

Final Report

Programme 2: Western Anglerfish

Prepared by:

**Mike Smith, Steve Warnes, John Dann, Denise
Goldsmith and Mike Armstrong**

Cefas, Lowestoft

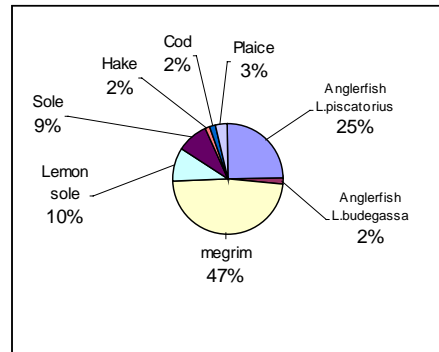


December 2005

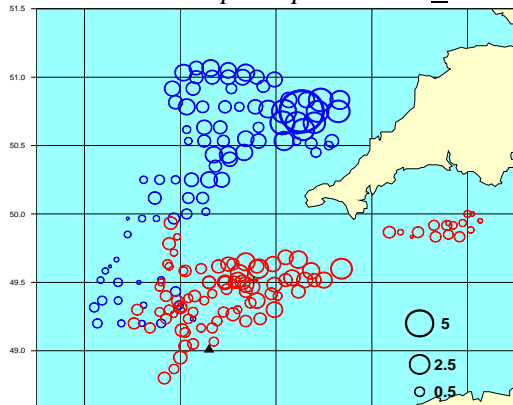
Summary

A Fisheries Science Partnership survey of anglerfish (monkfish) was carried out in October 2005 off the SW coast of England. The beam trawlers *Billy Rowney* and *Twilight III* were chartered to carry out a survey using the same trawl gear as on similar FSP surveys in autumn 2003 and 2004. The most abundant of eight important species caught was megrim (48% by number), followed by anglerfish (*L. piscatorius*) (25%), lemon sole (10%) and sole (9%). Anglerfish (*L. budegassa*), hake and cod each made up only 2% of these 8 commercial species total catch by number and were taken at a mean rate of fewer than two fish per

Commercial species composition



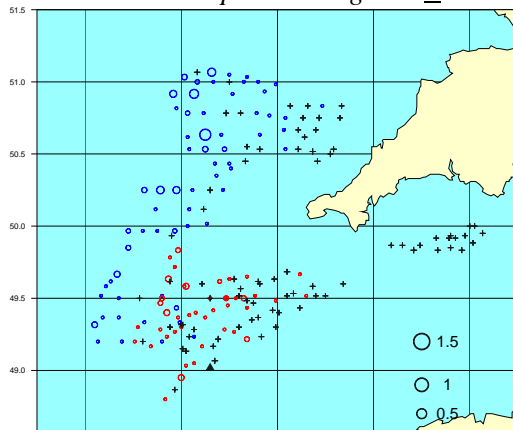
Distribution of *Lophius piscatorius* ≥ 25 cm



Anglerfish (*L. piscatorius*) were widely distributed throughout the surveyed area. Catch rates were higher in the northeast of the surveyed area and lower in the southeast and southwest of the surveyed area.

Anglerfish (*L. budegassa*) were much less abundant. They were quite widely distributed in the west of the surveyed area, but scarce in the east. Catch rates were highest in the northwest of the surveyed area.

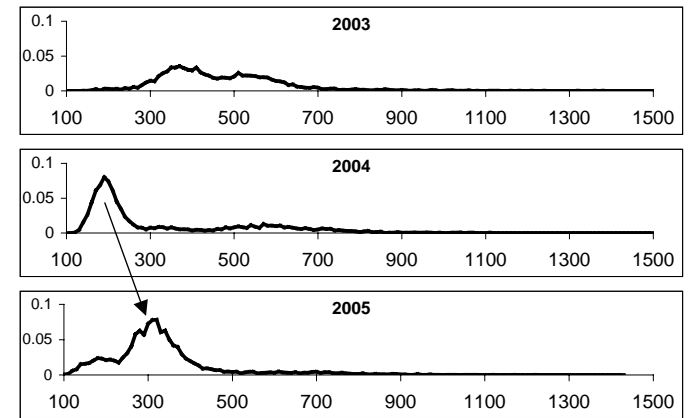
Distribution of *Lophius budegassa* ≥ 25 cm



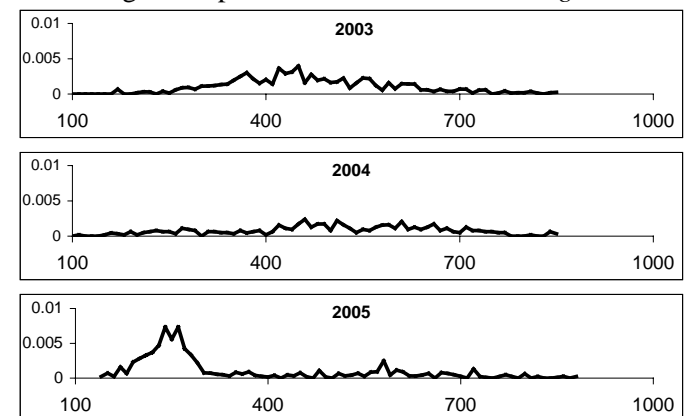
Length distributions for anglerfish (*L. piscatorius*) show a decline in abundance of larger fish. A strong year class first apparent in 2004 around 20 cm long was confirmed in 2005 at a modal length around 30 cm.

Corresponding distributions for anglerfish (*L. budegassa*) also show a decline in abundance of larger fish. There is an indication of increased abundance of small fish in 2005.

Mean length compositions, 2003–2005 *L. piscatorius*



Mean length compositions 2003–2005 *L. budegassa*



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 has now been funded by Defra. 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 2005/06 Programme 2, carried out on the anglerfish fishing grounds off the SW coast of England during October 2005. The project used the commercial beam trawler *Twilight III* (skipper M. Watson) to survey the southern part of the survey area from 6 to 11 and 13 to 18 September. The beam trawler *Billy Rowney* (skipper S. Moseley) surveyed the northern region from 13 to 19 and 22 to 26 October.

The vessels fished in the same areas, using the same gear and towing practices, as in the equivalent FSP trips in 2003 and 2004, and the survey can be considered the third in the time-series providing information on changes in abundance and size composition of anglerfish off SW England.

Two species of anglerfish are caught on these grounds. The most common species (scientific name *Lophius piscatorius*) is referred to as anglerfish or monk(fish) (*L. piscatorius*) in this report. The less common species (scientific name *Lophius budegassa*), is referred to as anglerfish or monk(fish) (*L. budegassa*) to avoid the use of common names such as "black anglerfish" or "white anglerfish" which can be used for the same species in different areas. The two species of anglerfish belong to populations that extend over a large area of the continental shelf to the west and southwest of the British Isles. The populations extend from coastal waters out to the shelf slope, and are fished by several nations using beam trawls, otter trawls and fixed nets. The area covered by the FSP survey is therefore only a small part of the overall range of the populations.

Results are presented separately for the two species.

Objectives

The objectives as outlined in the detailed plans (Appendix 1) were:

- 1) To repeat the surveys of anglerfish in the western Channel.
- 2) To provide data on the distribution and catch rates of anglerfish and other commercial species using commercial gear.
- 3) To determine length compositions of anglerfish and other commercial species in the catches.
- 4) To add to the time-series started in 2003.

The reports of the 2003 and 2004 western anglerfish surveys (Cotter *et al.*, 2004; Walmsley *et al.*, 2005) are available on the Cefas FSP website (www.cefas.co.uk).

The detailed operational plans were discussed at meetings between Cefas and the vessel owners on 18th August 2005 (Appendix 1).

The cruise narratives prepared by Cefas seagoing staff are reproduced in Appendix 2.

Methods

Vessels and gear

FV *Twilight III* (PZ137) is a steel beam trawler of 27 m reg. length, with a 783 kW engine, built in 1969. FV *Billy Rowney* (PZ538) is a steel beam trawler of 27 m reg. length, 783 kW engine, built in 1973.

Twilight III fished with two 9-m beam trawls fitted with chain mats and 3-bar flip-up ropes. Codends were constructed from 80 mm mesh. *Billy Rowney* fished with two 10-m beam trawls, similarly equipped with chain-mats, flip-up ropes and 80 mm mesh codends. Tows varied between 0.25 and 4.25 h depending partly on weather, with most between 1 and 2 h duration. Towing speeds were kept at 4–5 knots where possible. Table 1 summarizes the fishing activities of the two vessels.

Survey design

In order to better map the distribution of anglerfish, the survey areas were divided into 15' × 15' boxes (Appendix 1). Boxes were classified as those unsuitable for trawling, which were excluded from the survey, and boxes where anglerfish abundance was expected to be high or lower. More tows per box were carried out in the main anglerfish areas, but where possible all boxes covering suitable habitat for anglerfish were sampled. This provided for a somewhat more evenly spread distribution of stations than in previous years, although slightly fewer tows were made overall than in 2004.

Table 1. FSP 2005 Programme 2: Western Anglerfish. Details of fishing activities.

Vessel	Dates in 2005	Stations	Number of hauls	Fishing gear	Codend mesh	Tow duration (min) Average (range)
<i>Twilight III</i>	Sep 6–11, 13–18	1-49 1-48	97	2 × 9 m beam trawls	80 mm	105 (45–255)
<i>Billy Rowney</i>	Oct 14–19, 22–26	1-54 1-34	88	2 × 10 m beam trawls	80 mm	100 (15–180)

Sorting and processing the catch

Standard methods employed by Cefas staff for sorting and recording catches on commercial fishing vessels were employed (see FSP reports for 2004/05 for details). Catches were quantified and classified as 'discarded' or 'retained' according to advice from the fishing crew. Length measures were carried out on each component. Where catches were sampled rather than fully sorted, an appropriate raising factor was determined to allow the total catch to be estimated. In line with the detailed plan (Appendix 1), discard sampling was carried out for both species of anglerfish and for hake, cod, plaice and sole at all stations. Additional full discard sampling for all species was carried out at eight stations onboard *Twilight III* (Appendix 3).

Results

Fishing stations

Details of tow position, date and time, together with raised catches for eight commercial species (anglerfish [*L. piscatorius* and *L. budegassa*], megrim, sole, lemon sole, hake, cod and plaice) are given in Appendix 3. Details of all species sampled are held on a Cefas database. One haul (*Twilight III* 1/05, Station 9) was considered invalid for scientific purposes by the observer because of a large catch of sand and shells. Tow positions in general accord with the survey design (Appendix 1).

Spatial distribution of anglerfish

Both large (≥ 25 cm) and small (< 25 cm) anglerfish (*L. piscatorius*) were widely distributed throughout the area covered by the surveys, but smaller anglerfish (*L. piscatorius*) were less abundant south of Cornwall and Devon and in the southwestern part of the survey coverage. The greatest abundance of both large and small anglerfish (*L. piscatorius*) was northeast of the survey area (northwest of Trevoze Head).

Figure 1a. Catch rate of anglerfish (*L. piscatorius*) <25 cm long (no./m beam/h)

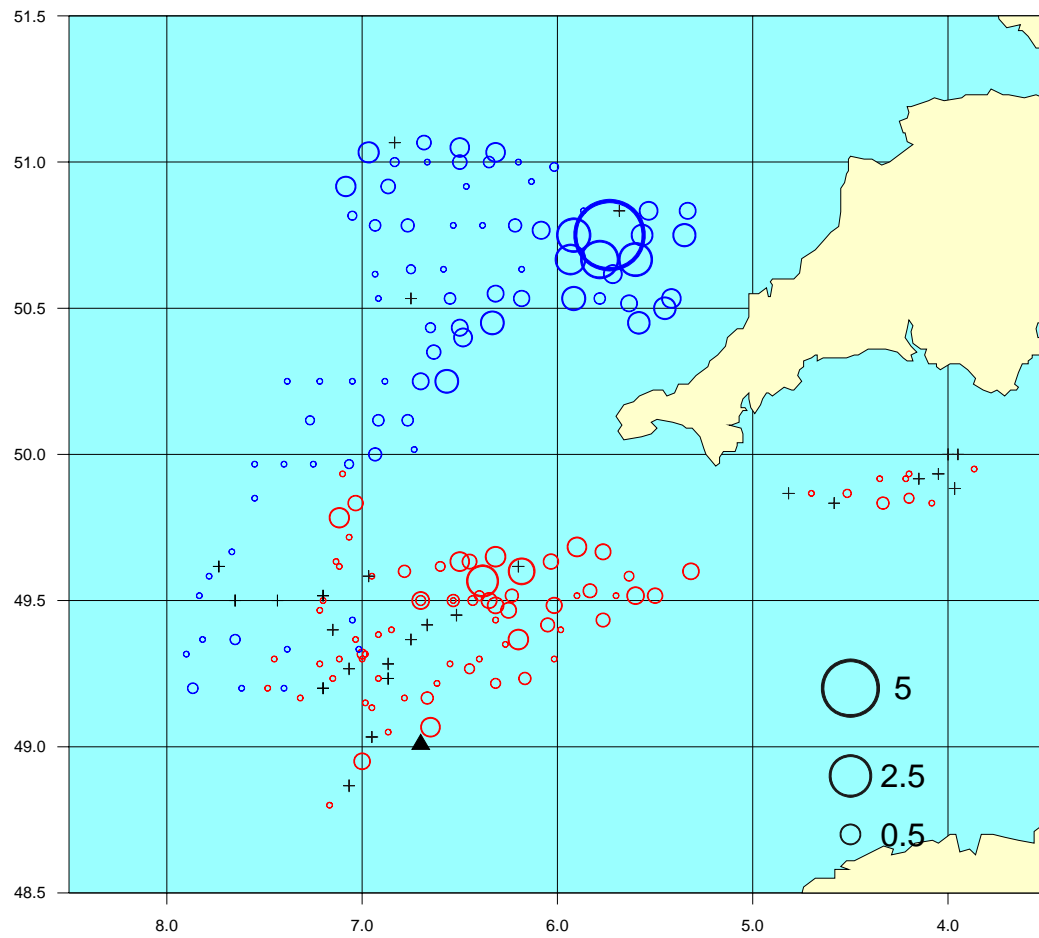
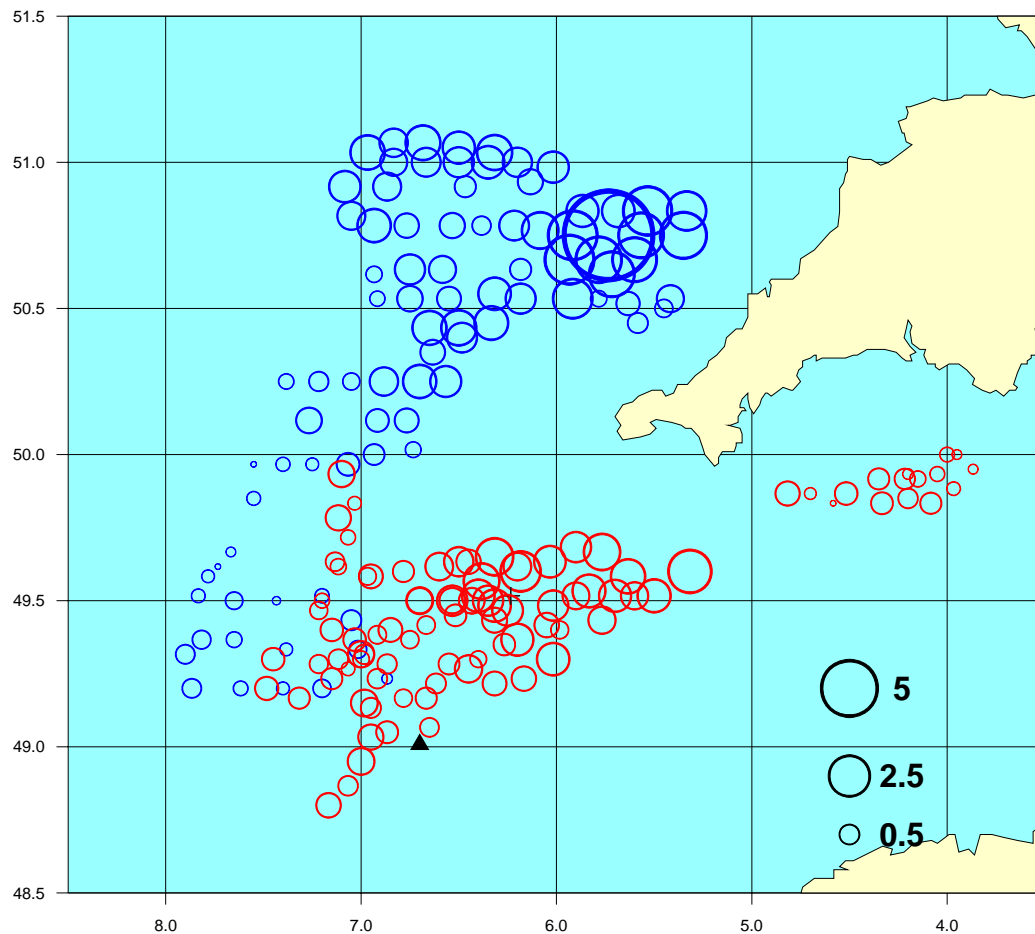


