

Canadian Atlantic Offshore Fishery Atlas

D.J. Scarratt

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CANADIAN SPECIAL PUBLICATION OF FISHERIES AND AQUATIC SCIENCES 47 (REVISED)

CANADIAN ATLANTIC OFFSHORE FISHERY ATLAS

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EDITED BY DR. D. J. SCARRATT

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DEPARTMENT OF FISHERIES AND OCEANS

APRIL, 1982

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FOREWORD

The fisheries of the Atlantic Coast have long played a very important role in the Canadian economy. In recent years, other industries have been making increasing use of fishery habitats and, as a result, the potential for conflict between industrial users has grown. Such conflicts can most effectively be addressed and resolved through consultation, based on good information.

This atlas has been prepared in the interests of fish habitat protection, in order that a digest of fisheries information be available to the petroleum industry, the marine transportation industry and to other interested parties. Since sensitivities change from season to season and from year to year it will be necessary to revise these maps and to publish

more detailed local information where possible. Site specific information should be obtained, as required, from regional Fisheries and Oceans laboratories and stations.

The Department of Fisheries and Oceans has a major role to play as manager of the marine fisheries and the habitats on which they depend. It is hoped that this publication will assist and encourage dialogue between fisheries interests and other users of these important and valuable habitats.

A. W. May
Assistant Deputy Minister
Atlantic Fisheries

ACKNOWLEDGMENTS

Numerous individuals contributed to this Atlas by providing original data and verification of the original maps. We wish to thank the members of the East Coast Offshore Drilling Committee of the Department of Fisheries and Oceans (ECODCOM) and their colleagues. In particular, we wish to express thanks to Dr. H. J. A. Neu for his contribution of previously unpublished data on wave climate.

Special acknowledgment is given to A. A. MacKay, G. B. Wood, and D. B. Yurick who compiled the text and prepared the maps.

Drawings of fishes are taken from Leim, A. H. and W. B. Scott. FISHES OF THE ATLANTIC COAST OF CANADA, F.R.B. Bull. No. 155, 1966. Other drawings are from Marine Research Associates Ltd. publications.

ABSTRACT

Scarratt, D. J. (ed.) 1982. CANADIAN ATLANTIC OFFSHORE FISHERY ATLAS. Can. Spec. Publ. Fish. Aquat. Sci. 47 (Revised): iv + 101 p.

The Atlas comprises a series of maps showing the distribution of various Canadian Atlantic commercial fishery species and other important marine resources, together with written descriptions of life history and biology appropriate to an understanding of their environmental sensitivity. Additional information is presented in graphical and written form of the prevailing winds, surface currents, and wave climate of the Northwest Atlantic.

RÉSUMÉ

Scarratt, D. J. (ed.) 1982. CANADIAN ATLANTIC OFFSHORE FISHERIES ATLAS. Can. Spec. Publ. Fish. Aquat. Sci. 47 (Revised): iv + 101 p.

Cet atlas contient une série de cartes montrant la distribution de divers espèces de poissons commerciaux et autres ressources marines importantes de l'Atlantique Canadienne, avec descriptions de leur vie naturelle et biologie propre à donner une compréhension de leur sensibilité environnementale. De plus, on présente des renseignements sous forme graphique et par écrit sur les vents prédominants, les courants de surface et le climat des vagues du nord-ouest de l'Atlantique.

TABLE OF CONTENTS

	PAGE
INTRODUCTION	1
OCEANOGRAPHY	5
WINDS	
WAVES	
CURRENTS	
IMPORTANT ENVIRONMENTAL FEATURES	
ICE, TEMPERATURE, AND SALINITY	
FISHERY	23
FISHING EFFORT	
KEY RESOURCE AREAS	
COMMERCIAL RESOURCE SPECIES — INVERTEBRATES	33
LOBSTER	34
SCALLOPS	36
SHRIMP	38
SNOWCRAB	40
SQUID	42
COMMERCIAL RESOURCE SPECIES — GROUND FISH	45
ATLANTIC ARGENTINE	46
COD	48
Haddock	50
RED & WHITE HAKE	52
SILVER HAKE	54
POLLOCK	56
REDFISH	58
COMMERCIAL RESOURCE SPECIES — FLATFISH	61
AMERICAN PLAICE	62
ATLANTIC HALIBUT	64
GREENLAND HALIBUT	66
WINTER FLOUNDER	68
WITCH FLOUNDER	70
YELLOWTAIL FLOUNDER	72
COMMERCIAL RESOURCE SPECIES — PELAGICS	75
BLUEFIN TUNA	76
CAPELIN	78
HERRING	80
MACKEREL	82
SWORDFISH	84
COMMERCIAL RESOURCE SPECIES — ANADROMOUS	87
ATLANTIC SALMON	88
RESOURCE SPECIES — BIRDS AND MAMMALS	91
MARINE BIRDS	92
SEALS	94
CETACEANS	96
REFERENCES	98
MAP FOR CORRECTIONS AND INFORMATION	101

INTRODUCTION

Since the 1977 Canadian declaration of Extended Jurisdiction to 360 km offshore, the Department of Fisheries and Oceans (previously Fisheries and Environment) has become increasingly involved in the provision of advice and guidance to other regulatory agencies on the offshore marine environment in general, and on fisheries in particular. This has taken a variety of forms, such as the evaluation of environmental impact statements, the review of contingency plans and a number of other interagency exercises concerned with proposed or potential industrial developments in the Canadian offshore zone. These ranged from the transport of industrial pollutants and seismic surveys to assessing the likely effects of offshore well drilling.

It was soon apparent that, whereas large amounts of valuable data and information existed on the fisheries and marine resources of the offshore zone, much of it was not in a suitable format for these purposes. There was no single document in which all data were summarized. Much of the relevant material was in fact unpublished and existed only in the files or minds of individual scientists. Accordingly, we canvassed knowledgeable experts in the Maritimes, Quebec and Newfoundland to obtain a rapid overview of the extent of current knowledge. This initial evaluation called for information on seven general fields of knowledge: distribution of areas of upwelling, mixing and high primary productivity; spawning or breeding areas of commercial or ecologically important species; larval or nursery areas; areas of adult distribution; migration routes; commercial fishing areas, and principal currents. With this broad selection it was hoped to identify, at least in general terms, all areas of recognizable concern for fisheries purposes. It was also considered necessary to have several levels of redundancy so that no part of the life history of a valuable species, or element in a food web, would be overlooked.

These early overviews were used both for review and information purposes on several occasions. However, it had always been the intention to edit and publish them as a general reference atlas of resources, with sufficient additional physical oceanographic data to indicate the type of climate that prevails in those areas. This atlas represents such an overview. It should not be considered more than a guide to the resources of an area in which a particular development may take place, nor does it relieve potential developers from the requirement to have a site-specific understanding of the resources and sensitivities their proposed developments may affect. Many of

the maps represent our understanding at a particular time and may be limited by available information. Thus, gaps in the distribution of some species may, in fact, represent a lack of knowledge rather than the absence of the fish in question in that area. Maps, such as those of fishing vessel distribution, are clearly subject to change as quotas and permit areas vary and as fish stocks rebuild.

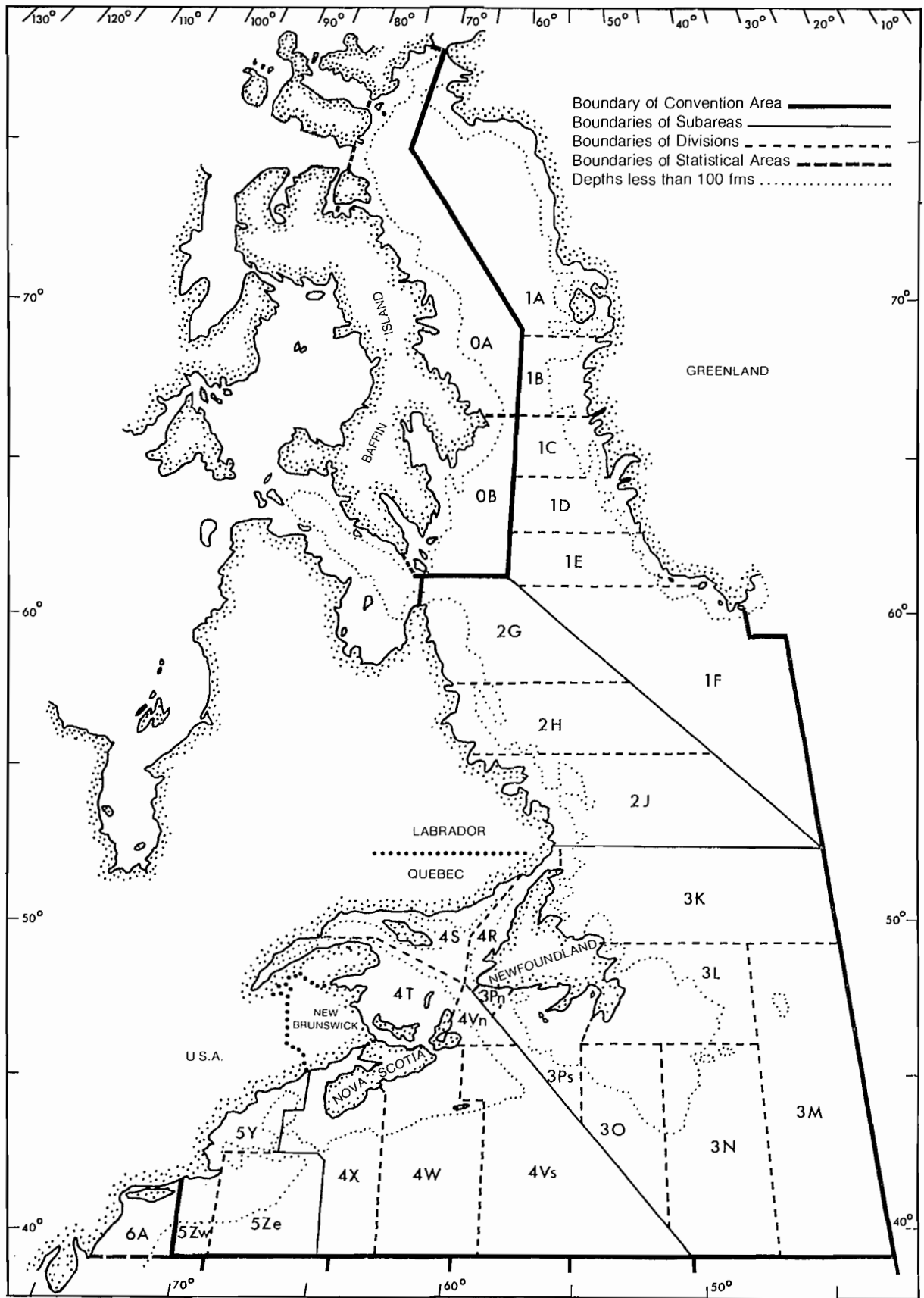
We have included maps of seabird distribution because we feel that this contributes to a general understanding of marine food webs and processes, and may help in locating areas of high marine productivity, which may otherwise not be identified. Maps of winds, waves and currents are included in order that both departmental staff and other users may have some appreciation of the ocean climate with which they are dealing.

Fisheries statistics present a particular problem. Estimates presented here are taken from "Resource Prospects for Canada's Atlantic Fisheries, 1980-1985". The whole business of fisheries management is extremely dynamic and assessments and projections made one year may be radically changed by the next. For that reason the projected estimates that are given should not be considered as other than a general guide and persons looking for current figures should consult with regional authorities.

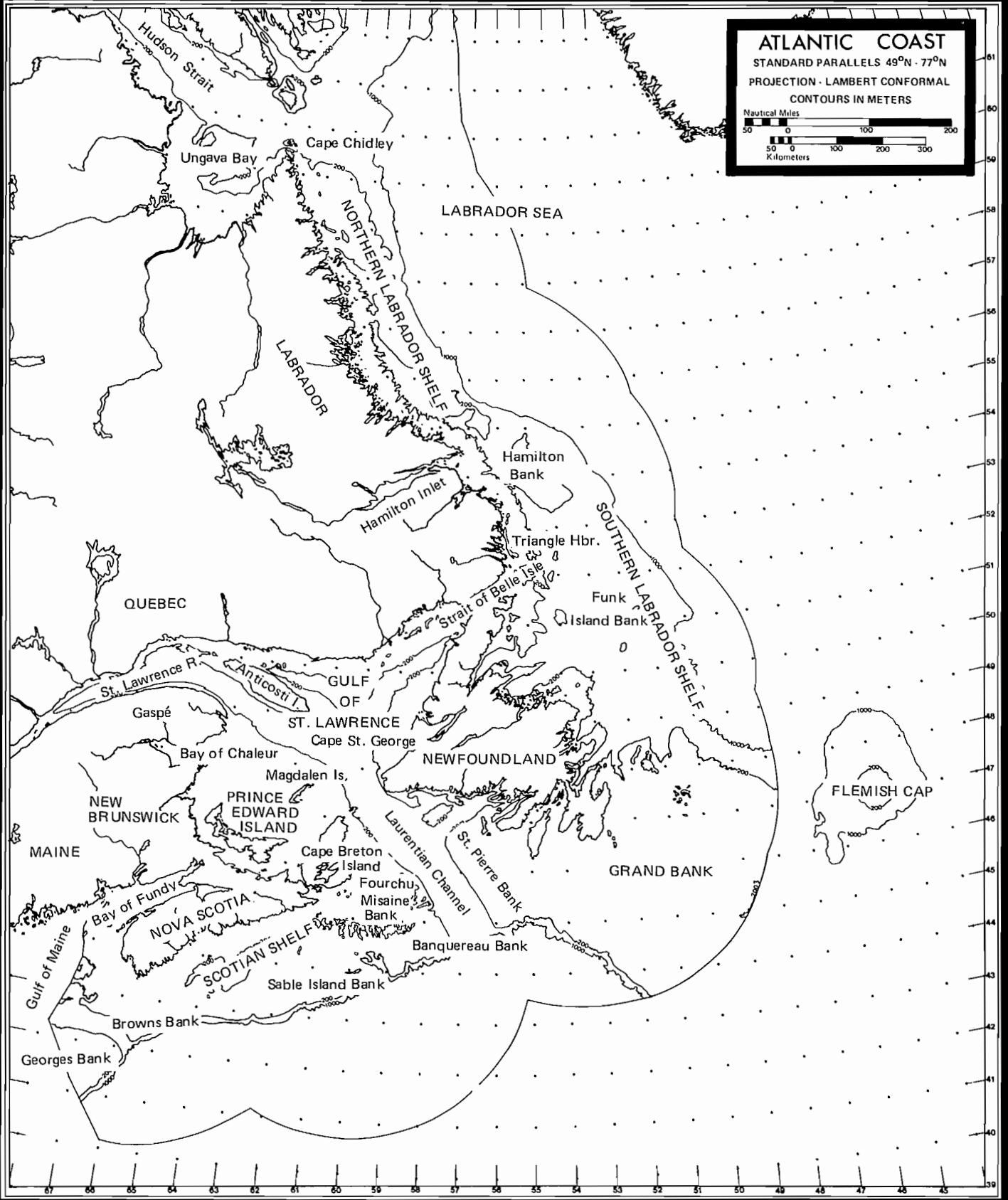
It is also recognized that apart from commercial benthic species, the benthos as such is not considered. These, together with a more thorough evaluation of plankton and primary productivity, might be subjects for future updating and elaborating of this report. To that end, it should be considered a working document.

Persons with special knowledge, not hitherto consulted, may disagree in detail with the interpretations expressed here. However, it must be appreciated that our knowledge and understanding are growing daily. Early drafts of this atlas which had limited circulation, resulted in numerous comments and corrections which are incorporated into this revised Special Publication. Ironically, some corrections were mutually contradictory, emphasizing the imperfect state of our understanding. One page of this atlas consists of a blank map which readers may use to provide the Department of Fisheries and Oceans with new information and constructive criticism which might be incorporated into future editions.

D. J. Scarratt
Department of Fisheries and Oceans
St. Andrews, N. B.



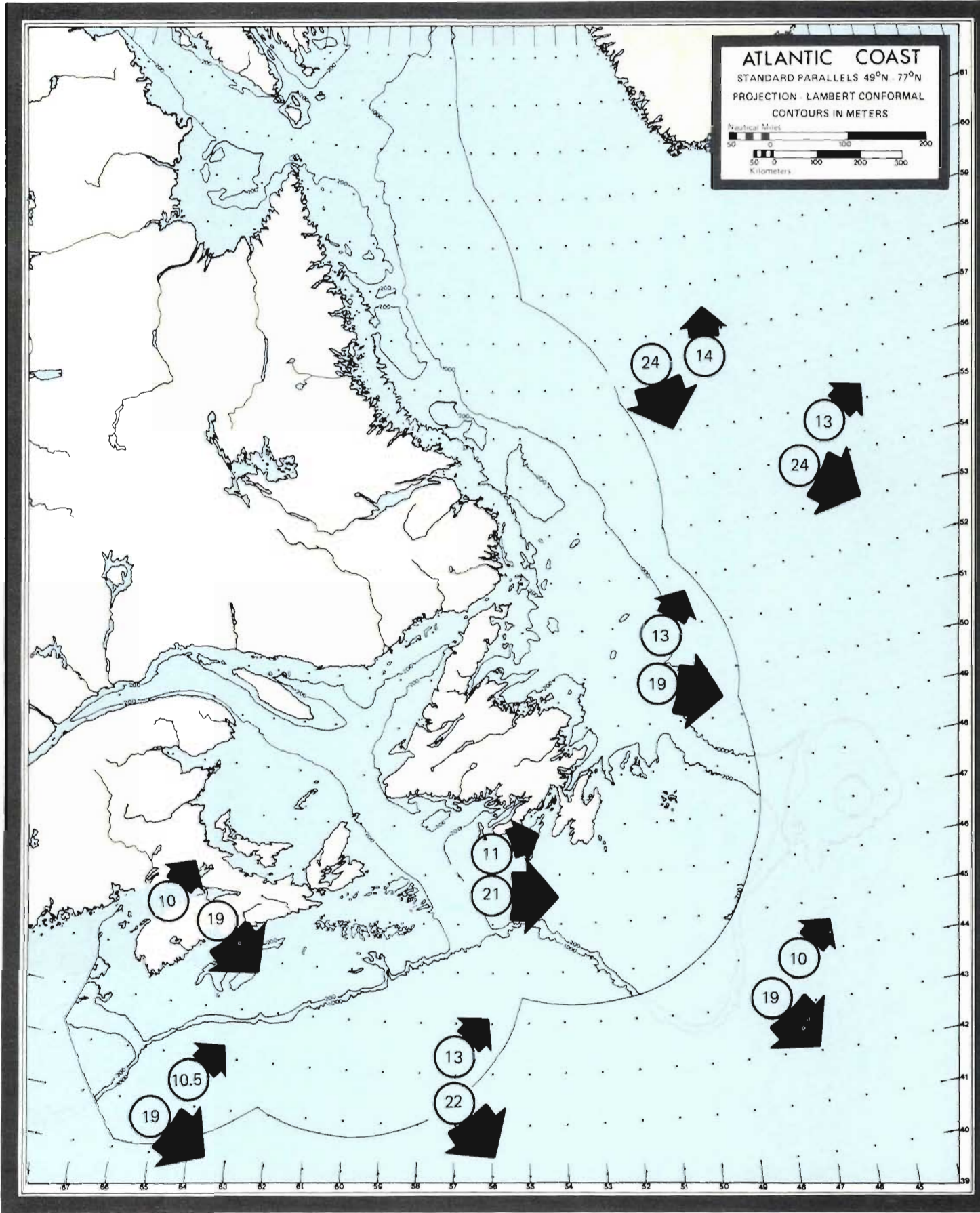
STATISTICAL DIVISIONS OF THE
 NAFO CONVENTION AREA



PRINCIPAL PLACE NAMES USED IN THE TEXT

OCEANOGRAPHY

Most fisheries of the Arctic and temperate zones are seasonal or, at least, show considerable seasonal fluctuations. The main reason for this is that the species concerned only form concentrations under special conditions. This is usually the case on the spawning, feeding and wintering grounds. The changes illustrated in this atlas are caused by seasonal, lunar or diurnal cycles. Superimposed on these cycles are irregular changes caused by physical factors such as wind, waves, currents, ice, temperature, salinity, etc. These factors influence both man's ability to pursue his fishery by creating hazardous conditions at sea and the fishes he pursues by affecting the feed, the drift of eggs and larvae, fish behaviour and distribution patterns. For these reasons, descriptions of environmental parameters are included in this atlas.

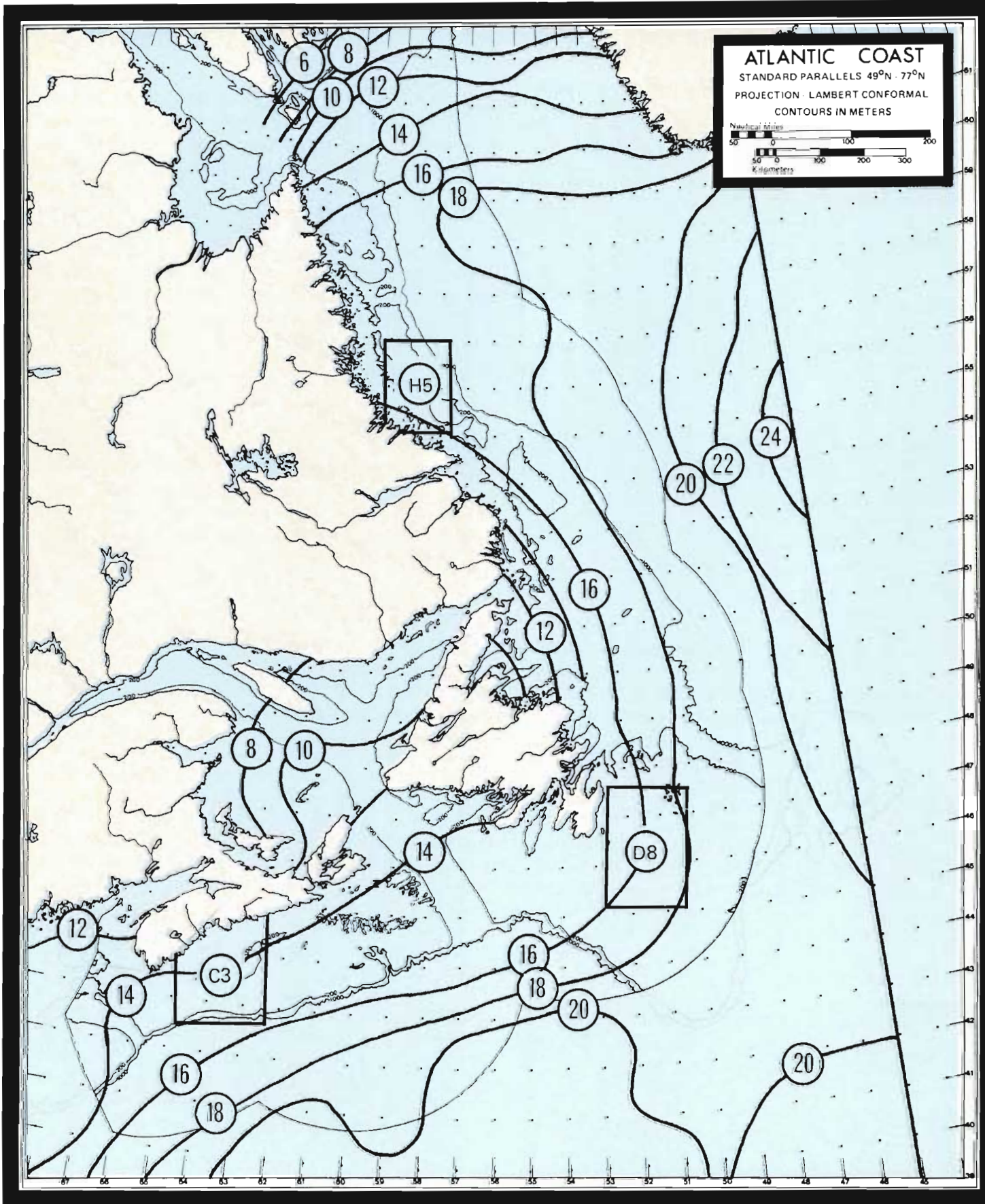


WINDS

Ocean winds have a major impact on the fishery of the east coast by limiting fishing capability, causing destruction of shore facilities and influencing fish stocks. Summer winds are generally southwesterly with mean speeds (July) ranging from 10 - 14 knots. Prevailing winter winds are generally northwesterly and stronger with mean speeds ranging from 18 - 24 knots. The winter climate is also dominated by cyclones sweeping the area from west to east which usually bring severe local conditions. These cyclones, up to 250 per year, follow one another at intervals of less than a day.

PREVAILING WINDS





WAVES

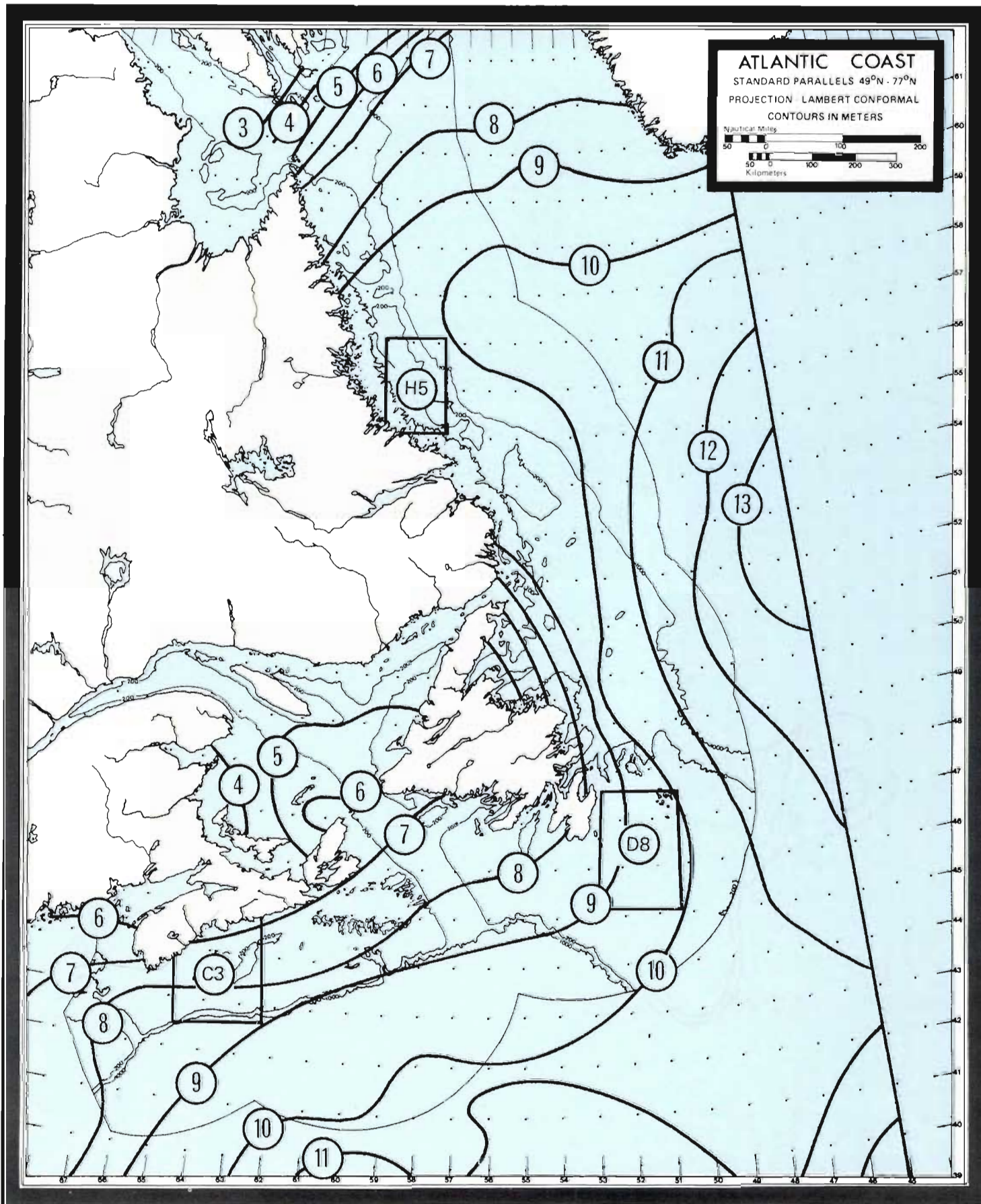
Ocean waves are normally generated by the wind blowing over the surface of the sea. The longer the time and the greater the distance that a uniform wind blows, the larger the waves that form. Once generated, waves can travel long distances as swell, which, combined with locally wind-generated waves and current, often create complex wave patterns which, particularly in winter, are dangerous to fishing vessels and their crews.

The first accompanying map shows the greatest wave height, in meters, that may be predicted from observations made in 1977-78. The second map shows the largest significant wave height, in meters, which is likely to be observed in any given year, based on 1977-78 data. Significant wave height is obtained by averaging the highest one third of the waves observed over a period of time. For instance, in a storm with a significant wave height of 7 m, individual wave heights will vary from 1 - 13 m, the average wave height will be 4.4 m, the average of the highest 10% of the waves will be 9 m, and 16% of all waves, or every sixth wave, will be greater than 7 m. The highest waves are about 1.8 x the significant wave height. Recent data indicate that for the Scotian Shelf at least, 1978 conditions were about average.

Exceedance graphs can be used to calculate the percentage of time when significant or maximum wave heights can be expected to exceed a given height, at three localities (C3, D8, and H5) in the North Atlantic.

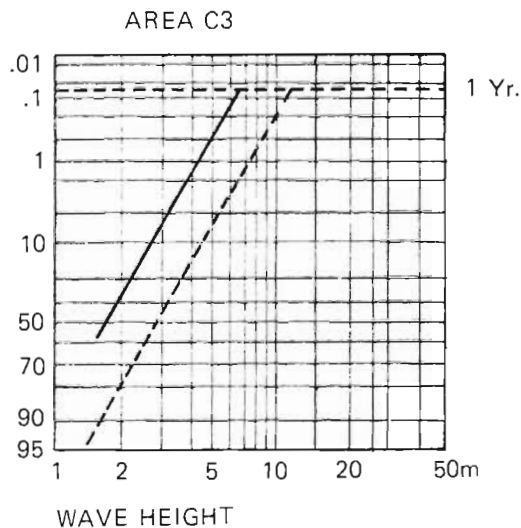
WAVES

**MAXIMUM ONE YEAR WAVE HEIGHT (m)
JUNE, 1977 - MAY, 1978**

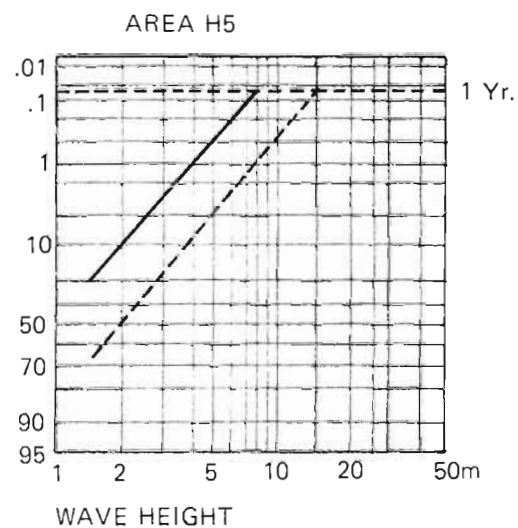


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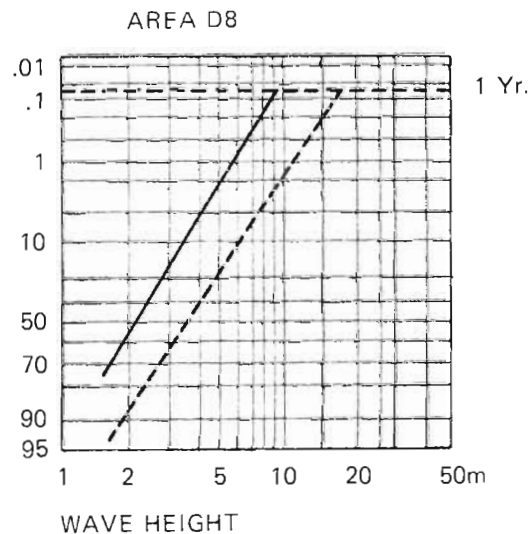
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% EXCEEDANCE

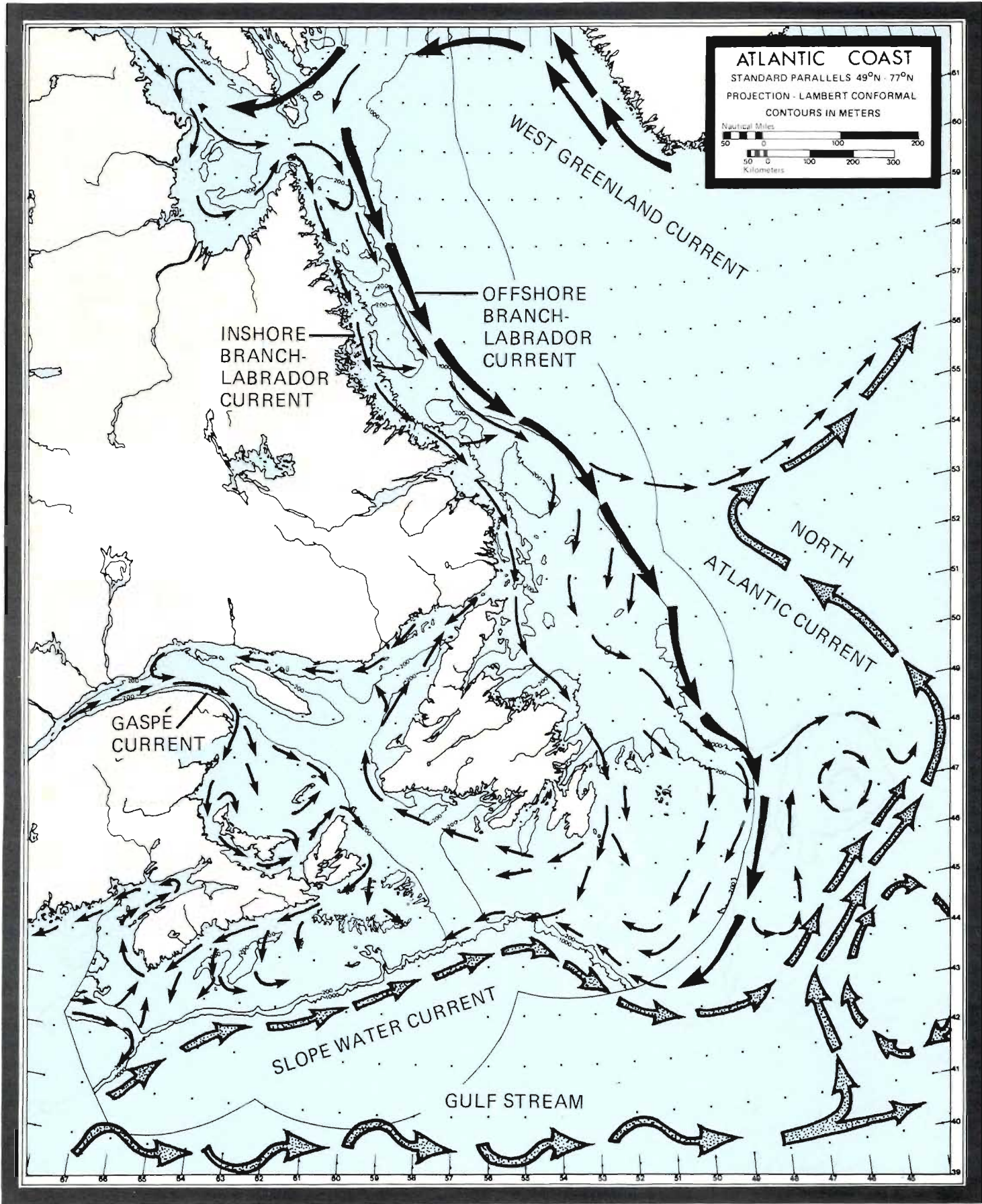


% EXCEEDANCE



WAVES

LARGEST ONE YEAR
 SIGNIFICANT WAVE HEIGHT (m)
 JUNE, 1977 - MAY, 1978



CURRENTS

Canadian Atlantic waters are formed, modified, and bounded by two major oceanic current systems: the cold Labrador Current and the warm Gulf Stream/Slope Water/North Atlantic current complex.

Coastal waters are cold and of low salinity and, generally, move southward and westward, mixing with river water from Hudson Bay, the Labrador coast and the St. Lawrence River. Offshore, the waters are warmer and more saline, moving eastward and northward. Mixing between these two bodies of water occurs along the edge of the continental shelf.

