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ANNUAL MEETING - JUNE 1975

Report of Meetings of Standing Committee on Research and Statistics (STACRES)*

Sixth Special Commission Meeting - January 1975

Chairman: A.W. May

Rapporteurs: V.M. Hodder
D.J. Garrod

STACRES met at Bergen, Norway, on 13-15 January 1975 at the request of the Commission to review the latest information available on the capelin resource and the fishery in Subareas 2 and 3, and to recommend TACs (total allowable catches) for 1975 (Appendix I). A further meeting was held on 16 January to consider what advice might be given relative to a proposal for a closed area regulation with respect to the capelin fishery in Div. 3L. Representatives were present from Canada, Denmark, Federal Republic of Germany, German Democratic Republic, Iceland, Norway, Poland, Portugal, Union of Soviet Socialist Republics, United Kingdom, and United States of America, and an observer from FAO (Appendix II).

1. Fishery Trends

Prior to 1972 the capelin fishery in Subareas 2 and 3 was carried out almost entirely by Canada and the catches were taken exclusively in coastal waters during the early summer spawning period. Catches declined from about 6,000 tons in the late 1950's to a level of 2,000-3,000 tons up to 1971. Offshore exploitation began in 1972 when 71,000 tons were reported (Table 1), more than 60% of which was taken in Subarea 2 and Div. 3K. In 1973 the total catch increased to 268,000 tons, shared almost equally between the northern part of the area (Subarea 2 and Div. 3K) and the southern part of the area (Div. 3LNOPs). Preliminary statistics for 1974 indicate a total catch of 269,000 tons (Table 2), 40% of which was taken in Subarea 2 and Div. 3K and nearly all of the remainder in Div. 3LNO. The catches in 1974 were restricted by TACs established for the two major stock complexes: Subarea 2 + Div. 3K and Div. 3LNOPs.

Although the total catches in 1973 and 1974 were about the same, there were significant changes in the pattern of fishing, especially in the southern area (Table 1); in 1973 nearly all of the catch from the southern area was taken on the southern part of the Grand Bank (Div. 3NO), but in 1974 a very substantial fishery developed on the northern part of the Grand Bank (Div. 3L), where 63,000 tons were taken compared with just 4,000 tons in 1973. Consequently, the catch on the southern half of the Grand Bank (Div. 3NO) declined from 127,000 tons in 1973 to about 90,000 tons in 1974.

The change in the fishery pattern was not only geographical but also seasonal in that the new fishery in Div. 3L took place mainly in April and May, in contrast to the fishery in Div. 3NO, which was mainly in June and July, as previously.

Table 1. Nominal catches of capelin (000 tons) in Subareas 2 and 3, 1970-74.

Area	1970	1971	1972	1973	1974
SA2	-	-	18	60	53
Div. 3K	+	+	28	76	58
Div. 3L	2	1	1	4	63
Div. 3NO	-	1	21	127	89
Subdiv. 3Ps	+	1	3	1	2
Total	2	3	71	268	269 ¹

¹ Total includes 3,500 tons by Portugal from Div. 3LNO.

* Presented to the Sixth Special Commission Meeting as Proceedings No. 1.

Table 2. Preliminary nominal catches of capelin (tons) in Subareas 2, 3 and 4 in 1974.

