

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD  
FISHERIES LABORATORY, LOWESTOFT, SUFFOLK, UK

1996 RESEARCH VESSEL PROGRAMME

REPORT: RV CORYSTES: Cruise 14b  
(PROVISIONAL: Not to be quoted without prior reference to the author)

STAFF: J H Nichols SIC  
P A Large  
M W Easey  
M Etherton  
P Stanton  
Ms S-J Moore (Observer - Ireland)  
M Hosking (SW Industry Observer) 21-23 November.

DURATION: 15-26 November 1996

LOCATION: Western English Channel.

1. To carry out an acoustic search, using echo sounders and sonar, and a fishing survey in and around the restricted area commonly referred to as the south-west mackerel box to obtain information on:
  - a) The distribution, size, age and maturity of mackerel.
  - b) The distribution and size composition of other pelagic species.
  - c) The size composition of all other by-catch species caught.

NARRATIVE:

Four staff travelled by road from Lowestoft and joined at Southampton on 14 November to relieve staff from cruise 14a. Mr Nichols and Ms Moore joined on 15 November. RV CORYSTES sailed from Southampton at 0836h 16 November and steamed towards Lyme Bay to start an echo sounder search for pelagic fish concentrations.

The survey began at 1400h using the 38Khz and 120Khz sounders. Two trial hauls were made with the 800 Engel trawl during which problems were found with the headline transducer. The echo sounder survey across Lyme Bay continued through the night to a point 10 nml south of Start Point at 0830h 17 November. After a further trial with the Engel trawl it was concluded that the headline transducer was transmitting a signal but not receiving it back. The Scanmar trawl system was fitted and functioned perfectly. The Furuno dual frequency (50Khz / 200Khz) transducer was rigged and this sounder used for the remainder of the survey, together with the 38Khz and 120Khz sounders.

The echo sounder survey continued from Start Point across to 5°W covering the area from 2 nml. to 10 nml. south of the Eddystone Lighthouse. A single Engel trawl haul was made on traces south of the Eddystone at 1750h. The survey then progressed southwards along longitude 5°W to 8 nml. beyond the southern limit of the Mackerel Box. Two Engel trawl hauls were made on traces found at latitude 49°40'N, one at dusk at 1630h 18 November and the second in the dark at 2120h. In deteriorating weather the survey was continued back northwards towards Falmouth.

The vessel was hove to in a severe south-easterly gale through the night until 1330h on 19 November when slow progress was made towards Lyme Bay and shelter off Teignmouth. The vessel remained hove to in this area until 0900h 20 November when it was decided to move around Start Point and into Bigbury Bay. By 1530h the wind strength had decreased and the survey was restarted covering the area between the Wolf Rock and the Lizard. At 0730h on 21 November an extensive mark was located 2 nml. south of the Lizard. It was not possible to shoot the mid-water trawl in this area because of the fixed gear. Feathering was carried out for half an hour to identify and sample this trace, before steaming to Falmouth to pick up Skipper Michael Hosking at 0950h.

The following two days were spent in an extensive echo sounder and sonar search of the area from the Wolf rock to Start Point south to the just beyond the southerly limit of the Mackerel Box. During this search the Simrad sonar was operated continuously in auto-scan mode. Major problems were experienced with this equipment after about thirty hours of continuous running. This resulted in the system having to be switched off for long periods and the loss of the auto-scan mode.

One Engel trawl haul was made on traces located 15nml. SW of Start Point at 0235h 22 November.

The densest trace located during the survey was found on the morning of 23 November, 20 nml SW of the Eddystone (12 nml south of the radar buoy). A fleet of 'fast' handliners was already working this patch and it was decided not to attempt to trawl in the area. Instead RV CORYSTES manoeuvred in close to the fleet and our own handlines were used to fish in the same area from 0930h to 1130h, using the sonar to maintain contact with the patch. Fishing in close proximity to the fleet presented no problems. Skipper Hosking made radio contact with them and they expressed great interest in the survey and asked for the age and maturity details of the samples we were taking in that area.

