

Final Report

Programme 16: Squid NE of England

Prepared by

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SUMMARY

The FV Nimrod, skipper Mr D. Handyside, was chartered in December 2006 and October 2007 to

1. Determine species, quantities and locations of squid on the rough grounds in the NE of England (ICES area IVb Statistical rectangles 39E8 and 38E8, see Figure 1).
2. Identify the species of squid found in the area.
3. Estimate potential by-catch of whitefish when trawling for squid.

Squid constituted 12% of the catch (by number) for the combined 2006 and 2007 survey. The main species identified were the European Northern squid, *Loligo forbesi* plus *Alloteuthis subulata*, and the rest was classified as *Loligo* sp. The amount of discards of commercial species varied depending on the area.

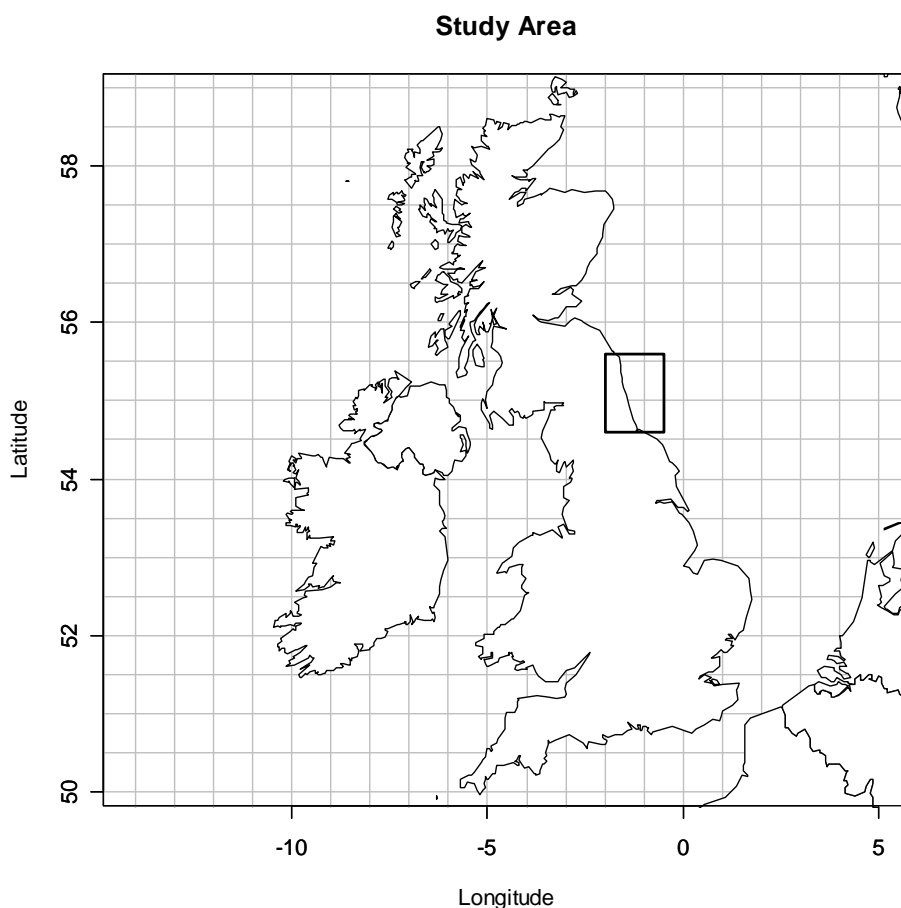


Figure 1. Squid NE of England FSP survey: UK and Ireland with a rectangle in the NE of England indicating the area of the survey.

Introduction

The Fisheries Science Partnership (FSP) was established in 2003 to build relationships between fishermen and scientists, and to involve fishermen in the co-commissioning of science. The FSP is funded by the UK's Department for Environment, Food and Rural Affairs (Defra). Ten projects were carried out during

2003/04, and a further ten in 2004/05, comprising a mixture of time-series surveys, fishing gear selectivity studies and examination of spatial patterns of catch compositions. Reports for FSP projects already completed are available on the FSP page of the Cefas website (www.cefas.co.uk).

A further three years of the FSP programme were funded by Defra from 2005/06. Industry proposals for FSP projects have typically been developed at a port/regional level, refined and agreed with Cefas and approved by the FSP Steering Group. Charter vessels are selected through an open tendering procedure, and are given dispensations from the relevant quota and effort controls and to fish in non-UK waters where appropriate.

This report presents the results of FSP 2006/07 Programme 20, a trawl and jigging survey of squid off the North East coast of England. The survey, on board the chartered vessel FV Nimrod, was planned to take place during the fourth quarter of 2006 to coincide with the period when squid were being caught in commercially viable quantities in the area. A first trip took place from 14 to 20 December 2006 (Part 1) but found very few squid, suggesting that squid had already moved away from the fishing grounds. The second trip took place from 11 to 17 October 2007 (Part 2). That survey was one of two surveys which aimed at developing jigging as an alternative low-impact method to catch squid with little by-catch. The second survey took place off the Western English Channel and is reported separately.

Objectives

The objective of the NE Coast squid survey were the following:

- a) To determine species of squid, quantity and location on the productive (mainly rough) ground off the NE Coast of England. Trawling allowed examination of squid catch rates in the area, identification of the species of squid available, and estimating the potential by-catch of whitefish when trawling for squid.
- b) To assess the viability of jigging to capture squid and to assess potential catch rates. Subsequent to the trawl survey, the potential of jigging was investigated, including jigging at night with lights.

The detailed operational plan for the survey was agreed between Cefas and the skipper on 5th December 2006. The operational plan is given in Appendix 1.

The cruise narrative prepared by Cefas seagoing staff is reproduced in Appendix 2.

Methods

Vessel and gear

The FV Nimrod is a 15.5 m registered length fishing trawler. The vessel carried two trawls for the survey owing to the likelihood of gear damage. Trawl 1 was a two-panel high lift trawl with cut away lower wings. Trawl 2 was a three-panel high lift trawl also with cut away lower wings.

Both nets were rigged on approximately 18 m of 14 inch “Rockhopper” ground gear. Codends of 40 mm mesh, 2 mm diameter were used on both trawls for most of the survey, but a smaller mesh cod end used in a previous FSP was deployed on trawl 2 for some of the hauls. Split bridles of approximately 45 m were deployed with 9 m of “sweeps”. Warp lengths varied with water depth. Both nets had headline heights checked using the vessel’s trawl sensor system. Trawl 1 achieved 4.8 m-headline height while Trawl 2 achieved 4.3 m. The gear was spread using a pair of Bison N° 8 Otter boards.

It was intended that tow duration should not exceed 1h but the type of ground being surveyed and the concentrations of static gear in the areas made this sometimes impossible.

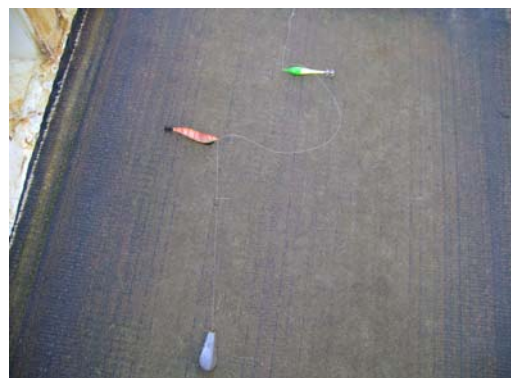
Lights and Jigs

Metal halide lights, 4000 W independently generated and the vessel’s four 400 W metal halide gantry mounted lights gave a total of 5600 W. It was originally intended to position the independent lighting set aft of the wheelhouse/galley, but this proved impossible. The generator/ lights were instead positioned on top of the vessel’s shelter deck on the starboard side (see photo below left).



South African and Japanese squid jigs of various types including plastic coated, fabric covered, weighted fluorescent and bait sticks were made. Light sticks were also deployed on the lines at certain time of the survey. The jigs were first rigged as learned during a training trip to South Africa. They are deployed in a paternoster style with typically two jigs to a line fitted approximately 1 m apart on 40 lb traces with 50 lb mainline and a 20 lb “rotten bottom”. The reason for the rotten bottom was

that if the rig became entangled in the seabed, theoretically only the lead weight would be lost (see photo below right).