Div.	Country	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	NK	Total
2J	Canada (inshore)	-	-	-	-	-	-	-	2	-	-	-	-	-	2
	Poland	-	-	-	-	-	-	-	2580	-	-	-	-	-	2580
	USSR	-	-	-	-	-	-	-	4141	22111	23038	1586	-	-	50876
	Total	-	-	-	-	-	-	-	6723	22111	23038	1586	-	-	53458
3K	Canada (inshore)	-	-	-	-	-	20	148	791	174	5	157	-	-	1295
	Canada (offshore)	-	-	-	-	-	-	-	196	-	7	-	-	-	203
	Poland	-	-	-	-	-	-	-	60	1050	2040	-	-	-	3150
	USSR	22	-	-	-	-	-	144	21826	19099	6022	6157	-	-	53270
Total	22	-	-	-	-	20	292	22677	19469	7084	8354	-	-	57918	
3L	Canada (inshore)	-	-	-	-	-	338	3267	965	329	-	-	-	-	4899
	Canada (offshore)	-	-	-	-	-	2786	1136	-	-	-	-	-	-	3922
	Norway	-	-	-	-	1853	648	-	-	-	-	-	-	-	2501
	USSR	-	-	954	19353	28101	1083	720	-	-	-	-	-	-	2550
Total	-	-	954	19353	30614	6025	5123	965	329	-	-	-	-	63363 ¹	
3N	Canada (offshore)	-	-	-	-	-	2577	-	-	-	-	-	-	-	2577
	Norway	-	-	-	-	-	23634	17270	-	-	-	-	-	-	40904
	USSR	-	-	-	-	-	23124	-	-	-	-	-	-	-	23124
	Total	-	-	-	-	-	49335	17270	-	-	-	-	-	-	66605 ¹
3O	Poland	-	-	840	350	-	-	-	-	-	-	-	-	-	1190
	Spain	...	...	...	...	...	...	...	...	...	...	...	...	6100	6100
	USSR	-	-	-	11030	3852	-	-	-	-	-	-	-	-	14882
	Total	...	...	840	350	11030	3852	...	...	...	...	...	...	6100	22172 ¹
3Ps	Canada (inshore)	-	-	-	-	7	684	927	1	391	9	9	-	-	2028
	Canada (offshore)	-	-	-	-	-	154	67	-	-	-	-	-	-	221
	Total	-	-	-	-	7	838	994	1	391	9	9	-	-	2249
3Pn	Canada (inshore)	-	-	-	-	-	9	+	1	-	-	-	-	-	10
	Canada (offshore)	-	-	-	-	-	160	-	-	-	-	-	-	-	160
	Total	-	-	-	-	-	169	+	1	-	-	-	-	-	170
4R	Canada	-	-	-	1	129	44	1	5	-	-	-	-	-	180
	Total	22	-	-	-	-	20	292	29400	41580	30122	9940	-	-	111376
GRAND TOTAL	2J+3K	-	-	954	19353	30614	6025	5123	965	329	-	-	-	-	63363
	3L	-	-	840	350	11030	53187	17270	-	-	-	-	-	6100	88777
	3N	-	-	-	-	7	1007	994	2	391	9	9	-	-	2419
	3P	-	-	-	-	-	44	1	5	-	-	-	-	-	180
GRAND TOTAL	-	-	-	-	-	-	-	-	-	-	-	-	-	266115 ¹	

¹ In addition, Portugal reported 3,500 tons from Div. 3LNO.

2. Stock Composition of the Capelin Resource

Review of age composition data from the fisheries in 1974 (Res. Doc. 75/2, 75/3, 75/7) has confirmed that the catches are composed of mature capelin of 3, 4 and 5 years of age. In the northern area (Subarea 2 + Div. 3K), these become available to the offshore fishery during the autumn of the year before they migrate inshore to spawn on the coast of east Newfoundland and Labrador. Elsewhere in Subarea 3, the maturing age groups can be fished as they migrate southward to spawn during the same year, either inshore on the eastern Newfoundland coast, or offshore on the Southeast Shoal of the Grand Bank. While commercial catches contain some proportion of juvenile capelin, these are not generally concentrated within the same area and time as the mature capelin during the periods of migration in which the fishery takes place.

The seasonal differences in distribution identify two major components of the capelin resource at this stage of their life history. The distinction is supported by differences in the growth rate between the two groups (Res. Doc. 75/2). Capelin in the northern area grow less rapidly and show local differences of growth which indicate that these capelin populations do not mix completely during a year. Part of the mature capelin in Div. 3L migrate to spawn inshore in that area and in so doing can be associated with the summer inshore migration of cod. A second part moves further south to spawn mainly offshore in Div. 3NO and some may also contribute to inshore spawning in Subdiv. 3Ps. Capelin in these various areas are distinguished by their growth rate and by the seasonal distribution of the fisheries to date, but acoustic surveys (Res. Doc. 75/3) show the distribution of capelin to be continuous at least at certain times, so that the possibility of exchange between the northern and southern components cannot be excluded.

The available data, therefore, support a broad subdivision of the total capelin population into a northern group, spawning in Subarea 2 and Div. 3K, and a southern group, spawning in Div. 3LNO. It is likely that each of these groups is further subdivided into separate spawning stocks, but the available evidence is insufficient to allow a finer subdivision to be made for management purposes.

3. Estimates of Stock Size

In October and November 1974 the USSR conducted an acoustic survey of capelin off Labrador and east Newfoundland, these most likely being the capelin that would spawn in Subarea 2 and Div. 3K in 1975 (Res. Doc. 75/7). The acoustic survey, supported by photographic techniques to estimate the abundance of capelin within shoals, gave a minimum estimate of 1.3 million tons biomass for this component of the total resource.

