MINISTRY OF AGRICULTURE, FISHERIES & FOOD
FISHERIES LABORATORY, LOWESTOFT, SUFFOLK NR33 0HT, ENGLAND

1996 RESEARCH VESSEL PROGRAMME

REPORT: RV CIROLANA : CRUISE 4b

STAFF:

Dr J Brown
Mr S Milligan (11 - 23 April)
Dr D Mills (11 - 23 April)
Mr L Woolner
Miss R Harrop
Mrs A Winpenny
Miss M Angelico (UCNW) (11 - 23 April)
Mr P King
Mr J Read (11-15 April)
Mrs A Reeve
Mr R Head (PML)
Mr L Fernand

(PML - Plymouth Marine Laboratory)
(UCNW - University College of North Wales)

DURATION: 12 - 26 April

LOCALITY: Irish Sea and Bristol Channel (Fig. 1 & 6)

AIMS:

1. To carry out SCANFISH trials and a survey of the NW Irish Sea and, if time and weather permit, extend this out to the Malin Shelf.

2. To collect simultaneous OPC (optical plankton counter) and net samples of plankton for comparison of size spectra.

3. To carry out a TTN (Tin Tow Net) grid of the NW Irish Sea.

4. To estimate primary and secondary production rates in different domains.

5. To maintain continuous records of T, S, chlorophyll and measure surface nutrient levels.

6. To deploy instruments at DANI mooring Station 45 (NW Irish Sea)

7. To recover ARGOS buoys deployed during the previous half of the cruise.

SUPPLEMENTARY AIM:

8. Following the Sea Empress oil spill, complete a TTN grid south from Milford Haven and across the Bristol Channel to provide an indication of egg and larvae distributions and enable comparison with previous years.

NARRATIVE: (All times GMT)

RV CIROLANA sailed, in deteriorating weather, from Liverpool at 0800 (12 April) for the western Irish Sea. The time until 13 April was spent sheltering in the lee of the Isle of Man from strong south-easterly gales, setting the tone for much of the first part of the cruise. The period was spent rectifying a number of equipment faults, not least of which was a complete inability to network any computer, thereby preventing data logging for 30 hours. With the majority of problems resolved and a partial respite in the weather, a line of TTN stations was occupied west of the Isle of Man (Fig. 2; Stns 2 - 6). Having completed these trials, a toroid buoy and anchor chain previously deployed by DANI were recovered (0900 14 April) (Fig. 1; Stn 45). By the end of the operation a freshening wind halted work until late afternoon when a 'U' shaped mooring with current meters, Fluorometer and transmissometer were deployed to complement instrumentation on a neighbouring DANI mooring.

Mr Read was put ashore at Port Erin on the morning of 15 April and a number of items of equipment collected. In the shelter of the Isle of Man, SCANFISH mounted with OPC was deployed and a trial line made westward to the Irish coast (Fig. 3; 12). After recovery, all appeared well and a grid was started (1800 15 April). Work continued, the central portion in rough weather, until 0900 17 April when it was halted to exchange crew members in Holyhead. A line of CTD's was occupied west from Anglesey (Fig. 4), before sheltering off the Irish coast from strong south-westerly winds. By midday 18 April conditions had improved sufficiently to commence TTN surveys close to the Irish coast. Work continued further offshore as the sea state improved, eventually allowing deployment of the LHPR (Longhurst Hardy Plankton Recorder) mounted with OPC (0800 19 April). Three stations (Fig. 4) had been identified during the SCANFISH surveys as suitable locations, each being occupied three times during the following 28 hours. Between deployments the opportunity was taken to make a CTD cast for ship board measurements of the rates of photosynthesis and respiration (0400 24 April).

Subsequently, two ARGOS buoys were retrieved east of the Isle of Man (Fig. 5) on passage to the start (2300 20 April) of the TTN grid (Fig. 2). This was to occupy the remainder of the scientific work, but unexpectedly, and within hours of our planned departure for Lowestoft, instructions were received to undertake an additional TTN survey south from Milford Haven (Fig. 6). Mr Milligan, Dr Mills and Miss Angelico were put ashore in Holyhead (1100 23 April). The supplementary TTN grid was started at 0700 24 April in good conditions and finished at 0200 25 April at which point RV CIROLANA sailed for Lowestoft.

Throughout the programme Mr Head collected mesozooplankton (200-2000 µm size range) samples for analysis of ATCase (Aspartic tricarboxylase) levels as an indicator of secondary production (Fig. 7 for positions). Additionally, samples of seawater particulates were collected to provide further sea truth data for the PML model (developed in conjunction with MAFF) which is directed at an understanding of plankton abundance and copepod production and the relationship with physical conditions.

