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Fishing Grounds Exploited in 1990 by Groundfish Longliners Based in Canada's Scotia-Fundy Region

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Abstract

Maps are presented of the grounds fished by the longline fleet of Canada's Scotia-Fundy Region, based on reports gathered during an interview survey of a large sample of boat captains. Overall, this fleet works from the coast out to the 500 fm contour and from the Canada/USA boundary to Flemish Cap. No one boat exploits more than a small part of this area and most are confined to the waters off their home ports. The grounds fished can be divided into the 'inside grounds', within 60 km of the coast which are typically fished by boats of less than 35 ft in length, the 'offshore banks' of Div. 4VWX and Subarea 5 that are mostly fished by boats of between 35 and 65 ft, and the 'distant grounds' of Subarea 3 that are mostly fished by boats longer than 65 ft. Some reasons for the distinctions among these three units and for the fishermen's choices of grounds within each unit are discussed, as is the evidence for inter-annual changes in the grounds fished.

Key words: Fishing vessels, longlines, Subareas 3 and 4

Introduction

Groundfish longlining is an important component of the fisheries in Canada's Scotia-Fundy Region (Fig. 1). The Department of Fisheries and Oceans (DFO) issued 2 703 longline licences (strictly longline designations on groundfish licences) in 1990, although only about 1 000 of them were utilized in that year. Many of these licences were on open boats 30 to 40 ft in length primarily designed for the lobster fisheries, though much of the groundfish caught by longline was taken by purpose-built longliners in the 40 to 45 ft range. The remainder of the longline fleet comprised 45 to 65 ft boats (127 licensed, 40 active in 1990) and a small number of larger vessels up to 150 ft in length (11 licensed, all of which longlined in 1990). The great majority of boats of all sizes fished traditional, bottom-set longline gear, hand-baited and worked from tubs. The primary species fished for were Atlantic cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), Atlantic halibut (*Hippoglossus hippoglossus*), hake (*Urophycis* spp.) and cusk (*Brosme brosme*) (Table 1).

An increasing sensitivity to marine environmental concerns and a developing doubt over the sustainability of past fishing practices, amongst both the fishing industry and fishery managers in Atlantic Canada, have recently focused attention on the possible advantages of hook-and-line methods for groundfish fishing (e.g. Haché, 1989). However, much of the information on which to base scientific advice concerning hook-and-line fisheries is lacking. As part of a broad effort to overcome this general deficiency, during 1990–91, an interview survey of Regional groundfish longline fishermen was carried out (Kenchington and Halliday, 1994). While the questionnaire administered during the interviews was primarily concerned with longline fishing gear, the grounds fished by the interviewees were also recorded.

Several regulatory restrictions influenced these fishing grounds. All Canadian boats were limited in the west by the Canada-USA maritime boundary (the 'ICJ Line'). From 1982, a sector management policy barred most Scotian-Fundy boats under 65 ft from fishing in other DFO regions, although fishing was allowed in Div. 3MNO. In 1990, vessels of 65 ft and over were managed under Enterprise Allocations (i.e. company catch quotas) and hence were restricted to stock areas for which their company had an allocation, the two over 100 ft vessels in the fleet being subject to different allocations from those that applied to the 65 to 100 ft boats. The overall catch quotas to which the under 65 ft boats were subject did not appear to influence the grounds that they fished. All groundfish boats were, however, subject to seasonal closures of Browns and Georges banks from March to May (except that boats fishing with large hooks on Georges Bank were exempted (Halliday, 1988)). Those banks were open to fishing for the rest of the year. Finally, a haddock nursery

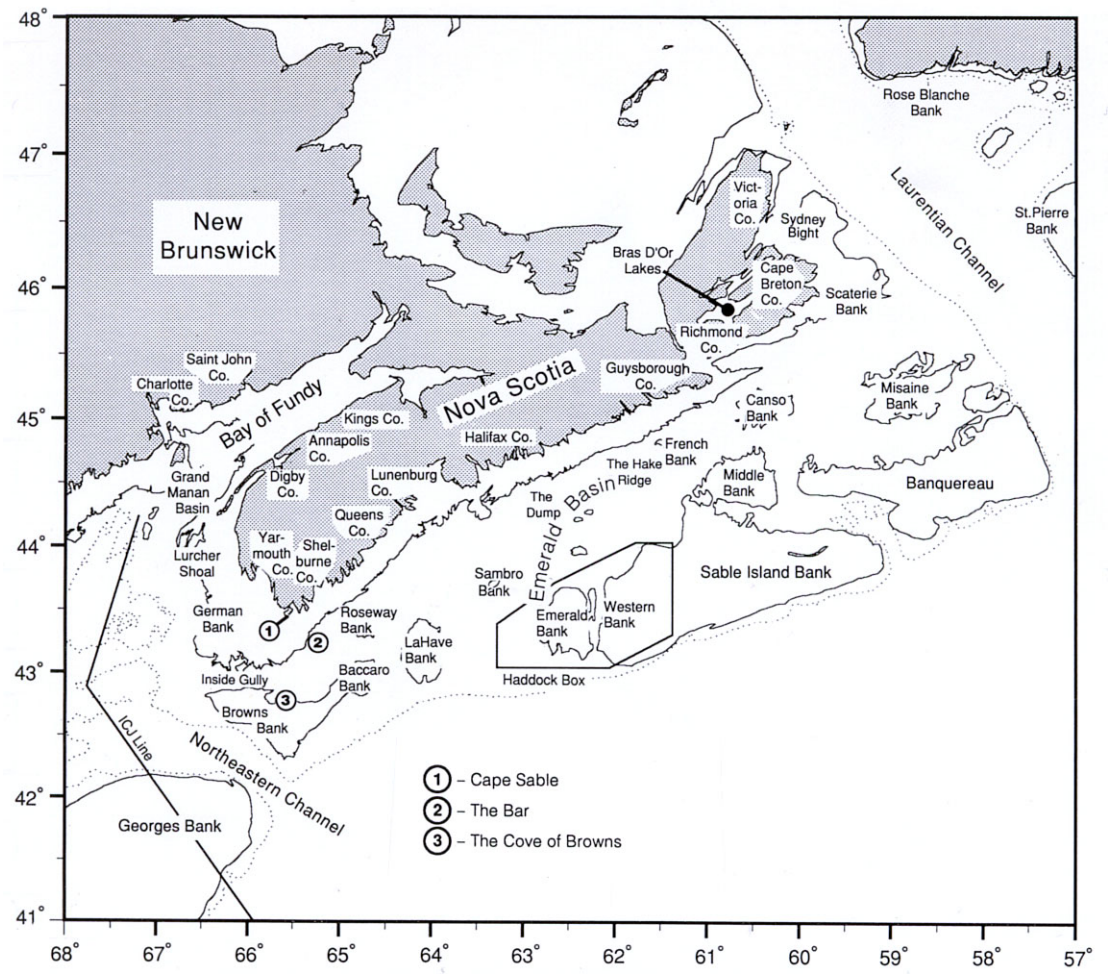

Fig. 1. Chart of the fishing grounds in NAFO Div. 4VWX, showing the locations of some bathymetric features and the boundaries of some administrative areas named in the text. Canada's Scotia-Fundy Region extends from the Laurentian Channel to the 'ICJ Line'.

TABLE 1. Groundfish landings (metric tons live weight) in Scotia-Fundy Region in 1990 by longline gear. (Extracted from DFO unpublished data files).

	Boat size class				
Species	Under 35 ft	35–45 ft	45–65 ft	Over 65 ft	Total
Cod	2 717	16 388	3 307	5 579	27 992
Haddock	1 023	5 443	1 018	71	7 555
Hake	732	2 837	1 276	1 754	6 599
Cusk	197	2 653	438	13	3 301
Halibut	115	626	335	508	1 584
Others	401	1 774	268	148	2 591
Total	5 184	29 722	6 643	8 072	49 622

area in Div. 4W was closed to mobile gear fishing from 1987, which in effect reserved this area on Western and Emerald banks (known as 'The Haddock Box') for longline fishing.

This paper presents summary maps of the grounds fished in 1990 by various sub-groups of the Scotia-Fundy longline fleet. The fishermen's choices of grounds are discussed in relation to regulatory

restrictions, bottom topography and sediment distributions, the operating ranges of the boats, resource availability and social constraints.

The interview data on fishing locations provide the first comprehensive account of the grounds fished by all sizes and types of groundfish longline boats based in the Scotia-Fundy Region. Although the larger boats (those over 25.5 GRT) are required to maintain logbooks and some maps of reported fishing locations have been prepared (Halliday *et al.*, 1986; Sinclair, 1992), the logbook data set is fragmentary and is not readily amenable to analysis. Since 1988 some of these boats have also carried observers from the Scotia-Fundy Observer Program but only a few longline trips each year have been observed and almost all of those have been on the largest boats in the Regional fleet. Finally, Halliday and Sinclair (1987) presented some maps of longline grounds but those were based on a survey of a self-selected sample of fishermen in one part of the Scotia-Fundy Region. The interview data are here compared to these published accounts to determine whether temporal changes in the grounds fished can be detected.

Methods

Details of the interview survey design have been presented by Kenchington and Halliday (1994). In brief: the population sampled for the survey was all Scotia-Fundy groundfish longline licences. These were divided into four classes based on the overall length of the licensed boat, *viz.*: under 35 ft, 35 to under 45 ft (here termed '35–45 ft'), 45 to under 65 ft (here '45–65 ft') and 65 ft and over (here 'over 65 ft'), those being the size groups used by DFO to categorize boats for vessel replacement and/or quota allocation purposes. The under 35 ft and 35–45 ft classes were then further subdivided by the area of residence of the licensee (defined by groups of counties) and all classes were subdivided into boats deemed 'active' (longline landing officially recorded in 1989) and 'inactive' (no such landing recorded). Because of the licensing protocols for Enterprise Allocation management, no inactive over 65 ft boat carries a licence. A sample of licences was then selected randomly from each boat-size/county-group/activity-level stratum.

A questionnaire was administered to the selected licensees who declared that there had been some longlining under their licences in 1990, or to their representatives, by the senior author between October 1990 and March 1991. The interviewees were asked to identify their 1990 longlining grounds on a set of medium-scale navigational charts. The interviewer transferred this information to one of two smaller-scale, contoured charts, with the assistance of the interviewee. These charts met at 57°W longitude leading to uncertainties in the recording of grounds on St. Pierre Bank. Those grounds were given nominal boundaries. Where the interviewee gave no specific landward limit for an inshore ground, an arbitrary boundary was placed just seaward of the outermost rocks and islands of the adjacent coast. The charted data were subject to many of the problems inherent to interview surveys (examined in detail by Kenchington and Halliday, 1994) but they probably captured a reasonable summary of the grounds longlined in 1990 by most interviewees, with the following limitations: (1) no distinction was made between those grounds only fished once, or a few times, in the year and those fished frequently, (2) conversely, some interviewees only reported commonly fished grounds, (3) data on the seasons at which particular grounds were fished, the species caught on each ground and on the depths fished were not often received, (4) the borders of reported grounds were often not recorded with a precision better than about 10 km and were sometimes much less precise and (5) within each reported ground, only some parts of the seabed were fished.

