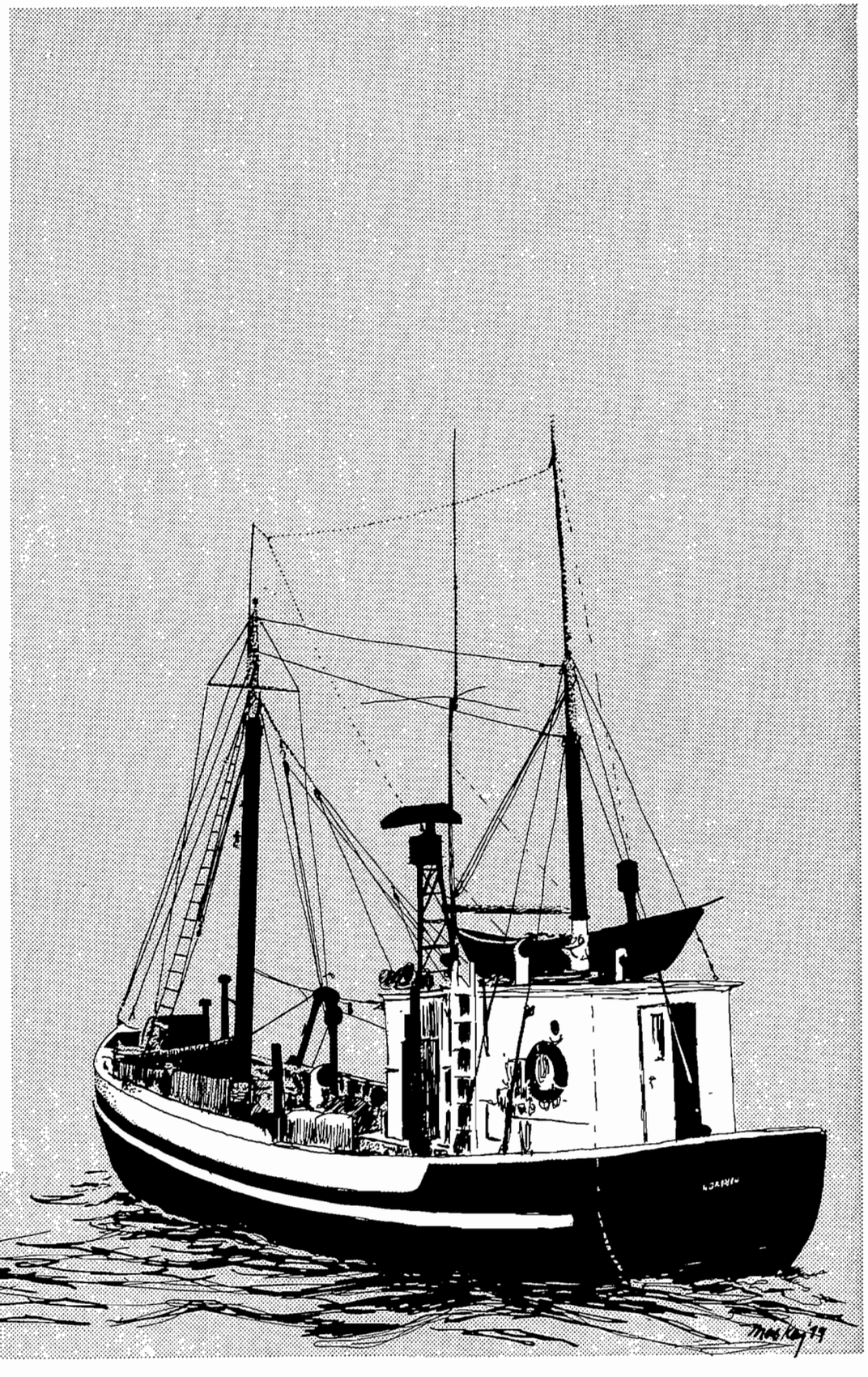
CANADIAN SPECIAL PUBLICATION OF FISHERIES AND AQUATIC SCIENCES 47

CANADIAN ATLANTIC OFFSHORE FISHERY ATLAS



Government of Canada
Fisheries and Oceans

Gouvernement du Canada
Pêches et Océans

CANADIAN SPECIAL PUBLICATION OF FISHERIES AND AQUATIC SCIENCES 47

CANADIAN ATLANTIC OFFSHORE FISHERY ATLAS

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MARINE RESEARCH ASSOCIATES LTD.
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DEPARTMENT OF FISHERIES AND OCEANS

DECEMBER, 1980

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* This atlas was prepared under a contract funded by the Fish Habitat Management Branch, Ottawa, and the Maritimes and Newfoundland Regions of the Department of Fisheries and Oceans. Dr. D.J. Scarratt, Biological Station, St. Andrews, N.B., acted as the Scientific Authority for the contract. Data for the maps were supplied by the staff from the Maritimes, Quebec, and Newfoundland Regions of the Department of Fisheries and Oceans, the Bedford Institute of Oceanography and a number of published and unpublished sources. All contributions are gratefully acknowledged.

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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

ACKNOWLEDGEMENTS

Numerous individuals contributed to this Atlas by providing original data and proofing 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 winds and waves.

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

Marine Research Associates Ltd. 1980. CANADIAN ATLANTIC OFFSHORE FISHERY ATLAS. Can. Spec. Publ. Fish. Aquat. Sci. 47: p. 88

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 North West Atlantic.

RÉSUMÉ

Marine Research Associates Ltd. 1980. CANADIAN ATLANTIC OFFSHORE FISHERIES ATLAS. Can. Spec. Publ. Fish. Aquat. Sci. 47: p. 88

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.

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INTRODUCTION

Since the 1977 Canadian declaration of Extended Jurisdiction to 200 miles offshore, the Department of Fisheries and Oceans (previously Fisheries and Environment Canada) 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, a canvass was made of knowledgeable experts in the Maritimes, Quebec and Newfoundland Regions in order to obtain a rapid overview of the extent of current knowledge. This initial evaluation called for information of 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 recognisable concern whether they were exploited for fisheries purposes or not. It was also considered 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 therefore 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.

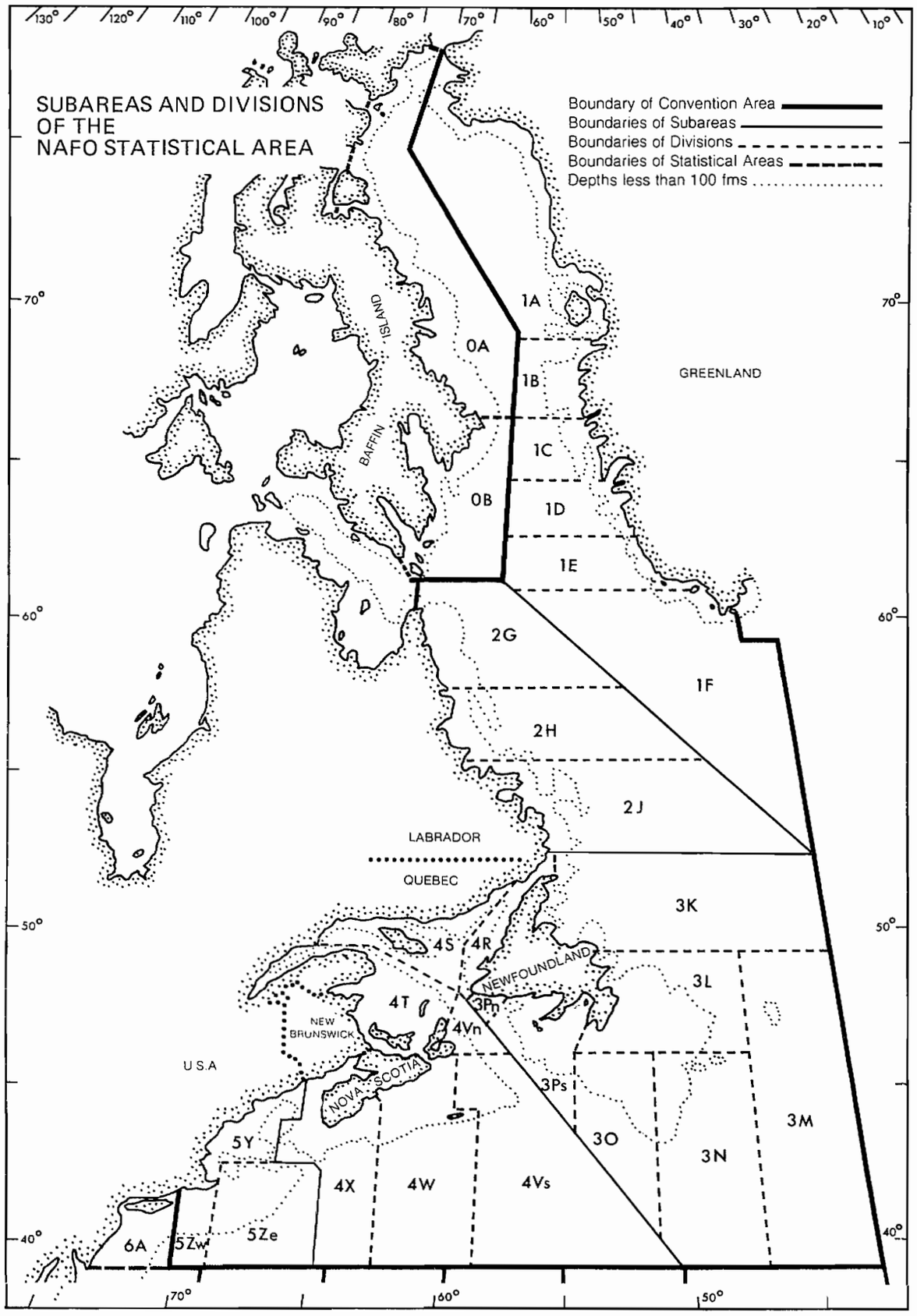
We have included maps of seabird distribution because we feel this contributes to a general understanding of marine food webs and processes, and may help in locating areas of high marine productivity, which may otherwise not be identified. Maps of winds, waves and currents are included in order that 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, 1980-85". 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.

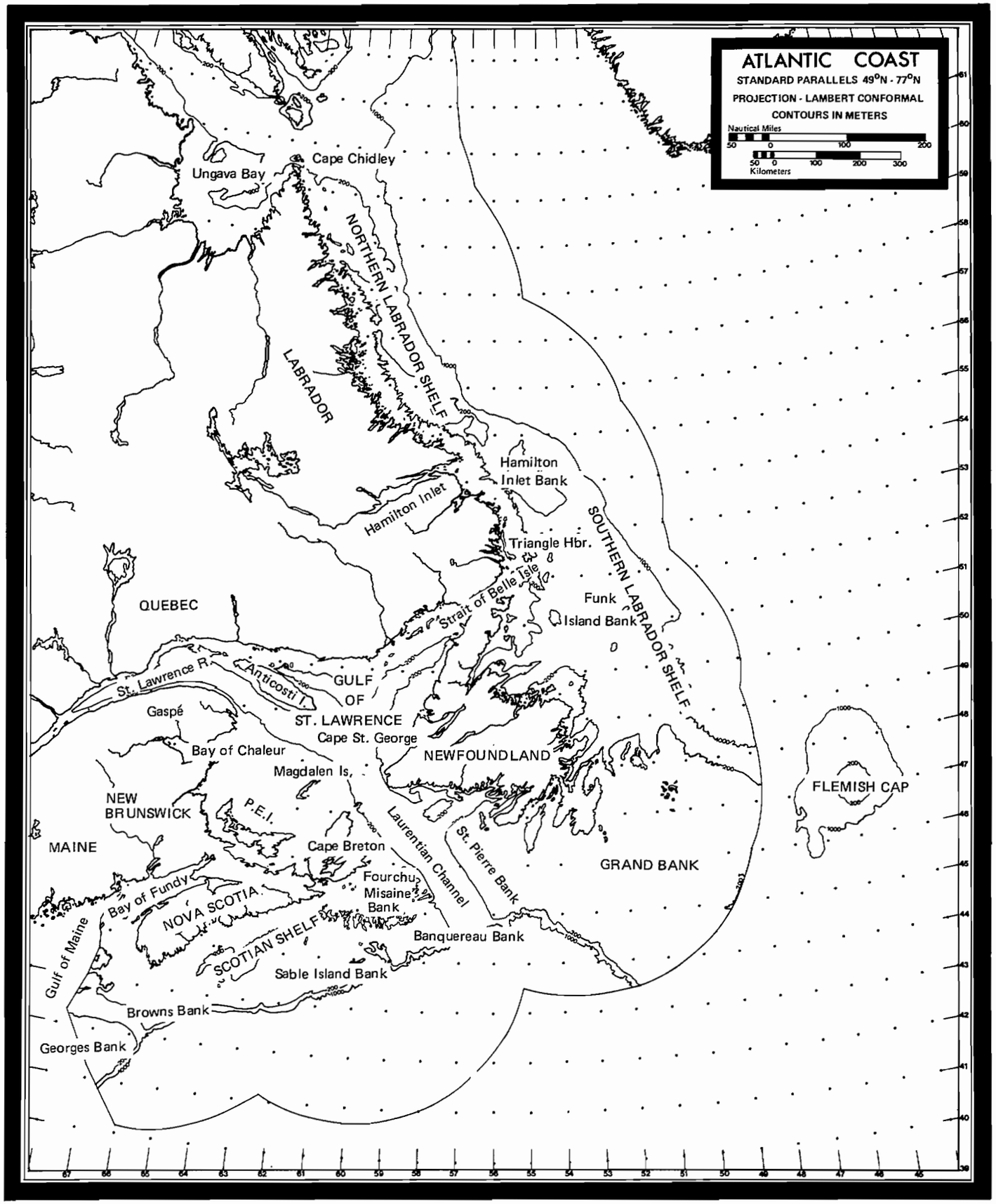
It is also recognized that apart from commercial benthic species, the benthos as such is not considered. These, together with a more thorough evaluation of plankton and primary productivity, might be the subjects for future updating and elaborating of this report. To that end, it should be considered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

Persons with specialist 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. An early draft of this atlas which had limited circulation, resulted in numerous comments and corrections which are incorporated into this 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 any future editions.

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



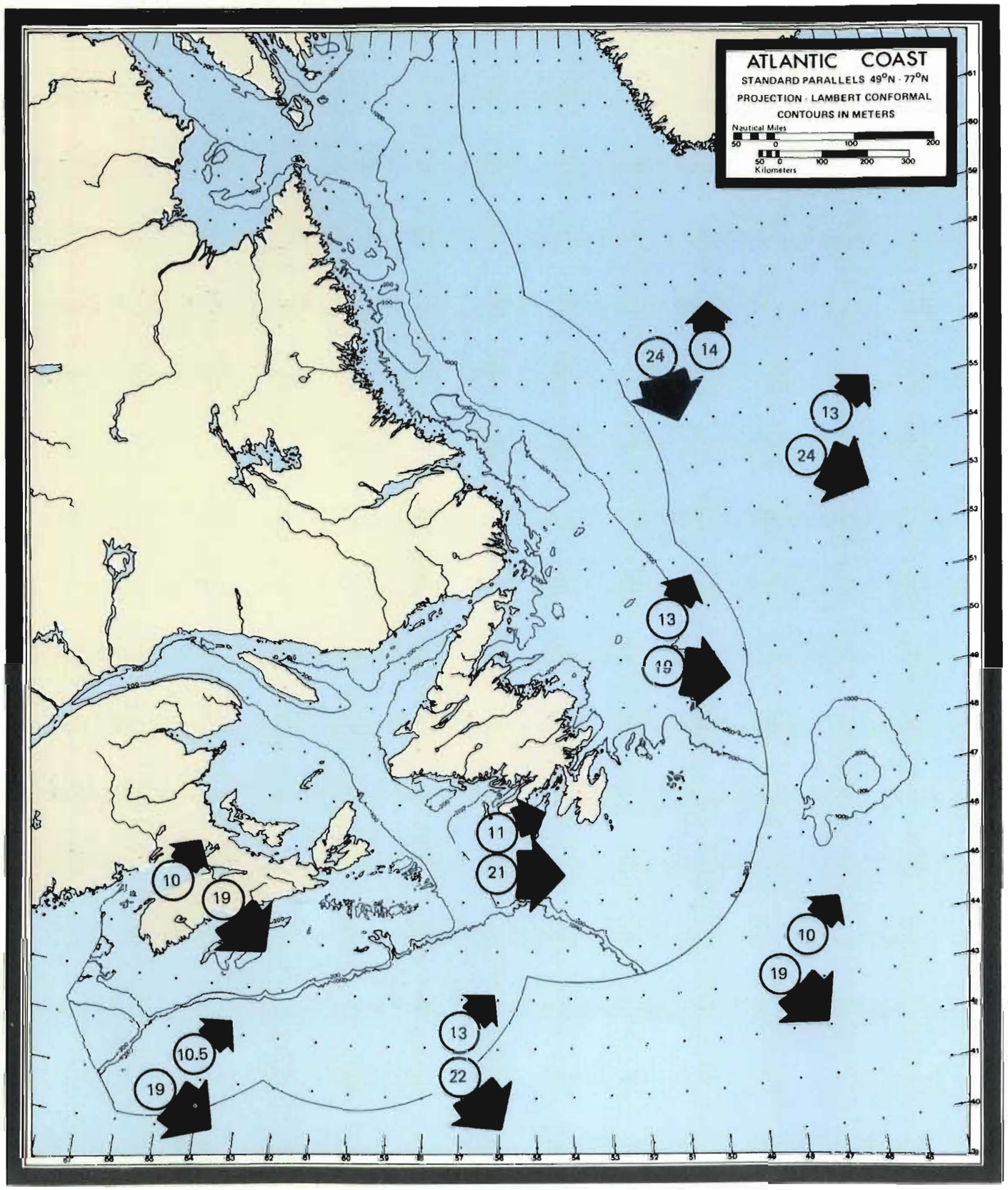
NAFO (ICNAF) SUBDIVISIONS AND
DIVISIONS MENTIONED IN THE TEXT



PRINCIPAL PLACE NAMES USED IN THE TEXT

OCEANOGRAPHY

Most fisheries of the Arctic 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 regular and predictable 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 mans' capability of pursuing 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.



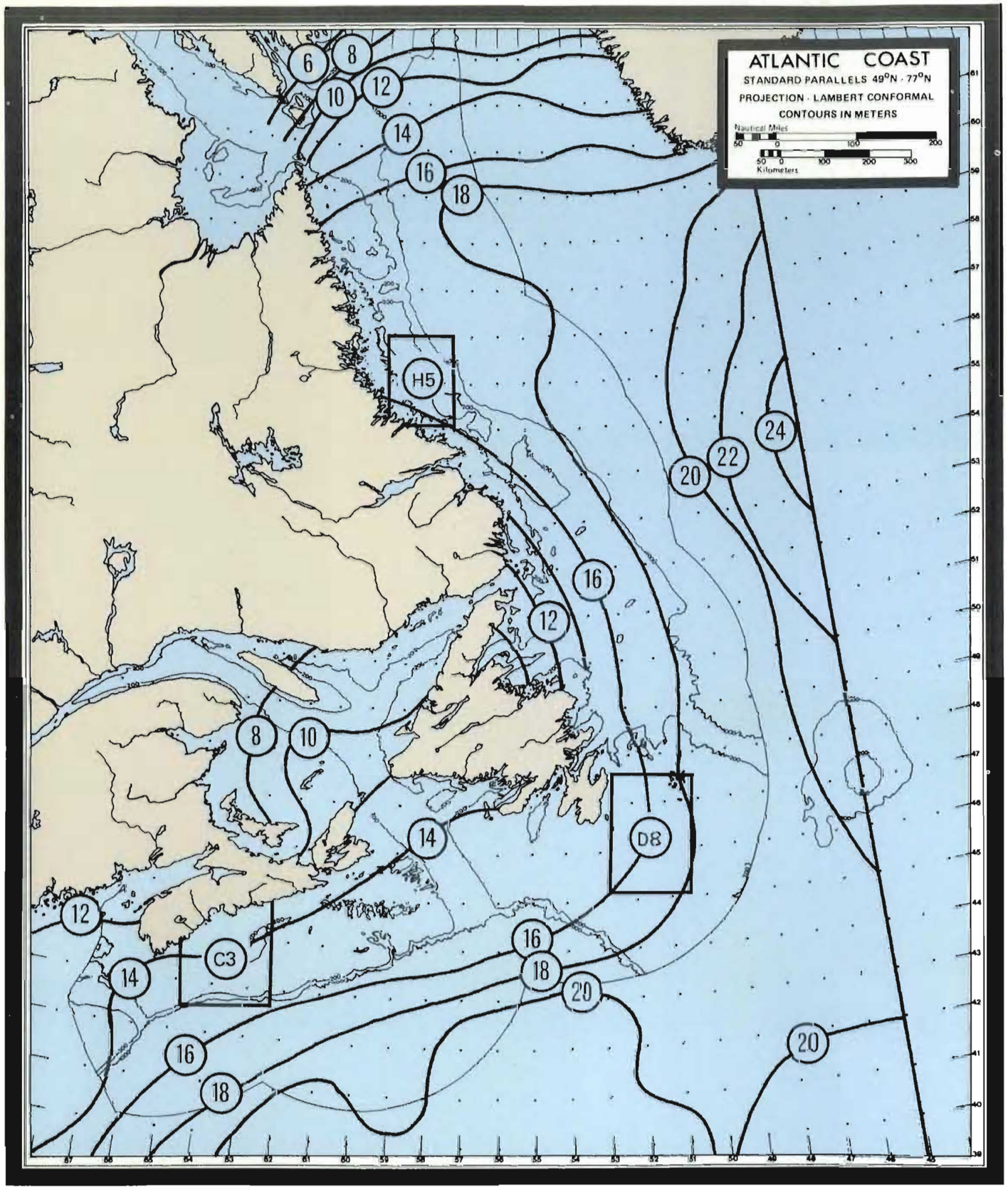
Extreme ocean winds have a major impact on the fishery of the east coast by limiting fishing capability, causing destruction of shore facilities and influencing fish stocks. Summer winds generally originate from a southerly direction with mean speeds (July) ranging from 10 to 14 knots. Prevailing winter winds are generally northwesterly and stronger with mean speeds ranging from 18 to 24 knots.

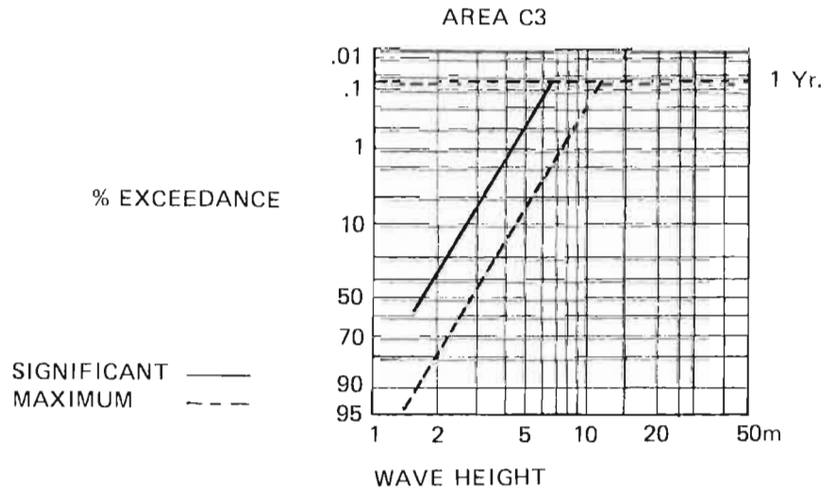
PREVAILING WINDS

WINTER (JANUARY)

SUMMER (JULY)

MONTHLY MEAN WIND SPEED (knots)





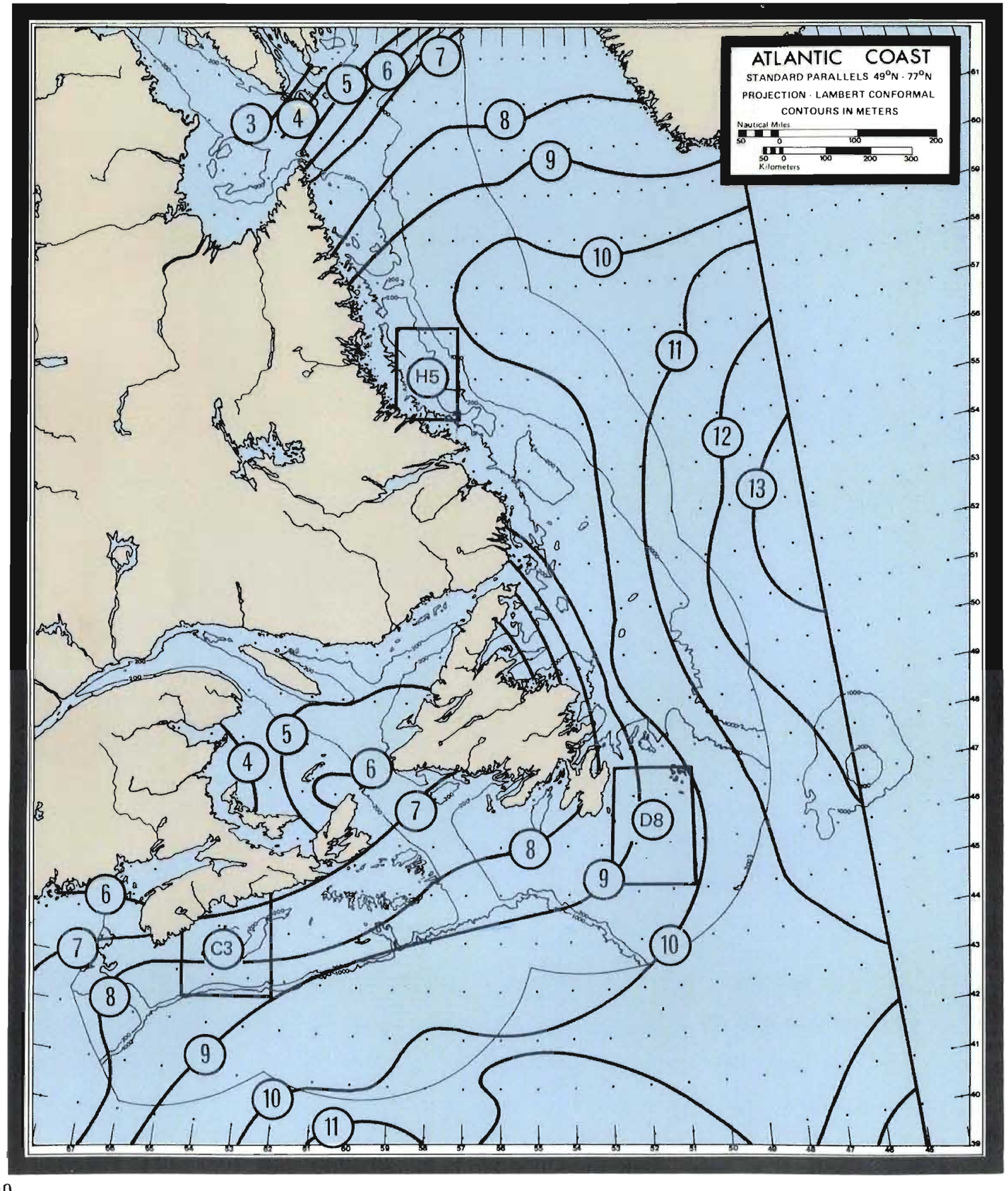
Ocean waves are normally generated by the wind blowing over the surface of the sea. The longer the time and the greater the distance that a uniform wind blows, the larger the waves that form. Once generated, waves can travel long distances as swell, which, combined with locally wind-generated waves and current, often creates 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 metres, that is likely to be observed in any given year. The second map shows the largest significant wave height, in metres, which is likely to be observed in any given year. Significant wave height is a measure of the severity of the sea state and 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 metres, individual wave heights will vary from 1 to 13 metres, the average wave height will be 4.4 metres, the average of the highest 10% of the waves will be 9 metres, and 16% of all waves or every sixth wave, will be greater than 7 metres. The highest waves are about 1.8 x the significant wave height.

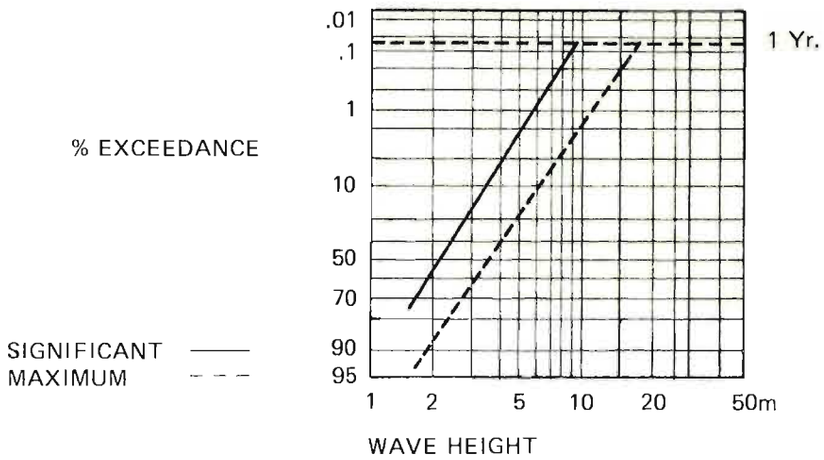
Exceedance graphs can be used to calculate the percentage of time when significant or maximum wave heights can be expected to exceed a given height, at three localities (C3, D8, and H5) in the North Atlantic.

WAVES

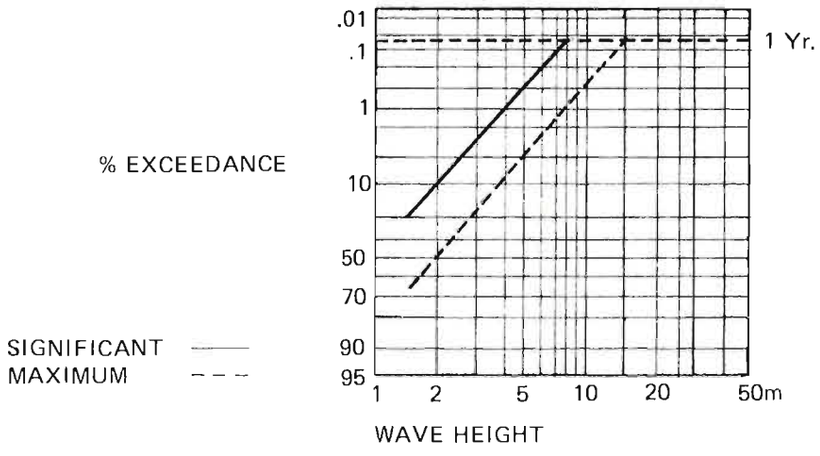
MAXIMUM ONE YEAR WAVE HEIGHT (M)
JUNE, 1977-MAY, 1978



AREA D8



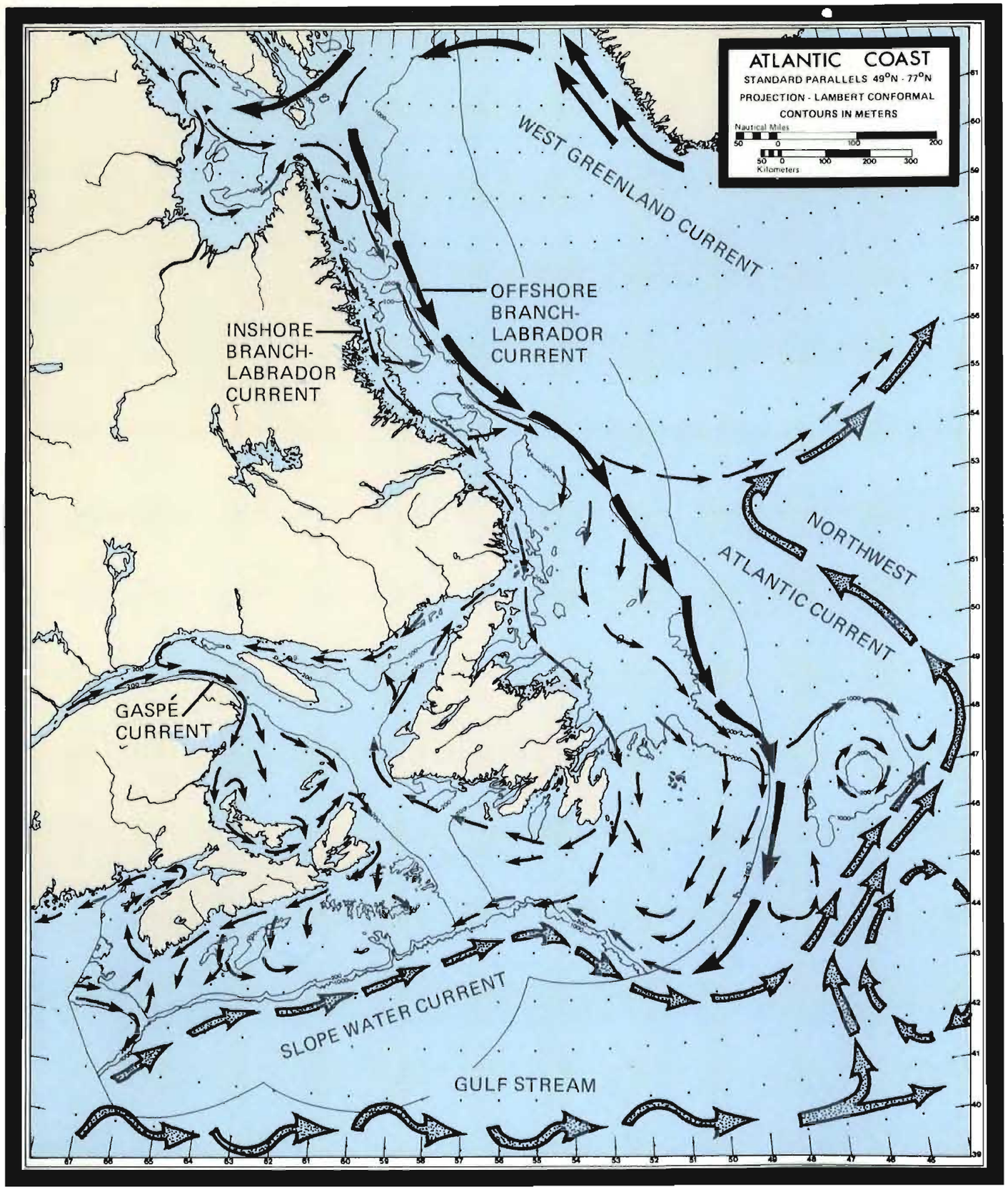
AREA H5



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/Northwest Atlantic current complex.