Figure 1b. Catch rate of anglerfish (*L. piscatorius*) ≥ 25 cm long (no./m beam/h)



Key:

○ : catch rate *Billy Rowney*

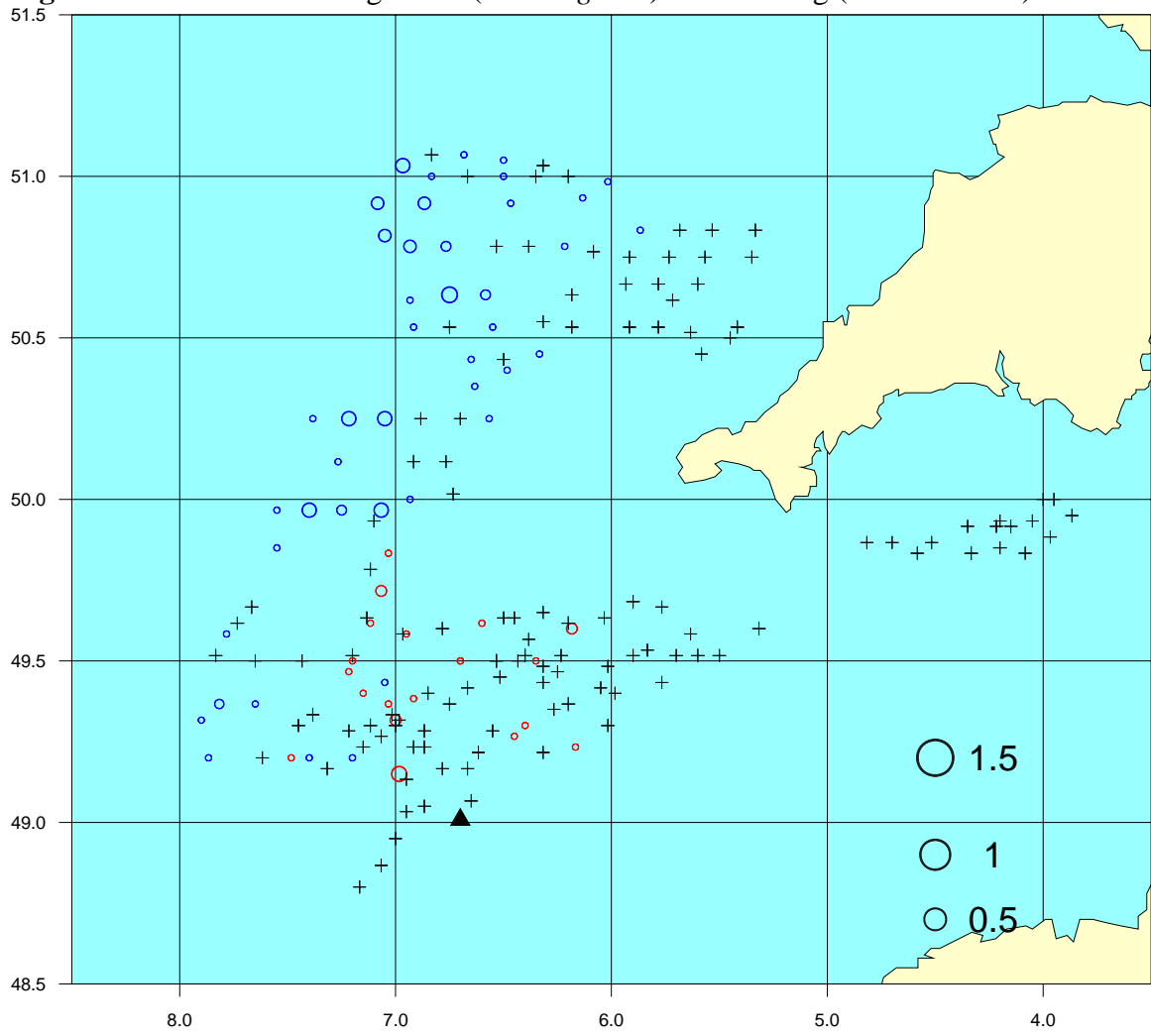
○ : catch rate *Twilight III*

+ : absence

▲ : invalid station

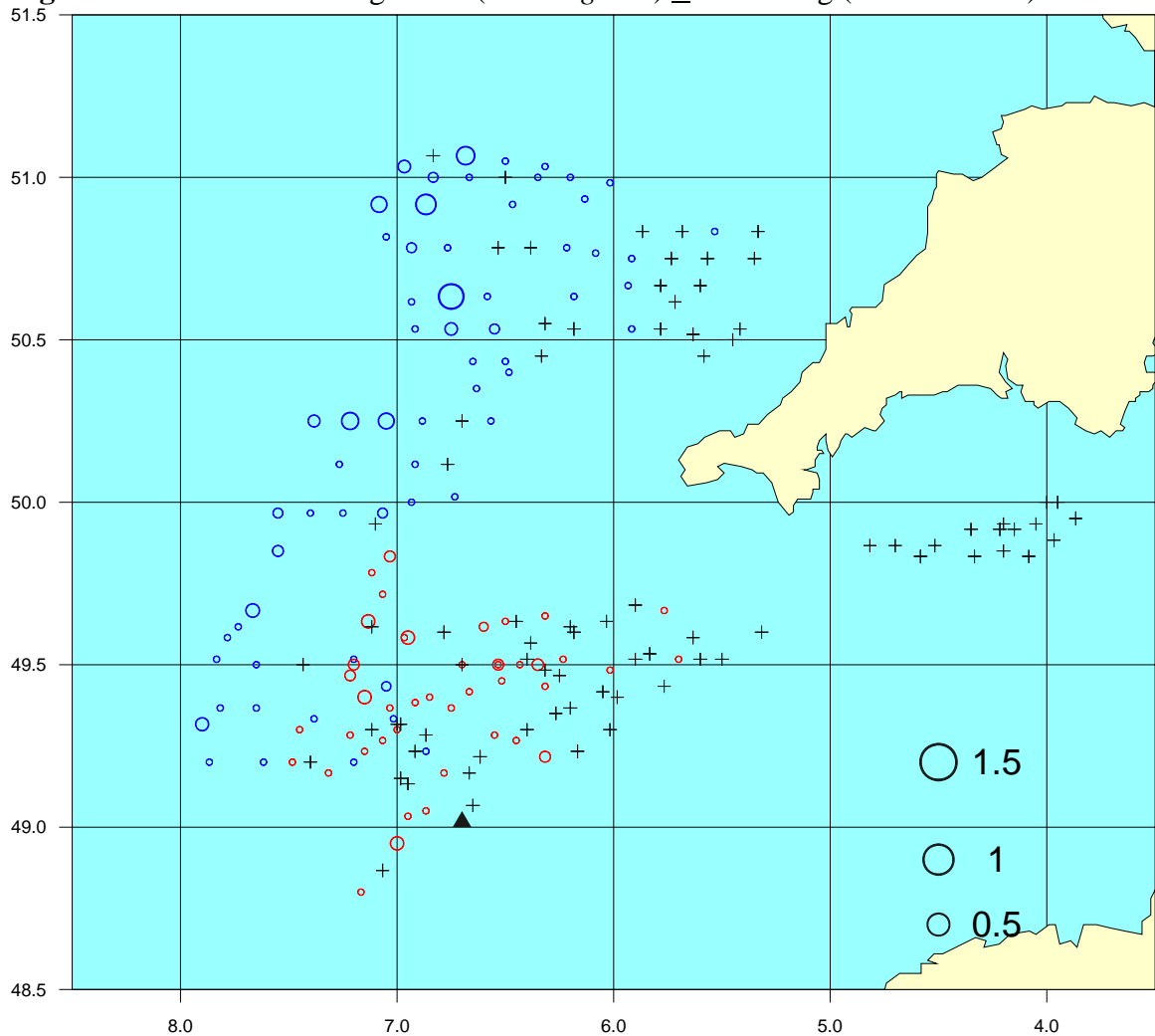
Throughout the surveyed area, the abundance of anglerfish (*L. budegassa*) was much lower than that of anglerfish (*L. piscatorius*). Both large and small anglerfish (*L. budegassa*) were scarce east of 6°W, but were more widely distributed farther west. The greatest abundance of both large and small anglerfish (*L. budegassa*) was northwest of the survey coverage.

Figure 2a. Catch rate of anglerfish (*L. budegassa*) <25 cm long (no./m beam/h)



- Key:**
- : catch rate *Billy Rowney*
 - : catch rate *Twilight III*
 - + : absence
 - ▲ : invalid station

Figure 2b. Catch rate of anglerfish (*L. budegassa*) ≥ 25 cm long (no./m beam/h)



Key:

- : catch rate *Billy Rowney*
- : catch rate *Twilight III*
- + : absence
- ▲ : invalid station

Anglerfish lengths and length distributions

Mean lengths of anglerfish (*L. piscatorius*) were greatest in the southwest and southeast of the surveyed area (Figure 3a), while mean lengths of anglerfish (*L. budegassa*) were highest southwest of the surveyed area (Figure 3b).

Figure 3a. Mean lengths (mm) of anglerfish (*L. piscatorius*) in the catch

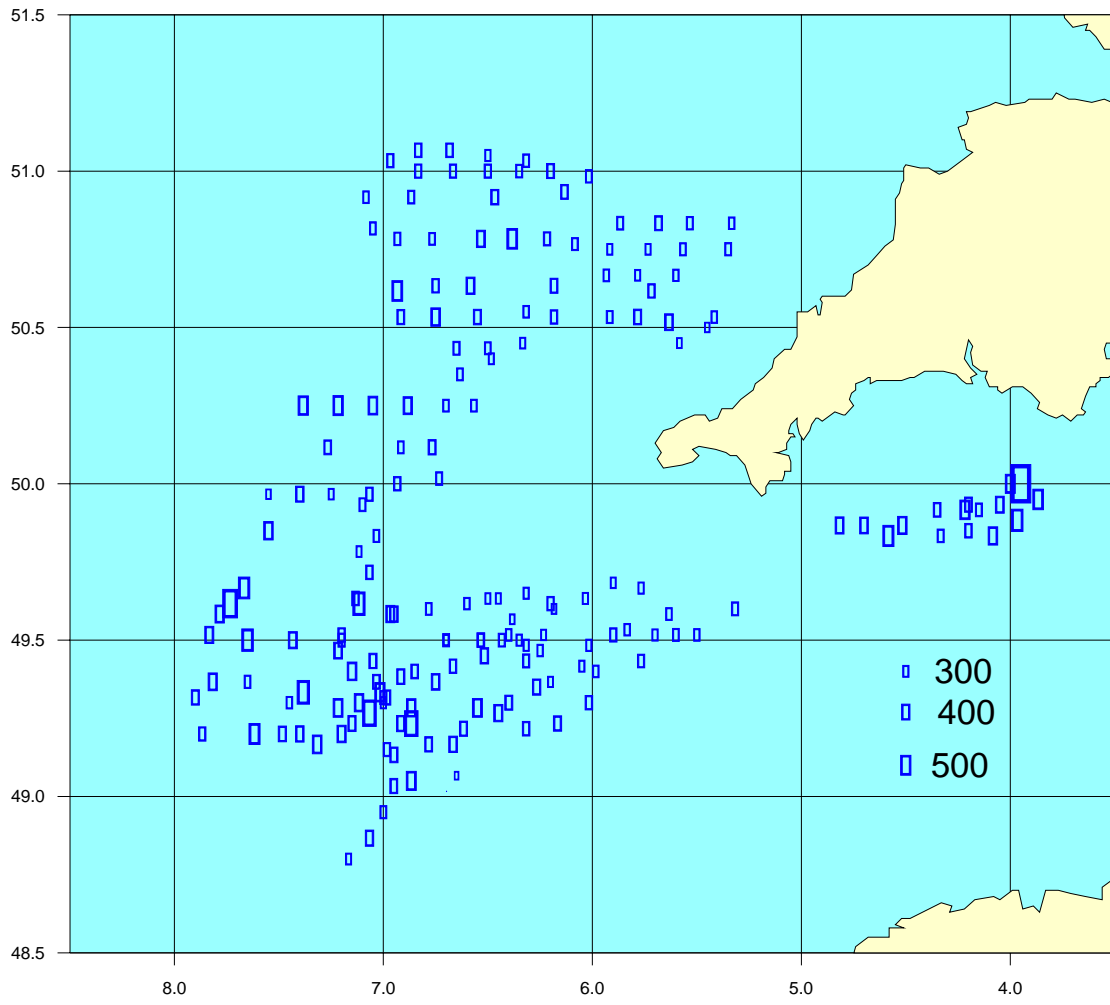
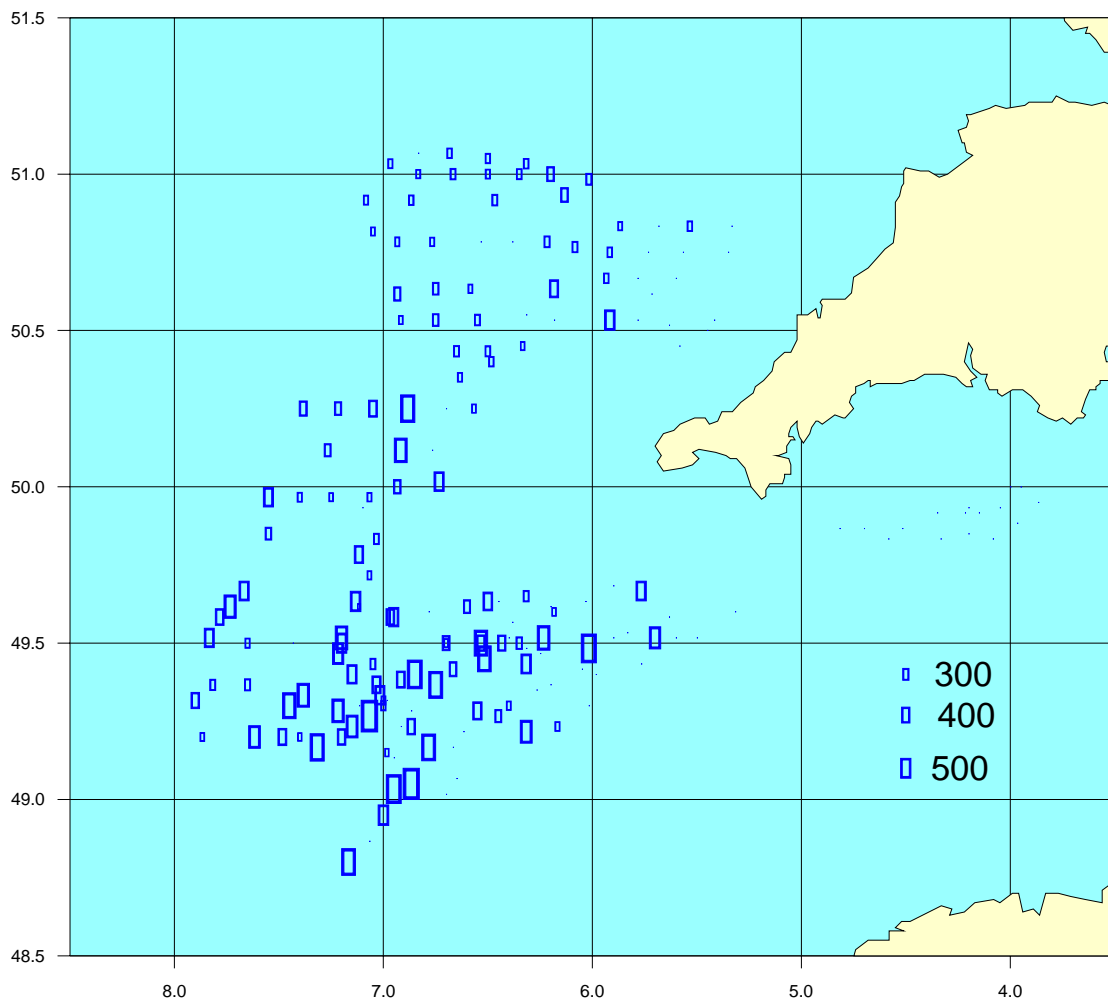


Figure 3b. Mean lengths (mm) of anglerfish (*L. budegassa*) in the catch



Length compositions as numbers per m beam length per h for anglerfish (*L. piscatorius*) in 2005 (Figure 4a) show that catch rates were generally higher in the northern area than in the southern area. Major peaks occur at around 15–20 cm and 28–35 cm in the northern area, while in the southern area there is a peak at around 32 cm, but the incoming year class at 15–20 cm appears to be less abundant.