The areas reported by 204 interviewees (Table 2) were traced onto summary charts, from which the maps presented here were prepared. No attempt

TABLE 2. Numbers of boats active in the Scotia-Fundy Region groundfish longline fleet and numbers that contributed data to the maps.

Size class	Number of active licences in fleet[a]	Number of boats that contributed data used in the maps
Over 65 ft	11	11
45–<65 ft	49	9
35–<45 ft	474	86
Under 35 ft	275	98

[a] For the over 65 ft class, the number of boats that fished under a groundfish longline Enterprise Allocation in 1990 is tabulated. For the other classes, the number of licences for which a groundfish longline landing was recorded in the DFO database in 1989 is given.

was made to expand the reported data by the inverse of the appropriate sampling fraction.

Results

Under 35 ft boats

The smallest class of boats was primarily confined to what the fishermen know as the 'inside grounds', within 10, 20 or sometimes 60 km of the coast and extending from off Victoria County to off Cape Sable (Fig. 2). These grounds are on the coastal slope, landward of the deep basins, holes and gullies that separate the coastal shallows from the offshore banks of the Scotian Shelf. Where shoal water extends further seaward, as on Scaterie Bank

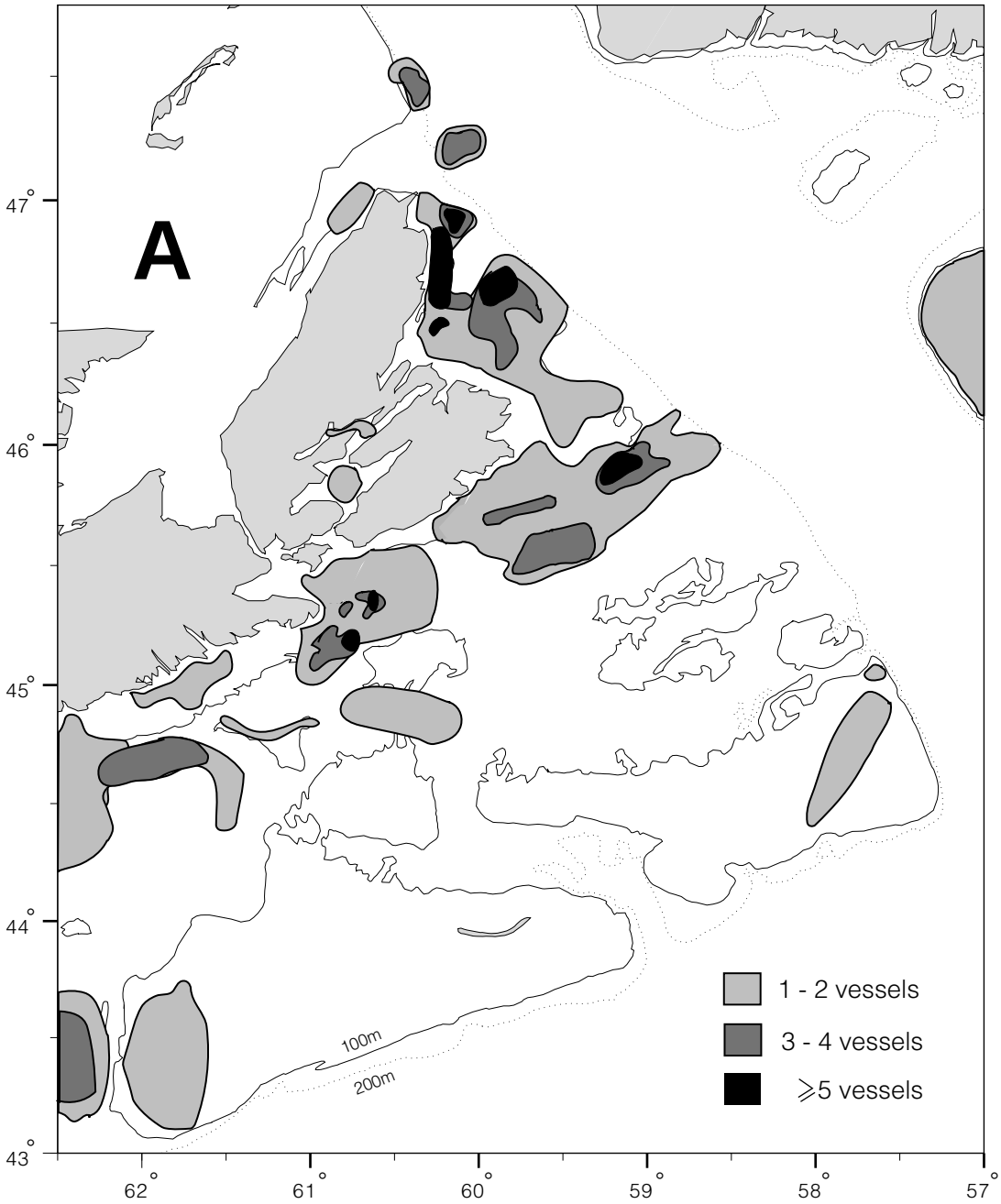

Fig. 2**A**. Map of the spatial distribution of longline fishing by under 35 ft boats in 1990: northeastern Scotian Shelf, St.Pierre Bank and Gulf of St.Lawrence. (Note areas fished in Bras D'Or Lakes. The area shaded on St.Pierre Bank is nominal, the report received being insufficient for more precise mapping.)

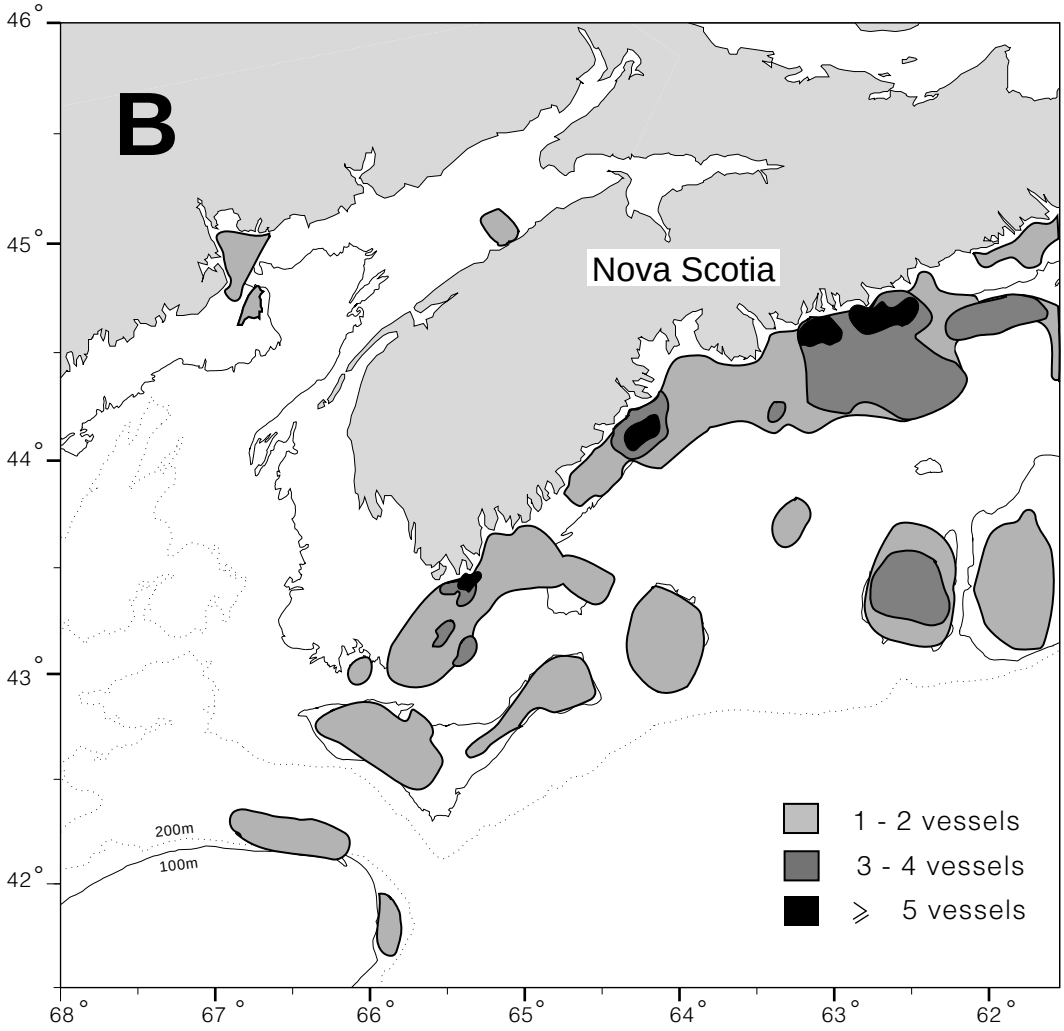

Fig. 2**B**. Map of the spatial distribution of longline fishing by under 35 ft boats in 1990: southwestern Scotian Shelf, Georges Bank, Gulf of Maine and Bay of Fundy.

and off Cape Sable, so too did the inside longline grounds.

Further seaward, there are a few minor banks that were within the range of under 35 ft boats. Some of these, such as Bickerton Ridge (on French Bank), Sambro Bank and Roseway Bank were fished by a few fishermen. The only mid-range grounds that received much attention, however, were the hake grounds known as The Hake Ridge and The Dump (a former ammunition dumping ground), on the lower slopes of Emerald Basin. These were fished at depths of about 70–85 fm.

A very few under 35 ft boats went further still and fished the offshore banks, from St. Pierre to Browns and even Georges banks. These grounds were much less important to this boat class than their prominence in Fig. 2 might suggest, however. Only nine interviewees reported fishing on any offshore bank in an under 35 ft boat, seven of whom worked boats of 34 ft 11 inches length (the maximum permitted under their licences: the others were 34 ft 10 inches and 32 ft overall). Eight of the nine fished offshore only in good weather and worked the inside grounds under other conditions.

While there seem to have been only limited opportunities for longlining in the Gulf of Maine and the Bay of Fundy by boats of any size class, the near-absence of fishing in that area by under 35 ft boats (Fig. 2) appears to be a consequence of factors in the lobster fishery. East of Cape Sable, many lobster boats are less than 35 ft in length, whereas to the westward they tend to be between 35 and 40 ft long. Since most of the small longline boats were used for lobster fishing in the appropriate season, west of Cape Sable there were few under 35 ft boats available for longlining. The limited longline effort by this boat class in that area was

sparsely distributed which, interacting with the sampling design of the interview survey, led to the apparent scatter of grounds in the Bay of Fundy seen in Fig. 2.