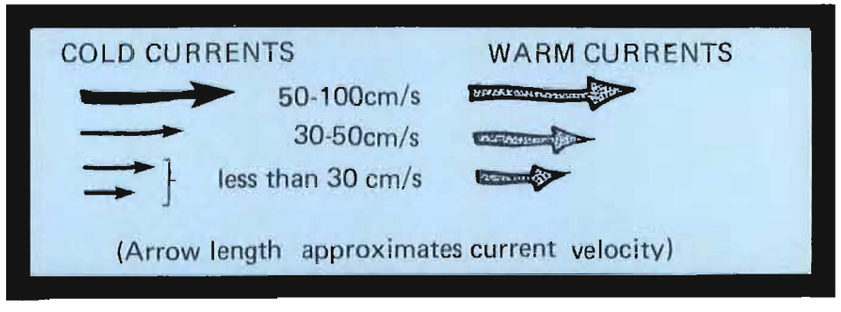
Coastal waters are cold and of low salinity and, generally, move southward and westward, mixing with river water from Hudson Bay, the Labrador coast and the St. Lawrence River. Offshore, the waters are warm and saline, moving eastward and northward. Mixing between these two bodies of water occurs along 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 and exits along the south side of the Strait where it 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 Banks and around and over the Newfoundland Grand Banks. The main current flows along the western side of Flemish Pass and southward to the Tail of the Grand Bank. Much of the water turns offshore in meanders and eddies, eventually mixing with the Northwest 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 with waters from the Grand Bank. A Labrador current core can be observed 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.

GENERAL SURFACE CIRCULATION

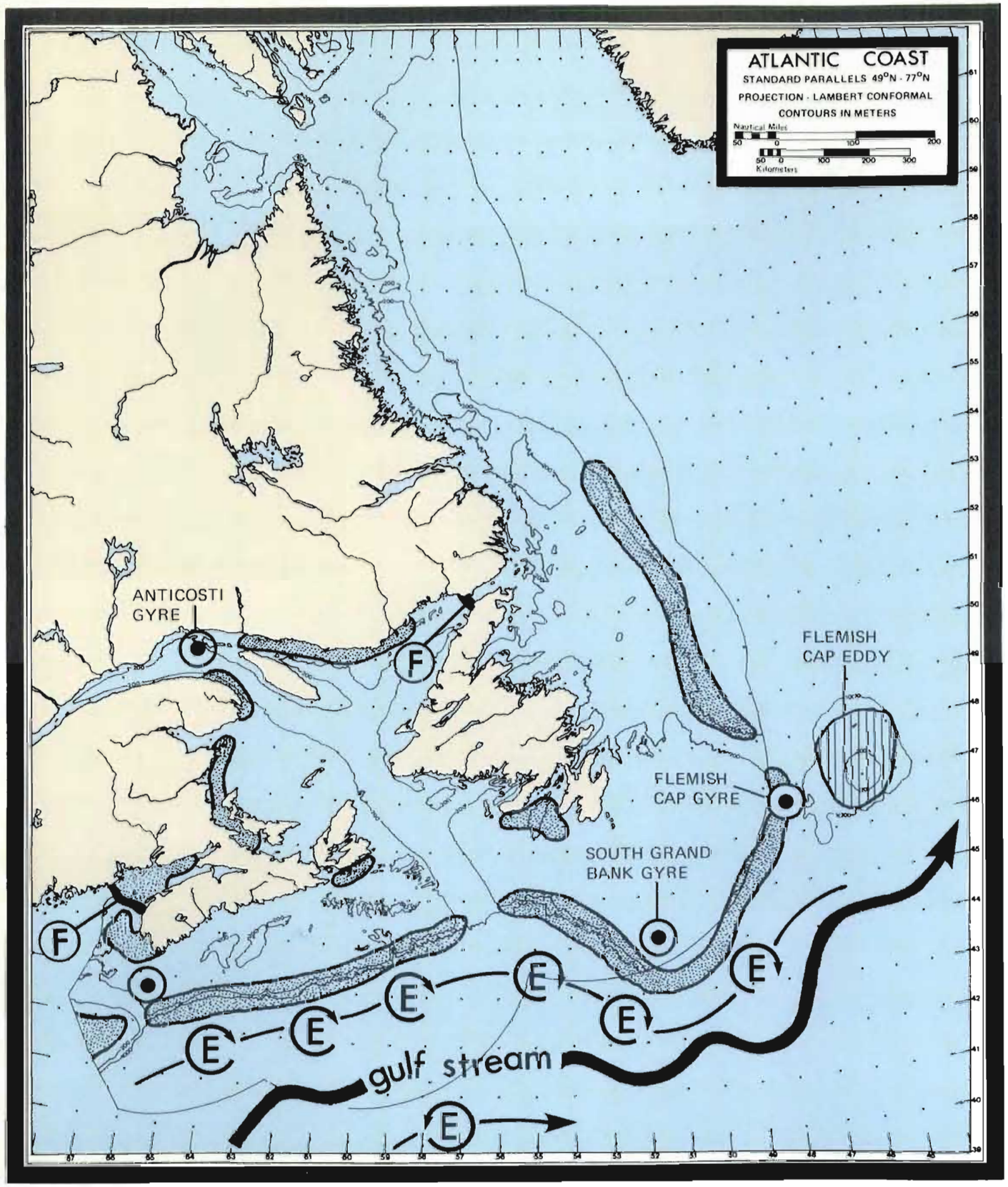


Waters exiting from the Gulf flow westward along the coast of Nova Scotia within 20 km of shore (Nova Scotia Current) and eventually enter the Bay of Fundy and Gulf of Maine. Offshore, the flows are generally weaker and more variable in direction, with a considerable offshore component, especially between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

Offshore, 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 Northwest 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 does not flow due east, but proceeds 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.

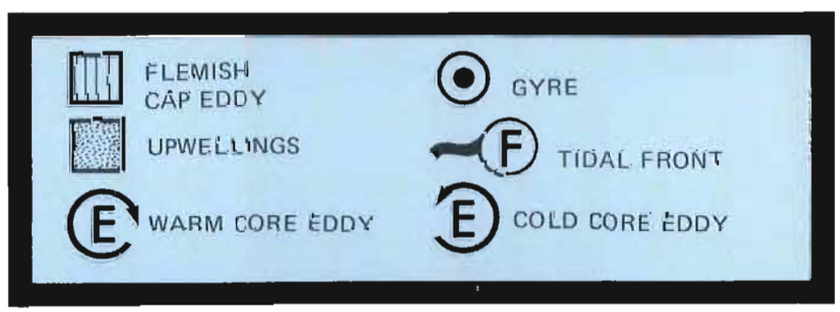
IMPORTANT ENVIRONMENTAL FEATURES

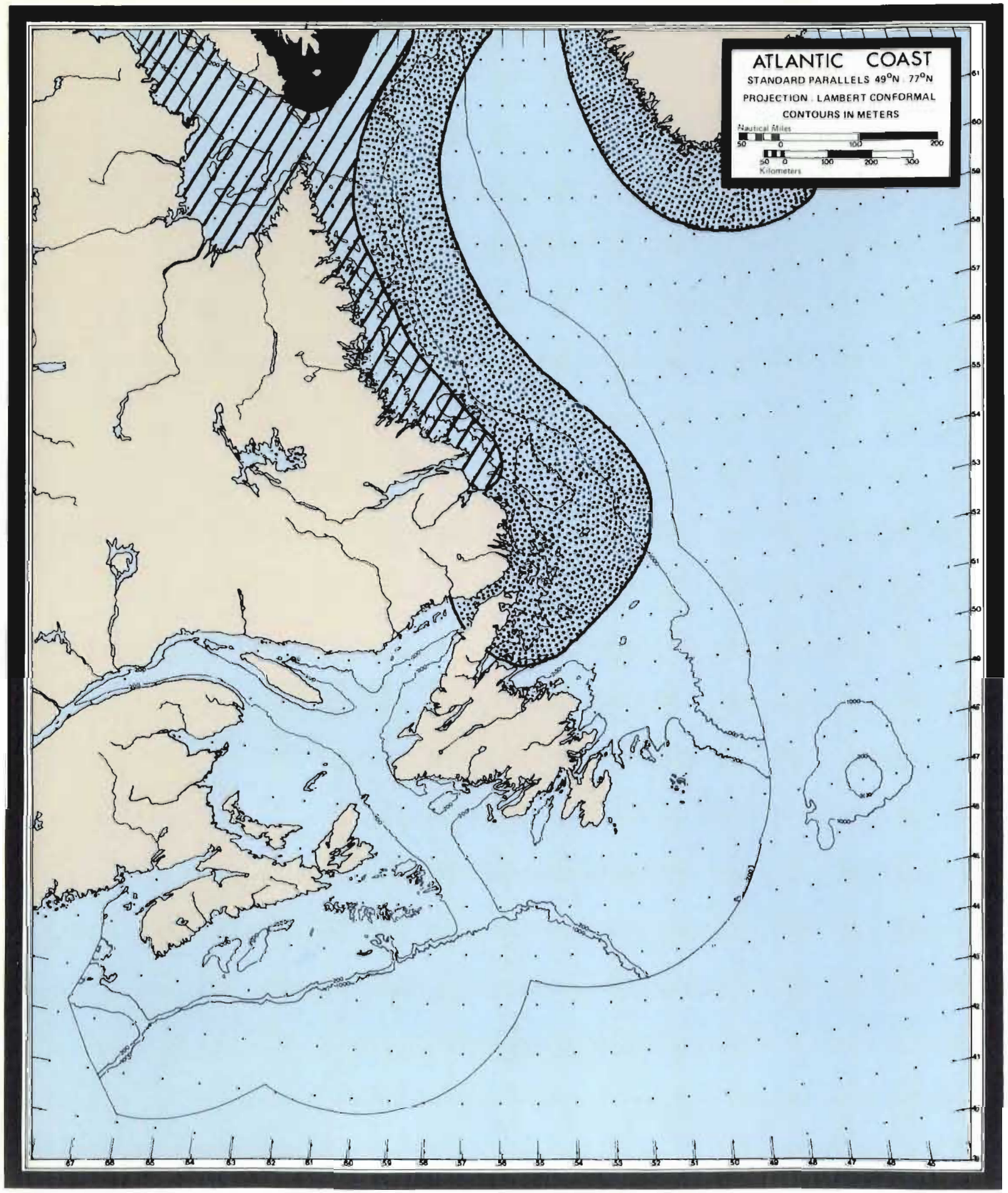


Apart from the foregoing environmental features of the northwest Atlantic, a number of additional oceanographic characteristics are considered to have profound effects on our living marine resources and, consequently, our fishery. Generally, these areas support concentrations of marine organisms, are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

While the mechanisms and exact localities of occurrence are not yet completely understood, sufficient data have been collected to present a preliminary map of these oceanographic phenomena. Principal features include: 1) UPWELLINGS AND TIDAL MIXING - areas where bottom topography, tides, winds and/or currents combine to produce vertical mixing throughout the water column. Such mixing appears to bring nutrients from deep water layers to the surface, thus promoting productivity in such areas. 2) TIDALLY GENERATED FRONTS - areas where mixing is created by the meeting of two bodies of water one of which is tidally generated, 3) WARM CORE EDDIES - warm core eddies form in the slope water region off the continental shelf by detachment of meanders from the landward side of the Gulf Stream. Cold core eddies form in the same manner on the seaward side of the Gulf Stream and contain a cold core of slope water. Warm core eddies have a warming influence on water temperature of the continental shelf, may influence current patterns and produce upwellings along the shelf which may result in nutrient enrichment, 4) GYRE - areas where circular current patterns, usually within the same water mass, are encountered

IMPORTANT ENVIRONMENTAL FEATURES





ICE, TEMPERATURE & SALINITY

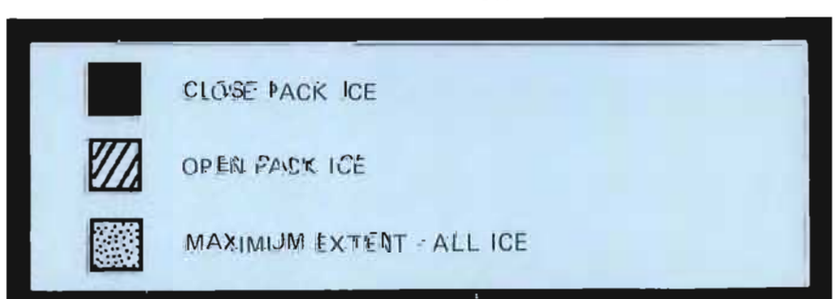
ICE:

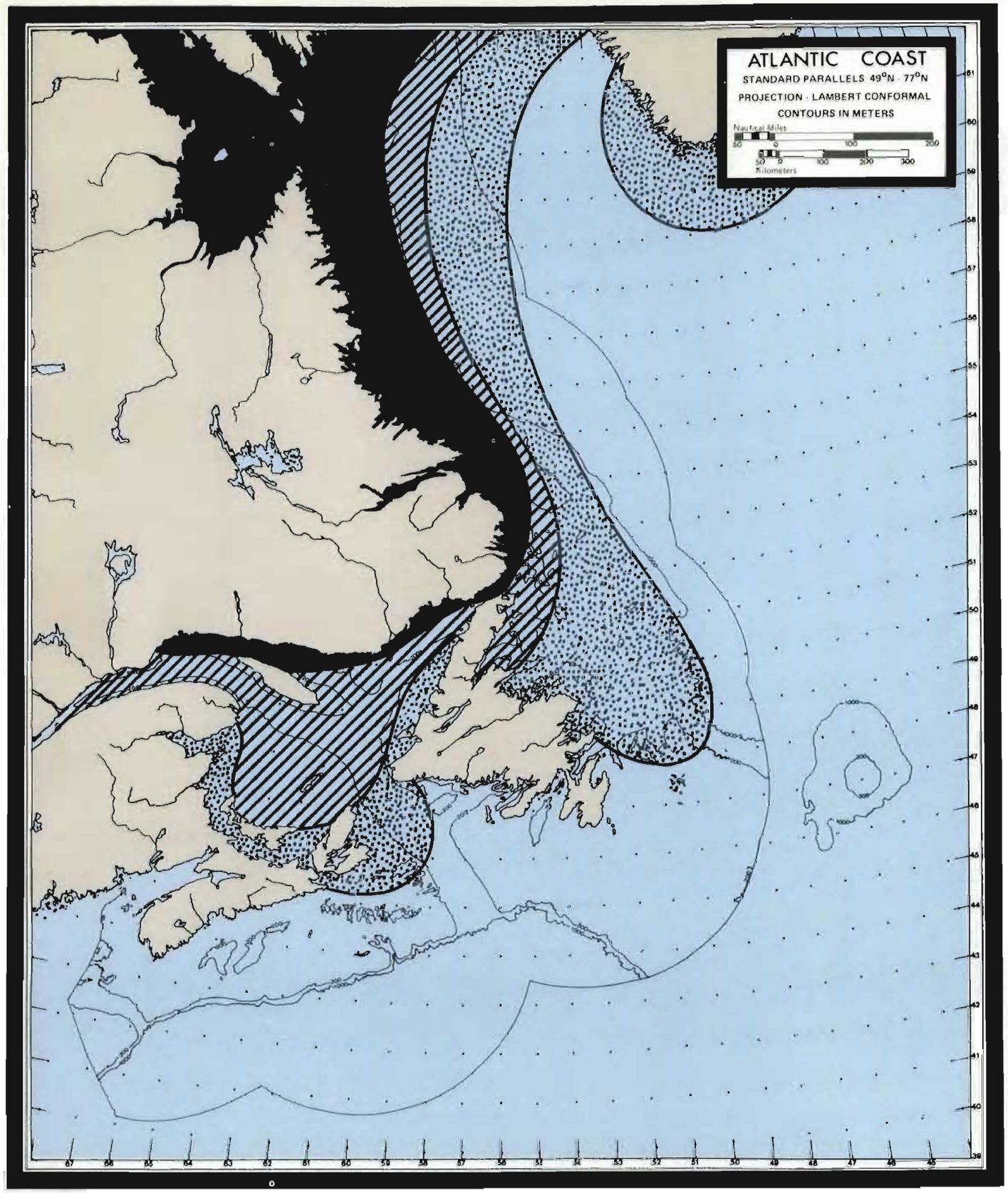
Labrador and Newfoundland

The two chief sources of Arctic ice for the western Atlantic are Davis Strait and Foxe Channel via Hudson Strait. The winter ice stream from Baffin Bay reaches Hudson Strait in late October or early November and is there joined, at Cape Chidley, about the first of November, by the heavy floes from Foxe Channel. The combined streams move down the Labrador Coast arriving off Belle Isle late in December. The first ice to arrive is, of course, open strings of young ice but this is soon replaced by heavy floes of true Arctic character which often extend 100 miles east of the entrance of the Strait of Belle Isle. The pack ice is of various ages but first-year ice predominates. Much of this ice enters the Strait along the northern side and soon fills the entire Strait. This action ordinarily closes the Belle Isle route to navigation until the latter part of June.

By January or early February this ice has reached the northern edge of the Grand Banks and by March the Pack has spread generally over the northern part of the Banks, often as far south as lat. 46°N. Again the first ice to appear is deceptively soft and open but is rapidly followed by heavier, more compact fields extending as far as the eye can see. In these latitudes, at this time of year, this ice has little of the appearance of the original winter pack. However, it is 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 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. If it survives to this latitude (43°N) it is generally very quickly melted in the warmer water south and east of the Tail. This ice, in the last stage of disintegration, is seldom a menace to navigation. In occasional instances of extremely heavy ice seasons, dangerous floes extend to the Tail of the Banks but rarely south or west of this point. There are always a few bergs in the ice fields 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. In some years the ice spreads westward from Cape Race completely blocking the harbours on the south coast of Newfoundland as far west as the Miquelon Islands.

AVERAGE EARLY SUMMER ICE CONDITIONS





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.

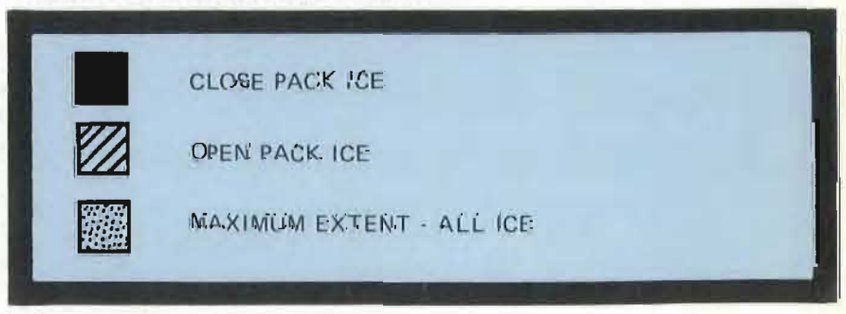
Ice formation usually starts in the river below Quebec about mid-December, and in Chaleur Bay and Northumberland Strait in the second half of the month. Maximum extent is reached about mid or late February, but growth is not always continuous up to this time. Warm temperatures can occur at any time during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

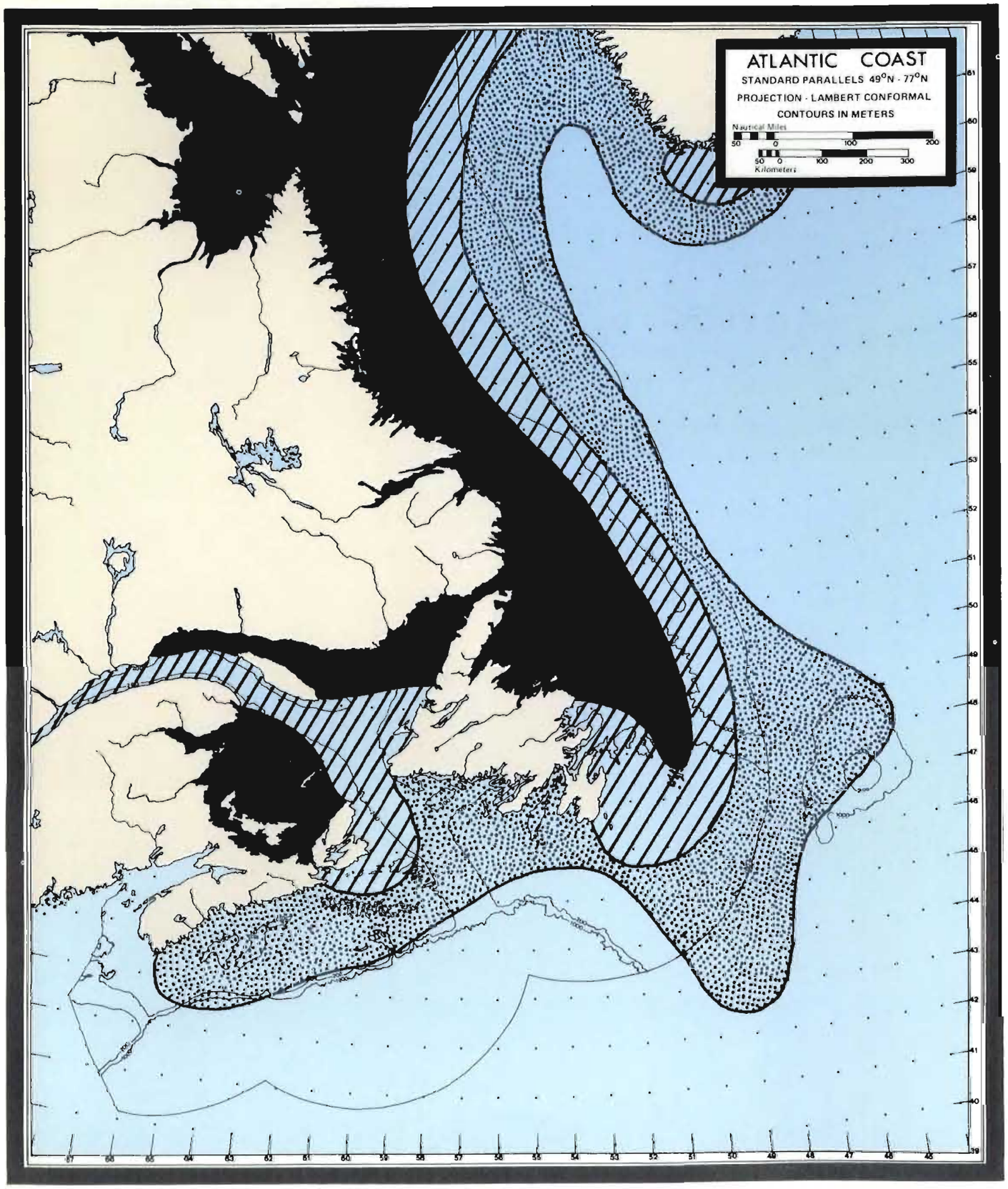
The ice stream departs the Gulf of St. Lawrence more or less constantly past St. Paul Island and Cape North spreading south and southwest toward Sable Island, frequently completely covering the banks north of that island, for short periods when the wind favors such drifts. This ice, as it leaves the Gulf, consists of heavy, tightly packed, rafted ice and forms a difficult barrier to all 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 Scatari Island along the Nova Scotia coast, though rarely drifting as far as Cape Sable. This last ice is always open and navigable when it reaches Halifax and it is doubtful whether field ice reported in the vicinity of Cape Sable or in the Gulf of Maine is Arctic ice.

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:

In describing temperature - salinity relationships, eastern Canadian waters have been divided into four zones:

(a) High Arctic: most of the polar region belongs to this zone, but the only High Arctic sector in our area is the Baffin Land Current water off northern and western Baffin Bay and in the adjacent channels. The surface layers of this zone are close to freezing even in August, the warmest month, and salinity is usually below 32°/oo.

(b) Low Arctic: areas influenced by the West Greenland and Labrador Currents. August surface temperatures are about 4°-10°C, and salinities about 31-34°/oo, with values as low as 29°/oo seasonally.

(c) Boreal: the North Atlantic Current and areas strongly influenced by it, such as the Irminger Sea, Scotian Shelf and Eastern Grand Banks. August surface temperatures are between about 10°-19°C; salinities are about 31-35°/oo (less on the Scotian Shelf and in the southern Gulf of St. Lawrence), overlapping with those of the Low Arctic zone.

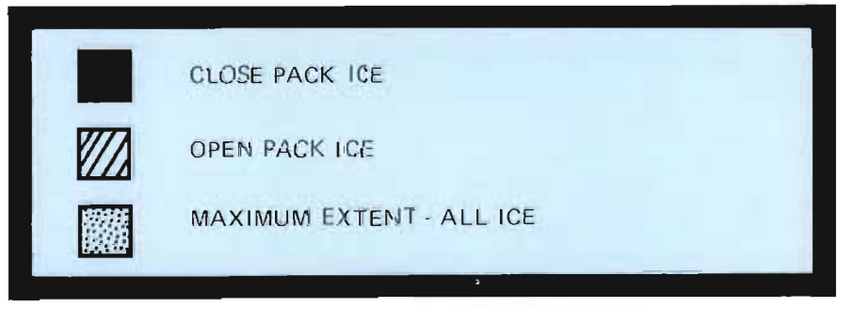
(d) Cool Subtropical: the waters of the North Atlantic Current. August surface temperatures are about 19°-23° C and salinities are over 35°/oo.

The boundaries of these zones are not exact and fluctuate seasonally; the Southern Gulf of St. Lawrence for example, changes from an ice-covered area in winter to one with surface waters of 16°C or more in summer. The water in the Gulf of St. Lawrence is strongly influenced by the fresh water discharged by the St. Lawrence River.

Dunbar et al. (1977) have summarized temperatures and salinities in the Gulf of St. Lawrence area as follows:

The 1915 Canadian Fisheries Expedition, the first important study of the Gulf, established the existence of the "cold layer", which in summer separates the warm upper layer from the deep water below. This cold layer extends from about 50m or less down to some 150m, varying in time and place. Salinities in it are of the order of 31 to 33°/oo, and temperatures lie at or below 0°C. It extends outside the Gulf through Cabot Strait to the Scotian Shelf. It was thought formerly that the cold layer consisted of Arctic or subarctic water entering through the Strait of Belle Isle, or more probably through Cabot Strait (and in fact a certain quantity of Labrador Current water does enter through both straits), but more recent study has shown that most of it must be formed in situ by a process of winter cooling.

AVERAGE SPRING ICE CONDITIONS



Although the water mass pattern shows a three-layered structure in summer, the basic pattern is two-layered in winter, when there is a cold layer varying in thickness from the surface to 100 or 150 m with temperatures as low as -1.7°C and salinities from 25-33°/oo. Beneath this cold layer is the deep water extending to the bottom of the Laurentian Channel, with temperatures mainly between 4 and 5°C, sometimes up to 6°C, and salinities close to 34.6°/oo. The temperature of the deep water varies, not seasonally, but rather in response to changes in the same water mass outside the Gulf.

There is a warming of the surface in the early spring (May-June) along the west coast of Newfoundland, due to oceanic water entering through Cabot Strait; in the lower estuary, associated with the clearing of the ice; and in the Baie des Chaleurs. The Magdalen Shallows and the Strait of Belle Isle remain ice-covered as a rule into the month of May. The early behaviour of the surface temperatures, in fact, is closely related to the ice conditions. Later in the season (August-September) the situation is to a great extent reversed, in that the estuary is overtaken by the southern part of the Gulf where the highest values are found. This is no doubt due both to the solar warming in the shallows and the upwelling at the head of the estuary, which has a decided cooling effect. The Harrington coast and the western part of the Esquiman Channel remains cool, under Labrador Current influence, and probably also wind influence, but the west coast of Newfoundland, in particular the southern part of it, is warmer, up to 14°-17°C.

Surface salinities range from about 24°/oo to a little above 32°/oo except for inshore regions, estuaries, etc., immediately affected by river outflow, where salinities are naturally lower.

The Labrador coast and north, east, and south Newfoundland salinities are dominated by the Labrador current with lows being due to the 32°/oo polar water. It may dip seasonally due to the Hudson Bay watershed. The surface low salinity (31.2°/oo) reaches St. Johns in September-October causing a decline from winter-spring salinities of 32.0-32.5°/oo. Deeper waters of the Labrador current are about 33°/oo year round in the Newfoundland region.

Average monthly surface temperatures in Newfoundland waters ranges from a low of -1°C in the February to March period to a high of 12°C in the summer. The bottom waters of the Grand Banks generally stay between 0 and 3.5°C. The eastern Grand Bank is very different from the other Newfoundland areas since it is washed by the North Atlantic current giving variable bottom temperatures up to 10°C. Flemish Cap is also unique having a gyre system of constant (2.5-4.0°C) bottom temperatures year round.

FISHERY

The fisheries of Newfoundland, Nova Scotia, P.E.I., New Brunswick and Quebec together account for about two-thirds the marketed value of all Canadian fish. Total landings on the Atlantic coast in 1977 amounted to one million tonnes, 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.