The Labrador Current begins at the southern end of Davis Strait where cold Arctic waters, carried southward along the Baffin Island Shelf, are joined by the somewhat warmer, saltier waters of the West Greenland current which moves across Davis Strait from the western coast of Greenland. Part of this current enters Hudson Strait where it mixes with the outflow from Hudson Bay, exits along the south side of the Strait, and rejoins the main mass of water moving southward along the Labrador coast. The main current consists of an inshore branch which is largely composed of waters originating from Hudson Bay and the Arctic and a stronger, offshore branch composed largely of waters from the West Greenland Current. While these two components can be distinguished, there is significant exchange between them, particularly at the saddles between banks.

Off Newfoundland, the Labrador Current flows southward onto the northeast Grand Bank and around and over the Newfoundland Grand Bank. The main current flows along the western side of Flemish Pass and southward to the Tail of the Bank. Much of the water turns offshore in meanders and eddies, eventually mixing with the North Atlantic Current and flowing northward

again. An inshore branch flows through the Avalon Channel and then turns westward at the edge of the continental shelf where it is joined by water from the Grand Bank. A Labrador current core can be detected as far west as the Laurentian Channel.

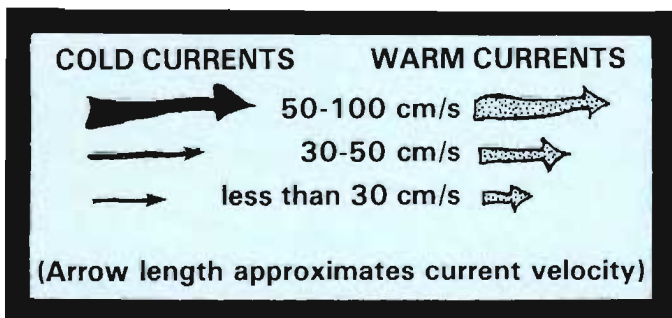
Within the Gulf of St. Lawrence, water exits from the estuary region as a strong coastal current, the Gaspé Current, which flows eastward along the Gaspé coast, around and over the Magdalen shallows and exits the Gulf of St. Lawrence on the western side of Cabot Strait.

Waters exiting from the Gulf flow westward along the coast of Nova Scotia within 20 km of shore (Nova Scotia Current) and eventually enter the Bay of Fundy and Gulf of Maine. Offshore, the flows are generally weaker and more variable in direction, with a considerable offshore component, especially between the various banks.

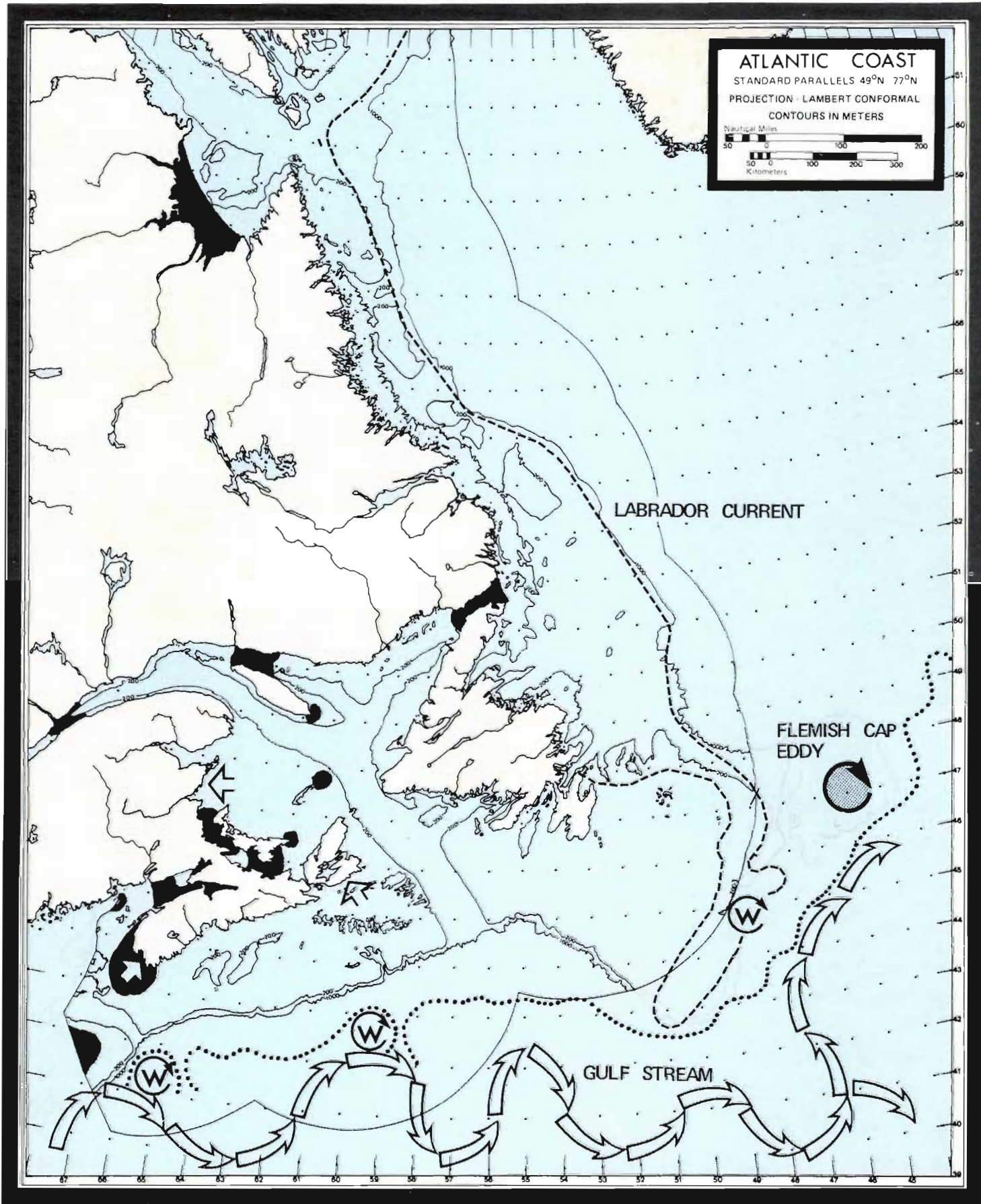
Offshore a warm slope water current flows eastward along the continental shelf south of Nova Scotia and Newfoundland to the Tail of the Grand Bank. Further south, the Gulf Stream also flows to the east, splitting at the Tail of the Bank. One branch turns northward and joins with the slope water current to form the North Atlantic Current which flows northward past Flemish Cap and loops into the Southern Labrador Sea before flowing eastward across the North Atlantic.

While the Gulf Stream is, on the average, several hundred kilometers south of the continental rise, it actually meanders eastward as a series of large, continually changing loops. A number of times each year, these loops break off to form warm core eddies which may impinge on the continental rise, causing an exchange between coastal and offshore waters.

GENERAL SURFACE CIRCULATION*



*This map shows long-term average conditions which probably never exist as such at any given moment due to seasonal changes in strength and direction. Thus the figure does not precisely define the currents for all time. Surface currents in the top meter are greatly influenced by the local wind, and in many areas will likely be more important than the currents shown on the map.



IMPORTANT ENVIRONMENTAL FEATURES

Apart from the foregoing environmental features of the northwest Atlantic, a number of areas show additional oceanographic characteristics which are considered to have profound effects on living marine resources and, consequently, on the fishery. Generally, these areas are considered to be highly productive and influence both the distribution patterns and development of marine animals.

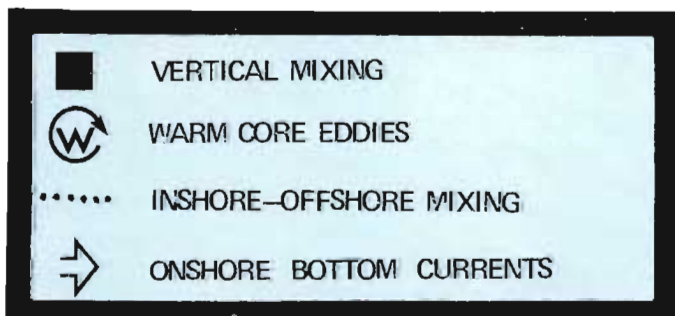
While the mechanisms and exact localities are not yet completely understood, sufficient data have been collected to present a preliminary map of these oceanographic phenomena. Principal features include:

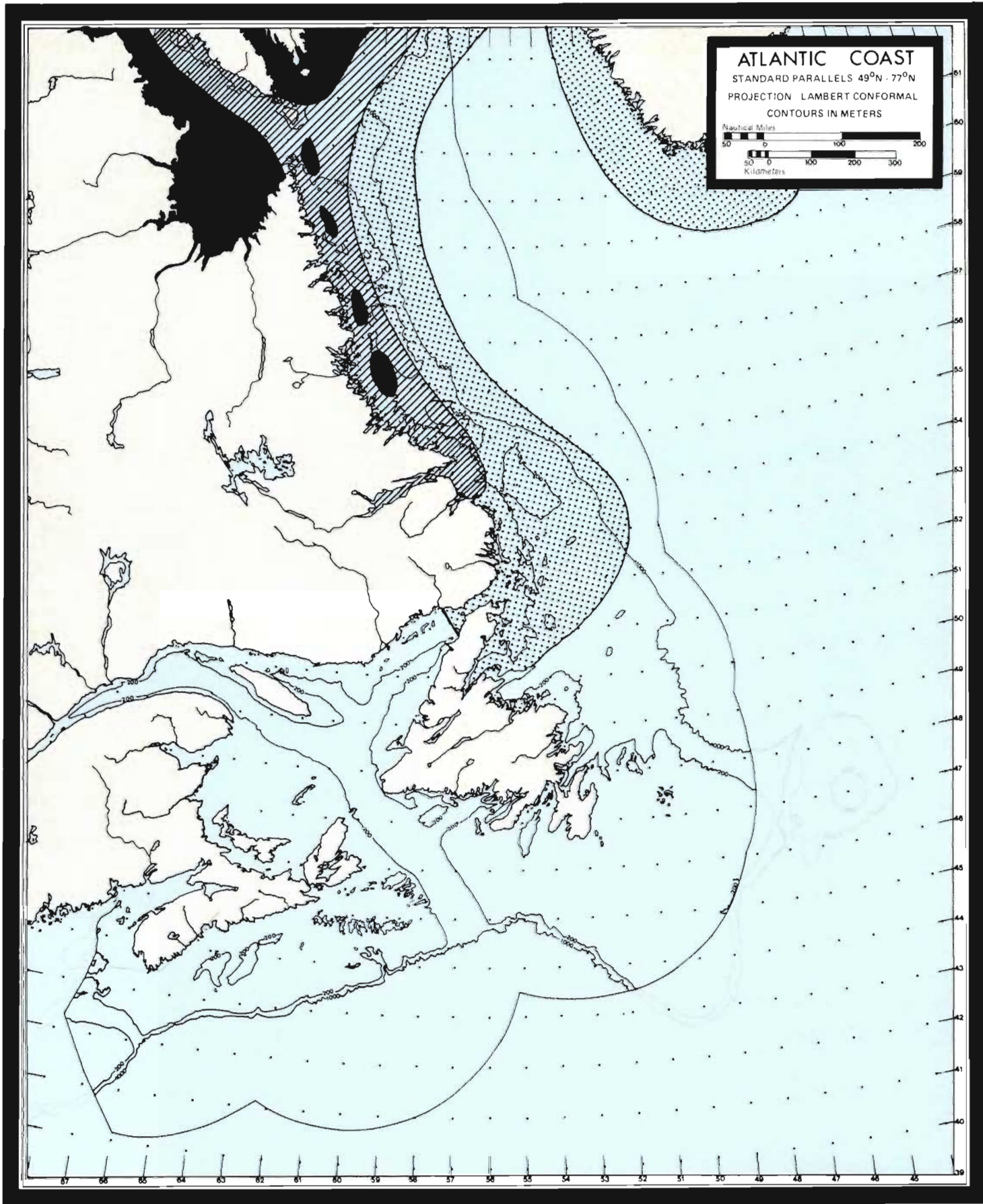
1. Mixing at the shelf/slope boundary — the boundary between inshore and offshore waters where mixing may enhance productivity.
2. Labrador Current — the boundary between the coldest part of the Labrador Current and warmer water.
3. Onshore bottom currents — areas in which there are known onshore bottom currents, possibly indicating upwelling, are indicated by a large arrow.
4. Warm core eddies — warm core eddies impinging on the shelf/slope and Labrador Current boundaries promote

mixing by exchanging inshore water with offshore water. They are formed when northerly meanders of the Gulf Stream are pinched off, enclosing a core of warmer offshore water.

5. Flemish Cap eddy — believed to be a partially closed circulation around Flemish Cap which serves to retain fish larvae on the Cap and increase survival rates.
6. Vertical mixing — areas in which tidal models indicate that the water column will be vertically mixed due to tides.
7. Cold core eddies, not shown on the map, are formed when southerly meanders of the Gulf Stream are pinched off enclosing a core of cooler, slope water.

IMPORTANT ENVIRONMENTAL FEATURES





ICE, TEMPERATURE & SALINITY

ICE:

Labrador and Newfoundland

The two chief sources of Arctic ice for the western Atlantic are Davis Strait and Hudson Strait. The winter ice stream from Baffin Bay reaches Hudson Strait in late November and is joined, at Cape Chidley, by heavy floes from Hudson Strait. The combined streams move down the Labrador Coast arriving off Belle Isle late in January. The first ice to arrive consists of open strings of young ice formed on the Labrador coast itself, but this is gradually replaced by heavier floes which have originated in more northern regions. The pack ice often extends 160 km east of the entrance to the Strait of Belle Isle and is of various ages, but first-year ice predominates. Some of this ice enters the Strait along the northern side and soon fills it entirely. This ordinarily closes the Belle Isle route to navigation until the latter part of June.

By mid February ice has reached the northern edge of the Grand Bank and by mid March the Pack has spread generally over the northern part of the Bank, sometimes as far south as lat. 46°N. Again the first ice to appear is deceptively soft and open but is followed by heavier, more compact fields extending up to 160 km offshore. In these latitudes, at this time of year, this ice has little of the appearance of the original winter pack. However, it can be heavy and compact enough to stop a vessel and may seriously damage any ship attempting to force a passage. There are two possible extensions of this ice following the movement of the major ocean currents of the region described above. Large quantities may drift south along the eastern

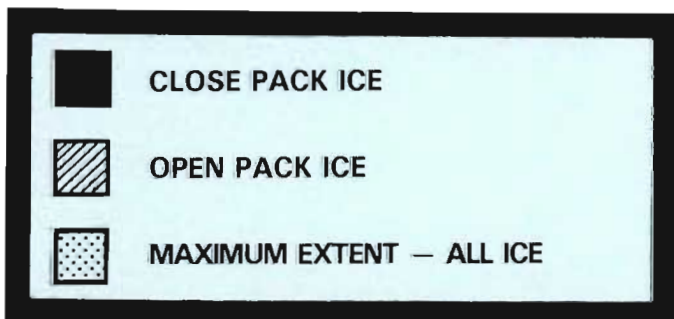
edge of the Bank breaking up into ice patches and belts as it moves south of 45°N lat., being mostly destroyed before reaching the Tail of the Bank. If it survives to this latitude (43°N) it is generally very quickly melted in the warmer water to the south and east. This ice, in the last stage of disintegration, is seldom a menace to navigation. Occasionally in seasons of extremely heavy ice, dangerous floes extend to the Tail of the Bank but rarely south or west of this point. There are always a few icebergs among the flows when they arrive at the Banks and often a great number. The other extension of the ice is along the east coast of Newfoundland and around Cape Race. From this point it spreads south and southwestward over the neighboring banks. There is no appreciable amount of ice experienced southwest of the shelf and a clear passage can regularly be found in the mouth of the deep Laurentian Channel leading toward Cabot Strait. On rare occasions the ice spreads westward from Cape Race completely blocking the harbors on the south coast of Newfoundland as far west as St. Pierre - Miquelon.

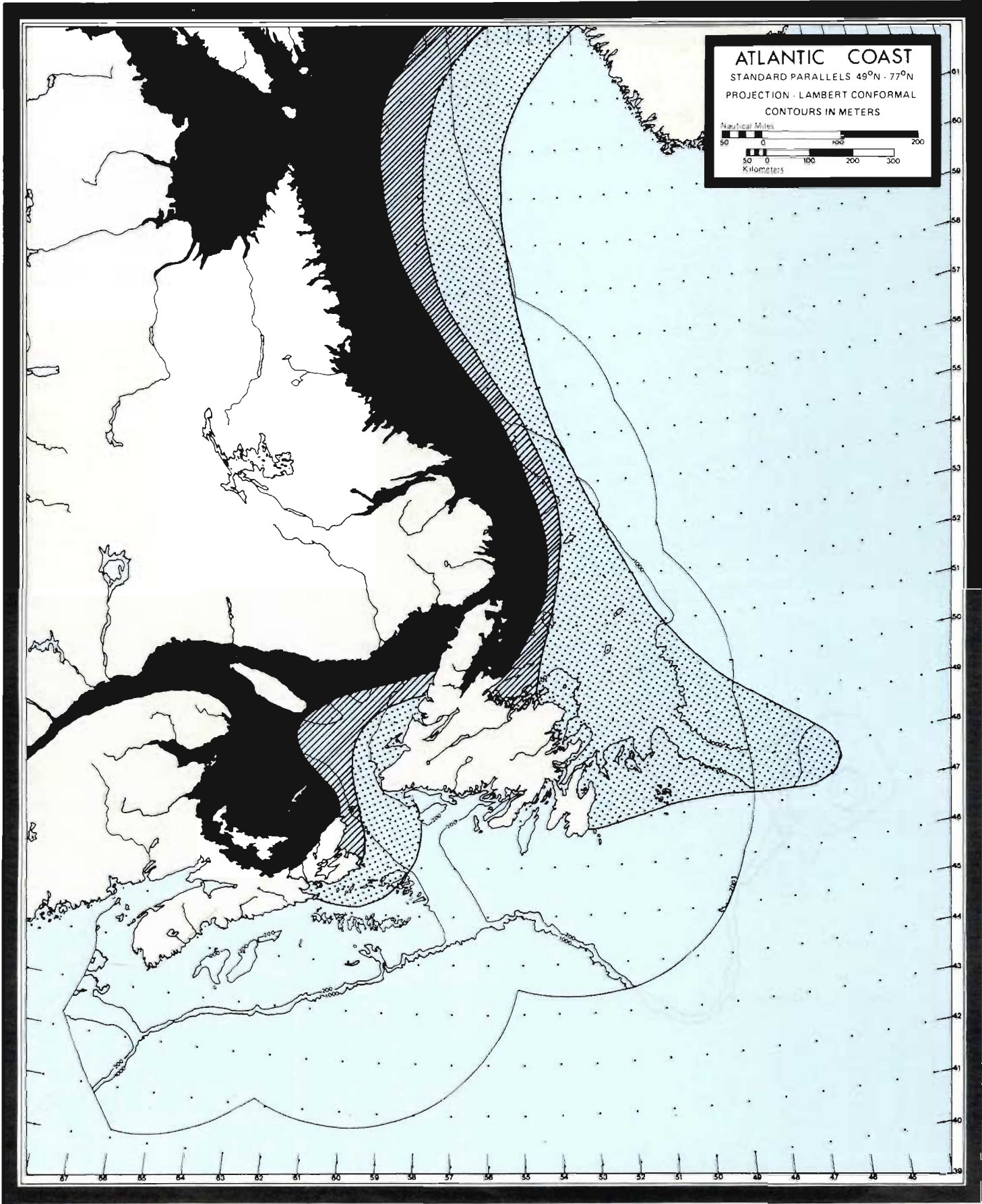
In April and May the winds tend to become westerly, the ice is driven eastward into warmer waters and melts, starting a northward retreat of the pack. It clears Belle Isle Strait about the end of May in most years and the northern Labrador coast about the third or fourth week in July.

Gulf of St. Lawrence and Scotian Shelf

Ice conditions in the Gulf of St. Lawrence vary in extent from year to year, and range from minimum ice cover in the west and southwest parts of the Gulf only, to the other extreme of virtually complete ice cover in the Gulf which may persist for as much as 4 weeks. Except for a small amount of older ice which sometimes comes through the Strait of Belle Isle in the spring, all ice is of one season's growth only, and much of it never gets past the young ice stage of development. Maximum thickness, except in ridges, is about 0.7 m.

AVERAGE EARLY SUMMER ICE CONDITIONS





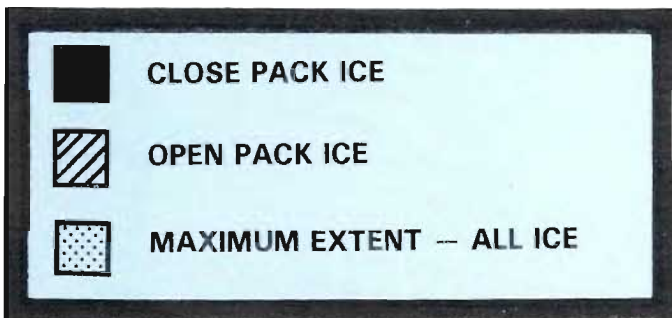
Ice formation usually starts in the river below Quebec about mid December, and in Chaleur Bay and Northumberland Strait in the second half of the month. Maximum extent is reached about mid or late February, but growth is not always continuous up to this time. Warm temperatures can occur at any time during the growth season and temporarily reverse the trend.

The ice stream departs the Gulf of St. Lawrence spreading south and westward toward Sable Island, frequently completely covering the banks north of that island, for short periods when the wind favors such drifts. The ice, as it leaves the Gulf, consists of heavy, tightly packed, rafted ice and forms a difficult barrier to navigation. With favorable winds, when the fields have their greatest extension, the ice spreads east-northeastward toward the southern shore of Newfoundland, though seldom actually reaching that coast. Some also moves southwestward from Scatarie Island along the Nova Scotia coast though only occasionally drifting as far as Halifax where it is always open and navigable.

The final retreat of the ice normally starts sometime in March, and complete clearing occurs anytime from late April to the end of May. Open water passage through the Gulf is nearly always possible anytime after the end of March and sometimes sooner.

From this description it might appear that the Gulf of St. Lawrence ice would present few problems to navigation, but this is not always the case. Stormy weather causes much ridging and rafting of the ice, and pressure at times can be severe. Polar icebreakers have, at times, been halted by the severe ice ridges which can develop across Cabot Strait.

AVERAGE WINTER ICE CONDITIONS



TEMPERATURE & SALINITY:

Temperature and salinity of the waters of Canada's eastern seaboard vary with depth, position and time. A general description of the surface waters of the region follows.

Most of the area in question is covered by a surface layer whose salinity is lower than the water beneath it as well as being less saline than the water offshore. This low salinity surface layer has a number of sources.

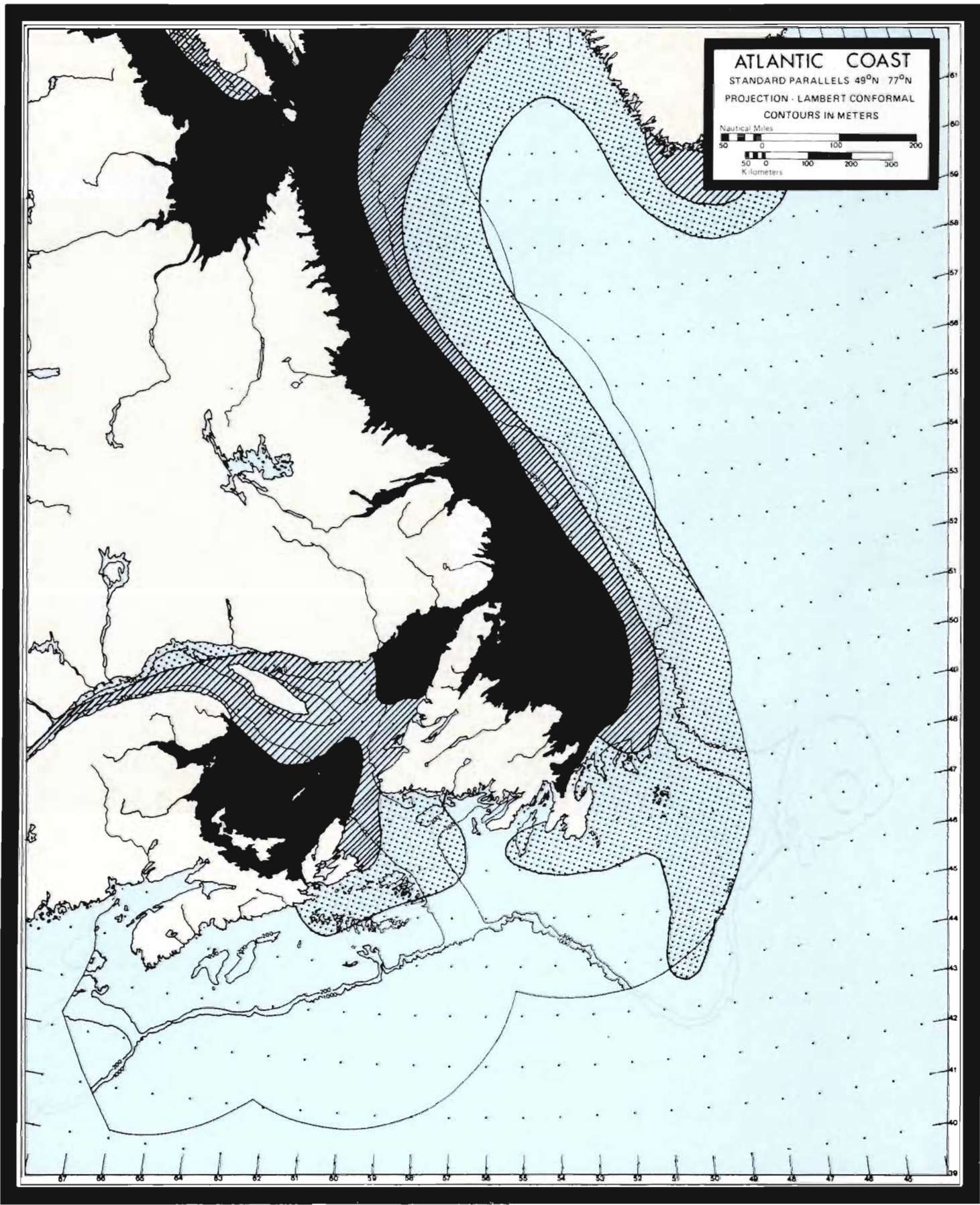
Along the coast of Baffin Island the low salinity surface layer arises from the Arctic surface waters which are also of low salinity. Off Baffin Island the salinity of this layer is generally less than 32‰ and its temperature even in the summer is close to the freezing point (-1.5 to -20°C).

Along the Labrador coast the low salinity surface layer arises from the outflow from Hudson Bay, low salinity water from the Baffin Island Current, and from the West Greenland Current. The salinities are least near the coasts (generally in the range of 31 - 33‰). There is a strong annual variation in the salinities, with values as low as 29‰ occurring as a pulse of low salinity water associated with spring runoff into Hudson Bay moves down the Labrador coast in late summer. Temperatures are at the freezing point in winter but warm up to 4 - 10°C by August.

The waters over the Newfoundland Grand Banks are similar to those off the Labrador Shelf. The salinity varies from a low of 31‰ in September/October to its winter-spring range of 32-32.5‰. Temperatures range from the freezing point in winter to highs of 12°C in summer.

The low salinity layer in the Gulf of St. Lawrence and on the Scotian Shelf arises from the fresh water runoff of the St. Lawrence River. The salinity ranges from values as low as 24‰ in the estuary to over 32‰ in parts of the Gulf of St. Lawrence and on the Scotian Shelf. Again there is a strong seasonal variation due to the spring runoff of the St. Lawrence River. Off Halifax salinities as low as 29‰ are seen with the passage of the low salinity pulse in the fall; during the remainder of the year salinities of 31-31.5‰ are observed.

In winter the surface layer in the Gulf is at the freezing point and extends to 100 - 150 m in depth. As spring advances, the surface begins to warm and freshen, forming a new surface layer some 50 m thick over the remnants of the previous winter's surface layer (this cold layer remains under the surface layer throughout the summer).



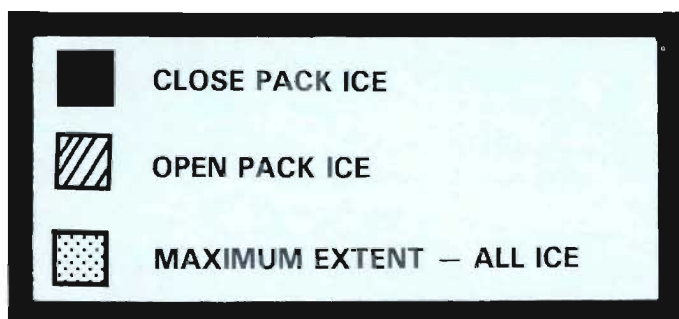
Summer surface temperatures reach values greater than 20°C in the southern Gulf but are colder along the northern shore and off the west coast of Newfoundland. Temperatures on the Scotian Shelf remain generally above 0°C in winter and warm to as high as 18-20°C by September

These low salinity surface layers generally extend off the coast to about the 2000 m isobath. Here a long sinuous front separates the coastal waters from the warmer, more saline (greater than 34‰) oceanic water offshore.

The bottom water on the continental shelves is a higher salinity water which has moved onto the shelves from offshore. Salinity on the Labrador shelves is about 33‰ and temperatures around 3°C. This same water is found on the Grand Banks; however, at times warmer and more saline (8°C, 34.5‰) oceanic water from the North Atlantic Current is found over the southern Grand Banks.

Oceanic water with a salinity of 34.6‰ and temperatures of 4-6°C enters the Gulf of St. Lawrence through the Laurentian Channel and forms the bottom water of the Gulf of St. Lawrence. Similar oceanic water is found on the banks and in the basins of the Scotian Shelf. Bottom temperatures greater than 9°C and salinities greater than 35‰ have been observed in Emerald Basin.

AVERAGE SPRING ICE CONDITIONS



FISHERY

The fisheries of Newfoundland, Nova Scotia, P.E.I., New Brunswick and Quebec together account for about two thirds of the marketed value of all Canadian fish. Total landings on the Atlantic coast in 1977 amounted to one million t, with a value of \$288 million. The marketed value was \$712 million. Groundfish made up more than one half of the catch, followed by herring and various species of molluscs and crustaceans.

Among the main species in the groundfish category, the total allowable catch (TAC) of cod is projected to increase to 352,000 t in 1985. For haddock and redfish virtually no change is predicted in the TAC, while for flatfish the TAC is anticipated to rise slightly from 135,000 t in 1977 to 152,000 t in 1985. The Canadian share of the total allowable catch of these traditional major groundfish species in 1978 was 428,000 t, or 60 %. Canada's share was about 70% in 1978, with even higher levels being projected for the future. Among the main Canadian pelagic species, herring catches are expected to fluctuate on a stock by stock basis as a result of variable recruitment but the overall TAC is expected to increase gradually to 230,000 t by 1985. The TAC for mackerel on the other hand is expected to increase from 105,000 t in 1977 to 300,000 t by 1985.

In the shellfish category lobster catches are expected to remain stable or decline while scallop and snow crab catches will fluctuate somewhat. There have been no reported foreign landings of shellfish from Canadian Fishery Zone 4. (east coast, offshore).

From a geographic point of view, fish stocks on the Scotian Shelf, which have recently increased rapidly, are projected to continue to increase gradually. Moderate recovery will be reflected in improved catch rates. On the Grand Banks the groundfish fisheries may accommodate some expansion, provided that conservation measures are respected. While the Scotian Shelf and Grand Bank fisheries do show hope for expansion. Gulf of St. Lawrence stocks appear to be fully exploited except for mackerel which could produce new possibilities for development. Cod stocks to the east and north of Newfoundland offer possibilities for relatively rapid and sustainable growth in the fishery of that area.

WINTER OFFSHORE DOMESTIC FISHERY AS INDICATED BY FLEET DISTRIBUTION

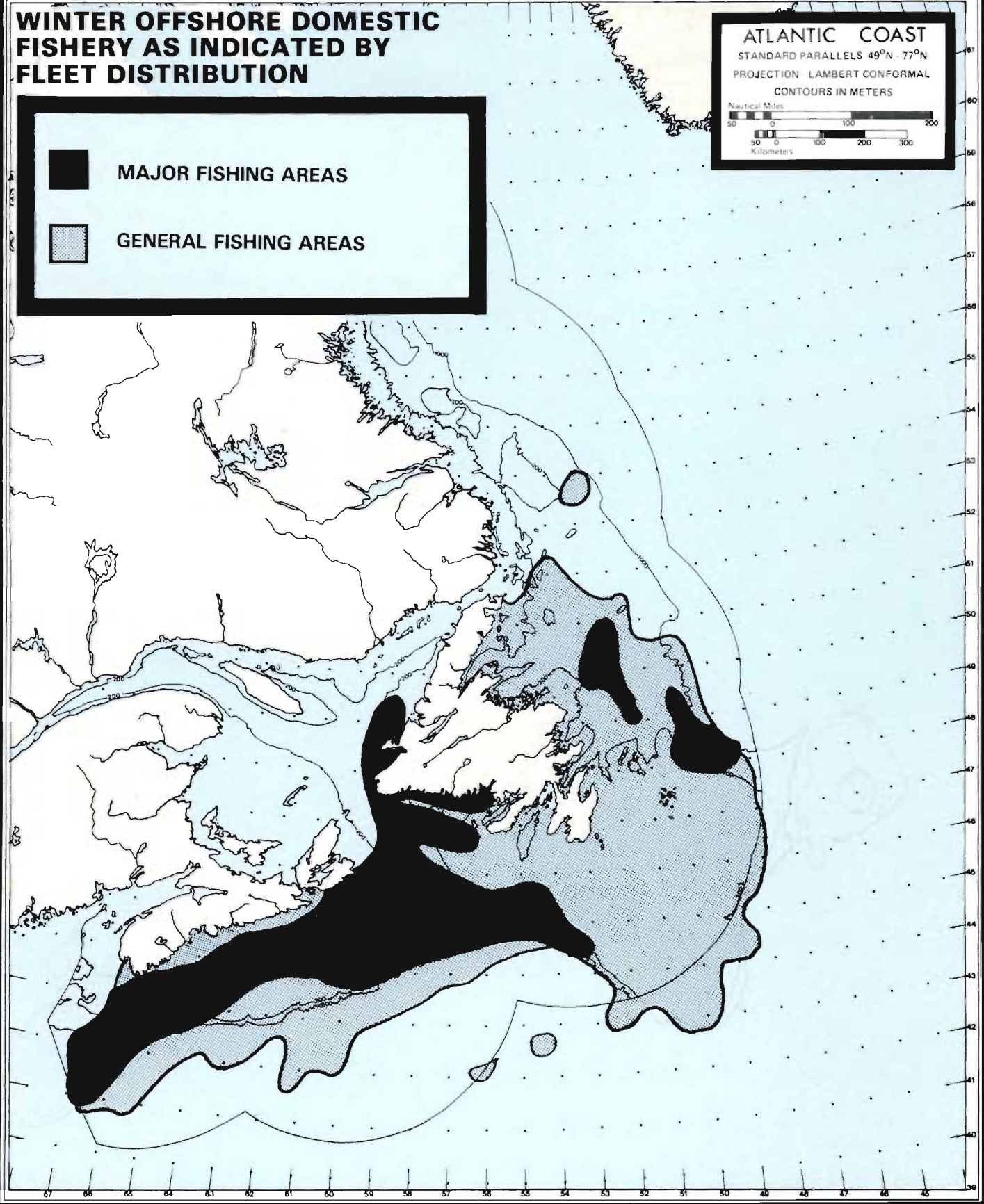
ATLANTIC COAST
STANDARD PARALLELS 49°N - 77°N
PROJECTION LAMBERT CONFORMAL
CONTOURS IN METERS

Nautical Miles
50 0 100 200

Kilometers
50 0 100 200 300

■ MAJOR FISHING AREAS

▨ GENERAL FISHING AREAS



FISHING EFFORT ✓

The accompanying maps attempt to define principal fishing areas utilized by domestic and foreign offshore fleets during the late 1970's. The maps are based on the reported location of vessels during these periods. Assuming that vessel location is an indicator of principal stock occurrence, certain conclusions can be reached.

The charts show generalized fishing vessel distribution for offshore vessels only. They do not record the distribution of Canadian vessels permitted to fish the Bay of Fundy and Gulf of St. Lawrence, which are generally less than 20 m overall length. Both the Bay of Fundy and Gulf of St. Lawrence are fished extensively, but these areas are not considered 'offshore', and with the exception of the spring cod fishery off S.W. Newfoundland, the Gulf of St. Lawrence and Bay of Fundy are not considered here.

Data were taken from surveillance overflights and mandatory reporting systems.