The shoreward margin of the inside grounds is not known with any certainty since many reports only specified the outer limits of the grounds. In general, however, it seems that very little longlining was done landward of the outermost rocks and islands, themselves usually a few kilometres seaward of the mainland along much of the Nova Scotian coast. Indeed, apart from Sydney Bight and the Bay of Fundy, embayments were generally avoided; almost no longlining was reported in Chedabucto Bay (Richmond and Guysborough counties) and none at all in St. Margaret's or Mahone bays (Lunenburg and Halifax counties) nor in any of the smaller bays and harbours along the coast. The sole exceptions to this rule concerned the Bras D'Or Lakes, where a few interviewees occasionally longlined for cod, and the channels between the Passamaquoddy islands (Charlotte county), where there was some halibut fishing. Neither area saw more than a little longline effort in 1990.

Although the total area exploited by under 35 ft longliners was quite large, individual small-boat fishermen were much more restricted in their choice of grounds than Fig. 2 might suggest. Figure 3, illustrating the grounds reported by fishermen from each county, shows that they made only limited alongshore movements. The boats out of Victoria County and Cape Breton County ports shared some grounds while some Halifax County fishermen worked well to the westward but otherwise there was limited overlap of the grounds chosen by the fishermen of the various counties. Inspection of the raw data showed a still more localized pattern, with individual interviewees usually fishing off their own home port only. Some reported exploiting areas as small as 100 km^2 and the median individually-reported area was less than 400 km^2. Some reports were of as much as 2 000 km^2, however, and one under 35 ft boat that went to the offshore banks exploited about 12 000 km^2. Within these areas, of course, only certain spots were fishable, though some of the offshore banks evidently offered extensive tracts of fishable seabed.

The individually-reported fishing grounds overlapped in many cases but no two fishermen with under 35 ft boats reported fishing exactly the same areas, even when the interview sample included several who fished from the same wharf. Some of these differences may result from inaccuracies in the reporting and recording of the grounds but from the interviewees' verbal reports it seems that some inside fishermen had their own preferred fishing spots, which differed from those of their neighbours, or at least that they placed more emphasis on some particular spots than their neighbours did. This dispersion of longline gear and effort was said by some to be deliberate and designed to share out the fish (while presumably reducing inter-boat conflicts; cf. Martin, 1979). This practice probably did not apply when fishing the offshore banks, however, where the boats often competed for the same areas and where the differences in the individually-reported grounds may have related more to differences in the steaming distances from particular ports to the various banks.

Cod were caught on almost all of the grounds where the under 35 ft boats fished, except for the specialized hake grounds on the edge of Emerald Basin. Haddock were a minor supplement to the cod fisheries south of Cape Breton County and generally increased in relative importance to the southward and westward until they were of primary interest off Cape Sable and in the 'Haddock Box'. Halibut were taken by this boat class in many small, select spots. These included places on the edge of the Laurentian Channel, some holes southeast of Cape Breton County and spots on the inside grounds all along the coast. Apart from when fishing for hake (which were typically taken at 70–85 fm), these boats usually longlined in depths of 20 to 65 fm, though a few interviewees reported grounds that extended to below 150 fm. With very few exceptions, their longlining was confined to the summer and autumn, between the seasons of bad weather, and ceased during the local lobster season. In general, the season of active longlining on any one part of the inside grounds was quite short and was apparently linked to the period of high fish availability.

35–45 ft boats

The 35–45 ft boats fished much the same grounds as did the under 35 ft class (Fig. 4 and 5) but there was a major quantitative difference, with the bigger boats placing much more emphasis on the offshore banks and much less on the inside grounds. As a result of the sampling protocols used in the survey and the marked individual variation in the grounds reported by each interviewee, this quantitative difference appears in the figures as both an increase in the density of reports of offshore fishing and an increase in the total offshore area included in the reports. Some of the areas shaded in Fig. 4 but not in Fig. 2, however, particularly those between the shore and Banquereau and between LaHave, Browns and Georges banks, may genuinely not have been fished by under 35 ft boats. Besides these grounds, the 35–45 ft class also exploited other areas that the smaller boats did not, notably the upper continental slope and the deep

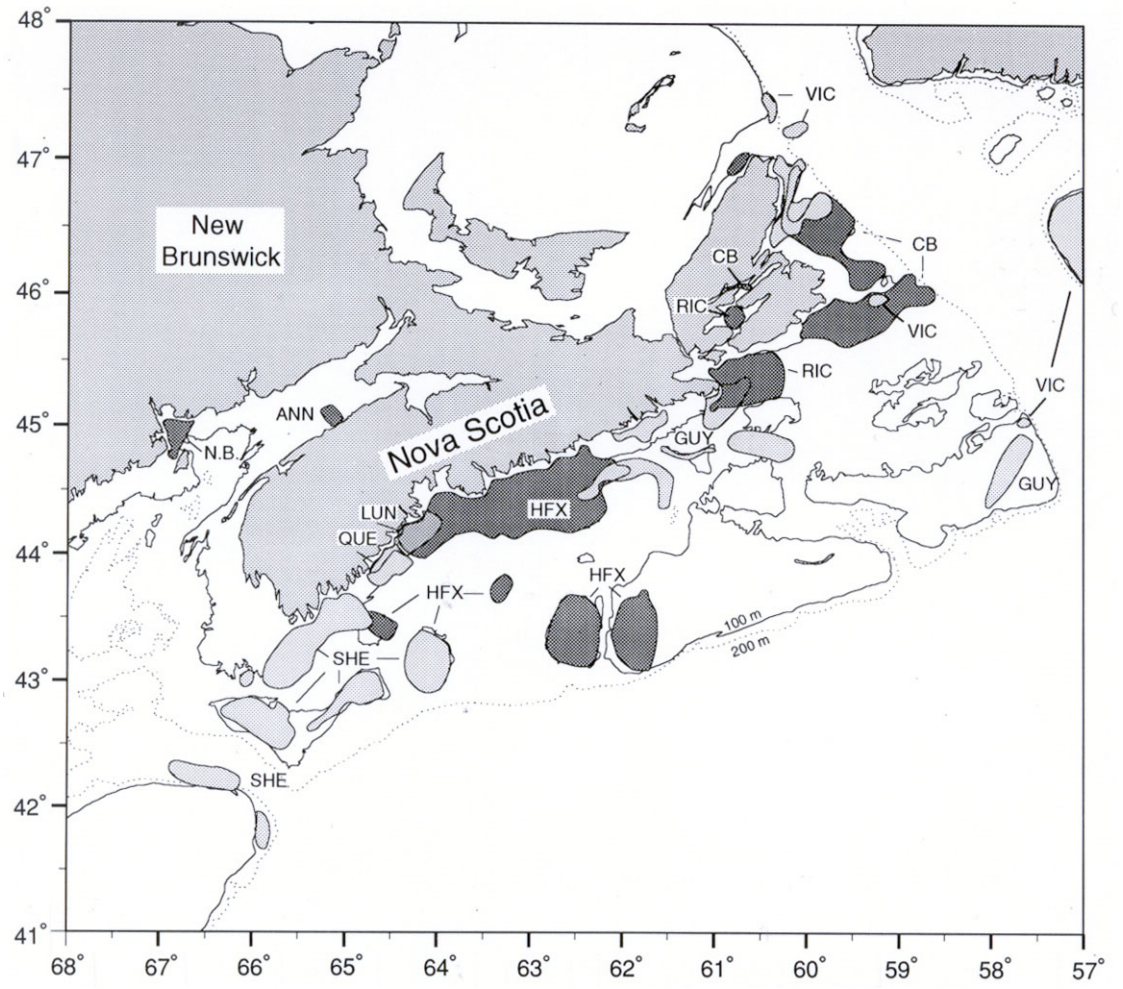

Fig. 3. Map of the spatial distribution of longline fishing by under 35 ft boats in 1990, showing the counties in which the boats fishing each area are based. (ANN: Annapolis Co., CB: Cape Breton Co., GUY: Guysborough Co., HFX: Halifax Co., LUN: Lunenburg Co., NB: Charlotte & St. John Cos., New Brunswick, QUE: Queens Co., RIC: Richmond Co., SHE: Shelburne Co., VIC: Victoria Co. The areas fished are differently shaded for clarity only. In some areas of overlap, the perimeter of one area is drawn over the shading of another.)

water east and north of Sable Island (both fished for halibut with a secondary fishery for hake) and various grounds in the Gulf of Maine and Bay of Fundy. The latter areas are those in which the local lobster boats are mostly over 35 ft in length.

On the inside grounds, the 35–45 ft boats fished essentially the same areas, species and seasons as the smaller boats did. Offshore, particularly favoured grounds included The Stone Fence and some of the deep holes around Misaine Bank (for cod and halibut), Western, Emerald, LaHave and Browns banks (haddock and cod), the Northeast Channel (cod and halibut), the northern edge of Georges Bank (cod and haddock) and The Inside Gully (winter haddock fishery). The Gulf of Maine grounds from German Bank to the slopes of Jordan Basin supported some hake fishing, besides some for cod and haddock, while Grand Manan Basin was fished for hake. The 35–45 ft boats fished much the same depths as did those in the smaller class, except that the halibut fishery on the continental slope extended into much deeper water, sometimes reaching 500 fm.

A few of these boats longlined all year. To the westward of Halifax, however, most carried lobster licences and in 1990 the fishermen concentrated on that fishery from the autumn to the spring, while east of Halifax, most boats of this size were laid up during the winter months. Within their longlining seasons, many fishermen changed their gear and

target species to suit seasonal changes in resource availability (or the large hook exemption to the March to May closure of Georges Bank) and these shifts necessarily involved seasonal changes in the grounds fished. Specific interviewee comments on seasonal shifts included some reports of fishing close in to land in the winter, fishing the southern ends of Western and Emerald banks in the winter but the northern ends in the summer, and fishing The Inside Gully in the winter. While Browns Bank was closed, some of those boats that were not lobstering moved to neighbouring banks (LaHave, German, Lurcher etc.) and others changed to large-hook gear and went to Georges Bank.