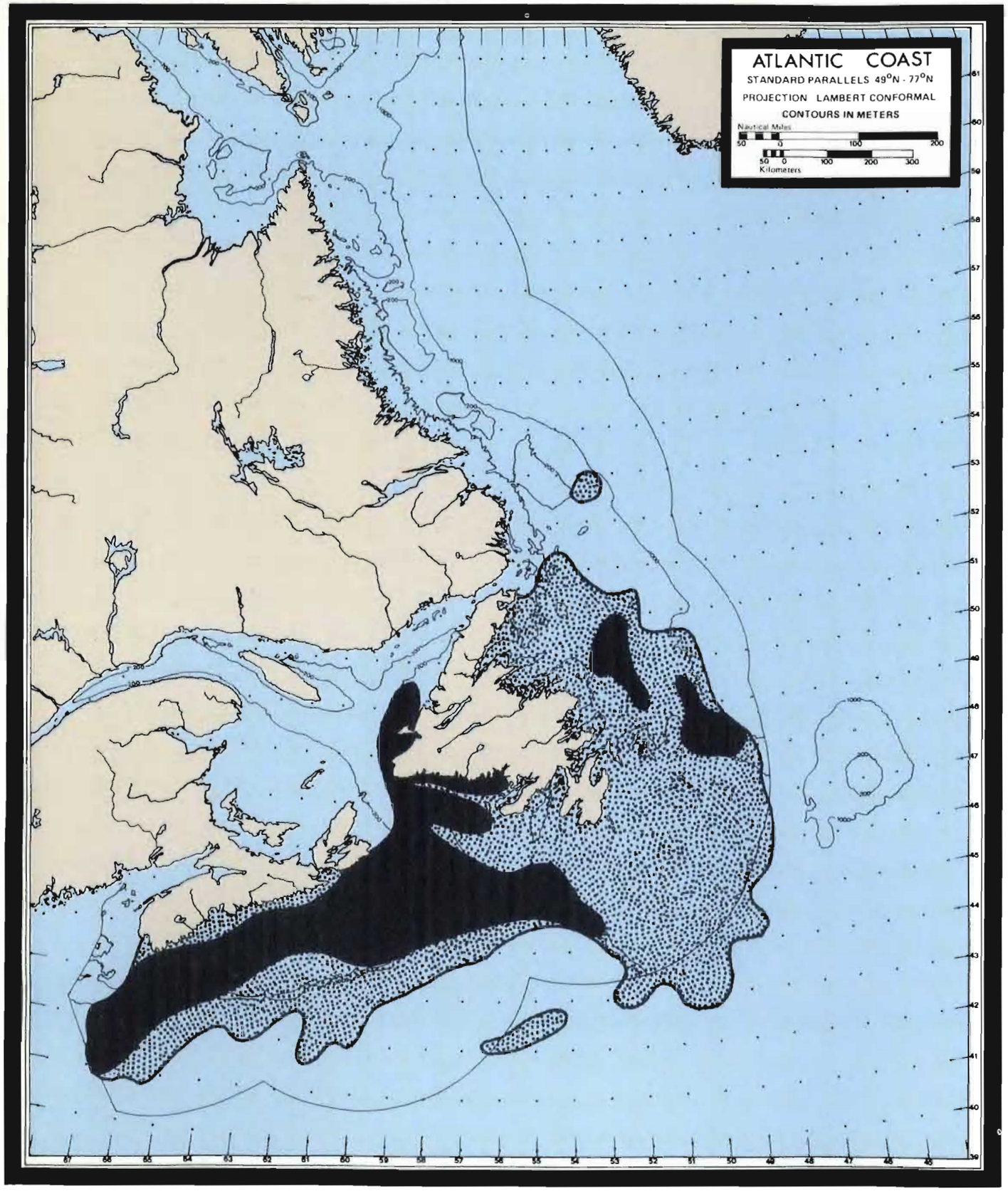
Among the main species in the groundfish category, the total allowable catch (TAC) of cod is projected to increase from 352,000 tonnes in 1985. For haddock and redfish virtually no change is predicted in the TAC, while for flatfish the TAC is anticipated to rise slightly from 135,000 tonnes in 1977 to 152,000 tonnes in 1985. The Canadian share of the total allowable catch of these traditional major groundfish species in 1977 was 428,000 tonnes or 60 percent. Canada's share is expected to increase to about 70% in 1978, with even higher levels being reached in the future.

Among the main Canadian pelagic species, the TAC for Atlantic herring is expected to increase only slightly from 250,000 tonnes in 1977 to 250,000 tonnes in 1985. The TAC for mackerel, on the other hand, is expected to increase from 105,000 tonnes in 1977 to 190,000 tonnes by the early 1980s.

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 zone 4.

From a geographic point of view, fish stocks of the Scotian Shelf are projected to increase gradually and the moderate recovery will be reflected in improved catch rates. On the Grand Banks the groundfish fisheries provide some hope for expansion over time. Overall, slow growth is expected in fisheries off the Scotian Shelf and Grand Banks and fisheries off the entrance to the Gulf of St. Lawrence are expected to decline. Cod stocks to the east and north of Newfoundland offer possibilities for relatively rapid and sustainable growth in the fishery of that area.

FISHING EFFORT



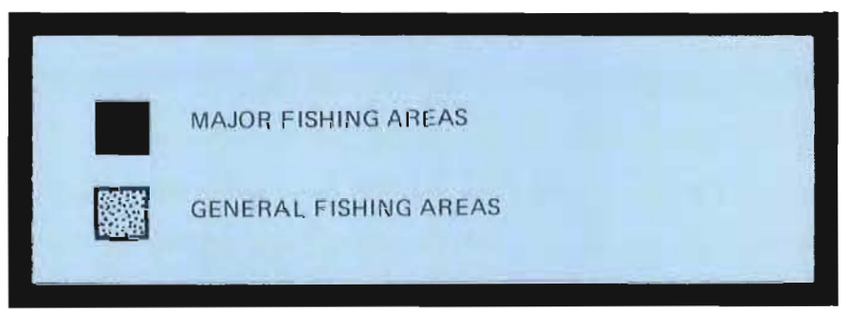
The accompanying maps attempt to define principal fishing areas utilized by domestic and foreign offshore fleets during the late 1970s. The maps are based on a mapping of the location of vessels during these periods. Assuming that vessel location is an indicator of principal stock occurrence, certain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

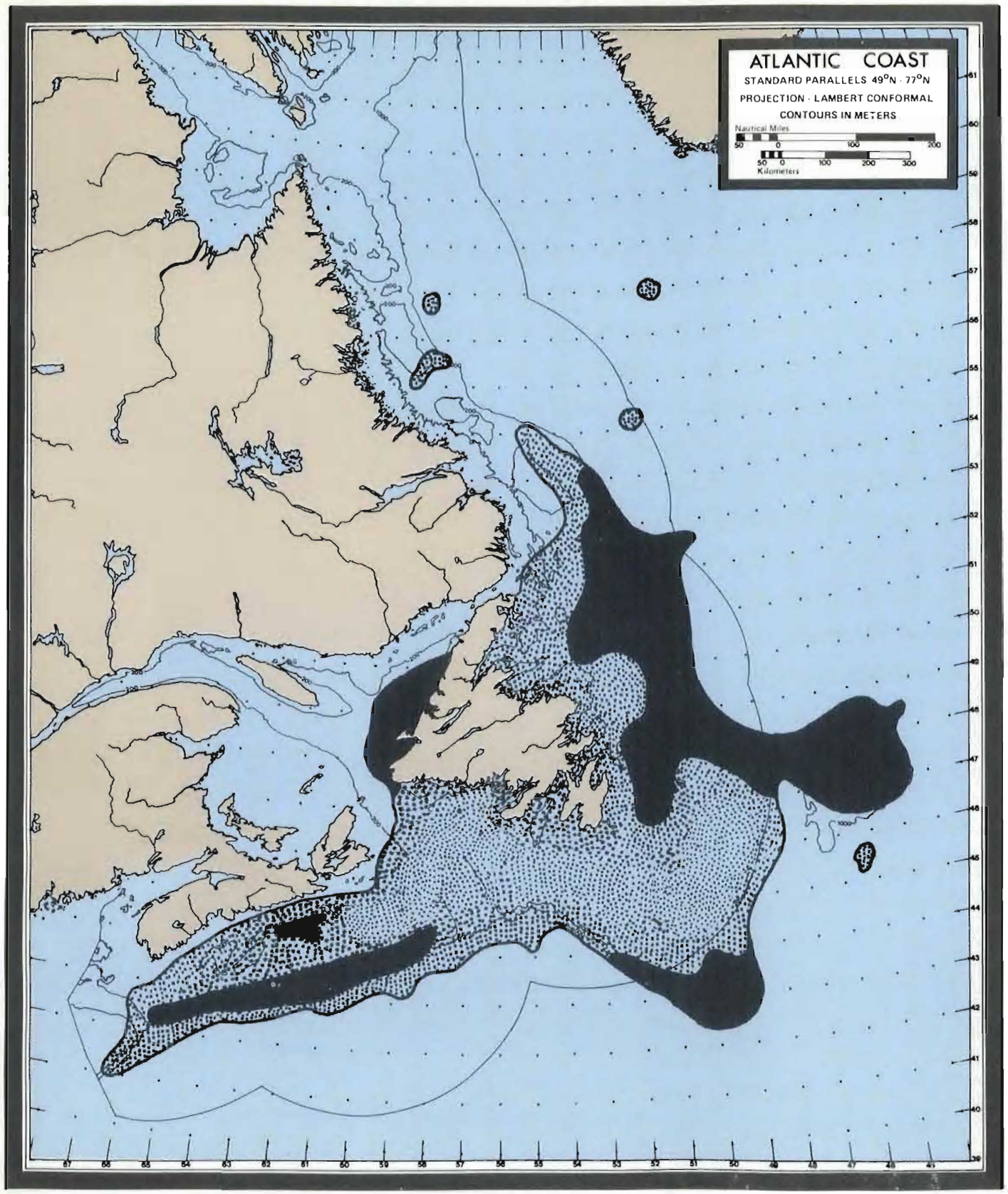
WINTER·

The domestic offshore fleet appears to have restricted its range and concentrated its efforts along the Scotian Shelf, Mouth of the Gulf of St. Lawrence, St. Pierre Bank and two areas to the northeast of Newfoundland.

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

WINTER OFFSHORE DOMESTIC FISHERY
AS INDICATED BY FLEET DISTRIBUTION

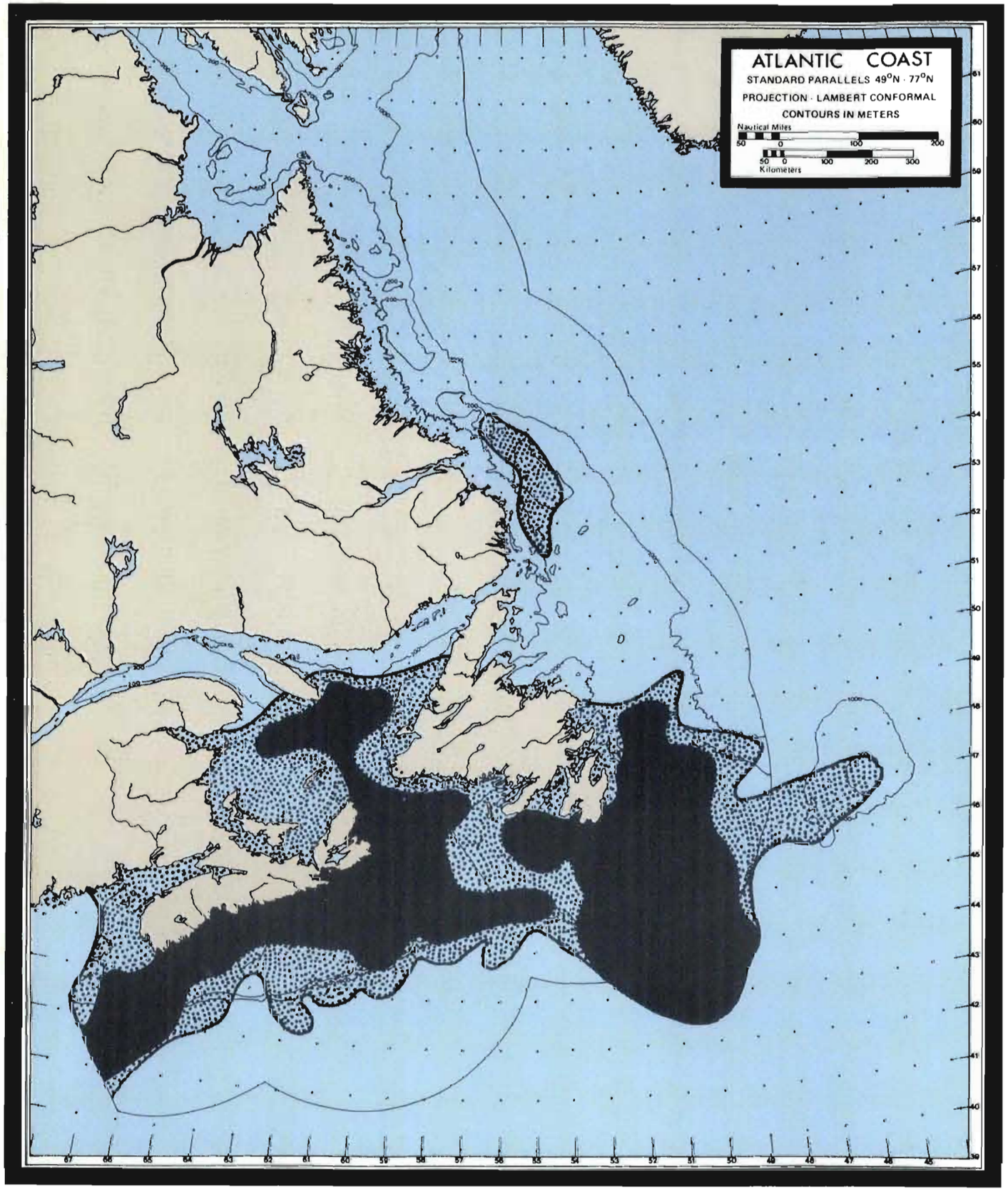




WINTER OFFSHORE FOREIGN FISHERY
AS INDICATED BY FLEET DISTRIBUTION

MAJOR FISHING AREAS

GENERAL FISHING AREAS

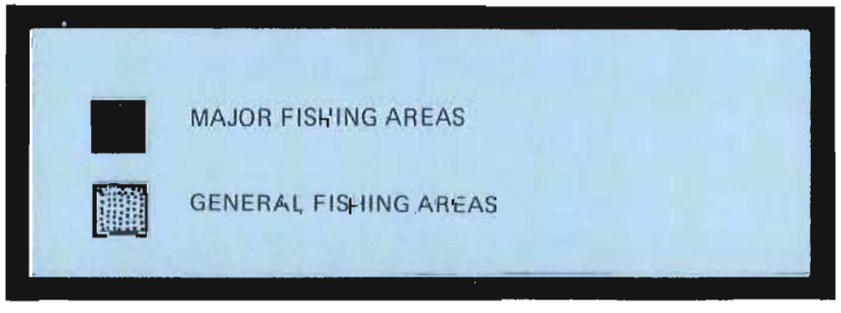


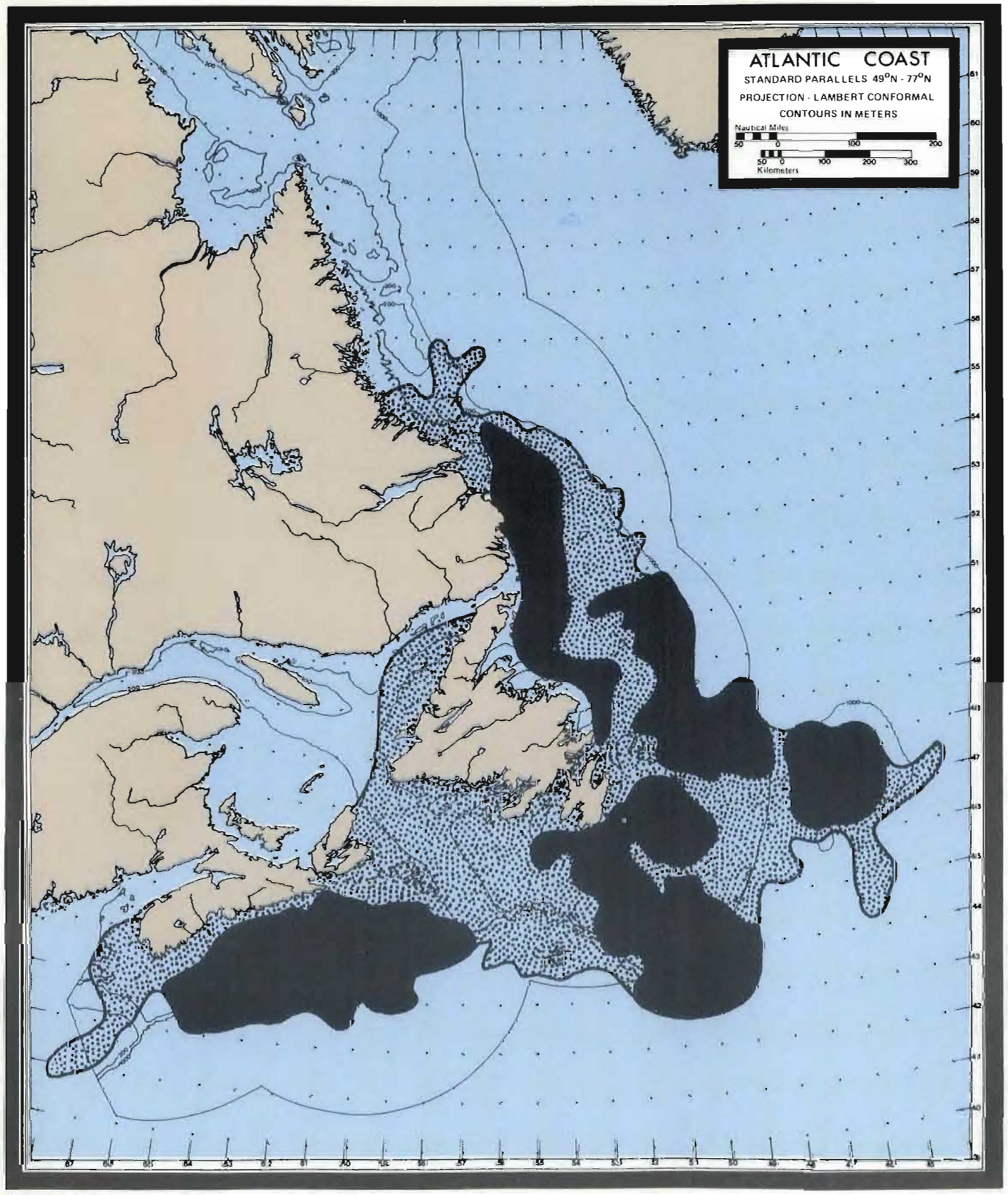
SUMMER:

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, the Northeast Newfoundland Shelf north to Hamilton Inlet Bank.

SUMMER OFFSHORE DOMESTIC FISHERY
AS INDICATED BY FLEET DISTRIBUTION



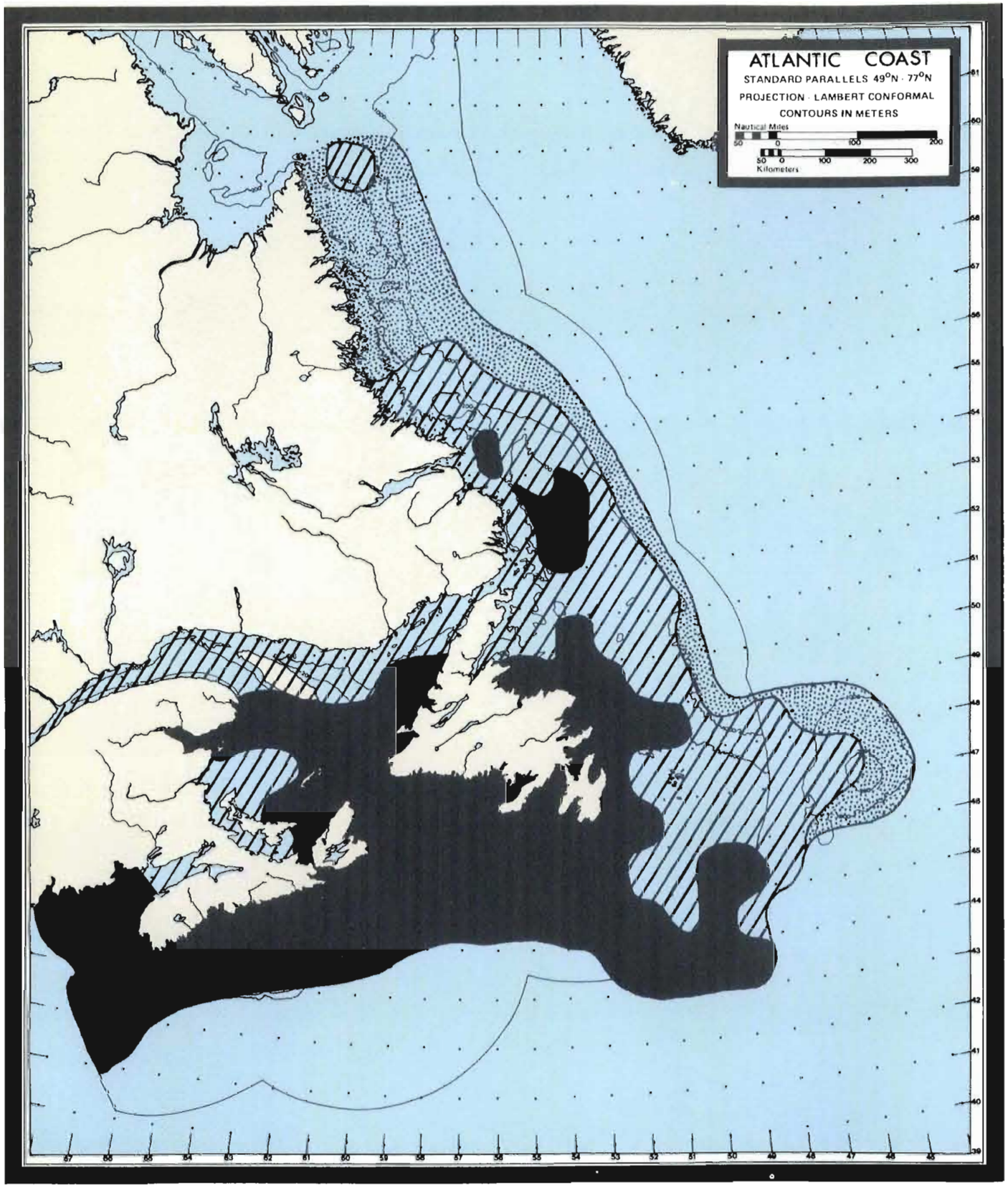


SUMMER OFFSHORE FOREIGN FISHERY
AS INDICATED BY FLEET DISTRIBUTION

MAJOR FISHING AREAS

GENERAL FISHING AREAS

KEY RESOURCE AREAS



The major distribution patterns of all species included in this atlas were analysed 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 inshore 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 the 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.

AREAS OF HIGH RESOURCE IMPORTANCE

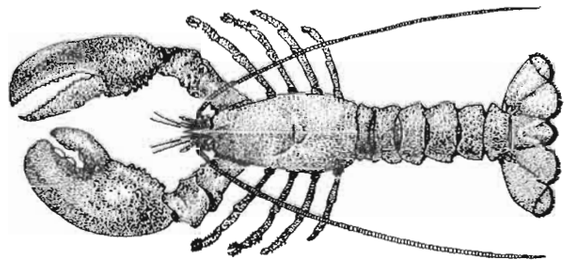
AREAS OF RESOURCE IMPORTANCE

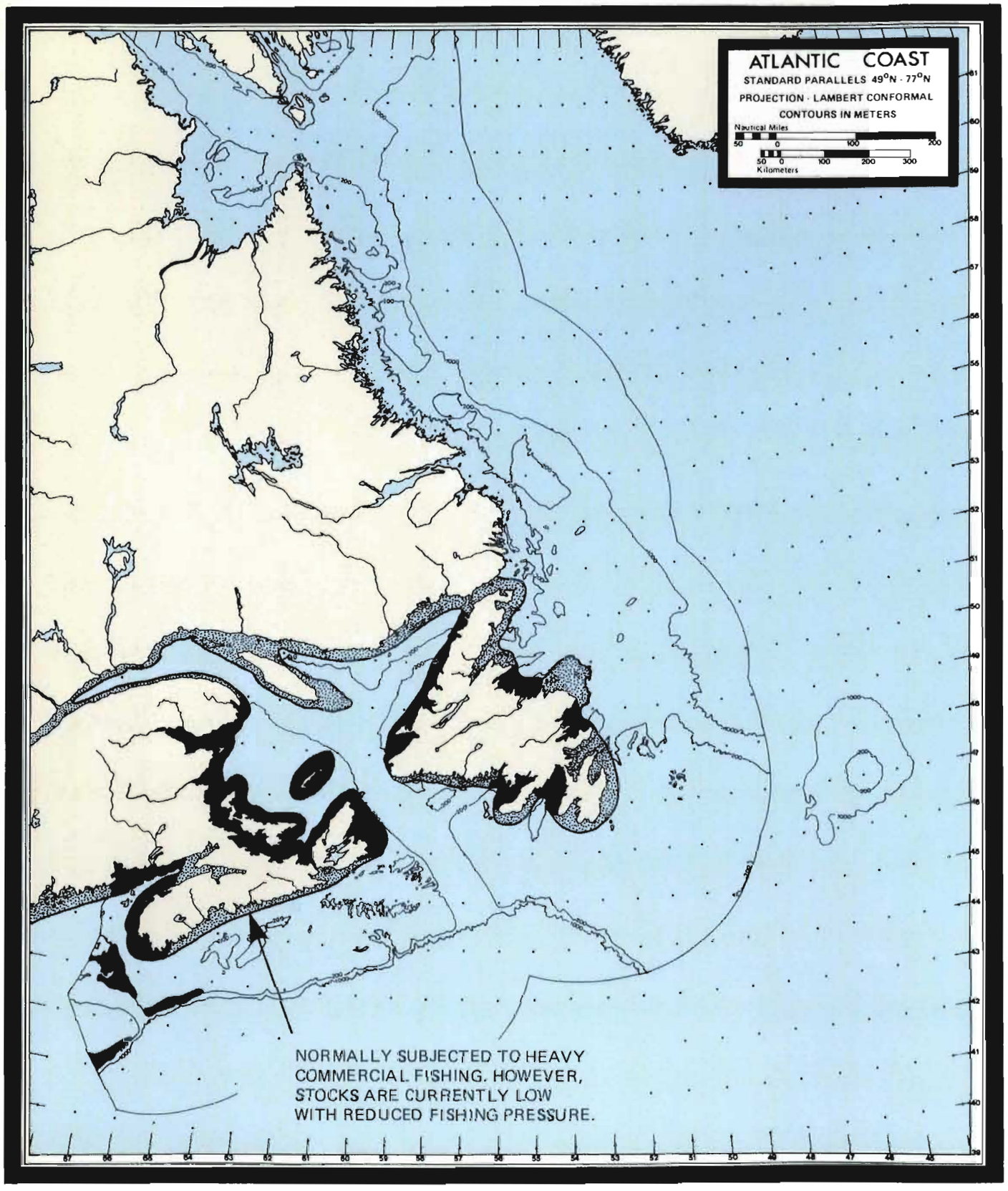
AREAS OF MINOR RESOURCE IMPORTANCE

COMMERCIAL RESOURCE SPECIES
INVERTEBRATES

LOBSTER

Homarus americanus Milne-Edwards





FAMILY: Nephropsidae

COMMON NAMES: American lobster

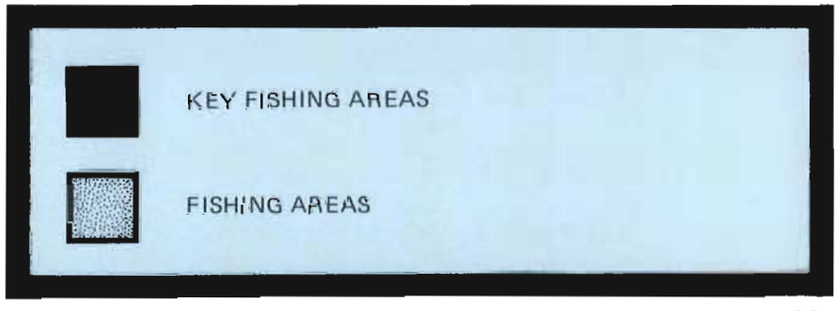
CODES: ICNAF - 622
FAO Taxonomic - 2,29(42)007,01
3 alpha ident. - LBA

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.

MAP KEY



FISHERY:

In terms of landed value, the lobster fishery is one of the most important and intensive fisheries in Atlantic Canada. Canadian landings have increased in recent years to about 19,000 MT from lows, in the period 1972 to 1974, of about 15,000 MT. 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 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 licenses 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% to 50% per year, are required if major stock declines are to be prevented in certain areas of the fishery in the future.

Presently, the lobster fishery is primarily an inshore fishery carried out with traditional lobster boats and gear. A few larger vessels carry on a limited offshore fishery off southwestern Nova Scotia; principally on Browns and Georges Banks.

UTILIZATION:

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

GENERAL BIOLOGY:

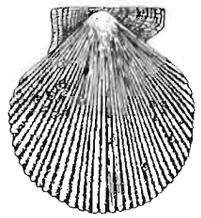
Lobster mature at lengths of 17 to 30 cm (½ to 2 pounds). Mating usually occurs in summer when hard-shelled males mate with recently moulted soft-shelled females. The sperm are maintained in the female's sperm sac until the eggs are laid about a month or more (early June to September) after mating at 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 one to two months. During this period they moult three times, changing form and growing at each moult. After they undergo their fourth moult, they settle to the bottom and begin progressive development leading to maturity.

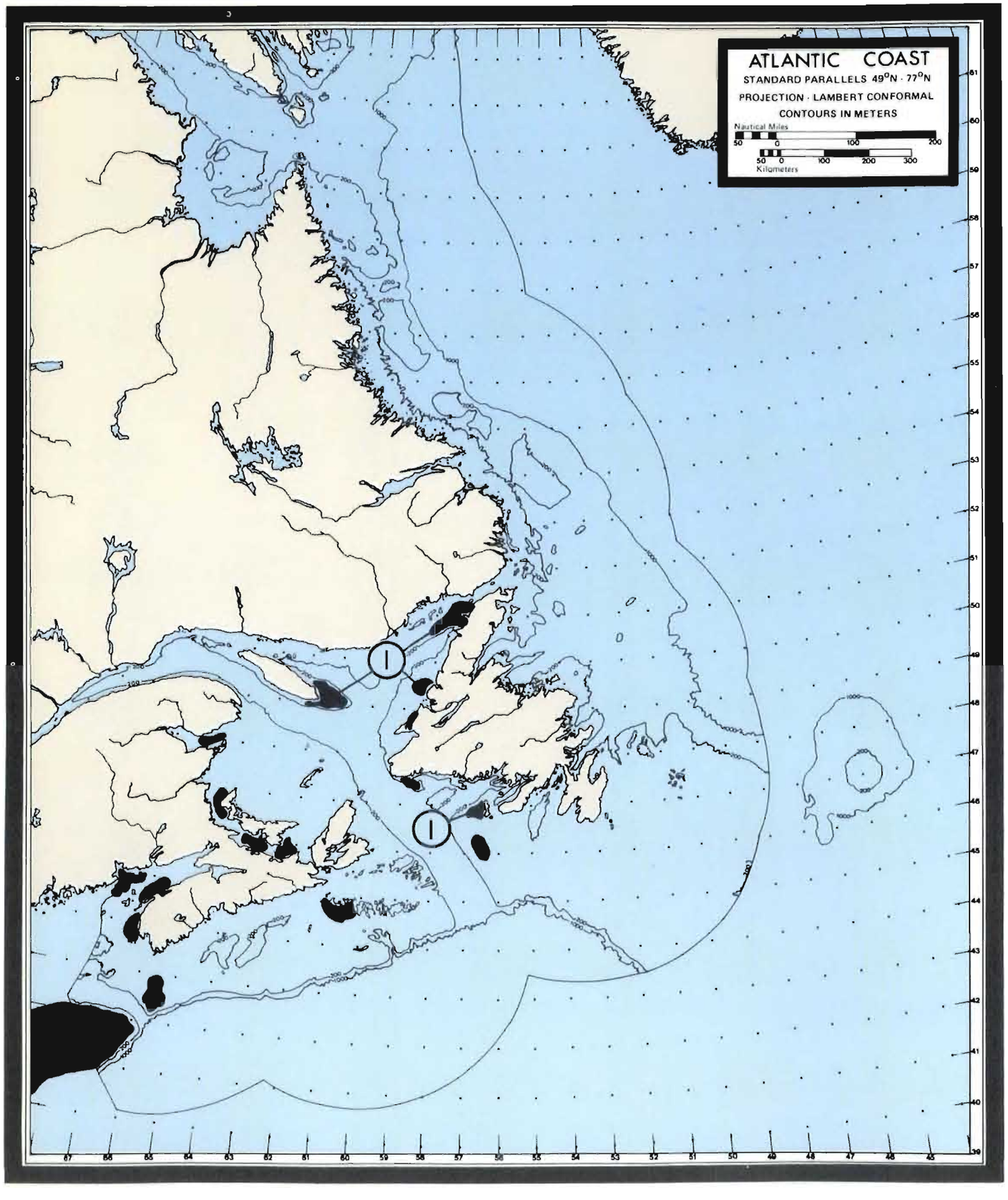
Adults favour rocky bottom where they live principally in burrows and crevices. Feeding generally takes place at night when they prey on worms, crabs, clams, mussels, sea urchins, starfish, chitons and other bottom animals.