WINTER:

The domestic offshore fleet concentrated its efforts along the Scotian Shelf, mouth of the Gulf of St. Lawrence, on St. Pierre Bank and into two areas to the northeast of Newfoundland.

The foreign fleet ranged more widely in the winter, concentrating on the Scotian Shelf, eastern Gulf of St. Lawrence, southern Grand Bank, Flemish Cap and Northeast Newfoundland Shelf north nearly to Hamilton Inlet Bank.

SUMMER:

The domestic fleet concentrated its efforts on the Scotian Shelf, Gulf of St. Lawrence and St. Pierre and Grand Banks.

The foreign fleet appears to have ranged more widely, concentrating its efforts on the Scotian Shelf, Grand Bank, and the Northeast Newfoundland Shelf north to Hamilton Inlet Bank.

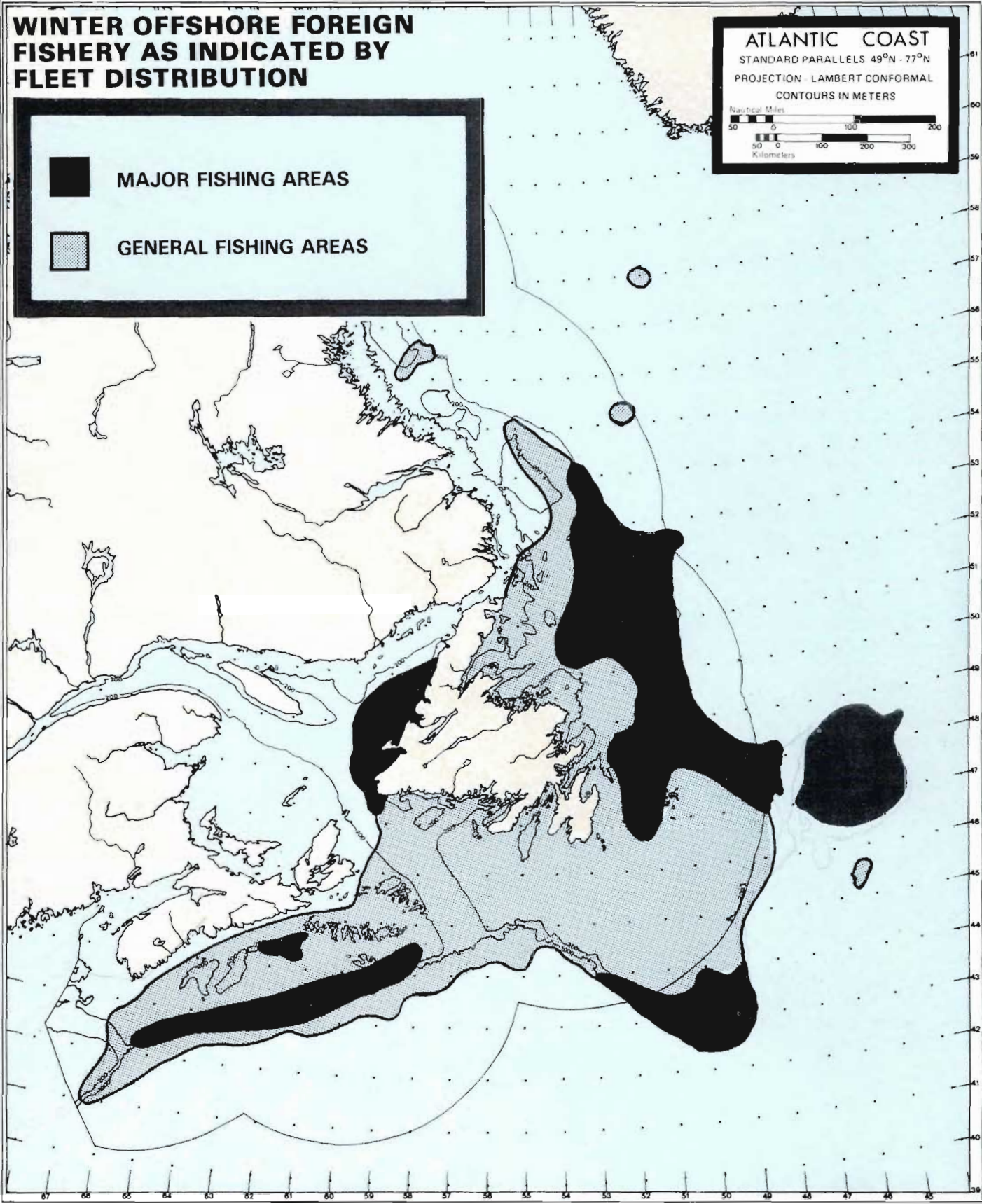
WINTER OFFSHORE FOREIGN FISHERY AS INDICATED BY FLEET DISTRIBUTION

- MAJOR FISHING AREAS
- GENERAL FISHING AREAS

ATLANTIC COAST
STANDARD PARALLELS 49°N - 77°N
PROJECTION LAMBERT CONFORMAL
CONTOURS IN METERS

Nautical Miles
0 50 100 200

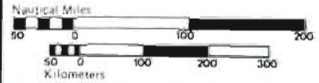
Kilometers
0 100 200 300



SUMMER OFFSHORE DOMESTIC FISHERY AS INDICATED BY FLEET DISTRIBUTION

ATLANTIC COAST

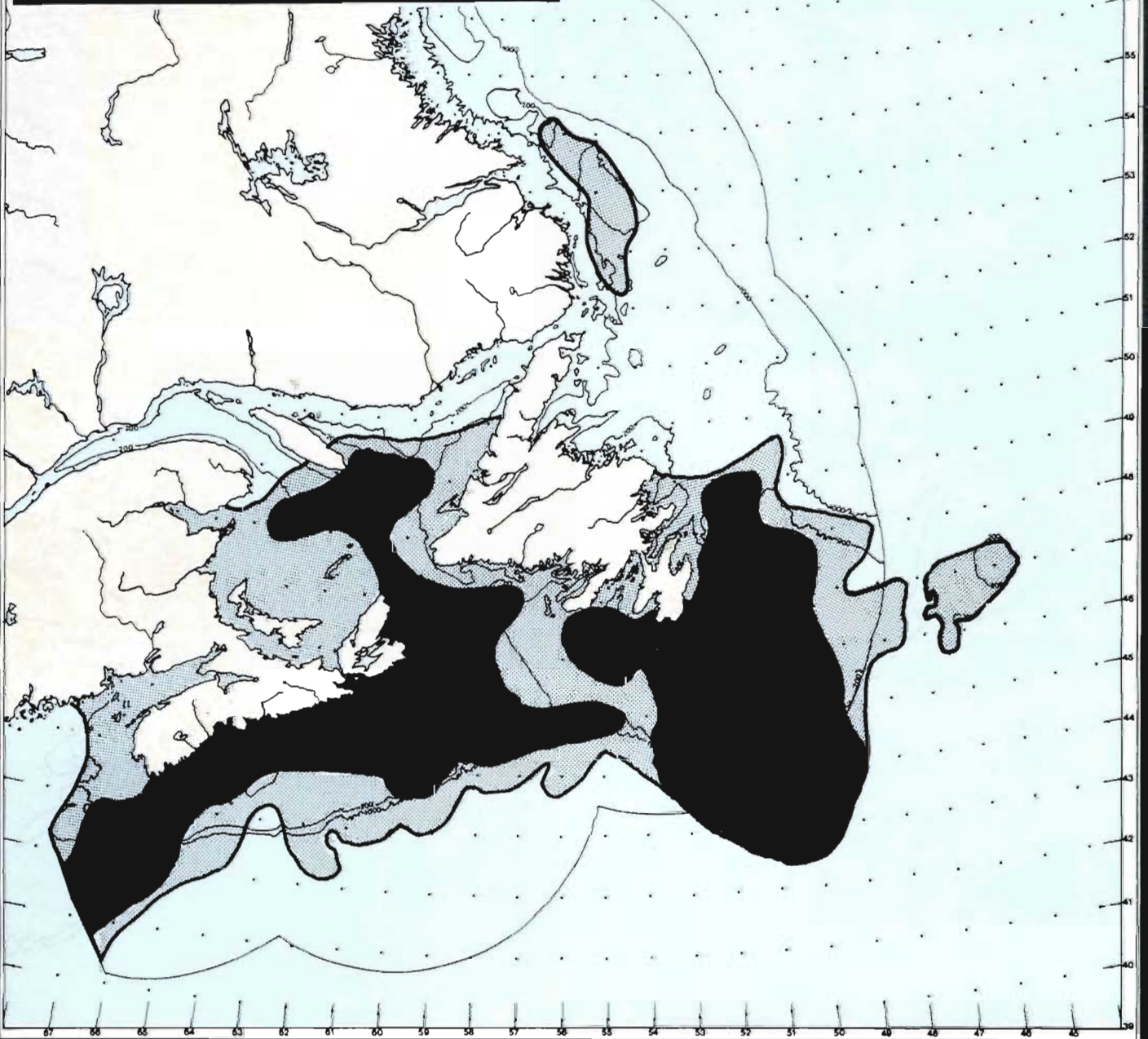
STANDARD PARALLELS 49°N - 77°N
PROJECTION LAMBERT CONFORMAL
CONTOURS IN METERS

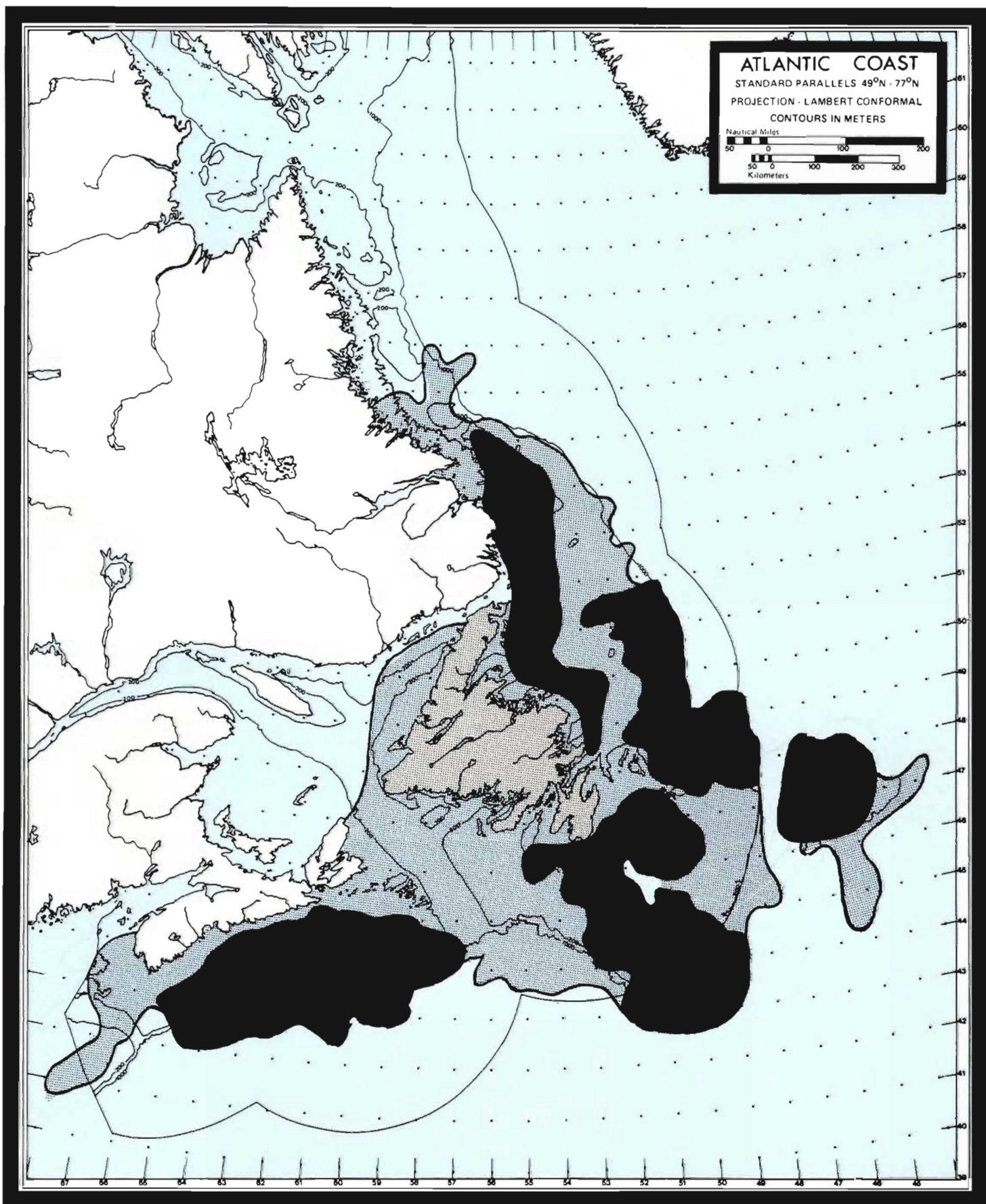


MAJOR FISHING AREAS

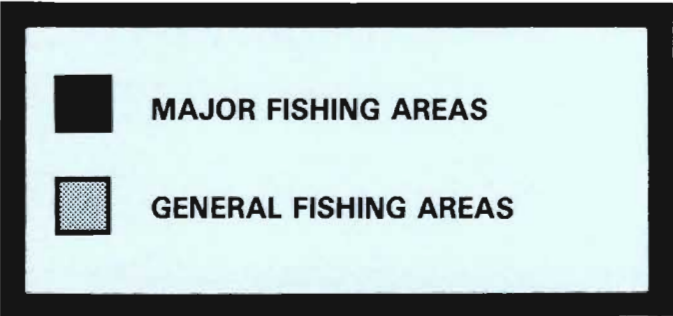


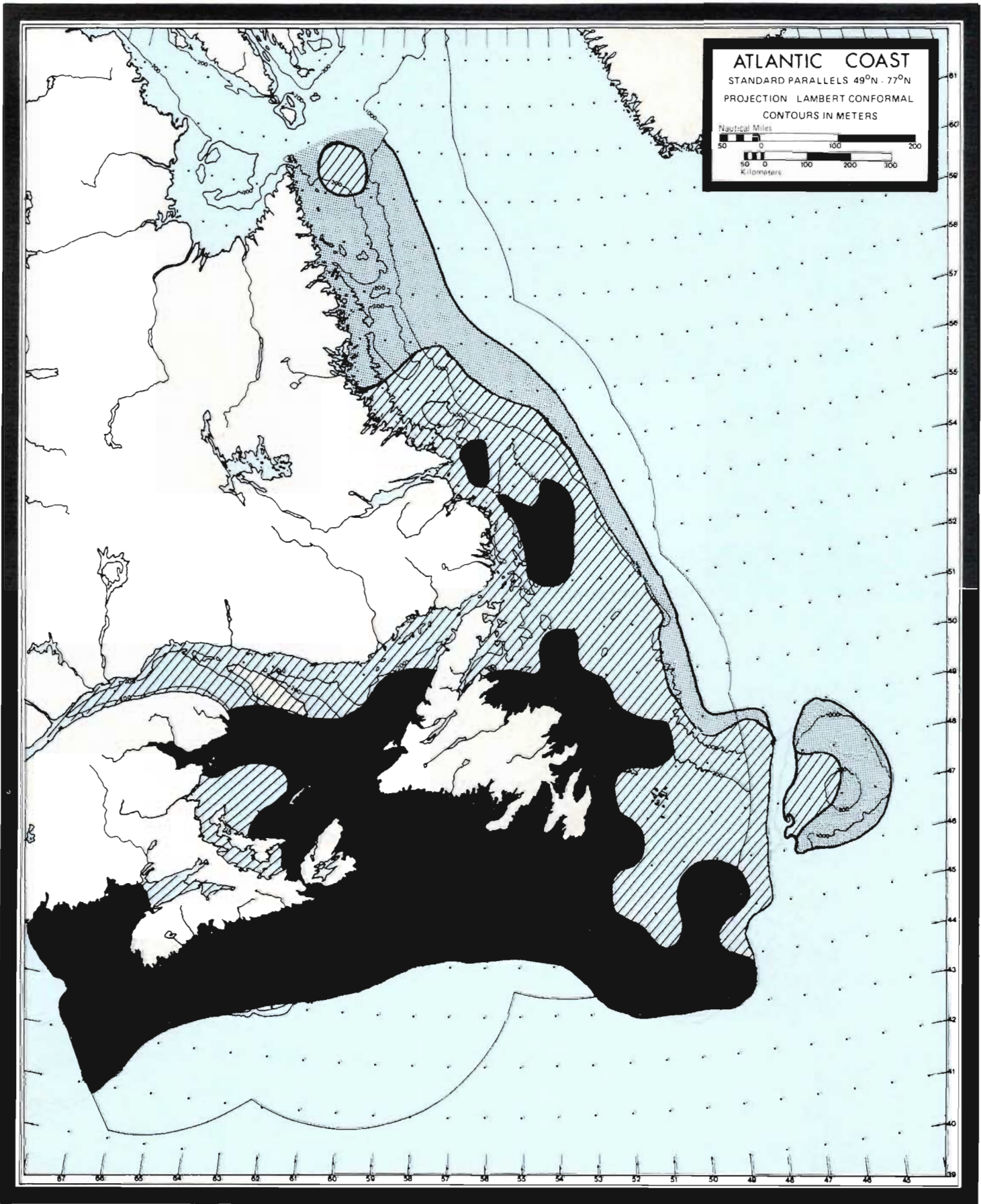
GENERAL FISHING AREAS





**SUMMER OFFSHORE FOREIGN
FISHERY AS INDICATED BY
FLEET DISTRIBUTION**





KEY RESOURCE AREAS

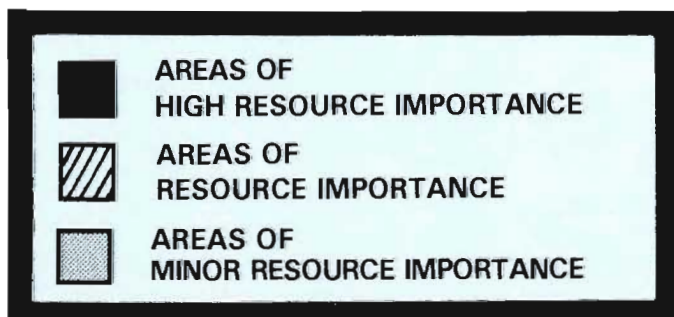
The major distribution patterns of all species included in this atlas were analyzed in an effort to define key fishing resource areas. The accompanying map indicates that, in terms of the fishery, areas of high resource importance include:

- 1) The mouth of the Bay of Fundy,
- 2) Georges Bank,
- 3) The Scotian Shelf,
- 4) The Southern Gulf of St. Lawrence,
- 5) The area south of Newfoundland from in-shore to the edge of the continental shelf and from St. Pierre Bank to the southeastern edge of Grand Bank,
- 6) The eastern shore of Newfoundland and,
- 7) Hamilton Inlet Bank.

It should be noted that this map is based on current knowledge regarding the distribution of commercial fish species. Since recent discoveries indicate important fisheries areas occur in the north and new information will accumulate regarding the fisheries resources of the Northwest Atlantic, the map should be used only as a guide and should not be considered as a definitive mapping of these resources, nor of their economic value.

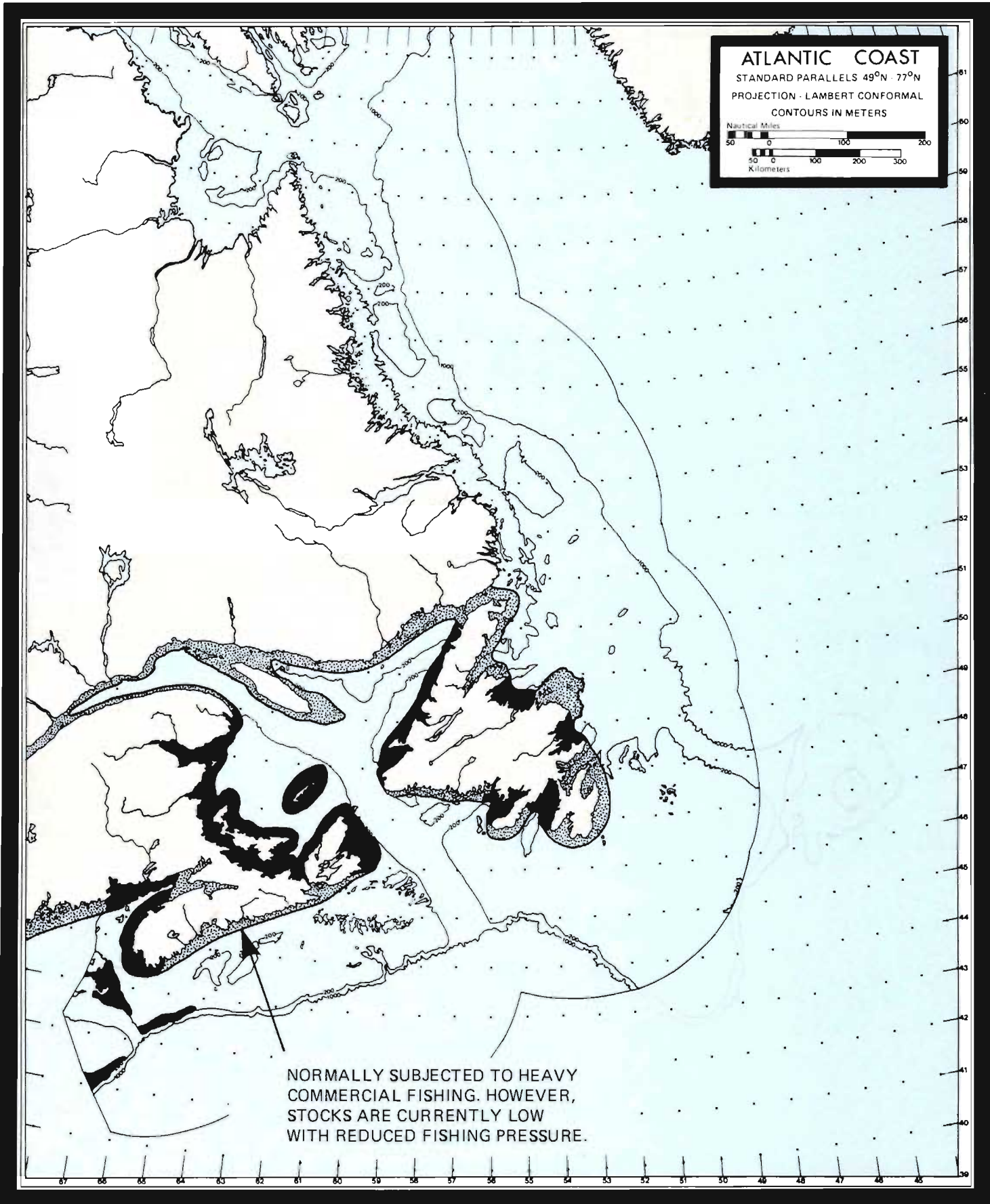
No inference should be drawn that areas of minor resource importance merit reduced levels of protection or management.

KEY RESOURCE AREAS



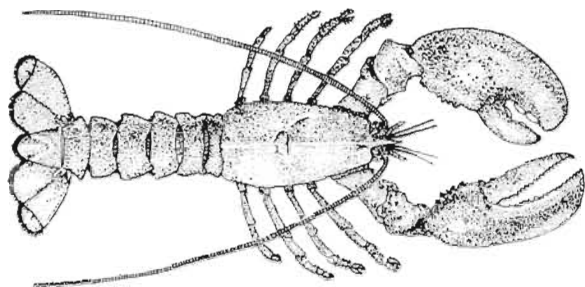
COMMERCIAL RESOURCE SPECIES

INVERTEBRATES



LOBSTER

Homarus americanus Milne-Edwards



FAMILY: Nephropsidae

COMMON NAMES: American lobster, homard

CODES: NAFO - 622

FAO Taxonomic - 2,29(42)007,01

3 alpha ident. - LBA

DISTRIBUTION:

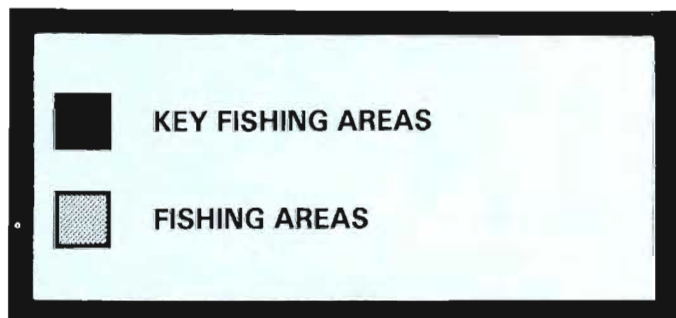
Lobsters occur from shallow water to the edge of the continental shelf along the Atlantic coast from Labrador to Cape Hatteras. Concentrations are found off Newfoundland, the Gulf of St. Lawrence, Nova Scotia, the Bay of Fundy and along the edge of the continental shelf in the vicinity of the Fundian Channel, particularly on Georges and Browns Banks.

While seasonal changes in distribution are not clearly understood, offshore lobsters are known to move extensively along the continental shelf and migrations towards shallow water in spring and summer, followed by a return to deeper water in autumn, have been documented on Georges Bank and in the Bay of Fundy.

FISHERY:

In terms of landed value, the lobster fishery is one of the most important fisheries in Atlantic Canada.

MAP KEY



Canadian landings have increased in recent years to about 19,000 t from lows, in the period 1972 to 1974, of about 15,000 t. In the Maritimes, the trends by area show an increase in the southern Gulf of St. Lawrence, a decline along the outer coast of Nova Scotia, and relatively stable landings in the Fundy to southwestern Nova Scotia region. Catches from the other provinces have been at or slightly higher than recent averages.

Despite the introduction of regulatory measures in the late 1960's which limit the number of licences and the number of traps fished per boat in all Canadian lobster fisheries, there has not been a resultant decrease in fishing pressure in any area; indeed, fishing pressure has probably increased. There is some prospect that the licence buy-back program may lead to a reduction in levels of fishing mortality.

National and international assessments indicate that increases in minimum legal size and reduced rates of removal, not exceeding 30-50% per year, are required if major stock declines are to be prevented in certain areas of the fishery in the future.

UTILIZATION:

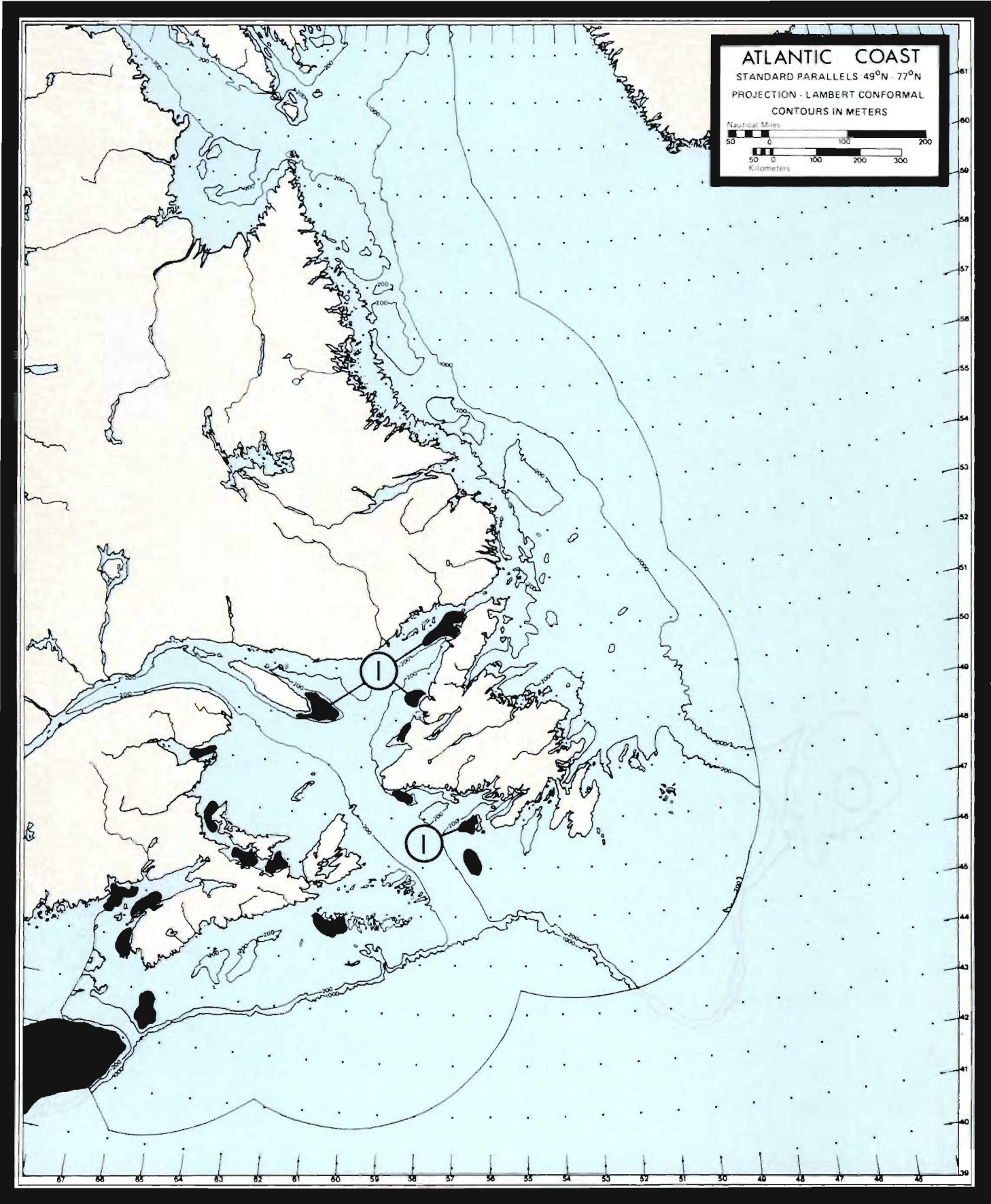
Sold for human consumption - live, fresh, frozen, canned and as a paste.

GENERAL BIOLOGY:

Lobsters mature at lengths of 17-30 cm (250 g-1000 g). Mating usually occurs in summer when hard-shelled males mate with recently molted soft-shelled females. The sperm are maintained in the female's sperm sac until the eggs are laid about 1 year after mating, at which time fertilization takes place. The eggs are carried by the female until they hatch about a year later. Larvae rise to the surface where they live a planktonic existence for about 1-2 months. During this period they molt three times, changing form and growing at each molt. Sometimes during the fourth stage, they settle to the bottom and begin progressive development leading to maturity.

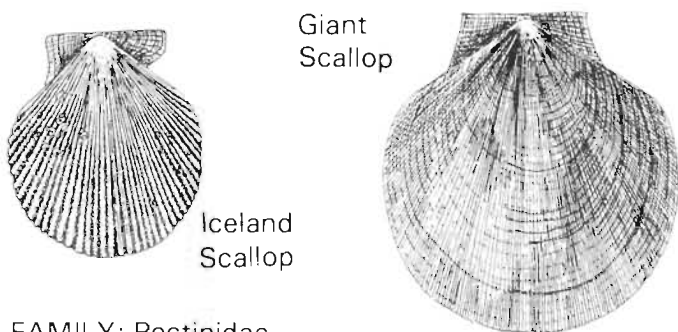
Adults favor rocky bottom, where they live principally in burrows and crevices. Feeding generally takes place at night when they prey on worms, crabs, clams, mussels, sea urchins, starfish, chitons and other bottom animals.

Lobsters are prey for a variety of marine animals. During their larval existence, they are part of the plankton and provide food for a variety of plankton-eating invertebrates and fish. Once they have settled to the bottom they are preyed upon by cod, sculpin, cunners, flounder and other fish.



SCALLOPS

Placopecten magellanicus (giant scallop)
Chlamys islandicus (Iceland scallop)



FAMILY: Pectinidae

COMMON NAMES: sea scallop, scallop, giant scallop, giant sea scallop, pétencie

CODES: NAFO - 539
FAO Taxonomic - 3,16(08)
3 alpha ident. - SCX

DISTRIBUTION:

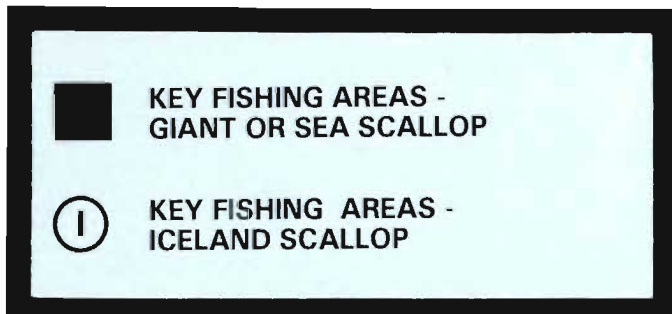
The giant scallop occurs from low water to depths of 180 m from Pistolet Bay, Newfoundland to Cape Hatteras, North Carolina. Concentrations are found off Newfoundland, the Gulf of St. Lawrence, Scotian Shelf, Bay of Fundy, and Georges Bank, principally on the Northern Edge, the Northeast Peak, the Great South Channel and the southeast part.

The Iceland scallop is a subarctic species that occurs in more northerly and colder waters than the larger giant scallop. In the western Atlantic, populations occur southwards to Buzzards Bay, Mass.

FISHERY:

Georges Bank supports the largest commercial offshore fishery. However, it is an important industry in other areas such as the Bay of Fundy, Port au Port Bay and St. Pierre Bank. Wide variations in landings occur in these areas due to sporadic

MAP KEY



overfishing and wide fluctuations in recruitment. Because of these fluctuations, sustainable yields will continue to be highly variable. Pulse fishing, related to stock abundance and economic factors, will continue to be the pattern of exploitation. Recent landings have declined from 13,000 t in 1977 to 5,000 t in 1980.

The inshore scallop fishery utilizes Digby-type drags fished from multi-purpose vessels. The offshore fishery is carried out from large vessels which are exclusively involved in the fishery and utilize heavier gear.

Individual giant scallop meats reach weights in excess of 30 g each. In order to reduce exploitation of young scallops, the law requires scallops sold to average less than 40 meats to the pound; but this is sometimes achieved by blending a few large meats with a number of smaller ones.

Fifty Iceland scallops are required to produce 1 pound of meat, compared with 35 giant scallops to 1 pound of meat (Georges Bank). Because of this difference and limited distribution, this species is of less commercial interest than the giant scallop. Nevertheless, there has been an active fishery in the northeast Gulf of St. Lawrence and Straits area since 1969 and a fishery has also developed in Labrador.

UTILIZATION:

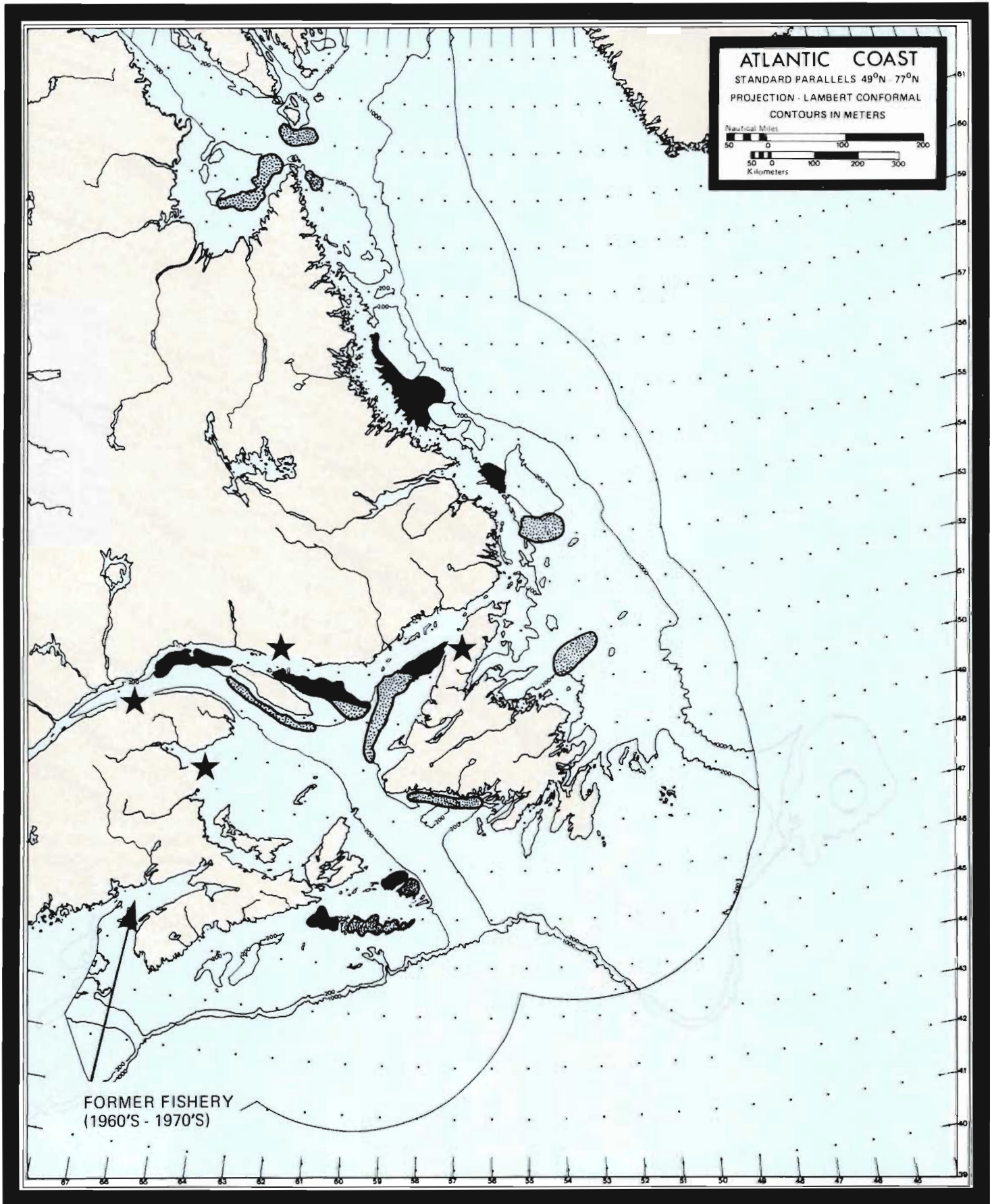
Sold for human consumption — fresh and frozen. Shells are used for collection of oyster spat.