The corresponding length composition for anglerfish (*L. budegassa*) (Figure 4b) shows that *L. budegassa* were considerably less abundant than *L. piscatorius* (by around a factor of 10). There is some evidence of a relatively good incoming year class at around 25 cm long in the northern area, but this peak is less prominent in the southern area.

Figure 4a. Anglerfish (*L. piscatorius*) length distributions by vessel (area) in 2005

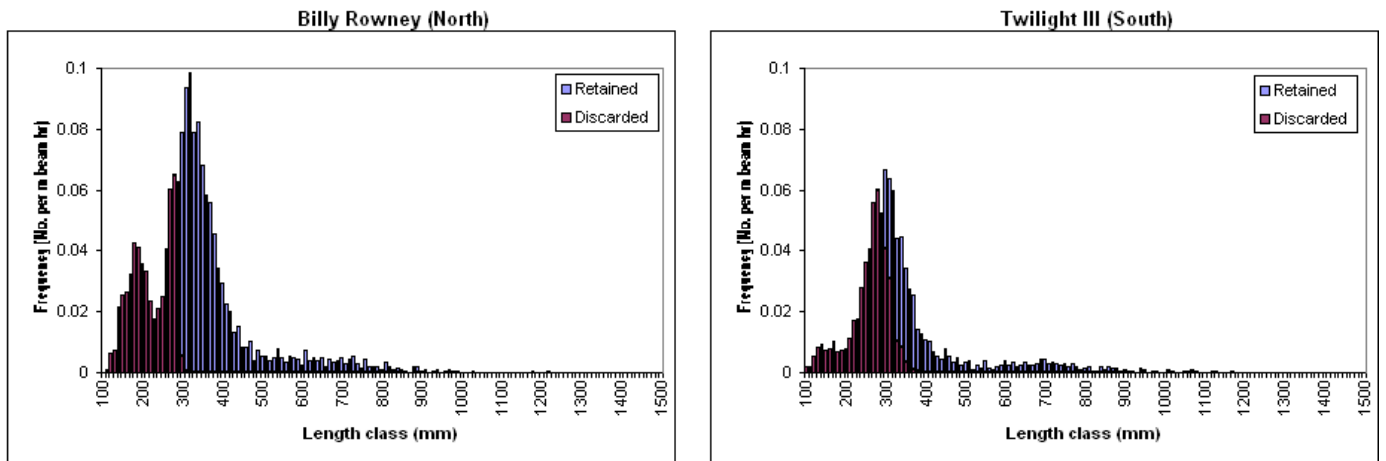


Figure 4b. Anglerfish (*L. budegassa*) length distributions by vessel (area) in 2005

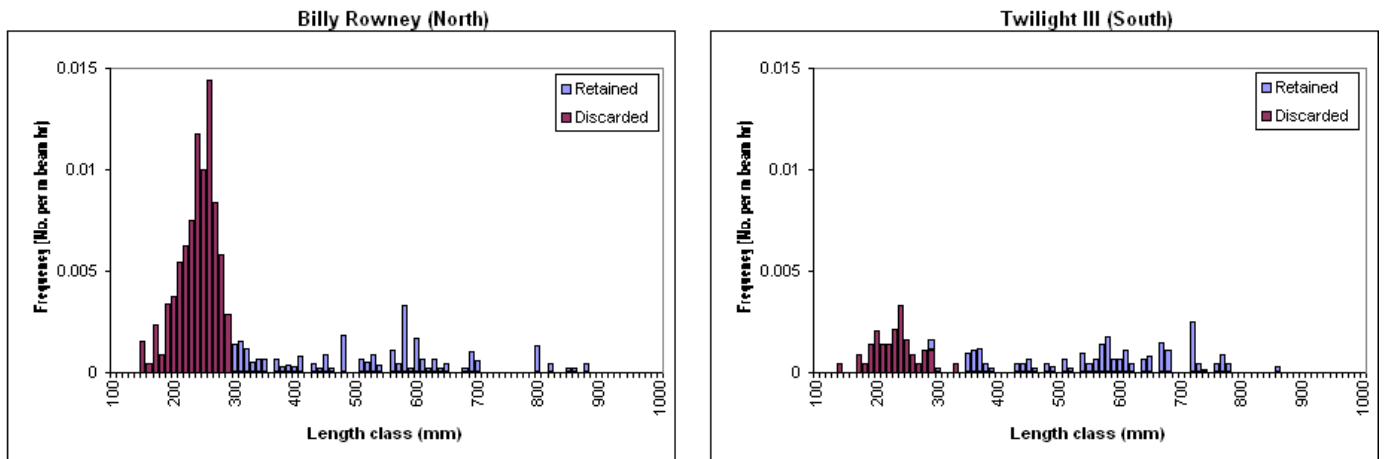
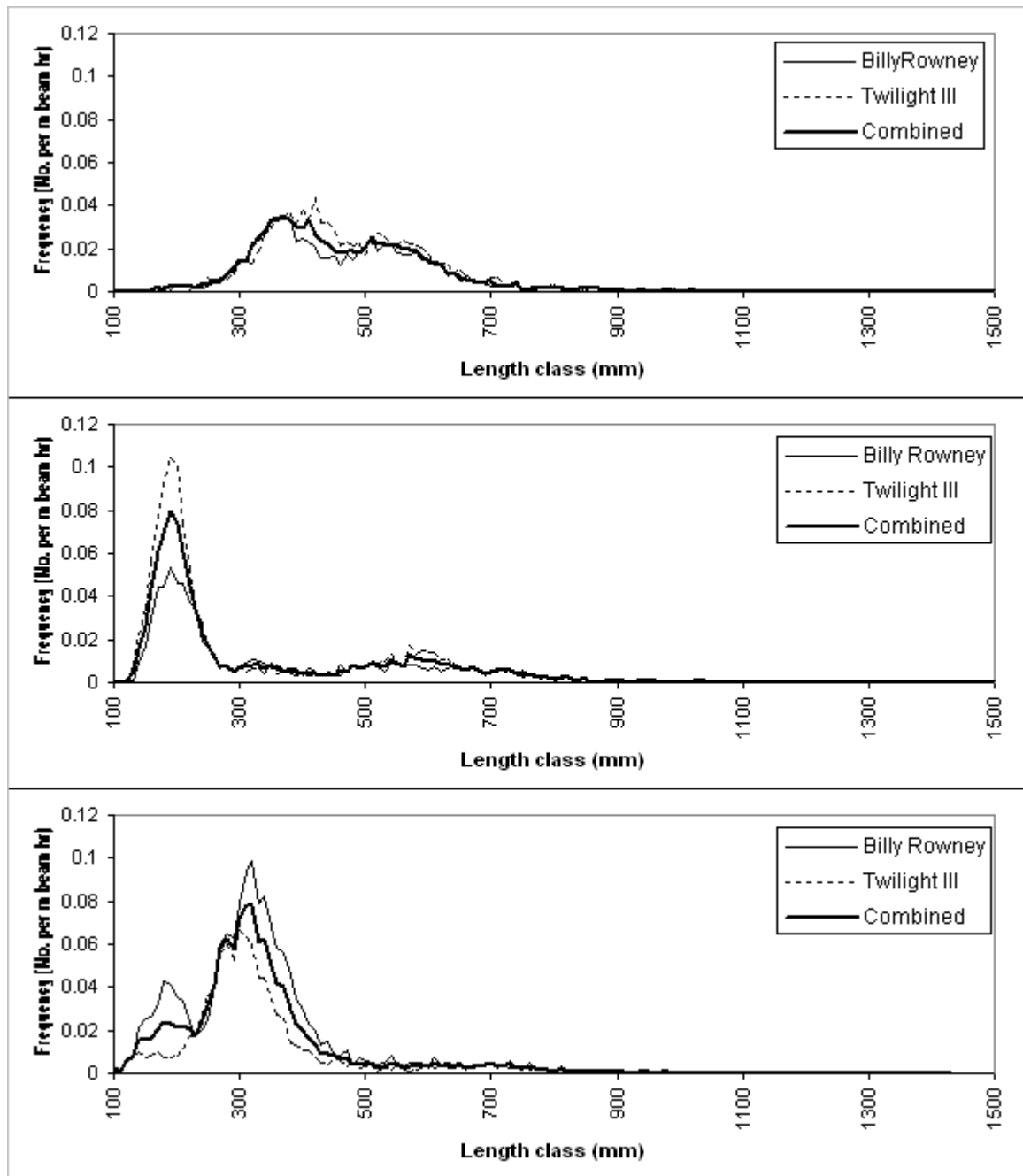


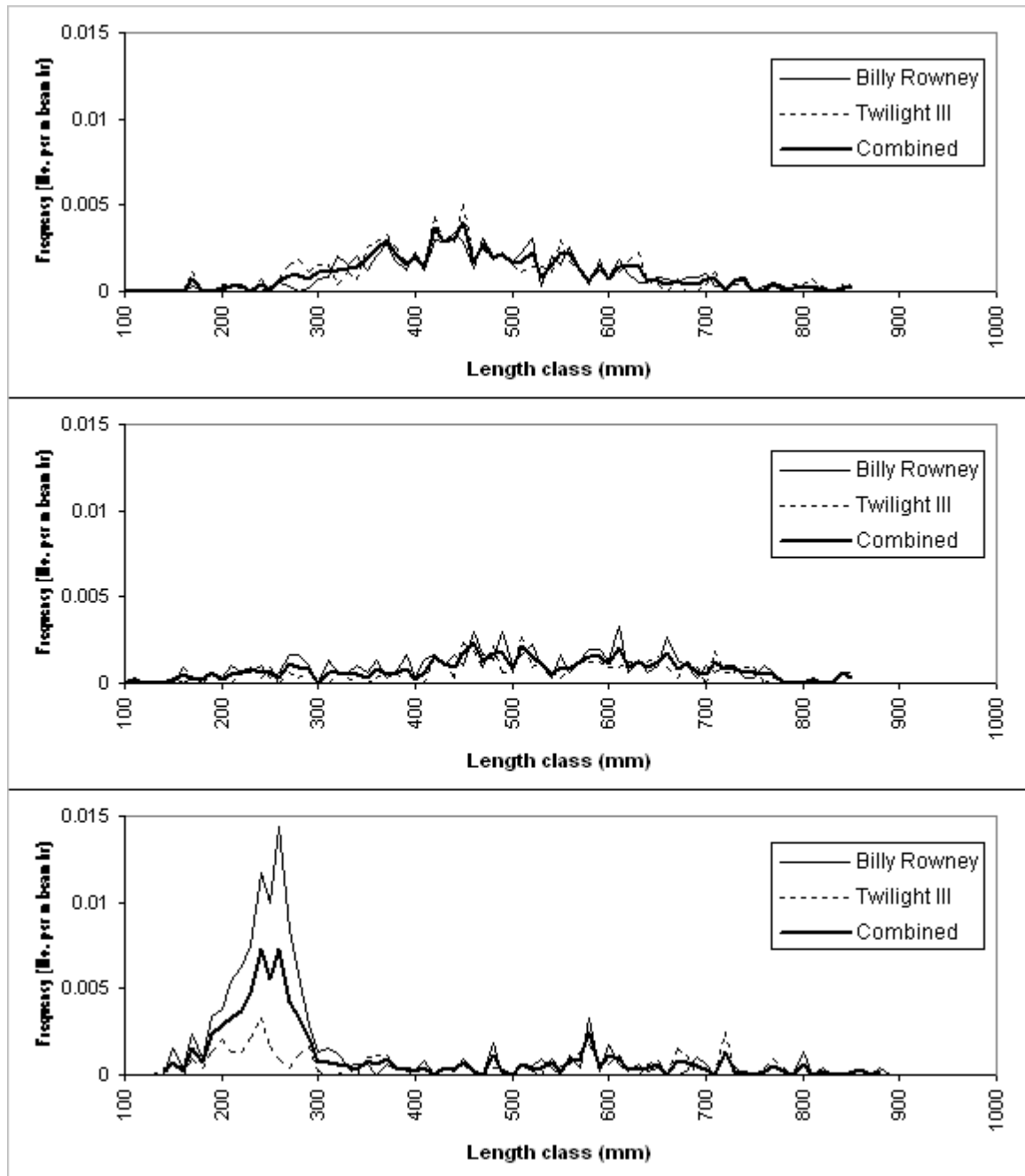
Figure 5a. Time-series of anglerfish (*L. piscatorius*) length frequencies (numbers per m beam per h per 10 mm length class) (2003 top to 2005 bottom)



Between 2003 and 2005, the abundance of larger (>50cm) anglerfish (*L. piscatorius*) declined considerably. A strong incoming year class was apparent in the 2004 survey, especially in the northern area, and this appears to have been confirmed in the 2005 survey, with high abundances of anglerfish in the 28–35 cm size range in both southern and northern areas. The incoming year class around 20 cm long is quite apparent in the northern area, but much less so in the southern area. FSP programme 6 Western Channel sole and plaice (FSP6, Armstrong *et al.*, 2005) presented time-series of anglerfish (*L. piscatorius*) length frequencies. Data for the western stratum of FSP6 show modes around 17 cm in 2004 and 25–35 cm in 2005, as found in this

programme. However, both these modes were absent from their eastern stratum, east of Rame Head.

Figure 5b. Time-series of anglerfish (*L. budegassa*) length frequencies (numbers per m beam per h per 10 mm length class) (2003 top to 2005 bottom)



Despite low catch rates of anglerfish (*L. budegassa*) relative to anglerfish (*L. piscatorius*) there was some evidence in the northern area that the incoming year class may be strong. However, this was less apparent in the southern area.