After consultation with a former colleague who is at present catching *L. forbesi* successfully off South West England it was decided to rig some of the lines in the way they do it there (1 jig on a 4 m flowing trace attached to a “French boom”, above left). Line colour was also changed to clear “amnesia” (Trade brand name). Weight for the rigs varied according to tidal conditions from 175 g to 400 g. A variety of

storage/hauling equipment was used including rods, handlines and manually operated reels known as “gurdies” (see picture below).



During tidal conditions, an old trawl door was used as a drogue.

Grapnel style anchors were attached to a 30 m chain, which was coupled to the vessel's main warp.

Survey design

The survey was designed to cover the North East coast, inshore of the Farn Deep, in ICES rectangles 39 E8 and 38 E8 (approximately between latitudes 54° 50'N and 55° 35'N, to the west of 1°W). Trawling was conducted in a way that sampled across the entire area of the fishing grounds of interest and within the agreed limits.

The initial design involved a total of 7 days trawl surveying on local rough ground followed by 7 days to evaluate jigging as a fishing method. The 7-day jigging study was to be carried out separately and subsequent to the trawl survey.

Sorting and processing of the catch

Standard methods employed by Cefas staff for sorting and recording catches on commercial fishing vessels were employed (see FSP reports for details). For each species retained for landing, the total volume of the catch (number of baskets) was recorded, and a length frequency was recorded for all or a sample of the fish. All species, whether retained or discarded, were measured at each haul. For the purpose of this report, the retained and discarded components were combined for the analysis. Where catches were sampled rather than fully sorted, an appropriate raising factor was determined to allow the total catch to be estimated.

FV Nimrod was equipped with a catch reception hopper and sorting table allowing random selection of samples and good detection of minority species, which could be easily separated. Owing to the relatively short tow durations and sometimes large hauls of whitefish by-catch, it was, in most cases necessary to subsample parts of the retained and discarded components. Catch rates of squid were low, so the entire squid catch was sampled and frozen for analysis at a later date.

Data analysis

Catch rates were calculated as numbers per hour towed to standardise for the effects on catch of variable tow times.

Results

Fishing stations

Details of position, data and time, along with total numbers of squid and fish caught for the main commercial species: whiting, haddock, Norway pout, cod and Nephrops are given in Appendix 3. Figures 2 and 3 show the shooting position of each haul made by the vessel. A total of 30 stations was carried in December 2006 and 32 in October 2007. During the latter surveying, stations 1 - 22 correspond to jigging stations where only one 18 cm mantle length squid *Loligo forbesi* was caught, so only the positions are shown in Figure 3. Main features of the fishing activities are listed in Table 1.

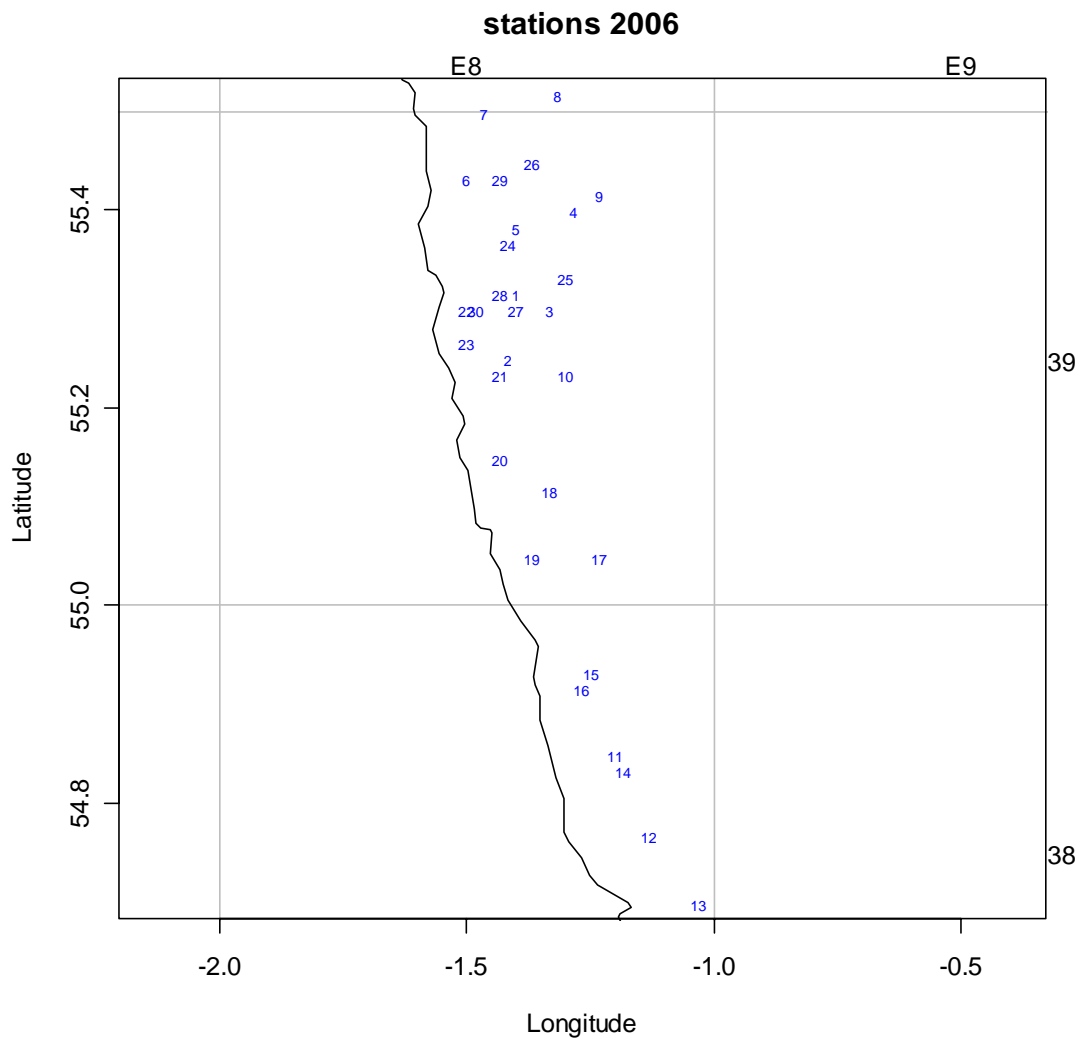


Figure 2. Squid NE of England FSP survey. Part 1 December 2006. Tow positions.