GENERAL BIOLOGY:

The giant scallop is easily recognized by its larger size (to 22.5 cm) and symmetrical "wings" on either side of the umbo. Sperm and eggs from mature adults are generally released into the sea when temperatures rise above 7.8°C. Fertilization is external. The developing larvae live a planktonic existence for 50-60 days after which they settle to the bottom and attach themselves to rocks and shells. Eventually, they detach themselves and begin an adult existence.

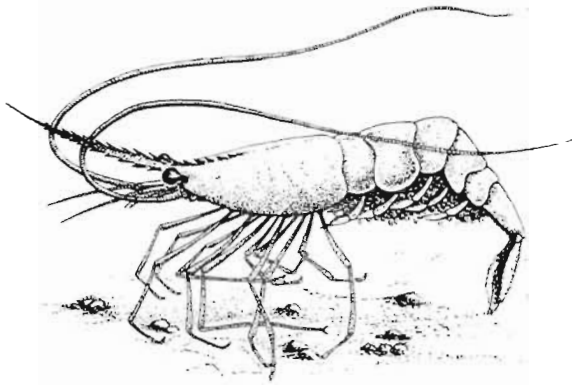
Scallops are preyed upon by cod, plaice, wolffish and starfish; parasites, boring sponges and shell worms are common.

The Iceland scallop is easily distinguished from the giant scallop by its asymmetrical wings and pronounced radial ribbing. Samples taken near Anchor Point, Newfoundland, showed ages for this population ranging between 3-17 years with most specimens falling within the 5-10 year category. Data suggest that a shell height of 9 cm is attained in 10-14 years. Growth appears to slow considerably after 10 years.



SHRIMP

Pandalus borealis, *Pandalus montagui*



FAMILY: Pandalidae

COMMON NAMES: pink shrimp, great northern prawn, creveite

P. borealis

P. montagui

CODES: ICNAF-632

ICNAF-639

FAO Taxonomic-
2,28(04)002,03

FAO Taxonomic-
2,34(04)002

3 alpha ident.-PRA

3 alpha ident.-PAN

DISTRIBUTION:

Pandalid shrimp are distributed from western Greenland off Baffin Island and in Ungava Bay, southward to the Gulf of Maine. Concentrations occur along the Labrador coast, the northern Gulf of St. Lawrence and southeast of Cape Breton Island. Formerly abundant in the Bay of Fundy as an extension of the Gulf of Maine population.

FISHERY:

Three major shrimp concentrations are currently under exploitation in the Gulf of St. Lawrence: a) Esquiman Channel, with projected sustainable catches from 1000 to 2600 t, depending upon

recruitment and relative effort of the fleet towards other species, b) Sept-Iles area, with projected yields of 3500t, and c) Anticosti Island area, a more recently but lightly exploited area with a potential yield approximating that for the Sept-Iles area. In addition, a fishery is under development off southeast Cape Breton where boats fished during 1979-1980 with some success. In the Labrador Sea, resources along the inner part of the Shelf may support long-term catches in the order of 4,000-10,000t.

A fishery developed in the Bay of Fundy during the 1960's. However, it collapsed by the mid 1970's, possibly as a result of overfishing.

The fishery is carried out by trawlers. Concern has been expressed about the presence of juvenile redfish in deep water shrimp catches and trawl designs are being considered which will, hopefully, exclude these fish.

UTILIZATION:

Sold for human consumption — fresh, frozen and canned. Wastes are processed into shrimp meal.

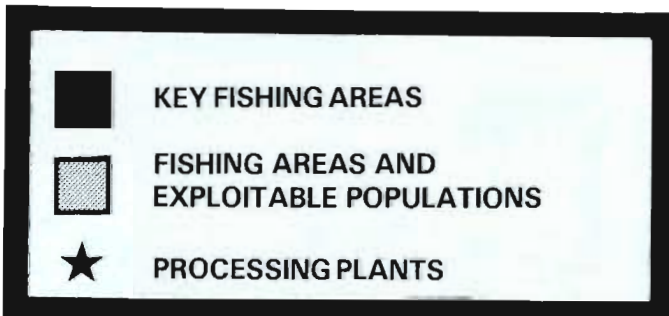
GENERAL BIOLOGY:

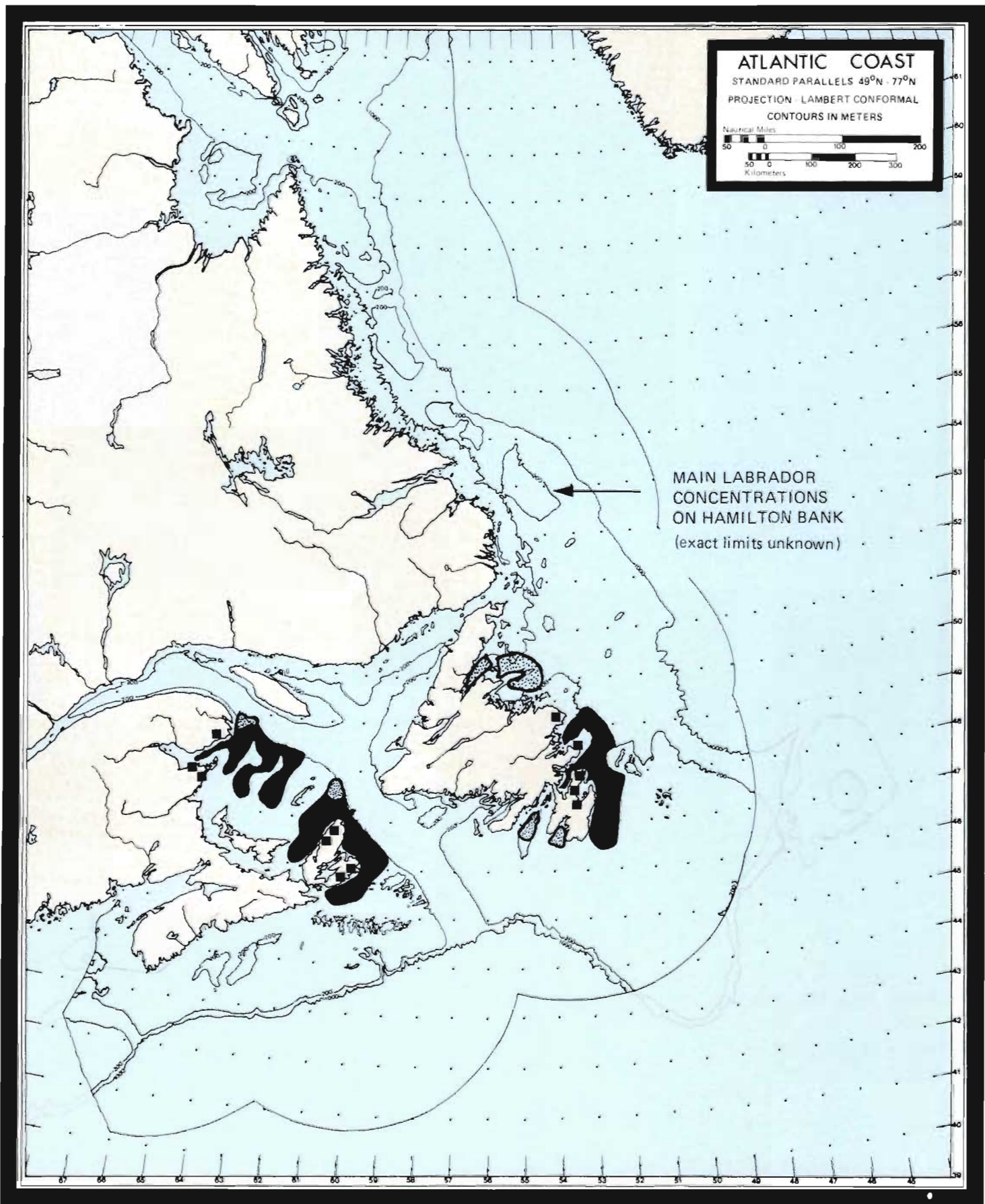
The two main commercial species are *Pandalus borealis*, and *Pandalus montagui*, the latter being the smaller of the two. Both species live in Atlantic waters from depths of 10-1,400 m, tolerate water temperatures from -1.68°C to 11° - 13°C and can be found existing in salinities ranging from 25.9-35.7‰.

Spawning takes place from September to April depending upon the area. Females carry between 400 and 3400 eggs until hatched. Incubation can take from 6-12 months depending on water temperature.

Pandalus is both a bottom feeder and a scavenger, although some pelagic prey have been found in stomach samples. Principal prey include polychaetes, echinoderms, protozoa and planktonic crustaceans.

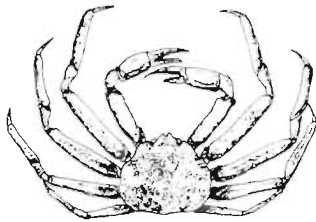
MAP KEY





SNOW CRAB

Chionoecetes opilio



FAMILY: Maiidae

COMMON NAMES: queen crab, snow crab, spider crab, crabe des neiges

CODES: NAFO - 610
FAO Taxonomic - 2,29(00)145,01
3 alpha ident. - CRQ

DISTRIBUTION:

Snow crabs occur at depths of 50-400 m, from west Greenland to the Gulf of Maine. They are abundant in the Gulf of St. Lawrence and around Cape Breton Island. In Newfoundland, they occur in coastal areas from Placentia Bay east around Avalon Peninsula and north to White Bay and off Labrador, mainly near Hamilton Inlet Bank.

FISHERY:

Landings from 1960-1967 averaged approximately 9t annually. From 1967 to 1969, landings rose from 500t-9,000t, and now average 25,000t annually. It appears that Gulf of St. Lawrence stocks are now fully exploited.

Regulations limit the number of traps to 150 per boat, except for the northeastern side of Cape Breton where the maximum number of traps per boat is restricted to 30, and Newfoundland where the limit is 800 traps. Only male crabs with a carapace width greater than 95 mm can be landed.

MAP KEY



This species is fished in the Gulf of St. Lawrence from 13-25 m boats, usually using 1.5x1.5x0.60m square metallic tube-framed traps with two entrances, covered with netting, and preferably baited with fresh herring. The fishery on the eastern coast of Cape Breton Island is carried out from 6-12m boats using large lobster traps, Japanese conical traps or small square traps. Japanese conical top-entry traps are fished from 12-20m boats in Newfoundland.

UTILIZATION:

Sold for human consumption - fresh, frozen and canned.

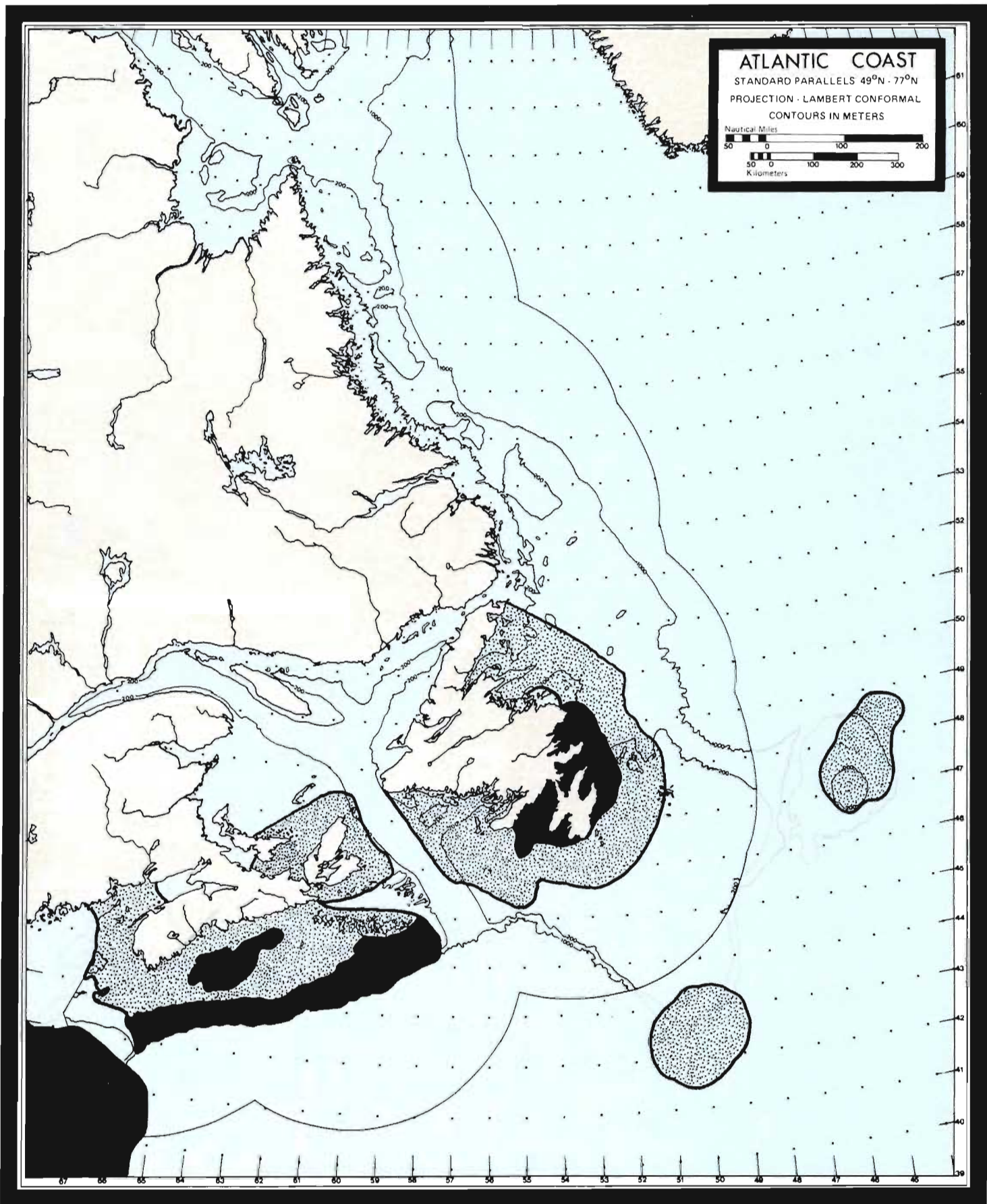
GENERAL BIOLOGY:

In Canadian waters, snow crabs are most commonly found in association with mud or sand-mud bottoms at temperatures ranging from 0-4.5°C. Small crabs may be found on gravelly bottom at shallower depths than large crabs.

Mating probably takes place in spring and early summer between mature hard-shelled males and soft-shelled females which have recently molted to maturity. Precopulatory embrace may last a week during which the male grasps the female with his claws until she molts, at which time he deposits sperm into the openings of the female's sperm sacs. Depending on the size of the female, 20,000-140,000 eggs are laid within a few days and deposited on hairy processes under her abdomen where they are carried for approximately 12 months. Hatching starts in May in the Gulf of St. Lawrence and is generally over by July. Several other batches of eggs may be laid without further mating; these eggs are fertilized by sperm stored in the sperm sacs from previous matings.

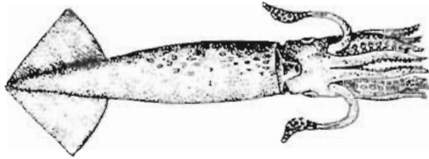
After hatching, larvae spend the next 3 months swimming freely at or near the surface. During this period they molt twice, changing form and growing appreciably at each molt. After the third larval stage they gradually sink to the sea floor where they molt again and, for the first time, resemble the adult in shape and colour. Most males are mature at a shell width of 6.5 cm and can mate successfully at that size. Among females, size at maturity varies from 5-9 cm in shell width. Since females never reach the commercially acceptable and minimum legal size they are not used by the fishery.

Snow crabs are omnivorous. Their stomachs may contain remains of marine bivalves, worms, small crustaceans, brittle stars, detritus and even fish.



SQUID

Loligo pealei (long-finned squid)
Illex illecebrosus (short-finned squid)



LONG-FINNED

SHORT-FINNED

FAMILY: Loliginidae

Ommastrephidae

COMMON NAMES: Long-finned squid, short-finned squid, encornet

CODES: NAFO-502

NAFO-504

FAO Taxonomic-

FAO Taxonomic -

3,21(04)001,05

3,21(05)010,01

3 alpha ident.-SQL

3 alpha ident.-SQL

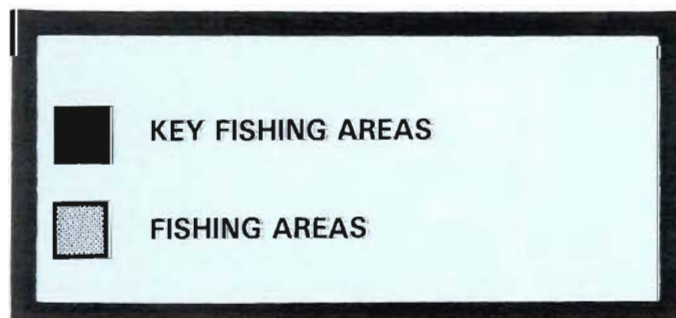
DISTRIBUTION:

Two commercial species of squid occur in Canadian waters: the long-finned squid and short-finned squid.

The long-finned species has a more southerly distribution, occurring from the Bay of Fundy and southeastern Nova Scotia south to Colombia. Major concentrations occur between Georges Bank and Cape Hatteras.

The short-finned squid has a more northerly distribution, occurring from southeastern Greenland to Florida, with major summer concentrations being found from Newfoundland to the Gulf of Maine. Winter distribution is unknown, but is suspected to be east of the continental shelf. An inshore migration takes place in spring and early

MAP KEY



summer with the largest concentrations being found in the vicinity of Georges Bank, on the Scotian Shelf and off the eastern shores of Newfoundland.

FISHERY:

Long-finned squid are primarily fished along the east coast of the United States. Landings were small until 1969 when the Japanese began trawling off the coast of New York. Countries currently fishing for the long-finned squid are Japan, U.S.S.R., Poland and Spain.

The traditional Newfoundland inshore fishery for short-finned squid is based on squid jigging in waters of less than 10 fathoms. Canadian landings have ranged from virtually nil in 1969 to 79,385 t in 1979. Squid fished off Newfoundland approach from the south and are taken on the southwestern part of the Grand Bank and on the southern part of St. Pierre Bank in spring prior to reaching the inshore area. Part of the population migrates inshore and supports a commercial fishery from early July to late November. A major short-finned squid fishery developed on the Scotian Shelf in the past 7 years, mainly by the U.S.S.R. and Japan. Canada is now entering this fishery and recorded landings of approximately 5,000 t in 1979. Elsewhere on the Canadian coast, squid fishing is occasional and less important.

Offshore, the Japanese employ echo sounding to locate squid and powerful surface illuminators and light lures to attract them to the surface where they are landed by mechanical jigs. The Canadian and foreign fleets employ trawls.

UTILIZATION:

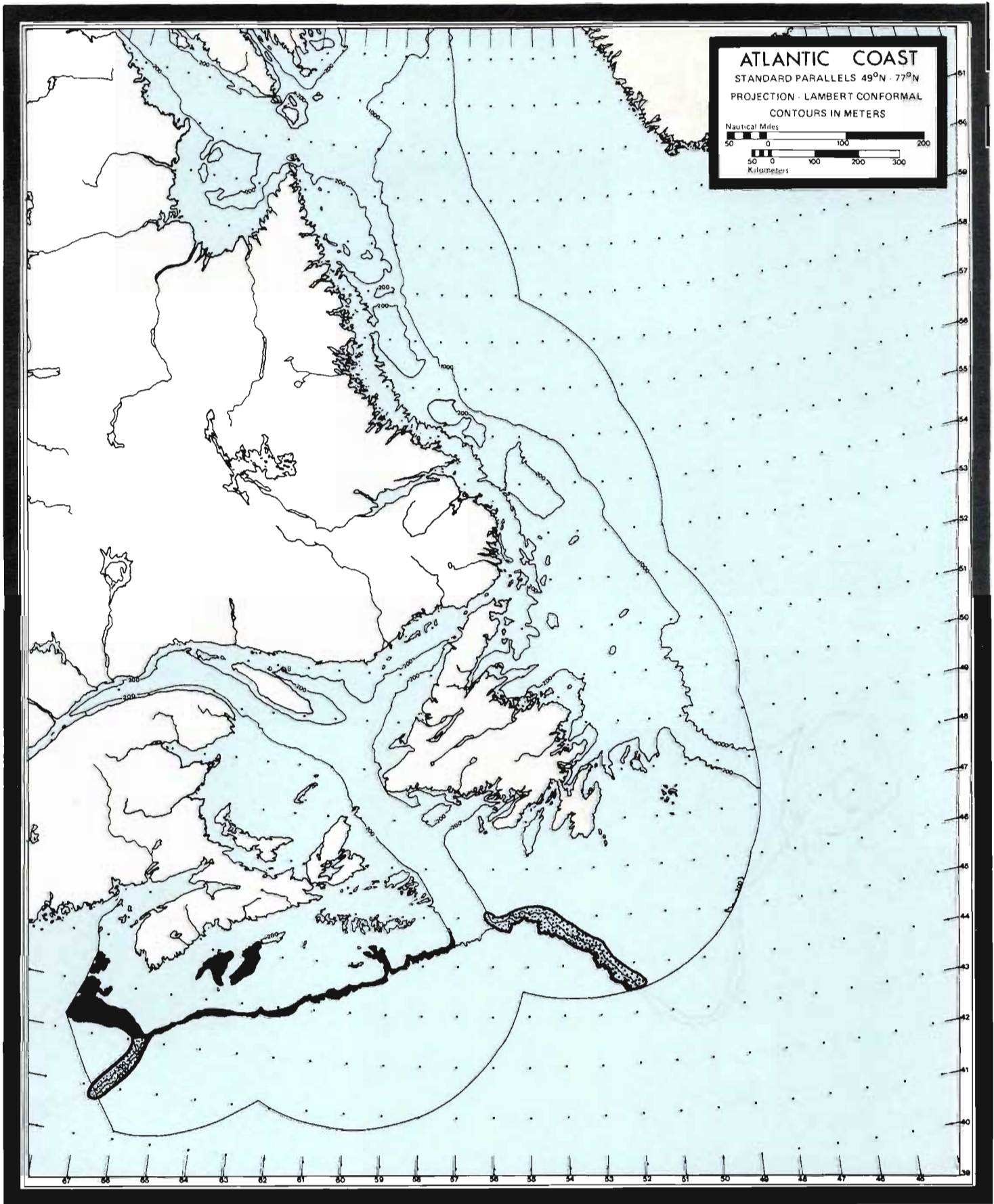
In Canada, squid were traditionally used only as bait. Currently it is sold as a delicacy in North American and Japanese markets.

GENERAL BIOLOGY:

Long-finned squid - Copulation and egg laying occur during the summer in inshore areas. Hatching takes approximately 20 days at 16 to 18°C. Maximum longevity is believed to be 36 months for males and 19 months for females.

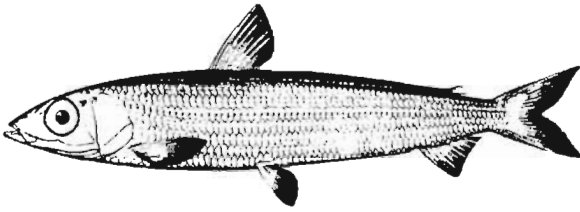
Short-finned squid - Less is known about the biology of this species. However, they arrive inshore as juveniles and by the time they depart in the fall are generally fully grown and the males are mature. Mating and spawning are believed to occur on their wintering ground at an age of 1 year, with the squid dying after spawning.

COMMERCIAL RESOURCE SPECIES GROUNDFISH



ATLANTIC ARGENTINE

Argentina silus Ascanius 1763



FAMILY: Argentinidae

COMMON NAMES: herring smelt, grande argentine.

CODES: NAFO - 312

FAO Taxonomic - 1,23(05)015

3 alpha ident. - ARG

DISTRIBUTION:

Argentine occur from 125-500 m along the continental shelf from southern Grand and Banquereau Banks southward to Georges Bank, and in deep water basins such as Georges and Emerald basins. Concentrations have been reported southeast of Browns Bank and south of Sable Island.

There is no evidence of seasonal changes in distribution. Spring spawning concentrations have been reported in Georges Basin.

FISHERY:

No fishery existed prior to 1963 when the U.S.S.R. became interested in the potential of this species and dominated the fishery until 1968 when the Japanese also became involved as a major exploiter.

The center of distribution of this resource is in the Fundian Channel area between Georges and Browns Banks but it also occurs along the Scotian Shelf and in depths of 200-500 m. Catches have been sporadic and have ranged from over 40,000 t to as little as 1,000 t, depending on whether or not

the U.S.S.R. fleet conducted a directed fishery. In most recent years, fishing effort has been reduced since the stock has its center of distribution close to the U.S.A. -Canada disputed zone, thus limiting fishing opportunities for third parties. Sustainable yield for the whole resource is probably no more than 15,000-20,000 t.

Argentine are caught by bottom and midwater trawls.

UTILIZATION:

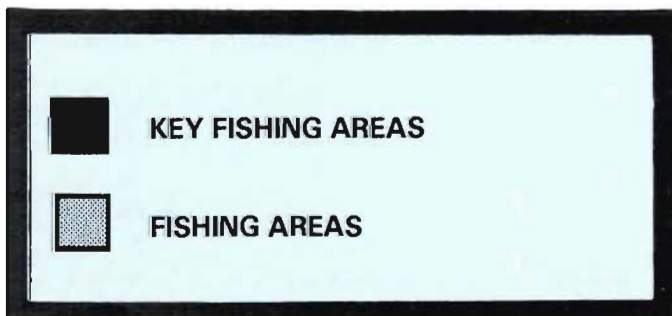
Sold for human consumption and fish meal.

GENERAL BIOLOGY:

Spawning takes place in late winter. Fertilized eggs are buoyant and float at intermediate depths. Juveniles also appear to be restricted to midwater. On settling to bottom, they are found in depths of 126 m or less and move into deeper water as they grow. Argentine mature in about 4 years, attain a maximum size of approximately 45 cm and may live 20 years or more.

Euphausiids are their principal prey.

MAP KEY

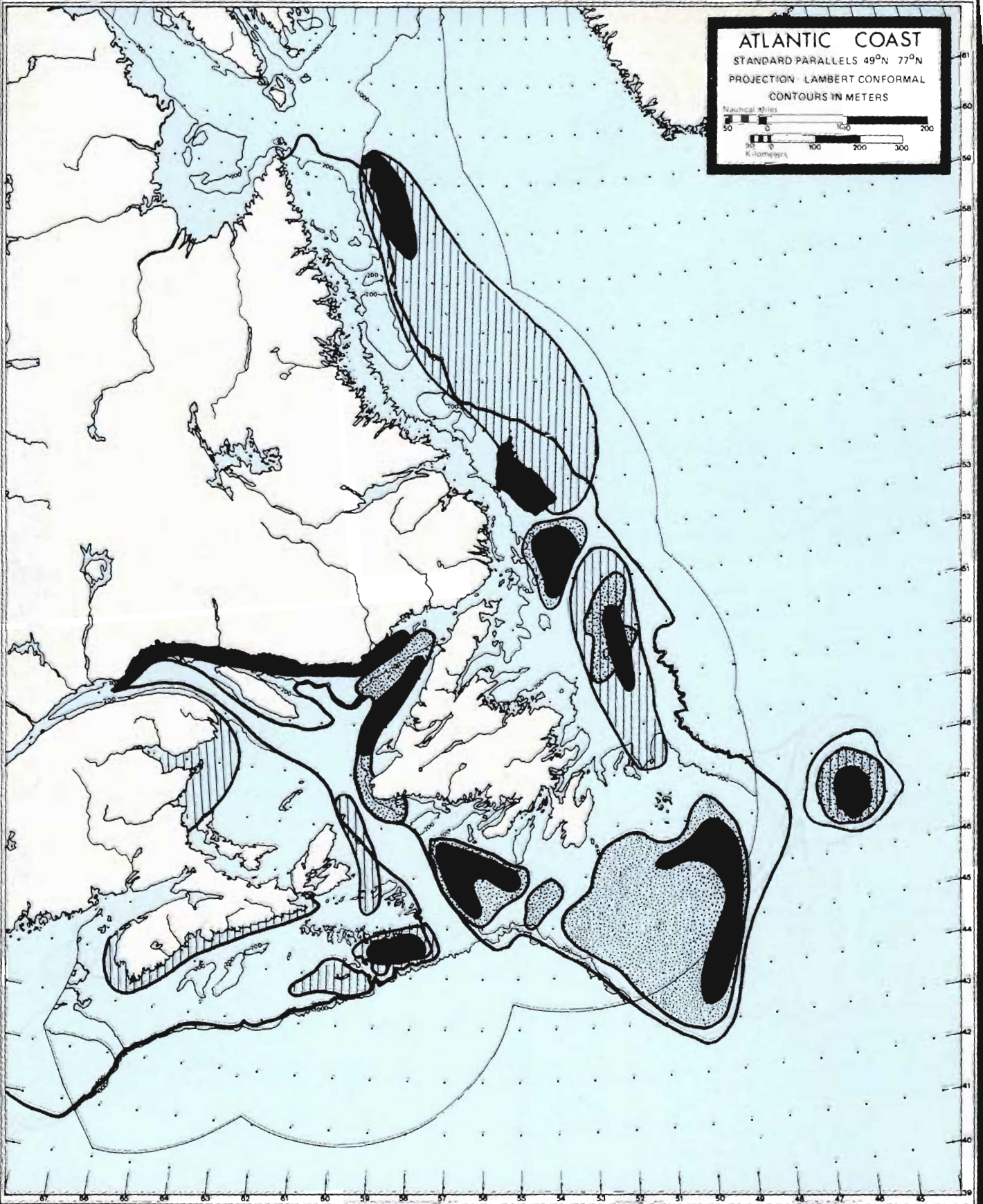


ATLANTIC COAST

STANDARD PARALLELS 49°N 77°N

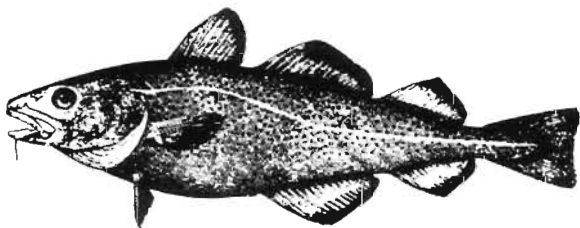
PROJECTION LAMBERT CONFORMAL

CONTOURS IN METERS



COD

Gadus morhua Linnaeus 1758



FAMILY: Gadidae

COMMON NAMES: codfish, morue commune

CODES: NAFO - 101

FAO Taxonomic - 1,48(04)002,02

3 alpha ident. - COD

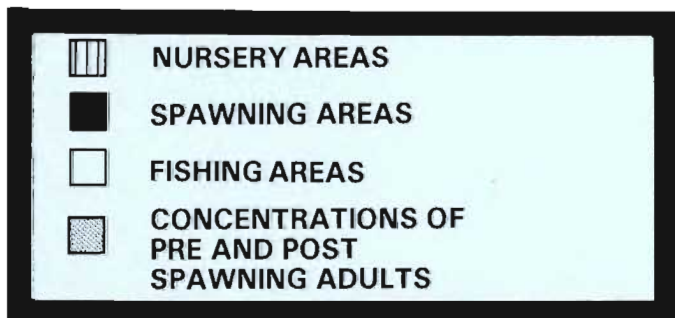
DISTRIBUTION:

Cod occur from inshore waters to the edge of the continental shelf along the coast from Hudson Strait, west Greenland and Davis Strait south to Cape Hatteras.

There is a major inshore movement of cod in the May-September period with a corresponding offshore movement in the fall. In the eastern Gulf of St. Lawrence, concentrations of prespawning cod, found off southwest Newfoundland, move northward in February - March along the west coast of Newfoundland and the Quebec north shore. In the western Gulf of St. Lawrence, concentrations move back and forth between winter areas northeast of Cape Breton Island and summer areas off the Gaspé and Bay of Chaleur.

Spawning areas have been identified on the edge of the northern Labrador Shelf off Cape Chidley, on Hamilton Inlet Bank, Belle Isle Bank, Funk Island Bank, Flemish Cap, the eastern and northern slopes of Grand Bank, the western and northern slopes of St. Pierre Bank, the west coast of Newfoundland and along the Quebec north shore.

MAP KEY



FISHERY:

Cod were fished as early as the 1500's by Basque fishermen and they continue to be one of the most important commercial fish species on the east coast and the single most important species in the Newfoundland - Labrador area.

The following summarizes the general status and 1980 TACs for various commercial cod stocks:

STOCK	STATUS	1980 TAC
Northern Labrador	Reduced by fishing and possible environmental change, probably rebuilding	20,000 t
Southern Labrador-Northern Grand Bank	Currently rebuilding	180,000 t
Flemish Cap	Depressed	13,000 t
Southern Grand Bank	Depressed - possibly starting to recover	26,000 t
St. Pierre Bank	Depressed but improving	28,000 t
North and east Gulf of St. Lawrence	Stable	75,000 t
Sydney Bright	Stable	5,000 t (potential landings)
Southern Gulf	Rebuilding	70,000 t (mid - 1980s)
Banquereau-Sable Island	Rebuilding	60,000 t (mid - 1980s)
Browns Bank	Depressed	16,000 t
Georges Bank	Stable	35,000 t

Cod are taken by otter trawl, longline, handline, pair trawl, Danish seine, cod trap and gillnet.

UTILIZATION:

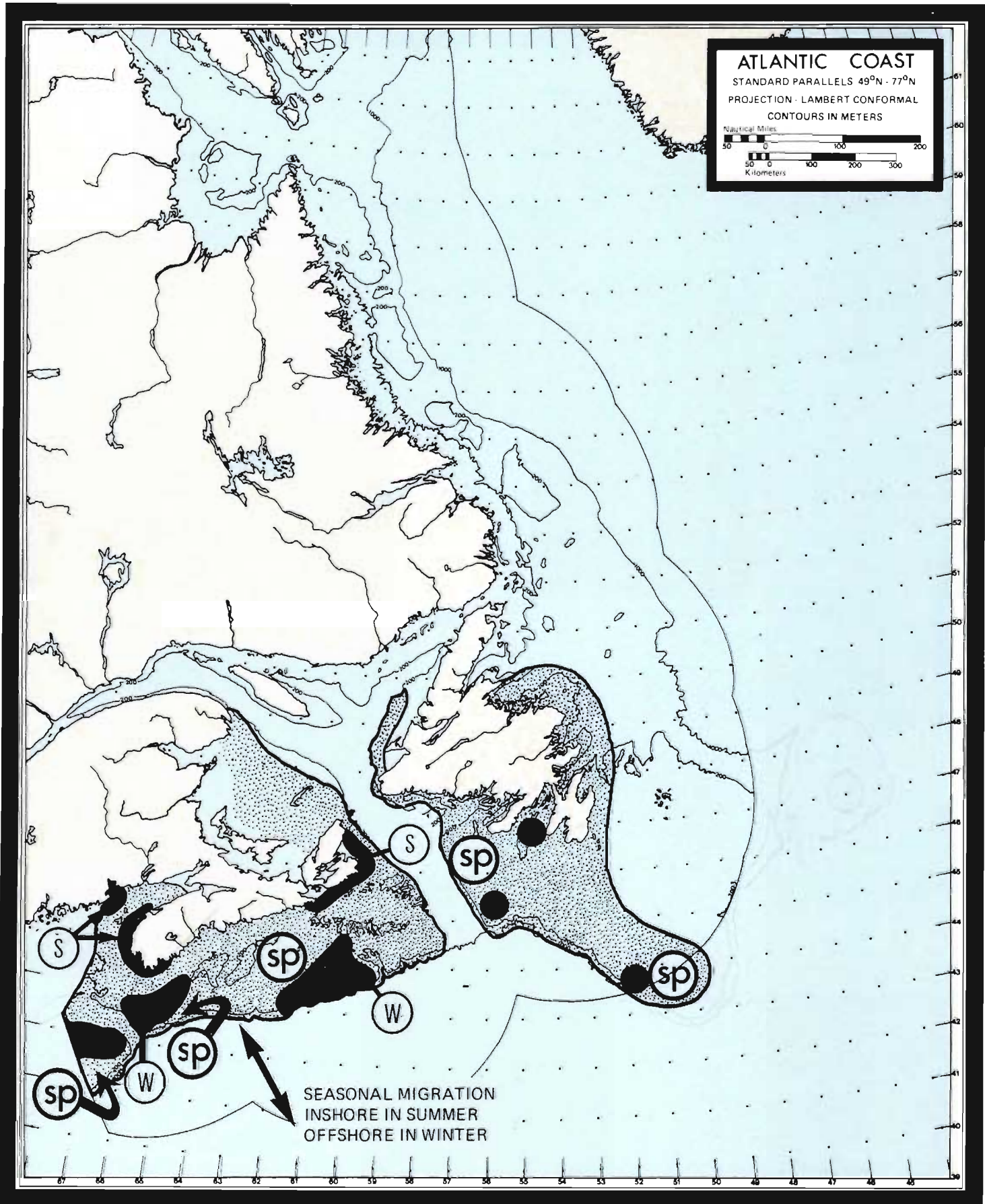
Sold for human consumption - fresh, frozen, smoked, salted and canned. Also used to produce fish meal, cod-liver oil and glue.