Catch composition

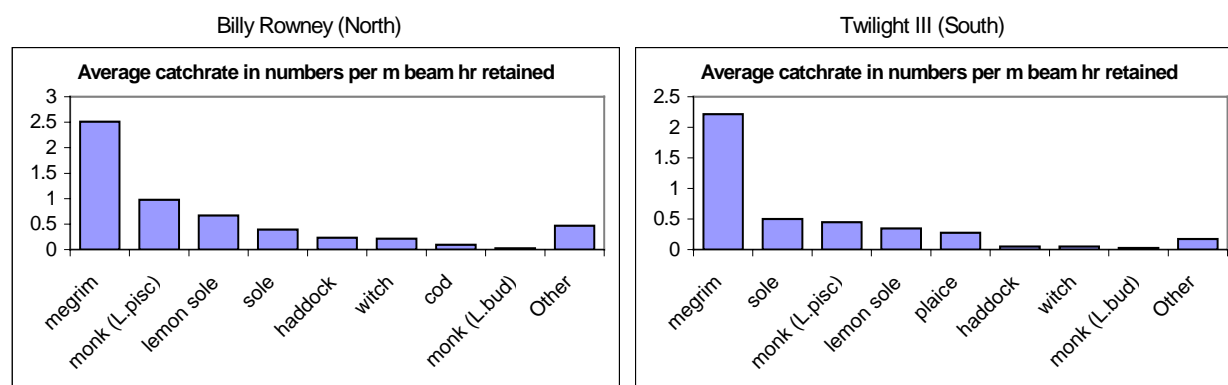
These surveys were ‘off quota’ and it was not clear that the discarding practice was fully representative of normal commercial operations. Discard rates are not therefore considered in detail.

Of eight commercially important species (Table 3), megrim was the most abundant by number, followed by monkfish (*L. piscatorius*), lemon sole and sole. Megrim was the most abundant commercial species in both northern and southern areas, but the rank of the other 3 species varied between areas (Figure 6).

Table 3. Absolute catch numbers, relative catch (within these species) and approximate average catch per h for 8 commercially important species

	Monk L. pisc	Monk L. bud	Megrim	Lemon sole	Sole	Plaice	Hake	Cod
Total catch number	6492	427	12388	2497	2429	906	402	450
Percentage	25	2	48	10	9	3	2	2
Approximate catch per h	25	1.5	47.9	10.1	9.1	3.4	1.7	1.8
2004 total catch number	6620	380	13376	1377	2420	388	146	180

Figure 6. Catch rates as numbers of retained fish per m beam hour of trawling averaged over all valid hauls by vessel (area)



A comparison of retained catch rates for a wider range of 16 commercially important species (Table 4) again highlighted the relative importance of these four species (megrim, anglerfish (*L. piscatorius*), lemon sole and sole). Anglerfish (*L. piscatorius*) were the most frequently encountered commercial species, occurring in 99% of tows, followed by sole (86%), megrim (82%) and lemon sole (76%). Previous years’ surveys also found anglerfish (*L. piscatorius*) to be the most ubiquitous commercial species, occurring in almost all hauls, but did not encounter other species with such high frequency, sole again being the second most common species in 2004 but occurring in just 66% of tows (Walmsley *et al.*, 2004).

Total catch numbers were similar to those of the 2004 surveys for anglerfish (*L. piscatorius* and *L. budegassa*), megrim and sole, but were higher in 2005 for lemon sole, plaice, cod and hake. However, the average catch rates of the last three bycatch species and anglerfish (*L. budegassa*) were considerably lower than those of the main target species.

Table 4. Percentage of stations where a species was caught and retained, mean catch rate of retained fish over all stations (nos per m beam per hr) and retained catch rate as a proportion of 16 commercially important species.

	Megrim	Monk L.pisc	Lemon sole	Sole	Plaice	Haddock	Witch	Cod
% occurrence	82	99	76	86	54	52	30	63
Mean catch rate	2.358	0.699	0.498	0.449	0.169	0.138	0.125	0.066
Catch rate (proportion)	0.504	0.150	0.106	0.096	0.036	0.030	0.027	0.014
	Red mullet	John Dory	Hake	Monk L. bud	Ling	Whiting	Brill	Turbot
% occurrence	8	31	35	43	24	24	17	15
Mean catch rate	0.034	0.032	0.029	0.026	0.016	0.016	0.011	0.008
Catch rate (proportion)	0.007	0.007	0.006	0.006	0.004	0.003	0.002	0.002

Length compositions of commercial by-catch species

Numbers caught in each 1 cm length class per m beam length per h of trawling, averaged over all valid hauls for megrim, hake and cod (Figure 7a), suggest that despite the generally low catch rates of beam trawlers for cod, frequencies for cod around 35–40 cm long were higher in 2005 than in 2004. Cod were more abundant in the northern area than in the southern, while the reverse was true for hake. The corresponding length compositions for sole, plaice and lemon sole (Figure 7b) show the relative importance of sole and lemon sole in the catches, while catch rates for plaice are very low in the northern area, but higher in the south.

Figure. 7a Length frequencies of megrim, hake and cod as numbers per m beam per h (10 mm length class) averaged over all valid hauls

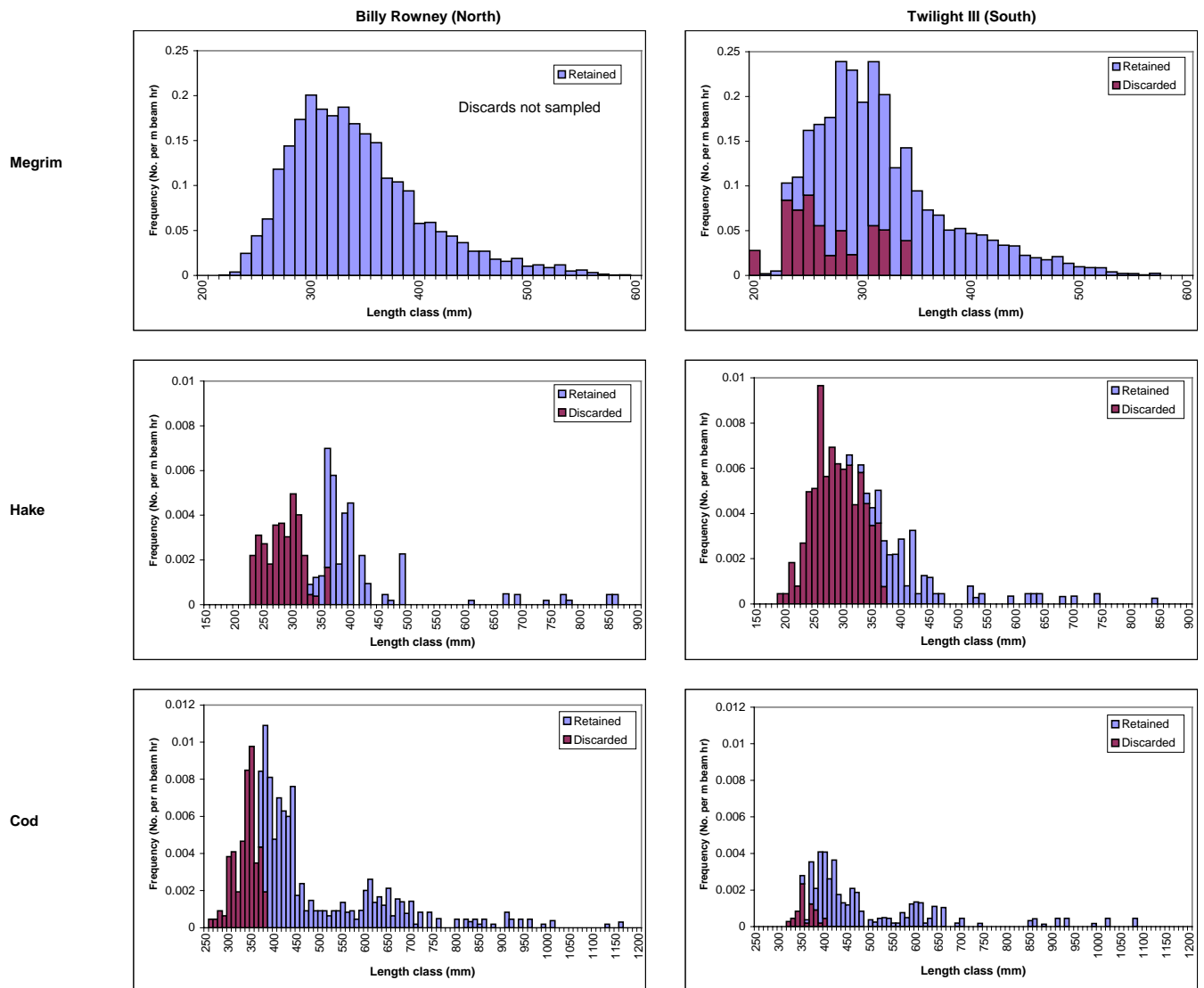
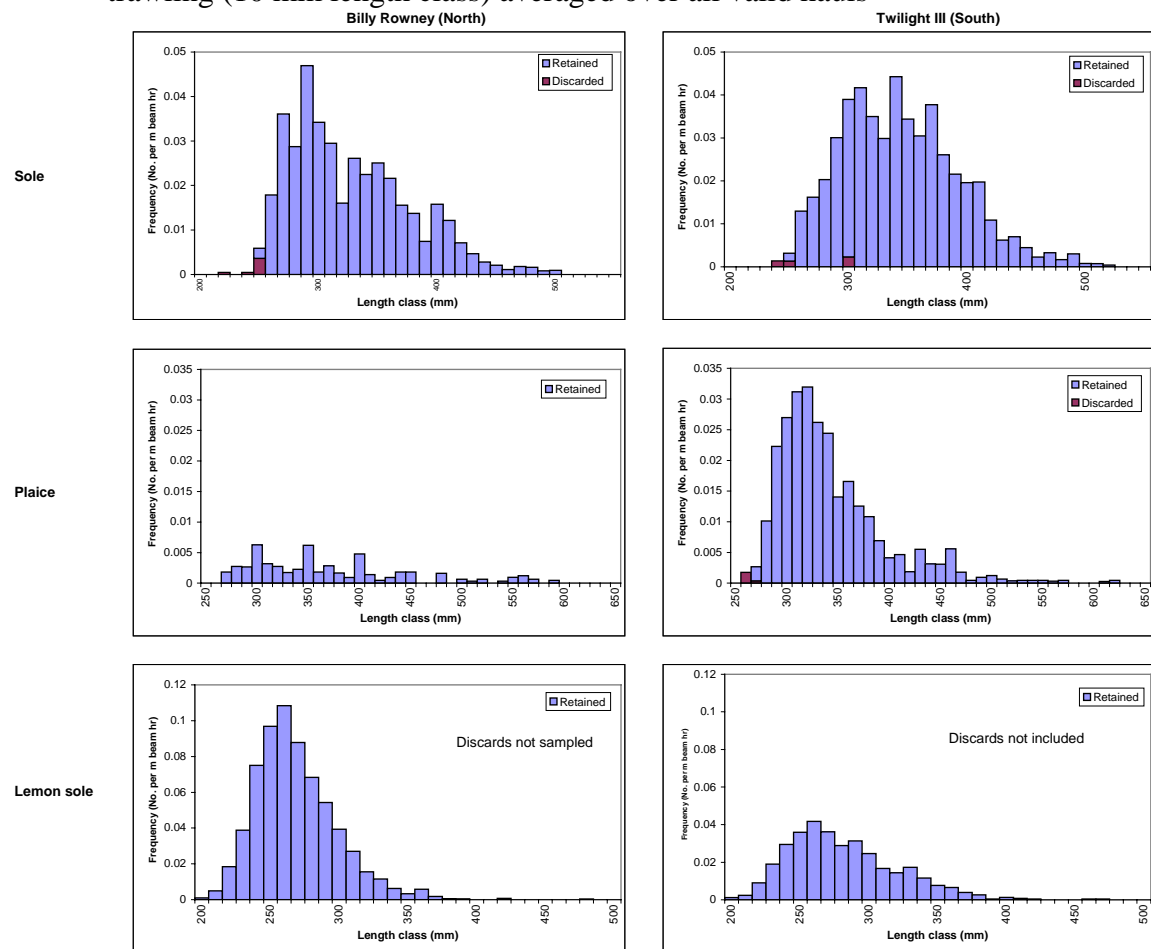


Figure. 7b. Length frequencies of sole, plaice and lemon sole as numbers per h of trawling (10 mm length class) averaged over all valid hauls



Discussion

FSP Programme 2 in 2005 continued successfully to build on previous FSP western anglerfish surveys using the same two beam trawl vessels, gears and towing practices. The overall design of the survey and areas covered were similar over the years, although in 2005 the stations were more evenly spread over the survey areas, to improve spatial coverage and resolution.

The surveys continue to confirm that the catches in this fishery consist predominantly of the target anglerfish species and megrim, with sole and lemon sole as important bycatch species in terms of numbers. Anglerfish (*L. piscatorius*) made up around 25% of the commercial catch by number, with a mean catch rate of around 25 per h. The other anglerfish species (*L. budegassa*) was far less abundant throughout the surveyed area, making up around 2% of the catch by number. with a mean catch rate of around 1.5 fish per h.

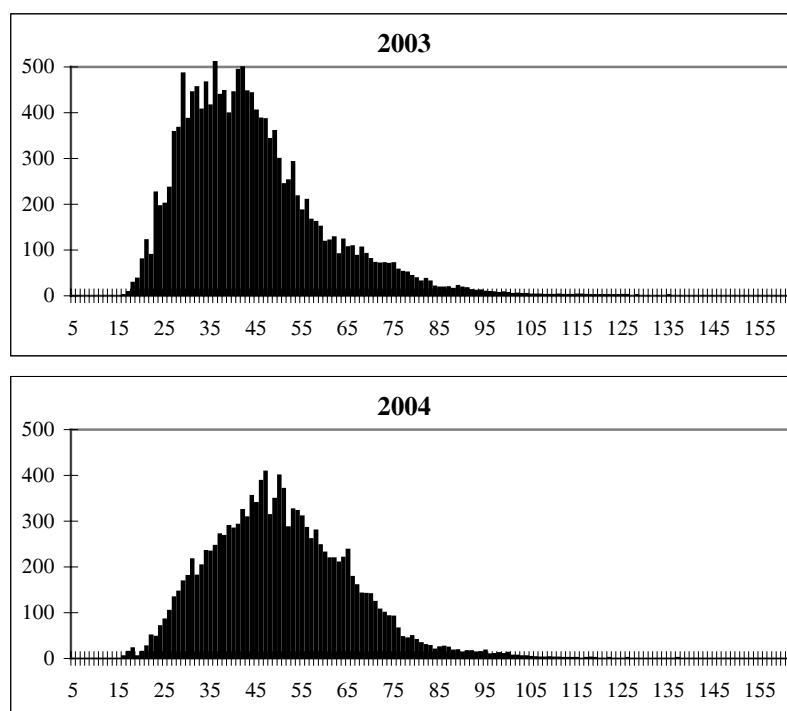
Catches of cod and hake were minimal by comparison, averaging only 1 fish per h, although the mean catch rates for cod and hake were roughly twice those of the 2004 surveys.

Trends in anglerfish abundance and size composition

The mean length frequency of anglerfish (*L. piscatorius*) in the FSP survey in 2004 showed a strong mode at around 20 cm, suggesting a relatively strong year class entering the fishery. This was observed in both the FSP western anglerfish survey and in the FSP Western Channel sole survey in 2004. The FSP surveys in 2005 confirm this through the presence of a strong mode at around 30 cm, again observed in both the western anglerfish and Western Channel sole FSP surveys. Catch rates of large anglerfish (*L. piscatorius*) have declined over the 3 years of the FSP surveys.

