Northwest Atlantic Fisheries Organization

Serial No. N2742 NAFO SCR Doc. 96/66

SCIENTIFIC COUNCIL MEETING - JUNE 1996

Tracking Movements of Juvenile Yellowtail Flounder in the Nursery Area on the Southern Grand Bank, NAFO Divisions 3LNO

by

M. J. Morgan and S. J. Walsh

Dept. of Fisheries and Oceans, P. O. Box 5667
St. John's, Newfoundland, Canada A1C 5X1

Abstract

Tag returns of juvenile yellowtail flounder were analyzed to examine movement in the nursery area of the Grand Bank stock. Juveniles are relatively sedentary moving an average of 29 nm in 384 free days. This implies that there are low transport rates out of the nursery area which is a major requirement to introducing year round closure as a technical measure to protect the juveniles from over-exploitation.

Introduction

Yellowtail flounder, *Pleuronectes ferruginea*, inhabits the continental shelf of the Northwestern Atlantic Ocean from Labrador to Chesapeake Bay at depths of 10-100 m, (Bigelow and Schroeder 1953). This species has reached its northern limit in commercial concentrations on the Grand Bank off the coast of Newfoundland (Walsh 1992). Here, juveniles and adults overlap considerably in their distribution and are generally concentrated on the southern Grand Bank, in and around the Southeast Shoal.

Earlier observations from tagging studies of yellowtail, 26 to 49 cm, from the northern region of the Southeast Shoal suggest that southern Grand Bank yellowtail flounder make limited movements from their release sites (Walsh 1987). This confirmed earlier studies of movements of adult yellowtail tagged on the New England fishing grounds (Royce et al. 1959; Lux 1993).

The Southeast Shoal area is an oceanic nursery area for the entire yellowatil flounder stock on the Grand Bank (Walsh 1992). Because this nursery area is mainly outside the Canadian 200 mile limit in the NAFO Regulatory Area it has been subjected to heavy fishing pressure by many non-Canadian fleets fishing in the Regulatory Area and the catches of juveniles have comprised the bulk of catches in these fisheries (Walsh 1991). Prior to the closure of the yellowtail fishery in 1994, there was a conflicting fishery taking place for juveniles outside the 200 mile limit and adults inside the 200 mile limit. In an effort to conserve and rebuild the stock, a permanent closure of the juvenile nursery area has been proposed as a management measure to reduce exploitation of juveniles and enhance stock recovery (Walsh et al. 1995; Brodie 1996).

This paper examines the movement of juvenile yellowtail flounder in the nursery area from tag returns of fish release inside and outside the 200 mile limit.

Materials and Methods

Yellowtail flounder were tagged and released in the area of the tail of the Grand Bank in NAFO Div. 3LNO during four research vessel trips from 1990 to 1993. Fish were captured using a Yankee 41 shrimp trawl which was towed for 15 minutes at a speed of 3.5 knots. Fish were placed in holding tanks and subsequently measured (total length) and tagged. Only fish between 15 and 35 cm were tagged so that mainly juveniles were released. Any fish with excessive bruising or scale loss were not tagged. The fish were returned to a holding tank after tagging and held until the release position was reached. There were 9 release positions, 6 inside Canada's 200 mile limit and 3 outside the 200 mile limit, i.e. in the Regulatory Area. The release positions as well as the number of fish released are given in Table 1 the positions are also shown in Figure 1. Only the releases of Petersen discs are shown. In 1990, 132 fish were also tagged with operculum dangler tags but none of these fish were returned. A total of 9379 fish with Petersen discs were released, 6861 inside of the 200 mile limit and 2518 in the Regulatory Area.

When tags were returned the information was entered into a database and a $20 reward sent to the person returning the tag. From this information, return position, days free, distance and direction travelled were calculated. Return positions were plotted for each release position separately, for release positions inside or outside the 200 mile limit and for fish returned up to 1 year following release, from more than 1 to 2 years following release and for more than 2 years following release.