GENERAL BIOLOGY:

Spawning takes place over a wide area on the continental shelf from March - December depending on the locality. Fertilized eggs are buoyant and float at the surface. Incubation time varies with temperature and takes approximately 14 days at 6°C. 14 days at 6°C.

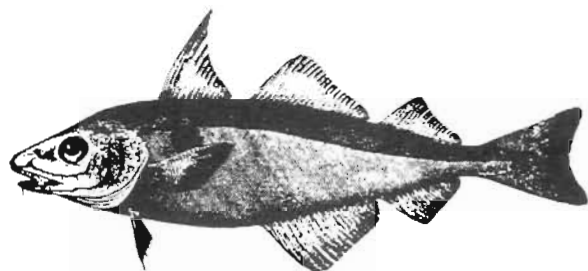
Growth rates vary from locality to locality. At ten years of age average lengths have been calculated as 70.8 cm in the southwest Gulf of St. Lawrence, 86.5 cm on the southern Grand Bank, and 57.0 cm inshore at Labrador.

Principal prey of fry includes copepods, barnacle larvae, amphipods and other small crustaceans. Adults feed on shrimp, small lobsters, crabs, euphausiids, mysids, herring, capelin, sand lance, mackerel, redfish, hake, flounder, blennies, cunner, sculpins, silversides, shad, gaspereau, young cod and haddock, squid, sea clams, whelks, mussels, nudibranchs, tunicates, comb-jellies, brittlestars, sea cucumbers, and worms.



HADDOCK

Melanogrammus aeglefinus (Linnaeus) 1758



FAMILY: Gadidae

COMMON NAMES: aiglefin

CODES: NAFO - 102

FAO Taxonomic - 1,48(04)010,01
3 alpha ident. - HAD

DISTRIBUTION:

Haddock occur from 10–220 m from inshore waters to the edge of the continental shelf along the coast from the Strait of Belle Isle south to Cape Hatteras.

In summer, concentrations occur in the Bay of Fundy, along the southwestern coast of Nova Scotia and to the east of Cape Breton Island. During the winter there is an offshore migration to Georges, Browns and Sable Island Banks. This species was formerly abundant at Placentia Bay, St. Pierre Bank and the southwestern area of the Grand Bank.

Spawning activity has been reported from Georges, Browns, Emerald, Grand and Scotian Shelf Banks.

FISHERY:

Haddock is a highly valued groundfish species. Long-term average catches from 1931 -

1962 were sustained at about 17,000 t. However, in the mid-1960's the foreign catch was heavy and the Canadian catch rose to 28,000 t average, reaching a peak of 42,000 t in 1966. Catches declined in subsequent years, resulting in closures in 1970 and the application of more stringent regulations. Currently, it appears that stocks are recovering on the Browns, Sable Island and Banquereau Banks and in the Gulf of Maine.

Haddock are harvested primarily by otter trawl. Inshore traps, handline, longline and gillnet are also used.

UTILIZATION:

Sold for human consumption — fresh, frozen, salted, smoked and to a small extent, canned.

GENERAL BIOLOGY:

Spawning occurs from late January to July depending on the area. Fertilized eggs are buoyant and float at or near the surface until they hatch. Hatching occurs in 25-32 days at 3°C; in 13-24 days at 5°C, and in 9-12 days at 10°C.

Developing larvae remain pelagic for about 3 months at which time they settle to the bottom.

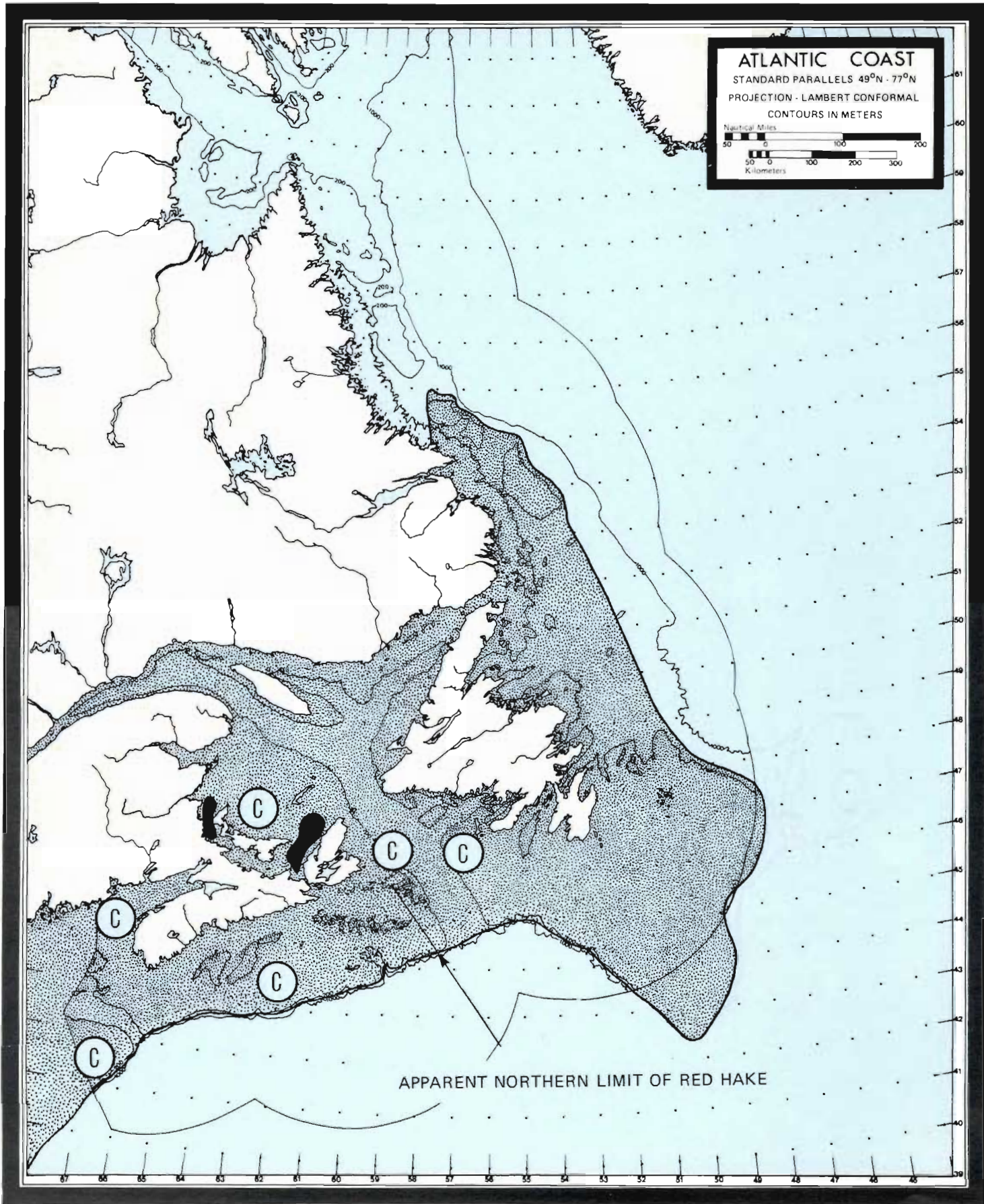
Growth rates vary from area to area. At 5 years they reach an average length of about 50 cm; at 10 years they average about 62 cm. Rare individuals may grow larger.

Over 200 prey species have been recorded in samples of haddock stomachs, including crustaceans, molluscs, echinoderms, annelids and fishes.

During the fry stage, haddock are preyed on by mackerel and jellyfish. Young and adults are eaten by cod, pollock, hake, monkfish, dogfish and skate.

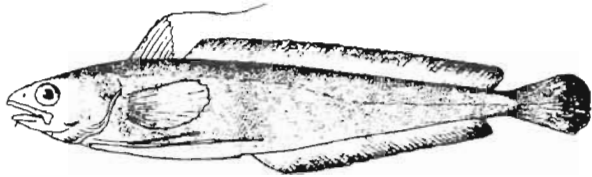
MAP KEY





RED HAKE & WHITE HAKE

Urophycis chuss (Walbaum) 1792
Urophycis tenuis (Mitchill) 1815



WHITE HAKE

RED HAKE

FAMILY: Gadidae

Gadidae

COMMON NAMES: squirrel hake, mud hake, ling, merluche, lingue.

CODES: NAFO -105

FAO Taxonomic -
1,48(04)008,02

3 alpha ident. - HKR

NAFO - 186

FAO Taxonomic -
1,48(04)008,03

3 ident. - HKW

NOTE:

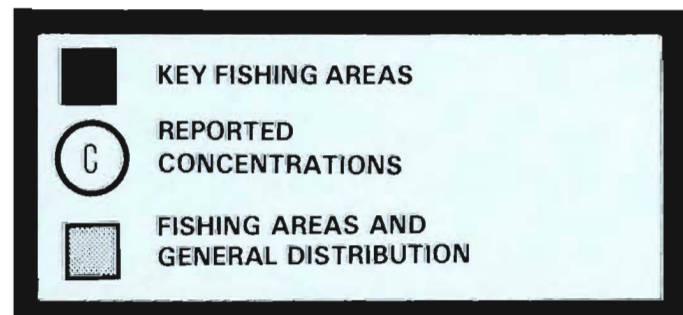
Until recently, some authorities considered *U. chuss* and *U. tenuis* to be one species. In addition, mixed landings of red and white hake have been reported together as a single species. These difficulties are apparently being resolved. Both species are considered together.

DISTRIBUTION:

White hake occur at depths of 2 to 1,000 m from southern Labrador, south to Florida, although they are not common north of the southern Grand Banks.

White hake are found predominantly on the continental slope in Canadian waters and exclusively so south of New England. They occur in the Gulf of St. Lawrence and mouth of the Bay of Fundy. Large concentrations are reported from the edge of the Laurentian Channel and St. Pierre Bank.

MAP KEY



Red hake are present in small numbers off Sable Island Bank and are abundant year round on the Scotian Shelf and southwestern edge of Georges Bank. Concentrations occur in Passamaquoddy Bay from midsummer to fall. Seasonal migrations appear to be inshore in the spring and offshore in the fall.

FISHERY:

While relatively large catches of red and white hake are made in deep water on the Scotian Shelf, the largest effort is currently being directed at seasonal inshore populations in the Gulf of St. Lawrence. A significant portion of Newfoundland landings usually comes from the inshore area along the western half of the south coast. Hake are also taken as an incidental catch from the southern part of the Grand Bank and St. Pierre Bank.

The average sustainable catch is estimated to be 4,000 t and 4,700 t for the southern Gulf of St. Lawrence and Scotian Shelf respectively.

Hake are fished with otter trawl, gill net, longline and handline.

UTILIZATION:

Red hake and white hake are sold fresh, frozen and salted. They are made into fish cakes and a very small number are smoked. The livers yield a valuable oil.

GENERAL BIOLOGY:

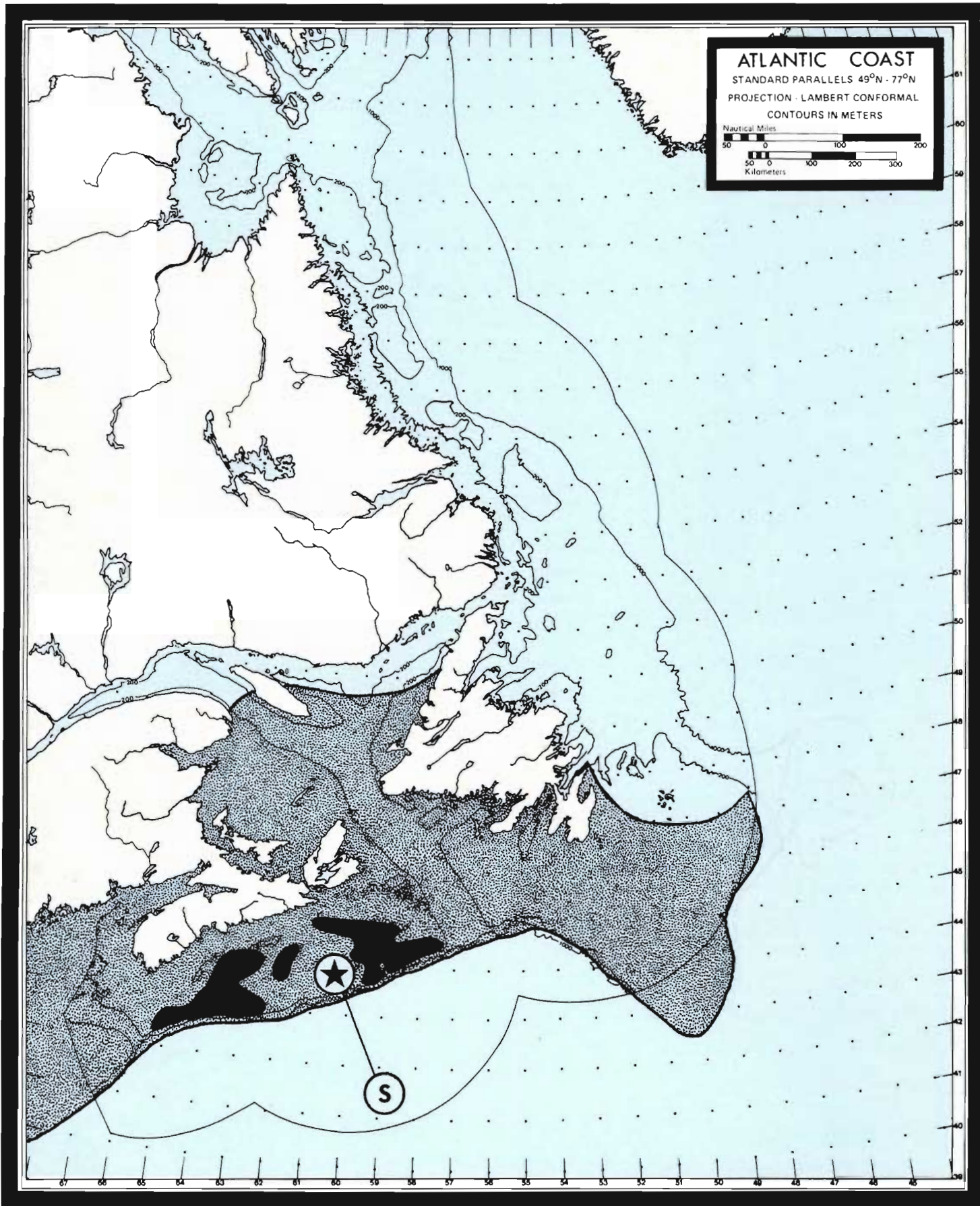
White hake spawn in the inshore areas of the Gulf of St. Lawrence between May and September with the peak spawning occurring in June. There is evidence of sporadic year round spawning on the continental slope.

Red hake spawn in Passamaquoddy Bay in September and on the Scotian Shelf in August.

Fertilized eggs float in the sea and incubation takes approximately 2 days at 15°C. Fry remain in surface waters until they reach 7-12 cm at which time they settle to the bottom.

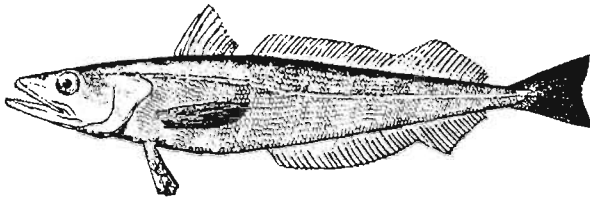
Growth appears to be relatively rapid with Bay of Fundy hake reaching a length of 39-47 cm in 3 years.

Small hake feed on copepods and amphipods, while larger individuals feed on euphausiids, sticklebacks, tomcod, herring, mackerel, sand lance, gaspereau, sculpins, and, occasionally, squid, periwinkles and worms.



SILVER HAKE

Merluccius bilinearis (Mitchill) 1814



FAMILY: Gadidae

COMMON NAMES: whiting, merlu argenté

CODES: NAFO - 104

FAO Taxonomic -1,48(04)004,04
3 alpha ident - HKS

DISTRIBUTION:

Silver hake occur between 54-270 m along the continental shelf from the southern and eastern part of the Gulf of St. Lawrence, to the Newfoundland Banks and southward to South Carolina. Main concentrations are found off the New England coast on the slope of Georges Bank and Nantucket Shoals and on the Scotian Shelf Banks.

Seasonal changes in distribution are generally inshore and northward to shallower water in the spring and offshore and southward to deeper water in the fall. Summer spawning concentrations have been identified on Sable Island Bank.

FISHERY:

Exploitation of silver hake on the Scotian Shelf has been almost entirely by the U.S.S.R., Cuba being a recent entry to the fishery. Peak catches were made in 1963 (123,000 t) and 1973 (300,000 t). The TAC was reduced to 70,000 t in 1977, increased to 81,000 t for 1978, reduced to 70,000 t again for 1979, and raised further to 90,000 t for

1980, the variation reflecting pronounced fluctuations in recruitment. The fishery, which is prosecuted largely with small-meshed bottom trawls, generates a substantial bycatch of young fish of other commercial species, thus having a depressing effect upon the productivity of the stocks involved. Minimum cod-end mesh size used in the directed silver hake fishery was set at 60 mm manila equivalent as of April 1, 1977.

Difficulty in predicting recruitment limits the usefulness of resource projections of more than one year for this species. Research programs are under way and it is hoped that realistic recruitment estimates can be obtained for the assessments of the early 1980's. It is assumed that a TAC of 70,000 t will be sustainable through 1985. The Canadian share of the 1980 TAC was 20,000 t.

UTILIZATION:

Sold for human consumption — fresh or frozen; used for fish meal.

GENERAL BIOLOGY:

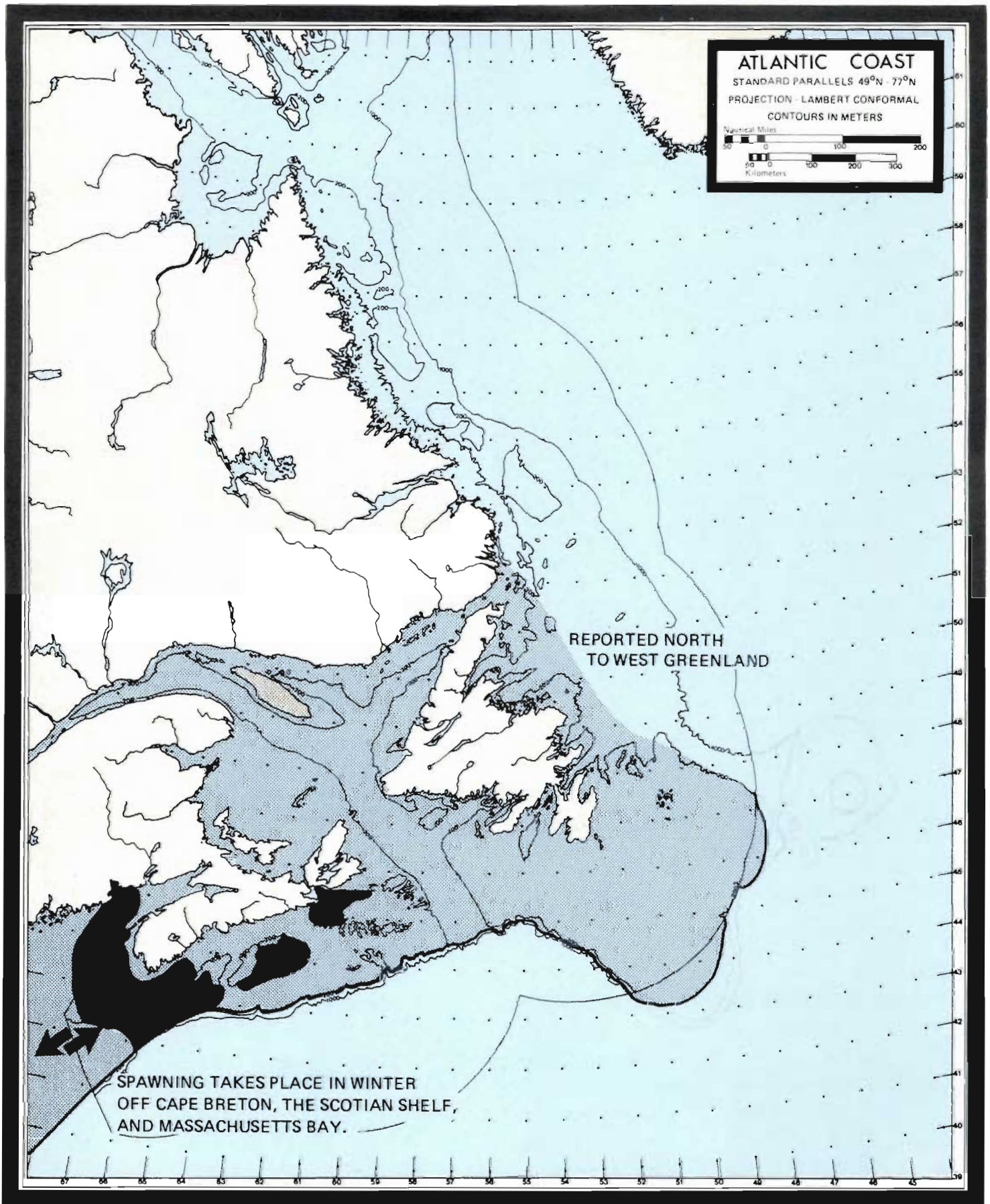
Spawning takes place from June-September over an extensive area from Middle Ground and Sable Island Bank to the mouth of Delaware Bay.

Fertilized eggs float in the water column and hatch in a few days. The fry apparently remain in surface waters until the end of their first summer or fall when they take to deeper water layers. Growth is moderately rapid and a length of 23-28 cm is reached in 2 years.

Prey species include herring, gaspereau, mackerel, silversides, smelt, butterfish, sand lance, myctophids, squid, decapods, crustaceans and euphausiids.

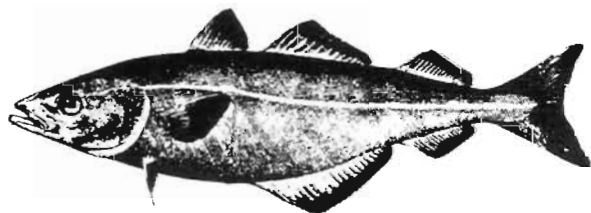
MAP KEY





POLLOCK

Pollachius virens (Linnaeus) 1758



FAMILY: Gadidae

COMMON NAMES: Boston bluefish, blister back, merlan-noir, merlan, colin, goberge.

CODES: NAFO - 106
FAO Taxonomic - 1,48(04)015,01
3 alpha ident. - POK

DISTRIBUTION:

Pollock occur from inshore waters to the edge of the continental shelf from Labrador and west Greenland south to Cape Hatteras. Concentrations occur from the Bay of Fundy to Browns Bank and on the Scotian Shelf.

Major changes in distribution take place seasonally with pollock arriving in Canadian waters from the east coast of the United States in late spring and returning in the late fall. Small numbers overwinter in northern part of their range.

FISHERY:

This fishery is centered on Browns Bank with substantial catches from both east and west. The TAC was reduced to 30,000 t for 1977-79 but, because of the apparent stability of present stocks, the 1980 TAC was raised to 40,000 t.

Historically, the bulk of the U.S. catch has been taken in Subarea 5 and Statistical area 6, and landed in Maine and Massachusetts ports. Most of the

Canadian catch has been taken in Division 4 and landed in Nova Scotia ports.

Pollock catches by distant water fleets have been of relatively minor significance. The foreign fishing effort increased until 1971, when the catch reached a maximum level. The stocks then decreased but appear to have made a come-back in recent years.

Pollock are taken by otter trawl, longline, handline and occasionally in weirs and traps.

UTILIZATION:

Sold for human consumption — fresh, frozen and salted.

GENERAL BIOLOGY:

Ripe adults congregate in late autumn and winter off the mouth of Massachusetts Bay, between Cape Anne and the Isle of Shoals. Evidence also suggests that spawning occurs on the Scotian Shelf and off Cape Breton. Spawning occurs from November through February and reaches a climax before winter minimum temperatures are reached.

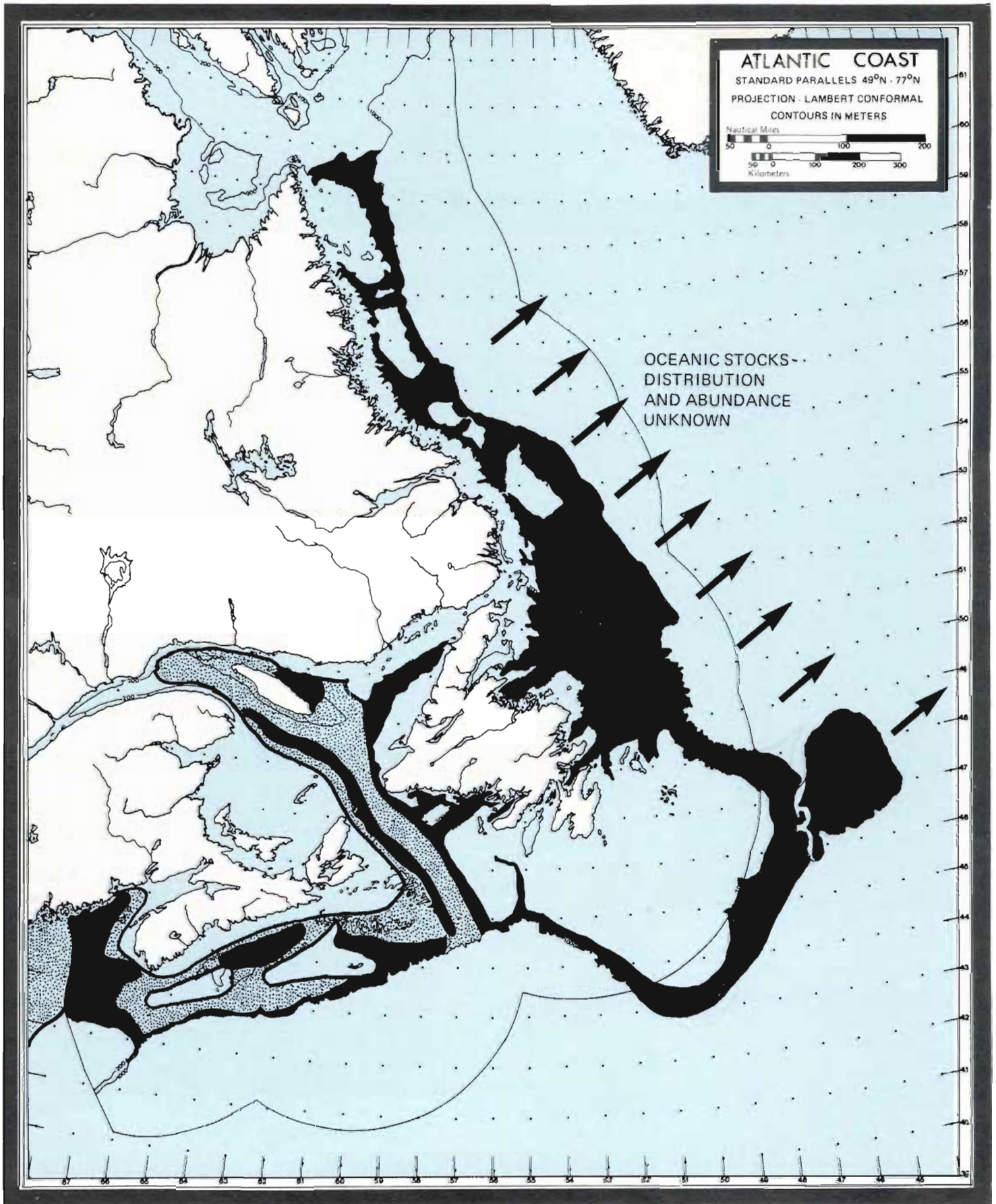
Fertilized eggs float in the water column and hatch in about 9 days at 6°C. Developing young (harbour pollock) move inshore in summer and are abundant around wharves, jetties and coastal areas of the Bay of Fundy and southwestern Nova Scotia.

Growth is rapid during the first year of life and declines with the onset of maturity. The average length of 6 year old fish is approximately 65 cm.

Pollock feed on crustaceans, euphausiids, sand lance, plaice, myctophids, hake and other species.

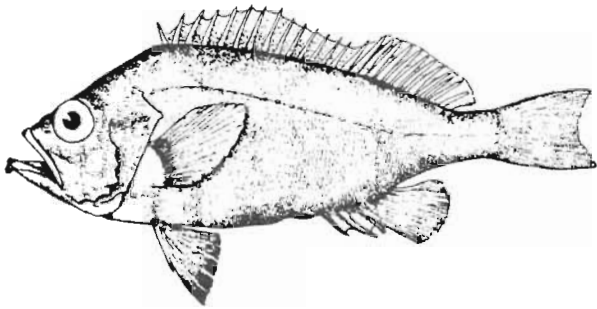
MAP KEY





REDFISH

Sebastes Spp.



FAMILY: Scorpaenidae

COMMON NAMES: ocean perch, rosefish, sébaste, poisson rouge, chèvre.

CODES: NAFO - 103
FAO Taxonomic - 1,78(01)001
3 alpha ident. - RED

DISTRIBUTION:

Redfish occur in gullies and on deep water slopes (100-750 m) along the coast from Baffin Island south to New Jersey. Concentrations occur on the edge of the Laurentian Channel, in the gully between Banquereau and Sable Island Banks northward to the deep water north of Middle Ground, in the deep channels north of Sambro Bank, in Emerald Basin and in the Gulf of Maine.

Although redfish are thought to be relatively sedentary, their occurrence in deep water makes it difficult to determine whether or not there are seasonal changes in distribution. There is some evidence that stocks on the west coast of Newfoundland migrate south out of the Gulf of St. Lawrence into the Rose Blanche Bank area in winter and return north into the Gulf in summer.

FISHERY:

Commercial exploitation of redfish began

about 1935 in the Gulf of Maine. Currently, they are fished between 200-350m all along the edge of the Continental Shelf from May to November. The peak fishing periods vary from area to area, but the most intensive effort is generally during July and August.

Stocks in NAFO Divisions 2 + 3K were depressed during the 1960's and early 1970's. However, they have shown improvement in recent years and prospects for recruitment appear to be good. The TAC for 1980 was set at 35,000 t, a level expected to be sustained over the next 5 years.

Redfish are fished with midwater and otter trawls. Juvenile fish are occasionally caught in shrimp trawls.

UTILIZATION:

Sold for human consumption — generally as fresh frozen fillets.

GENERAL BIOLOGY:

Three species of redfish (*Sebastes marinus*, *S. mentella* and *S. fasciatus*) occur in the north-western Atlantic. Until recently, it was thought that catches were composed primarily of *S. marinus* and *S. mentella*. It is now recognized that the major commercial species is *S. fasciatus*. The taxonomy is, however, complicated, and for management purposes it is likely that all three species will be managed together as a single unit under a single strategy.

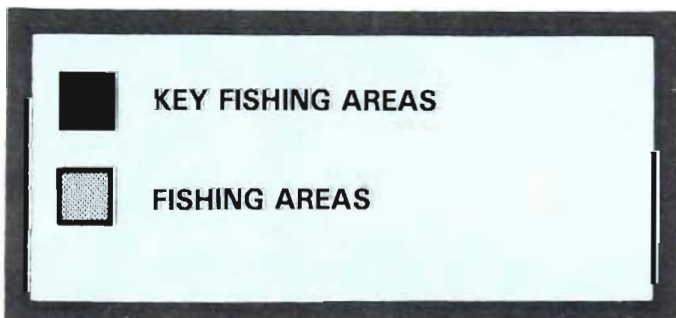
Mating takes place in August and September when males and females aggregate near the bottom along the continental shelf. The developing eggs are retained by the female until April or May when the young are released live by the females which gather to form prespawning and spawning concentrations. Fry remain in surface waters (0-100 m) until they reach a length of about 2.5 cm when they move to the bottom.

The growth rate is very slow and varies from population to population. Generally, it may take 10 years for an individual to reach a length of about 22 cm.

Prey species utilized by redfish include: euphausiids, small fish, decapods, copepods, and amphipods.

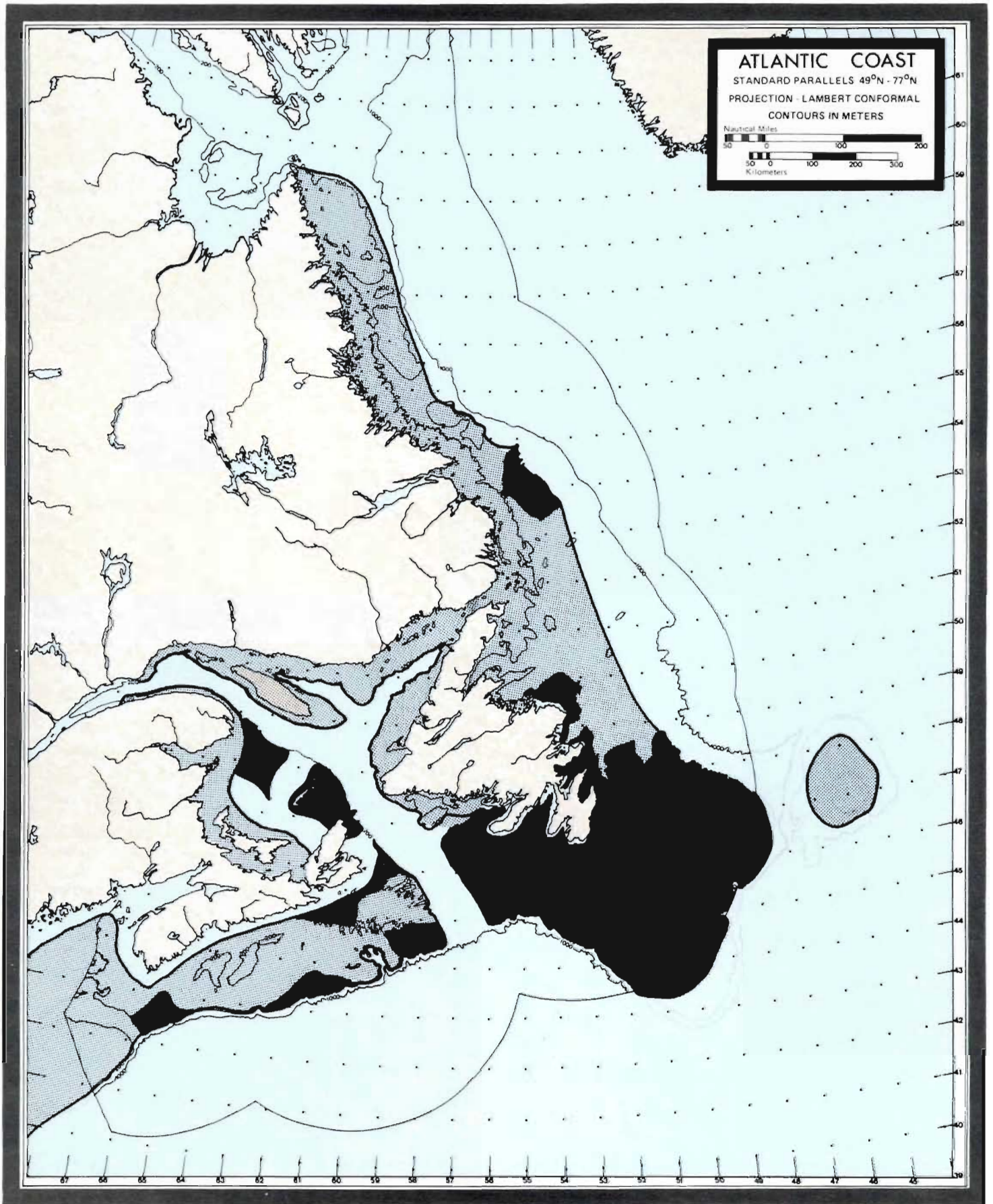
Principal predators are halibut and cod.

