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France Research Report for 1981

by

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Subarea 1

1. Status of the Fisheries

The French (M) fishery for northern deepwater shrimp off West Greenland was again conducted in 1981 by two freezer trawlers between June and September. The fishery took place mainly in Div. 1B on the Store Hellefiske Bank between 67°25'N and 68°00'N, a depth ranging from 200 to 335 meters. The mean catch rates by month were ranging from 290 to 380 kg/hour. Reported catches were 535 tons. The logbook of one of these trawlers was analysed in order to situate the fishing effort and the CPUE and to follow the evolution of the yields from one year to the other. In 1981, CPUE had increased of 45% (in kg/hour fished) or 66% (in tons/day fished) compared with the minimum level observed in 1979. These results were presented (SCR Doc. 81/XI/147) at the Special Assessment Meeting of November 1981, together with similar information on the French (M) fishery for shrimp off East Greenland (SCR Doc. 81/XI/157).

2. Special Research Studies

Biological data on shrimp were collected in this area and also presented at the Special Assessment Meeting in November 1981 (SCR Doc. 81/XI/147). These data were obtained from samples frozen on board the trawler "Finlande III" and analysed at the St. Pierre Laboratory. More than 1000 measurements and sexual determination (Fig. 1) were obtained for the July-August period. It was observed an important increase in young year-classes compared to previous years, causing a decrease in the mean length of shrimp in the commercial catches. These observations seemed to indicate a future improvement in the recruitment of this stock.

Also were collected biological data on shrimp off East Greenland (SCR Doc. 81/XI/157). More than 800 measurements and sexual determination were made and also presented in this paper (Fig. 2).

Subarea 2

1. Status of the Fisheries

No catch was reported from the French fishery in this area in 1981.

2. Special Research Studies

As in previous years, a research survey was carried out on board the R/V *Cryos* off Labrador in Division 2J in February 1981.

a) Hydrographic studies

From 30 January to 3 February 1981, ice extended in Division 2J down to the southeastern part of Hamilton Bank. From 15 XBT stations occupied in this division south of 53°N because

of ice conditions, the same thermal structure as observed in winter 1980 was identified: a very cold upper layer (negative temperatures) and a progressive increase in water temperatures from 100 meters depth to the bottom.

b) Biological studies

i) <u>Cod</u>

During the research survey of the R/V *Cryos*, a total of 16 trawling stations (30 minutes duration) were occupied southwest of Hamilton Bank. Due to ice conditions, the northern part of Division 2J was not sampled. In the research catches, cod represented 98% of the total in weight (92% in 1980). The largest average catch rates were obtained between 300 and 400 meters as indicated in the following table:

Strata (m)	No. sets	Catch-rates (kg/30 min)
201-300 301-400 401-500 501-750	4 9 (2) 1 1	561 1540 144 4
Total	16 (2)	1051

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These figures indicate clearly an increase in catch-rates of cod in this area from 1980 to 1981 (SCS Doc. 81/VI/18).

From the research catches, 4,822 cod were sexed and measured and 112 stomachs were sampled on this species for further trophic studies.

Length distribution were bimodal, the first mode being observed at 30-33 cm LT and corresponding to the 1978 year-class and the second one at 54 cm LT corresponding to the 1975 year-class (Fig. 3-A). The age structure for the whole cod stock complex (Div. 2J, 3KL) indicated the dominant 1975 year-class in the research catches (Fig. 3-D).

Subarea 3

Status of the Fisheries

a) Cod

1.

In 1981, catches of cod were reported from the French fishery (M and SP) in Divisions 3M, 3N, 30, 3Pn and 3Ps, but the French trawlers did not operate in Divs. 3KL.

- In Div. 3M and 3NO, the French (M) trawlers operated at a very low effort level and catches of 79 tons were reported. In French (SP) trawlers reported cod catches of 226 tons in Div. 3NO as by-catches in the flatfish fisheries.
- ii) In Subdiv. 3Ps, French (M and SP) trawlers reported cod catches of 2,352 tons and 2,692 tons respectively and the fishery was conducted mostly in winter and autumn. The inshore (SP) fishery took place in summer and reported a total cod catch of 333 tons, which is the lowest level for the recent period.
- b) Squid

In 1981, a small offshore fishery was conducted by French (M) trawlers in St. Pierre bank (Subdiv. 3Ps) from September to November. Reported catches were 144 tons. The inshore French (SP) fishery occurred from the end of June to the beginning of September in the territorial waters of St. Pierre and Miquelon Islands. After high commercial catch rates in July, catches decreased drastically in August to very low levels in September. This abnormal decrease in commercial catches from mid-August corresponded to an abnormal increase of surface temperatures in coastal waters (3.5°C above the average of the four previous years in August-September). Consequently, the total commercial catches for the St. Pierre dories were only 314 tons compared to 1,885 tons in 1980. Commercial catch rate was only 6.28 tons/dory/season against 37.7 in 1980 and 36.9 in 1979 (SCR Doc. 82/VI/19).

c) Other finfish

French (SP) trawlers operated in Div. 3NO where a small directed fishery on flatfish occurred. Catches of 558 tons and 210 tons were reported for yellowtail flounder and American plaice respectively.