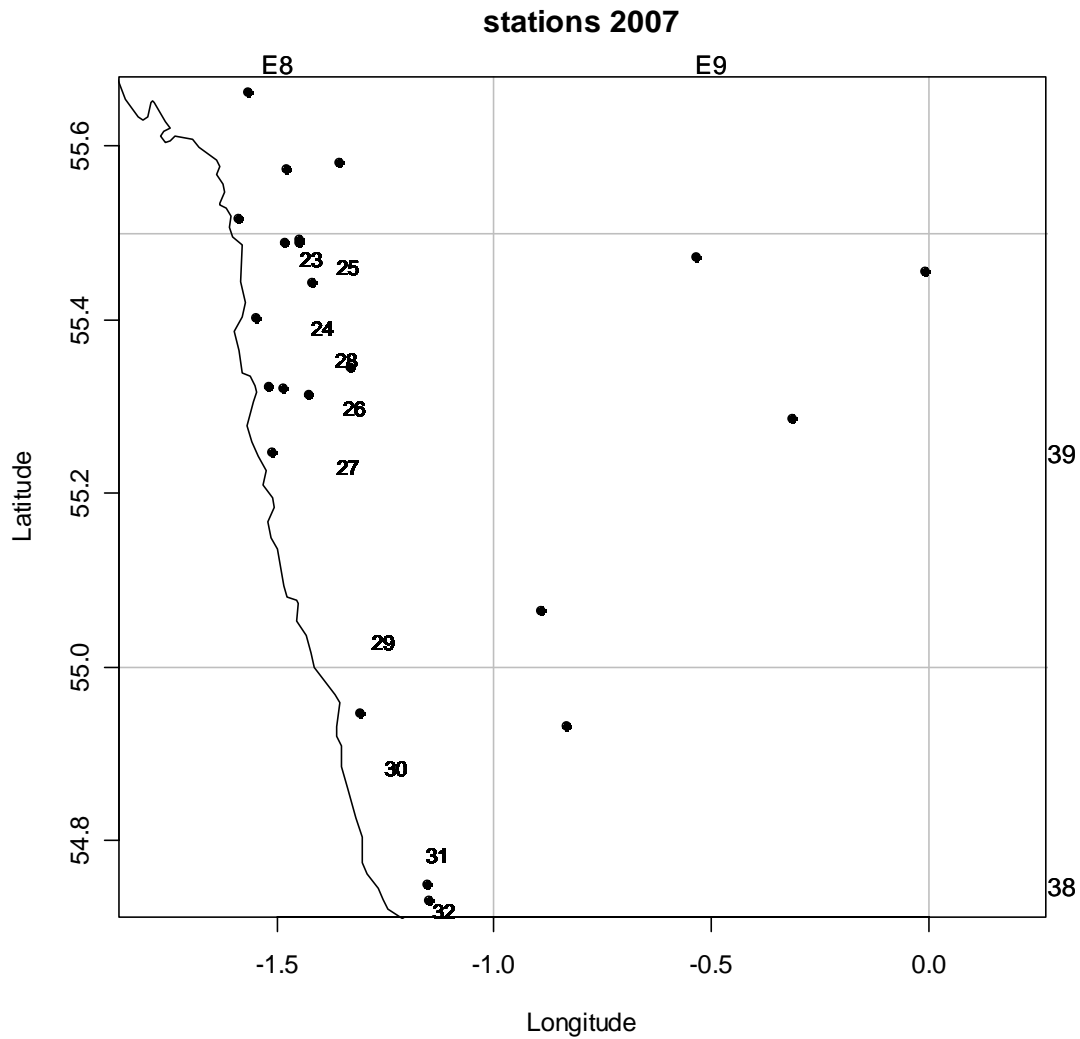


Figure 3. Squid NE of England FSP survey. Part 2, October 2007. Symbols refer to Jigging stations (1 – 22, numbers not printed), numbers 23 - 32 indicate the trawl positions.

Table 1. FSP Programme 20: Squid NE Coast. Details of fishing activities

Year	Dates	No. of hauls	Jigging stations	Average tow duration in minutes (range)
2006	14 – 20 December	30	0	99 (44 - 164)
2007	11 - 17 October	10	22	68 (32 – 81)

Distribution patterns

Plots of the distribution of *Loligo* sp., *Alloteuthis subulata* and of whitefish caught which includes cod, whiting and haddock, are shown by year in Figures 4 - 9.

Squid was separated and identified at the species level whenever possible. The distribution of *Loligo* sp. which includes *Loligo forbesi* (northern squid) and *Loligo vulgaris*, is plotted in Figures 4 and 5 by year. *Loligo* sp. were caught in all but three tows in 2006 and in all 10 tows performed in 2007, when large numbers were found in the northern part of the survey area. *Alloteuthis subulata*, which is a similar species to *Loligo* but much smaller and of no commercial value, were caught in small numbers in 2006, and in 2007 a large number of small *Alloteuthis* were caught in two trawls (Figures 6 and 7).

Whitefish were caught in all tows. Whiting, haddock and cod were caught, the latter in small quantities. The distribution of whitefish expressed in numbers per hour towing is shown in Figures 8 and 9 by year. Whiting were caught in all tows and constituted on average 88% by number of the whitefish for the entire survey. Cod were caught in all stations sampled in 2006 and in six tows in 2007. Haddock were caught in all but two stations in 2006 and at 9 stations in 2007.

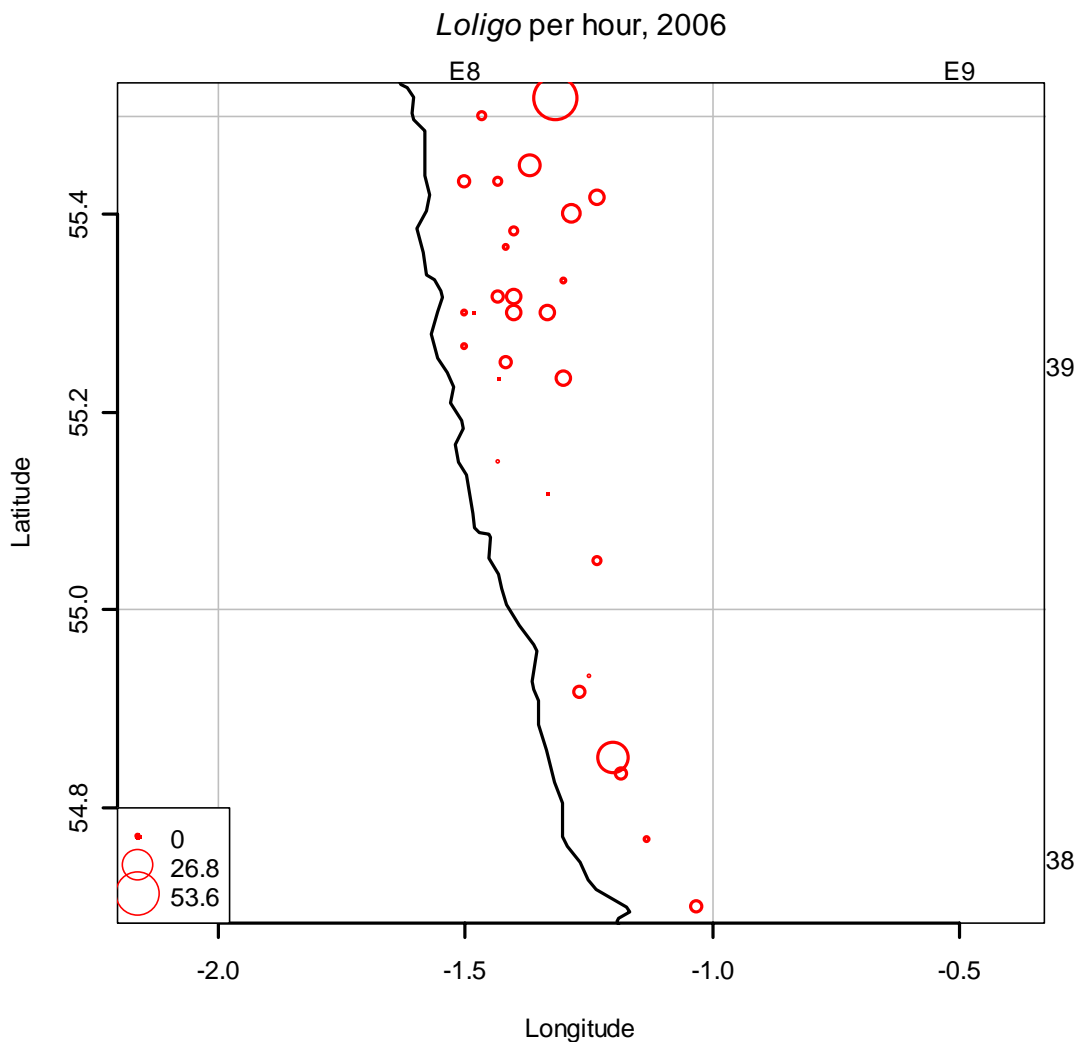


Figure 4. Squid NE of England FSP survey, Part 1. *Loligo* sp. per hour trawling.

