

**MINISTRY OF AGRICULTURE, FISHERIES AND FOOD
FISHERIES LABORATORY, LOWESTOFT, SUFFOLK, ENGLAND**

1994 RESEARCH VESSEL PROGRAMME

REPORT: RV CORYSTES: CRUISE 6

(PROVISIONAL: Not to be cited without prior reference to the author)

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B H Holford
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N S Page - (23-30 May)
G P Arnold - (30 May-6 June)

DURATION: 23 May-6 June

LOCALITY: Central North Sea

AIMS:

1. To use sector scanning sonar to describe patterns of vertical and horizontal movement in plaice (and cod) equipped with long-life transponding acoustic tags on their summer feeding grounds.
2. To measure tidal stream vectors with the ADCP and estimate fish swimming speed and orientation.
3. To test the telemetry tag decoder.
4. To estimate (for the Data Storage Tag programme) the survival of plaice caught by 4m beam trawl.

NARRATIVE: (all times are Greenwich Mean Time)

CORYSTES sailed at 1830 h on 23 May and proceeded overnight to the Dogger Bight to a position approximately 54° 20'N, 02° 00'E.

The morning of 24 May was spent repairing a break in the sector scanner transmitter cable. Subsequently, preliminary tests of the tag decoder were conducted (Aim 3) using a pressure sensing tag on a buff out to a range of 100 m. During the afternoon attempts were made to rectify a problem with the date/time input signal to the sector scanner. This problem was only partially corrected, nonetheless fish tracking commenced at 1920 h. A spent adult female plaice (E67 0984, plaice 1) fitted with a pressure sensing acoustic tag (P008) was released at 54° 20.26'N 01° 59.66'E. The fish was tracked until 1100 h on 26 May by which time it had remained on the sea bed for over 39 h.

Tracking was then temporarily abandoned to allow a cod, (E67 0987) equipped with a longlife transponding tag (D1), to be deployed on the sea bed in a cage in order that it might have time

(~24 h) to adjust its buoyancy prior to tracking. However, inspection with the sector scanner indicated that the cage had opened during deployment and the fish released. The cage was recovered but had sustained considerable damage, the door having been ripped off. It was not possible to track during the recovery of the cage and the cod was lost. CORYSTES subsequently steamed about 1.8 nm west to 54° 19.98'N, 01° 55.16'E, and another cod (E67 0989), equipped with a longlife transponding tag (D2), was deployed in a cage successfully. However, no tag signal could be obtained and the cage was recovered. On retesting, the tag was found to be faulty. A third cod (E67 0988) was equipped with a longlife transponding tag (D7) and deployed in a cage at 1745 h. Good tag signals were obtained. CORYSTES subsequently returned to resume tracking plaice 1 at 1830 h.

Tracking plaice 1 continued until 1100 h on 27 May, by which time this fish had remained in the same area for almost 64h, without making any excursions into midwater. The fish was abandoned and CORYSTES returned to release and track cod E67 0988 (above).

The cod cage dan was successfully recovered at 1200 h, but attempts to release the cage door failed. The cage was lifted but the cable parted when the cage reached the sea surface and the cage fell back to the sea bed. The tag signal was located with the sector scanner but it remained in the same position, without moving from the sea bed, confirming that the cod was still in the cage. Tracking ceased at 2300 h

On the morning of 28 May a successful attempt was made to recover the cod cage with the 4 m beam trawl. The sector scanner was deployed, the tag signal located and used to guide the trawl onto the target. Both the signal and the trawl could be clearly identified and the cage, together with the cod, were trawled at the first attempt. The cod was still alive and the cage was undamaged. The rest of the day was spent trawling for live plaice (Aim 4), correcting problems with the clock signal on the sector scanner, and modifying "Sextant" to give range and bearing of the target from the ship.

On the morning of 29 May an unsuccessful attempt was made to find plaice 1 which had previously been abandoned on 27 May. The search was finally abandoned at 1600 h and CORYSTES returned to Lowestoft. Staff changeover took place on the morning of 30 May by sea-rider. CORYSTES subsequently returned to the Dogger Bight and fish tracking resumed.

One of the female plaice caught during fishing on 28 May (42 cm, plaice 2, E67 0993) was equipped with a long life acoustic tag (D3) and released at 0005 h on 31 May at 54° 19.65'N, 01° 18.65'E, close to where it had been caught. Apart from a brief interlude of about 2 h on 2 June, during which tests on the tag decoder were completed, this fish was tracked continuously for 135 h until 1530 h on 5 June. The fish was finally abandoned at 54° 20.76'N 01° 18.13'E in order to return to Lowestoft.