In Subdiv. 3Ps, flatfish catches were also reported from the French (SP) trawlers: 364 tons for yellowtail flounder and 319 tons for American plaice.

Skate (*Raja radiata*) was also reported as by-catches in the cod fishery, by the French (SP) trawlers operating in Subdiv. 3Ps (286 tons).

Other finfish (redfish, haddock, pollock, witch flounder, wolffish) were also reported from Subdiv. 3Ps by the French (SP) trawlers but in small quantities (catches lower than 100 tons).

2. Special Research Studies

As in previous years, research was carried out in Subarea 3 and several surveys were conducted on board the R/V Cryos:

- in Div. 3KL in February 1981,

- in Subdiv. 3Ps in February, March, October and November 1981.

a) Hydrographic studies

i) On Ritu Bank (Div. 3K), 43 hydrographic stations (XBT) were occupied from 4 to 16 February. On the northern part of the bank, a very cold surface layer (temperatures ranging from -1°C to -1.7°C) was observed between 0 and 70 meters depth. Beneath this layer, water temperatures increased with depth and reached 3.5°C at 350 meters depth along the slope of the bank. On the bank itself, the cold surface layer was thinner (55 meters) and on the top of the bank, bottom temperatures averaged 1.5°C. Along the eastern and western slopes of Ritu Bank, waters were warmer than in the northern part but the temperatures were decreasing quickly during the survey with the extension of the ice covering to the south.

ii) On the northeastern slope of the Grand Bank (Div. 3L), 16 XBT casts were made in February.
As in Div. 3K, a cold surface layer (-1°C to -1.6°C) was observed but the deeper layers were colder than on Ritu Bank (between 0 and 2°C).

Generally speaking, the winter 1981 showed lower temperatures than in winter 1980 in Div. 3K and 3L: the cold surface layer was thicker and bottom temperatures were lower by about 0.5°C.

iii) In Subdiv. 3Ps, 83 XBT casts were made in Feburary-March 1981 and 96 XBT casts from 6 October to 9 November.

In winter 1981, the surface layer extended down to 60 meters with temperatures ranging from 1 to 3°C. The intermediate layer (60 to 150 meters depth) presented a complicated structure with mixing of warm and cold waters. The structure of these two layers seemed to be different than that observed in the previous four years. Usually, the cold surface layer (0 to 1°C) is observed down to 100 meters depth and the intermediate layer initiates a strong positive thermic gradient.

Under these layers, the slope water (6 to 8°C) was observed between 150 and 300 meters depth and the bottom water (below 5°C) occurred deeper than 400 meters.

These winter observations were presented in detail (SCR Doc. 81/VI/45) at June 1981 meeting of the Scientific Council.

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In autumn 1981, the surface layer warmed up (maximum temperature of 12°C) and was bordered by a sharp thermocline with the colder intermediate layer, which was however less cold than in autumn 1980. The slope and bottom waters was again observed with characteristics unchanged (temperatures and depth).

In average, the temperatures observed in autumn 1981 were thus above those observed in autumn 1980.

Observations from a station at the entrance of St. Pierre harbour (inshore Subdiv. 3Ps) indicated an abnormal increase of the surface temperatures in coastal waters during the summer period (3.5°C above the average of the previous years). These data were presented in SCR Doc. 82/VI/19.

b) Biological studies

i) Cod

A total of 43 trawling stations (30 min. duration) were occupied in Div. 3K during the research survey of the R/V *Cryos* in February 1981. The larger catch-rates (6,569 kg and 5,969kg/30 min.) were observed at the northern boundary of Div. 3K, between 300 and 400 meters. Mean catch-rates observed by strata during this survey are shown in the following table:

Strata (m)	No. sets	Catch rates (kg/30 min)
201-300 301-400 401-500	18 (2) 23 (2) 2	323 800 390
Total	43 (4)	583

A total of 8,760 cod were sexed and measured. Length frequency analysis in Div. 3K (Fig. 3-B) indicated the presence of a main mode at 54 cm LT with a smaller one at 33 cm LT. The 1974 and 1975 year-classes were dominant in the research catches and the 1978 year-class was also abundant.