After Skipper Hosking was put ashore at Falmouth at 1515h. 23 November the vessel returned to the handlining position worked earlier that day. By this time the handliner fleet had left the area. The large echo trace was relocated and the Engel trawl shot through the trace at 1805h. The echo survey was then continued through the night to the south of this area with the aim of returning to the large trace for further handlining at dawn on the following day. The trace was quickly relocated at 0810h on 24 November and handlining carried out for 30 minutes before the trace was lost. At the time the sonar was not working and the trace could not be tracked in the same way as on the previous day. A protracted fine scale search over the area for three hours

proved fruitless and was abandoned 1230h. By this time the wind had increased to 35 knots from the south-west making it impossible to either trawl or handline. The echo sounder survey was continued, in deteriorating weather conditions, north-eastwards towards Start Point. The survey was abandoned at 1830h with the wind gusting to 50 knots from the south-west. RV CORYSTES then began to make slow progress on course for Lowestoft. The weather improved during the night and good progress was made on 25 November arriving in Lowestoft at 0925h 26 November.

## RESULTS

### Aim 1.

The area of the SW Mackerel Box, between Start Point and the Wolf Rock and southwards from the Eddystone to its southerly limit, was extensively covered in an echo sounder survey. During part of this survey the sonar system was also operated. Lyme Bay was surveyed from latitude 50°30'N out to 50°10'N along east to west survey lines 5nm apart. (Figure 1)

It was not possible to survey any part of the Mackerel Box area north of the Cornish Peninsula in the time available.

Echo traces were remarkably sparse over most of the surveyed area. In Lyme Bay only a few scattered, near bottom, marks were found in the centre of the Bay.

Engel trawl and handline samples were taken to identify the traces whenever possible. The weight of all fish caught, either by handline or trawl, was recorded. The total catch or a weighed sub-sample of the catch of all species was measured. A length stratified sub-sample of all mackerel caught was sampled on board for length, weight, maturity, sex and the otoliths were removed for subsequent age determination. A total of 324 mackerel were sampled in this way. The mackerel caught in the area worked by the handline fleet were treated as a separate sample (177 fish) for this purpose.

For a preliminary analysis of the proportions of mackerel mature in the catches, the maturity/length ogive obtained on the Silver Harvester survey in 1995/96 was used.

An area of light near bottom marks was found on 17 November in a narrow band stretching from 10 nml. SW of Start Point to 10 nml SE of the Eddystone. These marks did not show up on the 200Khz sounder and were not thought to be mackerel. A single trawl haul in this area confirmed that they were mixed horse mackerel and pilchard with a few whiting and mackerel. The horse mackerel were small ranging in length from 8cm to 21cm with modes at 11cm and 16cm.

A small area of dense marks located some 20 nml SSE of the Lizard. was fished at dusk and in the dark on 18 November. The dusk catch consisted of 143 Kg of horse mackerel, 27 Kg of mackerel, a few pilchards and 2 anchovies. The dark haul took only 11 Kg of fish and it was concluded that the trawl did not pass directly through the mark. The catch of mackerel consisted of a high proportion (90%) of small, immature, fish. These mackerel ranged in size from 16cm to 36cm with modes at 18cm and 28 cm.

The horse mackerel ranged in length from 14 cm to 27cm with the mode at 21cm.

Handlining with feathered hooks on the dense trace 2 nml. off The Lizard confirmed this trace as mackerel. They ranged in length from 23 cm to 37 cm with 39% estimated as immature.

On 22 November the trawl was shot to identify a heavy trace 5 nml. south of the area fished on 17 November. It was thought that this trace could be mackerel but the haul, which targeted the mark perfectly, contained 368 Kg of pilchard with only a few mackerel and horse mackerel and four bass. The pilchards ranged in length from 19.5cm to 26cm with the mode at 22.5cm.