An alternative estimate of the longer term potential was also presented (Res. Doc. 75/2), based on an analysis of the food requirements of the major predators of capelin, i.e., cod, harp seals and whales. Stomach analyses for cod (Res. Doc. 75/2 and 75/5) show that capelin form the major component of the diet during the early summer period. This and similar information on habits of seals and whales enabled estimation of consumption of capelin by the existing predator resources which was compared with the amount that might have been consumed by these predators before they themselves become exploited. The analysis indicated a quantity of 1.25 million tons of capelin which is now surplus to the food requirements of the existing stocks of cod, seals and whales and which might, therefore, be taken by the fishery without detriment to these other important components of the ecosystem. The importance of the interspecific interactions has to be emphasized, but at present it is not possible to do more than speculate as to what effect the increased catches of capelin might have in terms of the abundance and distribution patterns of predators.

Both the specific estimate of the capelin resource in the northern area in the autumn of 1974 (1.3 million tons), and the broader view of the possible yield (1.25 million tons potentially surplus to predator requirements) point to a total resource of mature capelin well in excess of 1 million tons at the present time. An alternative mathematical formulation of the problem (Res. Doc. 75/6) gave a similar value.

The new information confirms previous views on the general magnitude of the resource, but it is not yet known what proportion could be caught without detriment either to the capelin through an effect on future recruitment or to the other dependent predator species.

4. Review of Previous Advice on TACs

The rapid development of an offshore fishery on capelin was first noted at the 1973 Annual Meeting, when STACRES was requested to examine the implications of establishing TACs for the capelin resources in Subareas 2 and 3. In the absence of any real knowledge of the capelin potential in the area, but recognizing that the potential might be as high as 750,000 tons, the Assessments Subcommittee recommended a TAC of 250,000 tons for 1974 as the first step in the development of the fishery, pending the acquisition of new information on the stocks, particularly in relation to the vital role played by capelin in the trophic ecology of the area. It was also recommended that future increases in TAC should be related to the rate at which new information became available to allow the full potential of the resource to be assessed. It was also recognized that there was at least partial separation of the capelin in Div. 3NO from those further north in Subarea 2 and Div. 3K.

At the Special Commission Meeting in January 1974, further development of the capelin fishery was noted when preliminary data indicated that the 1973 catch would exceed 260,000 tons, a value greater than the TAC of 250,000 tons recommended for 1974. New information presented indicated that a minimal stock breakdown would be Subarea 2 + Div. 3K as the northern stock complex and Div. 3LNOPs as the southern one. Consequently, the Assessments Subcommittee suggested that, if a partition of the 1974 TAC was required, the catch in the southern area should not exceed 150,000 tons. The Commission, consequently, adopted TACs of 110,000 tons for the northern area and 148,000 tons for the southern area, leaving open the possibility for any country with no specific allocation to catch up to 10,000 tons, no more than half of which to be caught in the southern area.

At the 1974 Annual Meeting, additional information presented to the Assessments Subcommittee did not alter the previous opinion that the potential catch of capelin in Subareas 2 and 3 could be 750,000 tons, and it was concluded that an appropriate adjustment of the TAC could be a catch of 500,000 tons in 1975, with this catch maintained for 3 years, and coupled with (i) the restriction of the fishery to mature fish and (ii) an undertaking that countries utilizing the resource conduct surveys on both adults and juveniles in order to monitor the effects of the fishery. It was also indicated that an appropriate partition of the TAC would be 300,000 tons for the northern area and 200,000 tons for the southern area. The matter of setting TACs for 1975 was deferred by the Commission to the present meeting.

5. Advice on Future Management of Capelin

New information presented at this meeting supported earlier scientific opinion that the potential MSY of capelin in Subareas 2 and 3 was about 750,000 tons. This estimate has been derived from direct surveys of capelin stocks and theoretical considerations of potential surplus production of capelin because of declines in the stocks of some major predators. STACRES is not now in a position to specify the kinds of interactions or to predict the effects on these major predators if fishing were to be carried on at this level. It was noted that no direct effects have yet been described in similar situations in other areas (e.g. cod and capelin fisheries in the Barents Sea). Under these circumstances, STACRES confirms its earlier advice that the most appropriate adjustment in the overall TAC could be to a level of 500,000 tons, not to be exceeded for three years, during which time the resources of capelin and other species would be monitored to determine whether any interspecies effects were occurring, but subject to adjustment within this period if new information warranted a change in the TAC level. STACRES points out that the increase to 500,000 tons is put forward as a suggested maximum adjustment of the TAC at this point in time, given the uncertainties surrounding interactions between species, yet providing for a level of fishing which might permit possible interactions to be detected.

Although existing estimates of MSY and stock sizes are very approximate, it appears that the capelin resource in the northern area (Subarea 2 + Div. 3K) is larger than that in the southern area (Div. 3LNOPs) by a ratio of 3 to 2. Taking this into account, STACRES again suggests that an appropriate split of a 500,000 ton TAC would be 300,000 tons in Subarea 2 and Div. 3K combined and 200,000 tons in Div. 3LNOPs.