A total of 304 stomachs were also sampled on cod in this area for further analysis on trophic conditions.

In Div. 3L, 18 trawling stations (30 min. duration) were occupied along the north and northeastern slopes of the Grand Bank in February 1981. The larger research catch rates were observed at 260 meters depth (1,470 kg/30 min.) in the northern part of the bank. The mean catch rates by strata were as follows:

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Strata (m)	No. sets	Catch rates (kg/30 min)
185-275 276-365	14 (1) 4	339 690
Total	18 (1)	421

A total of 5,007 cod were sexed and measured for research catches in Div. 3L. The length frequency analysis (Fig. 3-C) indicated the importance of a mode at 33 cm LT (1978 yearclass) with a smaller one at 54 cm LT.

As in other divisions, stomachs of cod were sampled (143) for further analysis at the laboratory.

In Subdiv. 3Pn, 10 research trawling stations were also occupied in February 1981. The catch rates for cod observed during this period were clearly higher than those observed during the same time in 1979 and 1980. The mean catch rates obtained by strata were as follows:

Strata (m)	No. sets	Catch rates (kg/30 min)
94-185 186-280 281-370 >370	3 3 2 2	932 281 45 23
Total	10	378

A total of 3,447 cod were sexed and measured from the research catches in this area. Length frequencies were ranging from 18 to 108 cm LT with a modal length at 39 cm LT. In Subdiv. 3Ps, two research surveys were conducted as in previous years on board the R/V *Cryos*, in winter and in autumn.

In February-March 1981, 104 trawling stations were occupied on St. Pierre Bank, Burgeo Bank and Green Bank. The higher catch rates were observed on Burgeo Bank (977 kg/30 min.) and on northwestern slope of St. Pierre Bank (485 kg/30 min.). A total of 2,040 cod were sexed and measured and 865 pairs of otoliths sampled for analysis of the length and age structure. A sample of 147 cod stomachs was also taken for further analysis at the laboratory. The length distribution in the research catches were ranging from 7 to 131 cm LT and two main modes were observed at 32 cm LT and 54 cm LT.

In October-November 1981, 96 research trawling stations were occupied in the same area. The larger catch rates were observed on St. Pierre Bank (399 kg/30 min.) and Burgeo Bank (152 kg/30 min.). A total of 3,070 cod were sexed and measured and 780 pairs of otoliths sampled for analysis of the length and age structure.

The totality of results obtained for cod in this area indicated that the 1974 year-class was dominant in the research catches and that the 1978 year-class was clearly stronger than the 1975, 1976 and 1977 ones. Moreover, the great abundance of individuals of one year old (1980 year-class) was also noted in the research catches. The future recruitment of these abundant cohorts should permit a more rapid reconstitution of the stock and an increase in the yields of the commercial fisheries.

ii) Squid

Biological observations were systematically made once a week on the commercial landings of the inshore fleet in St. Pierre from the end of June to the end of August 1981. The arrival of squid in the coastal waters of St. Pierre (Subdiv. 3Ps) corresponded to a warming up to about 7°C at the surface. More than 1,000 individuals were regularly sampled (sexes, maturity stages in relation to mantle length ML). Results of these observations (Fig. 4) were presented in SCR Doc. 82/VI/19. The growth rate was higher in 1981 compared to previous years but the sex-ratio indicated a smaller proportion of males. However, the unimodal structure of the length distributions and the maturity stages were very similar to those observed in previous years. A length-weight key for males and lemates was also provided from 1980 and 1981 data. Also, data collected during the winter surveys on board the R/V Cryots from 1972 to 1982 in Subareas 2-3 and 4 were presented (SCR Doc. 82/VI/21).

iii) Redfish

During the winter 1981 research survey of the R/V *Cryos*, the larger catch rates of redfish were observed on the western slope of Burgeo Bank (1,559 kg/30 min.). In autumn 1981, the

larger catch rates were also found on this slope (495 kg/30 min.) but also on the southern slope of St. Pierre Bank (835 kg/30 min.). However, these catch rates are very much smaller than those observed in autumn 1980 in Subdiv. 3Ps (SCS Doc. 81/VI/18) which is probably due to the variations in catchability of the species.