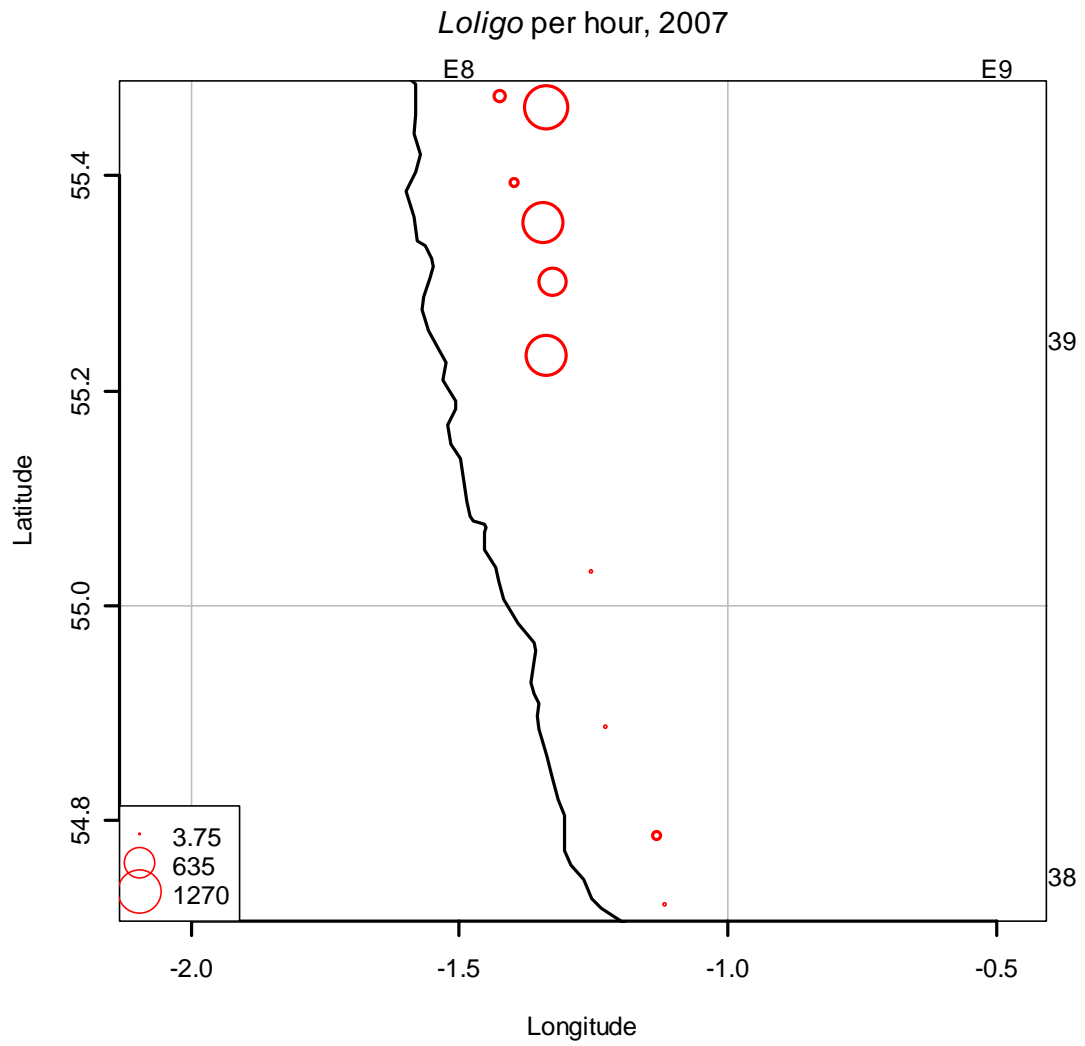


Figure 5. Squid NE of England FSP survey, Part 2. *Loligo* sp. per hour trawling.

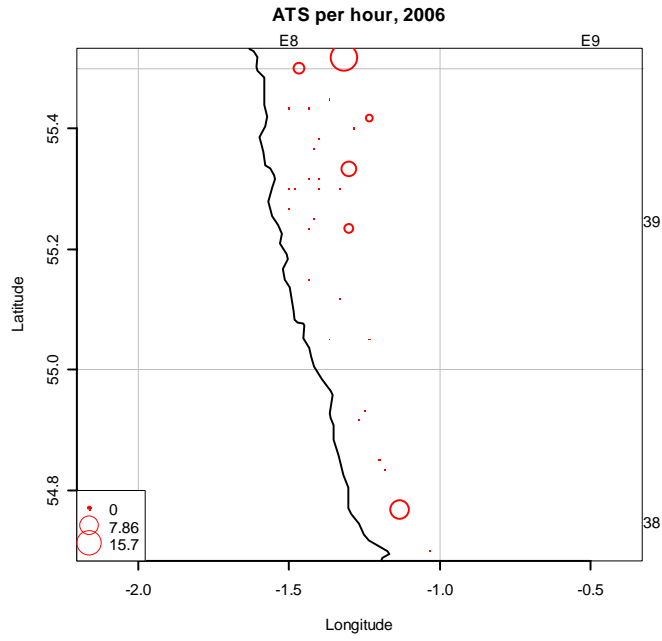


Figure 6. Squid NE of England FSP survey, Part 1. *Alloteuthis subulata* (ATS) numbers per hour trawling.

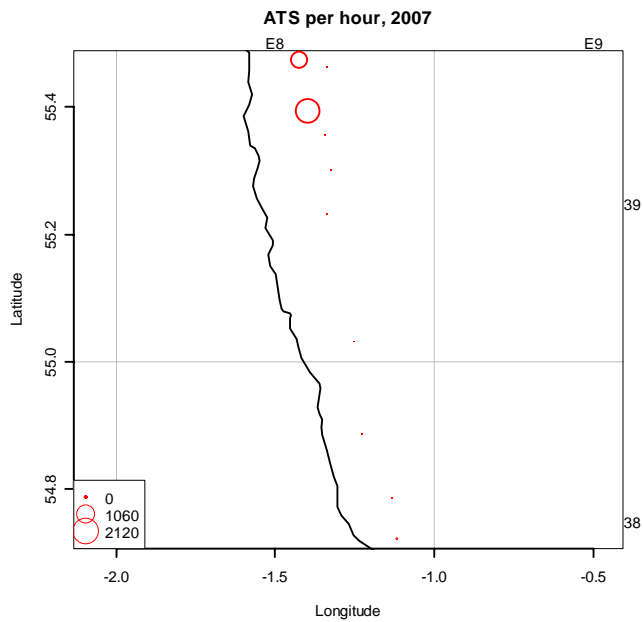


Figure 7. Squid NE of England FSP survey, Part 2. *Alloteuthis subulata* (ATS) numbers per hour trawling.

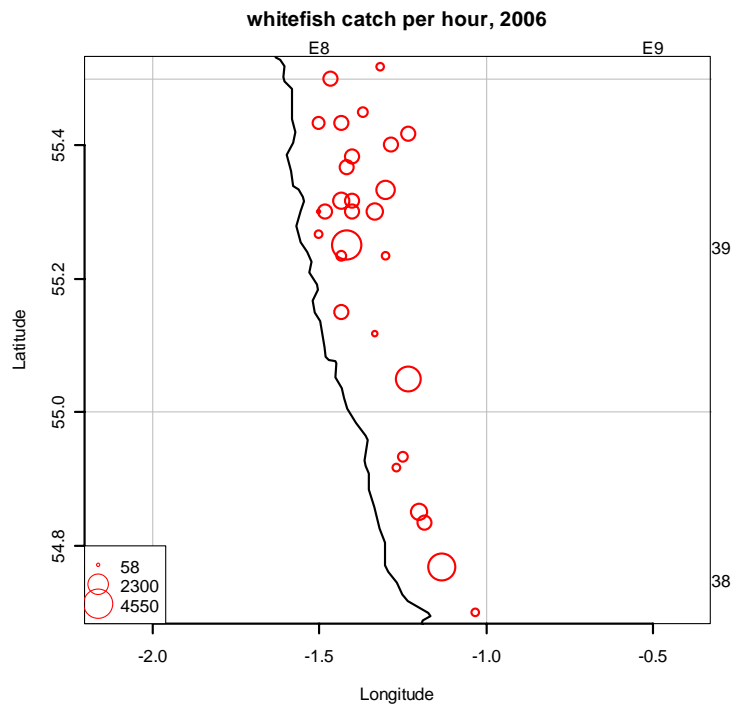


Figure 8. Squid NE of England FSP survey, Part 1. Whitefish (cod, haddock and whiting) numbers per hour trawling.

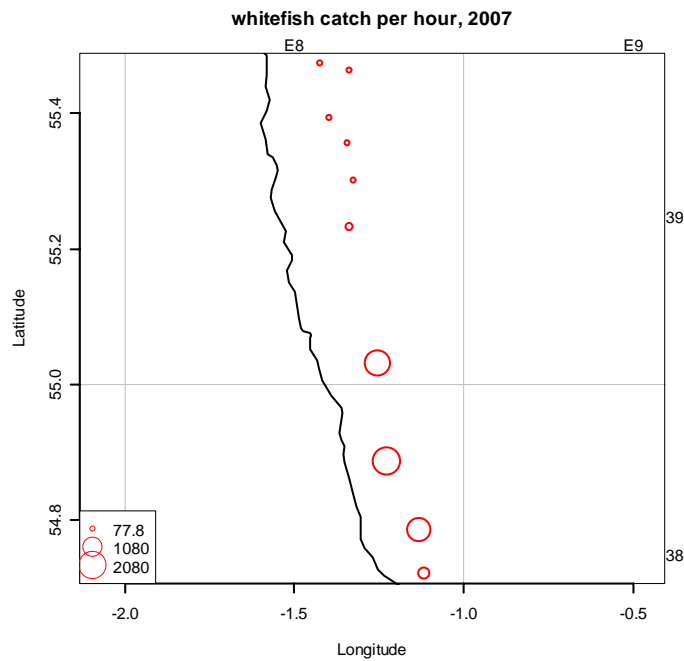


Figure 9. Squid NE of England FSP survey, Part 2. Whitefish (cod, haddock and whiting) numbers per hour trawling.