Lobster are prey for a variety of marine animals. During their larval existence, they are part of the plankton and provide food for a wide 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 islandica (Iceland scallop)





FAMILY: Pectinidae

COMMON NAMES: sea scallop, scallop

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

DISTRIBUTION:

The giant scallop occurs from low water to depths of 180 metres (600 ft.); from Pistolet Bay, Newfoundland, to Cape Hatteras. Concentrations are found off Newfoundland, the Gulf of St. Lawrence, Scotian Shelf, Bay of Fundy, and Georges Bank where the area of greatest abundance is between 36 and 90 metres; 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 from Newfoundland southwards to Buzzards Bay, Mass. It is abundant in the northeastern Gulf of St. Lawrence.

MAP KEY

KEY FISHING AREAS - GIANT SEA SCALLOP

I KEY FISHING AREAS - ICELAND SCALLOP

FISHERY:

The Georges Banks area supports the largest commercial offshore fishery. However, it is an important industry in other areas such as the Bay of Fundy, Gulf of St. Lawrence, Port au Port Bay and the St. Pierre Bank. Wide variations in landings occur in these areas due to sporadic overfishing and wide fluctuations in recruitment. Because of these fluctuations, sustainable yields will continue to be highly variable. Pulse fishing, due to stock abundance and economic factors, will continue to be the pattern of exploitation.

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

Individual giant scallop meats range to 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.

UTILIZATION:

Sold for human consumption - fresh and frozen.

GENERAL BIOLOGY:

The giant scallop is easily recognized by its large size (to 22.5 cm) and symmetrical "wings" on either side of the hinge. 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 to 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.

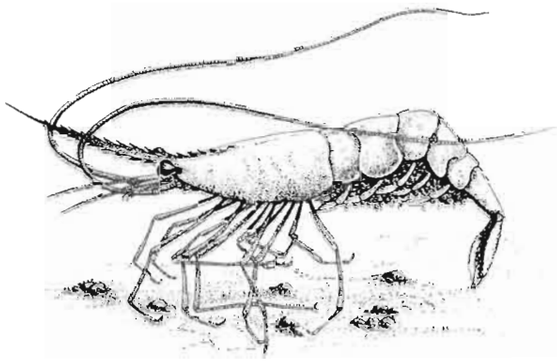
Scallops are generally found in well-defined "beds" where they often occur consistently from year to year. They are capable of living on a variety of bottom types, and usually live in depressions, particularly on mud bottom.

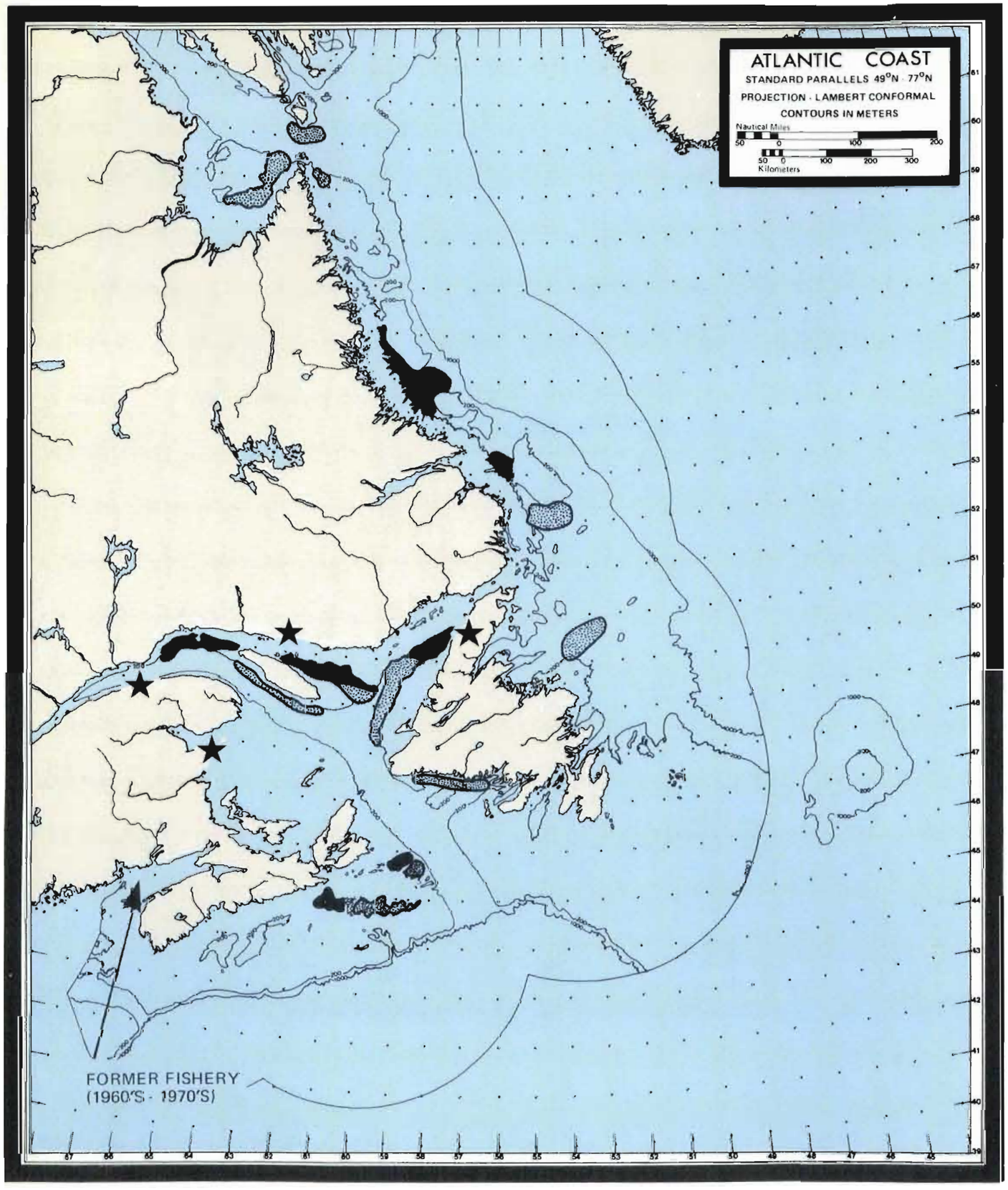
Scallops are preyed upon by cod, plaice, wolffish and starfish. Parasites, boring sponges and shell worms also cause mortalities.

The Iceland scallop is easily distinguished from the giant scallop by its asymmetrical hinge and pronounced radial ribbings. 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 length of 9 cm is attained in 9 to 10 years. Growth appears to slow considerably after 10 years. Approximately 50 Iceland scallops are required to produce one pound of meat; compared with 35 giant scallops to one pound of meat (Georges Bank). Because of this low yield and limited distribution, this species is of less commercial interest than the giant scallop and, consequently, less is known about its biology.

SHRIMP

Pandalus borealis, P. montagui





FAMILY: Pandalidae

COMMON NAMES: pink shrimp, great northern prawn

	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

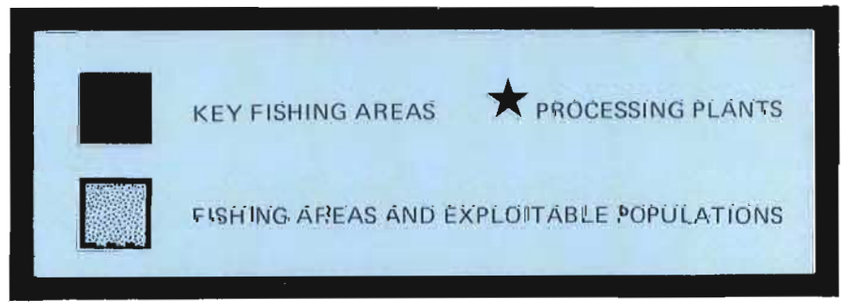
DISTRIBUTION:

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.

FISHERY.

Three major shrimp concentrations are presently under exploitation in the Gulf of St. Lawrence: a) Esquiman Channel with projected sustained catches from 1000 to 2600 MT, depending upon recruitment and relative effort of the fleet towards other species, b) Sept-Iles area, with projected

MAP KEY



yields of 3500 MT 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, recources along the inner part of the Shelf may support long-term catches in the order of 4,000-10,000 MT. Preliminary investigation suggests that up to 25% of the available stock may reside inside the Canadian Zone.

A fishery developed in the Bay of Fundy during the 1960's. However, it collapsed by the mid 1970's, probably as a result of overfishing. Some authorities maintain that this population may be controlled by temperature changes and that a fishery may begin again should stocks rebuild.

The fishery is carried out by large offshore trawlers. Concern has been expressed about the presence of juvenile redfish in 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:

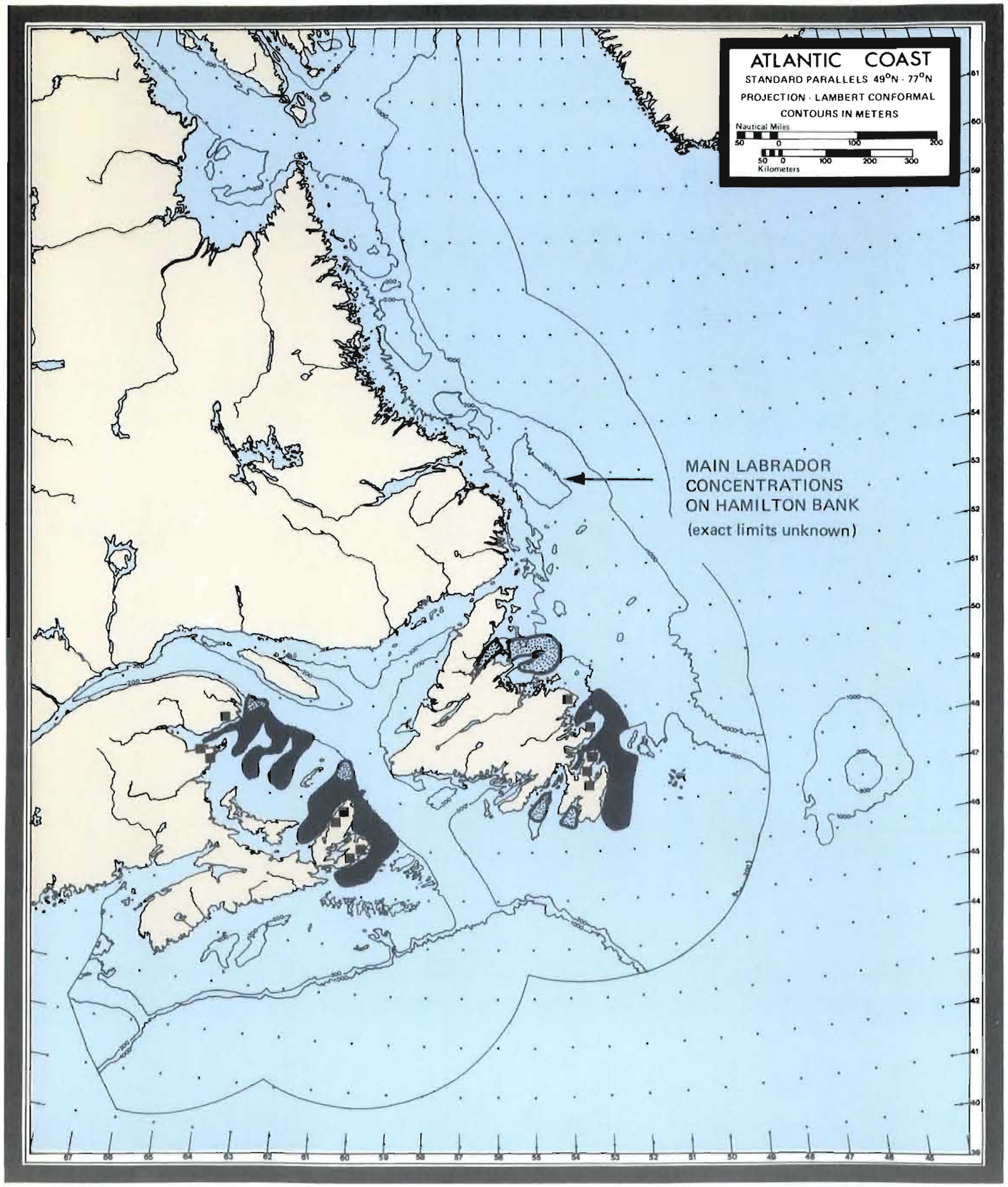
The two main commercial species are *Pandalus borealis,* and *Pandalus montagui;* the latter being the smaller of the two. Both species live in Atlantic waters from depths of 9 to 1,380 metres, tolerate water temperatures from-1.68°C to 11°C and can be found existing in salinities ranging from 25.9 to 35.7°/oo.

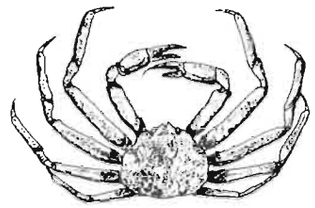
Spawning takes place from September to April depending upon the area. Females carry between 400 to 3400 eggs until hatched. Incubation can take from 6-12 months depending on water temperature.

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.

SNOW CRAB

Chionoecetes opilio





FAMILY: Maiidae

COMMON NAMES: queen crab, Zuwai crab

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

DISTRIBUTION:

Snow crabs occur, at depths of 54 to 324 metres, from west Greenland to the Gulf of Maine. They are abundant in the Gulf of St. Lawrence and around the north part of Cape Breton Island. In Newfound - land, they occur in coastal bays from Placentia Bay east around Avalon Peninsula and north to White Bay and off Labrador, mainly near Hamilton Inlet Bank.

No seasonal changes in distribution takes place as this species is essentially non-migratory.

FISHERY:

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

MAP KEY

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. Only male crabs with a carapace width in excess of 95 mm are taken.

This species is fished in the Gulf of St. Lawrence from 13 to 25 metre boats, usually using 1.5 m x 1.5 m x 0.6 m 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 to 12 metre boats using large lobster traps, Japanese conical traps or small square traps. Japanese conical top-entry traps are fished from 12 to 20 metre boats in Newfoundland.

UTILIZATION:

Sold for human consumption - fresh, frozen and canned.

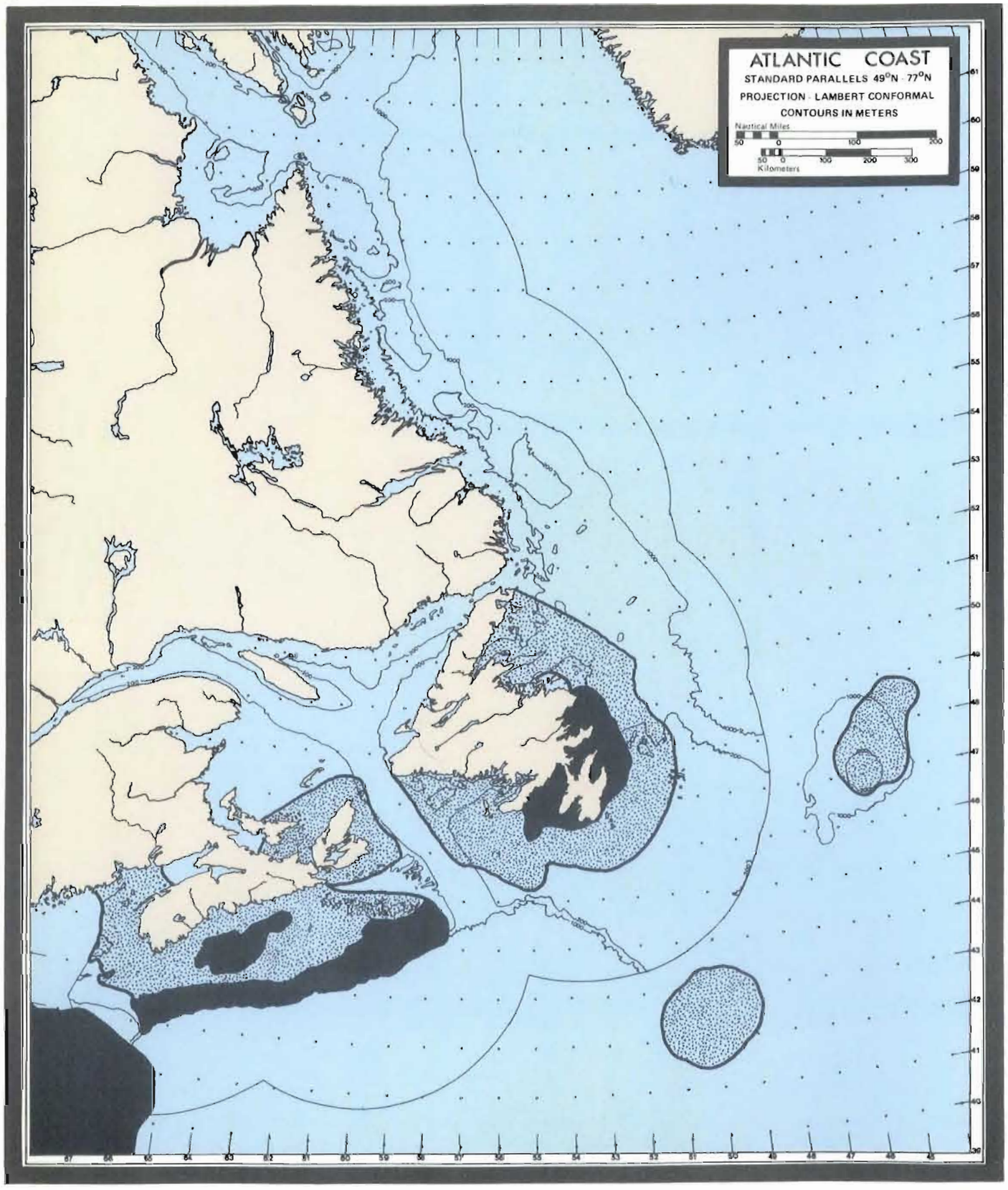
GENERAL BIOLOGY:

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 moulted to maturity. Precopulatory embrace may last a week during which the male grasps the female with his claws until she moults, at which time he deposits sperm into the openings of the female's sperm sacs. Depending on the size of the female, 20,000 to 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.

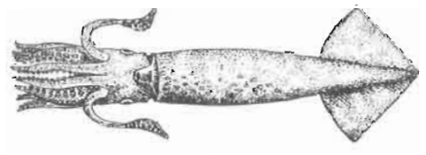
After hatching, larvae spend the next 3 months swimming freely at or near the surface. During this period they moult twice, changing form and growing appreciably at each moult. After the third larval stage they gradually sink to the sea floor where they moult again and, for the first time, resemble the adult in shape and colour. Most males are mature at a shell width of 6.5 cm. and can mate successfully at that size. For females, size at maturity varies from 5 to 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

CODES:	ICNAF-502	ICNAF-504
	FAO Taxonomic-3,21(04)001,05	FAO Taxonomic-3,21(05)010,01
	3 alpha ident. -SQL	3 alpha ident. -SQI

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 southeast 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 summer with the largest concentrations being found in the vicinity of Georges Bank, on the Scotian

MAP KEY

KEY FISHING AREAS

FISHING AREAS

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 presently 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 passive and is based on squid jigging in waters of less than 10 fathoms. Canadian landings have ranged from virtually nil in 1969 to 79,385 MT in 1979. Squid fished at 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 5 years, mainly by the U.S.S.R and Japan. Canada is now entering this fishery and recorded landings of approximately 5,000 MT in 1979. Elsewhere on the Canadian coast, squid fishing is occasional and less important.

Squid are caught on jigs inshore off Newfoundland. 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 U.S.S.R. fleets employ trawls.

UTILIZATION:

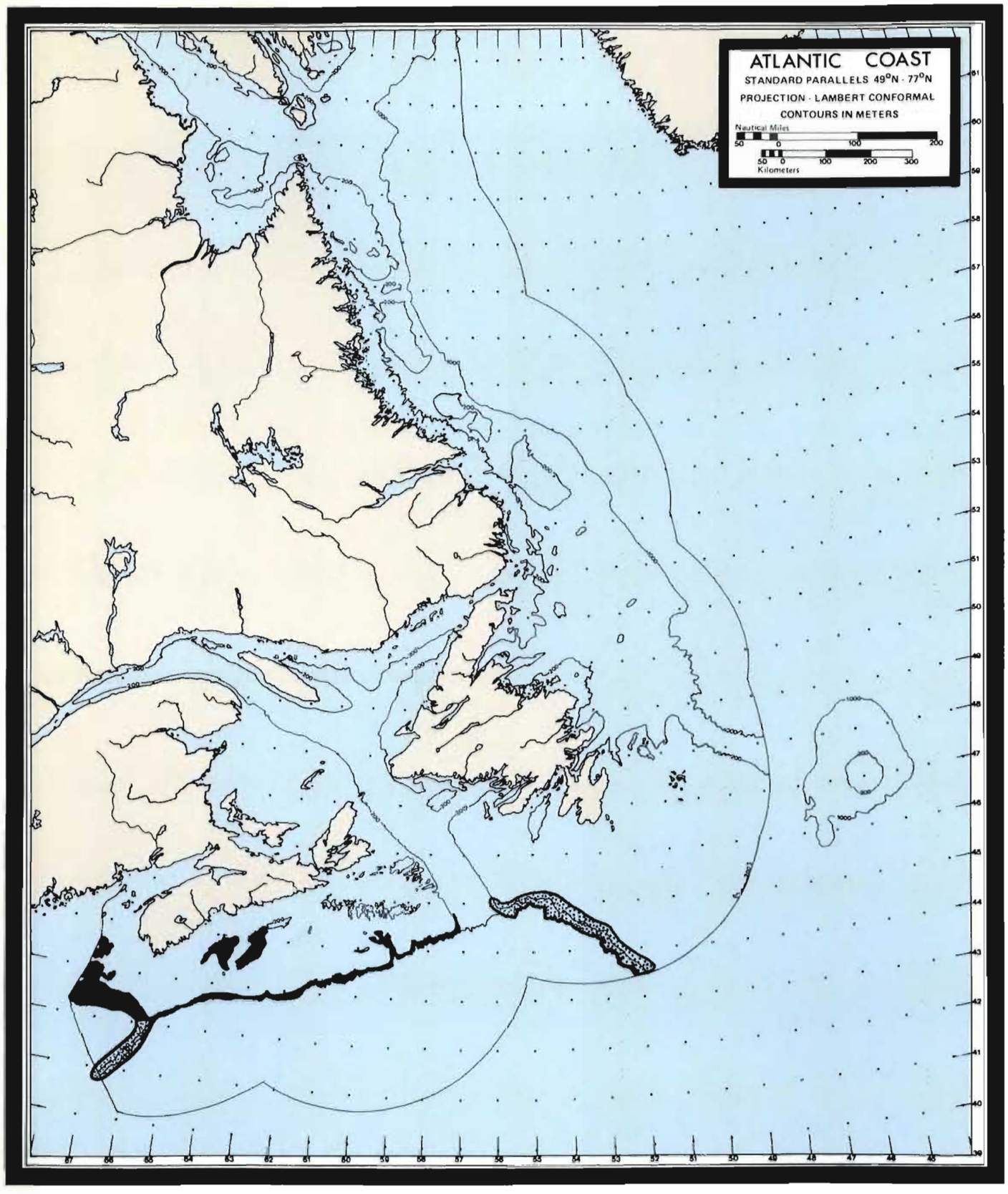
Squid were traditionally used only as bait. Currently it is also sold as a delicacy in North American markets and is a staple in the Japanese diet.

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.

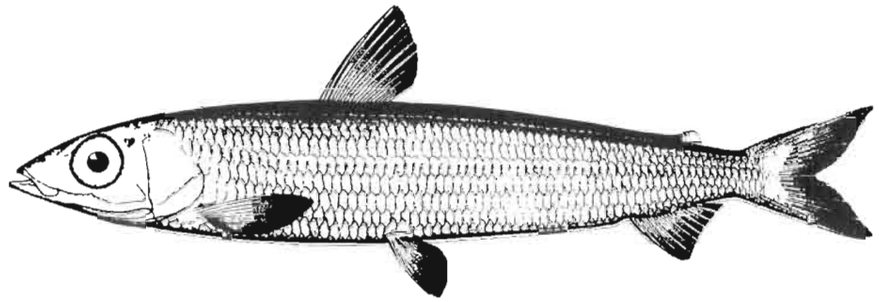
Short-finned squid - Less is known about the biology of this species. However, they arrive inshore as juveniles and by the time they depart in the fall are generally fully grown and the males are mature. Mating and spawning is believed to occur on their wintering ground at an age of one year with the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

COMMERCIAL RESOURCE SPECIES
FISHES



ATLANTIC ARGENTINE

Argentina silas Ascanius, 1963



FAMILY: Argentinidae

COMMON NAMES: herring smelt, grande Argentine

CODES: ICNAF - 312
FAO Taxonomic - 1,23(05)015
3 alpha ident. - ARG

DISTRIBUTION:

Argentine occur from 126 to 360 metres 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.

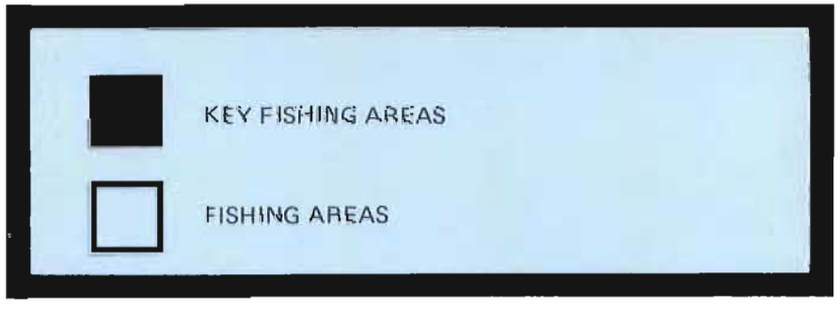
There is no evidence of seasonal changes in distribution. Spring spawning concentrations have been reported in Georges Basin.

FISHERY:

No fishery existed prior to 1963 when the USSR 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 centre of distribution of this resource is in the Fundian Channel

MAP KEY



area between Georges and Browns Banks but it also occurs along the slope of the Scotian Shelf and Georges Bank in depths of about 200-500 metres. Catches have been sporadic, and have ranged from over 40,000 MT to as little as 1,000 MT, 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 centre 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 MT.

Argentine are caught by bottom and midwater trawls.

UTILIZATION:

Sold for human consumption and fish meal.

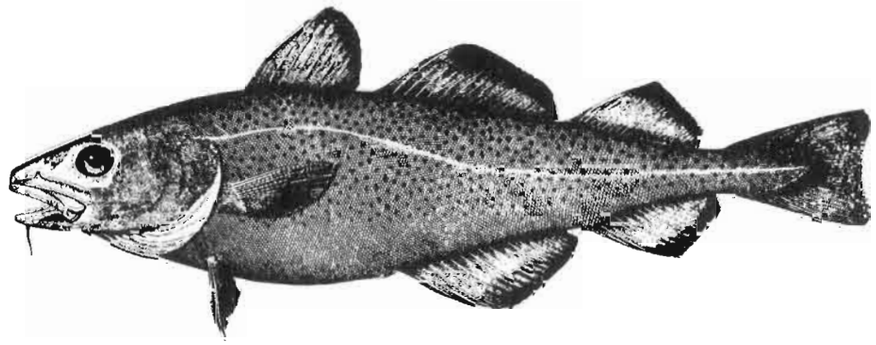
GENERAL BIOLOGY:

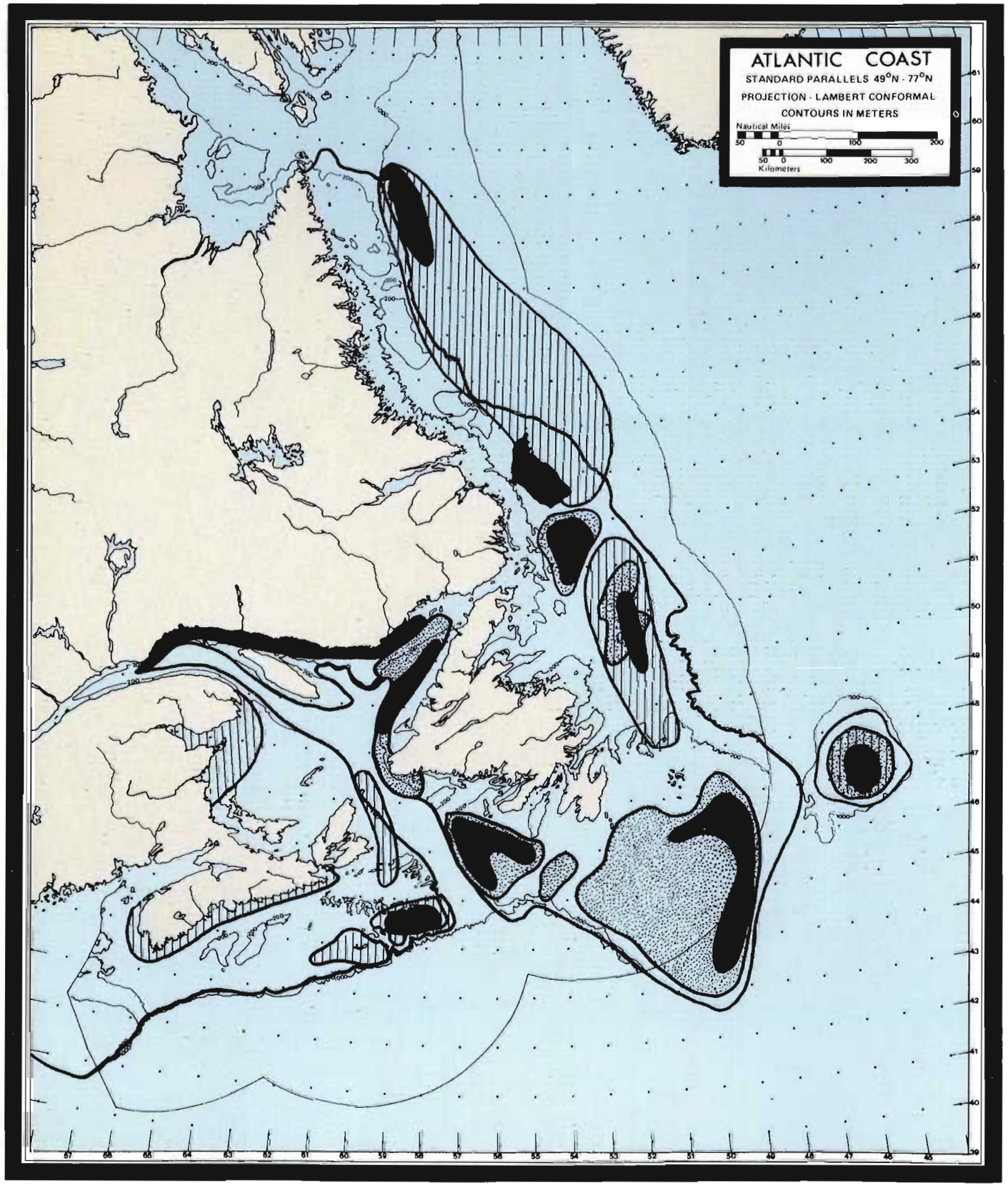
Spawning takes place in late winter. Fertilized eggs are buoyant and float at intermediate depths. Juveniles also appear to be restricted to midwater. On settling to bottom, they are found in depths of 126 metres or less and move into deeper water as they grow. Argentine mature in about 4 years, attain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

Euphausiids are their principal prey.