Length frequency distributions (Fig. 5) indicated a main mode at 23 cm LT, which corresponds to individuals entering in the fishery in 1982-83. Furthermore, small individuals (modal length at 7.5 cm LT in winter and 10 cm LT in autumn) were also abundant in the research catches of the R/V Cryos.

iv) <u>American plaice</u>

During winter and autumn surveys of the R/V *Cryos*, American plaice was observed in the totality of strata surveyed in Subdiv. 3Ps. In winter, its maximum abundance was observed around 200 meters depth then decreasing regularly with greater depth. In autumn, the species was found on the plateau of the banks with the larger catch rates at 150 meters depth and almost nil catches under 200 meters depth. The larger catch rates were observed in the southern part of St. Pierre Bank in winter (1,286 kg/30 min.) and in the northern part of Green Bank in autumn (2,106 kg/30 min.).

Length frequency distributions (Fig. 6) indicated several modes, the first one for both sexes at 23 cm LT, another one at 31 cm LT for the males and 37 cm LT for the females. Also noted was the scarcity of small individuals less than 15 cm LT. The age structure of the research catches since 1977 indicated that two large cohorts were now present in the fishery (1972 and 1974 year-classes).

Witch flounder

v)

As in previous years, this species was found during the two research surveys of the R/V *Cryos* in the deeper strata sampled in Subdiv. 3Ps. The larger catch rates were observed in both surveys on the slope of the Halibut Channel (37 kg/30 min.) and in the southwestern slope of St. Pierre Bank (27 kg/30 min. and 23 kg/30 min.).

Length frequency distributions established for each sex (Fig. 7) indicated that most of the research catches were composed of individuals larger than 22 cm LT. Also noted was the presence of young individuals with modal length of 17 cm LT in winter and 20 cm LT in autumn.

vi) Other finfish

Among other species observed during the two research surveys in Subdiv. 3Ps in 1981, the thorny skate was mainly observed on St. Pierre Bank between 50 and 150 meters depth. The larger catch rates were observed on the northwestern slope of St. Pierre Bank (179 kg/30 min.) and south of the Halibut Channel (42 kg/30 min.).

Also noted was the high catch rates of silver hake observed on the western slope of St. Pierre Bank during the winter research survey on board the R/V *Cryos* (1,193 kg/30 min.). On the contrary, the catch rates for this species in autumn 1981 were lower (358 kg/30 min.). The increase in biomass in Subdiv. 3Ps was related to the abundance of the 1978 year-class.

Observations were also made on Atlantic halibut during the research surveys in Subdiv. 3Ps. High catch rates were observed mainly on southern slopes of St. Pierre and Green Banks. It was noted that the biomass of this stock is increasing since 1979. Shellfich

vii) Shellfish

A part of the fall survey on board the R/V *Cryos* in October-November 1981 was devoted to a routine study on scallops (*Placopecten magellanicus* and *Chlamys islandicus*) gathering abundance indices and biological data on these two species on the St. Pierre Bank (Subdiv. 3Ps). A stratified method was used again during this survey with standard dredging tows of 10 minutes duration. The higher research catch rates were respectively of 32 kg and 10 kg per tow for *Placopecten* and *Chlamys* in the southeastern part of the St. Pierre Bank. A study was also carried out on a comparison of the efficiency of the New Bedford dredge and a French dredge modified to operate on rough bottom. Results indicated higher catch rates by unit of time with the American type and by unit of surface with the French type.

Subarea 4

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Status of the Fisheries

a) Cod

1.

As in previous years, most of the French catches for cod were reported from Subarea 4. The French (M and SP) fisheries operated mainly in the eastern Gulf of St. Lawrence (Div. 4R) and on Scatarie Bank (Subdiv. 4Vn) during the winter period.

- i) In Div. 4R, French (M) and French (SP) trawlers reported cod catches of 11,271 tons and 1,167 tons respectively, indicating a total increase of about 39% from 1980 to 1981. The fishery mainly occurred during the first three months of the year and was principally concentrated on the southern part of the Gulf of St. Lawrence.
- ii) In Subdiv. 4Vn, the French (M) fishery was also conducted during the first three months of the year and reported catches of 6,300 tons, indicating a decrease of about 12% from 1980 to 1981 due to the quota regulation system French (SP) trawlers reported catches of 1,258 tons and the fishery mostly occurred in March and April 1981. The reduction of catch from 1980 to 1981 in this area (38%) was also due to the quota regulation system. Length distribution of cod in the French commercial catches from this area were observed from samples on landings in St. Pierre. These data were sent to the NAFO Secretariat on 8 January 1982.
- b) Squid

2.

The 1981 squid fishery was also conducted on the Scotian Shelf (Div. 4W) by one French (M) trawler in September. The reported catches were only 198 tons, representing 60% of the 1980 catches in this area. This decrease was related to the lower availability of squid after mid-August on the Scotian Shelf.