Catch compositions

Squid, *Loligo* sp. and *Alloteuthis subulata*, made up just over 1% by number of all species caught in 2006 (Figure 10a) while in 2007 they made up 34% (Figure 10b), as a result of a few hauls where large numbers of small individuals were caught. Whiting was the most abundant whitefish, reaching 68% and 29% by number in 2006 and 2007, respectively. Haddock followed as the most abundant whitefish, making up 14% by number in 2006 but only 2% in 2007. Cod made up a low percentage of the catch in number, around 1%. A total of 417 and 128 cod were caught in 2006 and 2007, respectively.

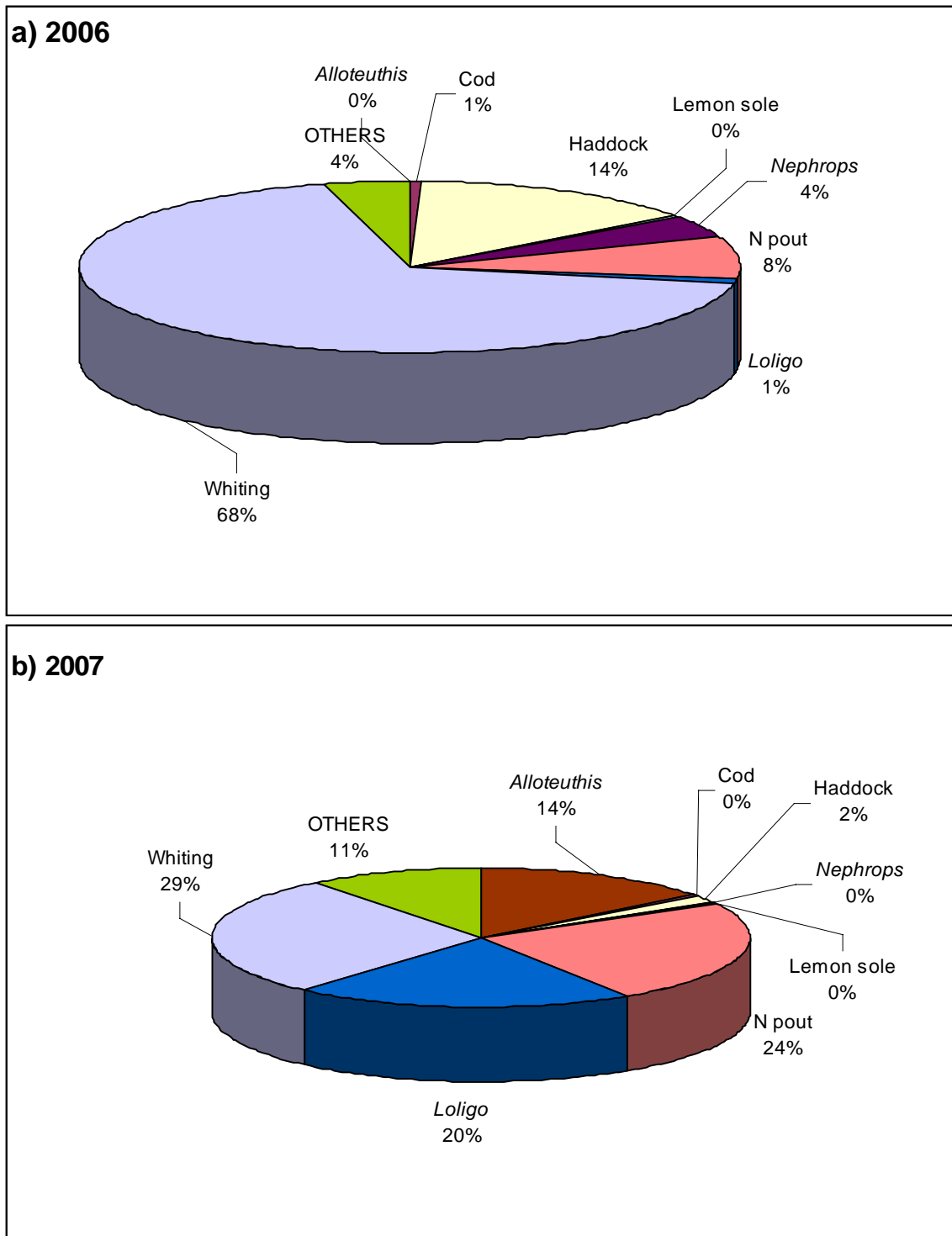


Figure 10. Squid NE of England FSP survey: percentage catch composition by number for Part 1 (a) and Part 2 (b).

Length compositions

The Northern squid caught in 2006 had a wide length range, with some large specimens reaching 52 cm mantle length. In 2007 the length distribution showed a clear peak between 14 and 16 cm (Figure 11). Two squid identified as *Loligo vulgaris*

were caught in 2006 and measured 15 and 16 cm mantle length. Some small squid were caught in 2006 but in 2007 large quantities of squid < 50 mm were caught in the northern part of the survey area. Those consisted mainly of *Alloteuthis subulata* or were classified as *Loligo* sp. as they could not be identified to species level.

The overall shape of the length frequency for cod remained fairly stable in 2006 and 2007, peaking between 36 and 38 cm. However, a considerable number of cod < 26 cm were caught in 2006, whereas those length groups were absent from the catches in 2007 (Figure 12).

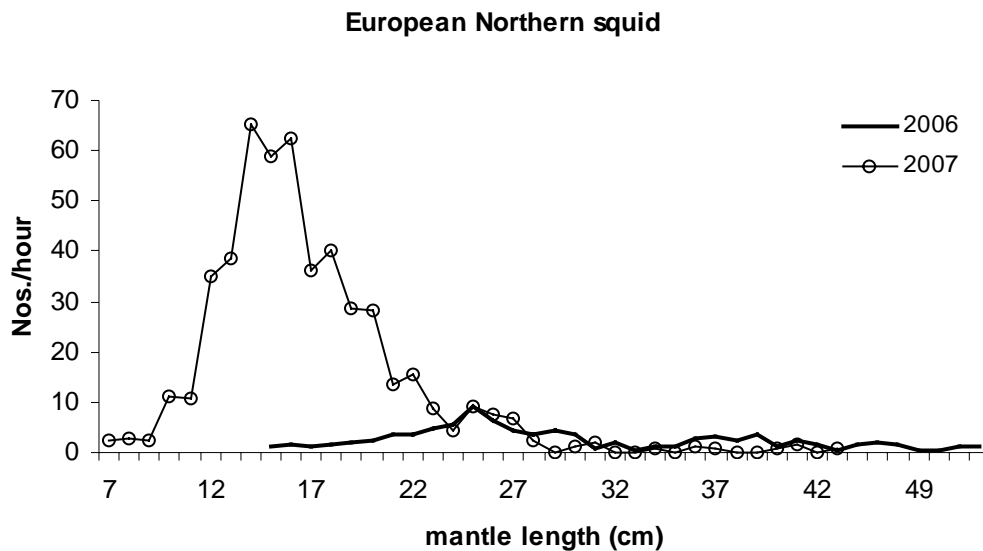


Figure 11. Squid NE of England FSP survey. Length frequency distribution of the European Northern squid *Loligo forbesi* for 2006 and 2007.