The strong year class recorded in the FSP surveys was not apparent in the international catch at length compositions for anglerfish (*L. piscatorius*) used by the ICES Working Group on the assessment of southern shelf stocks of Hake, Monk and Megrim (WGHMM, ICES 2005) in 2005 (Figure 8).

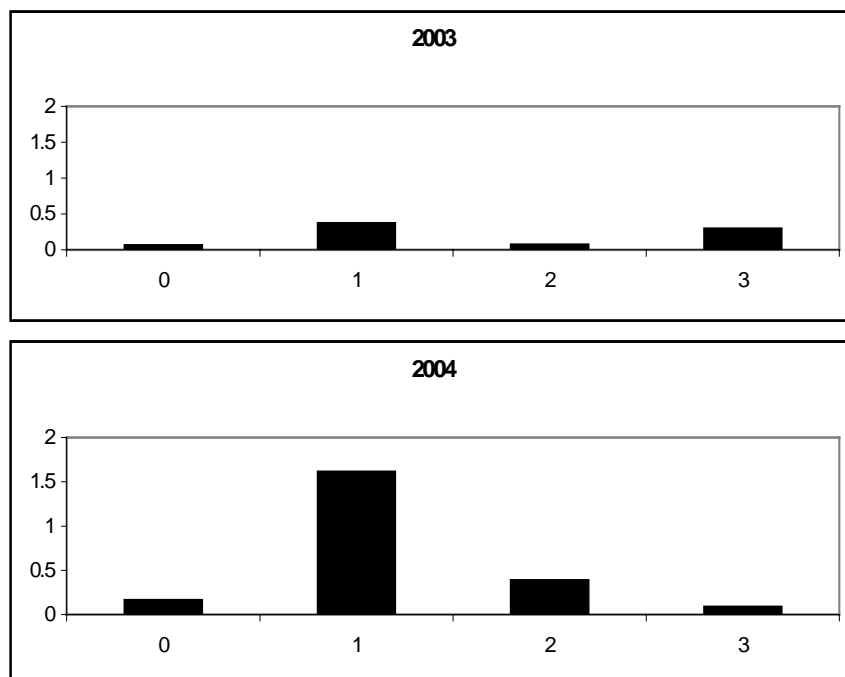
Figure 8. International catch at length compositions for anglerfish (*L. piscatorius*) used by WGHMM



Possible explanations for this are that these very small anglerfish were discarded and did not therefore appear in the landings, or alternatively that the high abundance observed in the FSP surveys is local to the South-Western Approaches. WGHMM expressed concern that discarding of anglerfish may be increasing through the enforcement of minimum sizes for sale (not MLS) (ICES, 2005).

The ICES working group assessment for anglerfish utilizes a survey, called Evhoe, carried out by the French institute, Ifremer, as an abundance index for anglerfish. The Evhoe survey index covers a wide area of the continental shelf, out to the shelf edge, of the western Celtic Sea and Bay of Biscay. The Evhoe survey used in the anglerfish (*L. piscatorius*) assessment (Figure 9) suggested that 1-year-olds were relatively abundant in autumn 2004.

Figure 9. Evhoe (October) survey abundance index for anglerfish (*L. piscatorius*), ages 0–3, 2003–2004.



Ageing of anglerfish is carried out by counting rings on thin sections taken from the illicium (the fish's "fishing rod"), or by counting rings on otoliths (earbones). In the ICES area the use of illicia is generally preferred, but there remain uncertainties with the technique. The report of the Anglerfish Illicia/Otoliths Ageing Workshop (ICES, 2004) listed a number of studies that have validated growth as being faster than that obtained from interpretation of illicia, including Wright *et al.* (2002), who suggested subtracting 1 year from ages obtained from illicia reading. Applying this to the Evhoe survey would suggest a high abundance of 0-group (rather than 1-group) fish in 2004, consistent with our interpretation of the high FSP catch rates at around 20 cm in 2004. However, further studies on anglerfish growth are needed to confirm this conclusion.

Despite catch rates of anglerfish (*L. budegassa*) in the survey being rather low, there was some evidence in the northern area that the incoming year class may be strong in 2005, although this was less apparent in the southern area.

Acknowledgements

This work was carried out in cooperation with the skippers and crew of the FV *Billy Rowney* (skipper Steve Mosely) and FV *Twilight III* (skipper Matthew Watson). Cefas offers sincere thanks to them for their valued contributions towards this ongoing survey programme. Cefas staff who contributed to the programme of sampling and analyses are also thanked for their help. The project was funded by Defra.

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Appendix 1: Detailed operation plan

Fisheries Science Partnership 2005/06

Western Channel Angler (North): September 2005

Detailed Operation Plan (as proposed 18th August 2005)

VESSEL

FV Billy Rowney

OBSERVERS

Steve Warnes

OBJECTIVES

To repeat the survey of Anglerfish in the western Channel (North) region carried out by *Billy Rowney* during 2004, using chain mat gear.

Provide data on the distribution and catch rates of anglerfish and other commercial species using commercial gear, based on the agreed survey design;

Determine length compositions of anglerfish and other commercial species in the catches

Add to the time-series started in 2003

FISHING GEAR

The fishing gear to be fitted and used is two 10 (ten) metre beams with chain mat and flip up ropes to be fished at about 4 knots at all of the depths within the defined area.

AREA OF OPERATION and TOW POSITIONS

Fishing will be undertaken within British Fishery limits and within the area bounded by straight lines joining: Hartland Point, 51°06'N and 7° W, 49°N and 8° 15' W, 49° and 7° W and Lands End. Fishing will be conducted in a way which samples across the entire specified area if grounds permit.

Annex A shows the survey area divided into 15' x 15' boxes. Boxes where trawling cannot take place, or which lie well beyond the typical distribution of anglerfish, are indicated. The remaining boxes will be divided into those where the main concentrations of anglerfish of any size are expected, and those where anglerfish are expected to be at lower abundance, based on previous FSP results and fishermen's knowledge. More tows per box will be carried out in the main anglerfish areas, but all boxes covering suitable habitat for anglerfish should be sampled where possible in order to map the extent of the distribution.

PERIOD OF SURVEY

The vessel will depart take place on dates agreed between the skipper and observer within the period September to November 2005. The duration of the trip will be two periods of six continuous days. There will be a maximum of three days, between the two six day periods, in port to land fish and refuel.

FISHING ACTIVITIES

Fishing will be required potentially over a 24- hour period with an uninterrupted period of 6 hours rest for the observer. Individual tows should cover the same distance as in the last two year's surveys, at approximately 4 knots over the ground, resulting in a typical tow duration of approx. 1 hour. In the event of very large catches requiring longer than normal processing, the time between hauling and shooting should be adjusted in consultation with the observer.

SORTING AND RECORDING THE CATCH

It is important that the catches of anglerfish, sole, plaice, megrim, cod and other commercial species are quantified as accurately as possible. The crew will be required to assist in sorting the catch as required by the observer and preparing any fish for sale. Standard Cefas methods for sorting and measuring commercial fish catches at sea will be carried out. The entire catch should be available to the observer for sampling, and none discarded without being recorded. Generally the catch will be sorted into three general categories:

Large and high value fish e.g. cod, turbot, John Dory and hake which may be landed or discarded but which can all be counted and measured (i.e. raising factor of 1.0).

The retained catch of other individuals of commercial species. The observer must be able to record the total number of boxes or baskets of retained fish of each species from each tow, and will carry out a length measure on either the whole catch (raising factor = 1.0) or a known sample of the catch (raising factor > 1.0).

Discarded anglerfish and cod. All anglerfish and cod to be discarded will be retained for counting and measuring (raising factor up to 1.0 depending on numbers). An estimate of the total bulk of discards of other species (in addition to those in (1)) should be made from each tow. Where time permits, an estimate of the species composition of this discarded catch should be made.

DATA TO BE RECORDED BY SKIPPER

The observer will provide recording sheets on which the skipper will record the following details for each tow:

Date

Tow number

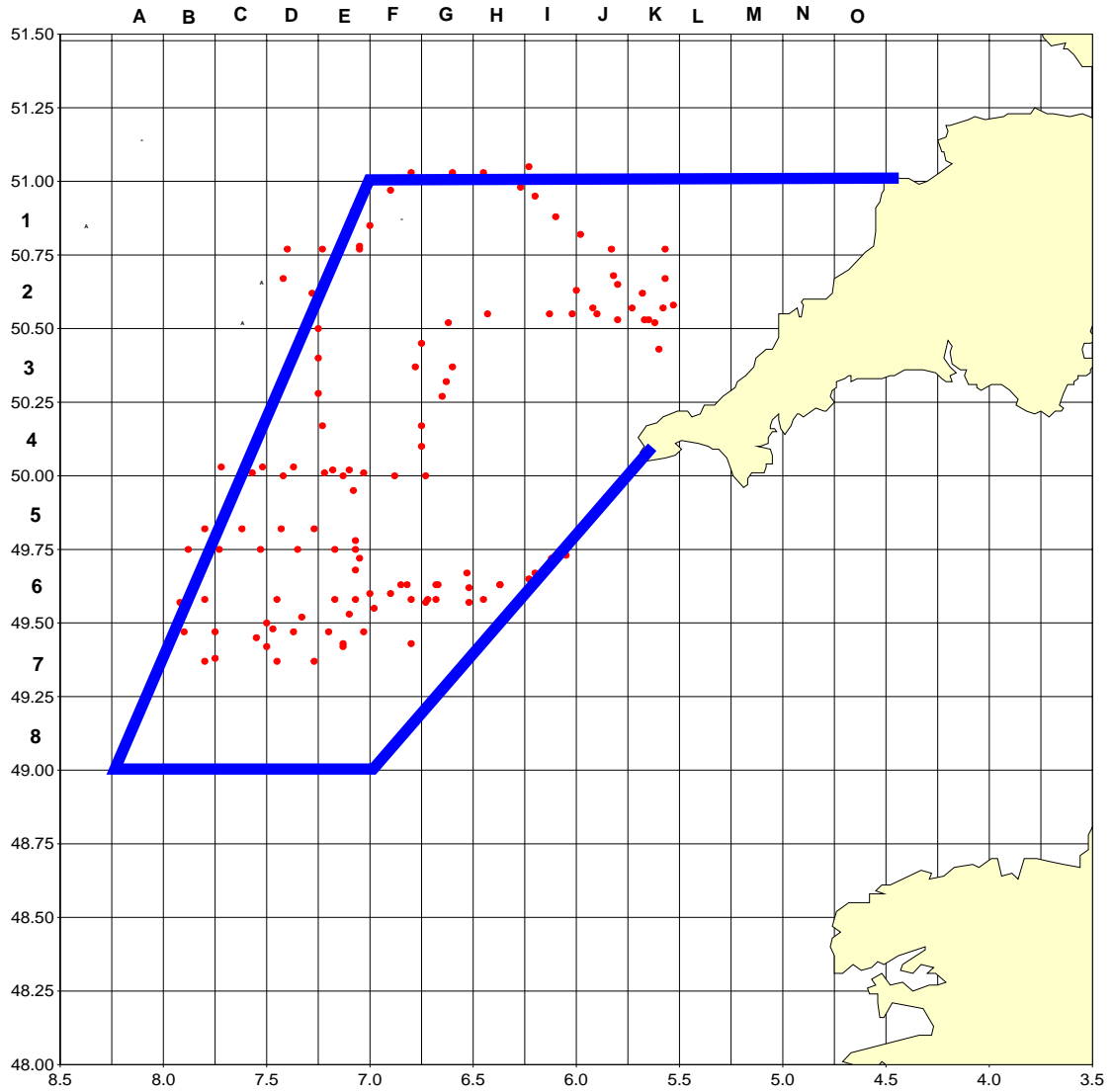
Shooting and hauling times

Shooting and hauling positions (latitude and longitude)

Time and position at any significant change in tow direction

Other relevant information (e.g. tidal state, weather conditions)

Annex 1a: Map of the area within which sampling will be required. Tow positions from previous FSP trips are indicated.



Western Channel Angler (South): September 2005

Detailed Operation Plan (as proposed 18th August 2005)

VESSEL

FV Twilight III

OBSERVERS

Steve Warnes

OBJECTIVES

To repeat the survey of Anglerfish in the western Channel (South) region carried out by *Twilight III* during 2004, using chain mat gear.

Provide data on the distribution and catch rates of anglerfish and other commercial species using commercial gear, based on the agreed survey design;

Determine length compositions of anglerfish and other commercial species in the catches

Add to the time-series started in 2003

FISHING GEAR

The fishing gear to be fitted and used is two 9 (nine) metre beams with chain mat and flip up ropes to be fished at about 4 knots at all of the depths within the defined area.

AREA OF OPERATION and TOW POSITIONS

Fishing will be undertaken within British Fishery limits and within the area bounded by straight lines joining: Salcombe, 49°30'N and 3° 50'W, 48°N and 7° 30' W, 50° and 7° 30' W and Lands End. Fishing will be conducted in a way which samples across the entire specified area if grounds permit.

Annex A shows the survey area divided into 15' x 15' boxes. Boxes where trawling cannot take place, or which lie well beyond the typical distribution of anglerfish, are indicated [to be identified at meeting]. The remaining boxes will be divided into those where the main concentrations of anglerfish of any size are expected, and those where anglerfish are expected to be at lower abundance, based on previous FSP results and fishermen's knowledge [to be identified at meeting]. More tows per box will be carried out in the main anglerfish areas, but all boxes covering suitable habitat for anglerfish should be sampled where possible in order to map the extent of the distribution.

PERIOD OF SURVEY

The vessel will depart take place on dates agreed between the skipper and observer within the period September to November 2005. The duration of the trip will be two periods of six continuous days. There will be a maximum of three days, between the two six day periods, in port to land fish and refuel.

FISHING ACTIVITIES

Fishing will be required potentially over a 24-hour period with an uninterrupted period of 6 hours rest for the observer. Individual tows should cover the same distance as in the last two year's surveys, at approximately 4 knots over the ground, resulting in a typical tow duration of approx. 1 hour, weather conditions permitting. In the event of very large catches requiring longer than normal processing, the time between hauling and shooting should be adjusted in consultation with the observer.

SORTING AND RECORDING THE CATCH

It is important that the catches of anglerfish, sole, plaice, megrim, cod and other commercial species are quantified as accurately as possible. The crew will be required to assist in sorting the catch as required by the observer and preparing any fish for sale. Standard Cefas methods for sorting and measuring commercial fish catches at sea will be carried out. The entire catch should be available to the observer for sampling, and none discarded without being recorded. Generally the catch will be sorted into three general categories:

Large and high value fish e.g. cod, turbot, John dory and hake which may be landed or discarded but which can all be counted and measured (i.e. raising factor of 1.0). The retained catch of other individuals of commercial species. The observer must be able to record the total number of boxes or baskets of retained fish of each species from each tow, and will carry out a length measure on either the whole catch (raising factor = 1.0) or a known sample of the catch (raising factor > 1.0).

Discarded anglerfish and cod. All anglerfish and cod to be discarded will be retained for counting and measuring (raising factor up to 1.0 depending on numbers). An estimate of the total bulk of discards of other species (in addition to those in (1)) should be made from each tow. Where time permits, an estimate of the species composition of this discarded catch should be made.