The two hours of handlining with the handliner fleet on 23 November yielded a catch of 140 Kg of mackerel. These fish ranged in length from 21cm to 42cm with only 16% estimated as immature. The Engel trawl haul on the same patch after dark on the same day took a total of 1237 Kg of mixed mackerel (54%) and pilchard (46%). This large catch was handled on board with great ease and released into the forward pound for sorting without difficulty. The mackerel ranged in length from 21cm to 35cm and 83% of them were estimated as immature. The length distribution of the pilchards was almost identical to those further east on the previous day. The handline catch on the following day consisted of a similar size range of mackerel to the handline catch of the previous day but with a higher percentage (36%) of small immature fish.

Catches of other species in the Engel trawl hauls were small. A total of 8 Kg of whiting, 7.3 Kg of bass (6 fish) and 0.07 Kg of anchovy were caught.

Additional aim.

Livers from 20 mackerel, six bass and 3 whiting were removed and frozen individually for The De Montfort University in Leicester.

J H Nichols  
2 December 1996

SEEN IN DRAFT:

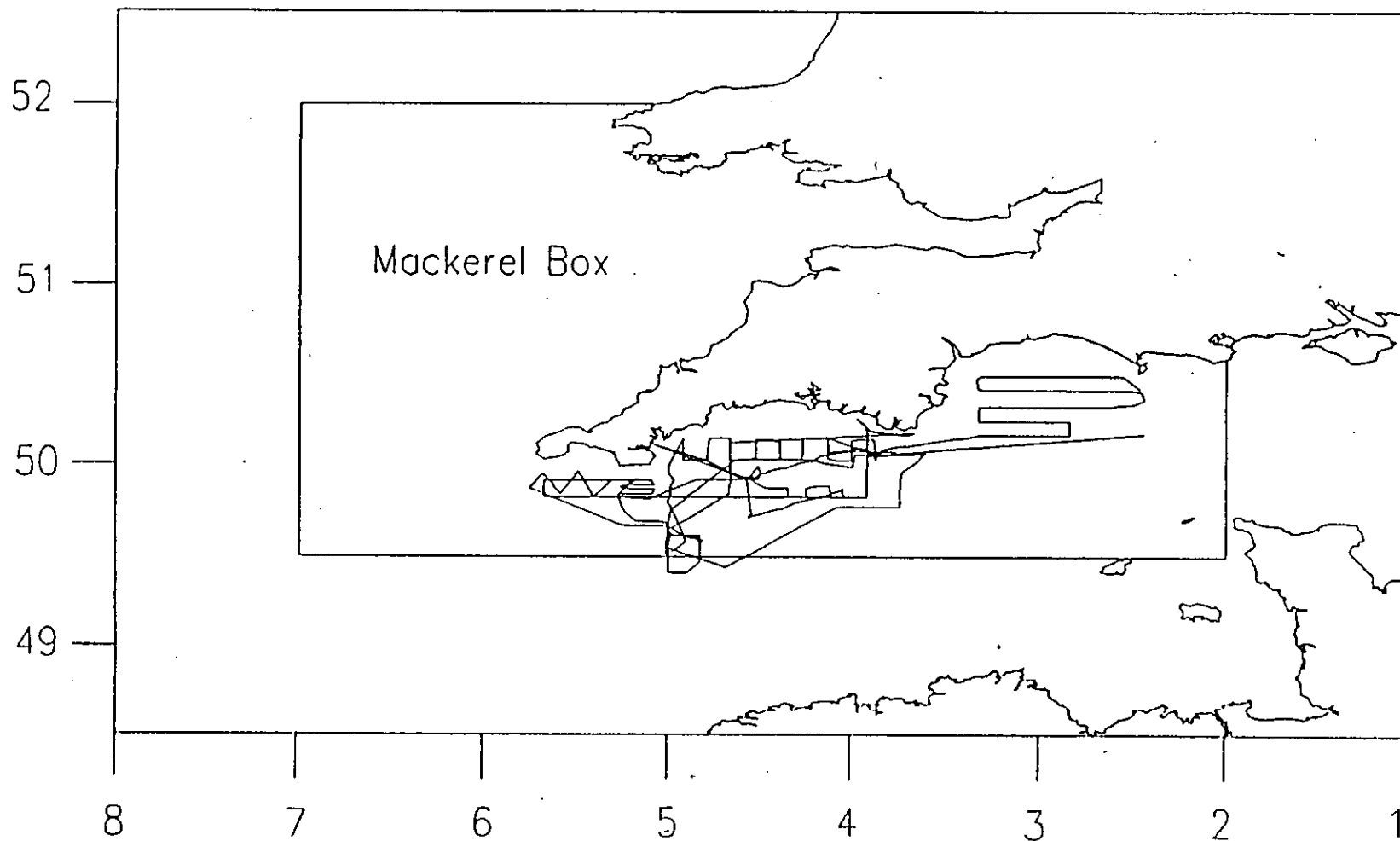
Captain B Chapman - Master  
W M May - Senior Fishing Master