Results

A total of 240 yellowtail flounder were returned or 2.6% of the number released. Of these 104 or 43.3% were returned by Canadian fishers. Figure 2 shows the return positions for each of the release positions separately. The greatest number of days free was 1236 and the farthest distance travelled was 122.6 nautical miles. The mean number of days free was 384.8 $\pm$ 22.5 days ($x \pm$ std err) and the mean distance travelled was 29.0 $\pm$ 1.6 nm. The location of returns were most frequently in a direction west, northwest or north of the release positions (direction relative to true north), although there were returns from all compass positions (Fig 3). There was a tendency for the fish to spread out from the release positions particularly after more than a year free but there was also substantial persistence in the area of release (Fig. 4) even among those that were not recovered for more than 2 years after release from the area of the Tail of the Bank.

For those yellowtail released inside the 200 mile limit 46.3% of the returns came from outside of the 200 mile limit (Fig 5). For yellowtail released outside of the 200 mile limit 93.9% of the returns were from outside the 200 mile limit in the Regulatory Area (Fig 6).

Discussion

The success of introducing a permanent area closure as a technical measure to protect a particular life stage from exploitation depends heavily on low transport rates, i.e. movement out of the area (Polacheck 1993). Although the tag returns were low, the results nevertheless confirm earlier observations about the movement of juveniles in the nursey area. In the resource assessment of this stock, the 1985 year class was the largest cohort in the 1980's (Brodie et al. 1994). By tracking the movement of this cohort as it grows older, we see that there there is persistence to stay in the nursery area, outside the 200 mile limit, with some dispersion occurring to the north and northwest as the fish became adults (Fig. 7). On the southern Grand Bank there is a southeast to northwest change in bottom type with an accompanying change in concentrations of juveniles (Walsh 1992). This implies low transport rates out of the nusery area sandy habitat. Similarily American plaice, tagged in the same area, show fidelity to the their nursery area in the Regulatory Area (Morgan 1996).

Acknowledgements

We thank the many technical staff and ships crew that were involved in the tagging of these fish. Lorene Tuck, R. Ennis and L. Mansfield handled the returns. Special thanks to D. Stansbury for SAS code for determinin direction, distance and days free.

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Table 1. Release positions and number fish released for juvenile yellowtail flounder tagged from 1990 to 1993.

Position	Latitude °N	Longitude °W	Number
1	4345	5125	13
2	4331	5047	108
3	4404	5030	1894
4	4340	5104	253
5	4400	5025	2537
6	4353	5040	1304
7	4344	4952	1409
8	4340	5030	1001
9	4353	5050	860
Total			9379