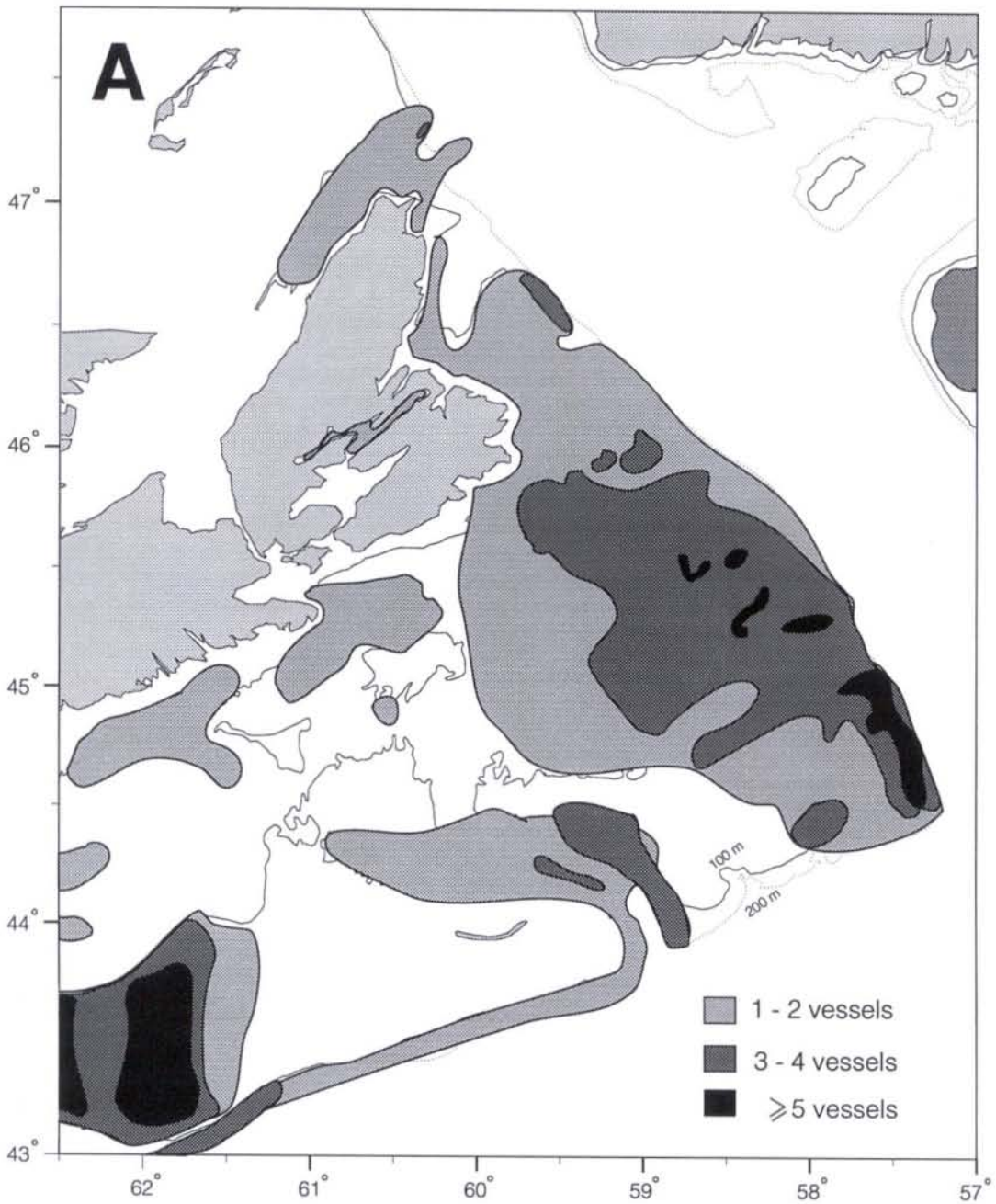

Fig. 4**A**. Map of the spatial distribution of longline fishing by 35–45 ft boats in 1990: northeastern Scotian Shelf, St.Pierre Bank and Gulf of St.Lawrence. (Note areas fished in Bras D'Or Lakes. The area shaded on St.Pierre Bank is nominal, the reports received being insufficient for more precise mapping.).

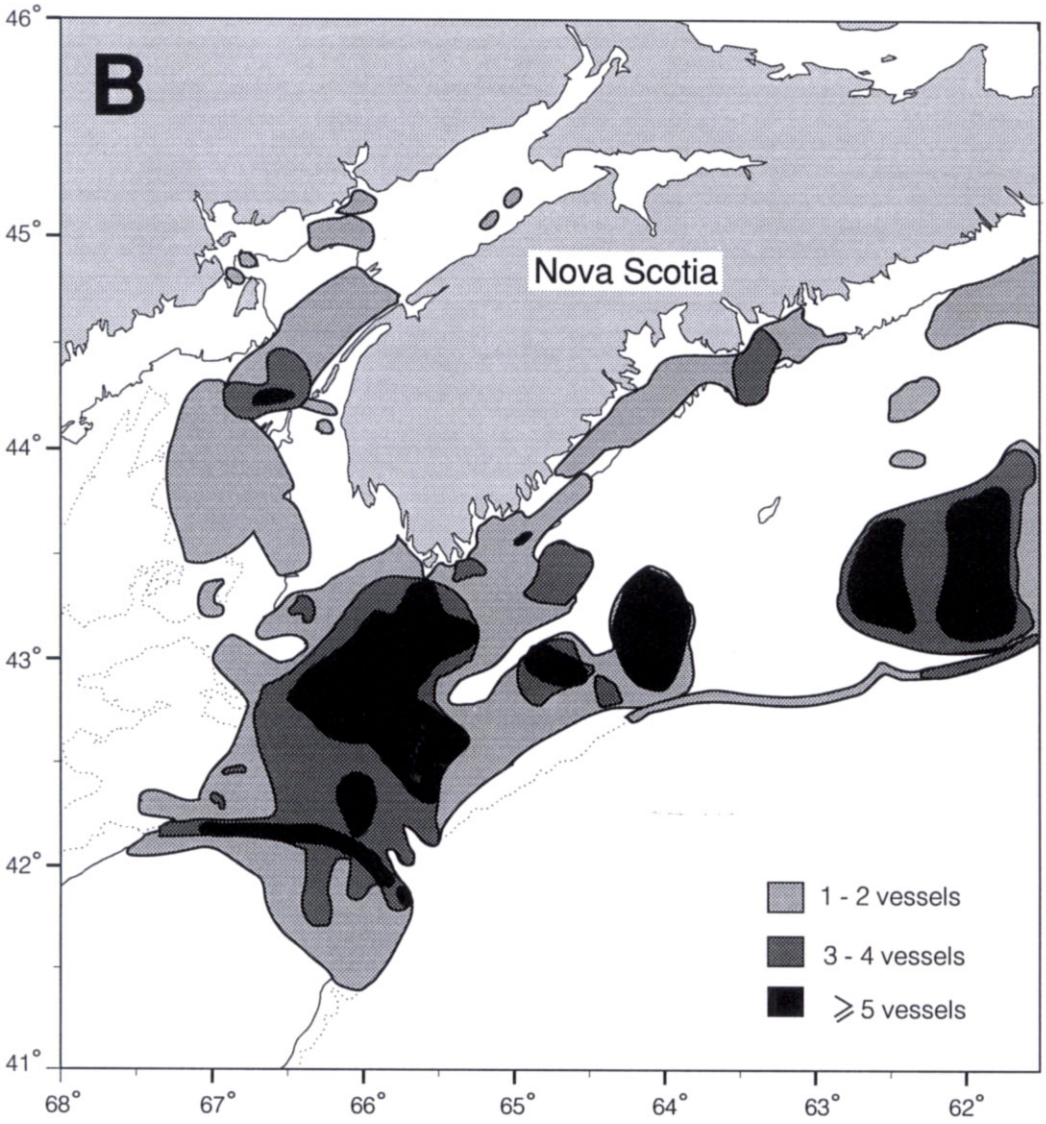

Fig. 4**B**. Map of the spatial distribution of longline fishing by 35–45 ft boats in 1990: southwestern Scotian Shelf, Georges Bank, Gulf of Maine and Bay of Fundy.

As with the smaller boats, this class avoided fishing in the deep basins between the inside grounds and the offshore banks. Some fished in small, scattered halibut holes, a few joined the under 35 ft fleet on The Hake Ridge, a larger number took haddock in The Inside Gully or hake in the Grand Manan Basin and a few fished the floor of the Northeast Channel but otherwise their longlining was confined to the coastal slope, the banks and the upper continental slope. Indeed, some of the offshore banks were ignored by the 35–45 ft fleet, in particular parts of Banquereau and all of Canso, Middle, Sable Island (excluding Western) and Sambro banks.

In some areas, the 35–45 ft boats can be divided into those that only fished the inside grounds and those that only went to the offshore banks. Thus, of 31 reports relating to boats based in or between Cape Breton and Queens Counties, 10 worked only the same inside grounds as the under 35 ft class and 12 worked only outside those grounds, leaving 9 fishing a mixture of inside and offshore areas. This pattern broke down off Shelburne County, perhaps because Browns Bank was accessible to quite small boats in the summer while the deeper water of The Inside Gully, between that bank and the land, was a prime winter haddock ground for some larger boats. Thus, there was a spatial (though

perhaps not a spatio-temporal) overlap in this area between the grounds fished by boats of different sizes. There was a further spatial separation off that county, however, between the boats that went as far as Georges Bank and those that did not. The raw data show that very few boats less than 39 ft long went to Georges Bank whereas most locally-based larger ones did. That this separation does not appear in the figures is an artifact of the boat size ranges used here.

The distributions of fishing by 35–45 ft boats from various counties (Fig. 5) generally reflected those shown by the under 35 ft boats, with fishermen usually working off their own shores and making relatively limited along-shore movements. The principal exceptions were those of Cape Breton County who fished off Victoria County and even in the Gulf of St.Lawrence, in addition to working off their own shores as far out as Banquereau, and across to St. Pierre Bank. One Kings County interviewee moved down the Bay of Fundy to join the hake fishery in Grand Manan Basin in the appropriate season. Otherwise, there was only slight inter-county overlap, even on the offshore banks.

On a finer scale, individual 35–45 ft boats that fished only the inside grounds typically exploited an area of about 400 km^2 whereas those that went offshore typically fished areas of about 4 000 km^2.