COD

Gadus morhua (Linnaeus, 1758)





FAMILY: Gadidae

COMMON NAMES: codfish, morue commune, cabillaud

CODES: ICNAF - 101
FAO Taxonomic - 1,48(04)002,02
3 alpha ident. - COD

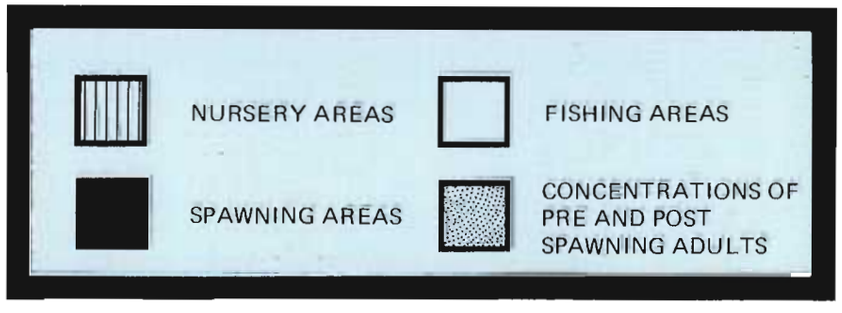
DISTRIBUTION:

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 to September period with a corresponding offshore movement in the fall. In the eastern Gulf of St. Lawrence, concentrations of pre-spawning 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,

MAP KEY



the western and northern slopes of St. Pierre Bank, the west coast of Newfoundland and along the Quebec north shore.

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 pressure	20,000 MT
Southern Labrador-Northern Grand Bank	Presently thought to be rebuilding	180,000 MT
Flemish Cap	Stable	13,000 MT
Southern Grand Bank	Depressed - possibly starting to recover	26,000 MT
St. Pierre Bank	Depressed but improving	28,000 MT
North and east Gulf of St. Lawrence	Stable	75,000 MT
Sydney Bight	Stable	5,000 MT (potential landings)
Southern Gulf	Rebuilding	70,000 MT (mid-1980s)
Banquereau-Sable Island	Rebuilding	60,000 MT (mid-1980s)
Browns Bank	Probably stable	16,000 MT
Georges Bank	Stable	35,000 MT

Cod are taken by otter trawl, longline, handline, pair trawl, Danish seine, cod traps 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:

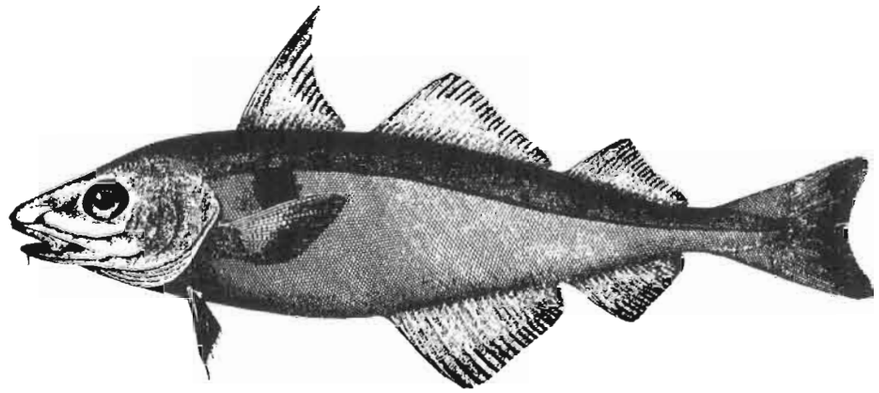
Spawning takes place over a wide area on the continental shelf from March to December depending on the locality. Fertilized eggs are buoyant and float at the surface. Incubation time varies with temperature and takes approximately 14 days at 6°C.

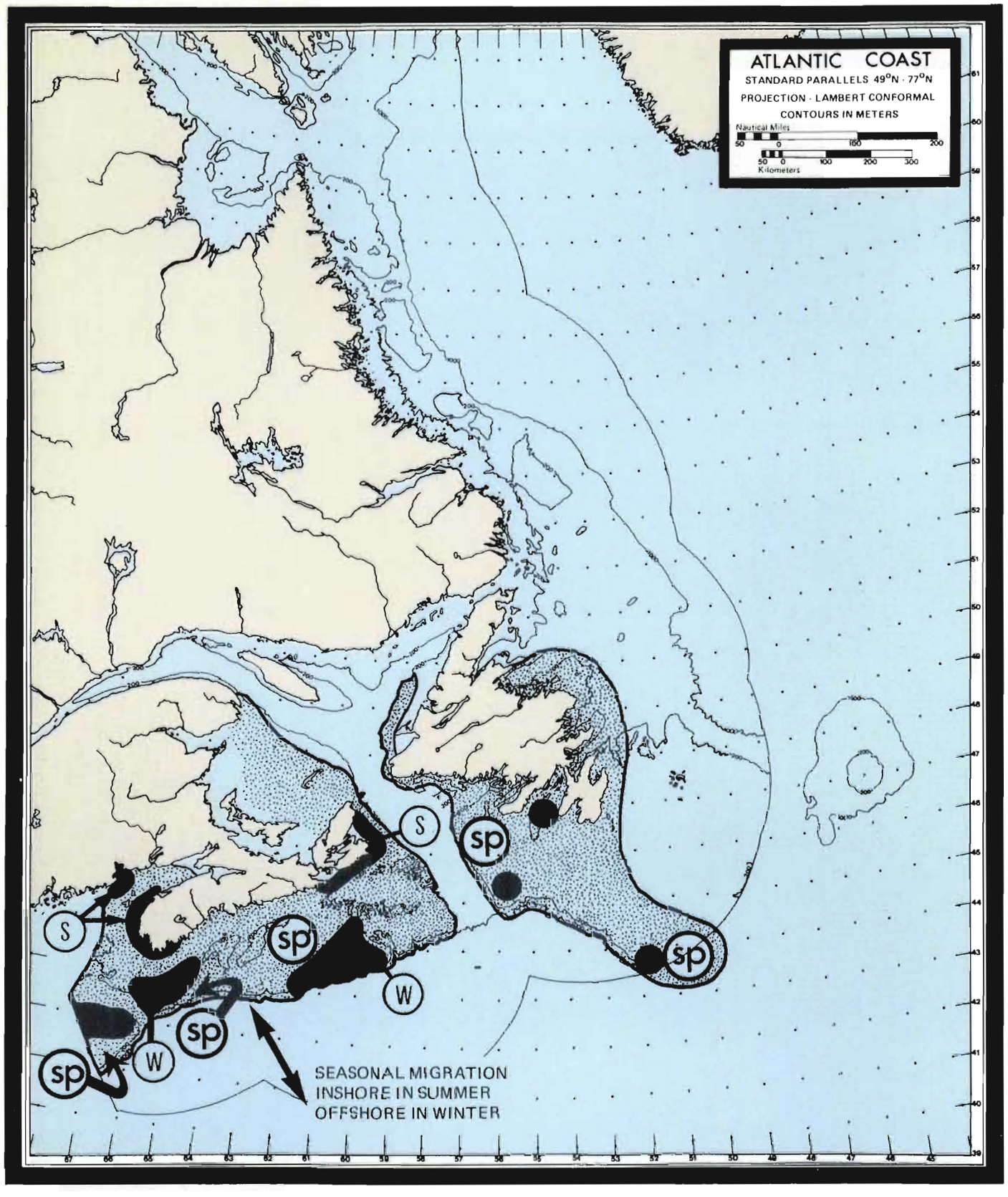
Growth rates vary from locality to locality. At ten years of age average lengths have been calculated as 70.8 cm in the southwest Gulf of St. Lawrence, 86.5 cm on the southern Grand Bank, and 57.0 cm inshore at Labrador.

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

HADDOCK

Melanogrammus aeglefinus (Linnaeus, 1758)





FAMILY: Gadidae

COMMON NAMES: aiglefin

CODES: ICNAF - 102
FAO Taxonomic - 1,48(04)010,01
3 alpha. ident. - HAD

DISTRIBUTION:

Haddock occur 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 south western 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 are a highly valued groundfish species. Long-term average

MAP KEY

catches from 1931 to 1962 were sustained at about 17,000 MT. However, in the mid-1960's, the Canadian catch rose to 28,000 MT average, reaching a peak of 42,000 MT 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:

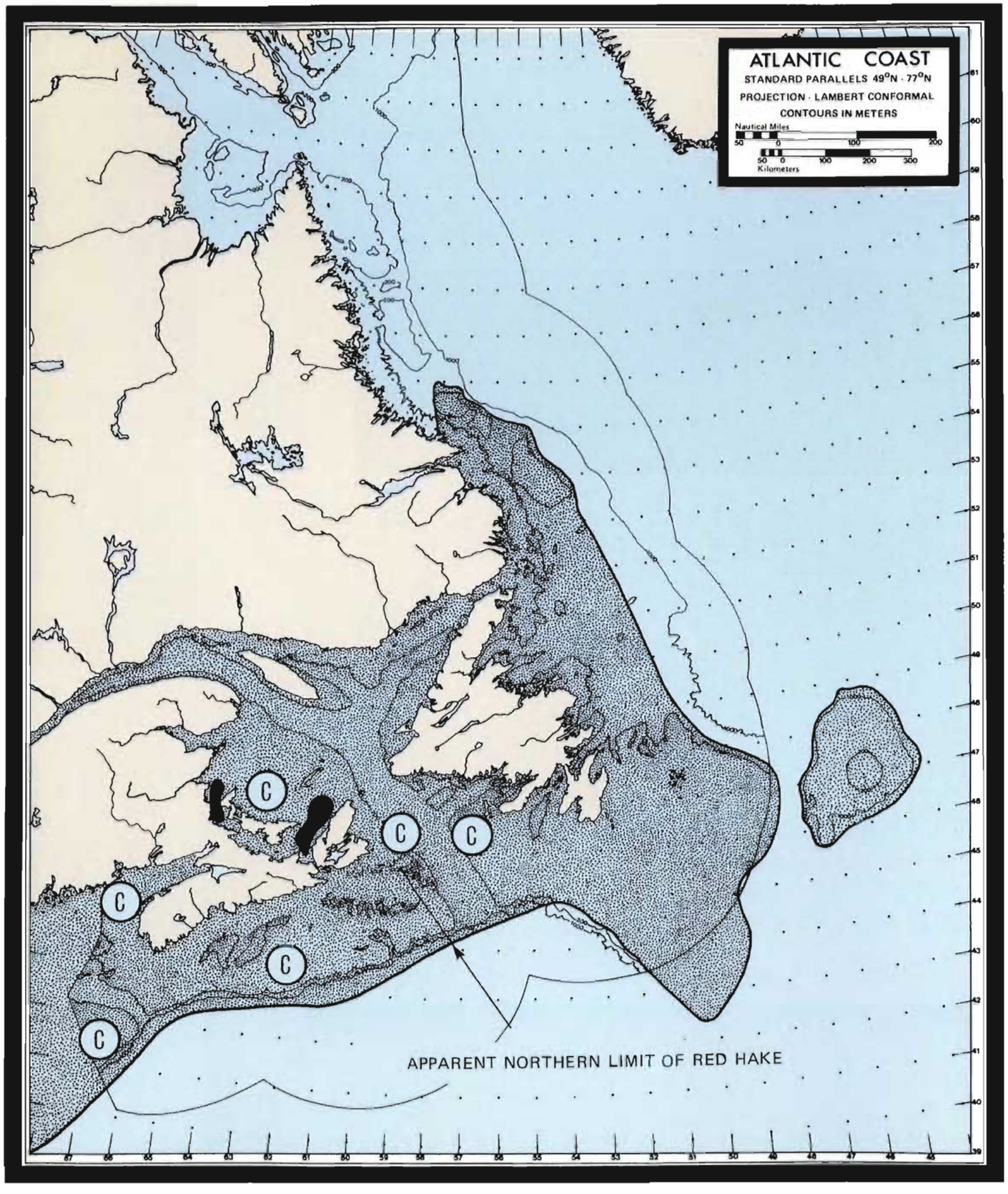
Spawning occurs from late January to July depending on the area. Fertilized eggs are buoyant and float at or near the surface until they hatch. Hatching occurs in 25-32 days at 3°C; in 13 to 24 days at 5°C, and in 9-12 days at 10°C.

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

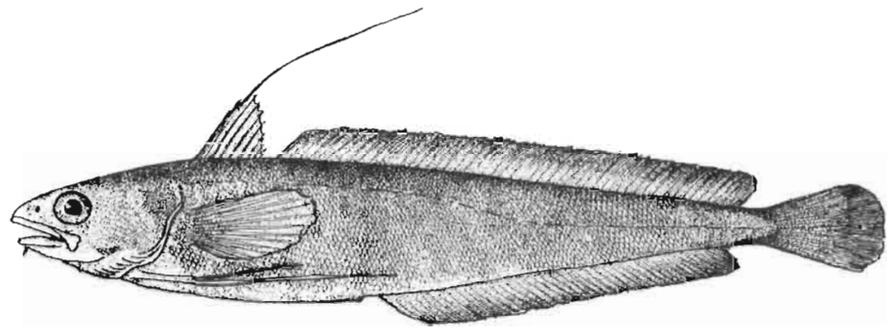
Over 200 prey species have been recorded in samples of haddock stomachs, including crustaceans, molluscs, echinoderms, annelids and fishes.

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.



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, merlucha, lingue

CODES:	ICNAF - 105	ICNAF - 186
	FAO Taxonomic-	FAO Taxonomic-
	1,**48**(04)008,**02**	1,48(04)008,03
	3 alpha ident. - HKR	3 alpha ident - HKW

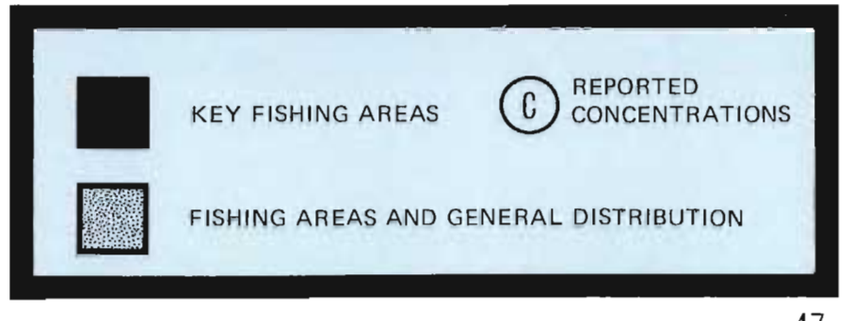
NOTE:

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 here considered together.

DISTRIBUTION:

Hake occur at depths of 2 to 990 metres from southern Labrador, south to Florida.

MAP KEY



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.

Red hake are present in small numbers off Sable Island Bank and are abundant year around on the Scotian Shelf and south-western edge of Georges Bank. Concentrations occur in Passamaquoddy Bay from mid-summer 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 presently 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 MT and 4,700 MT 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 peak spawning occurring in June. There is evidence of sporadic year around spawning on the Continental slope.

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

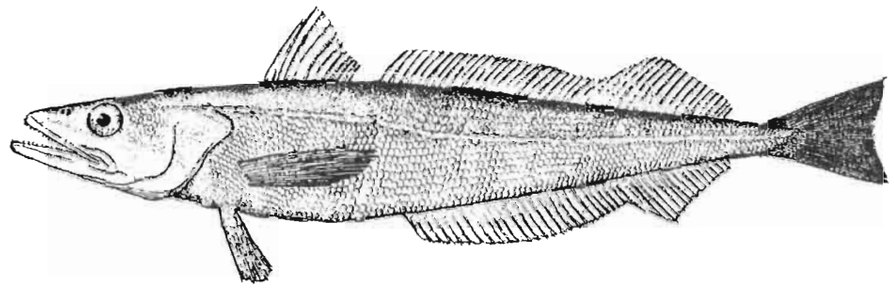
Fertilized eggs float in the sea and incubation takes approximately 2 days at 15°C. Fry remain in surface waters until they reach 3 to 5 inches at which time they settle to the bottom.

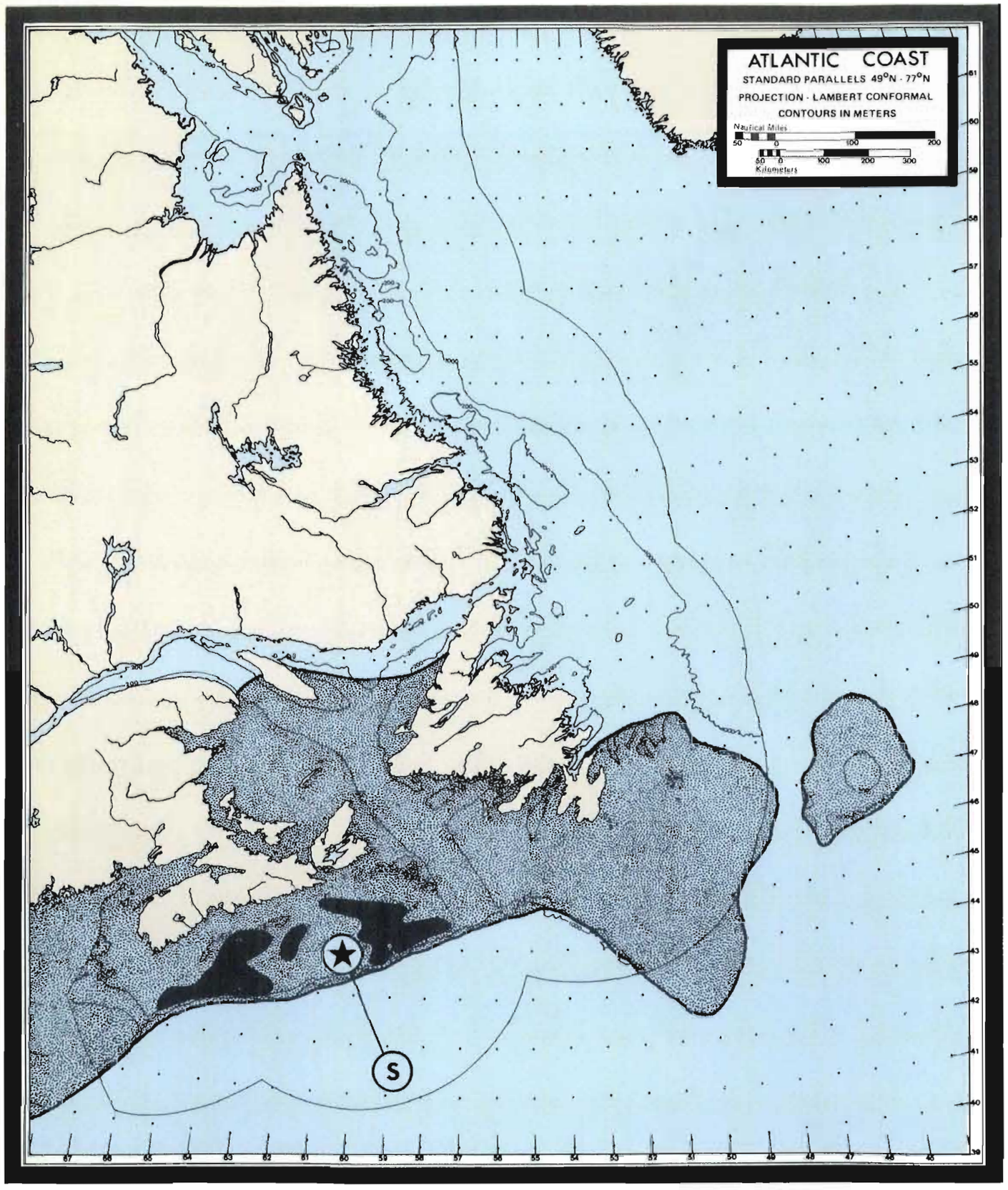
Growth appears to be relatively rapid with Bay of Fundy hake reaching a length of 39 to 47 cm in three years.

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

SILVER HAKE

Merluccius bilinearis (Mitchill, 1814)





FAMILY: Gadidae

COMMON NAMES: whiting, merlu argenté

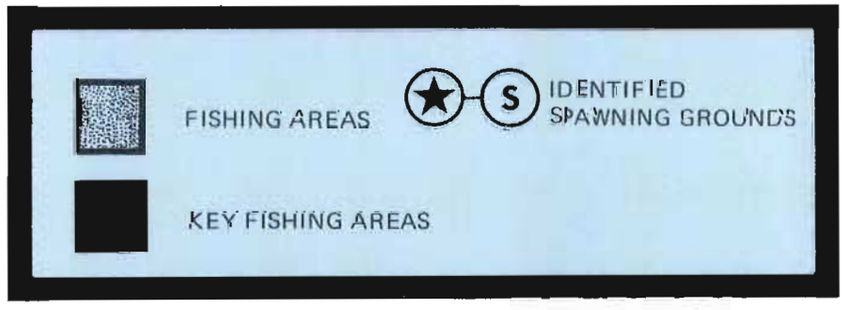
CODES: ICNAF - 104
FAO Taxonomic - 1,48(04)004,04
3 alpha ident - HKS

DISTRIBUTION:

Silver hake occur between 54 to 270 metres 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 the Georges Bank and Nantucket Shoals and on the Scotian Shelf banks. An isolated stock also exists in the Flemish Cap region.

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.

MAP KEY



FISHERY:

Exploitation of silver hake on the Scotian Shelf has been almost entirely by the U.S.S.R., Cuba being a recent entrant to the fishery. Peak catches were made in 1963 (123,000 MT) and 1973 (300,000 MT). The TAC was reduced to 70,000 MT in 1977, increased to 81,000 MT for 1978, reduced to 70,000 MT again for 1979, and raised further to 90,000 MT for 1980, the variation reflecting pronounced fluctuation in recruitment. The fishery, which is prosecuted largely with small-meshed bottom trawls, generates a substantial by-catch of young fish of other commercial species, thus having a depressant 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 manilla 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. For the purpose of this document, it is assumed that a TAC of 70,000 MT will be sustainable through 1985. The Canadian share of the 1980 TAC is 20,000 MT.

UTILIZATION:

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

GENERAL BIOLOGY:

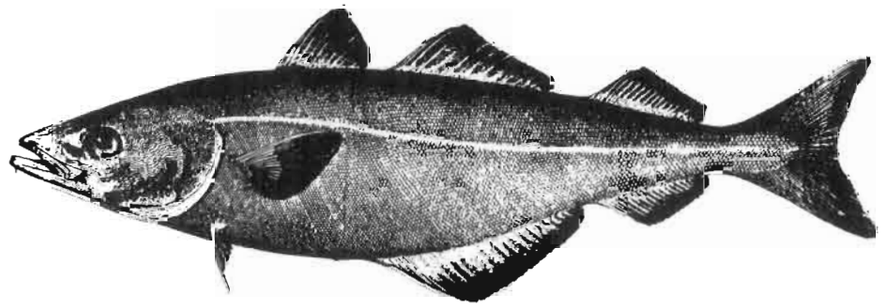
Spawning takes place from June to September over a wide area from Middle Ground and Sable Bank to the mouth of Delaware Bay.

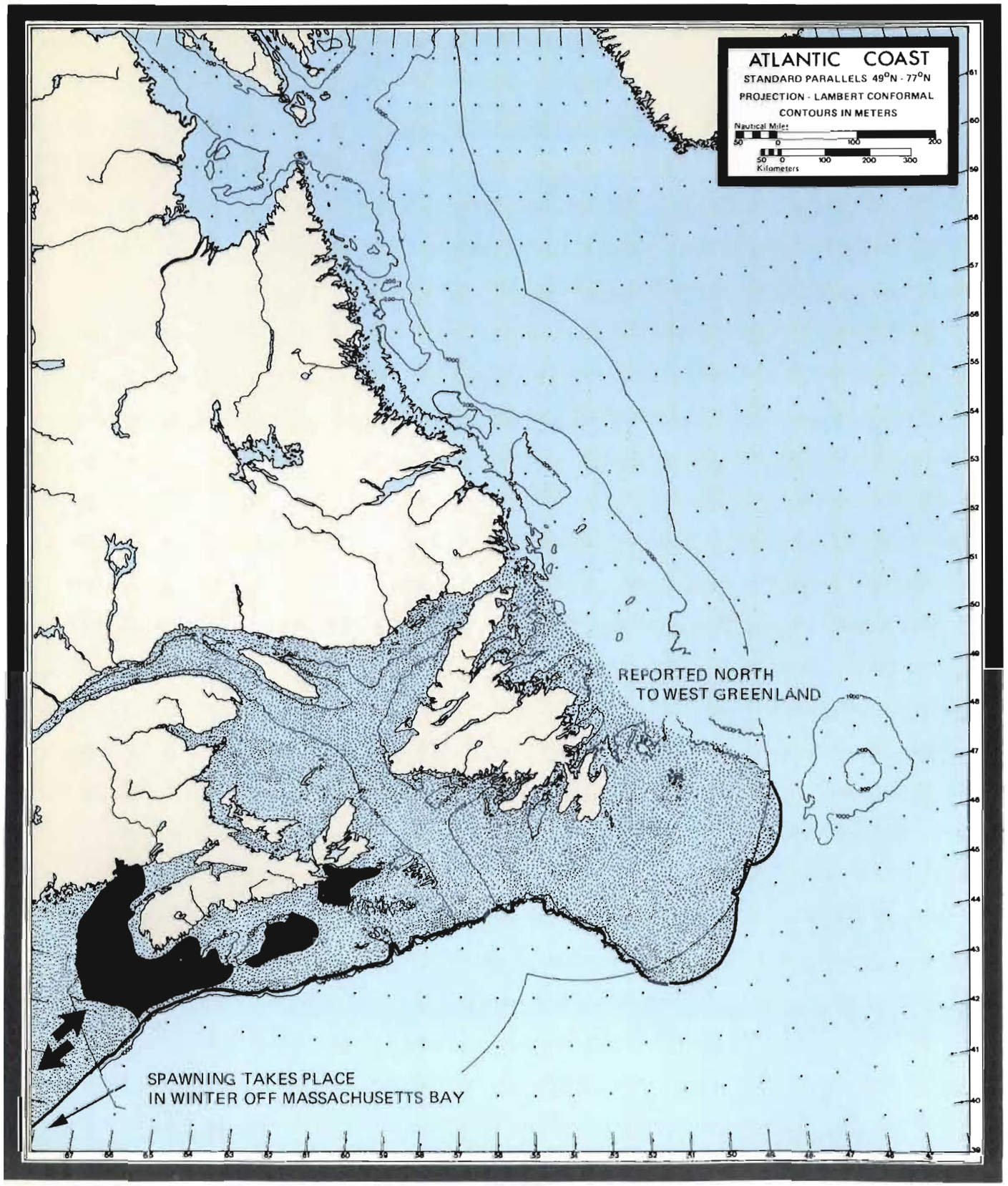
Fertilized eggs float in the water column and hatch in a few days. The fry apparently remain in surface waters until the end of their first summer or fall when they take to deeper water layers. Growth is moderately rapid and a length of 23 to 28 cm is reached in 2 years.

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

POLLOCK

Pollachius virens (Linnaeus, 1758)





FAMILY: Gadidae

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

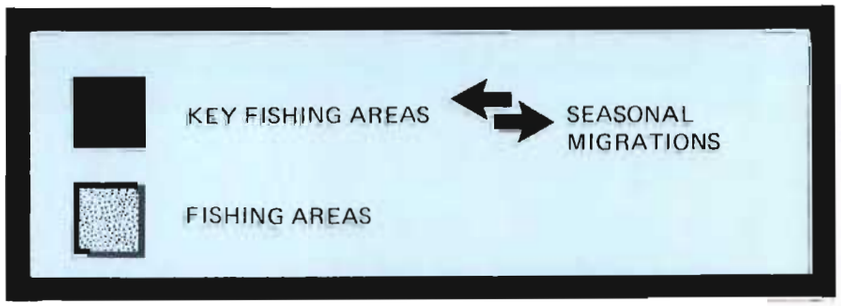
CODES: ICNAF - 106
FAO Taxonomic - 1,48(04)015,01
3 alpha ident. - POK

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 south in late spring and returning in the late fall. Small numbers overwinter in northern part of their range.

MAP KEY



FISHERY:

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

Historically, the bulk of the U.S. catch has been taken in sub-area 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, long-line, 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. There is some evidence which suggests that spawning may also occur on the Scotian Shelf and off Cape Breton. Spawning occurs from November through February and reaches a climax before winter minimum temperatures are reached.

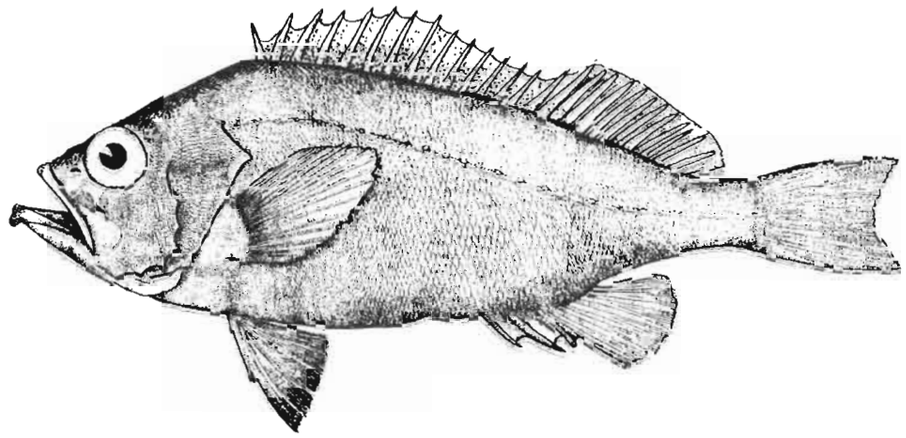
Fertilized eggs float in the water column and hatch in about 9 days at 6°C. Developing young (harbour pollock) more inshore in summer and are abundant around wharves, jetties and coastal areas of the Bay of Fundy and southwestern Nova Scotia.

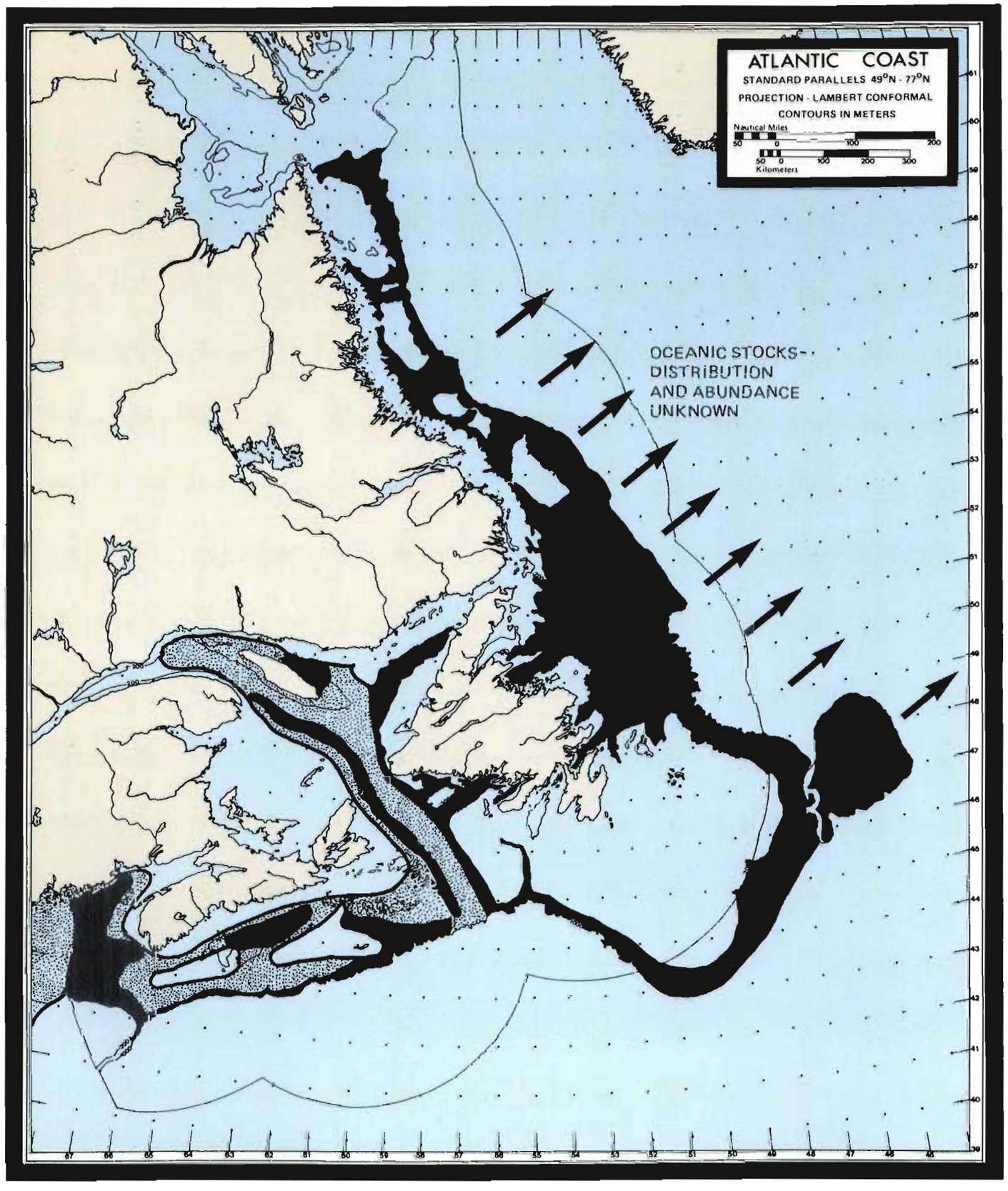
Growth is rapid during the first year of life and declines with the onset of maturity. The average length of six year old fish is approximately 65 cm.