MAP KEY



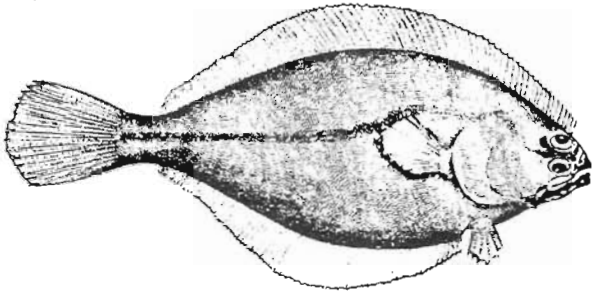
COMMERCIAL RESOURCE SPECIES

FLATFISH



AMERICAN PLAICE

Hippoglossoides platessoides (Fabricius) 1780



FAMILY: Pleuronectidae

COMMON NAMES: Canadian plaice, plaice, dab, sand dab, blackback, flounder, sole, plie canadienne.

CODES: NAFO - 112

FAO Taxonomic - 1,83(02)014,01

3 alpha ident. - PLA

DISTRIBUTION:

Plaice occur on fine sand or soft mud bottom at depths of 35-700 m from West Greenland to Rhode Island. Concentrations are found on Hamilton Inlet, Grand, St. Pierre, Fourchu, Misaine, Banquereau, Sable Island and Browns Banks and in the western Gulf of St. Lawrence.

Seasonal changes in distribution are mainly limited to inshore movement to shallower water in spring and offshore movement to deeper water in winter.

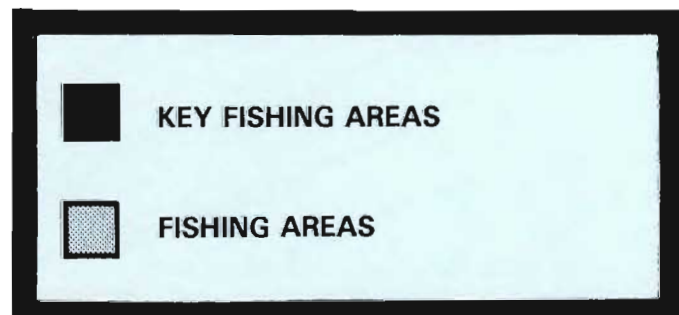
Plaice are caught in midwater trawls, indicating some vertical movement in the water column.

No specific spawning areas have been identified.

FISHERY:

The earliest recorded commercial catches were taken by Canadian trawlers on the Grand Banks in 1940.

MAP KEY



KEY FISHING AREAS

FISHING AREAS

In the Labrador - northeast Newfoundland area, catches have averaged 8,000 t. The TAC was reduced to 6,000 t for 1978-1979 because of evidence of stock decline. Prior to 1977, the main Canadian effort in this fishery was with gillnets, and a large proportion of the offshore catches was made as bycatch in the trawl fishery. However, in 1977, there was a significant offshore fishery by Canadian otter trawlers which took two thirds of the catch. This trawl catch declined again in 1978.

Nominal catches on Flemish Cap decreased from 4,000 - 5,000 t in 1965-66 to 1,500 t in 1974-77. A pre-emptive TAC of 2,000 t was set in 1974. This was raised to 4,000 t in 1978 but was reduced to 2,000 t again for 1979 and 1980. The TAC is likely to remain at this level to 1985. However, since this species is taken mainly as a bycatch in the cod fishery, increased catches could result in reductions in stock biomass for this species also.

With the exception of 1973 when 15,000 t were taken on St. Pierre Bank, the 1975-77 catch was approximately 5,000 t. Since 1974, the stock has been regulated by quotas; an initial TAC of 11,000 t was reduced progressively to 4,000 t for 1978 and 1979 to assist in stock rebuilding. The stock appears to be in fairly good condition with recent fishing mortalities being somewhat lower. Therefore the 1980 TAC was increased to 5,000 t which is projected to be sustainable in the 1980's.

UTILIZATION:

Sold for human consumption — fresh and frozen.

GENERAL BIOLOGY:

Spawning occurs throughout the range of the American plaice from April-July depending on the locality. Fertilized eggs float near the surface and hatch in 11 - 14 days at 5°C.

Size varies from locality to locality as follows for 5 year old fish:

Passamaquoddy Bay - 39 cm

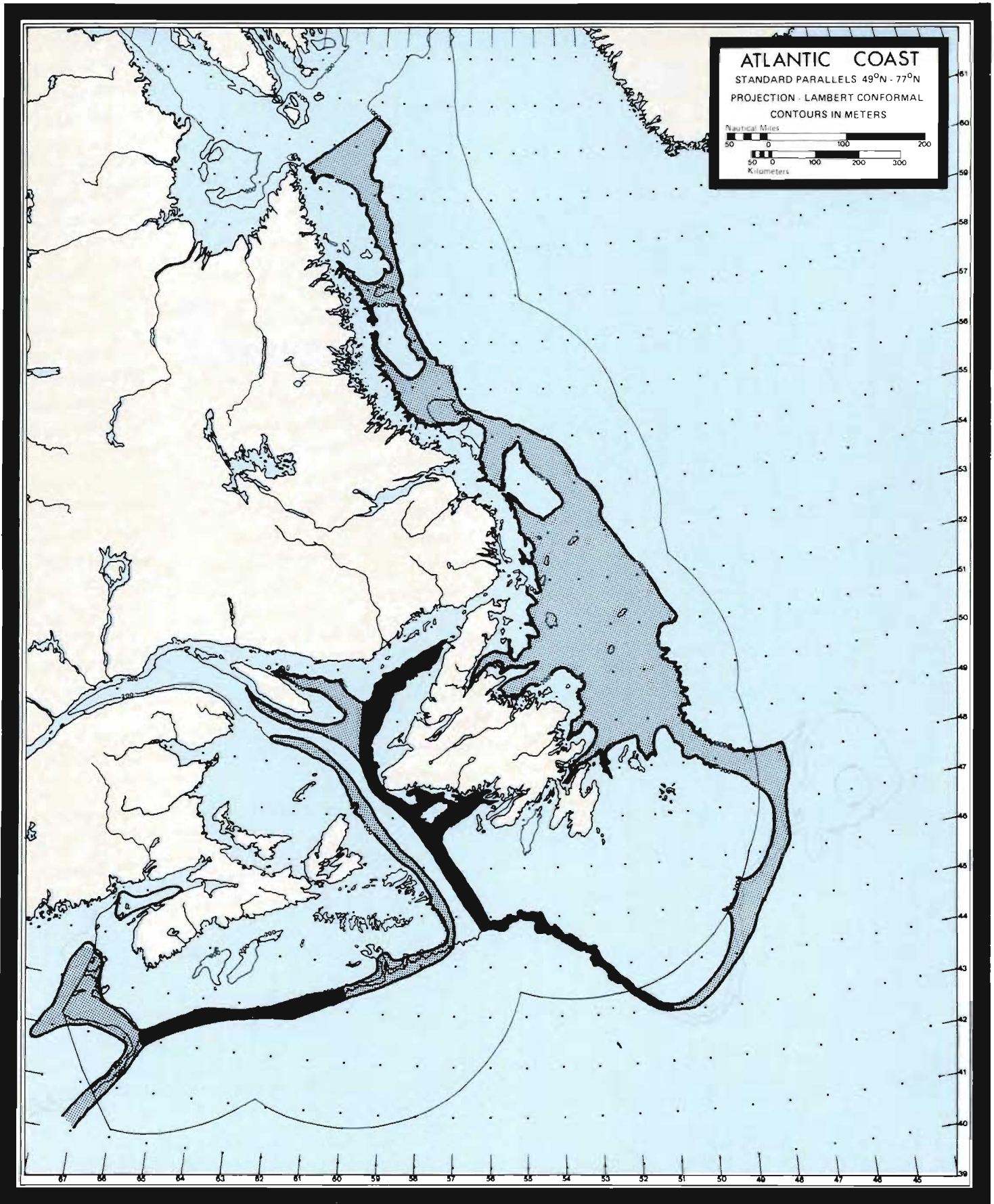
Southern Gulf of St. Lawrence - 22 cm

Bay of Islands, Newfoundland - 14 cm

Grand Bank - 30 cm

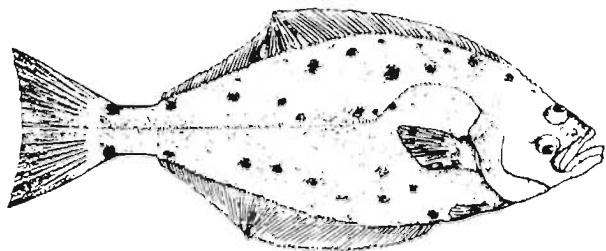
Prey species for fry and small plaice include diatoms, copepods, amphipods, caprellids, mysids, molluscs, shrimp, worms, sea squirts and occasionally, capelin, sand lance, and other small fishes.

Principal predators include skate, eelpout, sea ravens, cod, halibut, Greenland sharks and other large fishes.



ATLANTIC HALIBUT

Hippoglossus hippoglossus (Linnaeus) 1758



FAMILY: Pleuronectidae

COMMON NAMES: halibut, flétan

CODES: NAFO - 120
FAO Taxonomic - 1,83(02)002,01
3 alpha ident. - HAL

DISTRIBUTION:

Halibut occur along the coast from Greenland south to New Jersey. Concentrations have been reported along the continental slope from the southeastern part of the Grand Bank along the Laurentian Channel nearly to the Strait of Belle Isle, and along the edge of the Scotian Shelf.

Although tagged fish have travelled as far as 2,574 km, seasonal population shifts appear to be restricted to movements into shallow water areas in summer and movement to deeper water in winter.

FISHERY:

Although halibut are a highly valued food fish, landings are largely a bycatch from other fisheries and landed values are combined with other unrelated species. The fishery is concentrated in Subareas 3 and 4.

Halibut are taken by otter trawl, longline and, occasionally, handline.

UTILIZATION:

Sold for human consumption — fresh and frozen.

GENERAL BIOLOGY:

Available information suggests that spawning takes place in late winter and early spring at depths of over 180 m. The eggs are buoyant and drift at depths greater than 54 m. Incubation takes 16 days at about 6°C. It is not known how long the larvae remain pelagic.

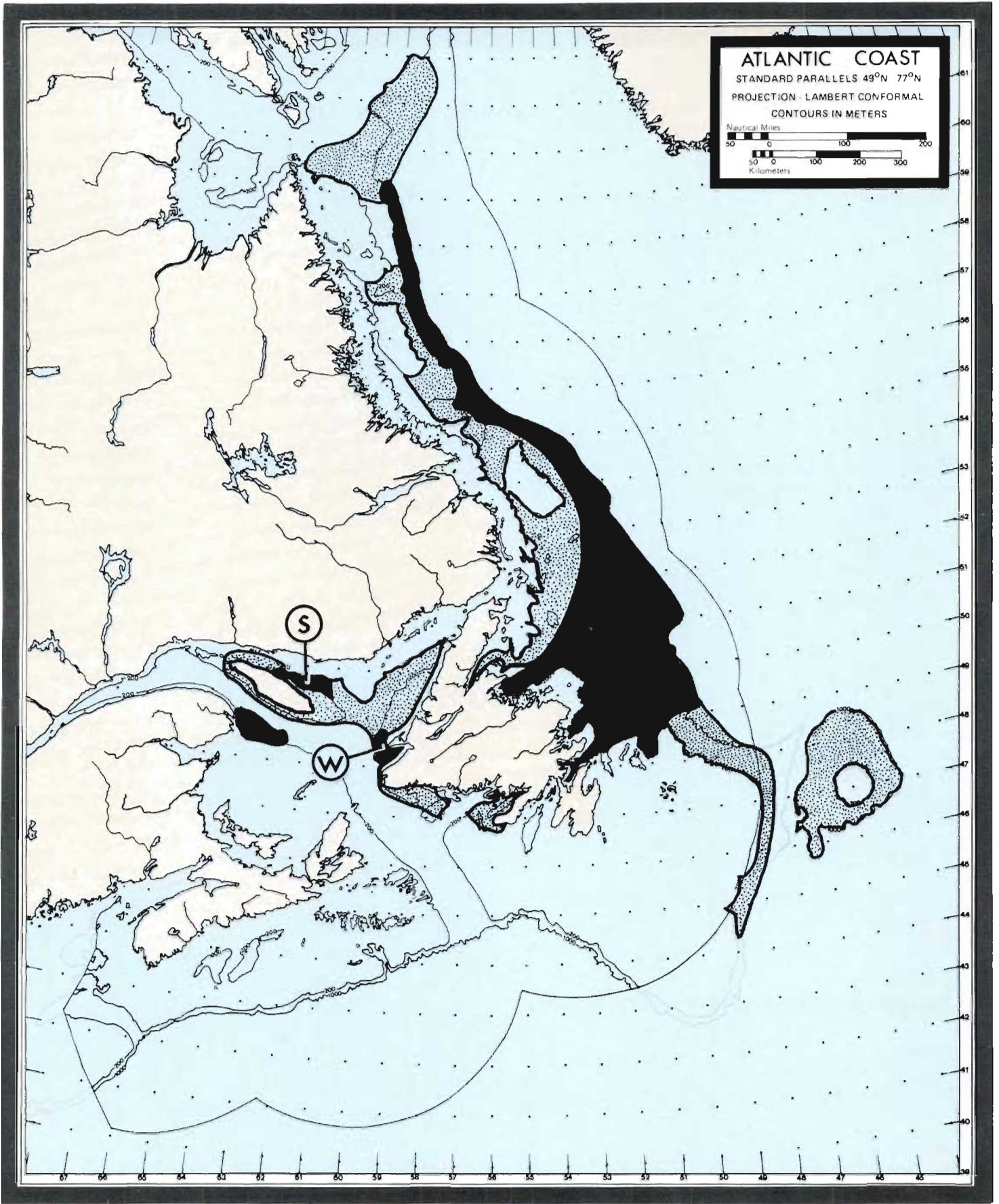
Adults grow to an average weight of 25-100 kg. Occasional specimens may reach a length of 2.4 m and a weight of 200 kg or more.

They are voracious feeders which forage throughout the water column. Young feed on small fish, crustaceans, crabs, shrimp and euphausiids. Adults appear to feed exclusively on fish.

Their position at the top of a food chain and their wide distribution make it impossible and inappropriate to develop a management strategy for this species.

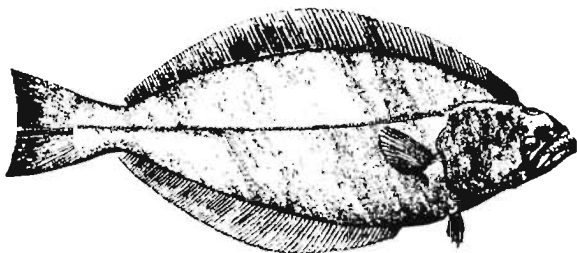
MAP KEY





GREENLAND HALIBUT

Reinhardtius hippoglossoides (Walbaum) 1792



FAMILY: Pleuronectidae

COMMON NAMES: turbot, Newfoundland turbot, flétan du Groenland.

CODES: NAFO - 118
FAO Taxonomic - 1,83(02)005,01
3 alpha ident. - GHL

DISTRIBUTION:

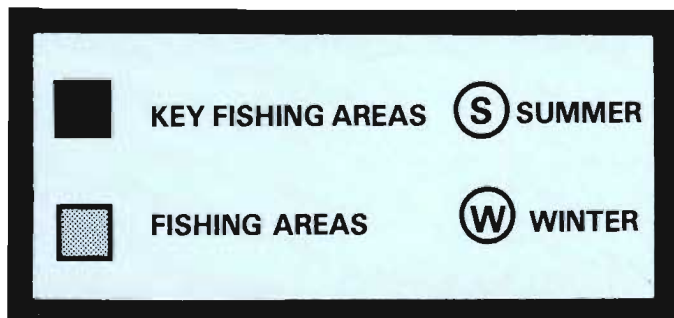
Greenland halibut occur at depths greater than 540 m on the continental slope from the Baffin Island area south to the northern part of the Grand Bank and in the northeastern Gulf of St. Lawrence. They have been recorded as far south as New Jersey. Concentrations occur from northern areas southward to the Grand Bank.

Seasonal changes in distribution occur and there is evidence that this species migrates over considerable distances, possibly in relation to spawning activity when mature fish move from deep coastal bays to deep water on the continental slope.

FISHERY:

Currently the best fishing localities are just south of Hamilton Inlet Bank, Notre Dame Bank, Trinity Bay and the Funk Island area.

MAP KEY



The Gulf of St. Lawrence fishery has been increasing in recent years. Landings were about 1,100 t in 1970, but declined in 1972 and then increased by stages to 2,000 t in 1976. In 1977 landings doubled to 4,000 t and increased further in 1978-79. Since the fishery is a relatively new one, the stock relationships are not yet fully known and, since there is evidence that catches comprise mostly immature fish, expansion of this fishery should be closely monitored.

In the Labrador-Grand Banks area catches averaged 29,000 t from 1972-1975, with a 1978 catch of 38,500 t. There is some doubt whether this stock is fully exploited, since large mature fish in deep water are not available to the Canadian longline fishery. The TAC was maintained from 1976-1979 at 30,000 t but increased to 35,000 t for 1980.

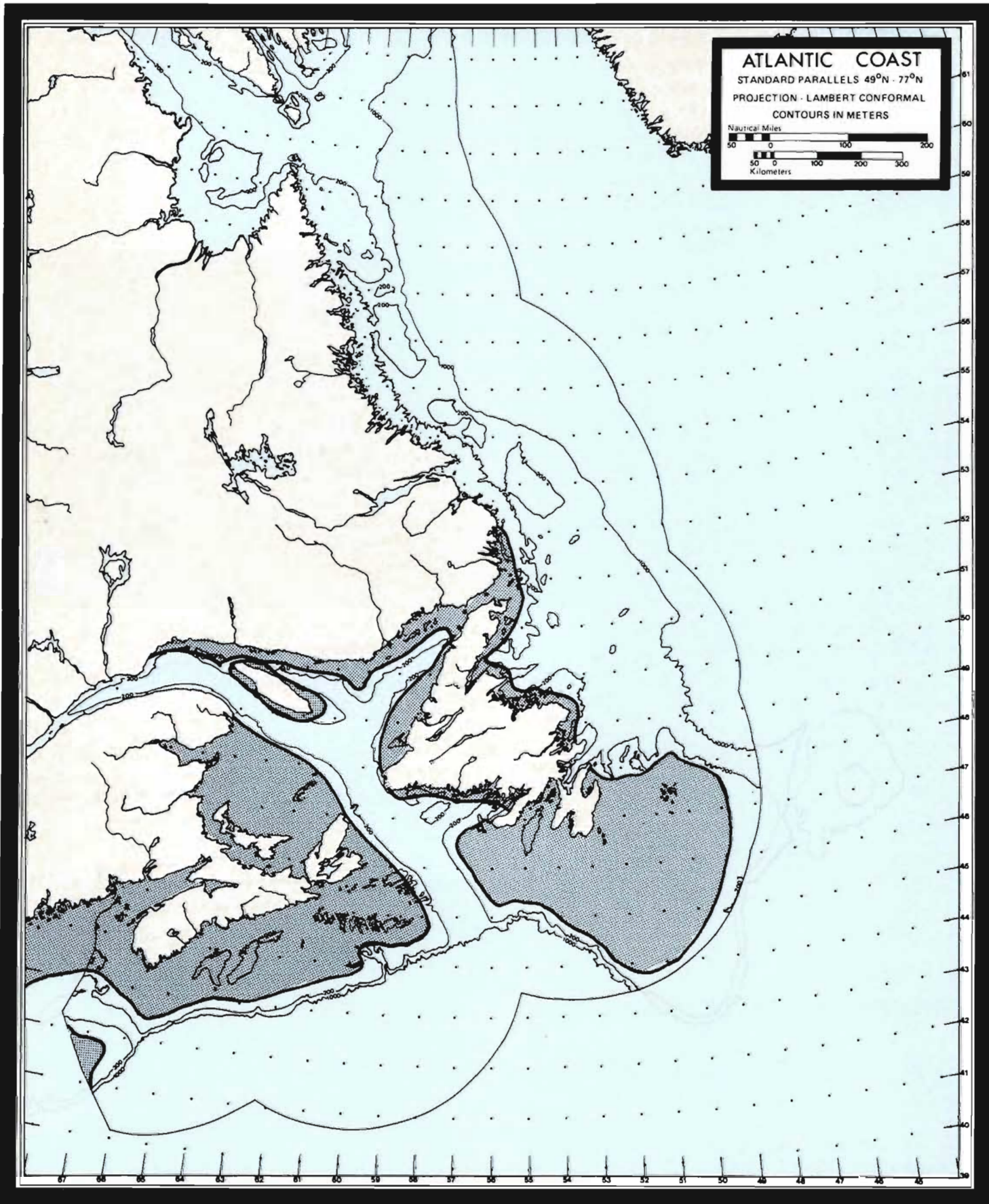
This species is taken by longline, gillnet and deep-water trawl.

UTILIZATION:

Greenland halibut are sold for human consumption as "turbot", fresh, frozen and salted.

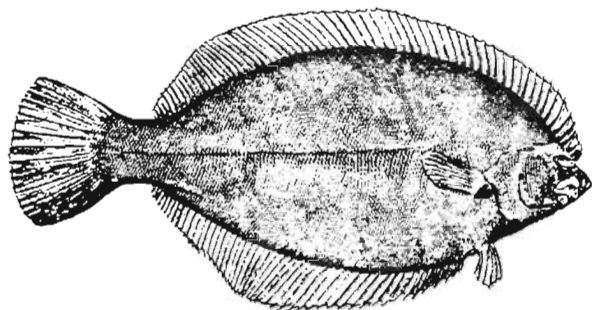
GENERAL BIOLOGY:

Spawning is believed to take place in deep water on the continental slope from Baffin Island to the northern part of the Grand Bank, probably in late winter and spring. Larvae probably occur throughout the area of distribution and it is thought that young may live in "shallower" water (180-270 m), moving to deeper water as they mature.



WINTER FLOUNDER

Pseudopleuronectes americanus (Walbaum) 1792



FAMILY: Pleuronectidae

COMMON NAMES: blackback, sole, flounder, dab, lemon sole, Georges Bank flounder, carrelet, plie rouge.

CODES: NAFO - 122

FAO Taxonomic - 1,83(02)050,03
3 alpha ident. - FLW

DISTRIBUTION:

Winter flounder occur from tide mark to 140 m along the coast from Battle Harbour and Windy Tickle, Labrador, south to North Carolina and Georgia. Concentrations occur during summer in most coastal bays and inlets and they are abundant in the Bay of Fundy and on Sable Island Bank.

Seasonal changes in distribution appear to be limited to offshore movements to deeper water in winter and inshore movements to shallow water in summer.

Spawning occurs throughout its range.

FISHERY:

The winter flounder has a variable commercial and sport value depending upon abundance, local tastes

and traditions. They are fished commercially in NAFO Subareas 4 and 5, and Statistical Area 6, but are not one of the main commercial species of flounder. Reported landings have also been negligible in Subareas 2 and 3. Although they may be present in considerable quantities in some areas, it is doubtful whether they have significant commercial fishing potential.

This species is taken by handline, spear, shut-off seine, trap, flounder drags and otter trawl.

UTILIZATION:

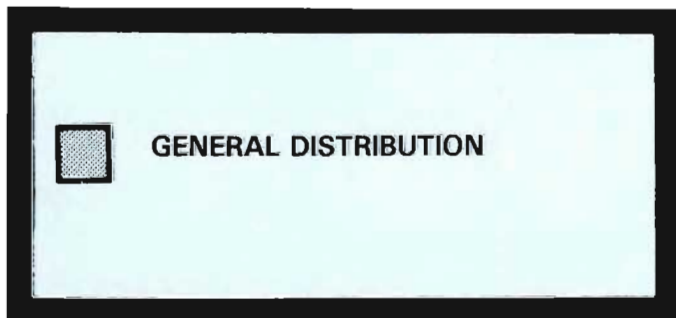
Sold for human consumption — fresh and frozen fillets — and for fish meal.

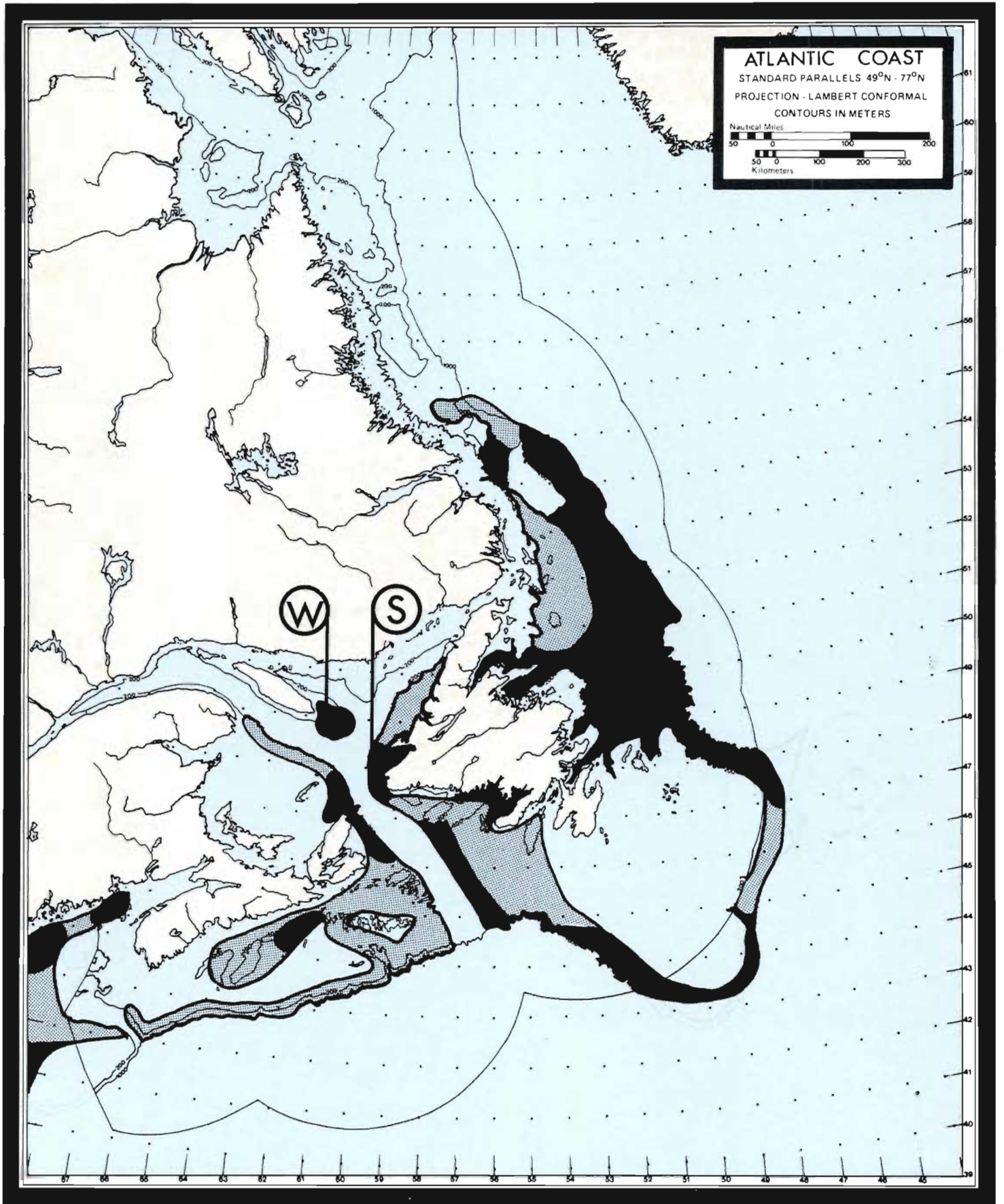
GENERAL BIOLOGY:

Spawning takes place in late winter and spring on shallow sandy bottom. The eggs sink to the bottom where they stick together in clusters. Incubation takes 15 - 18 days at approximately 3°C. Metamorphosis takes about 2½ - 3½ months at which time the fry have taken on the typical flatfish form. Adults probably mature at 3 years at a length of approximately 20 cm.

Principal prey includes amphipods isopods, worms, clams, snails, crabs, shrimp and some algae.

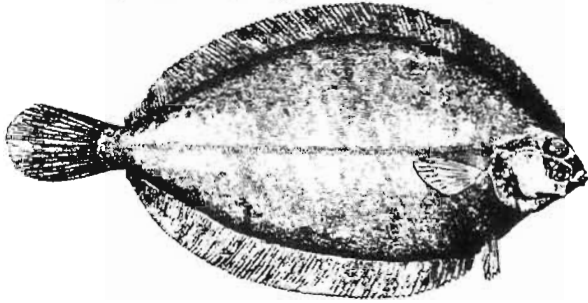
MAP KEY





WITCH FLOUNDER

Glyptocephalus cynoglossus (Linnaeus) 1758



FAMILY: Pleuronectidae

COMMON NAMES: gray sole, Craig fluke, pole flounder, flet, plie grise.

CODES: NAFO - 114

FAO Taxonomic - 1,83(02)001,02
3 alpha ident. - WIT

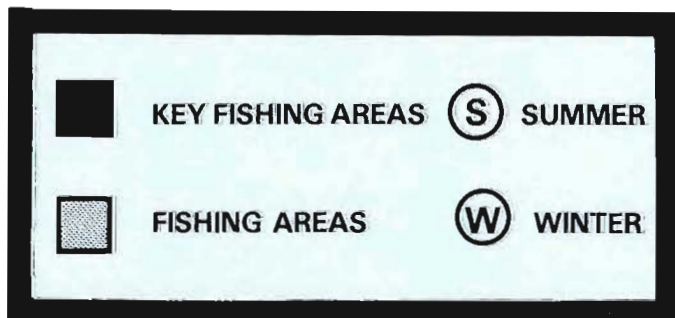
DISTRIBUTION:

Witch flounder occur principally at depths of 45 - 270 m from the area off Hamilton Inlet south to Cape Hatteras. Concentrations are reported from the Southern Labrador Shelf and on the northeast Newfoundland Shelf south to the northern part of Grand Bank; along the continental slope on the south of Grand Bank west to St. Pierre Bank; off Anticosti Island and Cape St. George; on the Scotian Shelf; on Georges Bank and at the mouth of the Bay of Fundy.

FISHERY:

The witch flounder fishery is most important in Divisions 2J, 3K and 3L. Before 1960 there was practically no fishery in this area. In the mid to late 60's, the industry flourished with huge catches being reported by Canadian, Russian and Polish fleets. Currently the fishery is almost totally dominated by Canadian vessels. Historically, the witch flounder was regarded as a bycatch by the foreign fleets and no accurate records were kept. Although stocks are somewhat depleted, the present TAC for witch

MAP KEY



flounder should enable the stocks to rebuild by the early 1980's.

In the Labrador - North Grand Bank area nominal catches increased from 4,400 t in 1961 to 24,000 t in 1973 followed by a decline to 6,900 t in 1978. A TAC of 22,000 t was first introduced in 1974, but has since been reduced to 17,000 t. Prior to 1977, the Canadian fishery was mostly in-shore, but in 1977 a directed otter trawl fishery took, more than one third of the Canadian catch. TACs from the stock are unlikely to exceed recent levels by 1985.

On the Southern Grand Banks, recent catches have ranged from 15,000 t in 1971 to 6,000 t during 1975-1977 and as low as 3,500 t in 1978, despite a TAC of 10,000 t in effect since 1974. This shortfall has apparently occurred because witch flounders in this division have, until recently, been largely a bycatch of other fisheries. The TAC for 1979 and 1980 was reduced to 7,000 t to allow stock rebuilding. It is likely that this will be an appropriate figure for the next few years, although inadequate sampling data preclude a more accurate assessment at present.

In the northern and eastern Gulf of St. Lawrence, catches have averaged 2,600 t since 1967, and have fluctuated between 900 t and 5,300 t during 1973-78. The TAC in 1977 and 1978 was 3,500 t but was raised to 5,000 t for 1979 following some excellent, although localized, winter fishing success. This TAC continued in 1980. In the southern and western Gulf, long-term catch has averaged 2,500 t from a complex of local stocks. No detailed assessment is feasible, but it seems likely that some modest increase in landings is possible.

A catch of 21,700 t was taken on the Scotian Shelf in 1968 but only 6,000 t in 1970; fluctuations were largely due to variation in the reported U.S.S.R. catch. The 1978 catch was 1,800 t.

Witch flounder are taken by otter trawl and Danish seine.

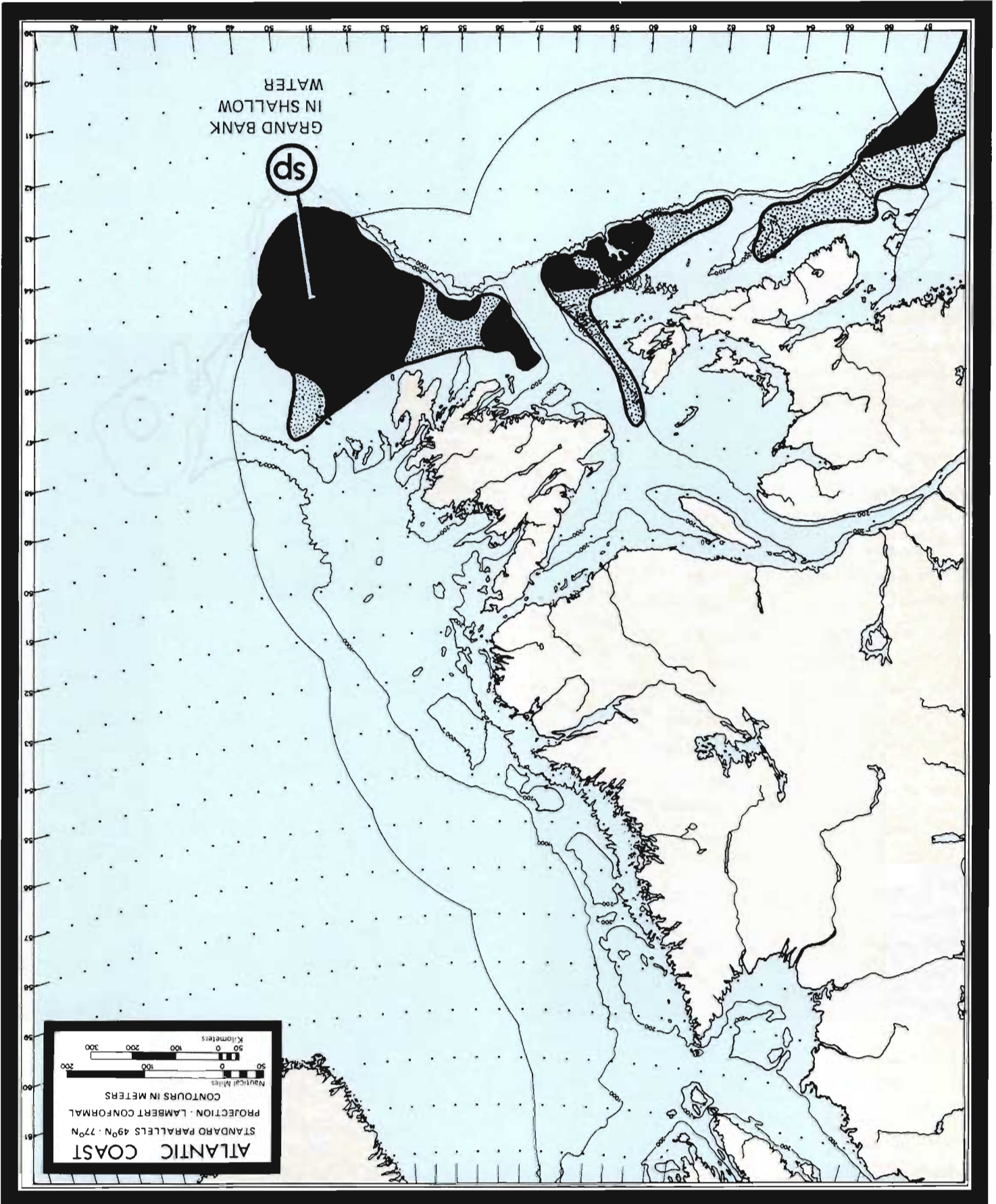
UTILIZATION:

Sold for human consumption as fresh and frozen fillets.