During tracking there were numerous minor "lock ups" with the sector scanner remote tilt and azimuth microprocessor which were easily reset. In addition there were a number of major "lock ups" which required the remote tilt and azimuth microprocessor to be reset by one of the electronic engineers.

RESULTS:

1. *Fish tracking.*

Two adult female plaice were followed for periods of 64 and 135 hours. The first was equipped with a pressure sensing acoustic transponder, the second with a long-life acoustic transponder. The tags worked extremely well giving clear signals out to over 300 m. The depth profile of plaice 1 as determined from the telemetry signal (taken from scanner data, not the tag decoder) was on average 7.6 m (range 3.1 to 13 m) deeper than that determined from the range and tilt data from the sector scanner (Fig 3). The cause of this difference needs to be investigated.

Neither of the fish tracked made any prolonged excursions into midwater, moving instead for short distances close to the sea bed, with no obvious directed movements (Figs. 1 and 2). Plaice 1 moved a net distance of 3780 m in 64 h while plaice 2 moved 2446 m in 135 h. These limited results indicate that on their feeding grounds, plaice only move between about 500 to 1500 m per day.

The upgraded sector scanner display (*Systems Engineering Ltd*) was run in parallel with the current system for the entire cruise. The system performed extremely well and, apart from occasional screen "lock ups" (which were easily reset), was free of faults, giving clear, high definition colour displays of bottom topography, and tag signals were clearly identifiable out to a range of well over 300 m.

All the fish tracked were tagged, prior to the start of the cruise, with a plastic "saddle" into which the long-life acoustic tag could be fitted. These worked well, there were relatively few problems due to poor tag signals, and none of the tracks was terminated as a result of the fish being lost.

No cod were tracked because of the problems encountered when releasing fish from cages.

This was the first occasion in which the sector scanner had been used for fish tracking since the hydraulics package had been modified by the workshop so as to eliminate the need for slip rings (a source of scanner problems in the past). The scanner performed extremely well for the entire cruise and there was no evidence of any problems with the hydraulics.

2. ADCP measurement of tidal stream vectors.

Measurements of the speed and direction of the tidal streams were made with the ADCP for long periods during the tracks of these fish. Acoustic interference on the sonar was apparent at all times but rarely made tracking difficult. However, since neither fish came into midwater for prolonged periods, no meaningful estimates of swimming speed or orientation could be made.

3. Telemetry tag decoder.

The decoder was tested both with pressure tags tied at set depths (20 & 40 m) to a buff floated away from the ship, and with the pressure tag attached to plaice 1. Buff tests were performed using only one transmitter module to minimise background noise.

In buff tests the range of the reference pulse was usually decoded accurately (generally to within 1 or 2 m) out to 270 m (Table 1). The telemetry pulse was regularly, although intermittently, decoded out to a range of no more than 110 m. However the depth values derived from the decoder were considerably different from the depth as determined from the sector scanner and there appears to be some error in the conversion from the delay between the reference and telemetry pulses to depth. At ranges greater than 110 m no telemetry pulse was decoded at all.

With the pressure sensing tag attached to a free ranging plaice no depth values were decoded at any range.

4. Estimate (for the Data Storage Tag programme) the survival of plaice caught by 4m beam trawl.

A total of 207 plaice was caught in twenty six, 15 minute, tows with the 4 m beam trawl. One hundred and eighteen of these fish >30 cm, and which appeared to be relatively undamaged, were kept for survival analysis, 19 of these were >40 cm. Of the 87 fish discarded, 58 were under 30 cm. By the time of docking (0700 h, 6 June) 24 of the 120 retained plaice had died, representing a mortality of 20%.

J D Metcalfe
5 June 1994

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FIGURE CAPTIONS:

Table 1. Tag decoder test results.

Figure 1. The ground track of plaice 1 (44 cm, Petersen tag No. E67 0984) which moved across the sea bed a net distance of 3780 m in 64 h.

Figure 2. The ground track of plaice 2 (42 cm, Petersen tag No. E67 0993) which moved across the sea bed a net distance of 2446 m in 135 h.

Figure 3. The vertical track (7 point running mean) of plaice 1 (equipped with a pressure sensing transponding acoustic tag) as determined from sector scanner range and tilt (——) and as determined from the telemetry signal from the pressure tag (- - - -).