DISTRIBUTION:

Basic list +  
J H Nichols  
P A Large  
M W Easey  
M Etherton  
P Stanton  
Ms S J Moore

Figure 1

Corystes 14b/96 Cruise Plot



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1996 RESEARCH VESSEL PROGRAMME

REPORT: RV CORYSTES: CRUISE 15

STAFF: JD Metcalfe (SIC)  
BH Holford  
BF Riches  
AA Buckley  
MO Eagle  
C O'Brien

DURATION: 4-23 DECEMBER

LOCALITY: Southern North Sea

AIMS:

1. To release approximately 180 adult plaice equipped with Mk I data storage tags (DSTs) together with a similar number of control fish tagged with Petersen tags.
2. To estimate errors in determining swimming speed and direction of fish tracked with sector scanning sonar by "tracking" an acoustic tag mounted on static gear.
3. To test the light gathering performance a Mk III DST on static gear near the sea bed (to be carried out in conjunction with Aim 2).
4. To estimate swimming speed and orientation of plaice on their pre-spawning migration by simultaneous use of the sector scanning sonar and the ADCP.
5. To compare sonar tracking and DST technologies on a free-ranging fish by tracking a plaice equipped both types of tag.

NARRATIVE: (All times are Greenwich Mean Time)

CORYSTES sailed at 1550 h on 4 December and proceeded to a position about 16 miles north-east of Smiths Knoll to release tagged plaice (Aim 1). The first batch of plaice (55 tagged with DSTs, and 48 tagged with Petersen discs) were released at 52° 49.89'N, 02° 39.98'E between 1950 and 2015 h. The second batch (54 tagged with DSTs, and 51 tagged with Petersen discs) were released at 52° 44.69'N, 02° 40.39'E between 2140 h and 2215 h. CORYSTES then steamed south-west overnight to a position about 12 miles east of Lowestoft.

The following morning, after tag trials, a camera frame equipped with a 300 kHz transponding tag, a Mk I DST, a MK III DST and an Aanderaa current meter was deployed at 52° 30.16'N, 02° 05.16'E at 1200 h. At about 1400 h CORYSTES overran the marker buoys and the line became fouled on the sector scanner. The frame was eventually retrieved having sustained only minor damage and was successfully re-

deployed at 52° 28.62'N, 02° 04.90'E at 1605h. The camera frame was tracked for 23 h until it was recovered at 1500 on 6 December.

CORYSTES subsequently steamed 9 miles further offshore and, after brief tag trials, fish tracking commenced at 1840 h with the release of a 40 cm female plaice (E69 7041) at 52° 29.65'N, 02° 19.79'E. Apart from a period of about 5 h on 8 December when the fish was lost (during which time it moved about 3.5 km to the north along the tidal stream path), this fish was tracked continuously for over 12½ days until 0730 h on 19 December when tracking had to be abandoned (at 53° 44.37'N, 01° 21.09'E) due to easterly gales and worsening sea conditions.

During the remainder of 19 December CORYSTES slowly steamed south to seek shelter in the lee of the Haisborough Sand. Despite the strong easterly winds which continued throughout 20 December, some pressure tests of the Mk III data storage tag were carried out successfully.

With the forecast of continuing strong easterly winds and poor sea conditions which would have prevented any fish tracking on 21 December, CORYSTES set course for Lowestoft, finally docking at 0530 h on 21 December.