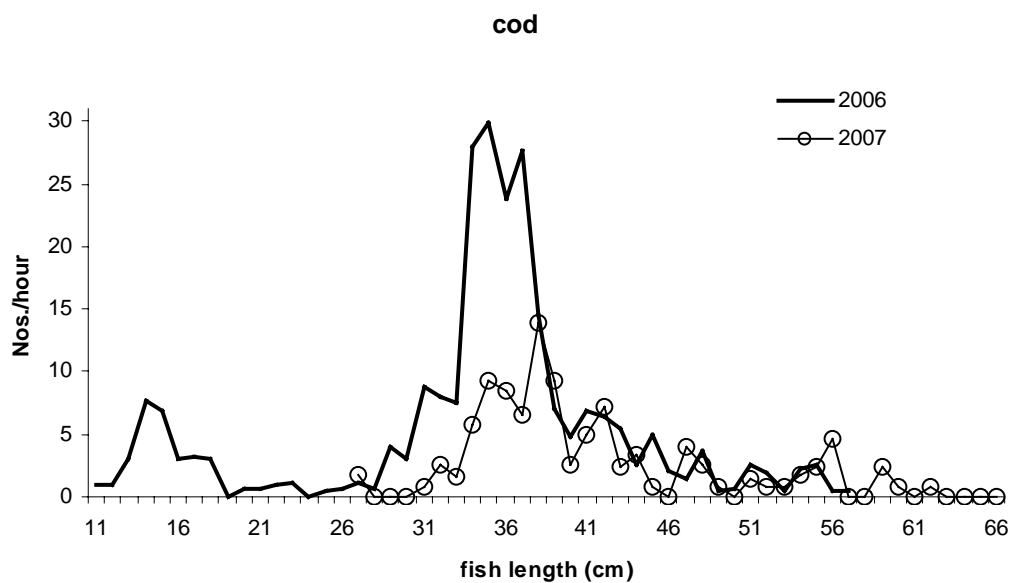


Figure 12. Squid NE of England FSP survey. Length frequency distribution of cod for 2006 and 2007.

Length frequencies of whiting and haddock showed very clear peaks at commercial sizes 30 and 28 cm respectively (Figures 13 and 14) but some undersize fish were also caught.

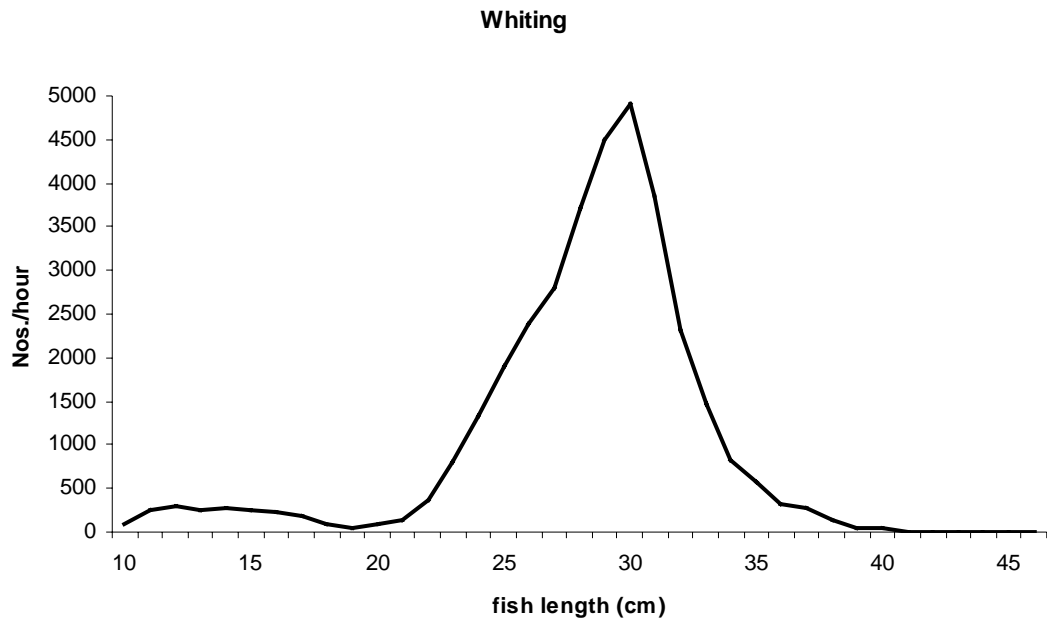


Figure 13. Squid NE of England FSP surveys. Combined 2006 and 2007 length frequency distribution of whiting.

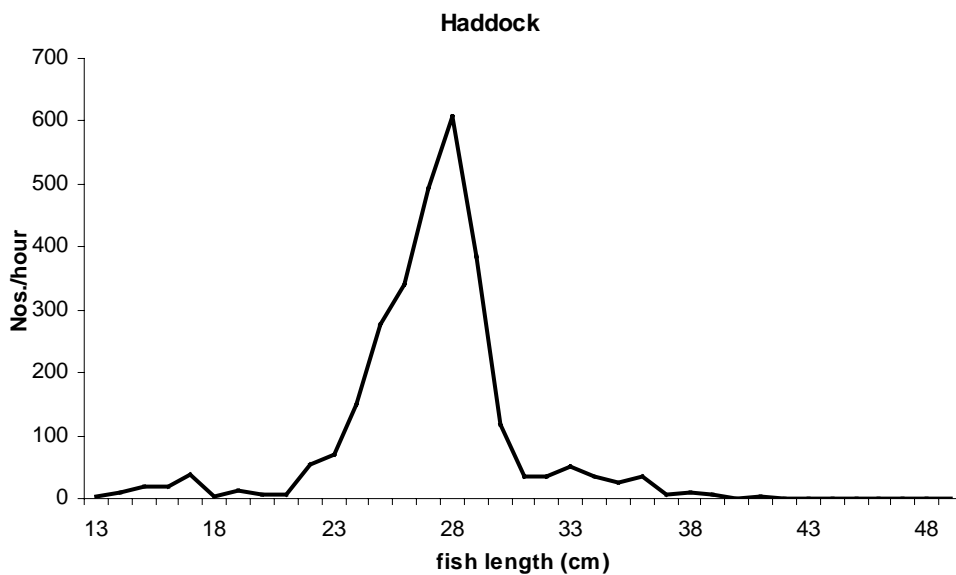


Figure 14. Squid NE of England FSP survey. Combined 2006 and 2007 length frequency distribution of haddock.

Biological data

Sex and maturity stage was determined for samples collected in 2006. Sex ratio was found to be close to 0.5 and 80% of the squid examined was found to be fully mature (maturity stage 5), see Figure 15. Quantities of squid eggs were found by static gear fishers, indicating that squid spawned in the area.

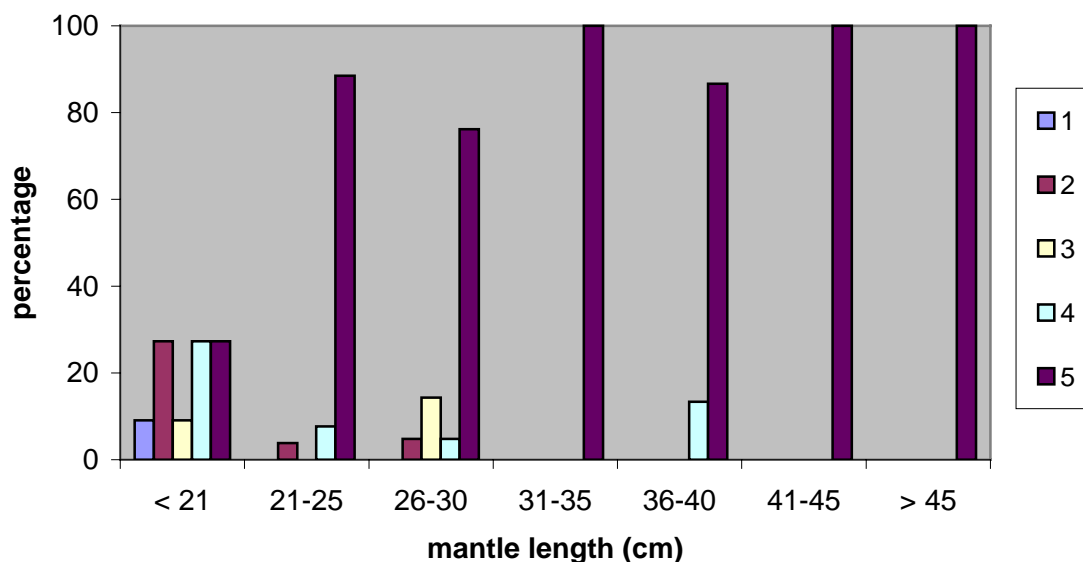


Figure 15. Squid NE of England FSP surveys. Percentage allocated to maturity stages 1 to 5 (where 1 corresponds to immature and 5 is ready to spawn) by mantle length class.

Discussion

The FSP NE of England squid survey took place in December 2006 and October 2007. Although the initial plan was to complete the survey in January 2007 at the very latest, a decision was made to delay its completion until the following season when squid were expected to return to the survey grounds in commercially viable quantities.