Table 1

RV CORYSTYES, 2 June 1994.								
Depths telemetered from pressure sensing acoustic transponder P014 as determined by the sector scanner and by the tag decoder.								
	'-----Sector scanner-----'			Set	'----- Tag decoder -----'			
Time	Range (m)	Delay (ms)#	Depth (m)\$	depth (m)	Depth (m)	psi	Range (m)	D range
12 50 16	78	50	18.71	20	58.5	99.78	77	1
13 00 58	74	50	18.71	20	55.97	96.1	74	0
13 01 33	80	50	18.71	20	60.58*	103.01*	80*	0
13 03 40	80	50	18.71	20	62.04	104.94	81	-1
13 07 33	103	50	18.71	20	82.9	135.36	103	0
13 09 30	111	50	18.71	20	90.34	146.21	110	1
13 16 40	146	50	18.71	20			145	1
13 19 06	156	50	18.71	20			155	1
13 24 52	188	52	20.16	20			187	1
13 27 54	220	52	20.16	20			219	1
13 31 12	261	50	18.71	20			259	2
13 34 25	289	50	18.71	20			273	16
13 54 08	79	78	38.93	40	43.84	78.42	60	19
14 03 38	116	74	36.04	40	94.17	151.78	114	2
$\$ '=(((\text{delay} * 2) - 20.61) / 1.9) - 14.5) / 1.4579$								
# "Delay" refers to the delay in ms recoder between the reference and the telemetry pulses								
* are averages of 3 values								
"D range" is the difference between the sector scanner and decoder values for tag range								