DATA TO BE RECORDED BY SKIPPER

The observer will provide recording sheets on which the skipper will record the following details for each tow:

Date

Tow number

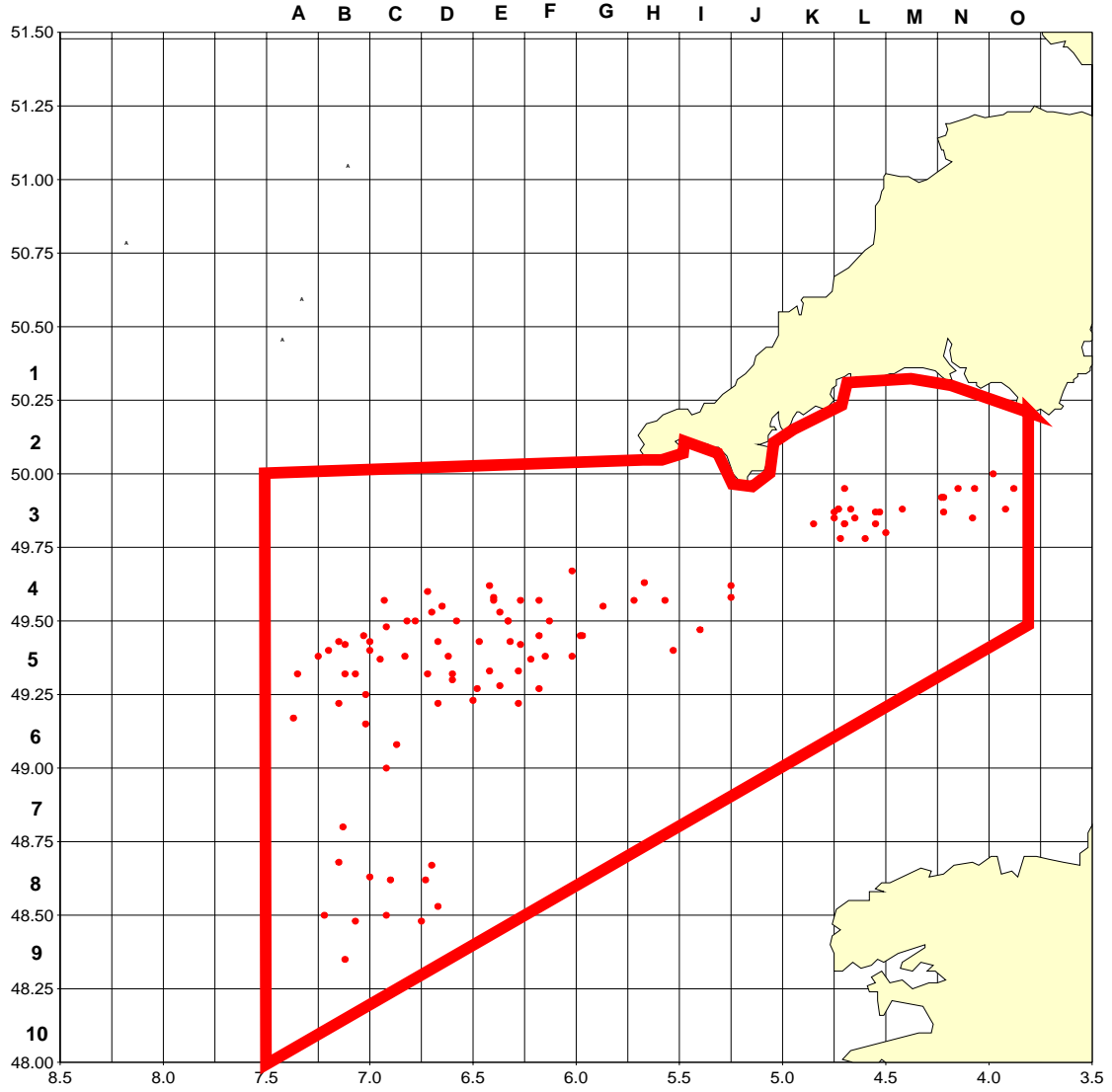
Shooting and hauling times

Shooting and hauling positions (latitude and longitude)

Time and position at any significant change in tow direction

Other relevant information (e.g. tidal state, weather conditions)

Annex 1a: Map of the area within which sampling will be required. Tow positions from previous FSP trips are indicated.



Appendix 2. Cruise reports

CENTRE FOR ENVIRONMENT, FISHERIES AND AQUACULTURE SCIENCE
LOWESTOFT LABORATORY, LOWESTOFT, SUFFOLK NR33 OHT
2005 FISHERIES SCIENCE PARTNERSHIP

FSP Programme 2. Western Anglerfish

REPORT: FV *BILLY ROWNEY* (PZ 137) cruises 1 & 2.

SKIPPER: S Moseley

Cefas STAFF: S Warnes

DURATION: Trip 1: 13th-19th October 2005
Trip 2: 22nd -26th October 2005

LOCATION: ICES Sea areas VIIIf,g,h

AIMS:

1. To repeat the survey of Anglerfish (*L. piscatorious* and *L. budegassa*) in the western Channel (North) region carried out by *BILLY ROWNEY* during 2004, using chain mat gear.
2. To provide data on the distribution and catch rates of anglerfish and other commercial species using commercial gear, based on the agreed survey design.
3. To determine length compositions of anglerfish and other commercial species in the catches).
4. To add to the time-series started in 2003.

NARRATIVE:

The terms of the dispensation restricted the area to be surveyed to UK waters outside the 12-mile limit. Because fishing on the 2003 and 2004 surveys showed no difference in Anglerfish catch rates between day and night, fishing was undertaken continuously rather than in daylight only, allowing a larger area to be surveyed. Where possible tow speed was kept at 4-5 knots.

Trip 1.

BILLY ROWNEY sailed from Newlyn 1150 on 14 October and proceeded to the North of the Scillies to start fishing in VIIIf. Fishing operations, using 10m beam-trawls with chain mats, commenced 1600 on 14 October. Fishing in VIIIf and VIIg continued in good weather until 1115 on 19 October. *BILLY ROWNEY* then headed for Newlyn, docking at 1700 19 October.

Trip 2.

BILLY ROWNEY sailed from Newlyn 1130 on 22 October and proceeded to a position to the South of the final position of trip 1 to commence fishing in VIII f at 1630 the same day. Work continued to cover ground to the South of the area surveyed on Trip 1 over the next two days. Tow length was increased on 24 October due to worsening weather conditions from the Southwest as *BILLY ROWNEY* proceeded to the SW corner of the grid. Fishing continued until 0650 26 October when, with gales forecast, *BILLY ROWNEY* made passage for Newlyn docking at 1330 26 October.

Results

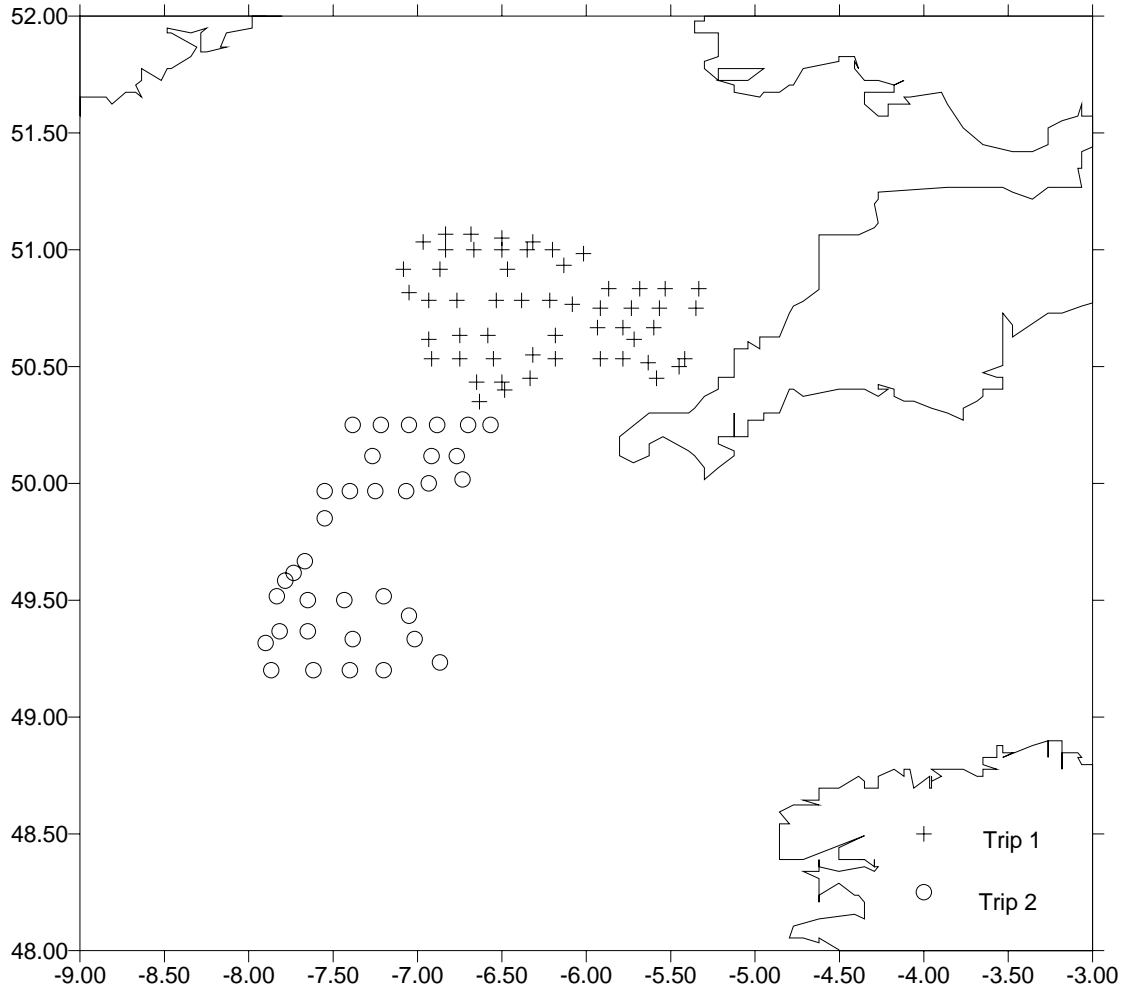
1. *BILLY ROWNEY* completed 88 tows over the two survey trips, all of which were valid. Figure 1 gives the position of the successful tows. The number of tows with catch data by ICES Rectangle is given below.

ICES Rectangle	Trip 1	Trip 2	Total
27E2		10	10
27E3		1	1
28E2		12	12
29E2		4	4
29E3	5	7	12
29E4	1		1
30E2	2		2
30E3	19		19
30E4	17		17
31E3	10		10
Grand Total	54	34	88

2. Length distributions of all Anglerfish, by species, were obtained at each haul for both retained and discarded fish.
3. At 84 stations length distributions were obtained for all commercial species retained.
4. Despite the poor weather conditions on trip 2 the survey area was covered adequately for use in the time-series.

S Warnes 22 October 2005.

Figure 1. BILLY ROWNEY Tow position by trip



Appendix 2. Cruise reports continued

CENTRE FOR ENVIRONMENT, FISHERIES AND AQUACULTURE SCIENCE
LOWESTOFT LABORATORY, LOWESTOFT, SUFFOLK NR33 OHT
2005 FISHERIES SCIENCE PARTNERSHIP

FSP Programme 2: Western Anglerfish

REPORT: FV *TWILIGHT III* (PZ 137) cruises 1 & 2.

SKIPPER: M Watson

Cefas STAFF: S Warnes

DURATION: Trip 1: 6th-11th September 2005
Trip 2: 13th -18th September 2005

LOCATION: ICES Sea areas VIIe-h

AIMS:

5. To repeat the survey of Anglerfish (*L. piscatorious* and *L. budegassa*) in the western Channel (South) region carried out by *Twilight III* during 2004, using chain mat gear.
6. To provide data on the distribution and catch rates of anglerfish and other commercial species using commercial gear, based on the agreed survey design.
7. To determine length compositions of anglerfish and other commercial species in the catches).
8. To add to the time-series started in 2003.

NARRATIVE:

The terms of the dispensation restricted the area to be surveyed to UK waters outside the 12-mile limit. Because fishing on the 2003 and 2004 surveys showed no difference in Anglerfish catch rates between day and night, fishing was undertaken continuously rather than in daylight only, allowing a larger area to be surveyed. Where possible tow speed was kept at 4-5 knots.

Trip 1.

TWILIGHT III sailed from Newlyn 1030 on 6 September and proceeded to the southwest of the survey area to start fishing in VIIh. Fishing operations, using 9m beam-trawls with chain mats, commenced 2040 on 6 September. Fishing in VIIh continued in good weather until *TWILIGHT III* was forced to move area on 7 September due to soft ground and dead shell meaning that the trawl came fast (27E3). Fishing continued in VIIh until the evening of 9 September when the vessel moved into western VIIe. Fishing in VIIe continued until 1345 11 September from where *TWILIGHT III* headed for Newlyn, docking at 1730 11 September.

Trip 2.

TWILIGHT III sailed from Newlyn 1045 on 13 September and proceeded to a position east of Lizard Point to commence fishing in VIIe at 1420 the same day. Fishing to the east of the Lizard continued until the evening of 14 September at which time it was decided to move SW of the Lizard to ground with lower quantities of dead shell (VIIIH) as this was presenting problems when fishing SE of the Lizard. By the evening of the 15 September the weather was deteriorating so tow length was increased to allow for better coverage of the area due to the time needed to clear the deck between hauls. Tow length was kept at a longer duration in VIIIh until the weather moderated at 0750 17 September. From the early morning 18 September *TWILIGHT III* moved into VIIe, fishing until 1115 the same day at which time passage was made to Newlyn. *Twilight III* docked at Newlyn 1730 18 September.

Results

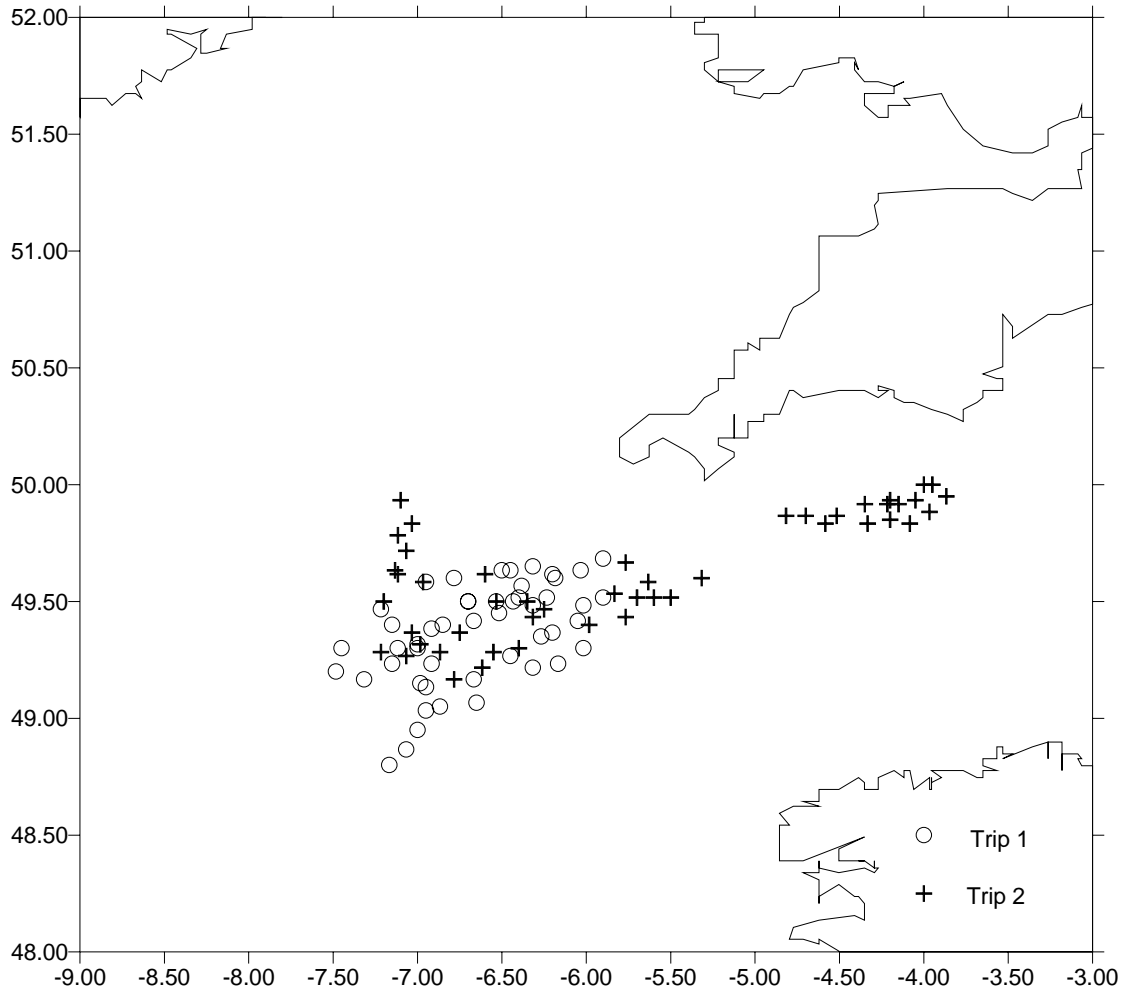
5. *TWILIGHT III* completed 98 tows over the two survey trips, of which only one was invalid due to a large catch of sand and shells. Figure 1 gives the position of the successful tows. The number of tows with catch data by ICES Rectangle is given below.

