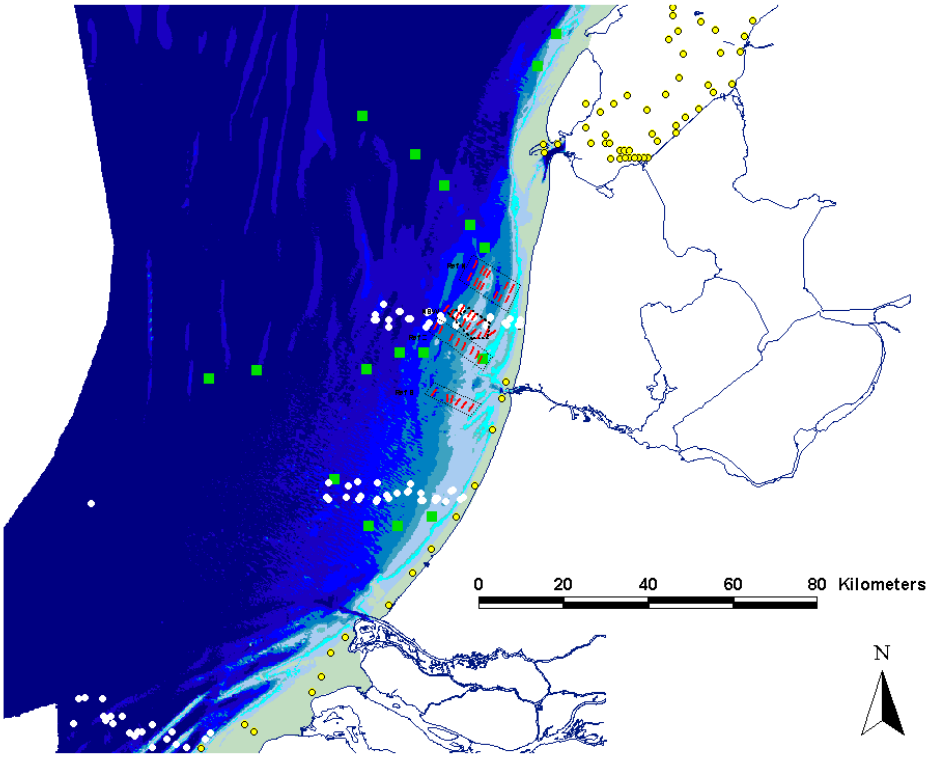

Figure 3.2. Map of the Dutch coastal zone indicating the positions of NSW and sampling stations of RIVO beam trawl surveys: Flyland (white dots); SNS: Sole Net Survey (green squares); DFS: Demersal Fish Survey (yellow dots). SNS, and DFS have been carried out yearly since 1970. Flyland project carried out in 2001 and 2002. For all surveys the same vessel (RV Isis) carried out the hauls, using beam trawl gear.

In April and September 2003 demersal fish in the coastal zone will be sampled in two RIVO surveys (SNS and DFS respectively). In combination with the baseline study, information on the demersal fish fauna in the coastal zone will be available from four periods (April, June, September 2003 and January 2004). In addition, RIVO sampled the demersal fish fauna year-round in 2001 and 2002 within the Flyland project (Grift et al. 2002, Grift & Welleman 2002). In this project, demersal fish were sampled with similar beam trawls along three transects, perpendicular to the coast. Combining all these data, the temporal variation in fish community structure within a year (seasonal variation) observed in 2003 and 2004 can be compared with the seasonal variation observed in the coastal zone in 2001 and 2002.

From the combination of data from these sources, occurrence of species throughout the season can be described and migration from and to the coastal zone can be inferred from the abundance of fish species in each period. Flounder, for example, is only abundant during summer when it migrates to the coastal zone from deeper areas. The temporal abundance of flounder in this period is a good indicator for migration of flounder to and from the coastal zone. For the most abundant species, these types of patterns will be described.

An exploration of the relationship between abiotic characteristics (depth, salinity) and abundance of key species will be made.

If time allows, an exploration of the relationship between the benthic fauna and the demersal fish will be made. However, as explained in Chapter 2, a detailed analysis is outside the scope of the programme.

3.2 Report writing

3.2.1 Fieldwork reports

After each survey and laboratory period, a fieldwork report will be delivered that contains
- A full report on the execution of the monitoring programme, including a description of the circumstances (days, weather conditions, specific situations, etc.), facilities and materials used, and other relevant information;
- A copy of the fieldwork forms or protocols, which have been used and filled out.
- As discussed with RIKZ during the kick off meeting, both first fieldwork reports will contain data on the occurrence of species and sizes. A separate report will be delivered at the end of Phase 2 containing all biological data, and densities and biomass data per age and sex (Table 3.1). These data can best be analysed after the second fieldwork period when age-length keys for all fish species have been established. Both fieldwork reports will present preliminary results that give a first impression of the demersal fish community and also the progress of the project will be discussed. A final report on biological data will be delivered that contains all data in the relevant format together with a description of the meta-data.

Table 3.1. Summary of information presented in reports of Phase 2. Symbols: '+' will be presented in the report; '-' will not be presented.

Report	Report 1 Field work	Report 2 Field work	Report Biological data
Density per species	+	+	-
Length–frequency distributions	+	+	-
Biomass per species	-	-	+
Density per age group	-	-	+
Age-length keys	-	-	+
Length-weight relationships	-	-	+
Maturity stages	-	-	+

3.2.2 Final report

By the end of the project, an extensive final report on the study, both in hard copy and in pdf format, has to be delivered containing:
- a description of the information needed to answer the objective(s);
- a description of the methods used in research, monitoring and analyses;
- a description of the sources used (written and verbal);
- a description of the base line (present) situation in sufficient detail;
- relevant graphics, tables, figures, maps and explanations;
- a description of the knowledge gaps;

- a bibliography;
- a recommendation on an approach for later (quantitative) evaluation of the learning objectives, including how to use gathered knowledge;
- a summary.