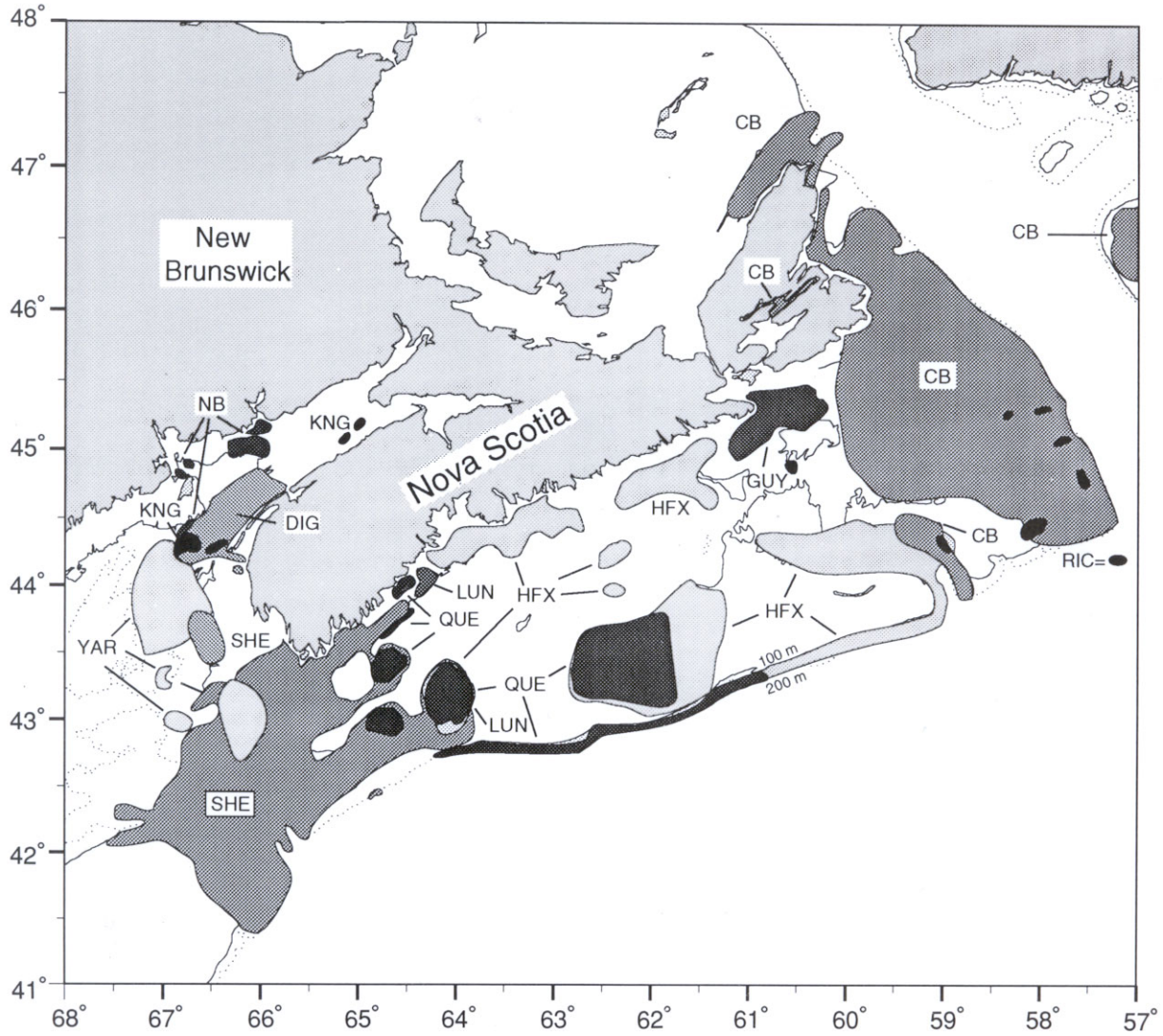

Fig. 5. Map of the spatial distribution of longline fishing by 35–45 ft boats in 1990, showing the counties in which the boats fishing each area are based. (CB: Cape Breton Co., DIG: Digby Co., GUY: Guysborough Co., HFX: Halifax Co., LUN: Lunenburg Co., NB: Charlotte & St. John Cos., New Brunswick, QUE: Queens Co., RIC: Richmond Co., SHE: Shelburne Co., YAR: Yarmouth Co. The areas fished are differently shaded for clarity only. In some areas of overlap, the perimeter of one area is drawn over the shading of another.)

Such 'typical' figures conceal extreme variation, however. One interviewee reported fishing just two spots, one on Browns Bank and the other in the Northeast Channel, neither of which exceeded 100 km² in area, whereas some others reported grounds exceeding 12 000 km². As with the smaller boats, these individual areas overlapped broadly.

45–65 ft boats

The survey interviews covered 14 licences for 45–65 ft boats that were declared active in 1990 but only nine of these interviews produced useable chart data, including two relating to boats that had not been fully active. The nine fished a variety of grounds from the Bay of Fundy and Georges Bank to Sydney Bight and the southwest edge of Grand Bank (Fig. 6: areas fished on Grand Bank not mapped) but this is unlikely to be a complete record of the grounds exploited by the approximately 35 longliners of this size that were active in 1990.

In so far as conclusions can be drawn from the few reports received, it seems that the 45–65 ft boats fished much the same grounds as those exploited by the 35–45 ft class, though with more emphasis on the deepwater halibut grounds along the continental slope (including their extension onto Grand Bank) and less on the inside grounds. Some of the bigger boats moved further alongshore than the smaller ones did: two Cape Breton County boats (not included in the Fig. 6 since the data provided were too imprecise) were reported as fishing exten-

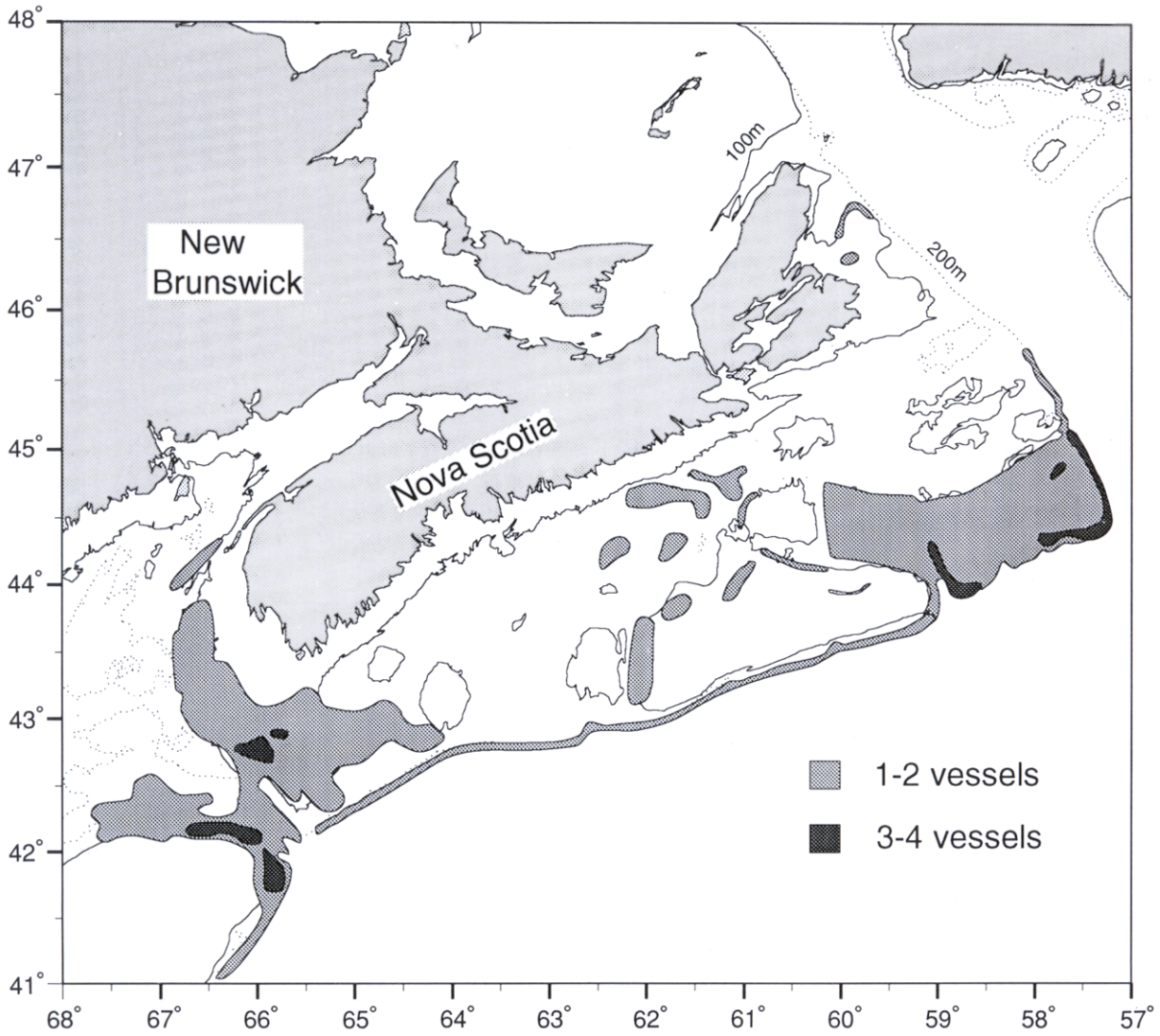

Fig. 6. Map of the spatial distribution of longline fishing by 45–65 ft boats in 1990. (In addition to the areas shown, two boats fished the continental slope along the southwest side of the Grand Bank.)

sively in the Gulf of St. Lawrence and off Newfoundland, while two Shelburne County boats fished both Banquereau and the continental slope between there and Browns Bank. One of these latter and one out of Halifax County were the two boats for which the reported grounds extended onto Grand Bank.

Apart from some gillnetting for pollock and some pelagic longlining for swordfish, these boats were dedicated groundfish longliners. Those based in Cape Breton County were laid up during the winter ice season but the rest worked almost 12 months in 1990. Within their groundfish longlining season, they made much the same within- and between-grounds movements as the larger 35–45 ft boats did.

Over 65 ft boats

The over 65 ft boats fished very different grounds from all but the furthest-ranging smaller boats (Fig. 7). Apart from pelagic longlining for swordfish in the summer, these boats only pursued one or more of three specialized longline fisheries: for big cod on Grand Bank and some neighbouring banks, for deepwater halibut and for hake on the continental slope. Their reported grounds reflected this specialization, with cod fishing from Banquereau to Grand Bank (mostly at 20 to 35 fm but some down to 100 fm), halibut fishing along the continental slope from Georges Bank to Flemish Cap (plus some in the mouth of the Laurentian Channel: all at 80 to 500 fm, depending on location and season) and directed hake fishing on the southwest edge of Grand Bank (at about 200 fm).

In another contrast to the smaller classes, the 11 over 65 ft boats tended to fish much the same grounds as one another. Only two fished west of Sable Island, however, while the two largest were excluded from cod fishing in Subdiv. 3Ps (through lack of quota for over 100 ft boats in that area) and the smaller and older boats in the class did not go