Consideration was given to the question of further subdivision of the TAC on the basis of existing knowledge of stock differentiation. It was concluded that further subdivision of the northern TAC was not practical at the moment due to insufficient knowledge of stock separation in this area. In the south, however, there is evidence to suggest that the fishery in Div. 3L may operate on several separate spawning components which spawn later inshore in Div. 3L, on the Southeast Shoal, and possibly in Subdiv. 3Ps. In 1974, Div. 3L supported a large fishery, while the catch in Subdiv. 3Ps was small. To preclude rapid development of a fishery on a possibly small stock in Subdiv. 3Ps, STACRES advises that an amount of 10,000 tons from the southern TAC be reserved as a maximum permissible catch from Subdiv. 3Ps, with the proviso that any part of this amount could be taken in Div. 3NO if not taken in the former area. For the southern area as a whole, it was concluded that it would be desirable for the fishery to be concentrated as much as possible on the concentrations of mature capelin in Div. 3NO to minimize potential adverse effects on capelin and other species. If this were practical, it would avoid the possibility of overfishing any one of the spawning components present in Div. 3L earlier in the season, and, for the inshore spawning stock, it would avoid the possibility of adversely affecting inshore migration and feeding success of the Div. 3L cod. If the principle of directing the southern fishery toward the spawning concentrations is accepted by the Commission, this objective could be achieved by further subdivision of the southern TAC. For example, it could be achieved by setting an upper limit for the Div. 3L fishery of 50,000 tons, with the proviso that any part of this amount not taken in Div. 3L could be taken in Div. 3NO.

To summarize, the management regime in the southern area would then consist of an overall maximum TAC of 200,000 tons, no more than 10,000 tons of which could be taken in Subdiv. 3Ps and no more than 50,000 tons of which could be taken in Div. 3L. If these maxima were not achieved in Subdiv. 3Ps and Div. 3L, the uncaught amounts could be added to the catches in Div. 3NO.

6. Advice on Closed Area Regulation in Div. 3L.

Noting the Canadian proposal for a closed area regulation with respect to the capelin fishery in Div. 3L (Comm. Doc. 75/1 revised), and taking into account the STACRES conclusion that it would be desirable to adopt measures which would tend to divert fishing from Div. 3L to the capelin concentrations in Div. 3NO, STACRES advises that the proposed closed area could be effective in giving additional protection to that component of the Div. 3L capelin migrating to spawn inshore. This would be given at a time when the capelin are most closely associated with cod migrating inshore which are highly dependent on capelin as food. It is noted that there is no specific biological rationale for specifying precisely the boundaries of such a closed area, although the area as proposed would appear to offer such protection during the May-June period. However, it is further noted that the area to the south and west of the coordinates 48°00'N, 51°45'W probably contain a mixture of inshore-migrating and offshore-migrating capelin.

7. Future Research

Improvement in advice to the Commission on management of capelin and on the effects of capelin fisheries on other species depends critically on direct estimations of capelin abundance and on research in species interactions. While both subject areas deserve priority, it was evident that survey results were more likely to be available in the shorter term. During 1975, Canadian and USSR vessels plan to carry out acoustic and fishing surveys in both the northern and southern areas, and a survey is also tentatively planned by Norway. Planning and coordination of these surveys, for most efficient use of vessel time and uniformity of techniques insofar as possible, will be considered at the Woods Hole meeting of the Biological Surveys Subcommittee in April 1975. It was noted that larval surveys could also contribute substantially to knowledge of abundance and stock separation.

Information on species interactions will require longer term research on biological systems and will have wider application as fisheries develop on species other than capelin at lower trophic levels, as well as application in mixed fisheries generally. The importance of beginning new studies and expanding existing research programs in this field cannot be overemphasized.

8. Appreciation

The Chairman expressed his appreciation for the excellent work of the participants during this Special Meeting of STACRES and thanked the Director of the Institute of Marine Research for the excellent meeting facilities provided.

APPENDIX I.

Agenda for STACRES Meeting - January 1975

1. Opening by the Chairman, Dr. A.W. May (Canada).
2. Rapporteurs.
3. Adoption of agenda.
4. Review of capelin stock discrimination data in relation to total allowable catches by areas in Subarea 2 and 3 (Redbook 1974, pages 29 and 83).
5. Reconsideration of advice on TACs for capelin in the stock areas.
6. Review of available data on interactions between capelin and other species.
7. Advice on TACs for capelin in relation to stock divisions, seasons, other fisheries, etc., taking the developing pattern of fishing into account.
8. Future research requirements.
9. Other matters.
10. Approval of report.
11. Adjournment.

APPENDIX II.

List of Participants at STACRES Meeting - January 1975

CANADA

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