Pollock feed on crustaceans, euphausiids, sand launce, plaice, myctophids and hake.

REDFISH

Sebastes Spp.





FAMILY: Scorpaenidae

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

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

DISTRIBUTION:

Redfish occur in gullies and on deep water slopes (108-630 metres) 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.

MAP KEY

FISHERY:

Commercial exploitation began about 1935 in the Gulf of Maine. Currently, they are fished between 100 and 180 fathoms 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 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 has been set at 35,000 MT, a level expected to be sustained over the next five years.

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

UTILIZATION:

Sold for human consumption - generally as fresh frozen fillets.

GENERAL BIOLOGY:

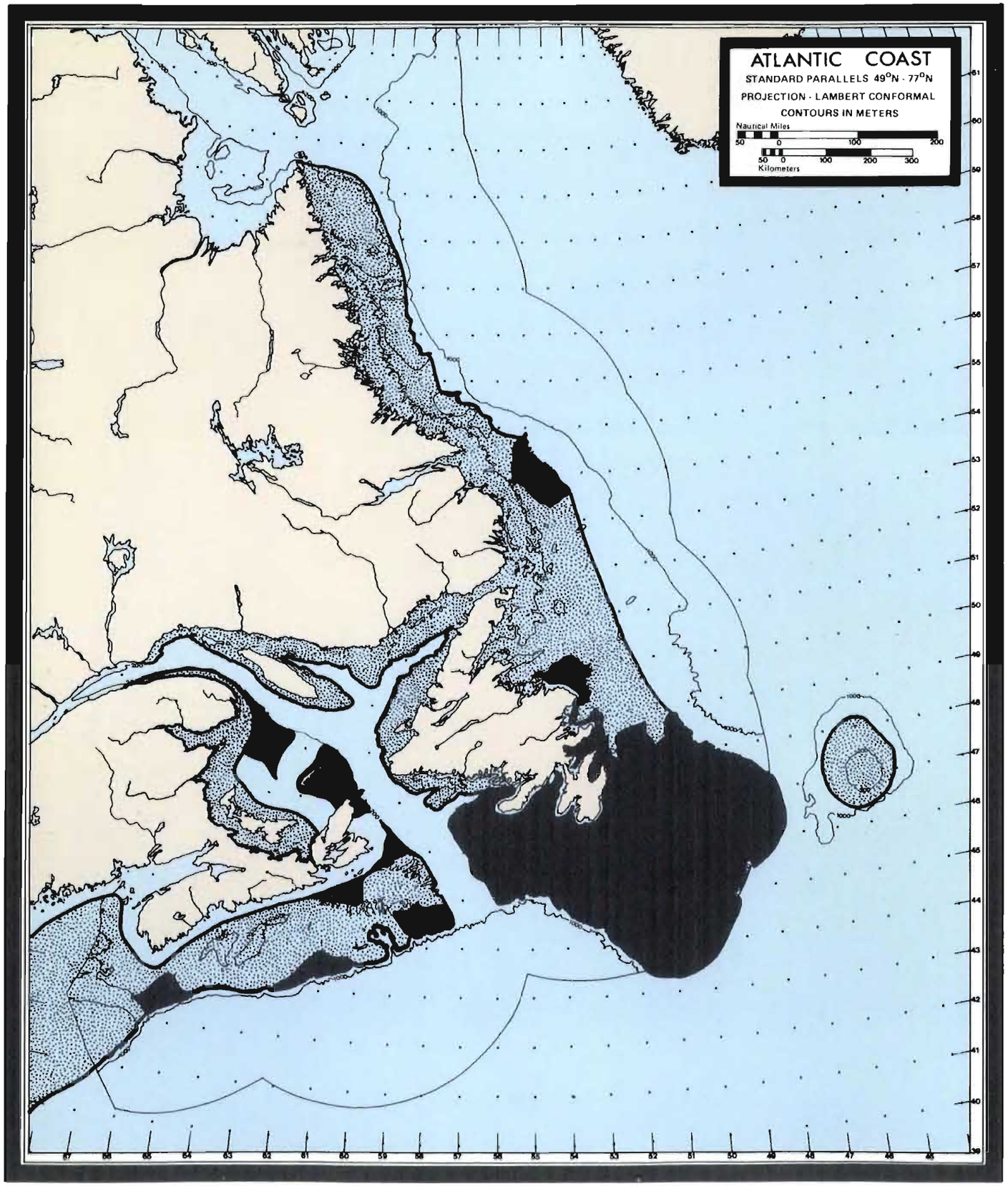
Three species of redfish *(Sebastes marinus, S. mentella* and *S. fasciatus)* occur in the northwestern Atlantic. Until recently, it was thought that catches were composed primarily of *S. marinus* and *S. mentella.* It is now recognized that the major commercial species is *S. fasciatus.*

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 pre-spawning and spawning concentrations. Fry remain in surface waters (0 to 100 metres) 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.

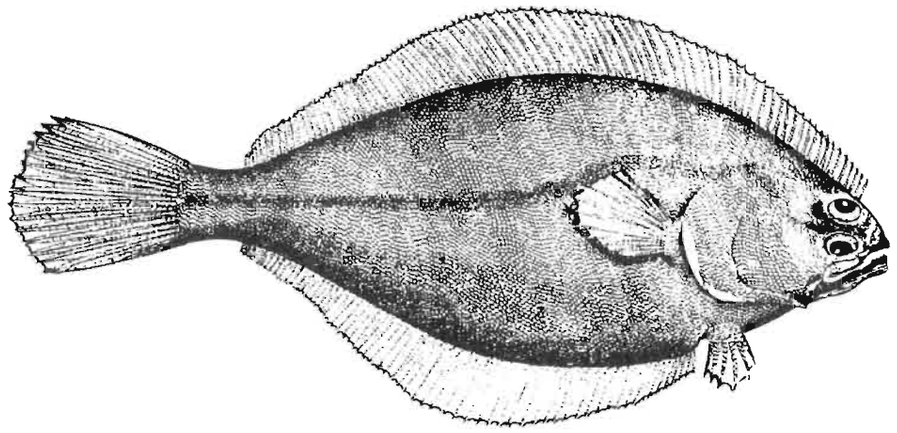
Prey species utilized by redfish include: euphausiids, small fish, decapods, copepods, and amphipods.

Principal predators are halibut and cod.



AMERICAN PLAICE

Hippoglossoides platessoides (Fabricius, 1780)



FAMILY: Pleuronectidae

COMMON NAMES: Canadian plaice, plaice, dab, sand dab, black back, flounder, sole, plie.

CODES: ICNAF - 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 36 to 702 metres 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.

MAP KEY

FISHERY:

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

In the Labrador - Northeast Newfoundland area, catches have averaged 8,000 MT. The TAC was reduced to 6,000 MT 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 were made as by-catches 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. The TAC is not likely to exceed 6,000 MT in the immediate future.

On the Grand Banks, catches declined from a peak of 94,000 MT in 1967 to 43,000 MT in 1975. Under a TAC of 47,000 MT in 1976-80 some rebuilding of the stock is expected to occur which should allow long-term yields of up to 58,000 MT over the next decade. Reduction of cod quotas in the area (and hence of plaice by-catch) may speed rebuilding of the stock.

Nominal catches on Flemish Cap decreased from 4,000 - 5,000 MT in 1965-66 to 1,500 MT in 1974-77. A pre-emptive TAC of 2,000 MT was set in 1974. This was raised to 4,000 MT in 1978 but was reduced to 2,000 MT again for 1979 and1980. The TAC is likely to remain at this level to 1985. However, since this species is taken mainly as a by-catch in the cod fishery increased cod catches could result in reductions in stock biomass for this species also.

With the exception of 1973 when 15,000 MT were taken on St. Pierre Bank, the 1975-77 was approximately 5,000 MT. Since 1974, the stock has been regulated by quota; an initial TAC of 11,000 MT was reduced progressively to 4,000 MT 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 MT 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 to July depending on the locality. Fertilized eggs float near the surface and hatch in 11 to 14 days at 5°C.

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

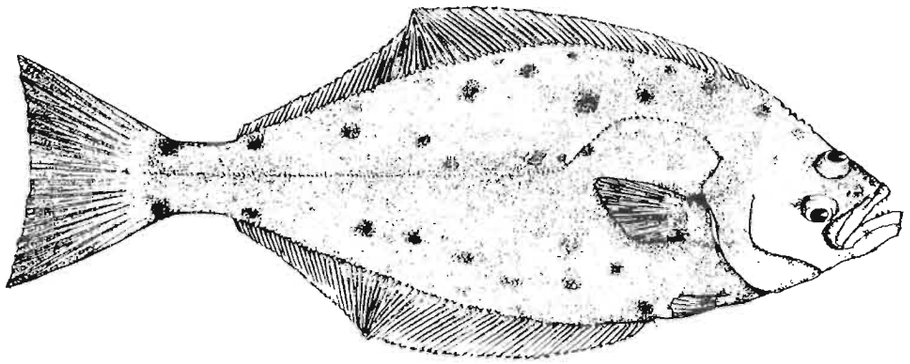
Passamaquoddy Bay - 39 cm
Southern Gulf of St. Lawrence - 22 cm
Bay of Islands, Newfoundland - 14 cm
Grand Bank - 30 cm

Prey species for fry and small plaice include diatoms, copepods, amphipods, crustaceans, Caprellids, mysids and shrimp. Larger plaice eat sand dollars, sea urchins, brittlestars, pelecypods, gastropods, shrimp, worms, sea squirts and, occasionally, capelin, sand launce, 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

CODES: ICNAF - 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 extending 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.

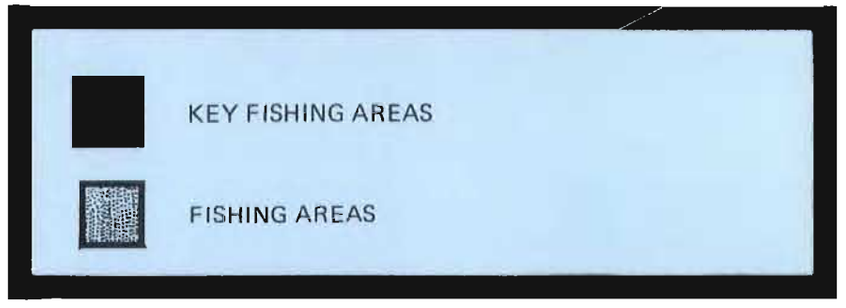
Although tagged fish have travelled as far as 2,574 km, seasonal population shifts appear to be restricted to movements into shallow water areas in summer and movement to deeper water in winter.

FISHERY:

Although halibut are a highly valued food fish, landings are largely a by-catch from other fisheries and landing values are combined with other unregulated species. The fishery is concentrated in Subareas 3 and 4 and total annual landings from both areas have rarely exceeded 15,000 MT.

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

MAP KEY



UTILIZATION:

Sold for human consumption - fresh and frozen.

GENERAL BIOLOGY:

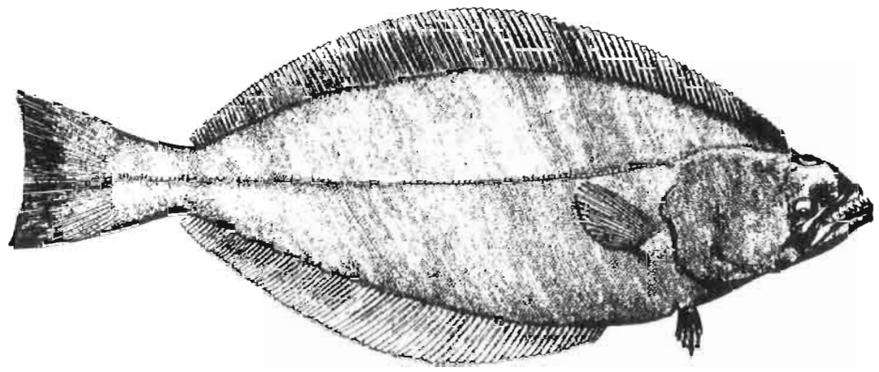
Available information suggests that spawning takes place in late winter and early spring at depths of over 180 metres. The eggs are buoyant and drift at depths greater than 54 metres. Incubation takes 16 days at about 6°C. It is not known how long the larvae remain pelagic.

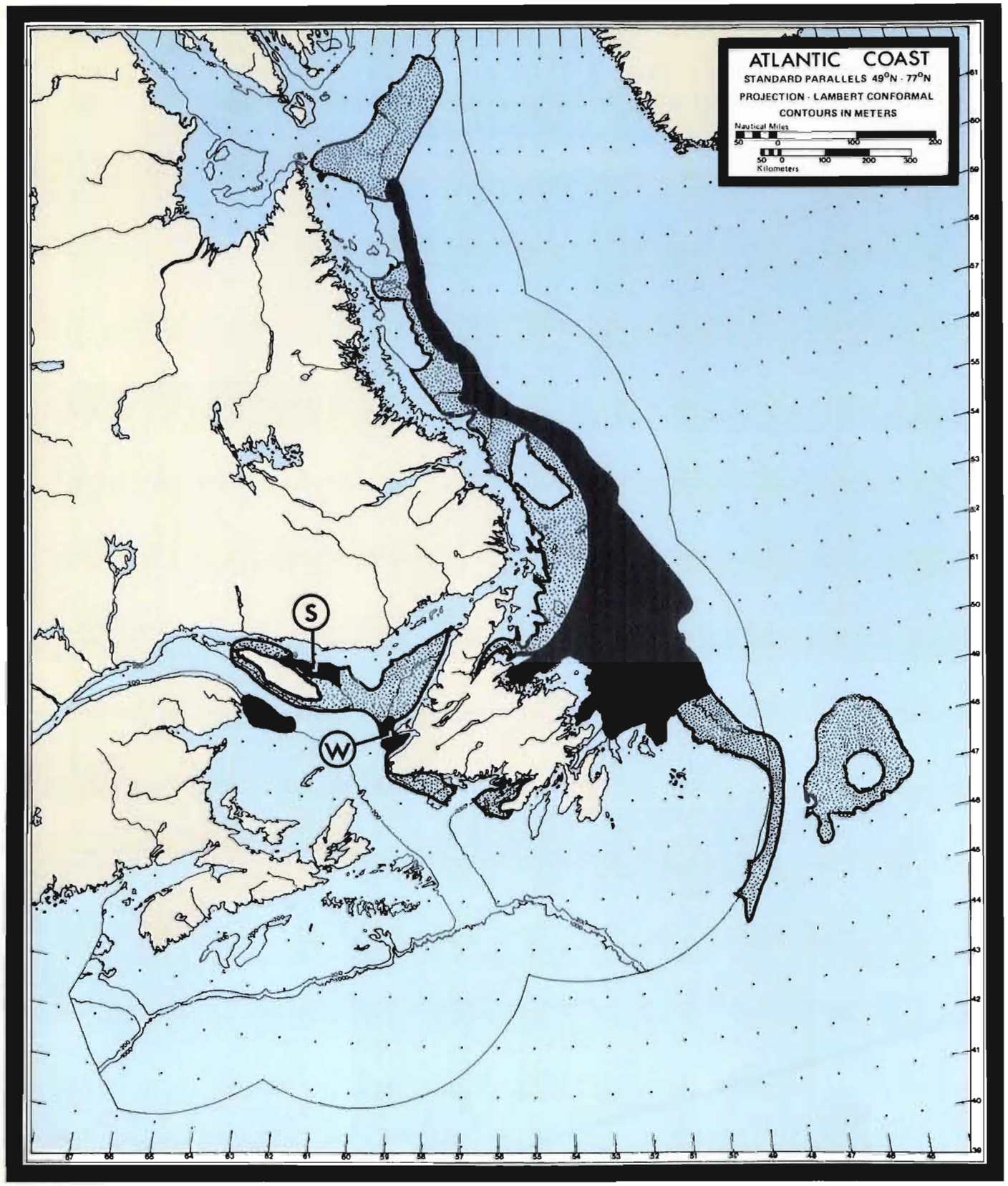
Adults grow to an average size of 25 to 102 Kg. and may reach a length of 2.4 metres and a weight of 200 Kg. or more.

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

GREENLAND HALIBUT

Reinhardtius hippoglossoides (Walbaum, 1792)





FAMILY: Pleuronectidae

COMMON NAMES: turbot, Newfoundland turbot

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

DISTRIBUTION:

Greenland Halibut occur at depths greater than 540 metres 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 distance, possibly in relation to spawning activity when mature fish move from deep coastal bays to deep water on the continental slope.

Spawning takes place over the entire area of major distribution.

FISHERY:

Presently the best fishing localities are just south of Hamilton Inlet

MAP KEY

Bank, Notre Dame Bay, Trinity Bay and the Funk Island area,

The Gulf of St. Lawrence fishery has been increasing in recent years. Landings were about 1,100 MT in 1970, but declined in 1972 and then increased by stages to 2,000 MT in 1976. In 1977 landings doubled to 4,000 MT. 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 MT from 1972 to 1975, with a 1978 catch of 38,500 MT. 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 to 1979 at 30,000 MT but has been increased to 35,000 MT for 1980, and subject to additional information, could continue at this level through the early 1980's.

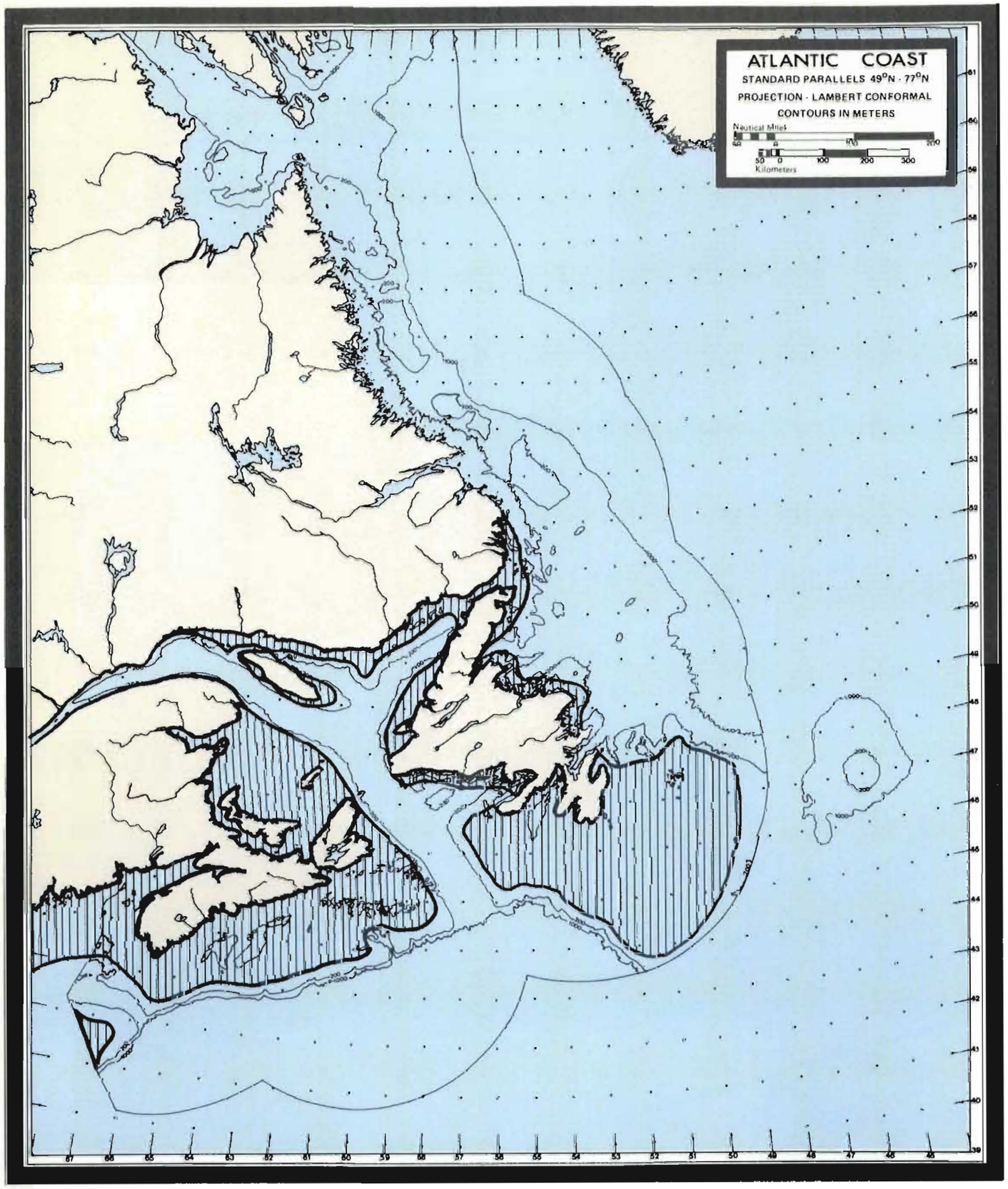
This species is taken by longline, gillnet and deep-water trawl.

UTILIZATION:

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

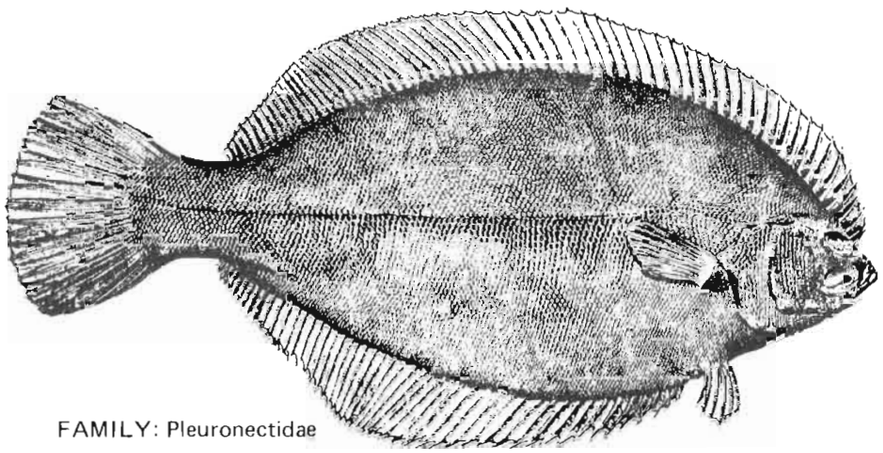
GENERAL BIOLOGY:

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 metres), 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: ICNAF - 122
FAO Taxonomic - 1,83(02)050,03
3 alpha ident. - FLW

Winter flounder occur from tide mark to 140 metres 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.

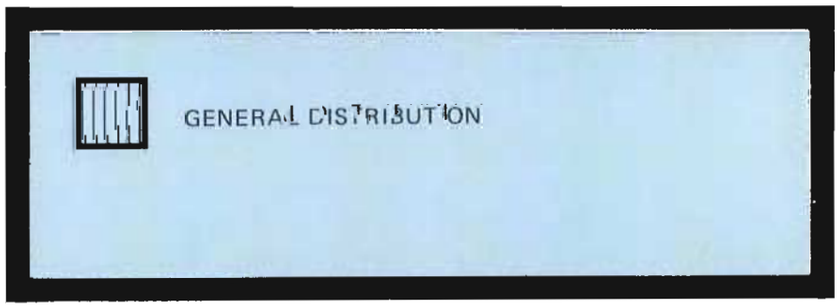
Seasonal changes in distribution appear to be limited to offshore movements to deeper water in winter and inshore movements to shallow water in summer.

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, 5, and 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.

MAP KEY



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.

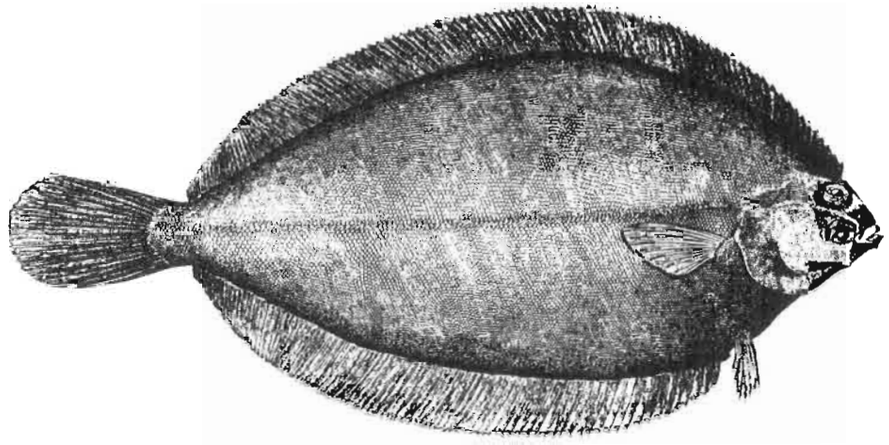
GENERAL BIOLOGY:

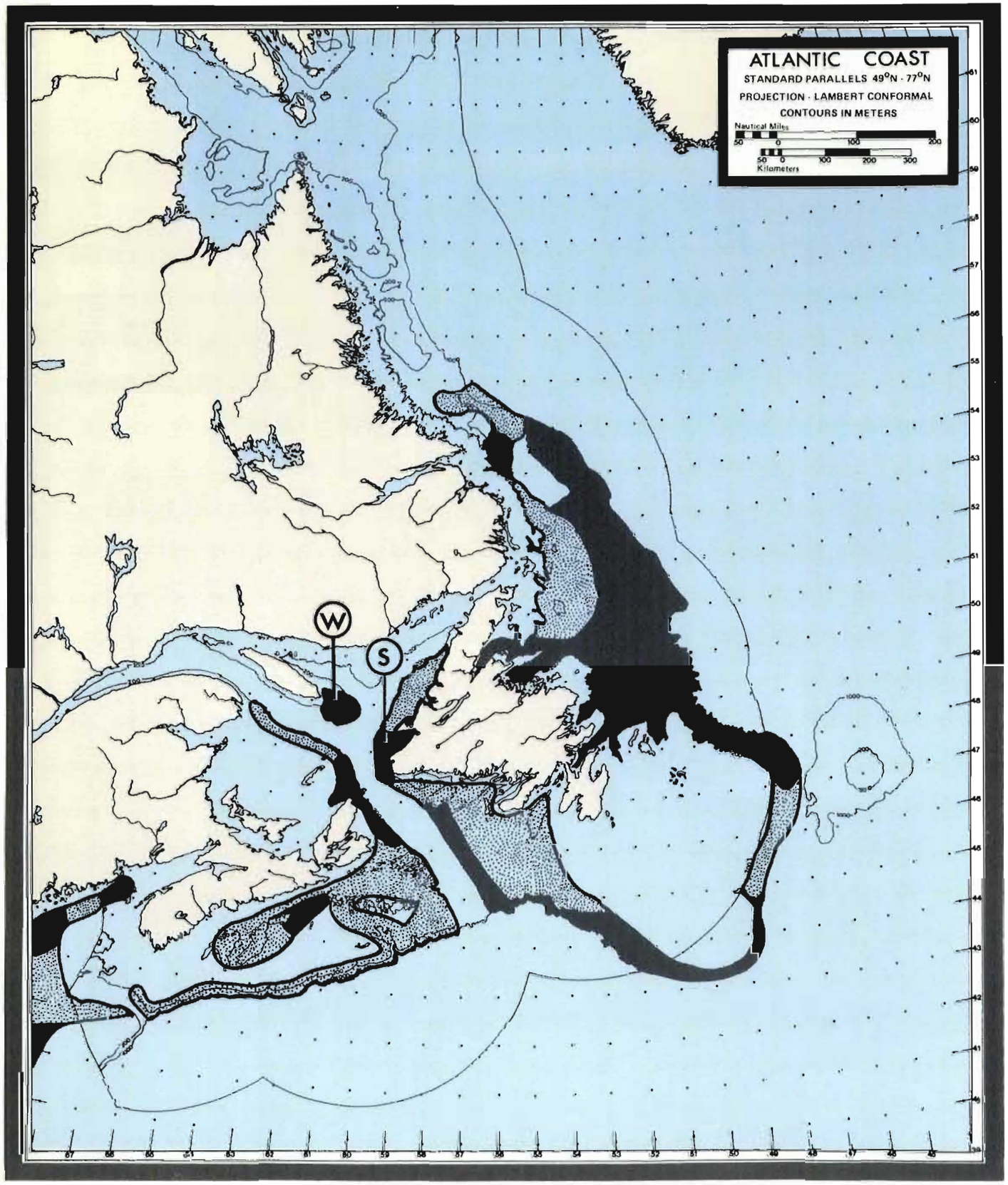
Spawning takes place in late winter and spring on shallow sandy bottom. The eggs sink to the bottom where they stick together in clusters. Incubation takes 15 to 18 days at approximately 3°C. Metamorphosis takes about 2½ to 3½ months at which time the fry have taken on the typical flatfish form. Adults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

Principal prey includes amphipods, isopods, worms, clams, snail eggs, crab, shrimp and some algae.

WITCH FLOUNDER

Glyptocephalus cynoglossus (Linnaeus, 1758)





FAMILY: Pleuronectidae

COMMON NAMES: gray sole, Craig fluke, pole flounder, flet

CODES: ICNAF - 114
FAO Taxonomic - 1,83(02)001,02
3 alpha ident. - WIT

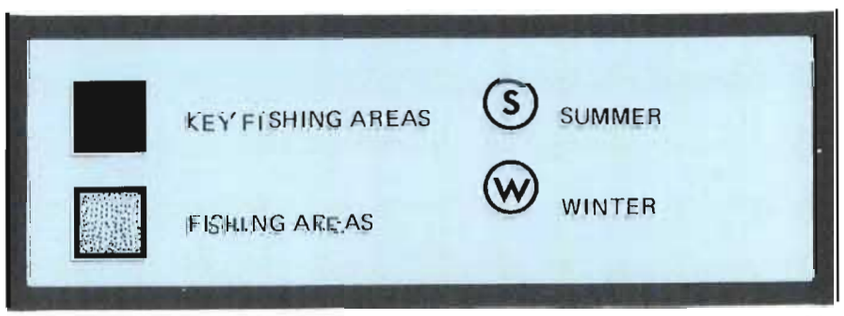
DISTRIBUTION:

Witch flounder occur principally at depths of 45 to 270 metres 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 virtually no fishery in these areas. However, from that time on, the industry flourished with huge catches being reported by Canadian, Russian and Polish fleets. Presently the fishery is almost

MAP KEY



totally dominated by Canadian vessels. Historically, the witch flounder was regarded as a by-catch to the foreign fleets and no accurate records were kept. Although stocks are somewhat depleted, the present TAC for witch flounder should enable the stocks to rebuild by the early 1980's.

In the Labrador - North Grand Banks area nominal catches increased from 4,400 MT in 1961 to 24,000 MT in 1973 followed by a decline to 6,900 MT in 1978. A TAC of 22,000 MT was first introduced in 1974, but has since been reduced to 17,000 MT. Prior to 1977, the Canadian fishery was mostly inshore, 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 MT in 1971 to 6,000 MT during 1975-1977 and as low as 3,500 MT in 1978, despite a TAC of 10,000 MT in effect since 1974. This shortfall has apparently occurred because witch flounders in this division have, until recently, been largely a by-catch of other fisheries. The TAC for 1979 and 1980 was reduced to 7,000 MT 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.

On the south coast of Newfoundland, nominal catches declined from 1,500 to 3,000 MT during 1971-1974 to 900 MT in 1976 but increased to 4,200 MT in 1977, and fell again to 1,000 MT in 1978. The information presently available indicates that the long-term average yield from the stock should be about 3,000 MT.