Fig. 1

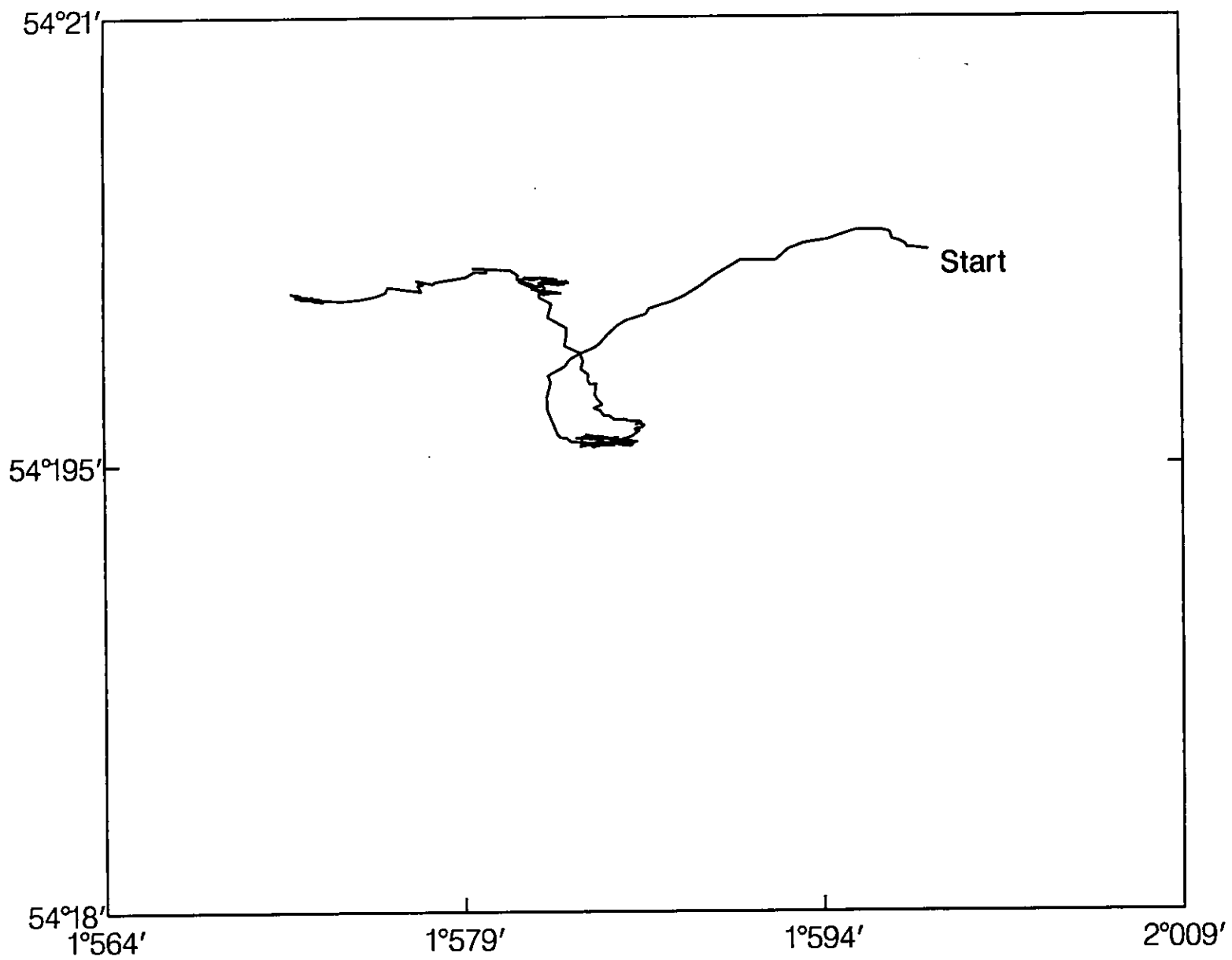


Fig. 2

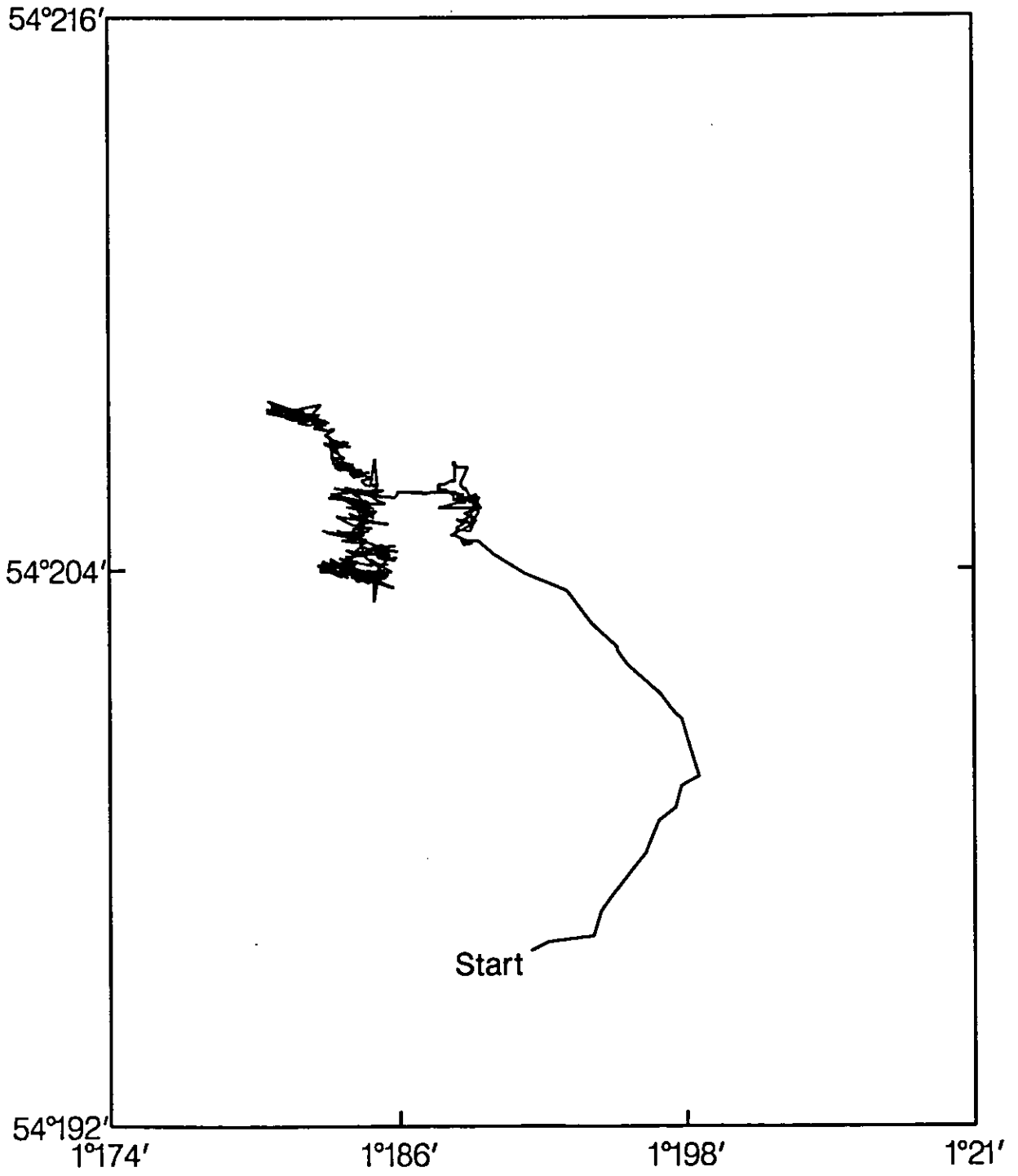


Fig. 3