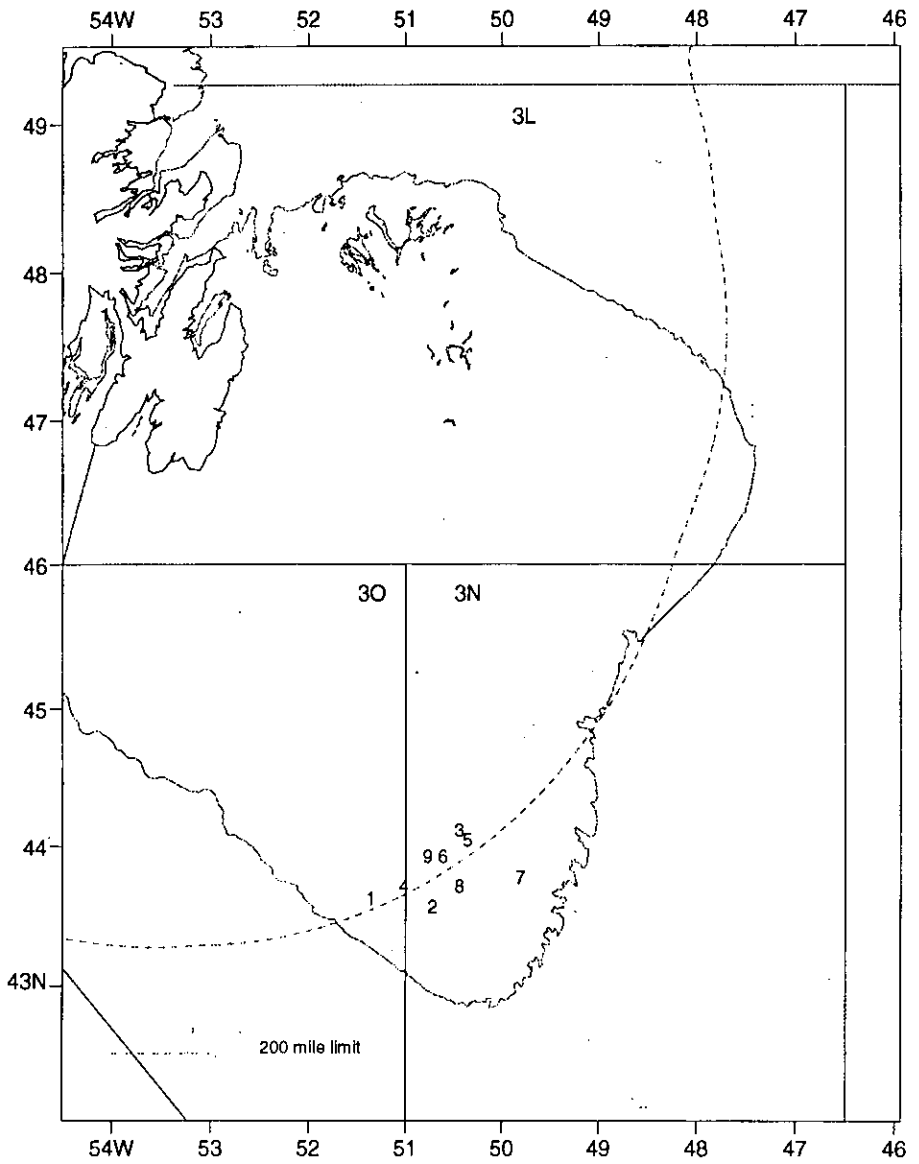

Figure 1 Release positions of juvenile yellowtail flounder.