In the northern and eastern Gulf of St. Lawrence, catches have averaged 2,600 MT since 1967, and have fluctuated between 900 MT and 5,300 MT during 1973-78. The TAC in 1977 and 1978 was 3,500 MT but was raised to 5,000 MT for 1979 following some excellent, although localized, winter fishing success. This TAC has been continued in 1980. In the southern and western Gulf, long-term catch has averaged 2,500 MT 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 MT was taken on the Scotian Shelf in 1968 but only 6,000 MT in 1970; fluctuations were largely due to variation in the reported U.S.S.R. catch. The 1978 catch was 1,800 MT.

Witch flounder are taken by otter trawl and Danish seine.

UTILIZATION:

Sold for human consumption as fresh and frozen fillets.

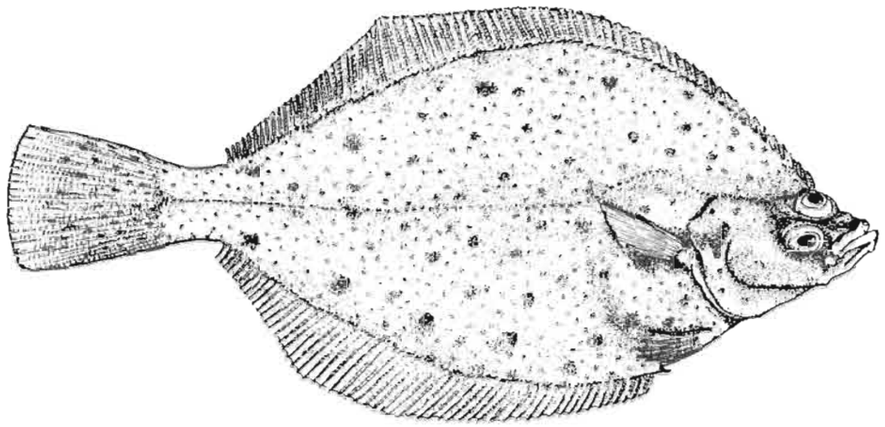
GENERAL BIOLOGY:

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

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

YELLOWTAIL FLOUNDER

Limanda ferruginea (Storer, 1839)



FAMILY: Pleuronectidae

COMMON NAMES: yellowtail flounder, rusty dab, yellowtail, queue jaune, sériole.

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

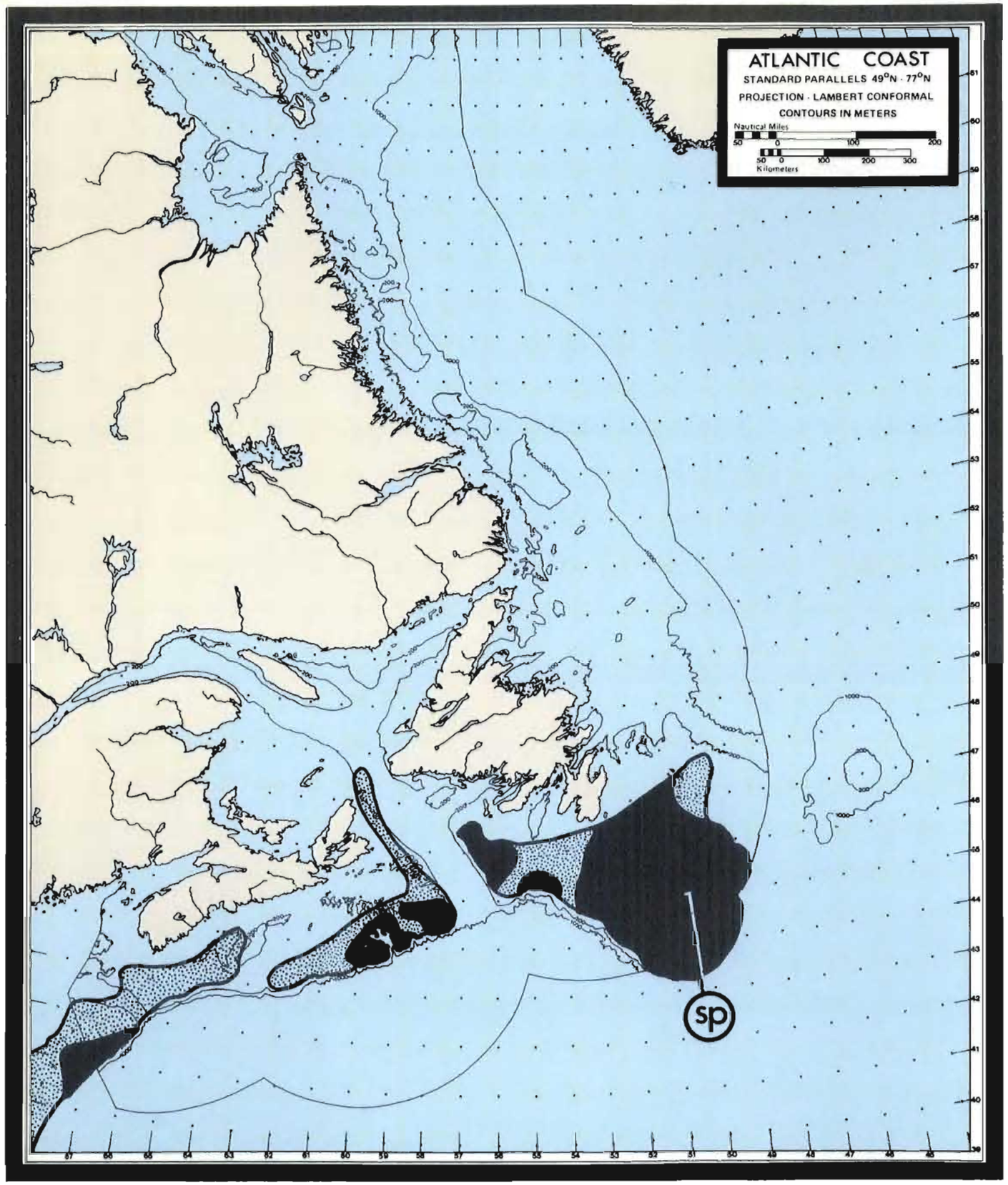
DISTRIBUTION:

Yellowtail occur on the continental shelf at depths of 9 to 108 metres 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 by-catch but due to reduction of



MAP KEY

numbers of other flatfish, they soon became of major importance in some areas.

Catches on the Scotian Shelf decreased from 9,400 MT in 1963 to 1,000 MT in 1976 and 1,500 MT 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 MT within 5-10 years.

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

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

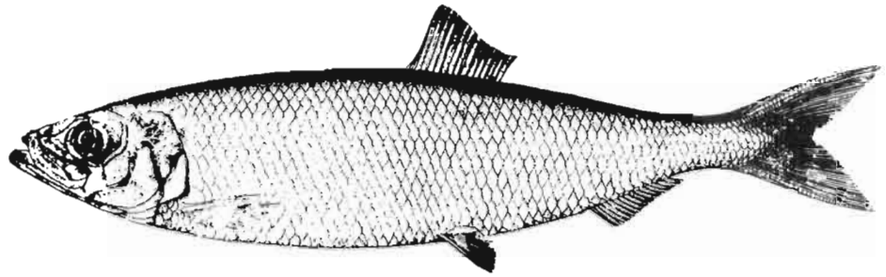
GENERAL BIOLOGY:

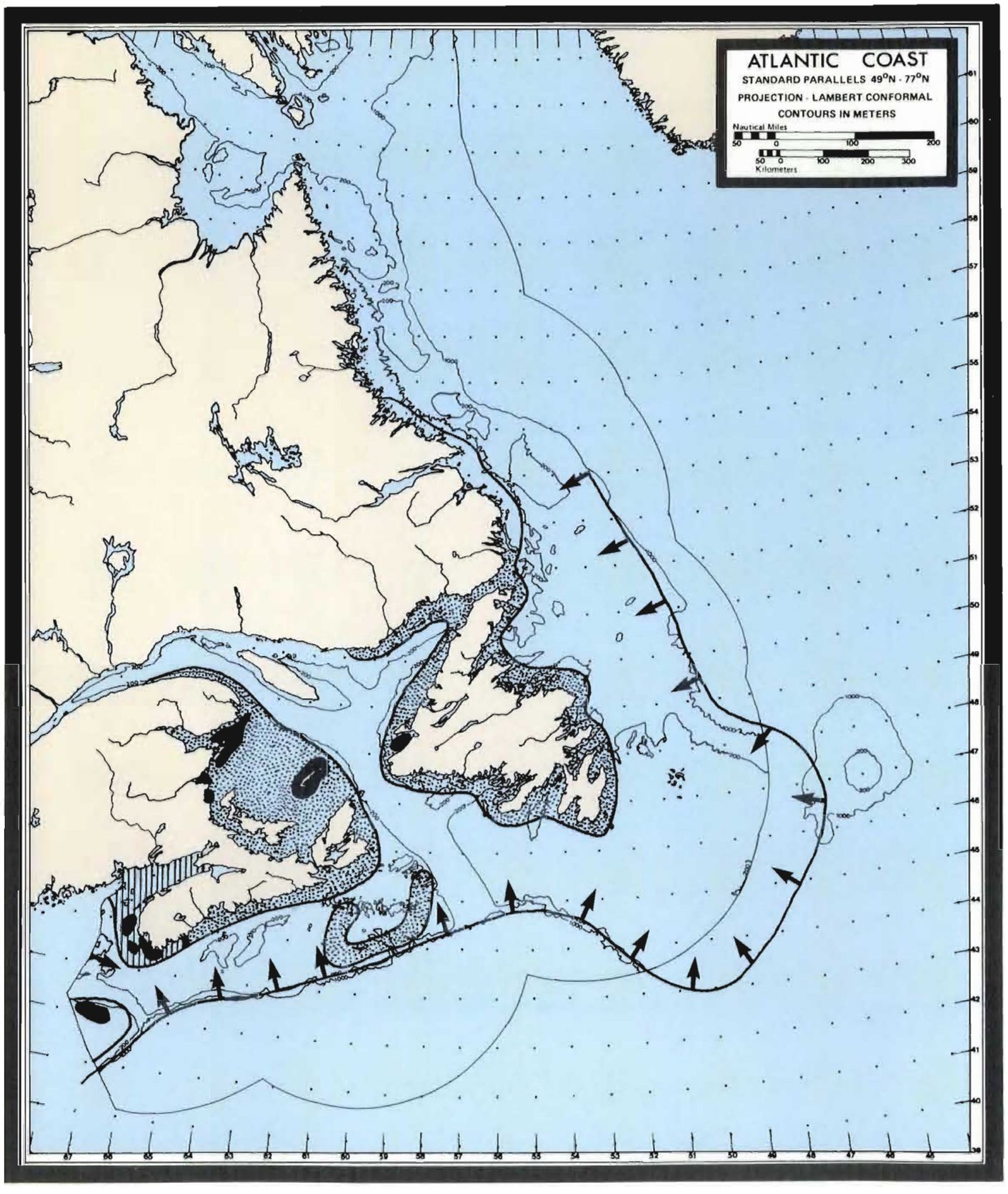
Spawning takes place between April and July depending on the locality. The eggs are buoyant and float to the surface where they hatch in 5 days at 10-11°C. Yellowtail reach a length of approximately 30 cm in 5 years and attain a maximum age of 11 years or more.

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

HERRING

Clupea harengus harengus Linnaeus, 1758





FAMILY: Clupeidae

COMMON NAMES: sea herring, sardine, hareng, hareng altantique

CODES: ICNAF - 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. Presently, although herring are caught in Atlantic waters over a wide area, the existing fishery is mostly inshore and it has not been necessary to exploit the offshore potential to supply existing

MAP KEY

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

The Gulf of St. Lawrence stock is returning to long-term average size now that the exceptionally abundant 1958 and 1959 year-classes have passed through the fishery. Assuming subsequent year-classes are average, catches should recover, following the heavy exploitation of the early 1970s, to provide catches approaching 75,000 MT by 1985.

Catches from the northeastern Scotian Shelf have declined from over 15,000 MT in the early 1970s to less than 4,000 MT 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 interrelationships.

In the Bay of Fundy and southwestern Scotian Shelf area, the adult stock is at an historical low. The 1978 catch of 89,000 MT was under the TAC of 20,000 MT, while the catch in 1979 fell short of the TAC by 33,000 MT. However, there is strong evidence of a good year-class (that of 1976) entering the fishery and the catch should reach 90,000 MT in 1981. If future recruitment is similar to that since the early 1960s a sustained yield of around 140,000 MT is possible.

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

UTILIZATION:

Sold for human consumption - fresh, frozen, salted 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 to November) with spring spawning taking place near shore and summer and fall spawning apparently taking place offshore. Fertilized eggs sink to the bottom 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 "nursing areas" such as the Bay of Fundy.

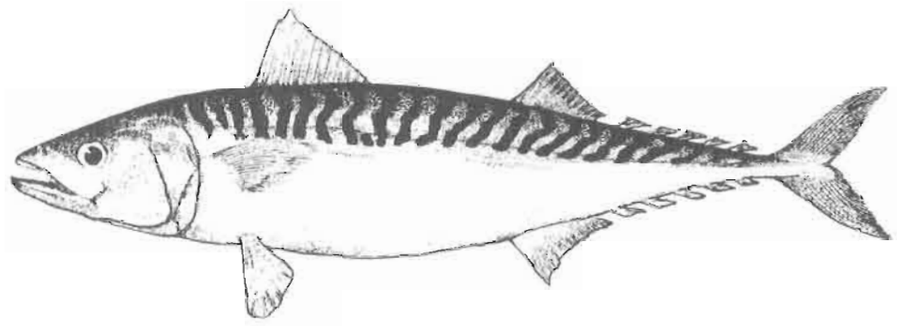
Adult growth varies from locality to locality. Herring from the outer coast of Nova Scotia average 35 cm in length at 9 years.

Principal prey includes copepods, euphausiids, mollusc larvae, fish eggs, arrow worms, pteropods, the larvae of sand launce, silversides, 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

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

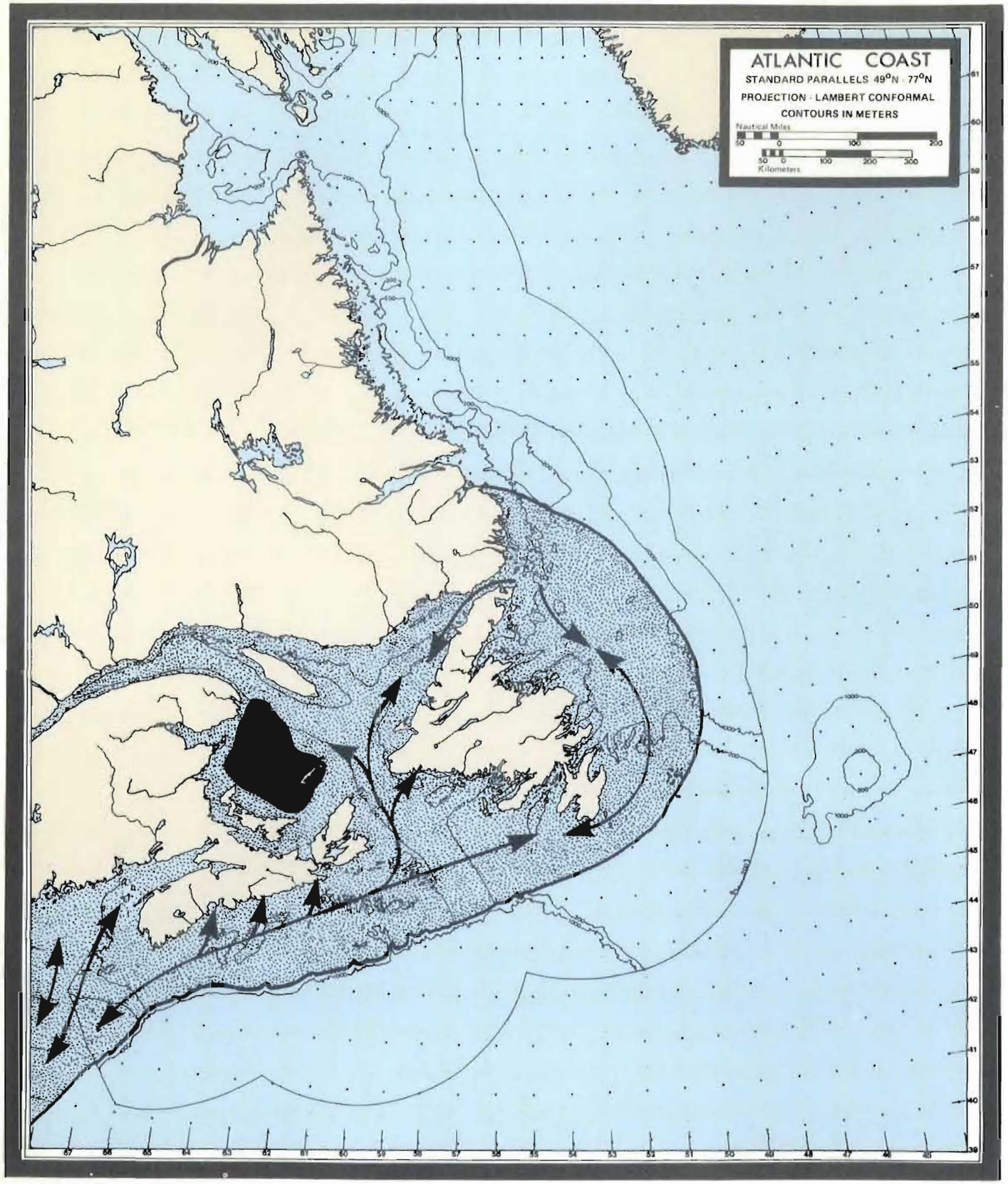
DISTRIBUTION:

Atlantic mackerel occur from inshore waters to the edge of the continental shelf from Triangle Harbour, Newfoundland south to Cape Hatteras. Concentration may be found, during summer, at any locality within its 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 de-



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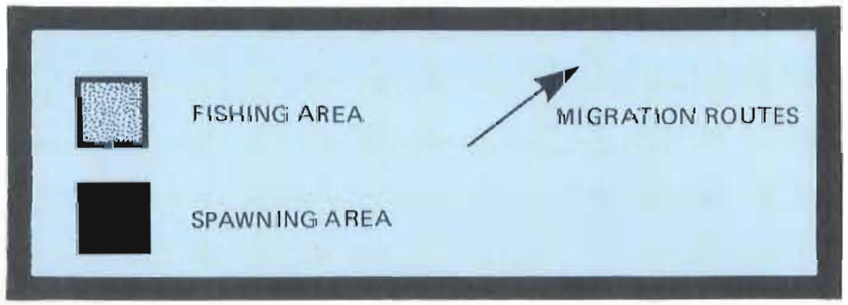


gree of mixing and relative contribution to the fishable stock are not yet known. Considerable difficulty exists in determining population sizes and mortality rates for this stock but an increase in abundance is expected following reduction of fishing effort on the overwintering stocks off southern New England. Depending on where and when the fish are caught, the TAC could reach 300,000 MT in the early 1980s. 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 to 45,000 MT, with an average catch of 30,000 MT.

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

UTILIZATION:

Sold for human consumption - fresh, frozen, salted and smoked.

GENERAL BIOLOGY:

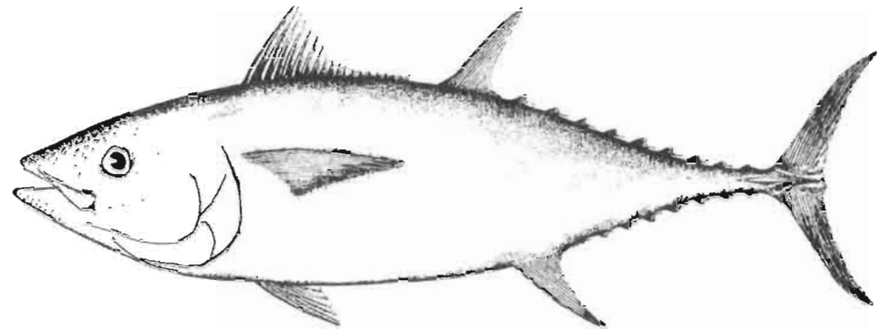
Spawning takes place from May to early July in Canadian waters. Fertilized eggs are buoyant and float in the upper 18 metres of the water column. Incubation takes 9 days at 10°C.

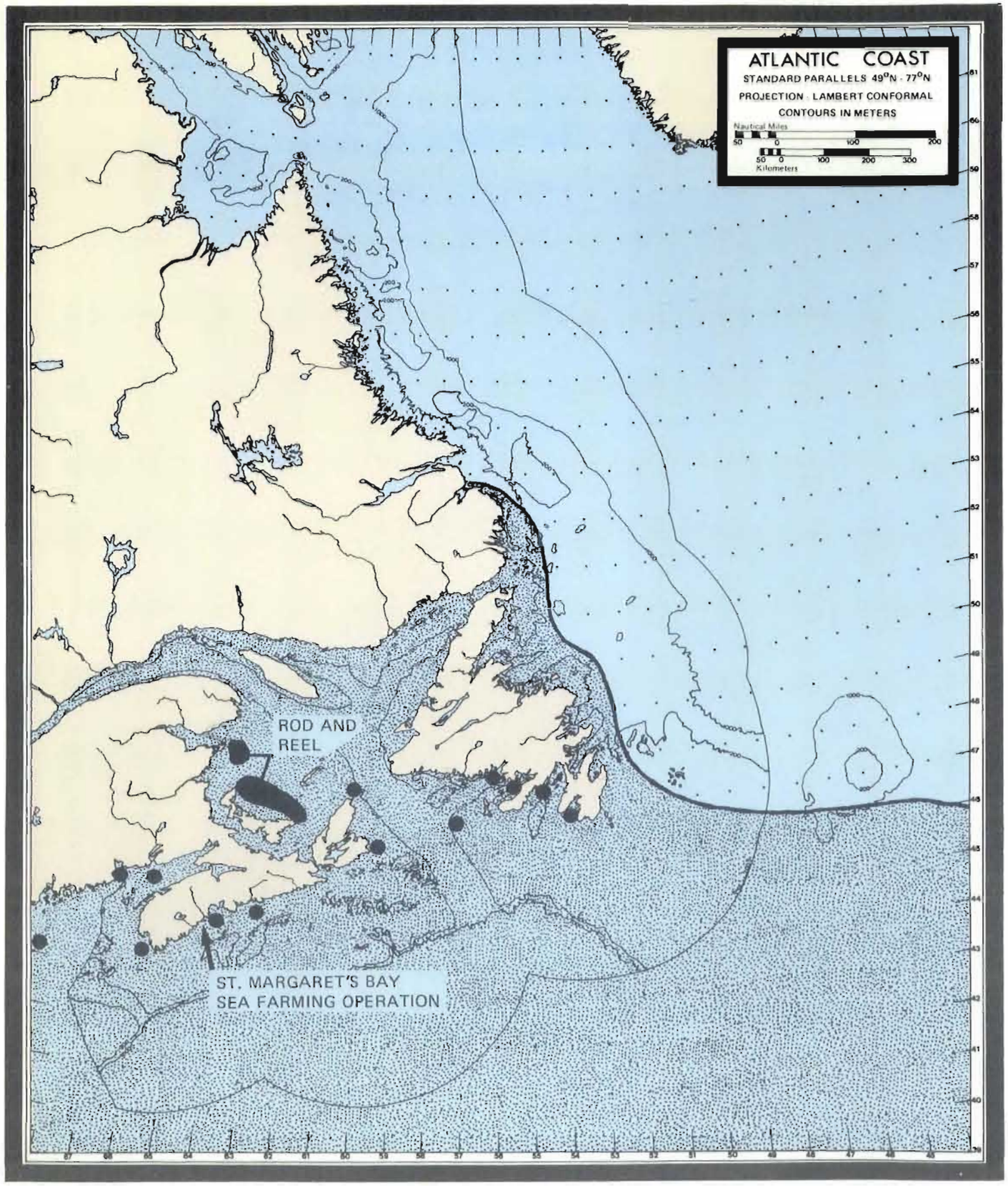
Early growth is rapid with the larvae reaching 5 cm in length in two months and 26 cm in a year. Subsequent growth is slower; six year old fish average 41 cm in length and those 8 years old are just under 45 cm in length.

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

BLUEFIN TUNA

Thunnus thynnus (Linnaeus, 1758)





FAMILY: Scombridae

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

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

DESTRIBUTION:

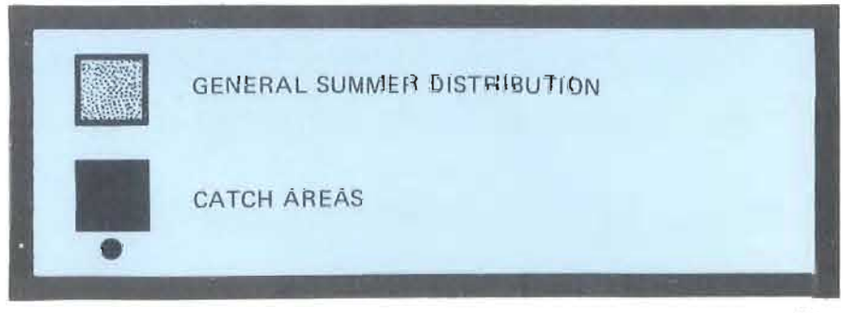
The bluefin tuna is a highly migratory species which occurs from inshore waters to the open Atlantic from Notre Dame Bay in Newfoundland southward to the West Indies.

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 south coast of Newfoundland. They occur in Canadian waters from spring to fall.

FISHERY

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

MAP KEY



The Canadian fishery currently depends almost entirely on older giant fish that migrate into Canadian waters in the summer. Large scale diversion of foreign fishing effort from the eastern Atlantic in recent years has increased the catches of larger fish and the danger of an adverse affect on the reproductive potential of all 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, longline, traps, floating trawl and, occasionally, in weirs. A sport fishery using rod and reel was previously located off southwestern Nova Scotia, but the centre 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 to Japanese markets.

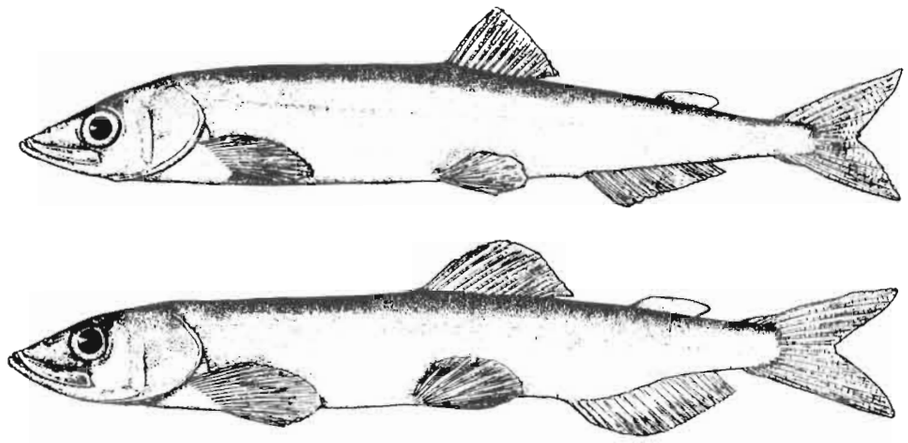
GENERAL BIOLOGY:

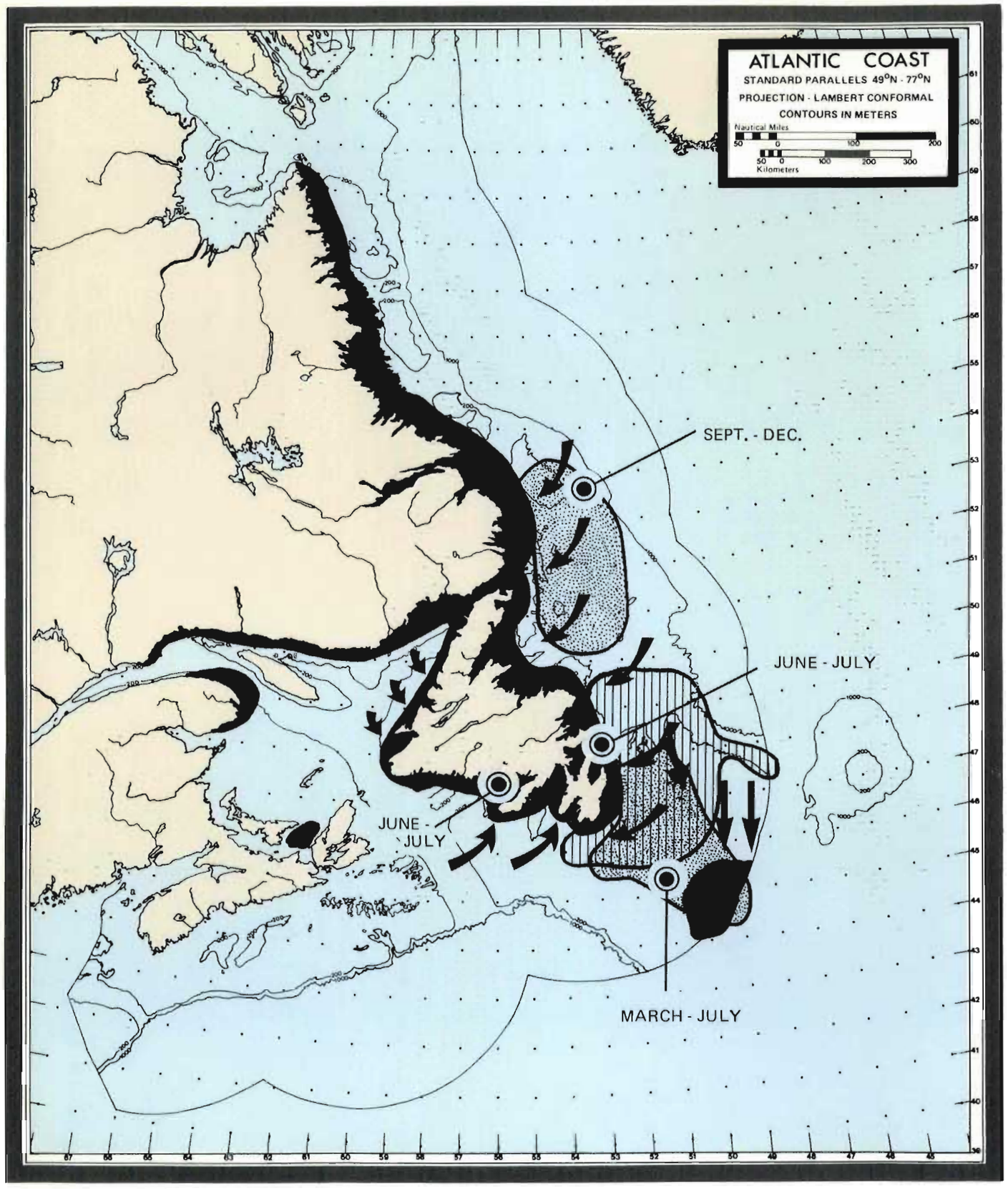
It is unlikely that spawning occurs in Canadian waters. In the western Atlantic, giant bluefin spawn in an area from the Caribbean to the Bahamas in spring and then follow the Gulf Stream northward, appearing off the Massachusetts coast in June and from Maine to Newfoundland shortly thereafter. Medium 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, occasionally, large fish such as redfish.

CAPELIN

Mallotus villosus (Müller, 1777)





FAMILY: Osmeridae

COMMON NAMES: caplin, lodde

CODES: ICNAF - 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 and commercial concentrations of adults occur from the Grand Bank north to Hamilton Inlet Bank. Seasonal changes in distribution take place in association with spawning activity. On the Grand Bank, migrations 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.

MAP KEY

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 have been most successful although 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 dogfood. Landings were as high as 25,000 MT for the Newfoundland area. Since 1950, landings of capelin have declined continuously to about 5,000 MT 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 dogfood. Inshore landings of capelin in 1973 increased substantially because of the increase in demand for female capelin with roe, fish meal and as a product for human consumption.

In 1973 the U.S.S.R. caught an estimated 212,000 MT and Norway 41,000 MT off the Canadian Atlantic coast; about 60 percent of the Soviet catch was taken off northeast Newfoundland and Labrador.

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 MT in 1978 to a long-term average of 200,000 MT.