In December 2006, the first part of the survey, by-catches of whitefish were taken in all hauls, but quantities varied greatly, from 2-3 baskets to 50 baskets. The retained by-catches consisted mainly of whiting, followed by haddock. Very few cod were taken throughout the survey. Of the hauls that were made on the “hard/soft” ground border and on the soft ground, reasonable quantities of *Nephrops norvegicus* were taken as a by-catch. Discard rates also varied greatly throughout the survey, ranging from 10% or less to 50% of the total catch. Again, whiting were the most discarded species with haddock and Norway pout the next most abundant discards. Some cod were also discarded, but numbers were low, typically fewer than 10 and only present in some of the hauls.

In October 2007, second part of the survey, the catch rates of *Loligo forbesi* were generally between 10 and >20 kg/hour. By-catch rates differed dramatically between areas, with very little by-catch taken on the northern part of the survey in 39E8. The farther south the survey progressed, the more abundant the by-catches of whitefish became.

Jigging only took place during the second part of the survey. Only one 18 cm mantle length *Loligo forbesi* was captured by this method along with one 48 cm cod. Squid were observed on the surface on two occasions, although it was not possible to determine species or whether they were attracted to the lights. On the second occasion, the squid were larger in size but did not bite the jigs.

The types of bottom encountered on the NE squid survey ranged from the muddy substratum of the prawn grounds to the almost continuous rocky substratum of the inshore grounds. These areas were interspersed with patches of broken ground (areas of muddier ground in between harder substratum). In these areas of broken and hard grounds, there were prawn creels shot almost everywhere, which put constraints not only on what ground could be towed, but also the times of day that could be fished. The vessel would not operate if the buoys that marked the end of the pots could not be seen, so night hauls in certain areas were not possible. Although most of the static gear fishers were cooperative, giving readings of their gear, some, especially part time fishers, were either non contactable or refused to give readings. This meant that in effect, some of the possible areas of interest were inaccessible. According to the skipper and other fishers in the area, there are areas of high pinnacles (> 3 m), which are not accessible to trawl fishers but may prove productive in a jig fishery if water was clearer.

To conclude, the squid found in commercial sizes and quantities was *L. forbesi*, which did not appear to be attracted and aggregated by the lights. However, water turbidity could have been the main factor preventing squid from biting. A jigging fishery in the area of this study is unlikely to be successful if the conditions of lack of water clarity prevail. It should also be noted that squid “season” is anyway very short.

Squid catch rates during trawling would probably sustain a commercial fishery. However, due to regulations concerning by-catch in any future directed squid fishery, discards of commercially important species were likely to be acceptable in statistical rectangle 39E8 but too high for a fishery in 38E8.

SQUID NE Coast: December 2006

Detailed Operation Plan (as agreed 5 December 2006)

VESSEL

"Nimrod" (skipper Mr David Handyside)

OBSERVER

David Peach (Cefas)

OBJECTIVES

- a) To determine species of squid, quantity and location on the productive (mainly rough) ground off the NE Coast of England. Trawling is proposed, to examine squid catch rates in the area, to identify the species of squid available, and to estimate the potential by-catch of whitefish when trawling for squid.
- b) To assess the viability of jigging to capture squid and to assess potential catch rates. Subsequent to the trawl survey, the potential of jigging will be investigated. This exercise will include jigging at night with lights.

FISHING GEAR

High lift trawl with a smallish codend and rockhopper ground gear to target squid. Jigging equipment.

AREA OF OPERATION and TOW POSITIONS

Fishing operations will be carried out off the North East coast, inshore of the Farn Deep, in ICES rectangles 39 E8 and 38 E8 (approximately between latitudes 54° 50'N and 55° 35'N, to the west of 1°W). Trawling will be conducted in a way that samples across the entire area of the fishing grounds of interest and within the agreed limits. The survey will be conducted entirely within British fisheries limits.

PERIOD OF SURVEY

The survey shall take place during December 2006 and January 2007 (weather permitting). During the survey period the named skipper and vessel will fish in the designated area for a minimum of 15 days. This will involve a total of 8 days trawl surveying on local rough ground followed by 7 days to evaluate jigging as a fishing method. The 15 days of the survey may be divided into two or three continuous

periods with the shortest possible time between each period. The 7-day jigging study will be carried out subsequent to the trawl survey and must be completed by no later than mid January 2007. The total of 15 days does not include days lost due to bad weather.

FISHING ACTIVITIES

- Fishing will be required potentially over a 24-h period. The vessel must adequately cover the distribution of the target species within the area of operation specified.
- Typical tow duration should be of approximately 1 h, but this can be increased slightly if representative samples are not attained from a 1 h tow. In the event of very large catches requiring longer processing time than normal, the time between hauling and shooting should be adjusted in consultation with the observer.
- The typical working time for the observer on deck will be 12–14 h per day, and the observer must have a sufficient period of continuous time for sleep (minimum 7 h per day).
- All fishing operations will form part of the survey and must be sampled by the observer as per the sampling requirements. No commercial fishing will take place outside the survey.

SORTING AND RECORDING THE CATCH

It is important that catches of squid and other commercial species be quantified as accurately as possible. The crew will be required to assist in sorting the catch as required by the observer, as well as preparing any fish for sale. Standard Cefas methods for sorting and measuring squid and fish catches at sea will be carried out. The entire catch should be available to the observer for sampling, and none should be discarded without being recorded.

The observer will collect samples of squid for sex and maturity determination ashore (at the laboratory), and the cruise reference, tow number, species, and length should be recorded for each sample. These samples are to be spread out over the entire area, and should be collected, labelled and if at all possible frozen on board. Collections should be made across the length range at each tow, as a guideline samples of 2 males and 2 females by each 4cm length class per station/ drift could result in good coverage. However, limited freezing capacity may determine the number of samples that may be collected.

Any squid that cannot be identified to species level should be labelled and frozen on board. Freezer bags containing the samples should contain no more than 5 or 6 specimens, so that they do not contaminate each other and can be prepared for analysis quickly at the laboratory.

DATA TO BE RECORDED BY SKIPPER

The observer will provide recording sheets on which the skipper will log the following details for each trawl/ drift:

Date
Station number
Start and end fishing times
Start and end positions (latitude and longitude)
Other relevant information (e.g. state of tide, weather conditions, seabed type)

The skipper should provide full details of gear and rigging, and at the end of the survey, an electronic copy of the fishing station positions from the plotter.

DATA TO BE RECORDED BY OBSERVER

The observer must ensure that all catch compositions, length frequencies and raising factors are fully and correctly entered on the recording sheets, and that all bridge log sheets and biological sampling sheets are collated at the end of each sampling day. Any significant deviations from the survey plan should be reported to Cefas immediately by the observer.

CRUISE REPORT

The observers will maintain a diary of activities, including an electronic copy where possible, and a draft cruise report in standard Cefas format will be prepared for submission to Cefas, Lowestoft, immediately after the cruise. The cruise narrative should be written at sea and read and agreed by the skipper (report will bear the sentence “seen in draft by skipper”).

Signed:

..... (skipper)

.....(date)

..... (Cefas)

.....(date)

Appendix 2: Cruise narrative

Due to the high concentrations of static gear and difficulty in contacting certain skippers to obtain gear locations, certain small areas of the grounds were inaccessible. Although the DOP stated that the survey should be carried out over a 24hr period, it was felt that it would be inadvisable to do so in case any gear not identified was accidentally destroyed.

Trip 1:

Nimrod sailed from Amble on the 14-12-06 at 0800. Fishing commenced at 0900 and five hauls were made on the 1st day. In total, 30 hauls were completed with 29 sampled. The vessel came fast on several occasions but trawl damage was sustained on only two.

Tow duration varied from 1 to 2.5 hrs to allow the vessel better coverage of certain areas and also to ensure the most productive times of twilight were fished. Some hauls were made during the night but only in areas where all gear positions were known. Two hauls were made along the border between hard and soft ground and one was made on soft ground to determine if any squid were in unlikely areas. It was felt that all likely areas had been covered in the time at sea and Nimrod returned to Amble at 1700 on 20-12-06.

Trip 2:

Jigging :

Generator and lights were lifted on board at local boat yard and vessel sailed on 11/10/2007 Jigging operations commenced at 1800 in 9 fm at anchor.

22 stations were covered in the jigging part of the survey in depths ranging from <10 to >40 fm. Bottom types encountered ranged from broken ground i.e. low rock interspersed with sandy patches to pinnacles of up to 4fm in height.

Drift / anchor times ranged from 0.25- 3.5 hours. Water clarity very poor in all areas of the survey with visibility ranging between approximately 1.5 m to 3 m.