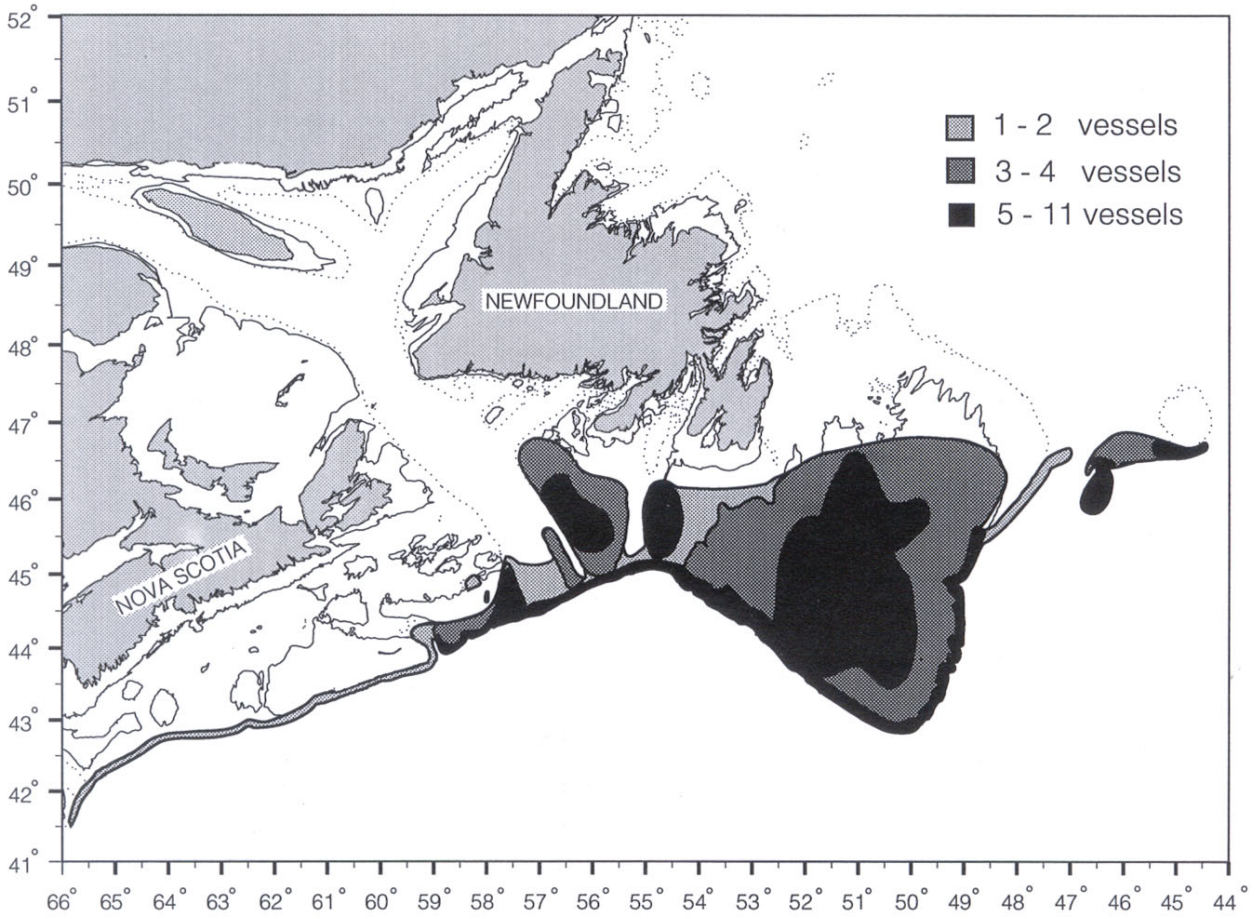

Fig. 7. Map of the spatial distribution of longline fishing by over 65 ft boats in 1990. (The area shaded on St.Pierre Bank is partly nominal, the reports received being insufficient for precise mapping.)

as far to the eastward as the larger and more modern ones; various captains setting their limits at the Virgin Rocks, South East Shoal, Tail of the Bank, the 200-mile boundary or some other such point. One captain specifically stated that his boat was too old to risk going further.

The big boats did have one feature in common with the smaller ones, in that they avoided fishing the channels between the banks. The sole exception to this (other than some probably overly-inclusive reporting between Green and Grand banks) was a single captain who gave, and under questioning confirmed, a report of fishing on the flat floor of the Laurentian Channel.

Discussion

Reliability of the maps

Throughout this paper, the longline fishermen's reports of their grounds have been accepted as accurate, subject only to the caveats outlined in the methods section. Those address the uncertainties in the reports but not the chance of deliberate deception by the interviewees. Such deception almost certainly occurred but its effect on the present data was probably small. Only one of the interviewees seemed to the interviewer to have concocted his entire report. His information had no material effect on the maps presented here since his reported grounds lay in a heavily fished area. Some other interviewees may have claimed to have set longline gear in 1990 where or when they did not but the congruence of the grounds reported by different fishermen was so strong that a few such errors will have had no noticeable effects on the maps presented here. A possibly more significant deception, in that it would leave grounds that were fished unshaded in the maps, would be the failure to report fishing that had occurred in closed areas. The only areas closed to under 65 ft boats that seem likely to have attracted the interviewees, other than those closed seasonally, were Div. 3P, 4R and 4T. It is thus possible that there was more fishing on St. Pierre Bank and in the Gulf of St. Lawrence than was reported. Some over 65 ft boats lacked Enterprise Allocations for particular Divisions and it is possible that individual boats in that class fished more widely than was reported. The nature of their specialized fisheries suggests that any such error would be minor. Otherwise, the maps are probably accurate at the limited levels of spatial and temporal precision that they convey.

The only directly comparable, independent data that can provide some confirmation of these maps are those gathered on groundfish longliners during 1990 by the Scotia-Fundy Observer Program. Data were collected on 10 trips on six boats, all six being in the over 65 ft class. Position data are available for a total of 258 sets made on these trips (perhaps 10% of the total for this class during the year). The close similarity between the distribution of these sets (Fig. 8) and the grounds reported by the captains of over 65 ft boats (Fig. 7) supports the validity of the survey data, for this class at least.

Large-scale spatial patterns

The maps presented here indicate that the Scotia-Fundy longline fleet exploits a wide area, extending from the upper Bay of Fundy, down the ICJ line to the southeastern side of Georges Bank and thence eastwards as far as Flemish Cap, in a broad swath reaching from the coast out to the 500 fm contour, and including some grounds in the Gulf of St. Lawrence. Within this overall area, the grounds can be divided into three units: the 'inside grounds', accessible to small boats day fishing from shore, the 'offshore banks', including the Scotian Shelf banks, Georges Bank and the continental slope in Div. 4VWX and in statistical unit 5Zc, and the 'distant grounds' in Subarea 3. The latter were primarily fished by the over 65 ft boats, while the offshore banks were fished mostly by the 35–45 ft and 45–65 ft classes and the inside grounds were largely left to the under 35 ft boats. These units were not fully discrete since there are some mid-range grounds, such as The Hake Ridge, while the inside and offshore units merged between Cape Sable and Browns Bank, and all boat classes fished both Banquereau and St.Pierre Bank. Furthermore, the Gulf of Maine and Bay of Fundy grounds did not fit the pattern. Nevertheless, the three units were generally well separated geographically and there was a strong tendency for each one to be fished by particular sizes of boats.

This division of the longline fisheries seems to have been caused by an interplay of several factors. Most clearly, the spatial separation between the inside and offshore units was founded on the lack of longlining in the deep basins of the Scotian Shelf, which provided the strong geographic break between the two sets of grounds. Based on the comments of many interviewees, it is certain that this lack of effort resulted from the poor catch rates that would be achieved by longlining on the soft sediments that are found in the basins (King, 1970; MacLean and King, 1971; Drapeau and King, 1972). The fishermen were not able, however, to distinguish fully between a lack of resource in those areas, the low availability to longline gear of such fish as were present and the consequences of the high densities on mud of scavengers (mainly hagfishes and amphipods), which eat the bait, and even the catch, off the hooks.

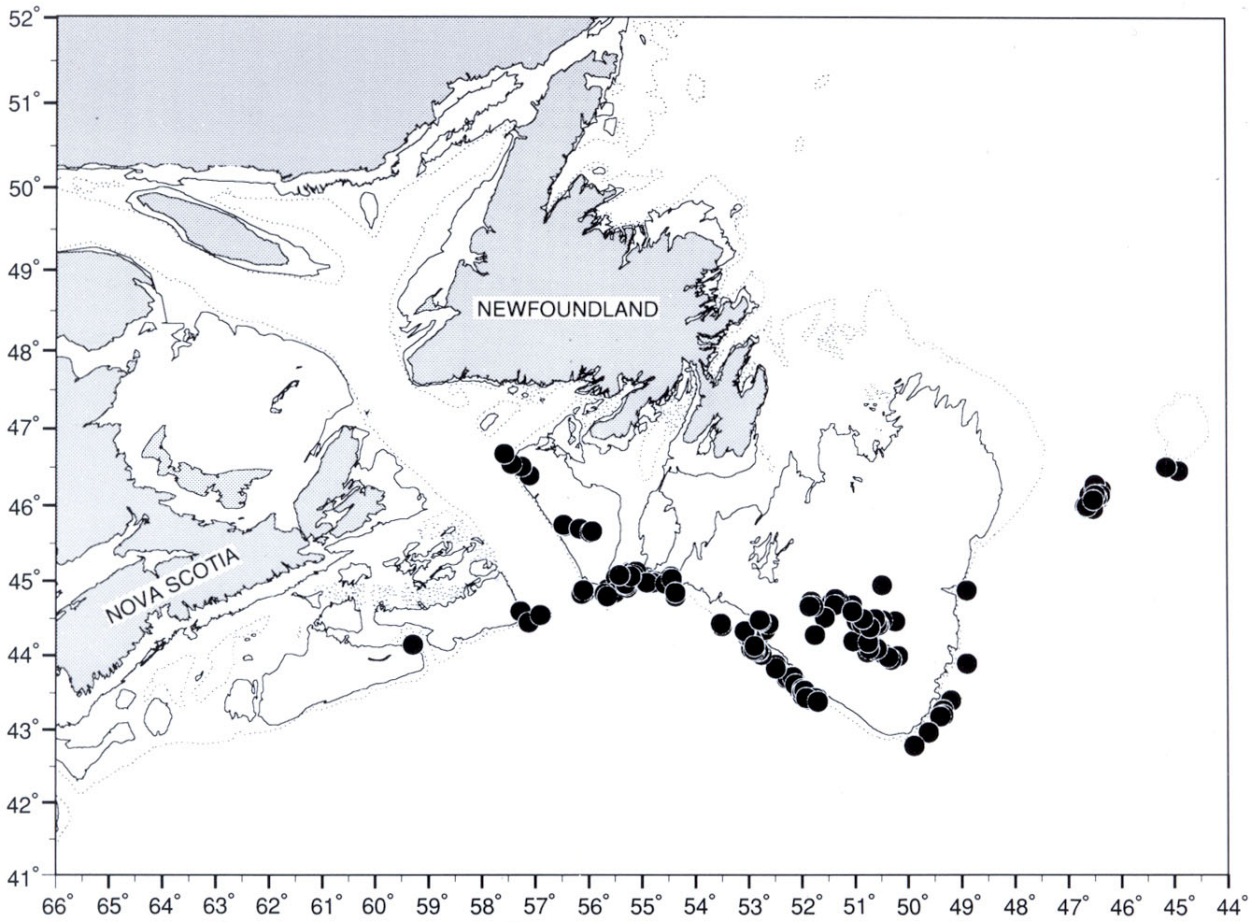

Fig. 8. Map of the locations of groundfish longline sets by over 65 ft boats recorded by observers in 1990.

The simple absence of longlining in the basins cannot alone explain more than a geographic distinction between the inside and offshore grounds, however. Other factors of importance to the observed division of the fisheries included the safe operating range of small boats and the fishermen's expectations of low catch rates on the inside grounds. There was no exact size of boat that distinguished one that could safely go to the banks from one that could not; a new glassfibre boat with a diesel engine and large fuel tanks was considered by some interviewees to be much safer offshore than a larger but older wooden boat with a gasoline engine. Nevertheless, bigger boats did tend to have a greater effective range and many small boat fishermen who fished the offshore banks believed that they were working at or beyond the safe limits of their boats. Some of those who did not go offshore stated during the interviews that their boats were not adequate for the trip. Meanwhile, there was a clear perception among the fishermen that longlining catch rates on the inside grounds had become severely depressed in recent years. Although the causes of this remain unclear, it undoubtedly influenced longline fishermen's choice of grounds.