ICES Rectangle	Trip 1	Trip 2	Total
26E2	2		2
27E2	8	4	12
27E3	21	9	30
27E4	1	2	3
28E2		7	7
28E3	15	4	19
28E4	2	6	8
28E5		14	14
28E6		2	2
Grand Total	49	48	97

6. Length distributions of all Anglerfish, by species, were obtained at each haul for both retained and discarded fish.
7. At 89 stations length distributions were obtained for all commercial species retained. Full discard sampling was undertaken at 8 of these stations.
8. Reasonable weather conditions enabled the survey area to be covered adequately for use in the time-series.

S Warnes 22 September 2005.

Figure 1. TWILIGHT III Tow position by trip



Appendix. 3. Tow details and numbers of fish caught for selected species (database of all sampled species is held at Cefas)

Discard sampling carried out at all stations for anglerfish, cod, hake, sole, plaice and some other large species, Full discard sampling where indicated.

Species codes:

MON: anglerfish (*L. piscatorius*), WAF: anglerfish (*L. budegassa*), MEG: megrim, LEM: lemon sole, SOL: sole, HKE: hake, COD: cod, PLE: plaice

Cruise	Stn	Shot			Haul				Shot			Valid	Rect	Full discard sampling	MON	WAF	MEG	LEM	SOL	HKE	COD	PLE	
		LatDeg	LatMin	LonDeg	LonMin	LatDeg	LatMin	LonDeg	LonMin	Date	time												TowMins
BILL 1/05	1	50	27	5	35	50	29	5	28	14/10/2005	16:00	75	V	29E4	N	28		4	40	3	1	1	1
BILL 1/05	2	50	30	5	27	50	32	5	24	14/10/2005	17:30	75	V	30E4	N	25		7	41	7	1	1	
BILL 1/05	3	50	32	5	25	50	32	5	33	14/10/2005	19:00	75	V	30E4	N	36		20	69	5			
BILL 1/05	4	50	31	5	38	50	32	5	45	14/10/2005	21:30	75	V	30E4	N	26		3	56	5		4	
BILL 1/05	5	50	32	5	47	50	32	5	53	14/10/2005	23:00	75	V	30E4	N	12		43	31	3		8	2
BILL 1/05	6	50	32	5	55	50	37	5	44	15/10/2005	00:30	180	V	30E4	N	181	1						
BILL 1/05	7	50	37	5	43	50	41	5	32	15/10/2005	04:00	180	V	30E4	N	212		72	240	80	1	12	4
BILL 1/05	8	50	40	5	36	50	40	5	45	15/10/2005	08:15	75	V	30E4	N	113		40	54	11	9	3	1
BILL 1/05	9	50	40	5	47	50	40	5	54	15/10/2005	09:50	75	V	30E4	N	131		78	38	19	1	2	
BILL 1/05	10	50	40	5	56	50	44	5	57	15/10/2005	11:30	75	V	30E4	N	124	1	106	48	22	26	5	6
BILL 1/05	11	50	45	5	55	50	45	5	46	15/10/2005	13:05	75	V	30E4	N	133	1	50	30	66	9	9	14
BILL 1/05	12	50	45	5	44	50	45	5	35	15/10/2005	15:45	15	V	30E4	N	107		26	44	13	5	10	3
BILL 1/05	13	50	45	5	34	50	45	5	25	15/10/2005	16:20	75	V	30E4	N	92		17	27	9	2	4	2
BILL 1/05	14	50	45	5	21	50	50	5	20	15/10/2005	18:55	75	V	30E4	N	99			18	4		3	
BILL 1/05	15	50	50	5	20	50	50	5	29	15/10/2005	20:30	75	V	30E4	N	65		12	32	29		9	4
BILL 1/05	16	50	50	5	32	50	50	5	39	15/10/2005	22:05	75	V	30E4	N	102	1	34	40	50		10	8
BILL 1/05	17	50	50	5	41	50	50	5	48	15/10/2005	23:45	75	V	30E4	N	38		18	24	70	1	6	8
BILL 1/05	18	50	50	5	52	50	57	6	1	16/10/2005	01:30	180	V	30E4	N	94	2						
BILL 1/05	19	50	59	6	1	51	2	6	17	16/10/2005	05:00	180	V	31E3	N	90	5	132	16	44	16	6	
BILL 1/05	20	51	2	6	19	51	3	6	28	16/10/2005	09:00	75	V	31E3	N	56	1	116	12	2	2	7	2
BILL 1/05	21	51	3	6	30	51	4	6	39	16/10/2005	10:45	75	V	31E3	N	48	2	95	6	5	18	8	5
BILL 1/05	22	51	4	6	41	51	4	6	50	16/10/2005	12:30	75	V	31E3	N	50	9	54	20	10		7	4
BILL 1/05	23	51	4	6	50	51	3	6	58	16/10/2005	14:05	75	V	31E3	N	28		60	17	4		4	6
BILL 1/05	24	51	2	6	58	51	0	6	51	16/10/2005	15:45	75	V	31E3	N	56	9	56	20	2	5	3	1
BILL 1/05	25	51	0	6	50	51	0	6	42	16/10/2005	17:20	75	V	31E3	N	28	5	41	8	6		2	1

Cruise	Shot				Haul				Shot				Full discard sampling									
	Stn	LatDeg	LatMin	LonDeg	LonMin	LatDeg	LatMin	LonDeg	LonMin	Date	time	TowMins	Valid	Rect	MON	WAF	MEG	LEM	SOL	HKE	COD	PLE
BILL 1/05	26	51	0	6	40	51	0	6	31	16/10/2005	19:50	75	V	31E3	N	31	1	76	5	2		1
BILL 1/05	27	51	0	6	30	50	50	6	22	16/10/2005	21:25	75	V	31E3	N	38	1	68	22			7
BILL 1/05	28	51	0	6	21	51	0	6	13	16/10/2005	22:55	75	V	31E3	N	42	2	76	10	4		
BILL 1/05	29	51	0	6	12	50	57	6	8	17/10/2005	00:25	75	V	30E3	N	31	1	46		6		3
BILL 1/05	30	50	56	6	8	50	55	6	26	17/10/2005	02:00	180	V	30E3	N	54	4					
BILL 1/05	31	50	55	6	28	50	55	6	49	17/10/2005	05:30	180	V	30E3	N	39	7	248	28		6	16
BILL 1/05	32	50	55	6	52	50	55	7	0	17/10/2005	09:40	75	V	30E3	N	33	14	114	4	2	1	5
BILL 1/05	33	50	55	7	5	50	50	7	3	17/10/2005	12:45	75	V	30E2	N	47	10	68	11	5		5 3
BILL 1/05	34	50	49	7	3	50	47	6	49	17/10/2005	14:25	75	V	30E2	N	30	5	56	8	5		3
BILL 1/05	35	50	47	6	56	50	47	6	48	17/10/2005	16:05	75	V	30E3	N	44	7	104	16	6	2	2
BILL 1/05	36	50	47	6	46	50	47	6	37	17/10/2005	17:45	75	V	30E3	N	25	5	78	9	5		9 2
BILL 1/05	37	50	47	6	32	50	47	6	24	17/10/2005	20:00	70	V	30E3	N	22		112	16	4	3	7
BILL 1/05	38	50	47	6	23	50	47	6	15	17/10/2005	21:35	75	V	30E3	N	12		70	3	6	2	2
BILL 1/05	39	50	47	6	13	50	47	6	7	17/10/2005	23:10	75	V	30E3	N	36	3	37	16	40	2	1 1
BILL 1/05	40	50	46	6	5	50	38	6	9	18/10/2005	01:00	180	V	30E3	N	140	2					
BILL 1/05	41	50	38	6	11	50	38	6	31	18/10/2005	04:45	180	V	30E3	N	41	3	156	51	30	1	13 3
BILL 1/05	42	50	38	6	35	50	38	6	43	18/10/2005	08:55	75	V	30E3	N	26	4	98	12	32		5
BILL 1/05	43	50	38	6	45	50	37	6	54	18/10/2005	10:30	75	V	30E3	N	35	22	59	5	11		5
BILL 1/05	44	50	37	6	56	50	32	6	56	18/10/2005	12:05	75	V	30E3	N	9	3	57	1	3	1	1
BILL 1/05	45	50	32	6	55	50	32	6	47	18/10/2005	13:40	75	V	30E3	N	9	3	88	4	4	1	2
BILL 1/05	46	50	32	6	45	50	32	6	37	18/10/2005	15:10	75	V	30E3	N	22	4	84	24	6	4	9
BILL 1/05	47	50	32	6	33	50	33	6	24	18/10/2005	17:05	75	V	30E3	N	23	4	118	12	6	3	11
BILL 1/05	48	50	33	6	19	50	32	6	12	18/10/2005	19:10	75	V	30E3	N	46		66	18	3		9
BILL 1/05	49	50	32	6	11	50	28	6	18	18/10/2005	21:25	90	V	30E3	N	47		98	20	20		6
BILL 1/05	50	50	27	6	20	50	26	6	28	18/10/2005	23:15	75	V	29E3	N	58	1	134	22	6		3
BILL 1/05	51	50	26	6	30	50	26	6	38	19/10/2005	00:45	75	V	29E3	N	53	1	55	33	6		4 1
BILL 1/05	52	50	26	6	39	50	19	6	37	19/10/2005	02:15	180	V	29E3	N	109	7					
BILL 1/05	53	50	21	6	38	50	26	6	34	19/10/2005	05:30	180	V	29E3	N	63	6	196	42	22	1	14 6
BILL 1/05	54	50	24	6	29	50	27	6	21	19/10/2005	10:00	75	V	29E3	N	41	4	88	14	4		3 2
BILL 2/05	1	50	15	6	34	50	15	6	42	22/10/2005	16:30	75	V	29E3	N	51	2	174	14	6	1	6
BILL 2/05	2	50	15	6	42	50	15	6	20	22/10/2005	18:05	75	V	29E3	N	48		114	42	10		2 4
BILL 2/05	3	50	15	6	53	50	15	7	1	22/10/2005	20:10	75	V	29E3	N	30	1	88	39	12	1	3 1
BILL 2/05	4	50	15	7	3	50	15	7	11	22/10/2005	21:45	75	V	29E2	N	10	11	68	14	8	3	3
BILL 2/05	5	50	15	7	13	50	15	7	22	22/10/2005	23:25	75	V	29E2	N	13	12	61	8	12		3
BILL 2/05	6	50	15	7	23	50	7	7	20	23/10/2005	01:00	180	V	29E2	N	18	10					

Cruise	Shot				Haul				Shot				Full discard sampling										
	Stn	LatDeg	LatMin	LonDeg	LonMin	LatDeg	LatMin	LonDeg	LonMin	Date	time	TowMins	Valid	Rect	MON	WAF	MEG	LEM	SOL	HKE	COD	PLE	
BILL 2/05	7	50	7	7	16	50	7	6	58	23/10/2005	06:05	175	V	29E2	N	59	6	180	27.5	57.5	1	1	2.5
BILL 2/05	8	50	7	6	55	50	7	6	47	23/10/2005	10:00	75	V	29E3	N	21	2	110	17	8	4		1
BILL 2/05	9	50	7	6	46	50	1	6	44	23/10/2005	11:45	75	V	29E3	N	23		134	6	2	1		
BILL 2/05	10	50	1	6	44	50	0	6	54	23/10/2005	13:20	90	V	29E3	N	12	2	170	2	12	2	1	2
BILL 2/05	11	50	0	6	56	49	58	7	3	23/10/2005	15:25	75	V	29E3	N	19	2	77	9	27		1	
BILL 2/05	12	49	58	7	4	49	58	7	2	23/10/2005	17:00	75	V	28E2	N	20	8	44	2	26		1	
BILL 2/05	13	49	58	7	15	49	58	7	23	23/10/2005	19:15	75	V	28E2	N	7	5	42		6	2	1	
BILL 2/05	14	49	58	7	24	49	58	7	31	23/10/2005	21:15	75	V	28E2	N	7	7	65		3			
BILL 2/05	15	49	58	7	33	49	53	7	33	23/10/2005	23:00	75	V	28E2	N	2	4	69		6			
BILL 2/05	16	49	51	7	33	49	40	7	41	24/10/2005	00:45	180	V	28E2	N	16	14						
BILL 2/05	17	49	40	7	40	49	34	7	46	24/10/2005	04:15	180	V	28E2	N	9	11	146		4		2	
BILL 2/05	18	49	37	7	44	49	33	7	48	24/10/2005	08:00	80	V	28E2	N	1	1	96		2		1	
BILL 2/05	19	49	35	7	47	49	30	7	51	24/10/2005	10:50	45	V	28E2	N	4	2	136				3	
BILL 2/05	20	49	31	7	50	49	30	7	40	24/10/2005	12:05	105	V	28E2	N	10	3	52	3	3			4
BILL 2/05	21	49	30	7	39	49	30	7	28	24/10/2005	14:15	105	V	28E2	N	13	1	61		3			
BILL 2/05	22	49	30	7	26	49	30	7	16	24/10/2005	16:25	105	V	28E2	N	4		71		4	2		
BILL 2/05	23	49	31	7	12	49	27	7	4	24/10/2005	19:10	110	V	28E2	N	9	1	61		18		3	
BILL 2/05	24	49	26	7	3	49	19	7	3	24/10/2005	21:45	105	V	27E2	N	19	5	59	1	14	1	1	
BILL 2/05	25	49	20	7	1	49	20	7	21	25/10/2005	00:15	180	V	27E2	N	24	3						
BILL 2/05	26	49	20	7	23	49	20	7	41	25/10/2005	04:15	180	V	27E2	N	14	4	82		8	1	6	
BILL 2/05	27	49	22	7	39	49	21	7	49	25/10/2005	08:30	110	V	27E2	N	16	5	79	3				3
BILL 2/05	28	49	22	7	49	49	18	7	56	25/10/2005	11:00	105	V	27E2	N	16	7	196	1	1			1
BILL 2/05	29	49	19	7	54	49	12	7	55	25/10/2005	13:40	105	V	27E2	N	18	8	116		6		1	4
BILL 2/05	30	49	12	7	52	49	12	7	41	25/10/2005	17:05	105	V	27E2	N	21	4	86		2	1		
BILL 2/05	31	49	12	7	37	49	12	7	26	25/10/2005	20:05	105	V	27E2	N	10	2	90	3	8		1	1
BILL 2/05	32	49	12	7	24	49	12	7	14	25/10/2005	22:15	105	V	27E2	N	9	1	50	1	16		3	1
BILL 2/05	33	49	12	7	12	49	14	6	54	26/10/2005	00:30	180	V	27E2	N	24	3						
BILL 2/05	34	49	14	6	52	49	22	6	38	26/10/2005	03:50	180	V	27E3	N	9	1	86	6	10		2	4
TWIL 1/05	1	48	48	7	10	48	51	7	4	06/09/2005	20:40	75	V	26E2	Y	19	1	104	3		1		
TWIL 1/05	2	48	52	7	4	48	56	7	1	06/09/2005	22:15	75	V	26E2	N	11		66	6	3			1
TWIL 1/05	3	48	57	7	0	49	1	6	57	06/09/2005	23:50	75	V	27E3	N	29	4	99	4	4	2	1	
TWIL 1/05	4	49	2	6	57	49	7	6	56	07/09/2005	01:30	180	V	27E3	N	46	1						
TWIL 1/05	5	49	8	6	57	49	15	6	57	07/09/2005	04:45	180	V	27E3	Y	33		298	4	36	2	3	
TWIL 1/05	6	49	14	6	55	49	11	6	47	07/09/2005	08:05	75	V	27E3	N	13		86	3	9			3