## RESULTS:

1. *Release of tagged fish.* One hundred and nine plaice equipped with Mk I data storage tags and 99 plaice tagged with Petersen discs were successfully released at two stations (52° 49.89'N, 02° 39.98'E and 52° 44.69'N, 02° 40.39'E) in the Southern Bight of the North Sea.
2. *Estimation of swimming speed errors.* A camera frame, equipped with an acoustic tag, was "tracked" successfully for 23 h, during which time continuous measurements of the tidal stream speed and direction were made with the ADCP. The resultant data will be used to calculate the speed of any apparent movement of the tag through the water and will be used to estimate the magnitude of the errors inherent in this method of calculating the swimming speed and orientation of the fish.
3. *Test of the light gathering performance a Mk III DST.* A Mk III DST with an unfiltered light sensor was mounted on the camera frame (2 above). The frame was lowered in approximately 5 m steps at 5 minute intervals. No light was detected below about 10 m depth (Fig. 1), almost certainly as a result of the very high turbidity of the sea water in the Southern Bight.
4. *Fish tracking.* One adult female plaice (Fish 1) fitted with a long-life acoustic tag was followed for a period of over 12½ days (301 h). This fish moved first north, and then north north-west, by selective tidal stream transport, along the western edges of Smiths Knoll and the Lemn Bank to a point about 3½ miles east of the Haddock Bank (Fig. 2). Here, apart from one very brief excursion into mid-water, it remained on the sea bed for almost two days before again moving north-west along the tidal stream path on the western side of the Sole Pit, towards the Flamborough Off Ground spawning area. The fish finally went to the sea bed at 53° 44.37'N, 01° 21.09'E on 0615 h on 17 December where it remained for over two days until it was abandoned due to bad weather at 0730 h on 19 December. The net distance covered by the fish during this time was 153 km.

During the first 4 days of the track, the fish came into mid-water on both the daytime and night-time north-going tides (Fig. 3). However from the fifth day the pattern of vertical movement changed and the fish came into mid-water on the transporting tide only during the night. During the day it remained stationary on the sea bed irrespective of the direction of the tidal stream. This pattern of behaviour became sufficiently consistent that, towards the end of the track (from day 10 onwards), when the fish was stationary on the sea bed during the daytime, it became possible to reduce the frequency with which the tag was interrogated by the sonar from once every two

seconds, to once every ten minutes. This served to conserve battery power and extend the tag life.

The long-life tag worked extremely well with the Systems Engineering sonar, giving clear signals out to over 350 m. Although some evidence of reduced signal strength was evident towards the end of the track, the tag was still giving clear signals at ranges of over 250 m on the last day. Measurements of the speed and direction of the tidal streams were made with the ADCP almost continuously during the track of the fish and extremely valuable data for calculating swimming speed or orientation were gathered from 15 mid-water excursions. The use of the "Sextant" survey software throughout the track reduced the problems associated with interference from the ADCP, or temporary loss of tag signal, making it possible to minimise the interrogation rate of the tag by the sonar, thereby significantly enhancing the tag life. This procedure, combined with an exceptionally prolonged period of fine weather, greatly assisted the work and allowed tracking of a single fish to continue for more than twice as long as the previous longest track.

Aim 5 was not carried out due to poor weather, which prevented further fish tracking.

JD Metcalfe  
20 December 1996

SEEN IN DRAFT: B J Chapman, (Master)  
W M May (Senior Fishing Mate)

INITIALLED: G P A

DISTRIBUTION:

Basic list +  
JD Metcalfe  
BH Holford  
BF Riches  
AA Buckley  
MO Eagle  
C O'Brien  
Clerk, Eastern Sea Fisheries Committee  
Foreign and Commonwealth Office