GENERAL BIOLOGY:

Spawning takes place in late spring to summer. Fertilized eggs float during their incubation period and hatch in 7 - 8 days at 8°C. Larvae apparently drift for 4 - 6 months before settling to the bottom and subsequent growth is slow.

Principal prey includes amphipods, shrimp, worms and small molluscs.



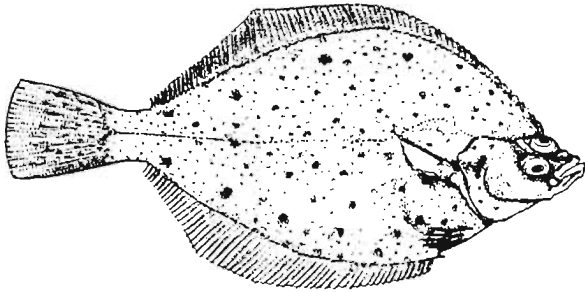
GRAND BANK
IN SHALLOW
WATER

ds

ATLANTIC COAST
STANDARD PARALLELS 49°N · 77°N
PROJECTION · LAMBERT CONFORMAL
CONTOURS IN METERS
Nautical Miles 0 100 200
Kilometers 0 100 200 300

YELLOWTAIL FLOUNDER

Limanda ferruginea (Storer) 1839



FAMILY: Pleuronectidae

COMMON NAMES: rusty dab, yellowtail, sériole, limande à queue jaune.

CODES: NAFO - 116
FAO Taxonomic - 1,83(02)024,04
3 alpha ident. - YEL

DISTRIBUTION:

Yellowtail occur on the continental shelf at depths of 10 - 100 m from the Labrador side of the Strait of Belle Isle, Gulf of St. Lawrence and Newfoundland banks south to Chesapeake Bay. Concentrations are reported on Grand, Green, St Pierre, Banquereau, Sable Island and Georges Banks.

Seasonal changes in distribution are limited to movement to shallower waters in spring with movement back to deeper water in the fall and winter.

FISHERY:

The commercial exploitation of yellowtail flounder began in the mid-1930's. Previous to this date, they were a bycatch but due to reduction of numbers of other flatfish they soon became of major importance in some areas.

Catches on the Scotian Shelf decreased from 9,400 t in 1963 to 1,000 t in 1976 and 1,500 t in

1978. Fishing mortality rates have been well in excess of those needed to allow stock rebuilding. Long-term potential yield from the stock is estimated to be 6,000 t within 5-10 years.

In the southern and western Gulf of St. Lawrence, an average annual catch of 25-30 t has been taken as a bycatch.

The principal fishing area is the Grand Bank where catches increased to 39,000 t in 1972 followed by a decline to 8,100 t in 1976 and a recovery to 15,500 t in 1978. A TAC of 50,000 t was introduced in 1973. This was reduced drastically to 8,000 t in 1976 as a result of severe reductions in abundance related to an apparent combination of overfishing and possibly adverse environmental factors. Some recovery has occurred and this is projected to continue gradually from a TAC of 18,000 t in 1979 to 20,000 t by 1985. Increased stock abundance should also result in higher catch rates.

Yellowtail are caught chiefly by otter trawl.

UTILIZATION:

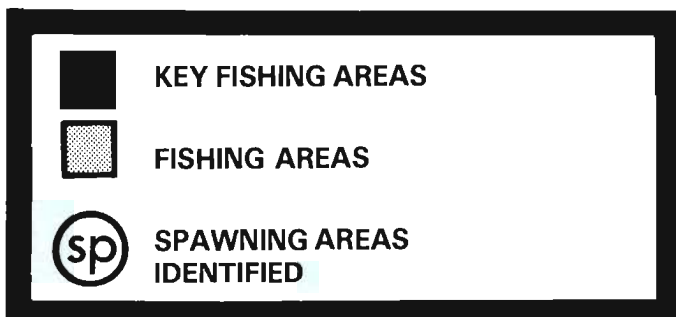
Sold for human consumption as fresh or frozen fillets.

GENERAL BIOLOGY:

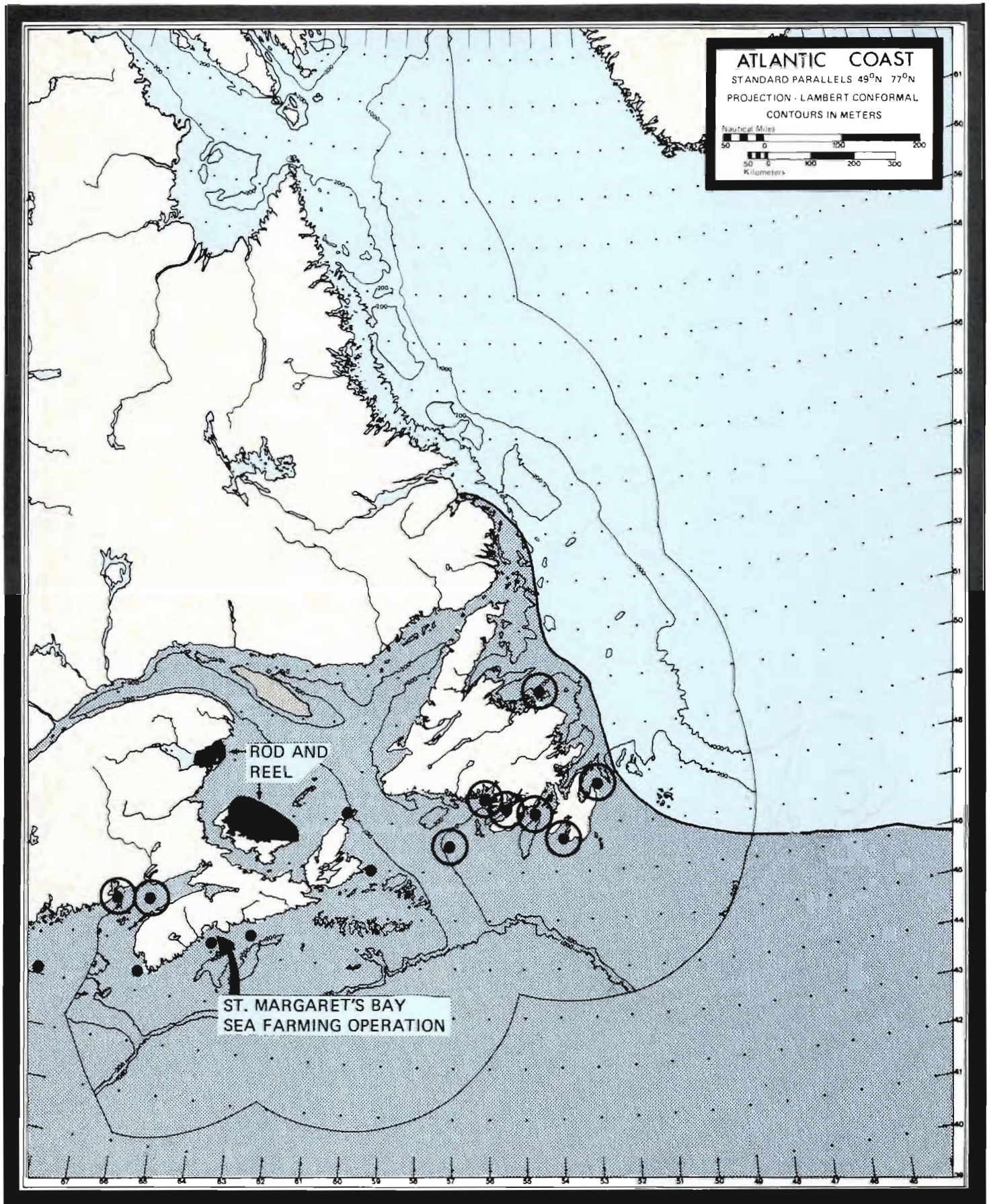
Spawning takes place between April and July depending on the locality. The eggs are buoyant and float to the surface where they hatch in 5 days at 10-11°C. Yellowtail reach a length of approximately 30 cm in 5 years and attain a maximum age of 11 years or more.

Prey species include amphipods, shrimp, mysids, small shellfish, worms and, occasionally, small fishes.

MAP KEY

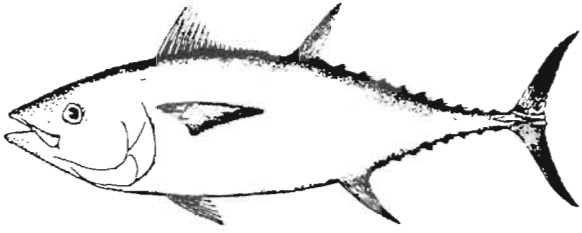


COMMERCIAL RESOURCE SPECIES PELAGICS



BLUEFIN TUNA

Thunnus thynnus (Linnaeus) 1758



FAMILY: Scombridae

COMMON NAMES: tunny, horse mackerel, albacore, tuna, bluefin, thon rouge.

CODES: NAFO - 280
FAO Taxonomic - 1,75(01)026,01
3 alpha ident. - BFT

DISTRIBUTION:

The bluefin tuna is a highly migratory species which is recorded as occurring from inshore waters to the open Atlantic, from Notre Dame Bay in Newfoundland southward to the West Indies.

Based on catch areas, principal concentrations in Canadian waters are in the Bay of Fundy, along the outer Nova Scotia coast, in the Gulf of St. Lawrence, and along the east coast of Newfoundland. Tuna occur in Canadian waters from late June to fall.

FISHERY:

Management of this migratory species is coordinated internationally by the International Commission for the Conservation of Atlantic Tuna (IC-CAT).

The Canadian fishery currently depends almost entirely on older and bigger fish that migrate into Canadian waters in the summer. Large scale diversion of foreign fishing effort from the eastern to the

western Atlantic in recent years has increased the catches of larger fish and the danger of an adverse effect on the reproductive potential of the species. Future Canadian catches will depend on the degree and effectiveness of management control.

An interesting sea farming operation is carried out in St. Margaret's Bay. Bluefin caught in mackerel traps are held and fed in net enclosures in an effort to maximize size and condition. The product of this operation is exported to Japan.

Bluefin are taken by purse seine, harpoon, traps, floating trawl and, occasionally, in weirs. A sport fishery using rod and reel was previously located off southwestern Nova Scotia, but the center of the Canadian sport fishery for tuna has now shifted to the Gulf of St. Lawrence.

UTILIZATION:

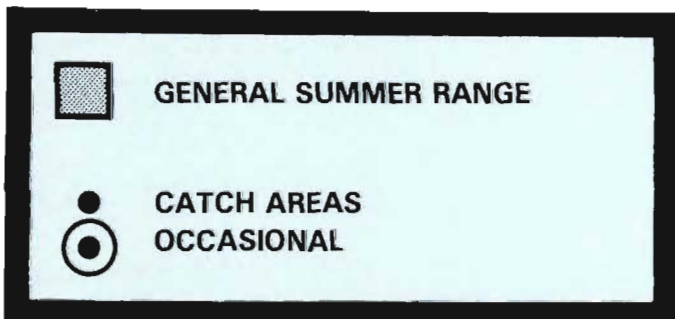
Sold for human consumption — fresh, frozen and canned. In recent years, Canadian tuna have been shipped fresh and frozen to Japan markets.

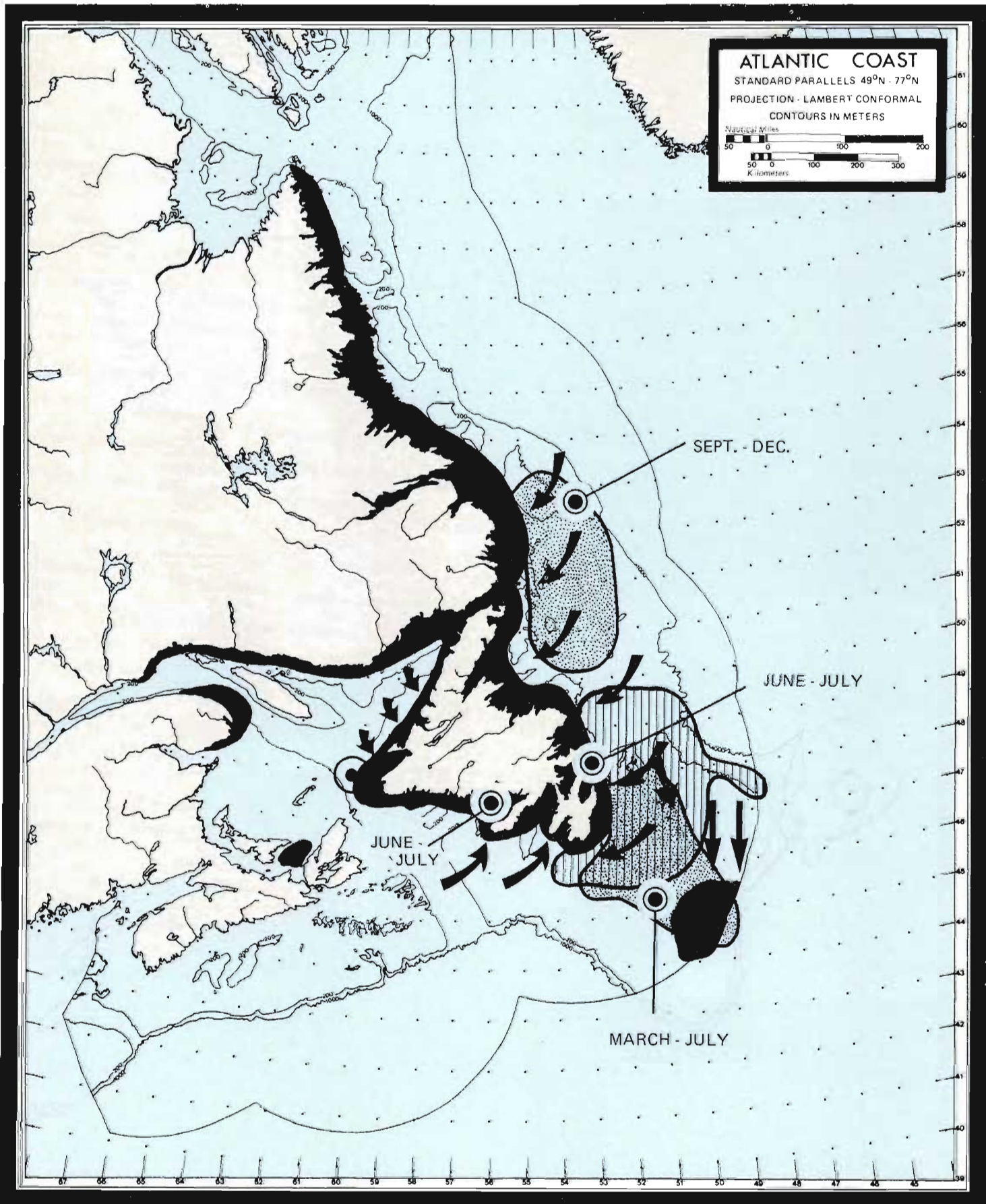
GENERAL BIOLOGY:

In the western Atlantic, giant bluefin spawn in an area from the Caribbean to the Bahamas in spring and then follow the Gulf Stream northward, appearing off the Massachusetts coast in June and from Maine to Newfoundland shortly thereafter. Medium bluefin are believed to spawn in the New York Bight area in summer. In the fall, bluefin move offshore and are found in widely separated areas. Some individuals make transatlantic migrations.

Bluefin feed on herring, mackerel, silver hake, billfish, squid, euphausiid shrimp and large fish such as redfish and salmon.

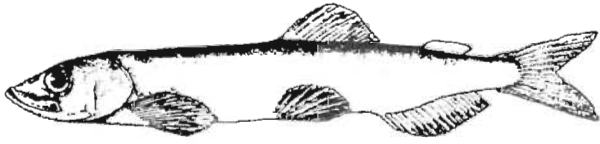
MAP KEY





CAPELIN

Mallotus villosus (Müller) 1777



FAMILY: Osmeridae

COMMON NAMES: caplin, lodde.

CODES: NAFO - 340

FAO - Taxonomic - 1,23(04)002,01

3 alpha ident. - CAP

DISTRIBUTION:

Capelin occur from inshore to the continental slope along the coast from Coronation Gulf, James, Hudson and Ungava Bays south to the Gulf of St. Lawrence and Grand Bank, rarely to the Bay of Fundy and Gulf of Maine. Spawning concentrations occur along the Labrador coast, around coastal Newfoundland, along the north shore of the Gulf of St. Lawrence, at Gaspé, west of Cape Breton Island, and on the Grand Bank. Concentrations of fry have been reported from Grand Bank north to Hamilton Inlet Bank. Seasonal changes in distribution take place from the northern areas, during May and June, to the southern part of the Bank where spawning takes place in June and July. At the same time, it is thought that capelin from the west and northwest slopes migrate inshore to spawn on the east coast of Newfoundland.

FISHERY:

Local inhabitants of Newfoundland have been taking capelin from inshore areas for many years, using cast nets and beach seines during the spawning period. Recently the introduction of the Scottish ring net technique, pair trawling and single-vessel midwater trawling for capelin in inshore areas has proven quite successful.

Offshore exploitation of capelin by Canadian vessels occurred for the first time in 1972 and 1973. Vessels fitted with midwater trawling gear

MAP KEY



have been successful and purse seining has also been attempted.

During the early part of this century, capelin were used extensively for raw fertilizer, bait in the line cod fishery and dog food. Landings were as high as 25,000 t for the Newfoundland area. Since 1950, landings of capelin have declined continuously to about 5,000 t between 1960 and 1970. The decline has been due to the changes in fishing methods for cod and a decrease in the domestic use of capelin as fertilizer and dog food. Inshore landings of capelin have increased substantially since 1973 because of the increase in demand for female capelin with roe, fish meal and as a product for human consumption.

The lack of refined estimates of capelin biomass in the Labrador-Grand Banks area, together with substantial fluctuations in recruitment and the complexity of relationships with predatory species of fish and marine mammals, make yield predictions extremely difficult. Since cod, whale and seal stocks should be increasing during the next few years, some decrease in capelin production may be expected with consequent reductions in the TAC for both northern and southern components of the capelin resource. The TAC of capelin is thus projected to decline from 500,000 t in 1978 to a long-term average of 200,000 t.

Annual catches of approximately 8,000 t have been realized in the Gulf of St. Lawrence in 1978 and 1979 and, provided that fishing is not concentrated in local spawning groups, could be increased to 25,000 t.

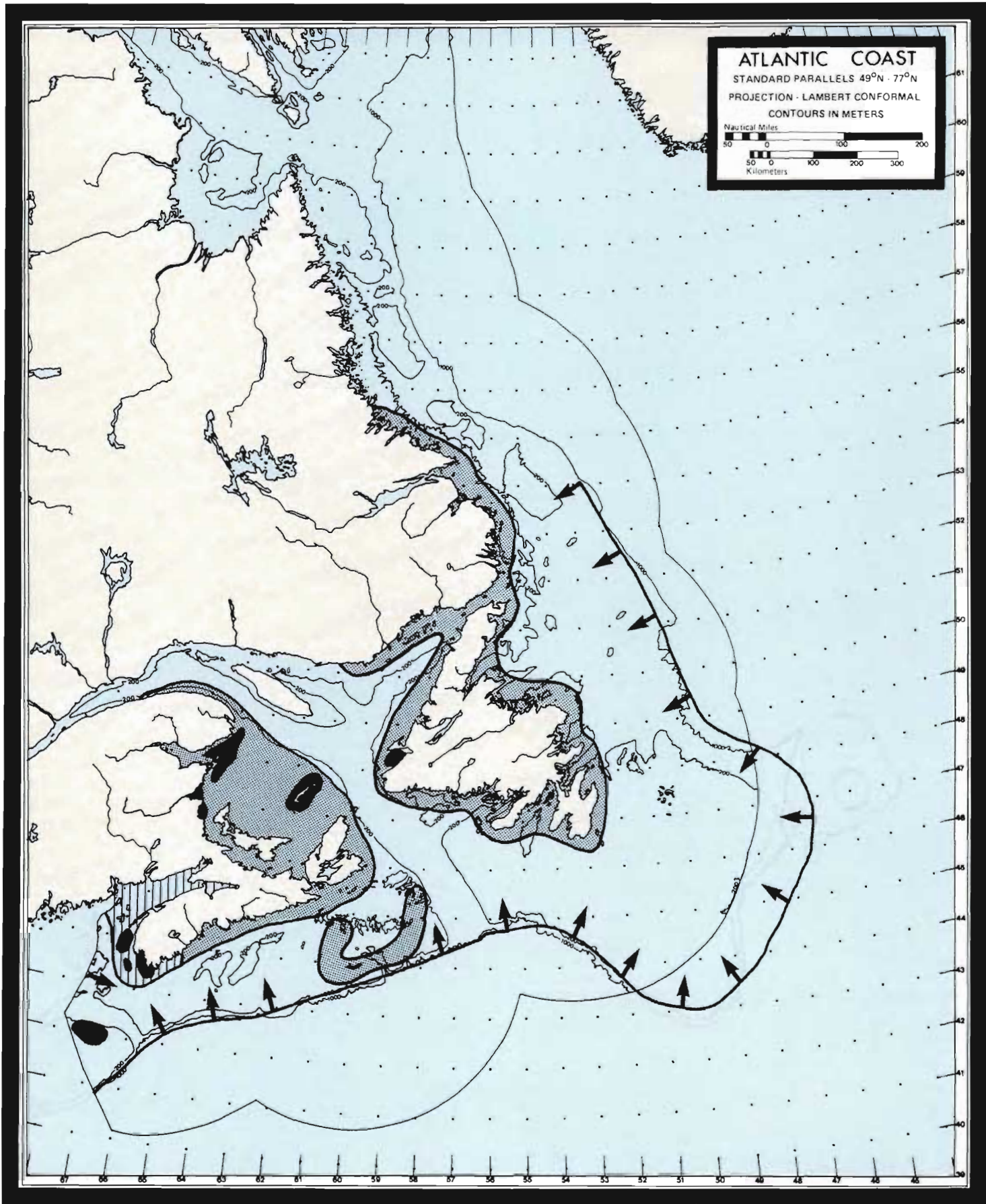
GENERAL BIOLOGY:

Spawning takes place in June and July and occasionally in late August, principally at night when the water temperatures are between 4.5° and 8.3°C. This species exhibits both demersal offshore spawning and inshore spawning on coarse sand or fine gravel beaches. Incubation takes about 2 weeks at 10°C. Following hatching, growth is rapid and on the Grand Bank a length of up to 8.75 cm may be reached by the first winter.

Capelin may reach sexual maturity as early as age group 2, but for the most part maturity occurs at age groups 3 and 4.

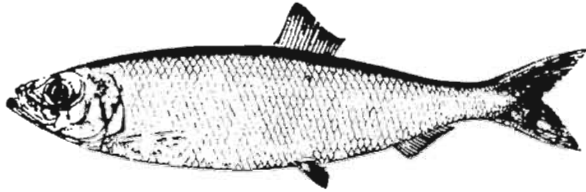
Principal prey includes copepods, amphipods, euphausiids, decapods, shrimp and capelin eggs.

The capelin is probably the most important prey species in the Northwest Atlantic, being utilized by cod, salmon, dogfish, haddock, flounder, sculpins, eelpout, herring, sea birds, seals and whales.



HERRING

Clupea harengus harengus Linnaeus 1758



FAMILY: Clupeidae

COMMON NAMES: sea herring, sardine, hareng, hareng atlantique.

CODES: NAFO - 202
FAO Taxonomic -1,21(05)001,05
3 alpha ident - HER

DISTRIBUTION:

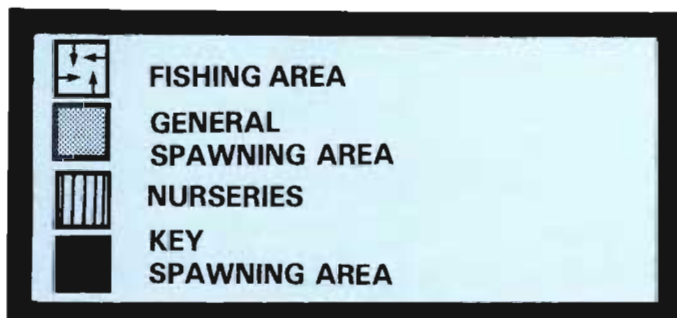
Herring occur from inshore to the edge of the continental shelf along the coast from northern Labrador south to Cape Hatteras. Concentrations may be encountered throughout its range. Historically, important areas of high abundance include coastal Newfoundland, the Gulf of St. Lawrence, coastal Nova Scotia, the Bay of Fundy and Georges Bank. Spawning occurs in most of these areas.

FISHERY:

This is one of the most important commercial fish species on the east coast and the foundation of an important historical fishery in New Brunswick and Nova Scotia. Currently, although herring are caught in Atlantic waters over a wide area, the existing fishery is mostly inshore and it has not been necessary to fish offshore in order to supply existing markets. It is felt that all herring stocks on the Atlantic coast are either fully exploited or over-exploited. Future catch levels should vary as a result of natural fluctuations in recruitment.

In Newfoundland, catches of eastern stocks declined, as a result of poor recruitment, from

MAP KEY



22,000 t in 1977 to 8,000 t in 1981. Recovery to 20,000 t is expected by 1985. Yields from western stocks are also expected to decrease from 16,000 t in 1978 to 10,000 t in 1980 with recovery to 15,000 t by 1983-85. Southern stocks are expected to rebuild from a TAC of 4,500 - 8,000 t by 1985.

Catches from the northeastern Scotian Shelf have declined from over 15,000 t in the early 1970's to less than 4,000 t in 1978. There has been very poor recruitment since the 1970 year-class, which has supported the declining fishery in recent years. To protect local stocks, the 1979 TAC was set below the level of the 1978 catch. Future catch levels for this management unit are unpredictable due, in part, to unclear stock inter-relationships.

in the Bay of Fundy and southwestern Scotian Shelf area, the adult stock is at an historical low. The 1978 catch of 89,000 t was under the TAC by 20,000 t, while the catch in 1979 fell short of the TAC by 33,000 t. However, there is strong evidence of a good year-class (that of 1976) entering the fishery and the catch approached 90,000 t in 1981. If future recruitment is similar to that since the early 1960's, a sustained yield of around 110,000 t is possible.

Herring are taken by purse seine, shut-off seine, weir and trap.

UTILIZATION:

Sold for human consumption — fresh, frozen, salted, canned, and smoked. Also used for bait and in the production of animal food, fish meal and oil.

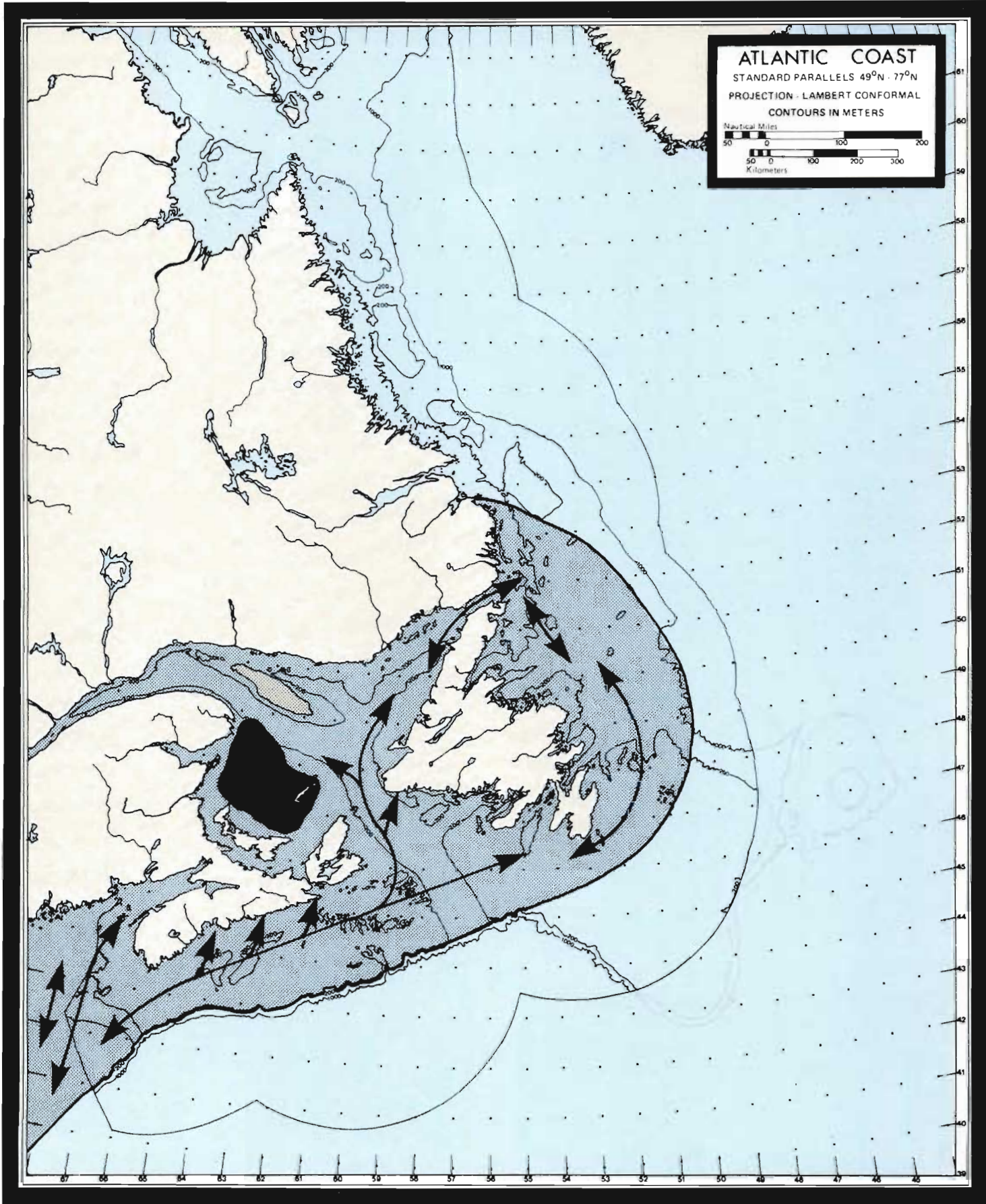
GENERAL BIOLOGY:

Spawning takes place during spring, summer and fall (April - November) with spring spawning taking place near shore and summer and fall spawning apparently taking place offshore. Eggs are laid close to the bottom and when fertilized sink and adhere to solid objects. Hatching time varies with water temperature, taking 11 days at 10°C. Larvae are moved by the currents and frequently are concentrated in "nursery areas" such as the Bay of Fundy.

Adult growth varies from locality to locality. Herring from the outer coast of Nova Scotia average 35 cm in length after 9 years.

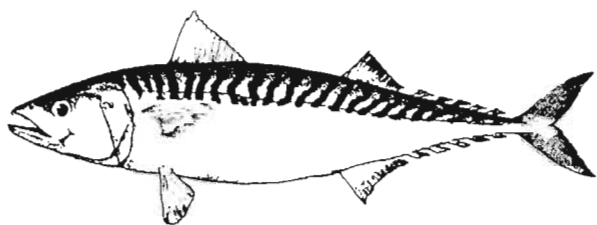
Principal prey includes copepods, euphausiids, mollusc larvae, fish eggs, herring and capelin.

Numerous predators feed on herring, including cod, silver hake, salmon, tuna, sharks, dogfish, squid, sea birds, seals, porpoise and whales.



MACKEREL

Scomber scombrus Linnaeus 1758



FAMILY: Scombridae

COMMON NAMES: common mackerel, mackerel, maquereau.

CODES: NAFO - 204
FAO Taxonomic - 1,75(01)002,05
3 alpha ident. - MAC

DISTRIBUTION:

Atlantic mackerel occur from inshore waters to the edge of the continental shelf from Triangle Harbour, Labrador, south to Cape Hatteras. Concentrations may be found, during summer, at any locality within the range. In Canadian waters, summer spawning concentrations have been identified in the western Gulf of St. Lawrence.

Seasonal changes in distribution take place with mackerel entering Canadian coastal waters in the summer after wintering in deeper waters on the continental slope and to the south. They return to their wintering grounds in the fall.

FISHERY:

Mackerel stocks from Newfoundland southwards are managed as a unit. Although two stock components have been identified (those spawning in the Gulf of St. Lawrence and those spawning south of Cape Cod), their degree of mixing and relative contribution to the fishable stock are not yet known. Considerable difficulty exists in deter-

mining population sizes and mortality rates for this stock but an increase in abundance is expected following reduction of fishing effort on the overwintering stocks off southern New England. Depending on where and when the fish are caught, the TAC could reach 300,000 t in the early 1980's. Since this is a transboundary stock, management measures will depend on Canada/U.S.A. agreements.

Canadian coastal fishing effort on this stock has depended largely on market conditions, while inshore catches are dependent on local availability of the fish rather than on overall abundance levels. Total catches in Subareas 3 and 4 during 1970-78 ranged from 21,000 - 45,000 t, with an average catch of 30,000 t.

Mackerel are taken by weir, purse seine, shutoff seine, gillnet and trap.

UTILIZATION:

Sold for human consumption — fresh, frozen, salted, canned and smoked.

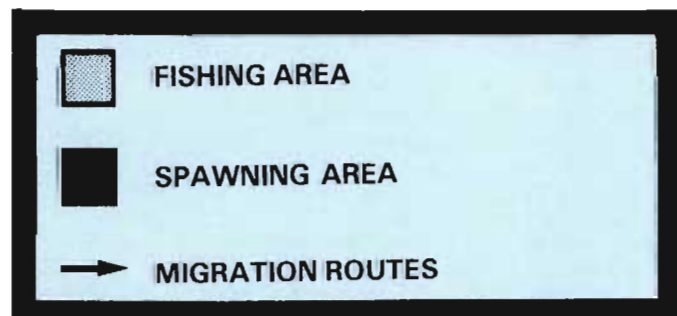
GENERAL BIOLOGY:

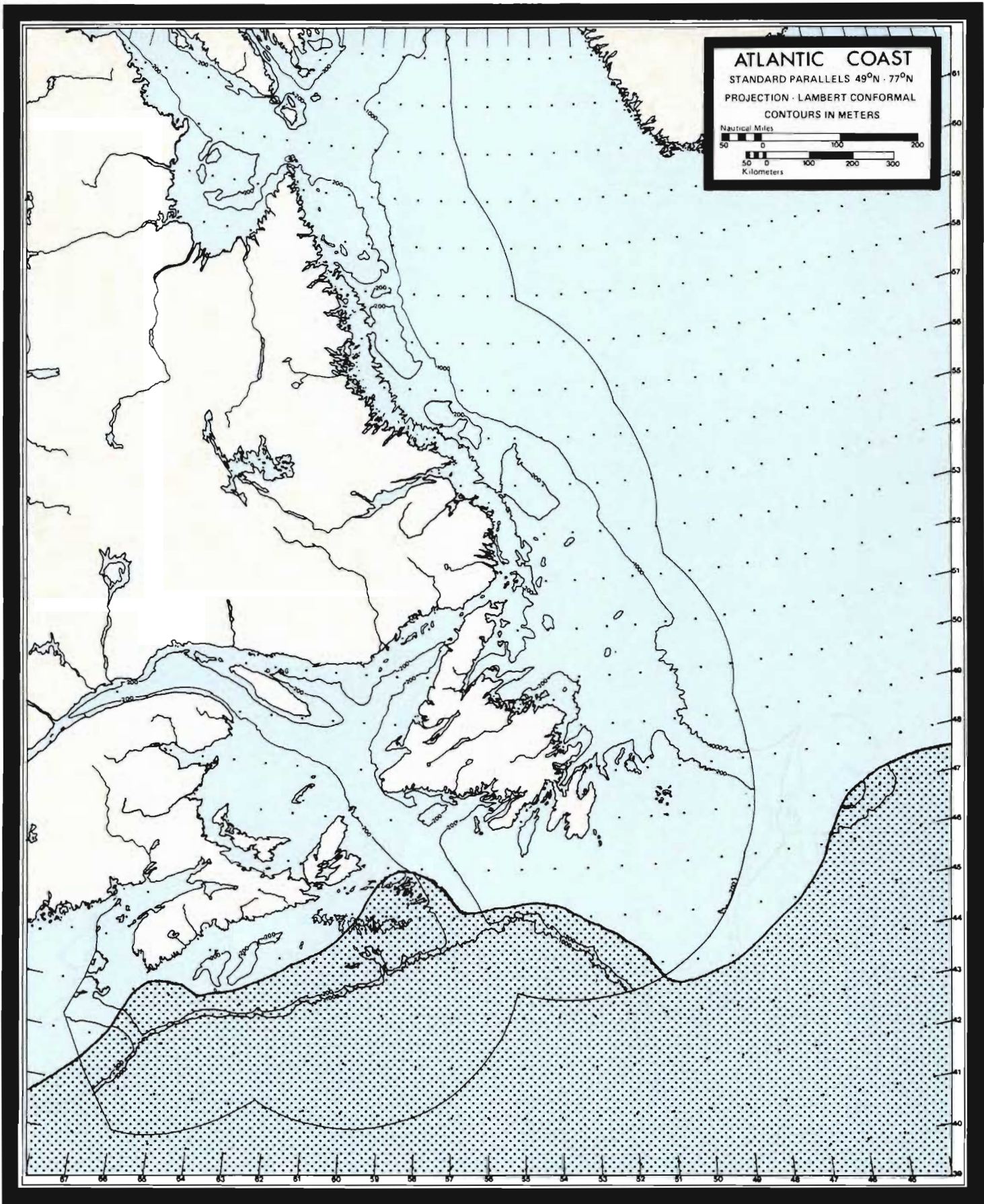
Spawning takes place from May to early July in Canadian waters. Fertilized eggs are buoyant and float in the upper 18 m of the water column. Incubation takes 9 days at 10°C.