Cruise	Shot				Haul				Shot				Full discard sampling										
	Stn	LatDeg	LatMin	LonDeg	LonMin	LatDeg	LatMin	LonDeg	LonMin	Date	time	TowMins	Valid	Rect	MON	WAF	MEG	LEM	SOL	HKE	COD	PLE	
TWIL 1/05	7	49	10	6	40	49	5	6	38	07/09/2005	10:40	75	V	27E3	N	17		79	3	8	5		
TWIL 1/05	8	49	4	6	39	49	1	6	41	07/09/2005	12:15	45	V	27E3	N	12		35	1	4	1	1	
TWIL 1/05	9	49	1	6	42	49	0	6	45	07/09/2005	13:20	40	I	27E3	N								
TWIL 1/05	10	49	3	6	52	49	8	6	58	07/09/2005	15:25	75	V	27E3	Y	16	1	116		6	3	6	2
TWIL 1/05	11	49	9	6	59	49	12	7	4	07/09/2005	17:00	75	V	27E3	N	24	5	95	2	8	4		
TWIL 1/05	12	49	18	7	7	49	23	7	8	07/09/2005	20:50	75	V	27E2	Y	12		77	3	10		1	
TWIL 1/05	13	49	24	7	9	49	27	7	14	07/09/2005	22:25	75	V	27E2	N	15	5	132		11		2	
TWIL 1/05	14	49	28	7	13	49	23	6	56	08/09/2005	00:00	180	V	27E2	N	24	8						
TWIL 1/05	15	49	23	6	55	49	18	7	1	08/09/2005	03:15	180	V	27E3	N	24	2	110	4	20			6
TWIL 1/05	16	49	19	7	0	49	21	6	52	08/09/2005	06:35	75	V	27E3	Y	24	3	98	10	18	3		
TWIL 1/05	17	49	18	7	0	49	15	7	7	08/09/2005	07:00	255	V	27E2	N	31	1	77		4	1	4	1
TWIL 1/05	18	49	14	7	9	49	11	7	17	08/09/2005	11:40	75	V	27E2	N	15	1	83		12	5		2
TWIL 1/05	19	49	10	7	19	49	11	7	27	08/09/2005	13:15	75	V	27E2	N	15	2	104	1	6	3		
TWIL 1/05	20	49	12	7	29	49	17	7	28	08/09/2005	14:50	75	V	27E2	N	17	3	70		10	7	1	2
TWIL 1/05	21	49	18	7	27	49	21	7	19	08/09/2005	16:25	75	V	27E2	N	17	1	90		12	6	3	2
TWIL 1/05	22	49	24	6	51	49	25	6	42	08/09/2005	21:10	75	V	27E3	N	18	1	69	3	24		1	6
TWIL 1/05	23	49	25	6	40	49	26	6	32	08/09/2005	22:45	75	V	27E3	N	9	1	61	2	13		2	7
TWIL 1/05	24	49	27	6	31	49	22	6	16	09/09/2005	00:15	180	V	27E3	N	33	1						
TWIL 1/05	25	49	21	6	16	49	14	6	29	09/09/2005	03:30	180	V	27E3	N	37		94	16	24	1	6	4
TWIL 1/05	26	49	16	6	27	49	18	6	20	09/09/2005	06:50	75	V	27E3	N	26	2	63	3	11		3	3
TWIL 1/05	27	49	22	6	12	49	25	6	5	09/09/2005	09:35	75	V	27E3	N	44		70	18	10	11	1	4
TWIL 1/05	28	49	25	6	3	49	20	6	1	09/09/2005	11:10	75	V	27E3	N	23		67	27	11	11	2	1
TWIL 1/05	29	49	18	6	1	49	15	6	8	09/09/2005	13:00	75	V	27E3	N	36		56	10		9	1	
TWIL 1/05	30	49	14	6	10	49	12	6	18	09/09/2005	14:35	75	V	27E3	N	22	1	52	15	1	10		1
TWIL 1/05	31	49	13	6	19	49	18	6	23	09/09/2005	16:10	75	V	27E3	N	20	3	72	2	10	2		
TWIL 1/05	32	49	29	6	19	49	29	6	3	09/09/2005	20:15	75	V	27E3	N	41		106	38	12		6	
TWIL 1/05	33	49	29	6	1	49	28	5	53	09/09/2005	21:50	80	V	27E4	N	38	1	58	22	18		2	
TWIL 1/05	34	49	31	5	54	49	31	6	13	10/09/2005	00:00	180	V	28E4	N	54							
TWIL 1/05	35	49	31	6	14	49	38	6	28	10/09/2005	03:15	180	V	28E3	N	59	1	112	38	52	2	9	14
TWIL 1/05	36	49	38	6	27	49	33	6	22	10/09/2005	06:35	135	V	28E3	N	42		79	12	28	6	2	6
TWIL 1/05	37	49	31	6	24	49	30	6	31	10/09/2005	09:10	75	V	28E3	N	37		82	22	25	2	1	10

Cruise	Shot				Haul				Shot				Full discard sampling										
	Stn	LatDeg	LatMin	LonDeg	LonMin	LatDeg	LatMin	LonDeg	LonMin	Date	time	TowMins	Valid	Rect	MON	WAF	MEG	LEM	SOL	HKE	COD	PLE	
TWIL 1/05	38	49	30	6	32	49	30	6	40	10/09/2005	10:40	75	V	28E3	N	24	2	93	10	15	1	4	
TWIL 1/05	39	49	30	6	42	49	30	6	51	10/09/2005	12:10	75	V	28E3	N	30	2	60	1	9	9	3	
TWIL 1/05	40	49	30	6	42	49	30	6	58	10/09/2005	13:45	75	V	28E3	N	23	2	89	2	10	5	2	
TWIL 1/05	41	49	35	6	57	49	36	6	49	10/09/2005	15:20	75	V	28E3	N	18	5	81		24	2	2	5
TWIL 1/05	42	49	36	6	47	49	37	6	39	10/09/2005	16:55	75	V	28E3	N	17		100	2	30	1		2
TWIL 1/05	43	49	38	6	30	49	39	6	21	10/09/2005	21:00	75	V	28E3	N	37	2	78	41	27	2		18
TWIL 1/05	44	49	39	6	19	49	37	6	12	10/09/2005	22:35	75	V	28E3	N	57	1	82	26	22		2	6
TWIL 1/05	45	49	37	6	12	49	30	6	25	11/09/2005	00:00	180	V	28E3	N	57							
TWIL 1/05	46	49	30	6	26	49	34	6	25	11/09/2005	03:15	180	V	28E3	N	55	2	82.5	22.5	75		1	38
TWIL 1/05	47	49	34	6	23	49	35	6	16	11/09/2005	06:35	75	V	28E3	N	72		78	23	31	9		4
TWIL 1/05	48	49	36	6	11	49	38	6	3	11/09/2005	09:30	75	V	28E3	Y	74	3	82	50	8	15	4	
TWIL 1/05	49	49	38	6	2	49	41	5	56	11/09/2005	11:00	75	V	28E3	N	38		100	26	8	4	4	
TWIL 1/05	50	49	41	5	54	49	43	5	48	11/09/2005	12:30	75	V	28E4	N	39		27	19	5	3		
TWIL 2/05	1	49	52	4	49	49	52	4	42	13/09/2005	14:20	60	V	28E5	N	14			24	4		1	
TWIL 2/05	2	49	52	4	42	49	52	4	34	13/09/2005	15:40	135	V	28E5	N	9			24	9	3		1
TWIL 2/05	3	49	52	4	31	49	54	4	22	13/09/2005	18:00	90	V	28E5	N	21			26	7	1	3	3
TWIL 2/05	4	49	55	4	21	49	55	4	14	13/09/2005	19:30	75	V	28E5	N	15			10	17		1	34
TWIL 2/05	5	49	55	4	13	49	56	4	4	13/09/2005	21:00	75	V	28E5	N	14			10	17		1	47
TWIL 2/05	6	49	56	4	3	50	1	4	2	13/09/2005	22:30	75	V	28E5	N	6			12	23		1	87
TWIL 2/05	7	50	0	4	0	49	56	4	13	14/09/2005	00:00	180	V	28E5	N	14							
TWIL 2/05	8	49	56	4	12	49	55	4	9	14/09/2005	03:15	180	V	28E5	N	11			10	36			174
TWIL 2/05	9	49	55	4	9	49	57	4	1	14/09/2005	06:30	75	V	28E5	Y	7			9	13	1		38
TWIL 2/05	10	50	0	3	57	49	57	3	51	14/09/2005	09:15	75	V	28E6	N	3			7	13			39
TWIL 2/05	11	49	57	3	52	49	58	3	57	14/09/2005	10:45	75	V	28E6	N	4			7	7			48
TWIL 2/05	12	49	53	3	58	49	50	4	5	14/09/2005	12:15	75	V	28E5	N	5			5	13	1		18
TWIL 2/05	13	49	50	4	5	49	51	4	11	14/09/2005	13:45	75	V	28E5	N	15			8	5			11
TWIL 2/05	14	49	51	4	12	49	50	4	19	14/09/2005	15:15	75	V	28E5	N	14			1	6	2	2	6
TWIL 2/05	15	49	50	4	20	49	49	4	26	14/09/2005	16:45	75	V	28E5	N	18		1	2	7	1	1	4
TWIL 2/05	16	49	50	4	35	49	52	4	42	14/09/2005	20:40	135	V	28E5	N	3			25	9		2	
TWIL 2/05	17	49	35	5	38	49	36	5	19	15/09/2005	03:00	180	V	28E4	N	99		26	46	6		14	
TWIL 2/05	18	49	36	5	19	49	34	5	25	15/09/2005	06:15	75	V	28E4	N	70		6	15	2		1	2

Cruise	Shot				Haul				Shot				Full discard sampling										
	Stn	LatDeg	LatMin	LonDeg	LonMin	LatDeg	LatMin	LonDeg	LonMin	Date	time	TowMins	Valid	Rect	MON	WAF	MEG	LEM	SOL	HKE	COD	PLE	
TWIL 2/05	19	49	31	5	30	49	30	5	40	15/09/2005	09:05	100	V	28E4	N	55		21	22	2	10	2	1
TWIL 2/05	20	49	31	5	42	49	32	5	51	15/09/2005	11:30	120	V	28E4	N	55	1	23	21	2	14	3	
TWIL 2/05	21	49	32	5	50	49	40	5	47	15/09/2005	13:30	105	V	28E4	N	56		38	15		6		5
TWIL 2/05	22	49	40	5	46	49	37	5	40	15/09/2005	15:30	105	V	28E4	N	70	1	28	13	14	4	1	5
TWIL 2/05	23	49	31	5	36	49	27	5	44	15/09/2005	19:15	105	V	27E4	N	43		21	15	4	1	1	1
TWIL 2/05	24	49	26	5	46	49	24	5	57	15/09/2005	21:15	105	V	27E4	N	39		84	22	2	1	8	
TWIL 2/05	25	49	24	5	59	49	26	6	18	15/09/2005	23:20	190	V	27E3	N	23							
TWIL 2/05	26	49	26	6	19	49	29	6	15	16/09/2005	02:45	195	V	27E3	N	54	2	74	28	24	1	2	18
TWIL 2/05	27	49	28	6	15	49	22	6	20	16/09/2005	06:15	105	V	27E3	N	51		70	6	18	6	5	9
TWIL 2/05	28	49	18	6	24	49	14	6	36	16/09/2005	09:30	120	V	27E3	N	15	1	108	4	26			1
TWIL 2/05	29	49	13	6	37	49	11	6	47	16/09/2005	11:45	105	V	27E3	N	19		55	2	12	9		1
TWIL 2/05	30	49	10	6	47	49	19	6	34	16/09/2005	13:50	190	V	27E3	N	23	1	178	4	14	1	3	6
TWIL 2/05	31	49	17	6	33	49	18	6	15	16/09/2005	17:30	195	V	27E3	N	35	1	88	2	20	1	2	3
TWIL 2/05	32	49	17	6	52	49	17	7	2	16/09/2005	21:05	105	V	27E3	N	15		116	6	14	2		2
TWIL 2/05	33	49	16	7	4	49	18	7	13	16/09/2005	23:10	105	V	27E2	N	7	2	104		10		3	2
TWIL 2/05	34	49	17	7	13	49	22	7	3	17/09/2005	01:15	180	V	27E2	N	24	1						
TWIL 2/05	35	49	22	7	2	49	23	6	43	17/09/2005	04:30	180	V	27E2	N	40	2	118	8	34	2	1	4
TWIL 2/05	36	49	22	6	45	49	20	6	53	17/09/2005	07:50	85	V	27E3	N	10	1	118	1	10	3	1	3
TWIL 2/05	37	49	19	6	59	49	22	7	7	17/09/2005	10:40	75	V	27E2	N	13		67		23	2		
TWIL 2/05	38	49	30	7	12	49	30	7	12	17/09/2005	13:15	75	V	28E2	Y	7	4	113		16	8		1
TWIL 2/05	39	49	38	7	8	49	44	7	7	17/09/2005	15:00	75	V	28E2	N	11	4	92		16	2	1	
TWIL 2/05	40	49	47	7	7	49	52	7	7	17/09/2005	16:50	70	V	28E2	N	28	2	73		22		2	1
TWIL 2/05	41	49	56	7	6	49	51	7	2	17/09/2005	19:35	75	V	28E2	N	23		62	1	13	1	1	
TWIL 2/05	42	49	50	7	2	49	44	7	3	17/09/2005	21:10	75	V	28E2	N	11	5	84		12	11	2	
TWIL 2/05	43	49	43	7	4	49	38	7	7	17/09/2005	22:50	75	V	28E2	N	7	4	57		17	5	1	1
TWIL 2/05	44	49	37	7	7	49	35	7	0	18/09/2005	00:25	75	V	28E2	N	8	1	37	3		3	1	2
TWIL 2/05	45	49	35	6	58	48	37	6	38	18/09/2005	02:00	180	V	28E3	N	20	3						
TWIL 2/05	46	49	37	6	36	49	32	6	20	18/09/2005	05:15	180	V	28E3	N	64	7	128	32	128	6	2	24
TWIL 2/05	47	49	30	6	21	49	30	6	30	18/09/2005	08:35	70	V	28E3	N	33	4	92	9	31	2		13
TWIL 2/05	48	49	30	6	32	49	34	6	32	18/09/2005	10:00	75	V	28E3	N	31	3	96	12	65		1	10