RESULTS (Preliminary):

1. This was the second occasion on which the SCANFISH mounted with the OPC was used, and the first with the OPC and new SCANFISH body. Since the last deployment of SCANFISH (Corystes 10/95) the rather unreliable Tritech altimeter has been replaced. The instrument package performed well, reaching a maximum depth of 118 m with approximately 550 m of cable deployed. The replacement altimeter is a vast improvement on its predecessor, giving reliable indication of height above the bed when within 30 m. The instrument now appears to handle well in the water with little roll. At times the sea state was Force 7, yet towing presented little problem, although recovery without damage would have been impossible. After recovery (0900 17 April), the pressure compensation bladder associated with the conductivity cell on the FSI CTD was found to have lost oil. To prevent ultimate ingress of water SCANFISH work with the FSI had to be halted. Apparently this is a flaw in the instrument, with the same fault currently being repaired on the other FSI. Further poor weather and the need to fulfil other cruise aims prevented redeployment of SCANFISH, although without the FSI quality of salinity data would have been low owing to the inadequacies of the GMI CTD sensor.

   The data indicated the presence of salinity dominated stratification in the western portion of the region (Fig. 8). Here the upper water column was associated with increased levels of fluorescence.

   Time lost to poor weather prevented work on the Malin Shelf.

2. Following the SCANFISH/OPC survey, three stations east of Dundalk Bay (Fig. 4) were chosen for joint LHPR and OPC deployments. The shallower (~40 m) inshore station demonstrated a near bed maximum in particles, whilst at the others there was a pycnocline at approximately 20 m and a near surface fluorescence maximum. All three stations were sampled in daylight and after dark. Stations chosen offered a suitable vertical contrast in particle densities, over which the OPC data can be compared in descrete intervals with plankton samples from the LHPR. Comparisons await analysis of the plankton samples at Lowestoft.

3. The majority of the planned Tin Tow stations were occupied. A number were dropped on the eastern and southern fringes owing to delays imposed by poor weather part way through the grid. Quantities of plankton were high in the vicinity of Dundalk Bay. Analysis awaits the return to Lowestoft.

4. Phytoplankton biomass was regularly determined from water samples drawn from the ship's underway pumped seawater system and from the CTD rosette bottles. Further information on the horizontal and vertical distribution of chlorophyll fluorescence was determined from SCANFISH tows. Shipboard measurements of the rates of photosynthesis and respiration obtained using a simulated *in situ* technique will be combined with the data on chlorophyll concentration, surface solar radiation and the sub-surface light regime to provide large scale estimates of primary production for the study area. Rates of microplankton community respiration ranged from close to zero to 0.075 $\mu molO_2\ l^{-1}\ h^{-1}$ with maximum light saturated rates of photosynthesis of up to 1.1 $\mu molO_2\ l^{-1}\ h^{-1}$. These results suggest an actively growing phytoplankton population with little loss due to respiration.

Water samples were collected and preserved for subsequent microscopic examination in the lab.. However, some samples were examined on board and the dominant phytoplankton species identified. There was evidence that the spring bloom had begun in the central and western parts of the study area. High levels of chlorophyll (up to 12 mg m^{-3}) were recorded in conjunction with surface depletion of nutrients and the species composition revealed the classic picture of a diatom dominated spring bloom. From the preliminary examination diatoms dominated the microplankton biomass with the chain forming diatom Thalassiosira decipans dominant in the 4 samples examined. Other species of diatoms recorded included *Chaetocerus* (numerous spp.) *Lauderia, Nitzschia, Bidulphia, Coscinodiscus, Rhizoselenia, Thalassionema* and *Asterionella,* with various species of *Paralia sulcata* and *Bacillaria paradoxa.* Dinoflagellates included several *Ceratium* species, *Peridinium* and other small and as yet unidentified forms. Several species of flagellates were also observed.

Size fractionated biomass, as chlorophyll, was determined in the Irish coastal waters by gently filtering seawater through a range of filters with pore sizes ranging from 20 to 2μm. More than 95% of chlorophyll was retained by the 20 μm filter which confirms with the view that large cells are likely to dominate when nitrate rather than ammonia is available to support algal growth.

Twenty samples were taken for ATCase analysis (Fig. 7) in regimes varying from the productive areas off the Irish coast adjacent to Dundalk Bay, where high numbers of mesozooplankton were seen, to the unproductive areas off Anglesey with low concentrations of mesozooplankton. As in previous years, the larger species of zooplankton e.g. *Calanus* sp. were only observed on the western side of the Irish Sea. On the eastern side no large copepod species were observed, but smaller species were found to be dominant. Some repeat sampling was carried out on the west of the Irish sea in conjunction with LHPR studies.

More than 70 surface (3 m) samples for seawater particulates were taken for chlorophyll and particulate carbon/nitrogen. Samples for seawater particulates and phytoplankton species were also taken from stations where net samples for mesozooplankton were taken. A number of repeat samplings were carried out to assist development of the PML model.

5. The continuous flow system was used to make along track near surface measurements of temperature, salinity and fluorescence throughout the cruise. Samples were regularly drawn off for calibration of salinity and fluorescence and the analysis of nutrients. The quality of the continuously logged data was degraded somewhat as an error introduced by recent alterations to the logging programme rendered the option of averaging readings unusable.