As discussed with RIKZ during the kick off meeting, the final report will focus on the following:
- a detailed description of the demersal fish community in the Dutch coastal zone;
- an integration of all results on the demersal fish fauna;
- a discussion of the possible effects of a wind farm on the demersal fish community.

Migration patterns of fish, inferred from the temporal variation in occurrence will be described. To describe these patterns, additional information on the occurrence of fish as observed in other sampling programmes will be used. If time allows, and data on the benthic community are readily available, the relationship between the benthic community and the demersal fish community will be briefly discussed.

3.3 Database delivery

By the end of Phase 2 all data that has been collected for this project will be delivered in a database:
- all validated basic data in the DONAR Interface Format (DIF);
- in case of aggregation of the data: all basic data in a database or spreadsheet form and validated aggregated data in the DONAR Interface Format;
- a description of the possibilities for RIKZ to check the quality of the data (for example the calibration data of the acoustic equipment and CTD device, results of reference samples (IRM or CRM) or an independent audit of the methods);
- all distribution data will be delivered in GIS-files (ESRI-format),
- a description of used methods and meta-data in Geokey-format, version 3.2.

The project results in four types of datasets:
1. catch data
2. biological data (age-length keys, sex and maturity data)
3. aggregated data: densities of fish species, sexes and age classes per location.
4. environmental data from the CTD.

All datasets will be delivered to RIKZ in the standard DONAR Interface Format. Aggregated data used for Tables and Figures in the final report will be delivered too.

As discussed during the kick off meeting, all data used to support the discussion on the occurrence and migration of demersal fish from outside the current project will be delivered in an integrated format. This implies that, for example, from the Flyland project total density (numbers per 1000 m^2) per species in the coastal zone per sampling period will be delivered.
The templates for the final database will be delivered in September 2003 and will be created in close cooperation with RIKZ.

4 PLANNING

The project will be divided into three phases; the strategy of approach, the fieldwork and the final report. An overview of the most important dates and deadlines is presented in Table 4.1.

Table 4.1. Overview of important dates and deadlines.

Event		Date
Start Phase 1		
	Concept plan of approach	15 May 2003
Start Phase 2		1 June 2003
	Concept field work report 1	15 August 2003
	Concept field work report 2	15 March 2004
	Concept products Phase 2	15 March 2004
Start Phase 3		1 April 2004
	Concept final report	30 June 2004
End of project		31 August 2004

A more detailed planning is presented in the Appendix 1 and the activities in this planning are briefly discussed in Table 4.2. The numbers refer to the numbers in the Appendix.

Table 4.2. Brief description of activities. The numbers of activities refer to the Appendix.

No.	Activity	Description
1	Strategy of approach	This report is the concept strategy of approach and has to be judged by RIKZ.
2	Internal review	Review of strategy of approach by senior scientist.
3	Preparing cruise 1	Preparing equipment, reservation of vessel, detailed cruise plan.
4	Cruise 1	Sampling of fish with beam trawl, collection of biological data.
5	Start up otolith analyses	Reading of otoliths for age determination. After the first sampling period, we will select species from which age will be determined. Contacts with foreign fisheries institutes will be made.
6	Data in database	Entering data in computer, all data in standard RIVO database, preparing data for Donar format. CTD data transformed into database format.
7	Fieldwork report 1	Report on cruises, preliminary results, densities of species and length classes.
8	Internal review	Review and discussion with senior scientist.
9	Preparing cruise 2	Preparing equipment, reservation of vessel, detailed cruise plan.
10	Cruise 2	Sampling of fish with beam trawl, collection of biological data.
11	Otolith analyses	Reading of otoliths for age determination.
12	Data in database	Entering data in computer, all data in standard RIVO database, preparing data for Donar format. CTD data transformed into database format.
13	Fieldwork report 2	Report on cruises, preliminary results, densities of species and length classes.
14	Internal review	Review and discussion with senior scientist.
15	Database delivery	Transformation of all data in Donar format. Delivery of all databases in DIF format.
16	Products Phase 2	Delivery of all fieldwork reports and data.
17	Data analysis	Analysis of the distribution of fish (species, age, sex, length), comparison with data from other programmes (surveys, Flyland project)
18	Report writing	Writing of final report.
19	Internal review	Review and discussion with senior scientist.
20	Final report	Delivery of concept of final report.

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Appendix 1
Detailed planning of the project

Table 1. Detailed planning of the project. Numbers in the table refer to the numbers of the activities also described in the text.

		Week	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
		Quarter				2							3																4								1																2																									
		Month	May	May	Jun	Jun	Jun	Jun	Jun	Jul	Jul	Jul	Jul	Aug	Aug	Aug	Aug	Sep	Sep	Sep	Sep	Sep	Oct	Oct	Oct	Oct	Nov	Nov	Nov	Nov	Dec	Dec	Dec	Dec	Dec	Jan	Jan	Jan	Jan	Feb	Feb	Feb	Feb	Mar	Mar	Mar	Mar	Mar	Apr	Apr	Apr	Apr	May	May	May	May	May	Jun	Jun	Jun	Jun	Jul	Jul	Jul	Jul	Aug	Aug	Aug	Aug	Aug
		Day	19	26	02	09	16	23	30	07	14	21	28	04	11	18	25	01	08	15	22	29	06	13	20	27	03	10	17	24	01	08	15	22	29	05	12	19	26	02	09	16	23	01	08	15	22	29	05	12	19	26	03	10	17	24	31	07	14	21	28	05	12	19	26	02	09	16	23	30
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