Annual catches of approximately 8,000 MT have been realized in the Gulf of St. Lawrence in 1978 and 1979, and, provided that fishing is not concentrated on local spawning groups, could be increased to 20-25,000 MT.

GENERAL BIOLOGY:

Spawning takes place in June and July and occasionally in late August, principally at night when water temperatures are between 4.5° and 8.3°C. This species exhibits both demersal offshore spawning and inshore spawning on course 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.

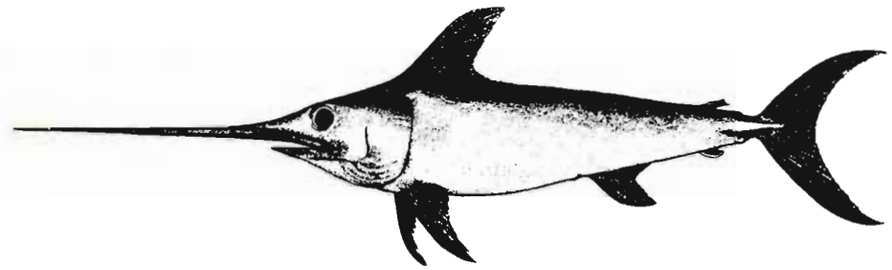
Capelin may reach sexual maturity as early as age group 2, but for the most part maturity occurs at age groups 3 and 4.

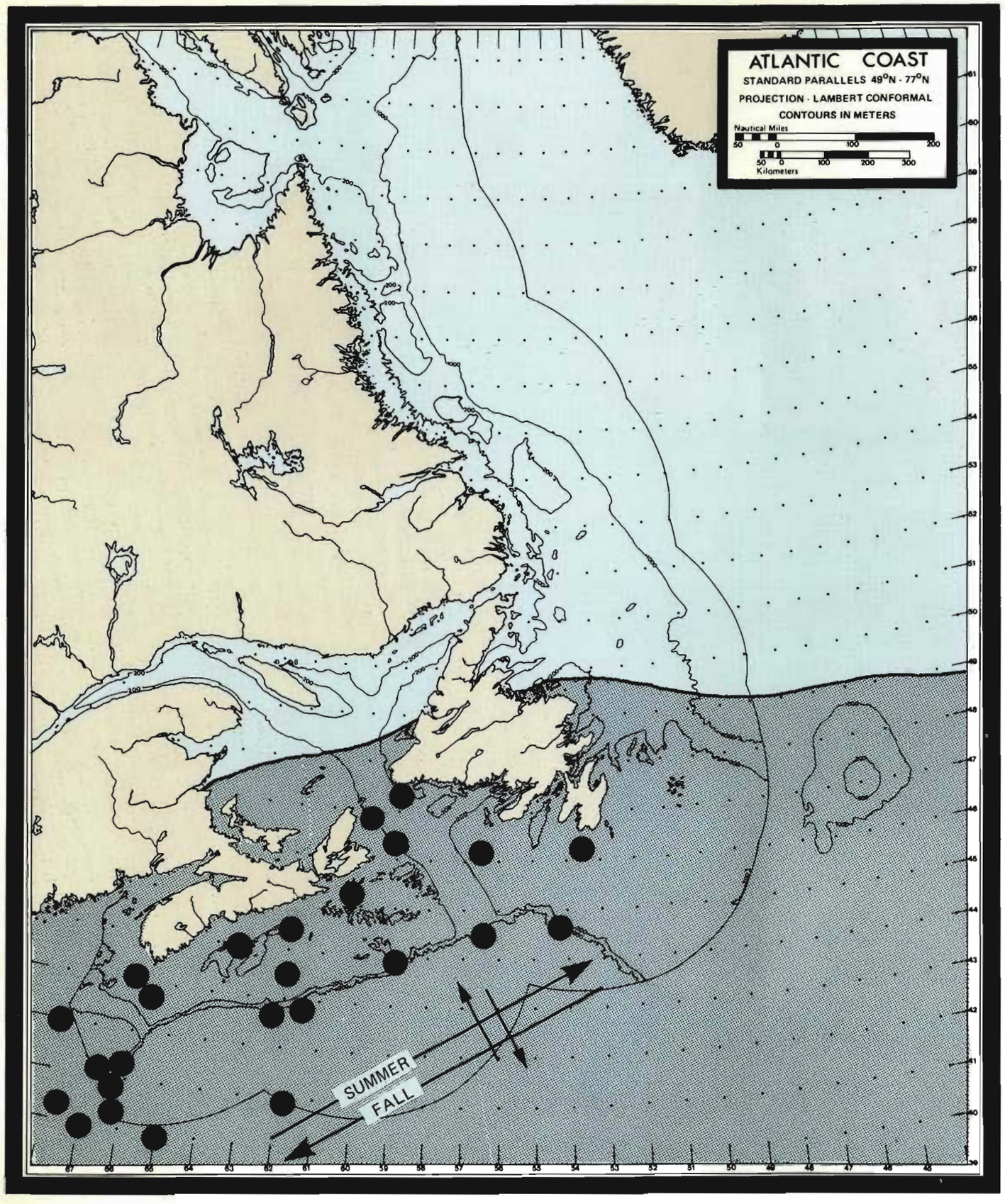
Principal prey includes Copepods, amphipods, euphausiids, decapods, shrimp and capelin eggs.

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.

SWORDFISH

Xiphias gladius Linnaeus, 1758





FAMILY: Xiphiidae

COMMON NAMES: broadbill, espadon

CODES: ICNAF - 264
FAO Taxonomic - 1,75(04)003,01
3 alpha ident. - SWO

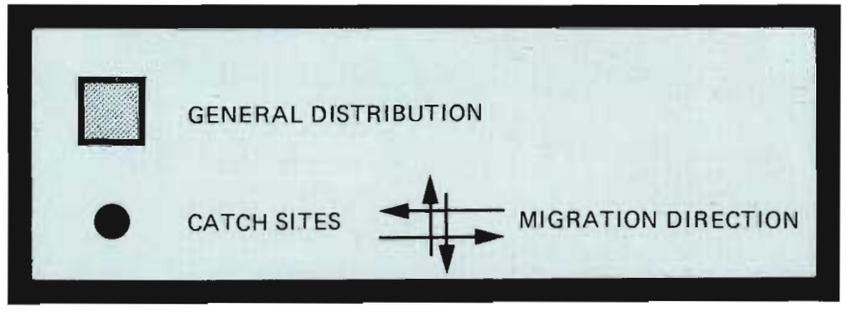
DISTRIBUTION:

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 south or deep water areas. They appear off the Canadian coast in early June and leave in mid-September.

FISHERY:

High mercury levels in swordfish resulted in official closure of the fishery in 1970. In spite of the closure, catches were transferred at sea from Canadian to U.S. vessels and it has been estimated that 2,300 MT were transferred in this manner in 1978. In 1979, permits were issued to land fish in Canada as well and it is possible that more than 3,000 MT was landed or trans-shipped at sea that year. 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 MT in the 1980s, since the total catch by the U.S.A. and Canada in 1979 probably exceeded the optimum catch levels.

MAP KEY



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

UTILIZATION:

Sold for human consumption - fresh and frozen.

GENERAL BIOLOGY:

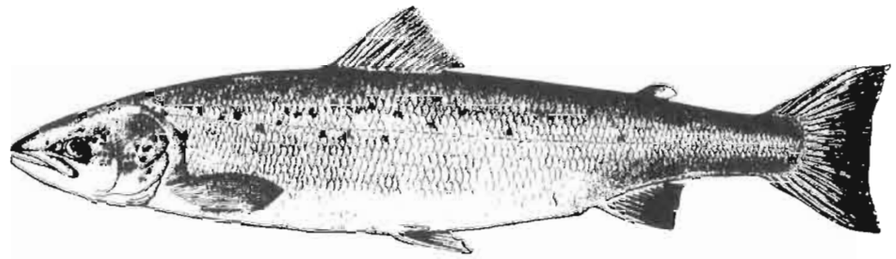
The swordfish is a migratory species observed near the surface in waters having a temperature of at least 18°C and occasionally in waters as cold as 10°C. It occurs in Canadian waters during summer and early fall.

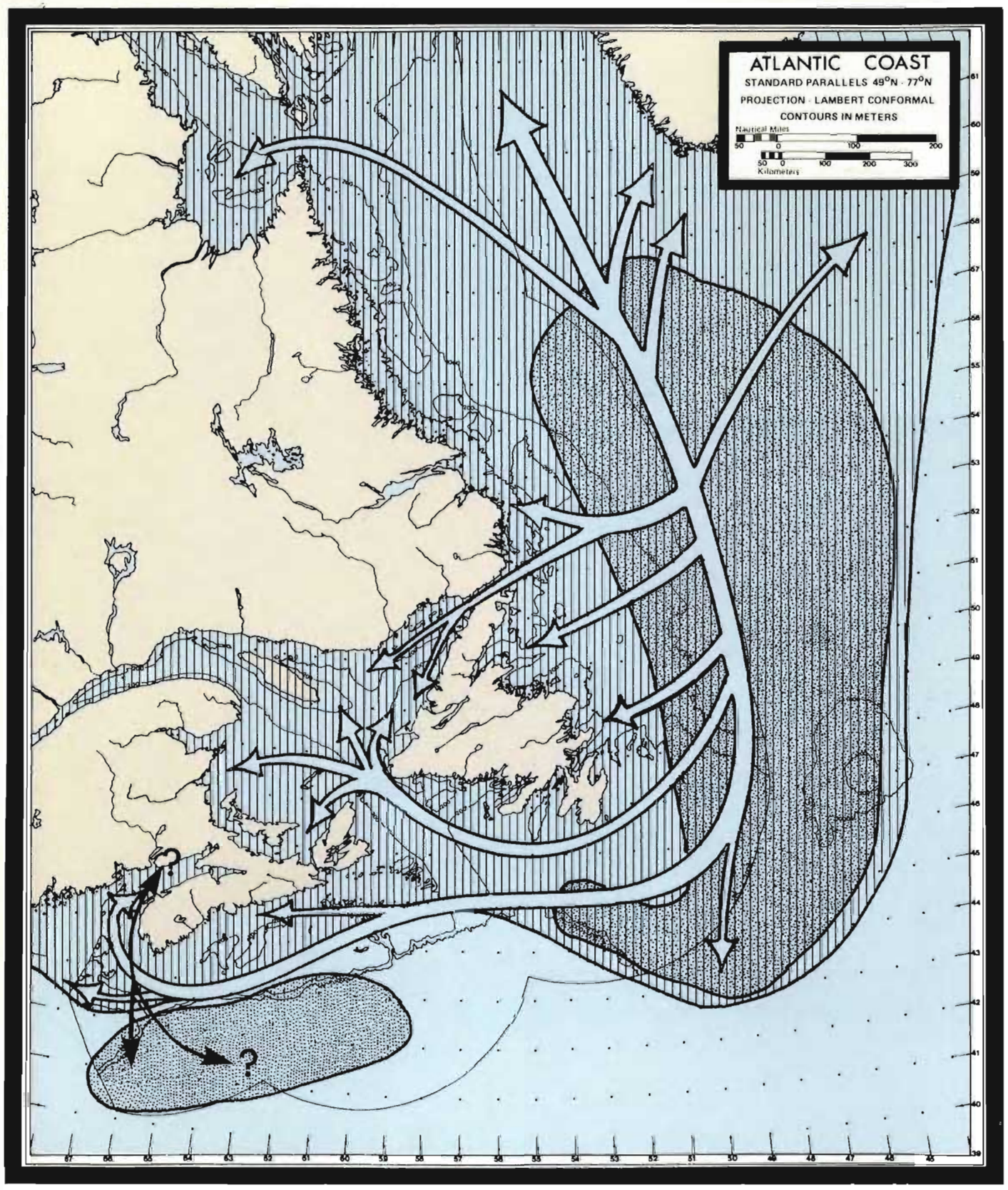
No spawning occurs off the Canadian east coast.

Swordfish feed on herring, mackerel, butterfish, silver hake, rat-tails and squid.

ATLANTIC SALMON

Salmo salar Linnaeus, 1758





FAMILY: Salmonidae

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

CODES: ICNAF - 318
FAO Taxonomic - 1,23(01)004,01
3 alpha ident. - SAL

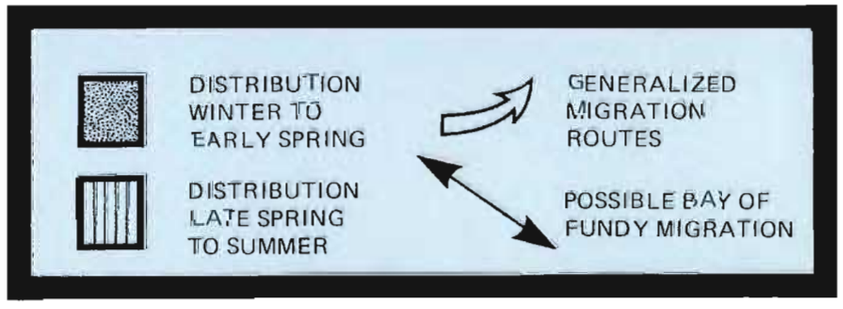
DISTRIBUTION:

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 runs along the coast of the United States. Canadian runs were also affected. However, the remote location of many rivers and 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.

MAP KEY



Long-term catches in Newfoundland and Labrador will potentially decrease due to habitat reduction caused by hydroelectric, industrial, municipal and recreational development. The threat of habitat degradation can be averted with improved habitat preservation practices and supplementary enhancement programs.

It is estimated that commercial fisheries catches in 1980 for Newfoundland and Labrador will be approximately 2,000 MT. Elsewhere in the Maritimes, commercial catches fell to 155 MT 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 is planned for 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 MT is projected for 1979. The ban on the Newfoundland drift net 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 to approximately the present level of 1,190 MT per year.

The first successful cage culture operation for Atlantic salmon in North America was established at Deer Island, New Brunswick in 1978. Since that time, two 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:

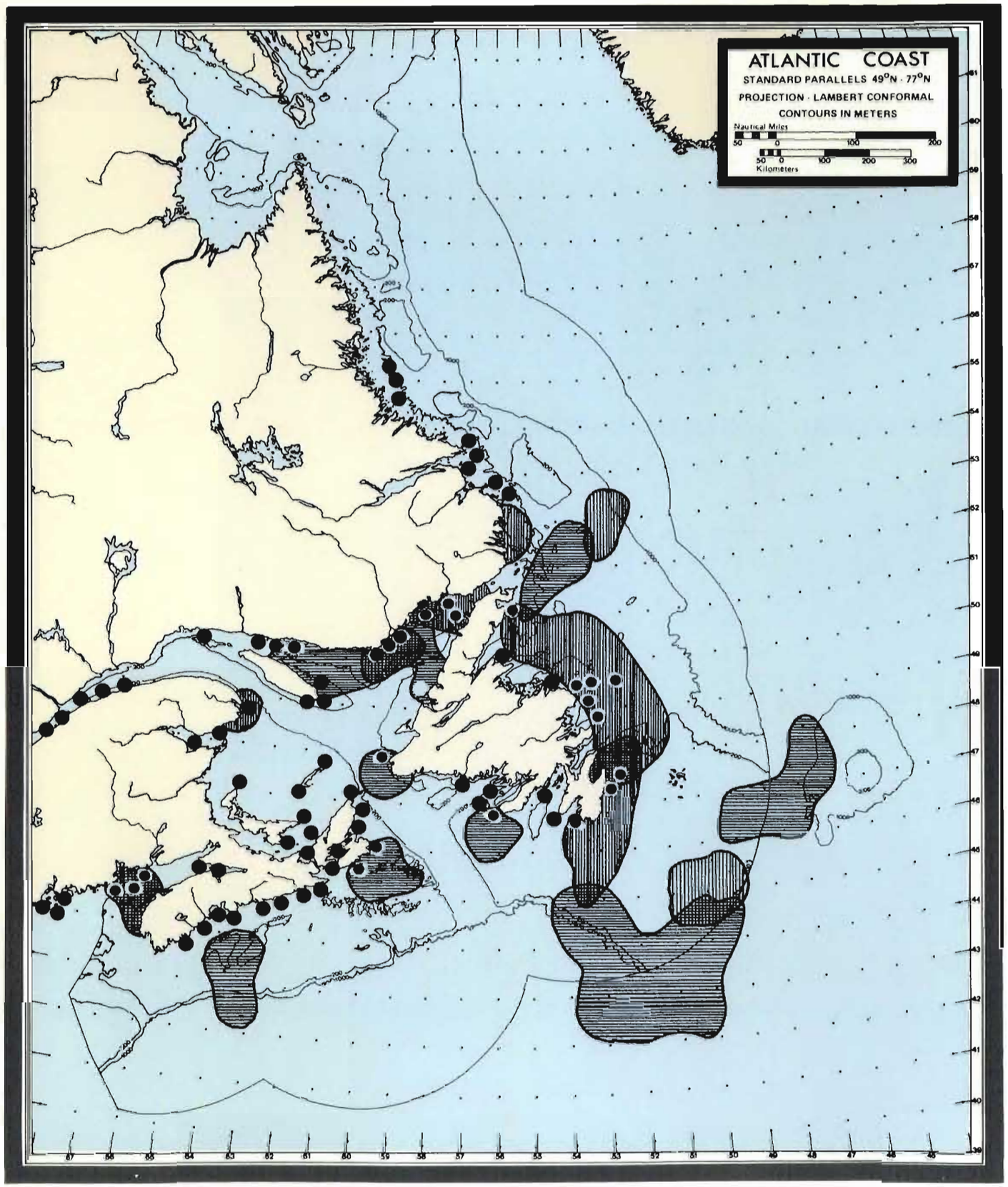
Spawning runs may take place in spring, summer, or fall depending on the stock and river involved. Actual spawning occurs in October and November when the eggs are deposited in depressions ("redds") in gravel beds and fertilized by the male. Hatching time varies with water temperature, but takes about 110 days at 4^{o}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 one year, weighing 3-7 kg and two year salmon weighting 1.5 to 3 kg. Salmon may live more than 9 years and are capable of spawning several times.

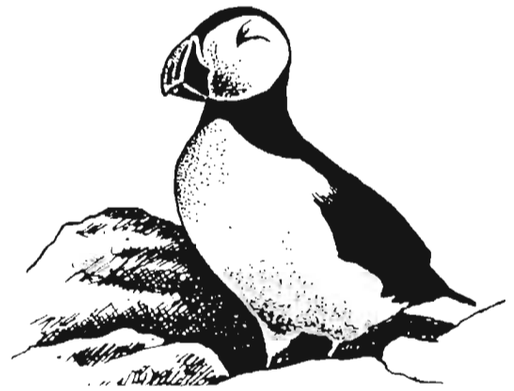
Parr feed on the larvae of mayflies, stoneflies and other insects as well as annelids and molluscs. At sea, salmon prey on herring, sand launce, gaspereau, smelt, capelin, mackerel, haddock, euphausiids, amphipods, decapods, etc.

In freshwater, young are fed on by eels, predaceous fishes and birds. At sea,principal predators are pollock, tuna, swordfish, and seals.

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 indicate 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.

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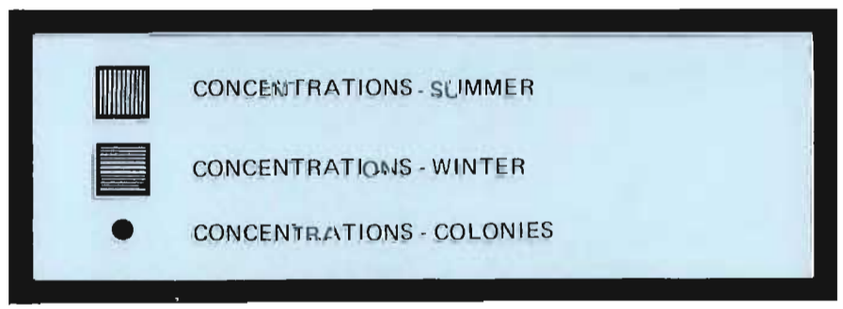
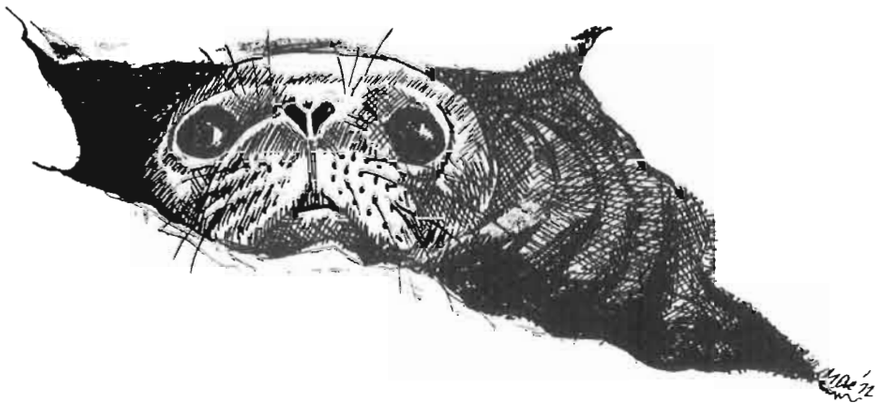


SEALS



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 *(Crystophora cristata)*

While Grey seals have an impact on the fishery as a result of net damage and the spreading of codworm to commercial fish species, only harp and hooded seals are exploited commercially.

HARP SEAL

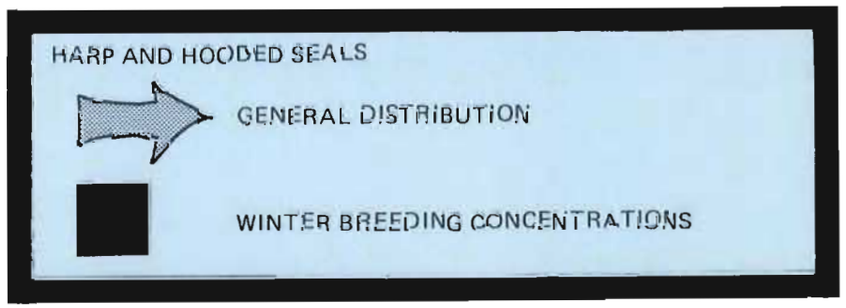
DISTRIBUTION:

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 of approximately 170,000 harp seals (from a TAC of 180,000

MAP KEY



for the entire Northwestern Atlantic) was allocated for the Gulf of St. Lawrence and "the Front", (northeast of Newfoundland) in 1978-1980. The present TAC is less than the estimated sustainable yield of 205,000 to 237,000 animals and will allow the recent population increase to continue. Present policy is to allow the population to grow from its present level of 1.3 to 1.4 million animals,age one and over, to an interim level of 1.6 million animals. Canada's share of the TAC in 1980 was 150,000.

GENERAL BIOLOGY:

Adults and juveniles feed in the eastern Arctic and West Greenland during the summer, moving towards the Labrador coast in the 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 pregnant females haul out on the Gulf ice and produce their pups. The Labrador herd begins pupping in early March. Pupping in both areas ceases by mid-March. Adult males are also present and breeding takes place after the pups are weaned. Following the pupping season, they remain on the ice and begin moulting.

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

DISTRIBUTION:

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.

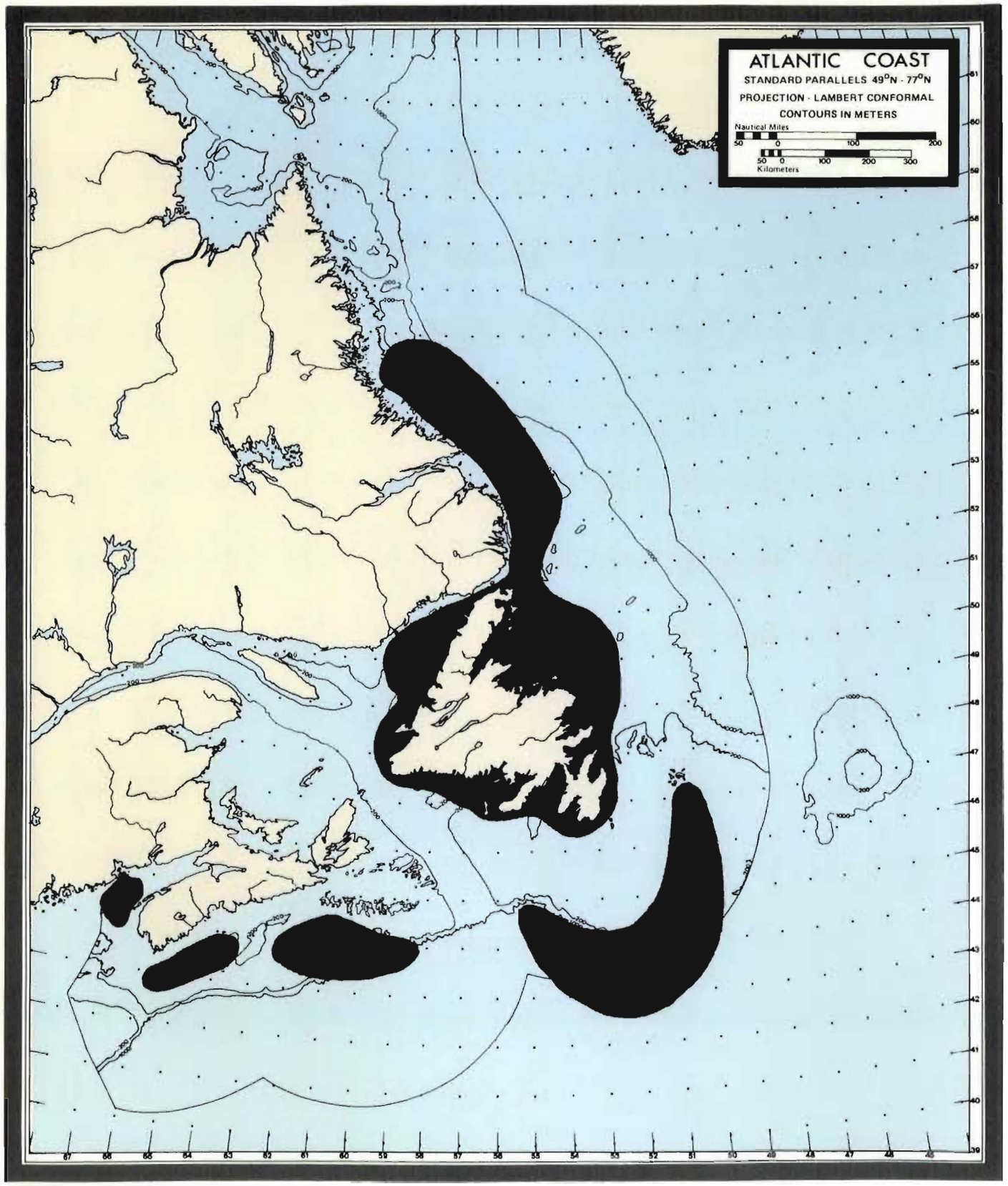
FISHERY:

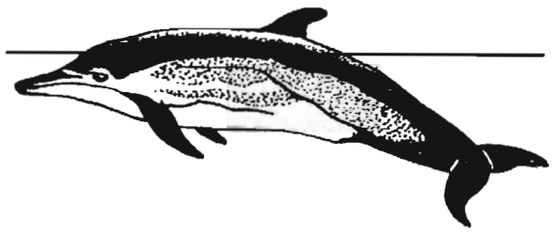
The TAC for hooded seals was 15,000 from 1977 to 1980. The kill of adult females is restricted to five percent of the daily catch. Hooded seals are more scattered in distribution than harp seals and require powerful and maneuverable vessels to hunt them effectively. Canada and Norway are each allocated a quota of 6,000 with an additional 3,000 being open to either country. In 1979 a total of 15,125 hooded seals were taken, compared with 10,223 in 1978. 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, pupping takes place about one week later.

WHALES





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

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

MAP KEY

KEY AREAS IDENTIFIED

In the past, the above species of whales have been subjected to sporadic whaling operations. Canadian whaling ended when the whaling plants at Blandford, Nova Scotia, and Dildo and Williamsport, Newfoundland, were closed in 1972. The primary species harvested was the fin whale with some sei, minke, and sperm whales being taken as well as pilot whales off Newfoundland. The scientists of the International Whaling Commission (IWC) continue to classify the sei whales off Atlantic Canada and the fin whale stock off Nova Scotia as Protection Stocks. Maximum catches agreed on by the IWC for stocks of fin and minke whales off Newfoundland were 90 and 48 respectively for 1978. Commercial whaling is, however, prohibited in waters under Canadian fisheries jurisdiction.

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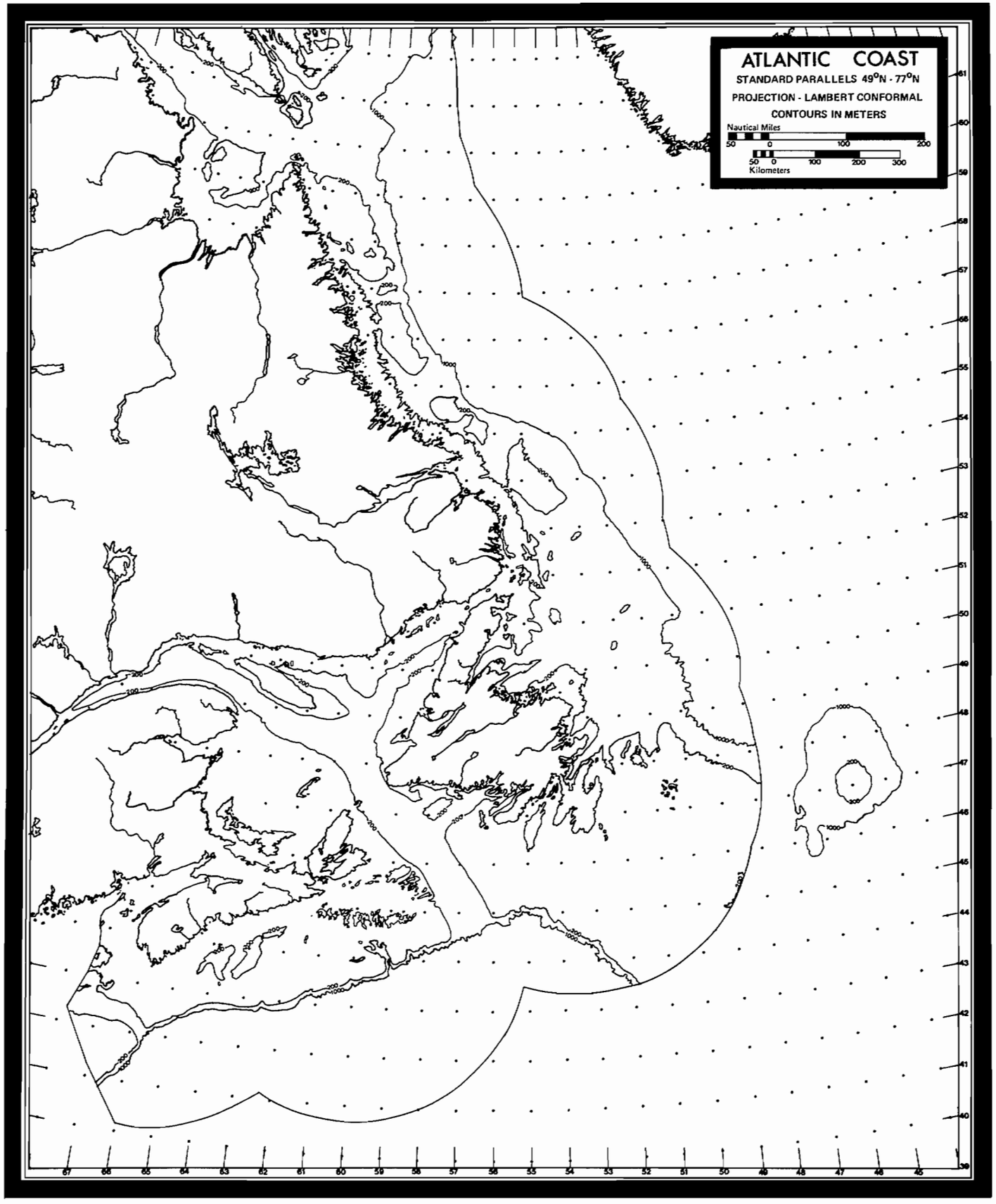

PLEASE USE THIS MAP FOR CORRECTIONS AND NEW INFORMATION.

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