6. Instruments (fluorometer, current meters and transmissometer) were successfully deployed alongside the DANI mooring in the western Irish Sea (Fig. 1; Stn 45). The latter was mounted with automatic water samplers designed to measure phytoplankton biomass, species composition and nutrients. The suite of instruments are intended for continual monitoring of the temporal variation of microplankton community structure in relation to physico-chemical environment.

7. Two ARGOS buoys (24019 and 24022; Fig. 5) were recovered having consistently moved north from their deployment locations. Of the other two, one (24059) ceased transmitting, whilst poor weather at the end of the cruise meant recovery of the other (24058) will be left to RV PRINCE MADOG. The further west buoys were deployed the more incipient and incoherent the sense of circulation. Experience suggests that buoy recovery from Cirolana will be difficult in all but the most favourable conditions.

8. The supplementary TTN grid was completed successfully with samples containing fish eggs and larvae. Analysis awaits the return to Lowestoft.

Despite approximately 2½ days of down time because of poor weather and one days delay in sailing, the original the aims of the cruise were met. This would not have been possible without the enthusiasm and expertise of the ships crew.

Juan Brown
(Scientist-in-Charge)
25 April 1996

SEEN IN DRAFT:

M.J. Willcock (Master)
R.F. Graham (Senior Fishing Mate)

INITIALLED: GPA

DISTRIBUTION:
BASIC LIST+

Dr J Brown x 5
Dr D Mills
Miss R Harrop
Mr L Fernand
Mr P King
Dr K Brander
Mr S Milligan
Mr L Woolner
Mrs A Winpenney
Mrs A Reeve
Mr J Read
Dr J Campbell