Special Research Studies

In 1981, research was carried out in Subarea 4 during two surveys: in Div. 4R in January on board the R/V *Cryos* and in Div. 4V, W, X in August-September on board the R/V *Thalassa*.

a) Hydrographic studies

- i) In the eastern Gulf of St. Lawrence (Div. 4R), 49 XBT casts were made from 9 to 23 January 1981. A picture of the thermic situation at this period of the year is given in Fig. 8 from one transect located in the southern part of the area. Three water layers were observed: a cold surface layer (0 to -1.2°C) down to 75 meters depth, an intermediate layer with homogeneous temperatures (1.2°C) from 90 to 130 meters depth, and a bottom layer with temperatures ranging from 2 to 6°C.
- ii) On the Scotian Shelf (Div. 4VWX), 100 XBT casts were made from 28 August to 22 September 1981 during the squid research survey on board the R/V *Thalassa*. Observations on the thermal conditions on Scotian Shelf (Div. 4VWX) were presented in SCR Doc. 82/VI/20 in relation to squid distribution and abundance. Three water layers were observed: a surface layer (from 0 to 30 m depth) with temperatures ranging from 15° to 20°C, an intermediate

layer (30 to 100 m depth) covering west of the shelf with temperatures between 1° and 6°C, a warmer water layer characterized by temperatures ranging from 6° to 11°C stretching all along the edge of the shelf and entering in the central depression of the Scotian Shelf.

b) <u>Biological studies</u>

i) <u>Cod</u>

In January 1981, 46 research trawling stations (30 minutes duration) were occupied in the eastern part of the Gulf of St. Lawrence (Div. 4R) during the survey of the R/V *Cryos*. Cod catches represented 61% of the total catches compared to 91% in January 1980. The larger catch rates were observed west of St. George Bay at depth ranging from 155 to 250 m and northwest of Bonne Bay between 170 and 190 meters. The mean catch rates by strata were as follows:

Strata		Catch rates		
(m)	No.	sets	(kg/30 min.)	(N/30 min.)
<94	6		106	142
94-185	21	(2)	580	612
186-278	11		5 97	903
279-370	5	(1)	176	140
Total	43	(3)	471	566

A total of 15,734 cod were sexed and measured, 753 individuals weighted and 808 pairs of otoliths sampled during this survey for further analysis on the length-weight-age structure of this stock.

Length were distributed from 12 to 84 cm LT with three modes: the main one at 36 cm LT, a second at 48-51 cm LT and another at 18 cm LT (Fig. 9). The age composition of the research catches indicated that the 1977 year-class (4 years old) was clearly dominant (30% of the numbers caught) while the 1974, 1975 and 1976 year-classes represented each between 15 and 18% of the individuals caught.

ii) Squid

A random stratified bottom trawl survey was carried out on the Scotian Shelf (Div. 4V, W, X) from 28 August to 22 September on board the R/V *Thalassa*. A total of 100 trawling stations (30 minutes duration) were occupied during the daylight period only. The detailed results on distribution, abundance and biological characteristics of squid were presented during this June 1982 Regular Meeting (SCR Doc. 81/VI/20, 30, 43 and 47).

The minimum trawlable biomass was calculated to be 53,000 tons for strata between 50 and 200 fathoms, i.e., about one third of the 1980 estimate (153,000 tons) for the same area covered.

The length distribution by sex (Fig. 10) indicated a three modes structure in the research catches: a group of large juveniles (5 to 11 cm ML) representing 10% of the number caught (against 2% in 1980); a group of medium squids (12 to 17 cm ML) still immature and just maturing and representing 2% of the numbers caught (against 8% in 1980); the bulk of the catches was composed of large adults (18 to 26 cm ML for males and 18 to 29 cm ML for females). This third group represented 88% in number against 80% in 1980, and was constituted of maturing and mature squid. Five mature females and 1 mated female were caught and used to estimate the fecundity of the species. The number of eggs was ranging from 100 to 500 per gram of body weight. Also, histological studies were carried out on males and females for comparison with the visual maturity stages used in the field.











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Fig. 5. Length distribution of redfish in Div. 3P from the R/V Cryos surveys in 1981.



Fig. 6. Length distribution of American plaice in Subdiv. 3Ps from the R/V Cryos surveys in 1981.



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Fig. 8. Hydrographic situation in the eastern Gulf of St. Lawrence (Div. 4R) in January 1981 - R/V Cryos survey.



Fig. 9. Length and age distribution of cod in Div. 4R from the R/V Cryos survey in January 1981.



Fig. 10. Length distribution by sex and maturity stages for squid in Div. 4VWX - R/V Thalassa survey (28 August-22 September 1981).

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