Early growth is rapid with the larvae reaching 5 cm in length in 2 months and 26 cm in a year. Subsequent growth is slower; 6 year old fish average 41 cm in length and those 8 years old are just under 45 cm in length.

Principal prey includes copepods, amphipods, euphausiids, arrow worms, crab larvae, worms, squid, fish eggs and fish fry such as herring, silversides and sand lance.

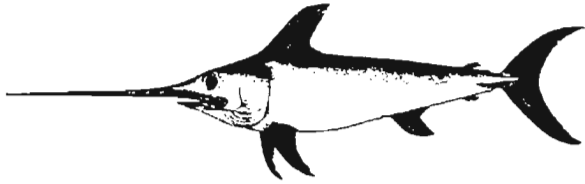
MAP KEY





SWORDFISH

Xiphias gladius Linnaeus 1758



FAMILY: Xiphiidae

COMMON NAMES: broadbill, espadon

CODES: NAFO - 264

FAO Taxonomic -1,75(04)003,01
3 alpha ident. - SWO

DISTRIBUTION:

Swordfish occur from near shore to the open Atlantic north to the Grand Bank and Gulf of St. Lawrence and south to Argentina. Catch statistics suggest that the largest concentrations, in Canadian waters, occur along the slope of the continental shelf in southern and deep water areas. They appear off the Canadian coast in early June and leave in mid September.

FISHERY:

High mercury levels resulted in a moratorium on the sale of swordfish in 1970. However, an unauthorized fishery developed and Canadian catches were transferred at sea to U.S. vessels to supply a black-market demand. It has been estimated that 2,300 t were transferred in this manner in 1978 and possibly more than 3,000 t in 1979. In 1979 the Canadian fishery was officially re-opened. Adding to the pressure on this species, a U.S.A. fishery has recently developed off the Carolinas, Florida and in the Gulf of Mexico. This may reduce the long-term catch for swordfish. It is unlikely that Canadian catches will exceed 2,500 t in the 1980's, since the total catch by the U.S.A. and

Canada in 1979 probably exceeded the optimum catch levels.

Swordfish were originally taken by harpoon. Longlines have been used since 1963.

UTILIZATION:

Sold for human consumption — fresh and frozen.

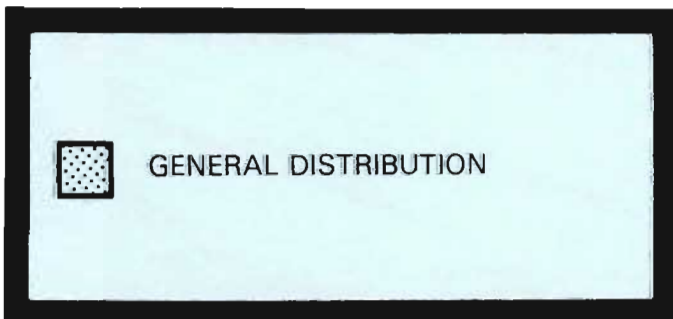
GENERAL BIOLOGY:

The swordfish is a migratory species observed near the surface in waters having a temperature of at least 18°C, and occasionally in waters as cold as 10°C.

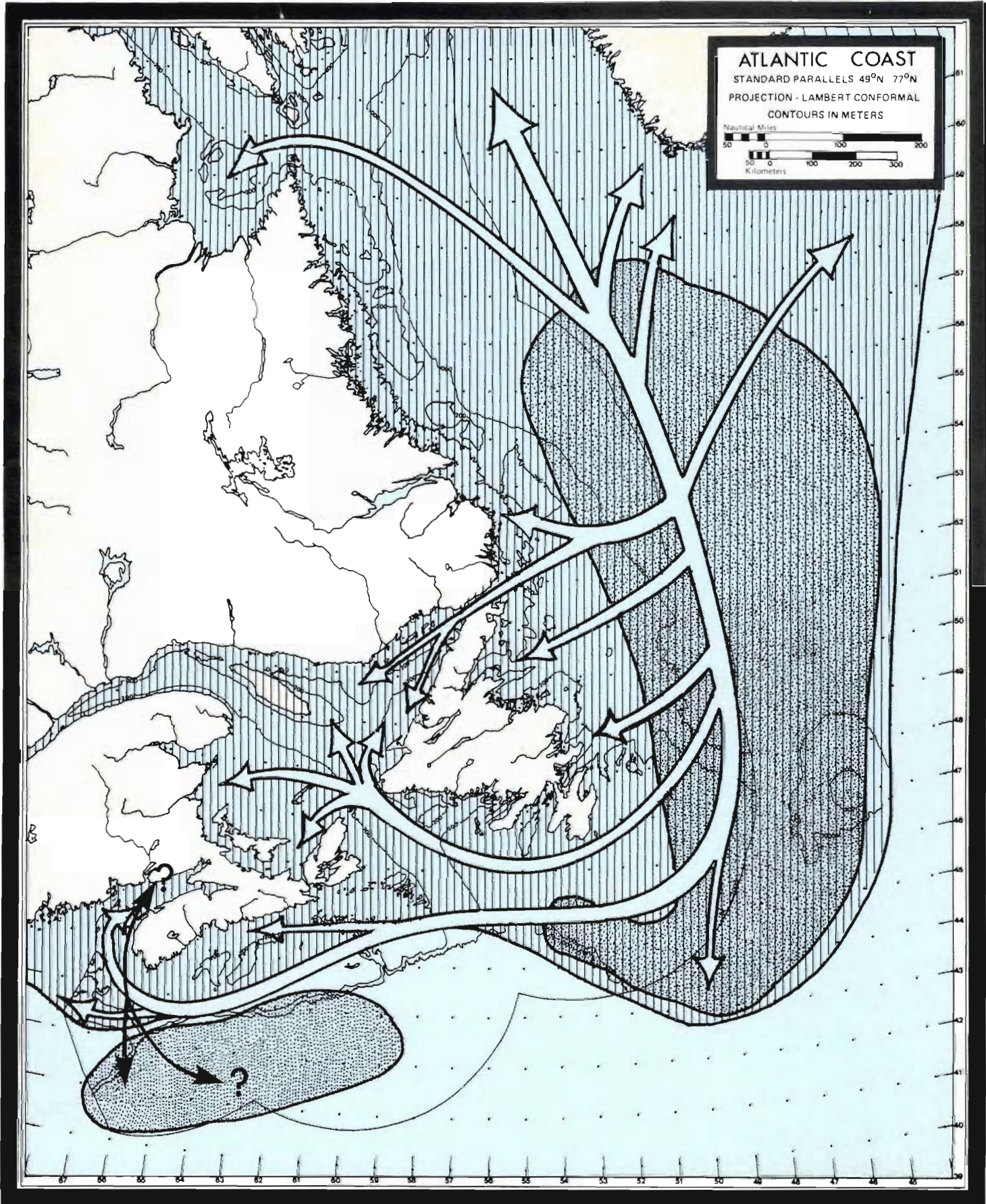
No spawning occurs off the Canadian east coast.

Swordfish feed on herring, mackerel, butterfish, silver hake, rat-tails, squid, cod, redfish, lanternfish, flatfish and other species.

MAP KEY

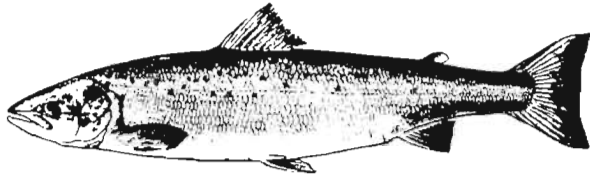


COMMERCIAL RESOURCE SPECIES ANADROMOUS



ATLANTIC SALMON

Salmo salar Linnaeus 1758



FAMILY: Salmonidae

COMMON NAMES: salmon, ouananiche, black salmon, grilse, kelt, saumon.

CODES: NAFO - 318

FAO Taxonomic - 1,23(01)004,01

3 alpha ident - SAL

DISTRIBUTION:

Salmon occur from inshore to the open Atlantic from Ungava Bay and western Greenland south to the Connecticut River and formerly to the Hudson River. Concentrations occur off Greenland and in coastal areas associated with spawning rivers.

FISHERY:

Historically, salmon were abundant in many rivers and streams along the Atlantic coast. Dams, pollution and destruction of habitat virtually eliminated the runs along the coast of the United States. Canadian runs were also affected. However, the remote location of many rivers and introduction of management controls have helped to maintain stocks at a level where they remain a valuable resource utilized by the commercial and sport fisheries. The future of the fisheries will depend on the effectiveness of continued management controls, catch levels on the high seas, and human impacts on rivers used for spawning.

It was estimated that commercial fisheries catches in 1980 for Newfoundland and Labrador would be approximately 2,000 t. Elsewhere in the Maritimes, commercial catches fell to 155 t in 1971, 20% of the 1967 level. A ban was imposed on commercial salmon fishing in New Brunswick in 1971. Opinions vary among commercial

fishermen, sports fishermen and authorities as to whether or not increased runs are the result of this closure. Nevertheless, a partial re-opening of the fishery occurred in 1981. There is no doubt that this fishery will continue to be the focus of contentious debate.

Commercial catches in Nova Scotia are projected to decline in the long term, unless additional management measures are introduced. A catch of approximately 60 t was projected for 1979. The ban on the Newfoundland driftnet fishery, introduced in 1972, should result in somewhat improved returns to Maritimes rivers by reducing at-sea interceptions in Canadian waters. Future yields from New Brunswick and Quebec rivers will, to a large extent, be dependent upon continued limitation of the west Greenland salmon fishery.

The first successful cage culture operation for Atlantic salmon in North America was established at Deer Island, New Brunswick, in 1978. Since that time, four crops have been successfully marketed. Currently, experimental cages have been established at Campobello and Grand Manan Islands in New Brunswick and operations are being planned for other areas including southeastern Nova Scotia and Newfoundland.

Salmon are taken by trawl, driftnet, gillnet and rod and reel.

UTILIZATION:

Sold for human consumption — fresh, frozen and smoked.

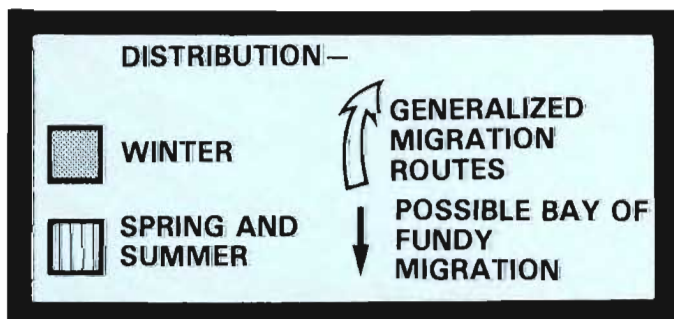
GENERAL BIOLOGY:

Spawning runs may take place in spring, summer, or fall depending on the stock and river involved. Actual spawning occurs in October and November when the eggs are deposited in depressions ("redds") in gravel beds and fertilized by the male. Hatching time varies with water temperature, but takes about 110 days at 4°C. Generally, hatching occurs in April and fry emerge from the gravel in May or June. Young salmon parr grow slowly and remain in the stream for 2 or 3 years. Parr transform into smolts in the spring at which time they move into the sea. Growth at sea is rapid with fish returning as grilse, after 1 year, weighing 1.5 - 3 kg and 2 sea-year salmon weighing 3 - 7 kg. Salmon may live more than 9 years and are capable of spawning several times.

Parr feed on the larvae of mayflies, stoneflies and other insects as well as on annelids and molluscs. At sea salmon prey on herring, sand lance, gaspereau, smelt, capelin, mackerel, haddock, euphausiids, amphipods, decapods, etc.

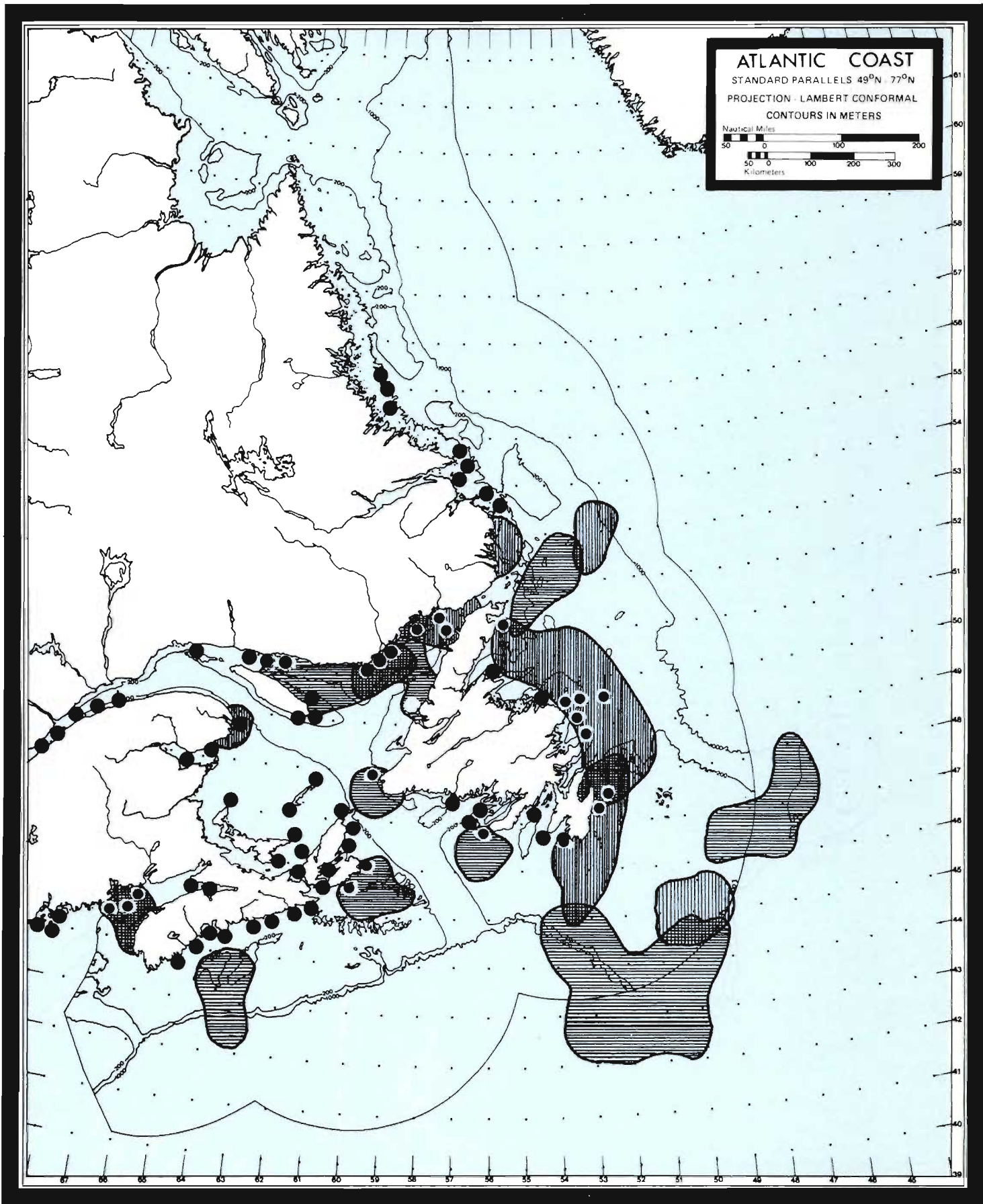
In fresh water, young are fed on by fishes and birds. At sea predators are pollock, tuna, swordfish and other species.

MAP KEY

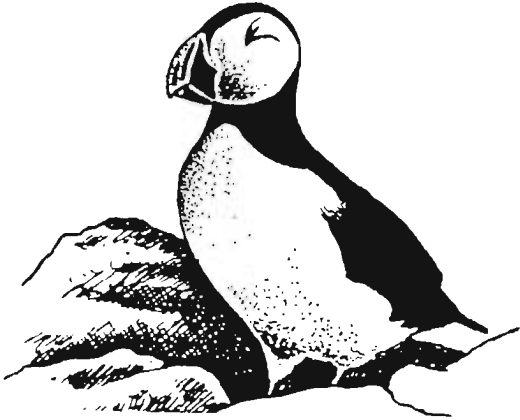




RESOURCE SPECIES BIRDS AND MAMMALS






MARINE BIRDS

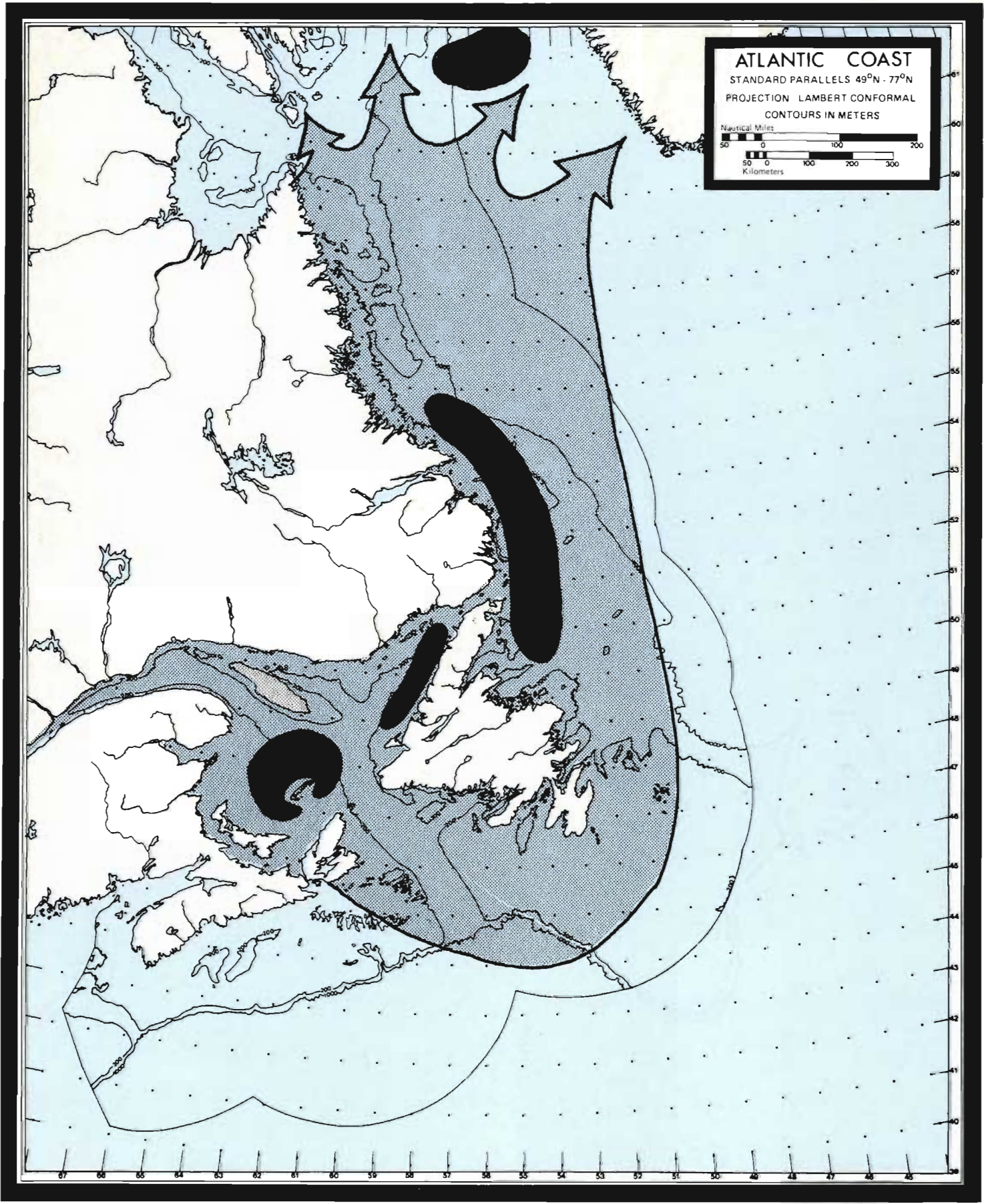


While marine birds are not considered to be a commercial marine resource, they are an important component of marine ecosystems. They utilize many of the same foods as the fishes which occupy the same range and, because of this, the presence of large concentrations of pelagic birds indicates that the areas in which they occur are highly productive and important to commercial fish species and the fishery.

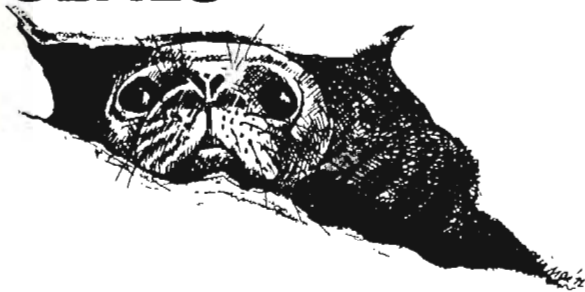
Major concentrations have been identified in the following areas: off Labrador in the Belle Isle -Triangle Harbour - Hawke Channel area, off the east coast of Newfoundland, in the vicinity of Flemish Cap, along the southern part of the Grand Bank, on St. Pierre Bank, off St. Georges Bay, in the northern Gulf of St. Lawrence from Anticosti to the Strait of Belle Isle, off Gaspé, east of Cape Breton, on the Scotian Shelf, and at the mouth of the Bay of Fundy. Important colonies occur along the entire coast.

MAP KEY

	CONCENTRATIONS — SUMMER
	CONCENTRATIONS — WINTER
	CONCENTRATIONS — COLONIES



SEALS



Six species of seals occur in the Northwest Atlantic:

- Bearded Seal (*Erignathus barbatus*)
- Grey Seal (*Halichoerus grypus*)
- Harbour Seal (*Phoca vitulina*)
- Ringed Seal (*Phoca hispida*)
- Harp Seal (*Phoca groenlandica*)
- Hooded Seal (*Cystophora cristata*)

Interactions between marine mammals and fish are complex. They include, for example, impact on the fishery as a result of gear damage, the spreading of codworm to commercial fish species, and consumption of commercially important species. Harp and hooded seals are the primary species which are exploited commercially.

HARP SEAL:

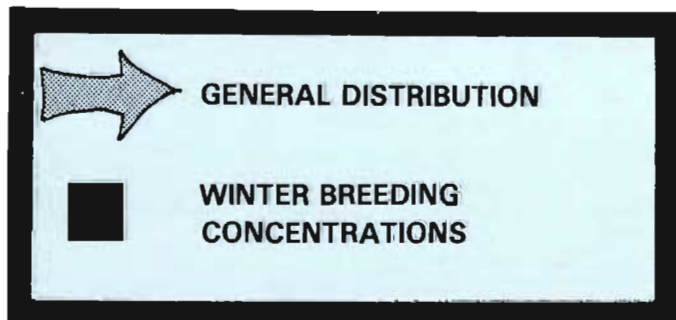
DISTRIBUTION:

The harp seal is most commonly found in eastern Arctic waters in summer. It occurs southward, in winter and early spring, to the Gulf of St. Lawrence, off northwestern Newfoundland and in the vicinity of the Magdalen Islands.

FISHERY:

A total quota of 170,000 harp seals in Canadian waters was allocated for the Gulf of St. Lawrence and "the Front", (northeast of Newfoundland) in 1978-1981, including a suballocation of 20,000 to Norway in 1978-1980 and

MAP KEY



22,500 in 1981. This is less than the estimated sustainable yield of 234,000 animals and will allow the population to grow to a level of 1.6 million animals. In 1980, the population was estimated to be 1.57 million animals, age one and over.

GENERAL BIOLOGY:

Adults and juveniles feed in the eastern Arctic and West Greenland during the summer, moving towards the Labrador coast in late fall. By December, some seals are feeding off Labrador and northeast Newfoundland while other groups move into the Gulf of St. Lawrence.

By late February, the females haul out on the Gulf ice and produce their pups. The Labrador herd begins whelping in early March. Pupping in both areas ceases by mid March. Adult males are also present and mating takes place after the pups are weaned. Following the whelping season, they remain on the ice and begin molting.

In early spring, they feed upon capelin and zooplankton in the Labrador-Newfoundland area and begin their migration back to the eastern Arctic and West Greenland.

HOODED SEAL:

Hooded seals occur from Cape Sabine south to Nova Scotia, Newfoundland and the Gulf of St. Lawrence. Winter concentrations are found off the Greenland coast, along the coast of Labrador and in the Gulf of St. Lawrence off northwestern Newfoundland and in the vicinity of the Magdalen Islands.

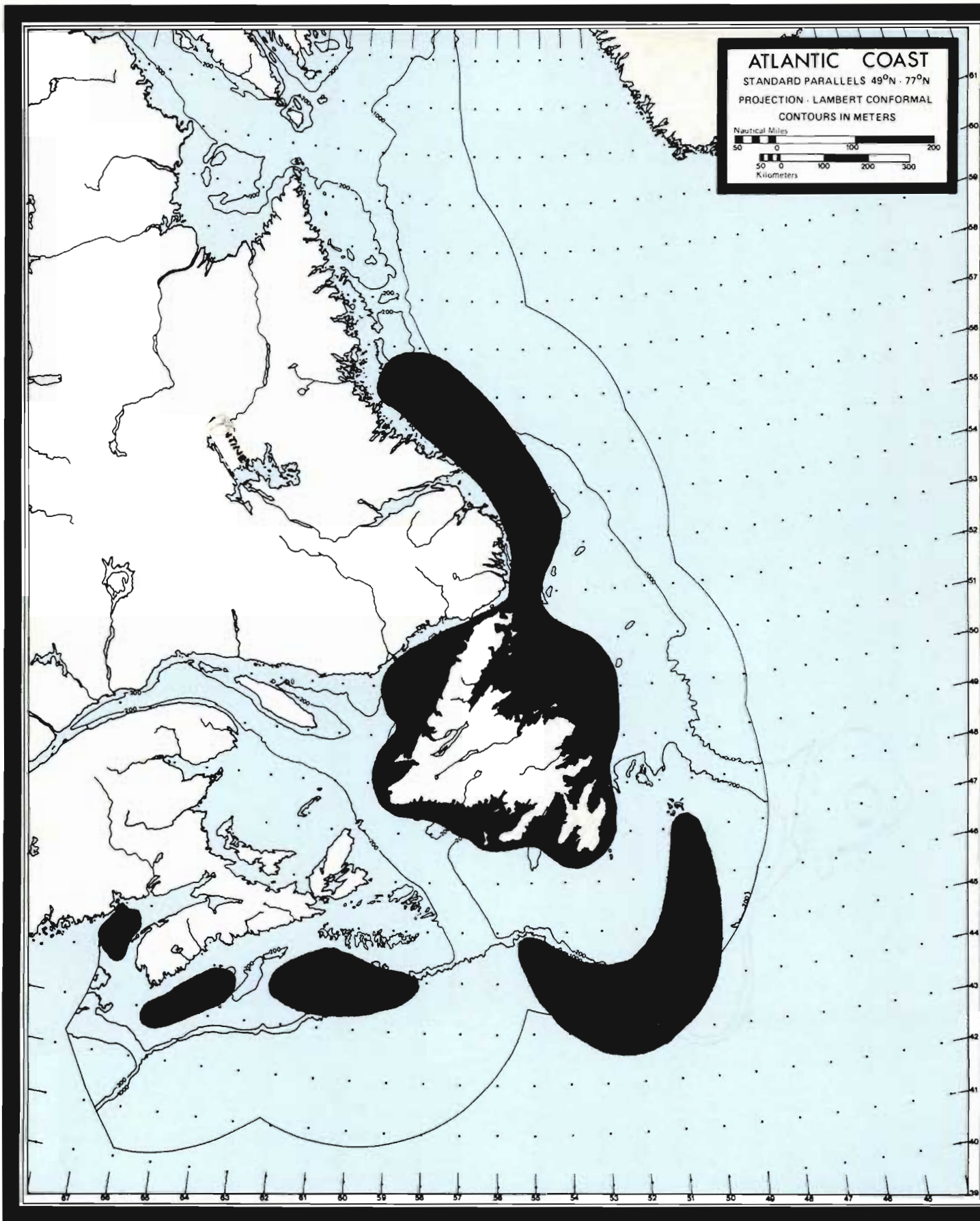
FISHERY:

The fishery for hooded seals takes place at the Front only.

The TAC was 15,000 from 1977 - 1980. The kill of adult females is maintained below 5 % of the daily catch. Hooded seals are now more scattered in distribution than harp seals and require powerful and maneuverable vessels to hunt them effectively. Canada and Norway are each allocated a quota of 6,000 with an additional 3,000 being open to either country. The population is currently being exploited near the sustainable level.

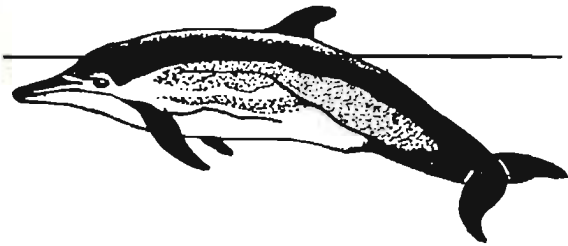
GENERAL BIOLOGY:

The general biology of hooded seals is essentially the same as for harp seals as previously described. However, whelping takes place about 1 week later.



CETACEANS

(Whales, dolphins and porpoises)



Numerous species of cetaceans occur off Canada's Atlantic coast, including:

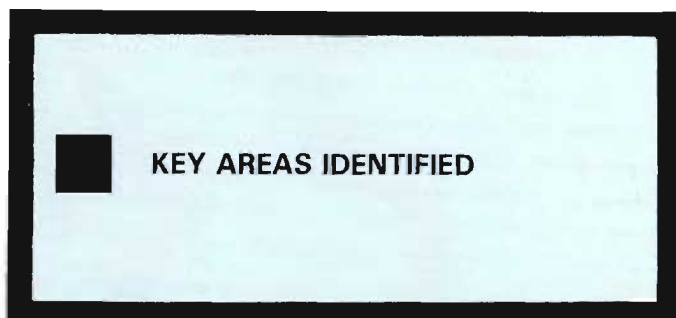
- Sowerby's Beaked Whale (*Mesoplodon bidens*)
- Blainville's Beaked Whale (*Mesoplodon densirostris*)
- True's Beaked Whale (*Mesoplodon mirus*)
- Northern Bottlenosed Whale (*Hyperoodon ampullatus*)
- Sperm Whale (*Physeter macrocephalus*)
- Pigmy Sperm Whale (*Kogia breviceps*)
- Beluga (*Delphinapterus leucas*)
- Narwhal (*Monodon monoceros*)
- Common Dolphin (*Delphinus delphis*)
- Bottlenosed Dolphin (*Tursiops truncatus*)
- White-Beaked Dolphin (*Lagenorhynchus albirostris*)
- Atlantic White-Sided Dolphin (*Lagenorhynchus acutus*)

and Dildo and Williamsport, Newfoundland, were closed by ministerial order in 1972. The primary species harvested was the fin whale with some sei, minke, and sperm whales taken as well as pilot whales off Newfoundland. Commercial whaling is prohibited in waters under Canadian fisheries jurisdiction. However, narwhal and beluga are hunted, primarily by Inuit for subsistence purposes.

- Killer Whale (*Orcinus orca*)
- Atlantic Pilot Whale (*Globicephala melaena*)
- Harbour Porpoise (*Phocoena phocoena*)
- Fin Whale (*Balaenoptera physalus*)
- Sei Whale (*Balaenoptera borealis*)
- Minke Whale (*Balaenoptera acutorostrata*)
- Blue Whale (*Balaenoptera musculus*)
- Humpback Whale (*Megaptera novaeangliae*)
- Right Whale (*Balaena glacialis*)
- Bowhead Whale (*Balaena mysticetus*)

In the past some of these cetaceans have been subjected to whaling operations. Canadian whaling ended when the plants at Blandford, Nova Scotia,

MAP KEY



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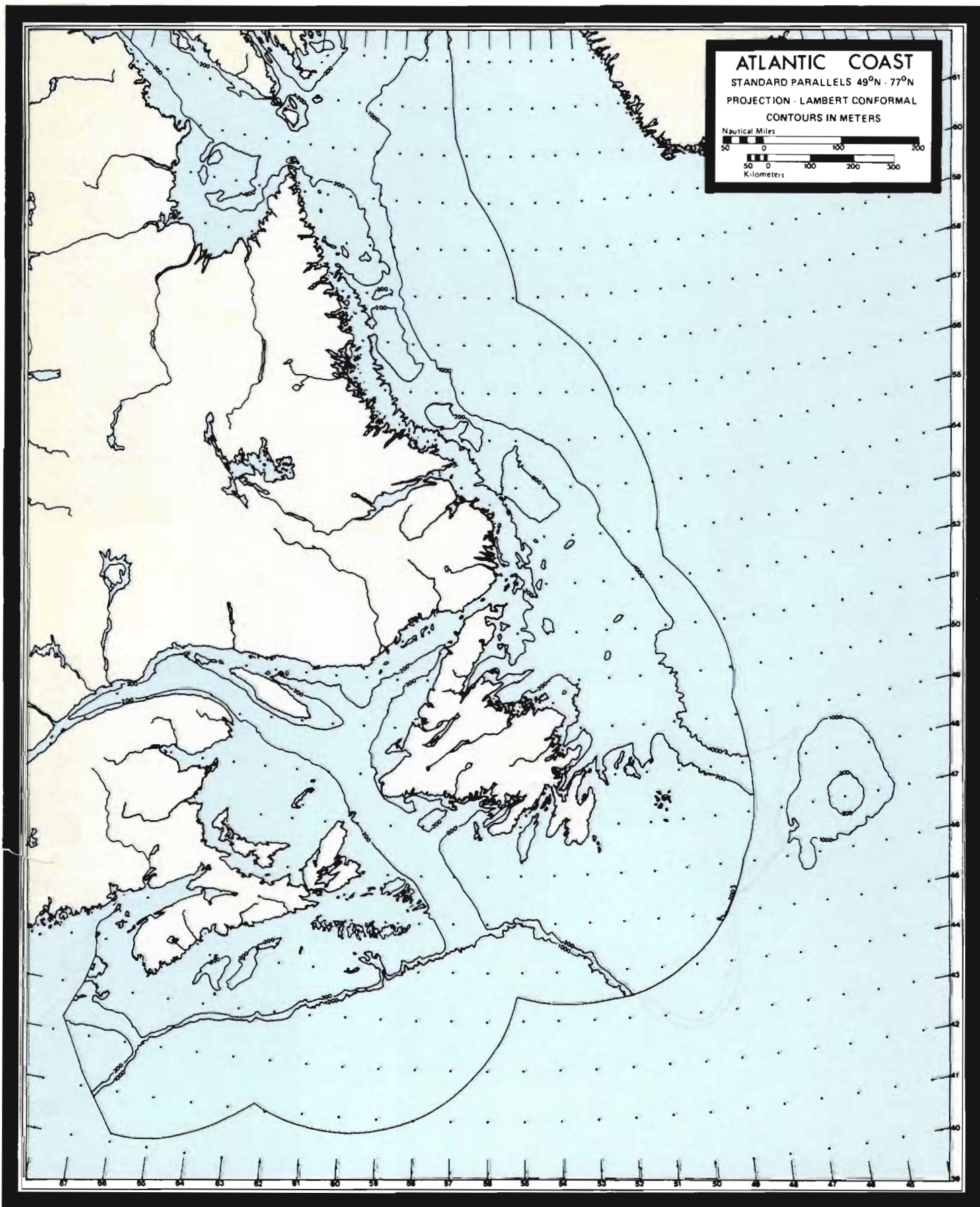
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SEND TEXT AND SKETCH TO:
DR. D. J. SCARRATT
Department of Fisheries and Oceans
Biological Station
St. Andrews, N. B. EOG 2X0