Fig. 1

Cirolana 4b/96

Location chart

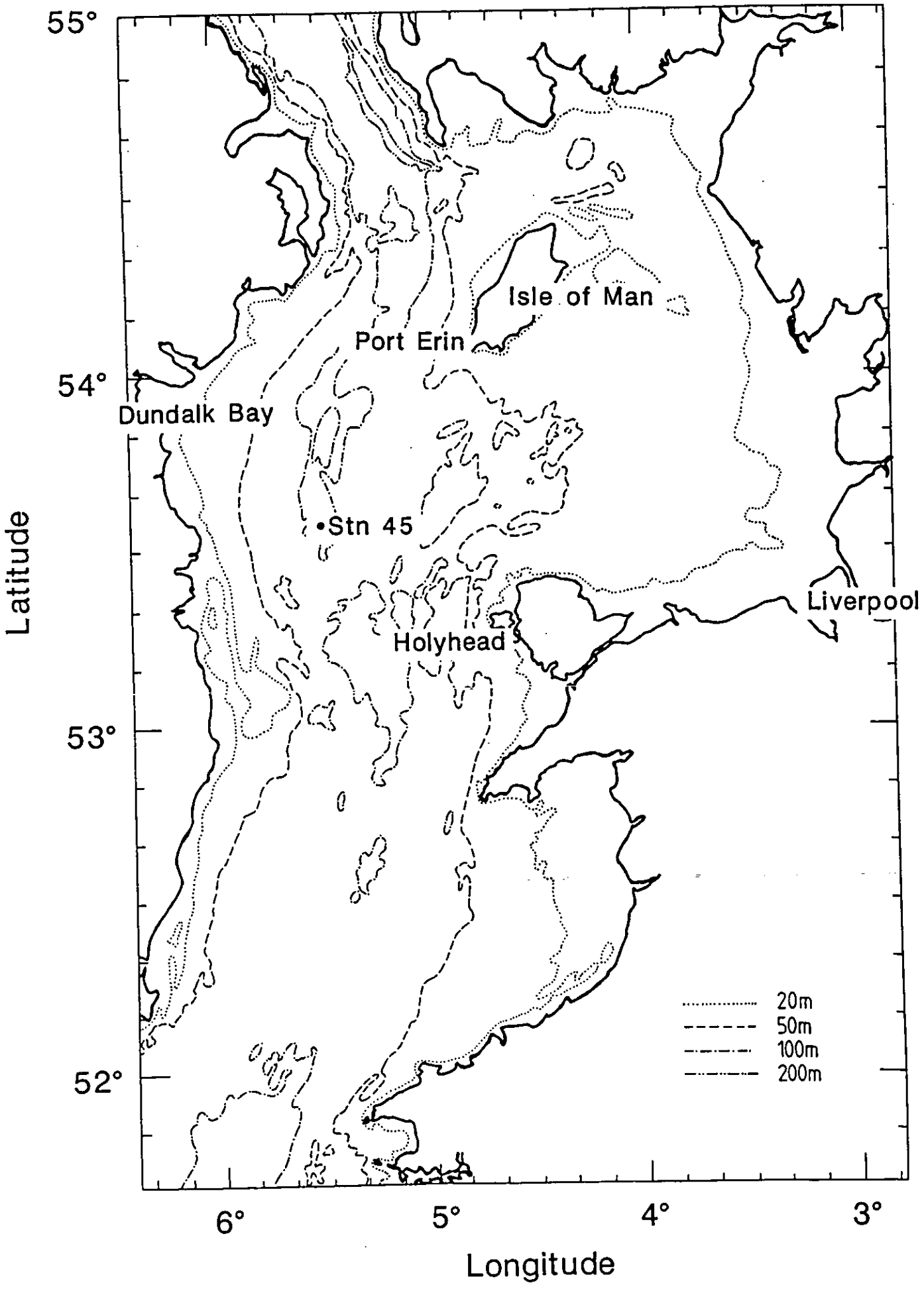

Fig. 2

Cirolana 4b/96

TTN station positions