During the survey, it was twice necessary to return to Amble. The first time to pick up the trawl door (drogue) and then to pick up lines and leads to re-rig the gear.

On two occasions it was felt justified to extend the survey area to ascertain if water was any clearer. The first occasion meant jigging to the East of 01° and the second it was decided to try 1.1 miles to the SSE of the Farne Islands.

On one occasion we decided to try short drifts up the rock slope to the peak where the echo sounder was showing good marks just off the seabed.

On one occasion the drift was aborted as too much gear was being lost. Other drifts had to be aborted when the tide became too strong (>1.2kt).

One drift was undertaken in a location known to have had an abundance of squid spawn the previous year.

15/10/2007: Jigging component of the survey suspended. Vessel steamed in to Amble to remove generator and bring trawl gear on board.

Trawling:

16/10/2007:

In total, 10 hauls were made in as wide an area as possible in the time remaining. The time was split between the two rectangles 39E8 and 38E8. 6 hauls were undertaken in 39E8 and 4 hauls in 38E8.

Hauls were carried out on hard ground with no time being spent on the border between rough and clean or on the clean ground. Tows were kept in the region of 1 to 1.5 hours.

Nimrod returned to Amble for final landing at 2100 17/10/2007

Appendix 3: Squid NE of England FSP survey. Part 1, December 2006. Tow details and catch numbers per tow for main commercial species (data for other species are held on the Cefas data base).

Station	RECTAN	Shot latitude	Shot longitude	Haul latitude	Haul longitude	Duration (Mins)	Allote uthis	SQUID SP.	N. SQUID	COD	HADD-OCK	WHITING	LEM. SOLE	Nway POUT	PLAICE (EUR)	Nephrops		
1	39E8	55.37	1.45	W	55.32	1.40	W	60	0	0	6	2	90	1186	0	56	3	0
2	39E8	55.32	1.40	W	55.25	1.42	W	80	0	0	5	26	910	5126	1	270	1	0
3	39E8	55.25	1.40	W	55.30	1.33	W	80	0	0	9	7	557	1776	3	0	3	0
4	39E8	55.30	1.35	W	55.40	1.28	W	110	0	8	9	7	189	2262	5	273	0	0
5	39E8	55.35	1.33	W	55.38	1.40	W	67	0	0	2	5	49	1326	1	248	0	0
6	39E8	55.38	1.50	W	55.43	1.50	W	65	0	0	4	23	0	847	0	19	0	0
7	39E8	55.43	1.50	W	55.50	1.47	W	100	5	0	5	18	3	1859	0	45	3	0
8	39E8	55.52	1.43	W	55.52	1.32	W	84	22	75	0	6	17	541	7	306	0	0
9	39E8	55.48	1.25	W	55.42	1.23	W	90	2	10	1	3	104	1484	3	52	0	0
10	39E8	55.32	1.25	W	55.23	1.30	W	120	4	0	11	0	168	827	7	74	1	0
11	38E8	54.95	1.23	W	54.85	1.20	W	130	0	1	35	14	46	3406.5	0	71	1	156
12	38E8	54.85	1.18	W	54.77	1.13	W	100	14	0	2	32	446	6691	0	340	0	0
13	38E8	54.75	1.15	W	54.70	1.03	W	103	0	0	6	47	37	458	0	162	0	0
14	38E8	54.78	1.13	W	54.83	1.18	W	120	0	0	4	43	280	2226	0	183	0	0
15	38E8	55.02	1.30	W	54.93	1.25	W	116	0	0	1	48	126	1224	1	156	4	1180
16	38E8	54.98	1.32	W	54.92	1.27	W	71	0	0	4	14	33	531	0	31	0	0
17	39E8	54.95	1.22	W	55.05	1.23	W	113	0	0	3	16	5753	832	11	309	3	2340
18	39E8	55.05	1.25	W	55.12	1.33	W	87	0	0	0	1	1	321	2	52	1	1
19	39E8	55.03	1.35	W	55.05	1.37	W	44	0	0	1	0	0	0	0	0	0	0
20	39E8	55.07	1.38	W	55.15	1.43	W	95	0	0	1	10	1	1724	0	1700	0	0
21	39E8	55.17	1.43	W	55.23	1.43	W	100	0	0	1	6	1	1114	0	532	0	0
22	39E8	55.27	1.48	W	55.30	1.50	W	60	0	0	0	4	0	64	0	0	0	0

23	39E8	55.28	1.55	W	55.27	1.50	W	92	0	0	2	5	0	627	1	0	1	0
24	39E8	55.22	1.38	W	55.37	1.42	W	164	0	0	1	3	542	2499	0	352	1	0
25	39E8	55.23	1.30	W	55.33	1.30	W	115	0	0	2	6	1193	2278	7	48	0	0
26	39E8	55.35	1.32	W	55.45	1.37	W	124	11	0	2	6	217	959	6	147	3	0
27	39E8	55.40	1.43	W	55.30	1.40	W	109	0	0	16	12	120	1815	3	195	0	0
28	39E8	55.23	1.38	W	55.32	1.43	W	108	0	0	9	9	630	2421	6	198	7	0
29	39E8	55.32	1.43	W	55.43	1.43	W	135	0	0	8	20	46	2731	9	280	0	0
30	39E8	55.43	1.45	W	55.30	1.48	W	137	0	0	7	24	24	3029	2	34	1	0

Appendix 3: Squid NE of England FSP survey Part 2, October 2007. Jigging positions

Station	RECTAN	Shot latitude	Shot longitude	Haul latitude	Haul longitude	Duration
1	39E9	55	27.24	0	0.34	W 120
2	39E9	55	28.34	0	31.96	W 70
3	39E8	55	29.24	1	26.88	W 145
4	39E8	55	19.17	1	29.10	W 189
5	39E8	55	18.78	1	25.62	W 80
6	39E8	55	19.37	1	31.06	W 45
7	39E8	55	14.91	1	30.43	W 15
8	38E8	54	57.26	1	18.54	W 30
9	38E8	54	45.37	1	9.16	W 138
10	38E8	54	42.00	1	6.38	W 165
11	38E9	54	56.09	0	49.52	W 120
12	39E9	55	4.28	0	53.90	W 210
13	39E9	55	15.20	0	18.03	W 80
14	39E8	55	20.20	1	19.36	W 30
15	39E8	55	21.85	1	33.02	W 150
16	39E8	55	29.06	1	26.84	W 90
17	39E8	55	29.41	1	26.84	W 75
18	40E8	55	35.14	1	21.48	W 58
19	40E8	55	35.57	1	29.38	W 75
20	40E8	55	38.17	1	34.29	W 80
21	40E8	55	30.92	1	25.29	W 210
22	39E8	55	27.28	1	25.74	W 180

Appendix 3. Squid NE of England FSP survey, Part 2, October 2007. Tow details and catch numbers per tow for main commercial species (data for other species are held on the Cefas data base).

Station	RECTAN	Shot latitude	Shot longitude		Haul latitude	Haul longitude	Duration (Mins)	Alloteut-his	SQUID SP.	N. SQUID	COD	HADD-OCK	WHITING	L. SOLE	Nway POUT	PLAICE (EUR)	Nephrops	
23	39E8	55.25	1.27	W	55.28	1.25	W	60	1016	0	90	0	5	120	0	94	1	0
24	39E8	55.27	1.24	W	55.23	1.23	W	81	2860	0	88	0	0	105	4	11	0	0
25	39E8	55.23	1.23	W	55.27	1.2	W	75	0	1488	96	0	2	113	1	86	0	0
26	39E8	55.21	1.20	W	55.18	1.19	W	75	0	594	109	7	11	113	14	30	0	0
27	39E8	55.17	1.19	W	55.13	1.2	W	70	0	1377	56	9	23	227	7	565	0	0
28	39E8	55.17	1.20	W	55.21	1.2	W	70	0	1272	48	11	42	90	22	18	0	0
29	39E8	55.04	1.18	W	55.01	1.15	W	70	0	0	6	45	97	2050	15	1120	18	70
30	38E8	54.56	1.14	W	54.53	1.13	W	70	0	0	7	18	33	2376	1	2552	5	0
31	38E8	54.5	1.10	W	54.47	1.07	W	80	0	0	102	38	155	1858	4	1548	9	0
32	38E8	54.44	1.08	W	54.43	1.06	W	32	2	0	2	0	27	159	0	105	22	0