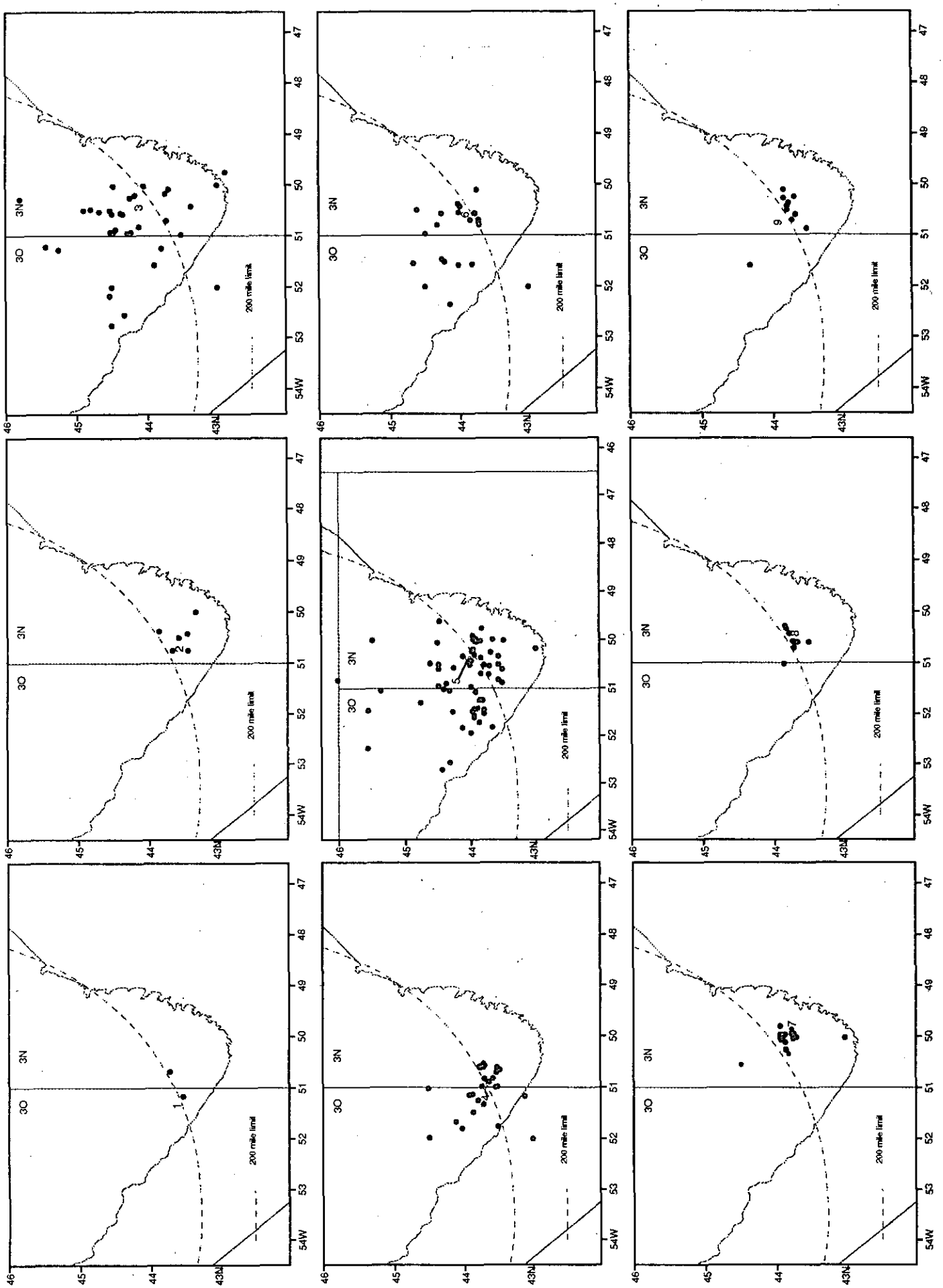

Figure 2 Returns of juvenile yellowtail flounder from each of nine release positions near Canada's 200 mile limit.

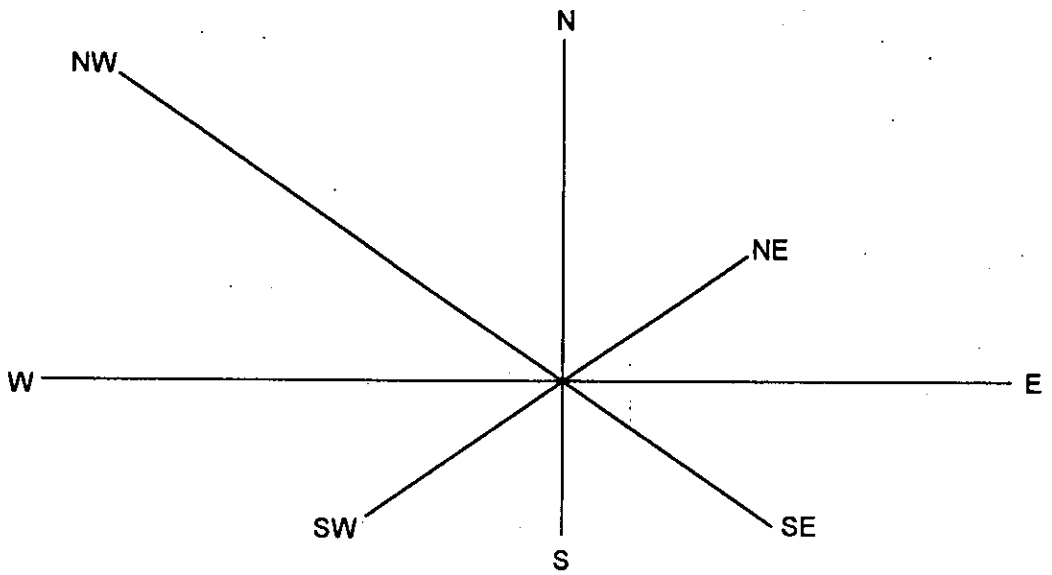

Figure 3 Frequency of direction of recapture position relative to release position for juvenile yellowtail. Direction is relative to true north. Length of an arm indicates the frequency.