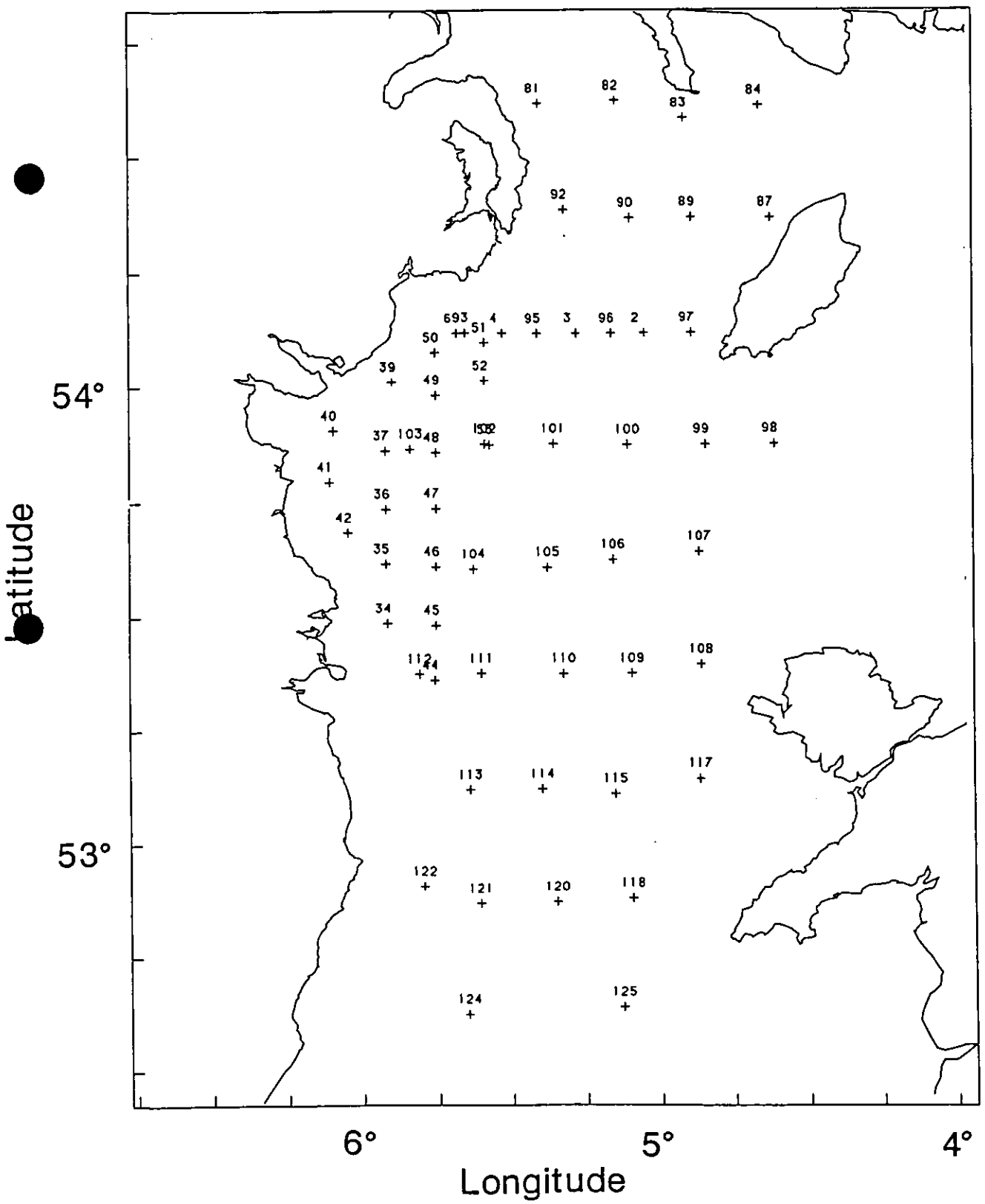

Fig. 3

Cirolana 4b/96

Scanfish survey legs

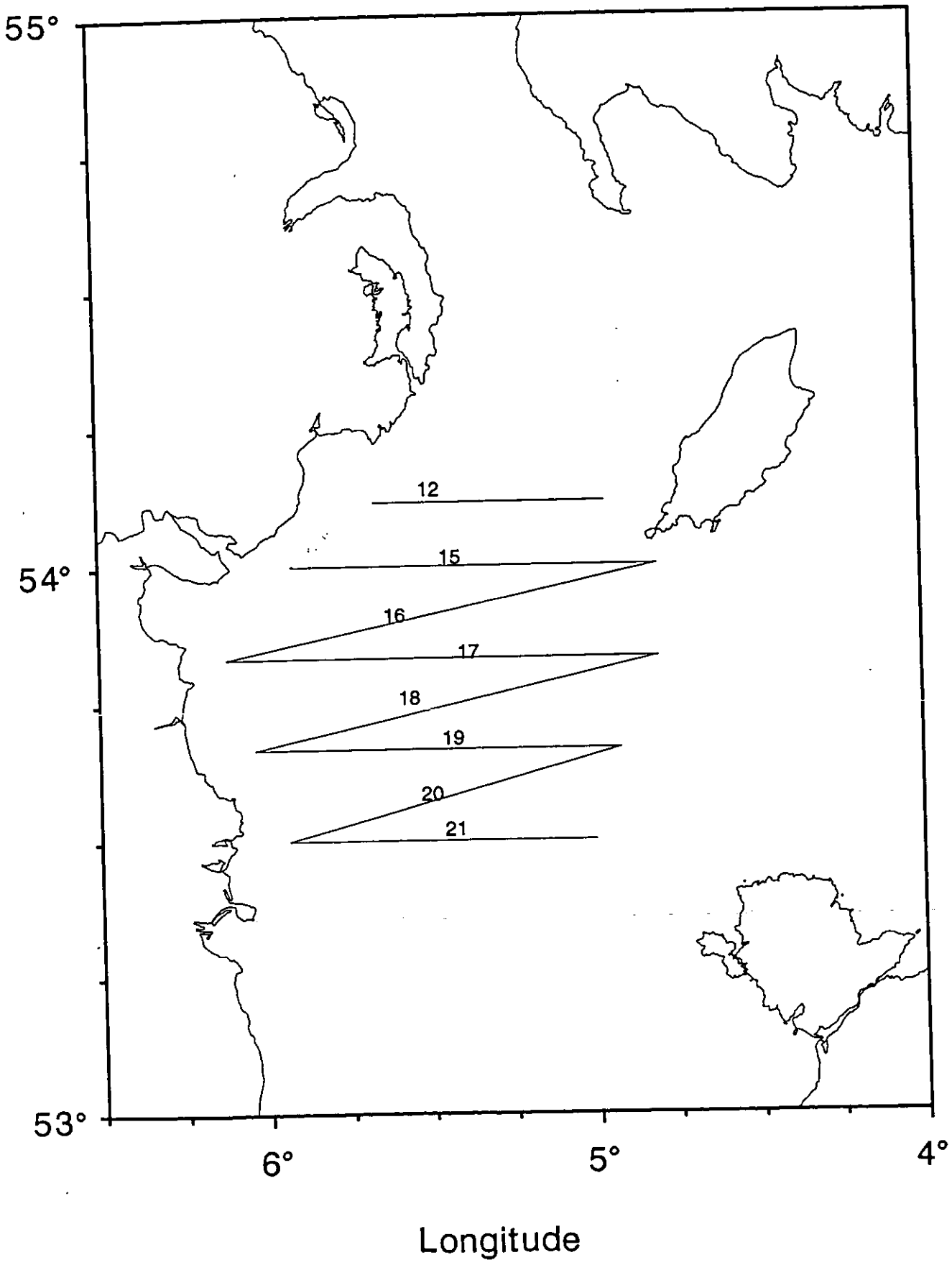

Fig. 4

Cirolana 4b/96