The intersection of these factors may explain the observed distinction between the inside and offshore grounds. Fishermen whose boats were not capable of going beyond the basins had to choose between doing what fishing they could on the inside grounds and quitting longlining altogether (unless they had one of the few mid-range grounds within reach of their home port). Those whose boats could go to the offshore banks usually chose to do so, presumably because offshore fishing promised better earnings.

The distinction between the offshore and distant fishing areas was partly a matter of fishery regulations, since most under 65 ft boats were barred from Div. 3P whereas the over 65 ft boats had very limited Enterprise Allocations for Div. 4VWX or statistical unit 5Zc. The concerns over seaworthiness that prevented the small boats going to the offshore banks also constrained the grounds fished

by some 65 to 95 ft boats (relative to those worked by the largest boats) and those same concerns presumably prevented most under 65 ft Scotia-Fundy Region longliners from bypassing Div. 3P to fish Div. 3NO.

Medium-scale spatial patterns

Within each of the three units, inside, offshore and distant, most areas were fished by at least some boats but a few were not. The absence of longlining in the deep basins and channels, while not universal, was notable, as was its absence from medium- and small embayments. Some shallow offshore areas, which appear little different to the prime grounds, were also not fished with longline gear during 1990 by any of the interviewees. In general, their reports suggested that these choices were controlled by their expectations of catch rates; Sambro, Sable Island, Middle and Canso banks, the bays and the deep basins were largely or completely ignored because they were not thought to have enough longline-available fish for profitable fishing. There is no reason to doubt the general validity of these expectations, though the reasons for the low fish densities or availabilities are unsure.

It might be expected that fish densities and availabilities would be strongly influenced by the benthic habitat. Certainly, the fishermen regarded the type and condition of the 'bottom' as being important to their fishing success (Kenchington and Halliday, 1994). Their descriptions of the ideal sediment type for each species were not fully consistent but, on most grounds, the best 'bottom' for cod fishing was said to be 'hard', 'rocky' or composed of small stones. Haddock, in contrast, were most available to longline gear on gravel, sand or shell sediments while hake were best taken on muddy sand or mud with small stones. Halibut were caught on any sediment type from mud to rock, depending on the area, season and depth being fished.

The surficial sediments of the areas of present interest have been mapped in detail (King, 1970; MacLean and King, 1971; Drapeau and King, 1972; Fader *et al.*, 1977, 1982, 1988; MacLean *et al.*, 1977; Fader and Miller, 1986) and attempts have been made to relate this geological information to the distribution of the fish resources (Scott, 1982a; Mahon *et al.*, 1984). None of the longline fishermen's descriptions of good gadid 'bottom' types accord closely with the geological classifications, however. This disagreement may arise, in part, because King's (1970) classification scheme was primarily concerned with the origin and development of the sediments and has been applied to strata with thicknesses of the order of metres and spatial extends of (usually) a kilometre or more. The benthos, the fish and the fishermen, in contrast, probably respond to the present nature of the uppermost few centimetres of the sediment and over spatial scales of metres to hundreds of metres. As mapped, the geological formations are also internally heterogeneous, particularly those that represent coarser sediments. Thus, the map units 'Scotian Shelf Drift', 'Laurentian Drift' and 'Grand Banks Drift', for example, are all poorly-sorted glacial tills, the geological distinctions between them being largely based on the different parent rocks that contributed to each (King, 1970; MacLean and King, 1971; Fader *et al.*, 1982; Fader and Miller, 1986). This difference is unlikely to be of much biological relevance. Conversely, the term 'Emerald Silt' is applied to sediments that can be silty clays, clayey or sandy silts, silty or clayey sands or even silty sands with gravel, each of which could provide a quite different fish habitat but which were all formed as proglacial submarine deposits (King, 1970, MacLean and King, 1971; Drapeau and King, 1972; MacLean *et al.*, 1977; Fader *et al.*, 1977). Above a late glacial palaeo-shoreline that can be found at 63 fm depth throughout the Scotian Shelf area, King's (1970) scheme classifies almost all surficial sediments in Div. 4VWX as 'Sable Island Sand and Gravel', on the basis of their having been re-worked during the marine transgression (King, 1970; MacLean and King, 1971; Drapeau and King, 1972; MacLean *et al.*, 1977; Fader *et al.*, 1977). As mapped, Georges Bank is covered with a more-or-less homogeneous deposit of this sediment, some areas having more and some less than 50% gravel mixed with sand (Fader *et al.*, 1988). In contrast, a recent detailed study of the biologically-active layer on the northern part of that bank has shown it to be composed of gravel pavements (probably the fishermen's 'rocky bottom') interspersed with mobile sand ridges, both of which grade southwards into large areas of sand and gravelly sand (Valentine and Lough, 1991). The pavements and mobile sand support quite different benthic communities. Thus, even if the distribution of the longline grounds was determined by benthic habitat characteristics and even if those characteristics were highly correlated with substrate type, given these differences between the objectives of the geological classification and the issues and scales of importance to the fish and fishermen, exact correspondence between the maps of surficial sediments and those of the longline grounds would not be expected.

Despite these problems, however, there is some congruence between the two sets of maps as they relate to cod and haddock longlining. Most of the grounds where those species were caught are shallower than 65 fm, which corresponds to their preferred depth range on the Scotian Shelf as measured by summer research vessel trawl surveys from 1970 to 1979 (Scott, 1982b). As noted above,

the seabed above the 65 fm contour is almost exclusively floored by 'Sable Island Sand and Gravel' or its differently-named equivalents (King, 1970; MacLean and King, 1971; Drapeau and King, 1972; Fader *et al.*, 1977, 1982, 1988; MacLean *et al.*, 1977; Fader and Miller, 1986). Whether it is the depth, the sediment type or some other factor that influences this distribution of cod and haddock longlining and whether they act via the habitat preferences of the resources or directly on the efficiency of the gear are, however, impossible to determine, given the close correlation between these factors. Certainly, neither depth nor sediment type, as it is mapped, can explain why some banks are ignored while others nearby are fished intensively, nor why certain parts of some banks are preferred to other parts. Nor is either factor an absolute and invariant control on longlining. The prominent haddock ground in The Inside Gully, for example, is about 70 fm deep and is floored with a gravel-rich variant of 'Sambro Sand' (Drapeau and King, 1972), a sublittoral sediment that is more commonly a complex of silty and clayey sands. Moreover, there is at least some longlining for cod or haddock on each of the other sediment types recognized by King (1970), though perhaps only where either the sediment is unusually modified or the fish show aberrant behaviour.

The distribution of the hake fisheries bore quite different relations to the maps of sediments and resource biomass than did those for cod and haddock. Scott (1976, 1981, 1982a,b) found that white hake on the Scotian Shelf had a preferred depth range, as recorded in the summer surveys, of 100 to 150 fm and were caught in greatest numbers in areas of 'LaHave Clay' sediments (the softest class of mud in this area: King, 1970). Notable quantities of hake have been taken by the surveys on the floors of Emerald, Georges, Jordan and Grand Manan basins, as well as along the upper continental slope. In contrast to this distribution of the resource, the specialized hake fishery on the Scotian Shelf was located on deposits of 'Emerald Silt' at 70 to 85 fm along the edge of the Emerald Basin. The fishermen specifically avoided the hake-rich 'LaHave Clay' floor of that basin because of the abundance of scavengers. The Grand Manan Basin hake fishery did lie in an area which has seen high research vessel catch rates but it was on a deposit of 'Scotian Shelf Drift' (Fader *et al.*, 1977) and was not matched by similar fishing on the 'LaHave Clay' of Jordan Basin. These observations may be explained by the hake fisheries being in areas where the distributions of the clay-preferring hake overlap with those of rather coarser sediments, which have lower densities of scavengers and thus permit relatively-high hake availability to longline gear. If this hypothesis is correct, the benthic habitat that fulfils the requirements of both the hake and the fishermen is found on 'Emerald Silt' around the Emerald Basin but on 'Scotian Shelf Drift' in the Bay of Fundy, where substrate modification by tidal winnowing is pronounced.

The halibut fishermen appeared to fish on every sediment type and every habitat type, from inshore rocky areas to the continental slope, that were accessible to their boats. This may reflect the diverse preferences of the fish but could equally be an artifact resulting from the very fine scale targeting practices of these fishermen, who may have found small spots of prime halibut 'bottom' amidst areas of quite different habitat. Halibut are too rarely taken by the research vessel surveys (Scott, 1976) for analysis of those catches to provide a useful comparison.

There were some places where a few fishermen reported longlining on the flat bottoms of basins and gullies. The special cases of the Grand Manan Basin and The Inside Gully have already been noted. The floor of the Northeast Channel, which was intensively fished, is nominally composed of 'Sambro Sand' and 'Emerald Silt' with patches of 'Scotian Shelf Drift'. As a result of tidal winnowing, however, the seabed is made of much coarser particles than these classifications suggest (Fader *et al.*, 1988; G.B.J. Fader, Atlantic Geosciences Centre, Bedford Institute of Oceanography, pers.comm.) and much of it would probably be regarded as 'rocky' by the fishermen and hence as prime 'bottom', despite its depth. No interviewees reported fishing in the northwestern quadrant of Georges Basin where this coarse material gives way to the finer 'LaHave Clay' (Fader *et al.*, 1988). Similarly, the one interviewee who reported halibut fishing on the floor of the Laurentian Channel named an area near its mouth where 'Emerald Silt' crops out through the 'LaHave Clay' that otherwise covers the area (Fader *et al.*, 1982). Thus, the sediments in these two particular deep areas are not inconsistent with those fished at lesser depths elsewhere and the mapped distributions of longlining support the conclusion that the fishermen avoid areas of soft mud rather than basins and channels *per se*.

The principal feature of the distributions of longlining grounds that does not seem to be explicable by the distribution of habitat characteristics is the lack of longlining on some offshore banks and, within the areas that were fished, its greater concentration on some banks than on others. In several areas, according to the interview reports, the absence or limited extent of longlining in 1990 was a recent development. Banquereau, Sable Island Bank and Sambro Bank, in particular, were all said to have been fished in the 1980s and subsequently abandoned because they no longer provided adequate catch rates.

It is also notable that the closure of the 'Haddock Box' to mobile gear led to a substantial longline fishery on Emerald and Western banks. The eastern and southern borders of the longline grounds reported in that area closely followed the boundaries of the 'Box' (its northern and western limits lie over deep water) and it is likely that the location of those borders was defined by the regulated absence of trawler fishing, although there was nothing in the regulations to prevent the longline boats fishing outside the closed zone. The mechanisms by which the closure had this effect are not certain but might involve the avoidance of direct gear conflicts and real or perceived differences in resource density inside and outside the closed area.