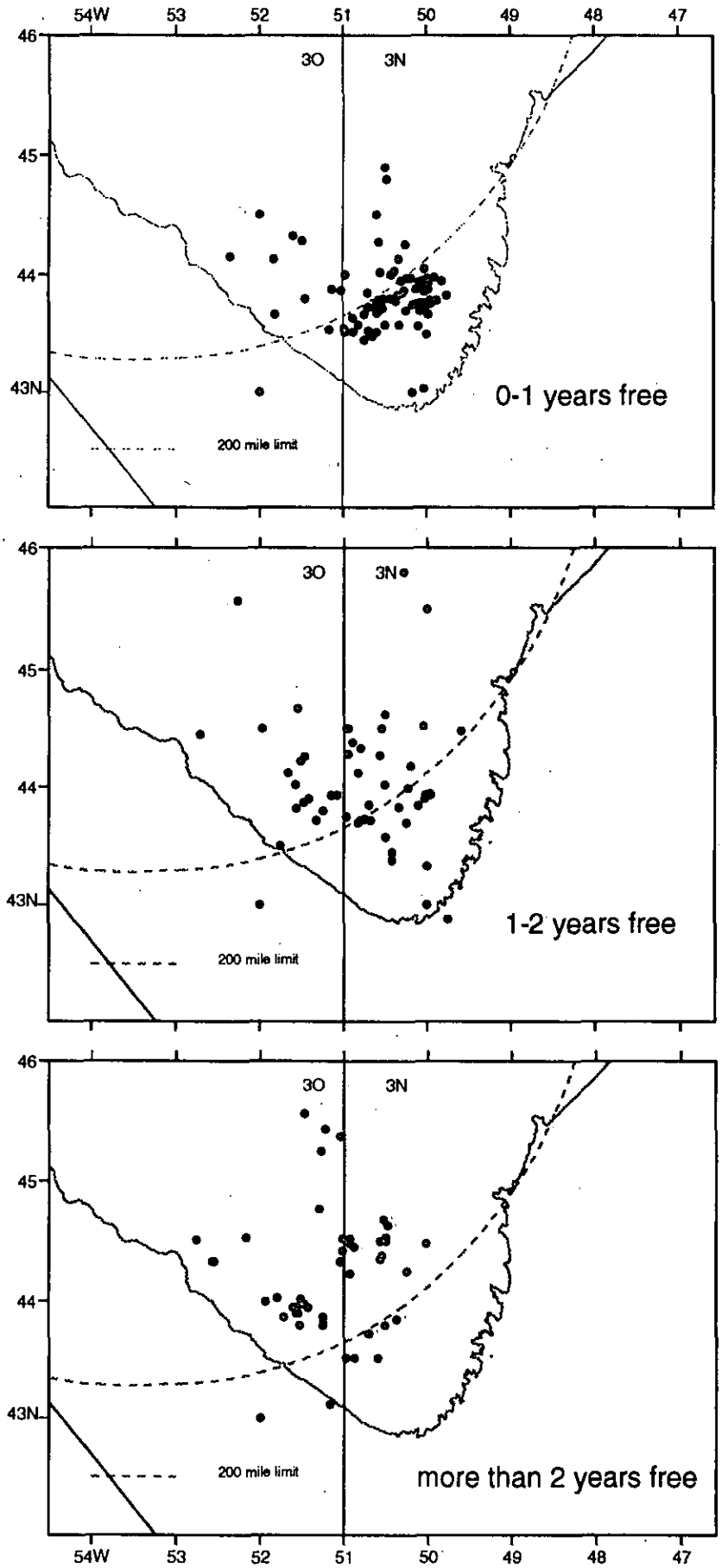

Figure 4 Returns of juvenile yellowtail from differing periods after release.