#### FIGURE CAPTIONS:

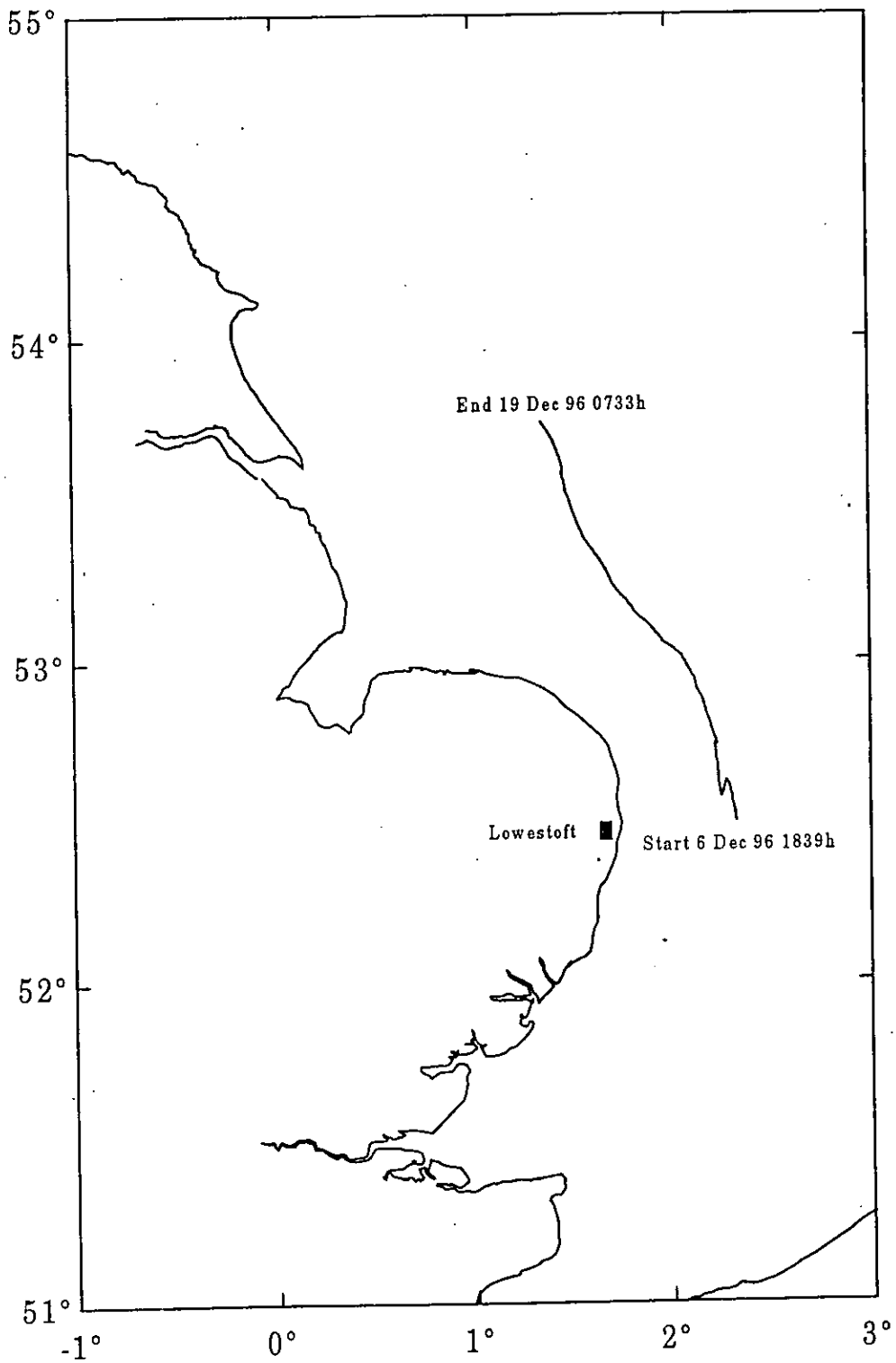
**Figure 1.** The pressure (depth) and light level records from the Mk III data storage tag during deployment to the sea bed in approximately 5 m steps.

**Figure 2.** The ground track of Fish 1 (40 cm, Petersen tag No. E69 7041) which moved 153 km to the north by selective tidal stream in 12½ days.