+ CTD station positions

• LHPR and OPC station positions

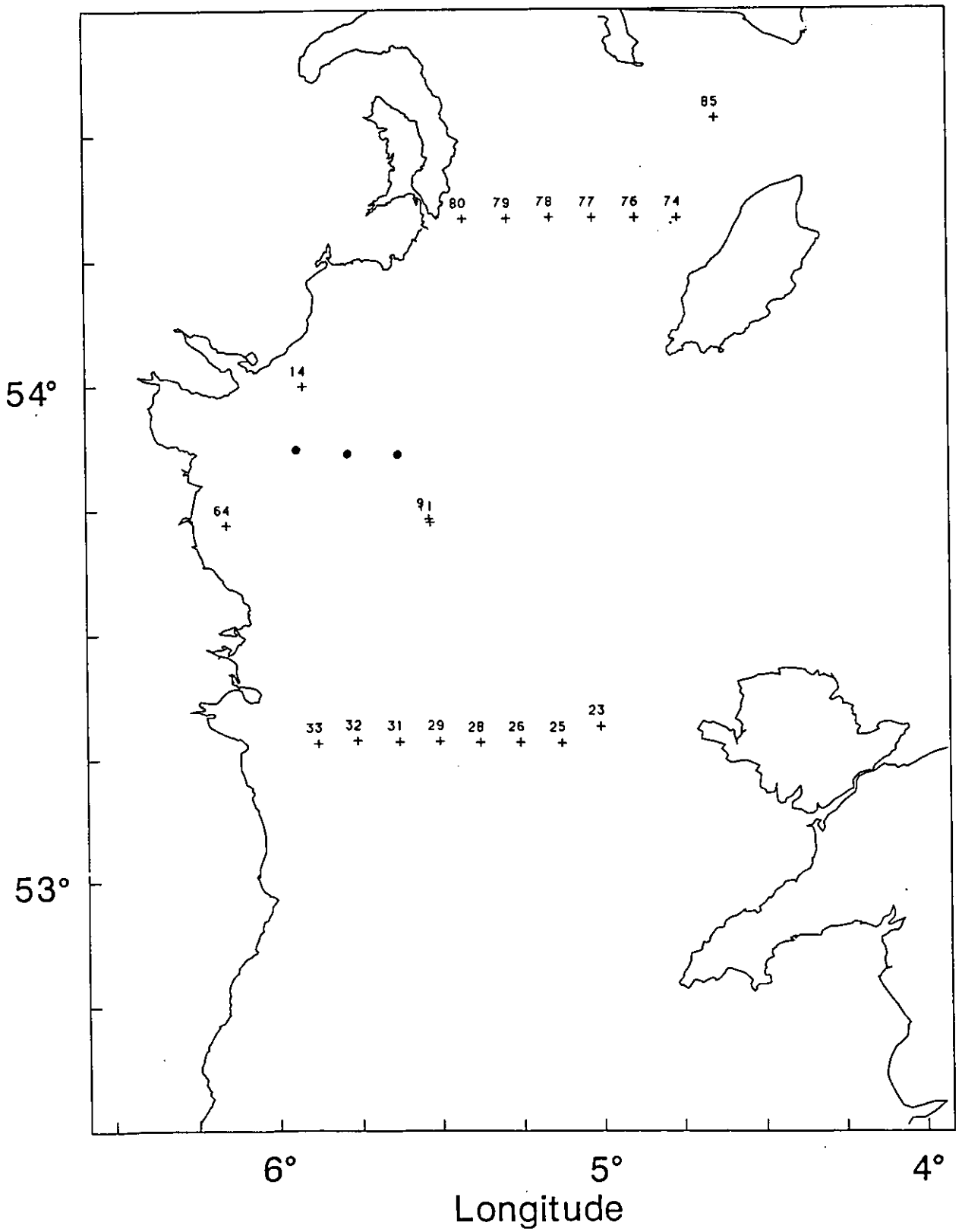

Fig. 5

Cirolana 4b/96

ARGOS buoy tracks