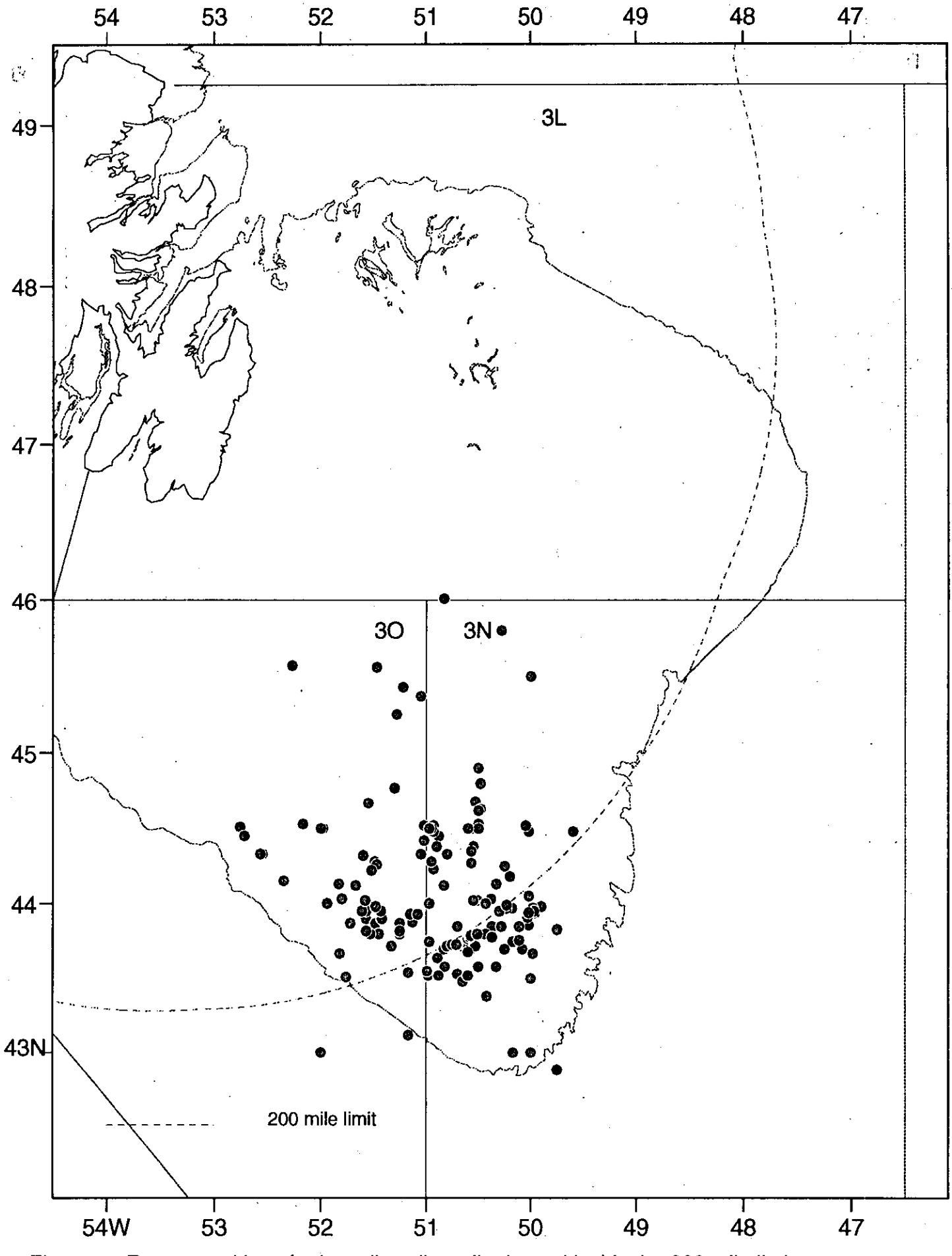

Figure 5 . Return positions for juvenile yellowtail released inside the 200 mile limit.