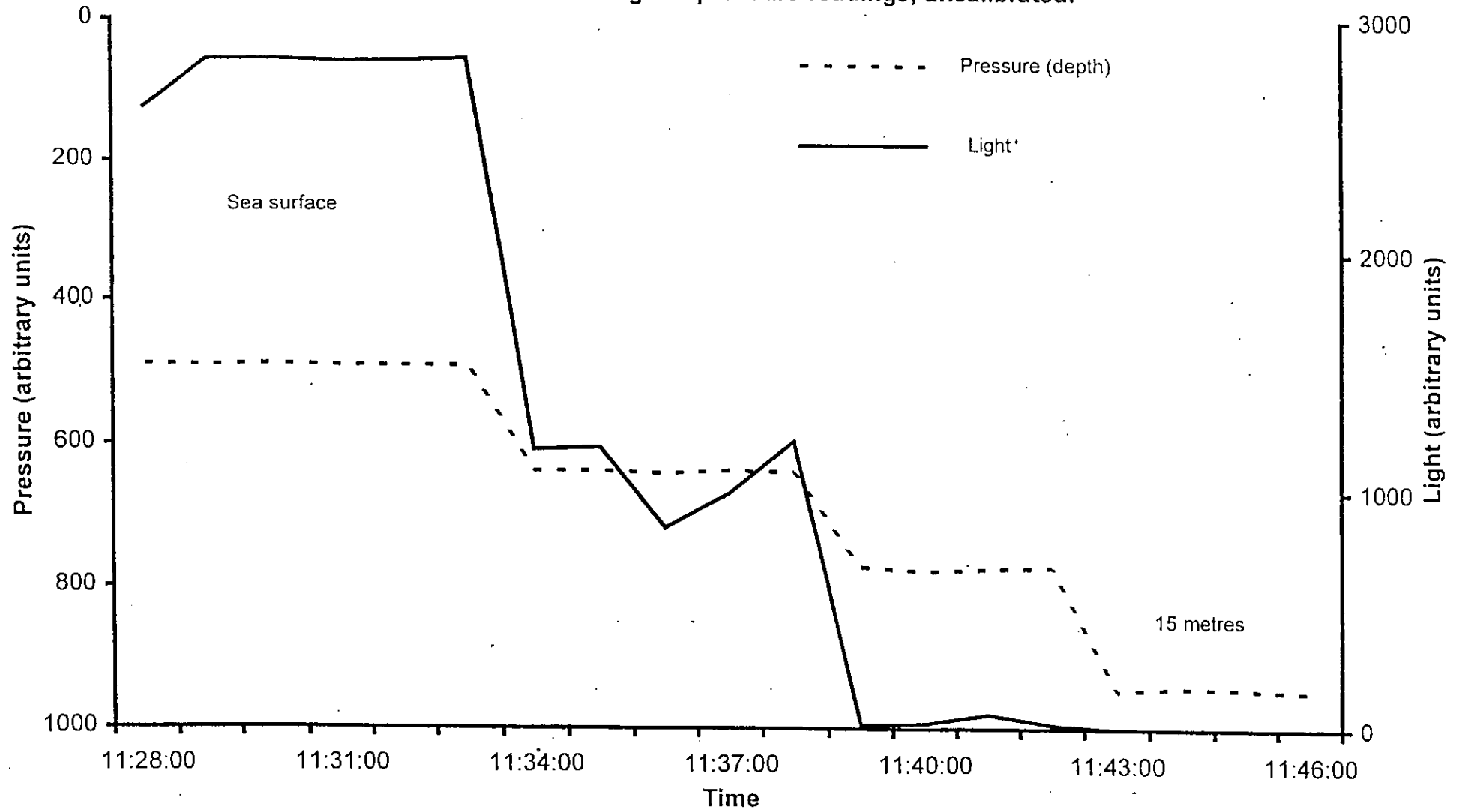
**Figure 3.** The vertical track (7 point running mean with bottom contact preserved) of Fish 1 (fish: — ; sea bed: ----).



Ground track, fish 1, (female plaice, 40cm), 6-19 December.



Test DST mk III - Light & pressure readings, uncalibrated.



Vertical track, fish 1 (female plaice, 40cm), 6-19 December.