Space limitations

Much of the longline fleet appeared to be constrained by the area available for fishing. This was confirmed for some particular fisheries by the anecdotal reports of interviewees who described, for example, fitting larger engines in their boats to give them an advantage over their neighbours when racing out to The Inside Gully after a period of bad weather; the first arrivals reserving the ground for themselves by setting their gear on it. On Western Bank in the summer, when the grounds were more continuously occupied, the fishermen set down LORAN 'lanes' to keep their gear parallel to and clear of their neighbours'. By report, they often had to select an unoccupied 'lane', rather than taking one where they expected the fish to be plentiful. In deepwater halibut fishing, where the usual strategy was to set on a number of privately-known spots that had proven good in the past, it was said not to be unusual to be displaced from a pre-chosen location when it proved to be already occupied by another boat's gear.

This space limitation was greatly strengthened by the tendency for fishermen in under 65 ft boats to confine themselves to particular parts of the grounds. The boats that fished the offshore banks may have been confined to those off their home ports by the costs of steaming further. The inside boats, however, not infrequently went 40 km offshore but rarely more than 10 or 20 km along the shore from their home ports, suggesting that steaming distances alone cannot explain their localization. This might instead be caused by the resource being generally richer further from shore, thus rewarding with higher catch rates the extra costs of steaming off but not those of steaming parallel to the land. Alternatively, the pattern may have some anthropological cause, though it is unlikely that the fishermen from one port were forcibly excluded from the grounds of others (as does happen in the lobster fisheries: Davis, 1984). There is little evidence of such exclusion being strongly applied in the groundfish fisheries (Martin, 1979; Davis, 1984; Acheson, 1988) and, while some interviewees referred to coercion during lobster seasons, none was mentioned during the present survey as being exercised against longlining activity.

There were only a few exceptions to this limited along-shore movement of small boats, the principal one being in the Sydney Bight area. Seasonal movements, by which small longline boats were operated out of ports other than their home ports, used to be normal there, with boats from Victoria and Cape Breton counties moving to Newfoundland to fish the Rose Blanche Bank cod as well as shifting between the west and south shores of the Bight. Some Newfoundland boats have moved seasonally to Sydney Bight since the 1940s (Stiles, 1972). In 1990, the catch rates on each of the grounds were said by some interviewees to be too low to justify these movements, though some still occurred.

The extreme localization of small-boat, inside fishing did lead to an important behavioral difference between fishermen who worked the inside grounds and most of those who fished the offshore banks. The former group were area-specialists, being confined to the small areas off their home ports. In order to prolong their fishing seasons, they had to be resource-generalists, taking a series of different species at appropriate times of the year (cf. Acheson, 1988). These typically included lobster and often herring, mackerel, crabs or scallops, in addition to groundfish. The large boats, in contrast, were able to move to wherever groundfish were available at a particular season. The efficient use of large, high-cost boats required, however, that they be specialized for particular kinds of fishing, such as longlining. Thus, most over 40 ft boats were area-generalists and resource-specialists. Some intermediate-sized boats were able to pursue an area-generalist, resource-generalist strategy. This was particularly seen in southwest Nova Scotia where, with the relative abundances of various resources in 1990, some fishermen chose to use fully-decked longline boats in the lobster fisheries during the appropriate season. Conversely, the Sydney Bight area may offer so few alternative resources that local small-boat longline fishermen have traditionally had to be cod-specialists, compelling them to develop their area-generalizing pattern of seasonal movements.

Changes in the longline grounds since 1960

There are very few published data on the distribution of Scotia-Fundy Region groundfish longlining in earlier years with which these maps can be compared. From landings data it appears that, except for a short-lived hake fishery, until the mid-1980s there was very little Nova Scotian hook and line fishing on the Grand Banks after the dory schooner fishery for cod ended in 1962. The growth, since

1984, of a specialized fishery for large cod in Div. 3NO is a major change in the Scotia-Fundy longline fisheries which has led to an expansion of the grounds fished by over 65 ft boats.

Among the few studies of other components of these fisheries, Halliday *et al.* (1986) have presented some small-scale maps of the distribution of Canadian fishing effort west of 64°W longitude, including two of the number of longline hooks set in each 10' by 10' rectangle (in 1960–72 and 1973–77, respectively), based on logbook data, but these maps were not thought to be fully reliable. No information on the sizes of boats that contributed to the logbook program nor on the proportion of total effort that was included is available. Within these limitations, the map for 1960–72 showed a relatively even density of effort along the northern edge of Georges Bank, in the mouth of the Northeast Channel, up the 50 fm contour past German and Lurcher banks, on parts of LaHave and Roseway Banks and particularly from Baccaro Bank and the southern tip of Browns in to the 50 fm contour near the shore. The data for 1973–77 suggested much more extensive fishing, extending from the north around to the east side of Georges Bank (but not on the Northeast Peak itself), throughout the Northeast Channel, much more broadly up the coast, almost to Grand Manan, and in almost every rectangle eastward from the Northeast Channel to 64°W, including some of those inside the 50 fm line. It is not possible to tell how much of this apparent increase in the extent of the grounds between 1960–72 and 1973–77 was simply a result of more comprehensive data collection, as logbooks became compulsory for boats over 25.5 GRT in 1972.

Sinclair (1992) mapped cod-directed longline effort in Subdiv. 4Vs and Div. 4W in 1984 and 1985, based on logbook data, as part of a study of the effects of fishing practices on partial recruitment. He found dense effort on the northern tip of Banquereau and between there and Misaine Bank, with less concentrated activity elsewhere on those banks. In Div. 4W, the logbooks only recorded scattered cod-directed effort on Sable Island Bank and on the inside grounds off Halifax County.

In 1985, through the mediation of the Longliner Branch of the Nova Scotia Fisherman's Association, Halliday and Sinclair (1987) circulated a survey, designed to elucidate the grounds fished in 1982–84, to the longline fishermen of the Cape Sable Island-Woods Harbour area of Shelburne County. They received useful responses from 24 fishermen (representing about 20% of the licensed 40–65 ft longliner fleet in the area plus one fisherman with a 36 ft boat). For this sector of the fleet and for this one home area, they were able to extract more information than is available from the present interviews because their survey gathered data on seasonal distributions of effort and on the species caught in each area. In sum, they found that relatively high numbers of boats fished Browns Bank (principally around the Cove of Browns), the northern edge of Georges Bank and the mouth of the Northeast Channel. Less important areas included the rest of Browns, LaHave, Baccaro and Roseway banks, 'The Bar', the continental slope eastward from LaHave Bank, all of the northern and eastern sides of Georges Bank, the deep water of the Northeast Channel, and the area around German Bank.

Effort distribution in 1973–77 ((Halliday *et al.*, 1986) was rather similar to that reported for the 35–45 ft class west of 64°W in the present study. There seems to have been a marked decrease in fishing from German Bank northwards (except in the Grand Manan Basin and other parts of the Bay of Fundy where the 1973–77 logbook data showed no activity) and there may have been a reduction in effort on Roseway Bank and in the surrounding waters. Otherwise no changes between 1977 and 1990 can be reliably perceived, given the resolutions of the two data sets. Even the change north of German Bank may be an artifact: fishing in this area was reported by some 45–65 ft boats in the present survey, which size class would probably be relatively more intensively represented in the logbook data than it is in the interview data.

The reported distribution of fishing in 1982–84 in Div. 4X suggests a choice of grounds intermediate between that for 1973–77 and that for 1990. The greater resolution of the data permits further interpretation, however. The concentration of boats on the Cove of Browns in the winters of the mid-1980s that was recorded by Halliday and Sinclair (1987) was recalled by some interviewees during the present survey. In 1990, however, most of the boats fished The Inside Gully in that season while the Cove of Browns was said to no longer have desirable concentrations of fish. There had also been some retreat, between 1982–84 and 1990, from the westernmost areas fished along the north side of Georges Bank; presumably because the final settlement of the ICJ line drove back the limit of Canadian fishing. These differences are minor, however, and there seems to have been relatively little change in the areas fished by boats out of western Shelburne County ports between 1982–84 and 1990, on the spatial scales recorded in the two sets of maps.

To the eastward, Sinclair's (1992) map suggests a distribution of longline effort in Subdiv. 4Vs that is in general accord with the grounds reported as fished in 1990 by the 35–45 ft boats. The present survey found that a rather wider area was fished but

some of this apparent expansion must be due to the inclusion of deepwater halibut-directed effort, which Sinclair (1992) did not map. The remaining differences probably relate to the deficiencies of the two data sets, rather than to any marked change in fishing practices between 1984 and 1990. In Div. 4W, in contrast, Sinclair (1992) found very little cod-directed longline effort, perhaps because most longlining there is directed towards haddock, halibut or hake. Such effort as he did find offshore, however, was scattered across Sable Island Bank where none of the interviewees reported fishing for cod in 1990. This appears to be a genuine temporal change in recent years; one which was indeed reported during several of the interviews.

In the only other published mention of the Scotia-Fundy longline grounds Davis (1984), using data for 1974–77 gathered during an anthropological field study, divided the boats of the Port LaTour-area of Shelburne County into two classes: open boats 11 m in length or less (his 'inshore') and 12–18 m boats with fish holds (his 'offshore'). The 'offshore' boats, which would be classed as 35–45 and 45–65 ft boats in the present study, fished the northern edge of Browns Bank (possibly the Cove of Browns) with 'fine gear', suitable for haddock and cod, in the early winter, moving still closer to the land when the bank was closed. When it was re-opened in June and with the coming of summer weather, these boats mostly took 'big gear', for halibut and cod, and worked the outer edge of Browns Bank, Georges Bank and the Sable Island grounds. With the change in the weather in about September, they returned to the inside edge of Browns Bank. This distribution is fully in accord with those mapped by Halliday *et al.* (1986) and by Halliday and Sinclair (1987), except for the record of fishing off Sable Island which lay outside of the former study's area of concern. The Shelburne County fishermen seem to have abandoned trips to the eastward for gadid fishing by 1990 except for a few 45–65 ft boats.

Davis' (1984) 'inshore', or under 35 ft, boats did not go more than a few kilometres beyond the Brazil Rocks, themselves about 10 km off the mouth of the Port LaTour inlet. Within this zone, they worked longlines seaward of the Brazils and in a broad band between those rocks and the fairway buoy (about 2 km off the mouth of the inlet). This is a very different area from that worked by similar boats in 1990. Of nine Port LaTour-area small-boat fishermen interviewed for the present study, none longlined inside the Brazil Rocks and all but two went more than 10 km from land; four of them going to middle-distance and offshore grounds, from The Bar to Georges Bank. This marked change is fully in accord with comments made by many interviewees who worked small boats, based everywhere from Victoria County to the Bay of Fundy, to the effect that they went much further off in 1990 than they did even a few years before.

As noted above, other interviewees' reports suggested that their choices of which particular grounds to fish on the banks changed from year to year, even if their general pattern of offshore fishing did not. The Cove of Browns and Roseway, Sambro, Sable Island, Banquereau and Rose Blanche banks were all said to have seen more longlining by some interviewees in the 1980s than they did in 1990. Western and Emerald banks and The Inside Gully may have seen the reverse trend.

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