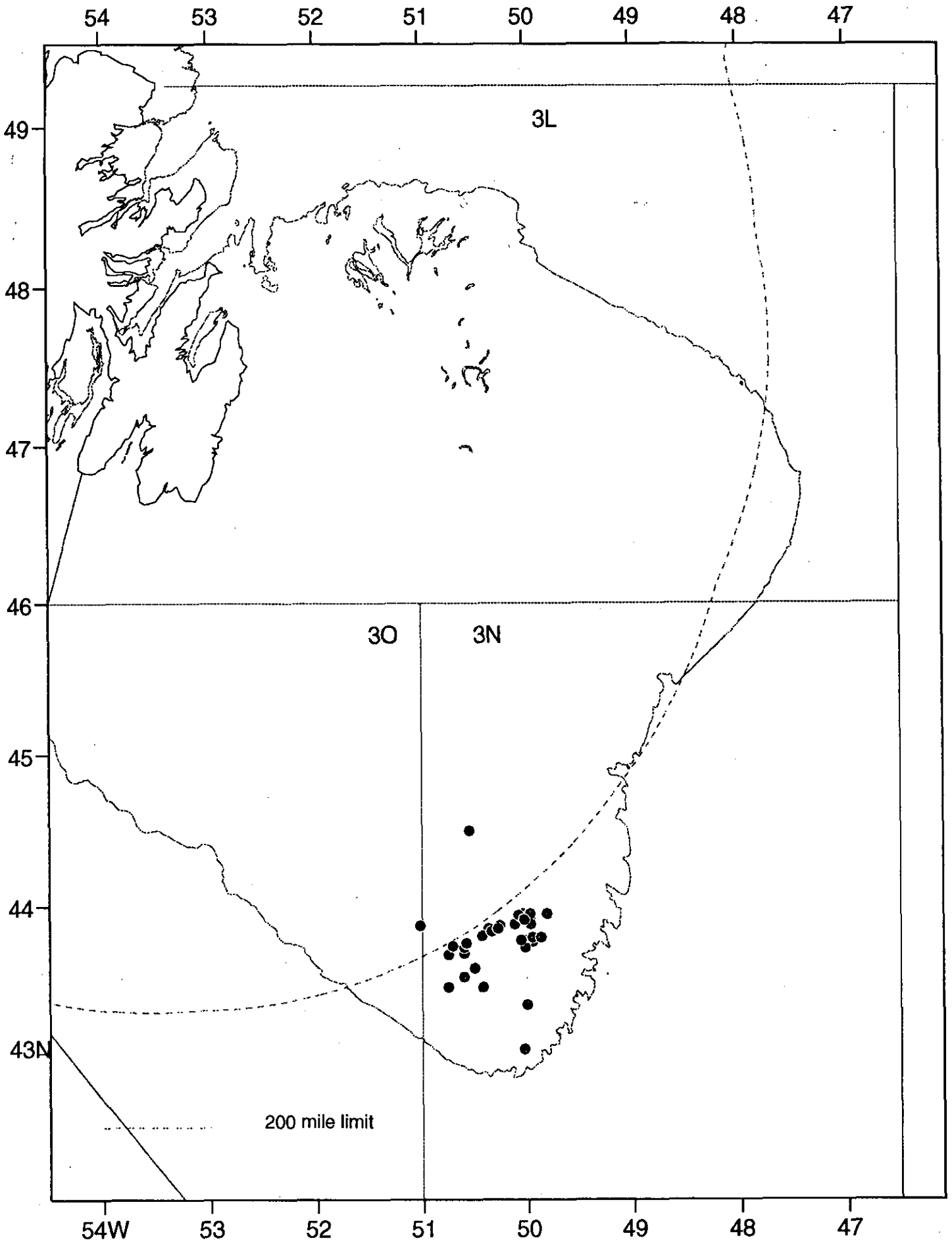

Figure 6 Return positions for juvenile yellowtail released outside the 200 mile limit.