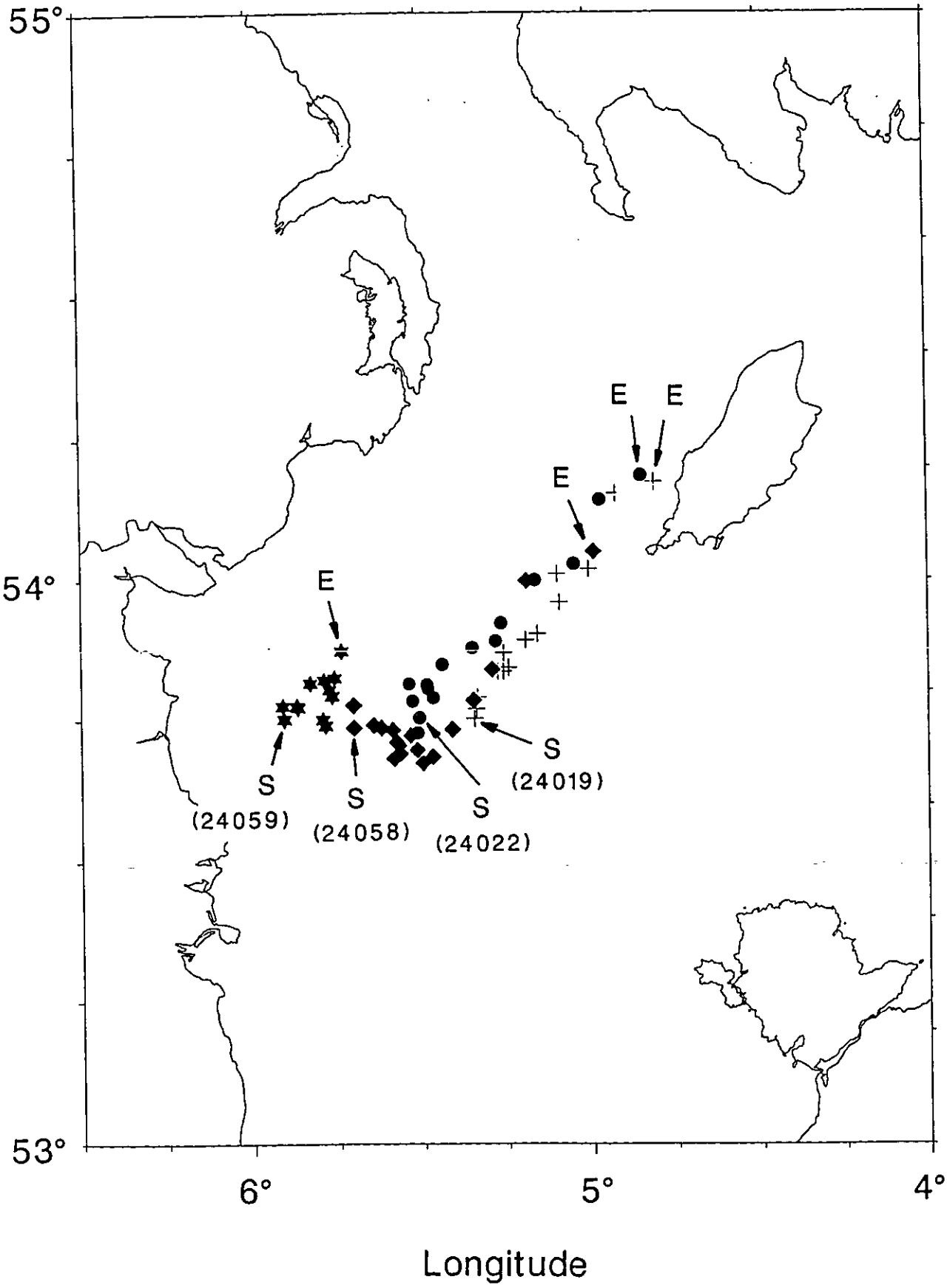

Fig. 6

Cirolana 4b/96

Supplementary TTN station positions

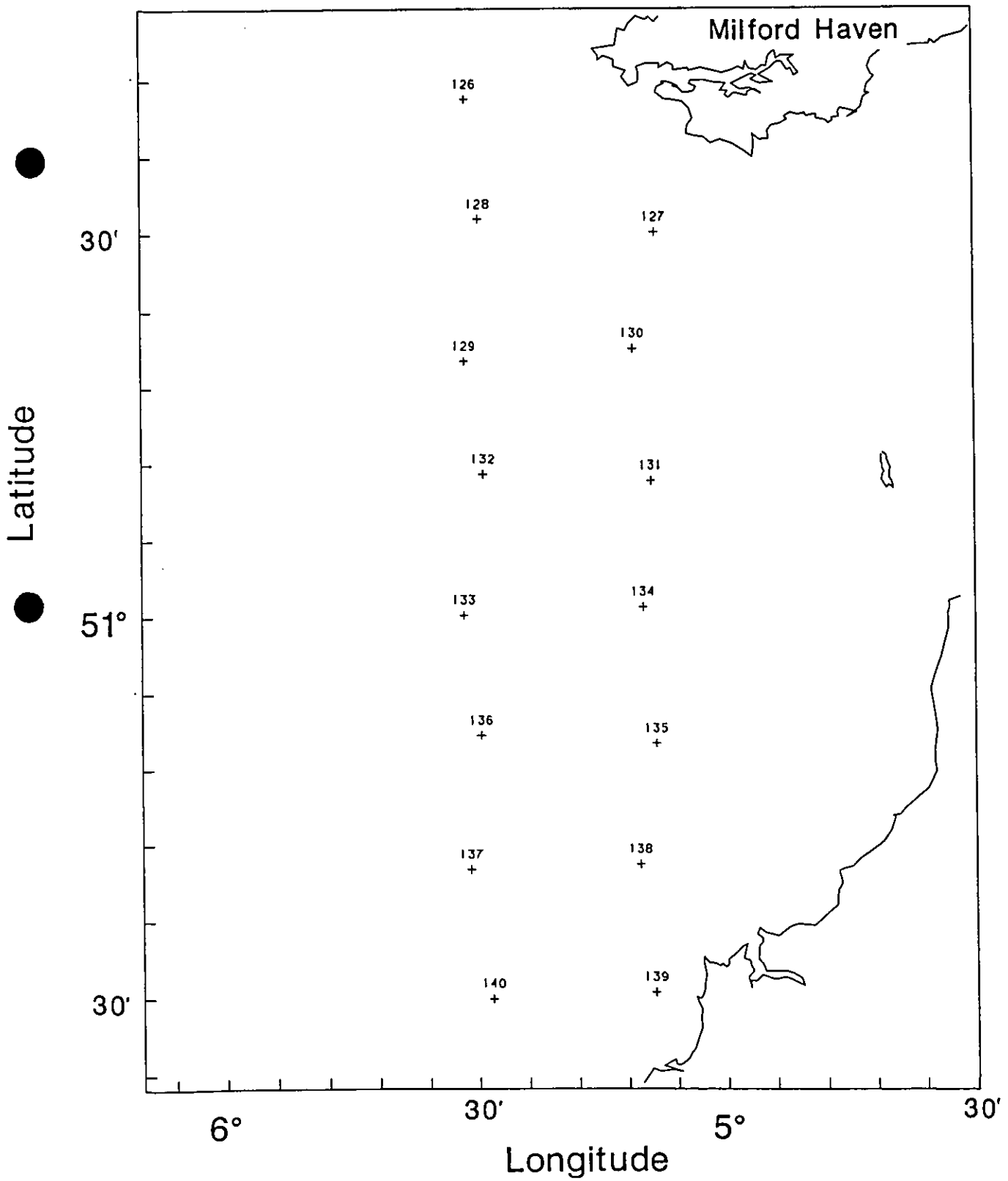

Fig. 7