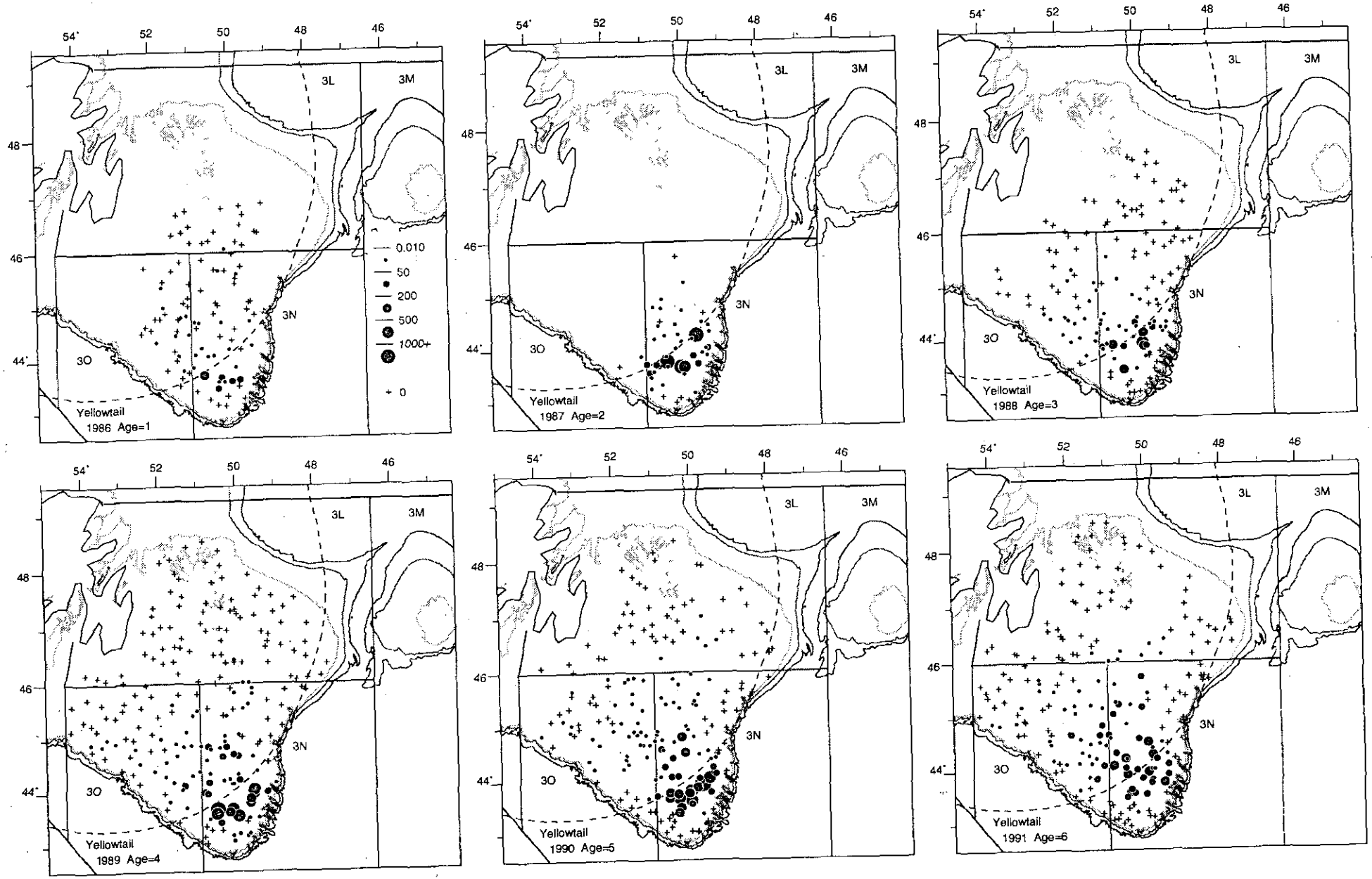

Fig. 7 Distribution of Yellowtail catches from 1986-1991 (1985 year class) Canadian Juvenile Flatfish surveys to NAFO Divisions 3LNO by the Canadian research vessel Wilfred Templeman. Plots are of the # of fish for year class 1985. All survey tows standardized to 1.3 nautical miles.

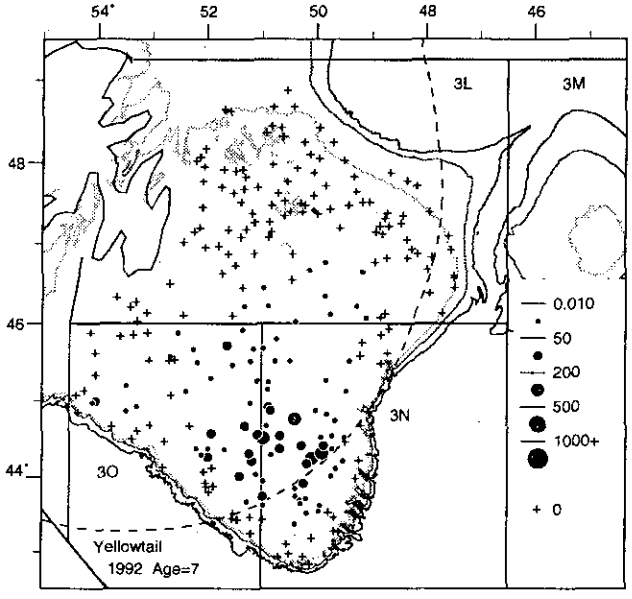

Fig. 7 Distribution of Yellowtail catches from 1992 Canadian Juvenile Flatfish surveys to NAFO Divisions 3LNO by the Canadian research vessel Wilfred Templeman. Plots are of the # of fish for year class 1985. All survey tows standardized to 1.3 nautical miles.