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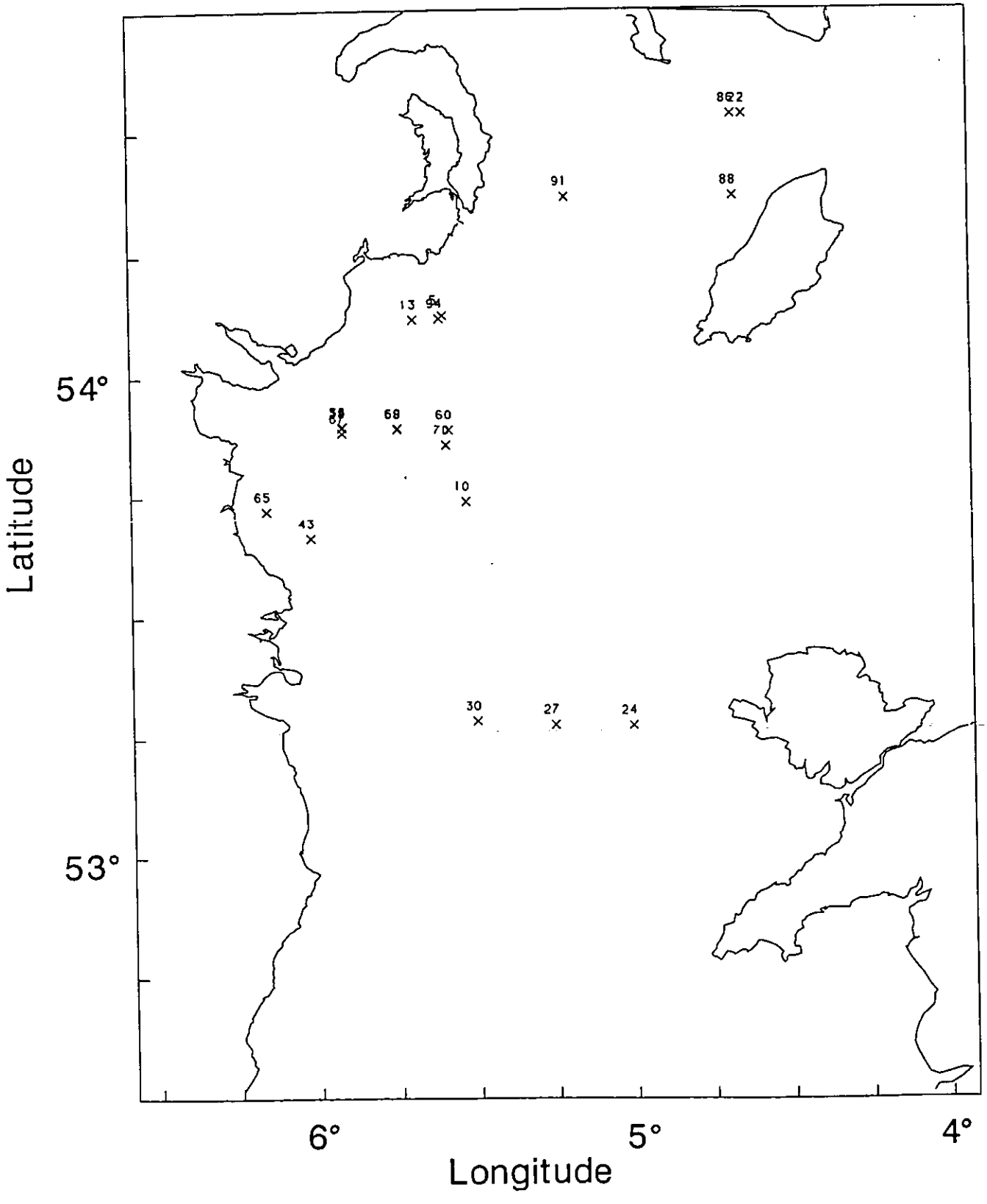
ATCase station positions



Cirolana 4b/96

Fig. 8