International Commission for the Northwest Atlantic Fisheries

ANNUAL MEETING - JUNE 1974

Correction for Table 1 Res. Doc. 74/48 Bowering and Pitt

Table 1. Witch - ICNAF 2J, 3K and 3L. Nominal catches with data from Summ. Doc. 74/25 added.

Year	Canada	FRG	Poland	USSR	UK	GDR	Non-Member	Total Stock	Calculated No. removed '000
1962	29		82	355	13		1	480	900
1963	17	3	259	89	7		2	377	1000
1964	103		752	164	24	543		1586	2900
1965	41	29	1876	2002	58	380		4386	7900
1966	187	9	659	1868	29	1045		3797	6800
1967	901		926	1933	9	332		4101	7400
1968	446		1990	7734	33	358		10561	19000
1969	1355		957	9726	1	781		12820	23100
1970	4020		3566	9934		653		18173	32700
1971	8030	75	5404	2018	9	508		16064	28900
1972	5520	6	4013	7016	225	538		17318	31200
1973	3694	1324	11802	2883	133	2327		22163	39900

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An assessment of witch (Glyptocephalus cynoglossus) for
ICNAF Divisions 2J-3KL

by

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Introduction

The Canadian fishery in ICNAF Divisions 3K and 3L is almost entirely by the inshore fleet using monofilament gillnets. The fishery for the various flatfish species have become of major importance to the northeast coast fishermen in recent years especially since the availability of cod, the traditional fishery in this area, has decreased.

Nominal catches of witch in these divisions have increased fairly rapidly since 1962 (Table 1) and reached 18,000 tons in 1970. Preliminary figures for 1973 indicate a catch in excess of 22,000 tons. Canada, Poland and the USSR accounted for most of the catch with landings by the latter two countries usually in excess of the Canadian catch. The Polish catch in 1973 was nearly 12,000 tons with total Canadian catch dropping below 4000 tons including catches outside the Convention Area. Since no information on the division of stocks are available, witch from ICNAF Divisions 2J-3KL were combined for purposes of stock management.

Material and Methods

In preparing an assessment for witch from this stock a major difficulty was securing samples that would adequately represent the Canadian gillnet and the larger European otter trawler fishery. The only available otoliths were from Canadian commercial gillnets and research vessel catches. Sampling of the Canadian commercial fishery in Divisions 3K and 3L has been in progress since 1970 with most of the sampling occurring in Division 3K. Samples from research vessel cruises (A. T. Cameron) were available for 1970, 1971 and 1973.

As indicated no age data were available from the European fleet fishery for this stock. Length frequencies published in 1968, 1969 and available for 1972 from the Polish fishery were not separated by sex and hence could not be used since we found sufficient differences in growth and age composition to warrant separation of the sexes.

Estimation of total mortality (Z) were made from catch curves of age data collected by the A. T. Cameron 1970-73 (Fig. 3). The latter ship uses a 41-5 otter trawl and a lined codend. Gillnets used by the commercial fishery have a mesh size of 165-203 mm. A comparison of age and length

composition data (Fig. 1) indicates that while research vessels catch more small fish, there was little difference in the position of the modal age and length. The major difference was in the peak at age 9 in the males where gillnets caught proportionally higher quantities. It seemed therefore that research vessel data would be more representative of the stock in estimating values of Z.

A small amount of research vessel age data were available for 1949-1952 from Divisions 2J and 3KL and gave values of 0.20 to 0.25 from catch curves for females and males, respectively. Since this was prior to a commercial fishery they suggest possible values of M.

Growth curves using the Ricker (1958) method to fit the von Bertalanffy equation were calculated for male and female witch (Fig. 2). The Beverton and Holt yield per recruit model was applied to males and females separately using the following parameters:

		Males	Females
W_∞	asymptotic weight	3.28 kg	3.80 kg
K	from Bertalanffy equation	0.10	0.11
t_0	from Bertalanffy equation	-2.96 yr	-2.01 yr
t_p	age at recruitment	5 yr	5 yr
t_p^1	age at mean selection length	6.5 yr	6.5 yr
t_λ	last age of significant contribution	16 yr	20 yr

Values of M of 0.15, 0.20 and 0.25 were used (Fig. 4) and yield per recruit values were computed up to F = 2.5.

Results

The yield curves were essentially flat-topped with F_{max} occurring at 0.85 for females and at 1.5 for males (M = 0.15) (Fig. 4). For other values of M no maximum values were obtained up to F = 2.5. However, beyond fishing mortality values of 0.8 to 1.0 the increments in yield per recruit were extremely small. Estimated levels of $F_{0.1}$ (Gulland and Boerema, 1972) for the females were 0.19, 0.22 and 0.29 and for males 0.25, 0.30 and 0.33 with M = 0.15, 0.20 and 0.25, respectively.

Estimates of total mortality (Z) from research vessel catch curves, in 1970-73 gave estimates of 0.47 for males and 0.42 for females (Fig. 3). These values are beyond $F_{0.1}$ with M = 0.15 for both males and females and approximately equal to $F_{0.1}$ at M = 0.2 and below $F_{0.1}$ for M = 0.25. These estimates probably represent the average level of total mortality during 1962-71 when removals averaged 11.0 million fish or 6400 tons annually. For 1972-73 the average total removals and weight increased threefold to approximately 34.6 million fish or 20,000 tons (Table 1).

Discussion

A major difficulty in studying the abundance of this stock of witch is the lack of catch and effort data. Some information is available from the Canadian gillnet fishery, but this covers only a very small section of the fleet and while indicating a general decline in abundance it may not be indicative of abundance since gillnetters have moved progressively offshore as catch per net in coastal localities diminished. No effort data, however, are available from the European otter trawler fleet because up to 1972 this information was reported under a combined "flounder" category in ICNAF Statistical Bulletins.

It seems likely that recent catches of witch in Divisions 2J and 3K in particular were principally from a virgin stock. Canadian research vessel cruises have generally produced catches consisting to a considerable extent of large old witch especially from the area just south of Hamilton Inlet Bank. The total stock size seems to be comparatively small and Chekhova (1973) reported that while witch appeared to be increasing in abundance they were only present in less than commercial

quantities at least down to 400 m, thus as   with Canadian research vessels, USSR surveys do not appear to have caught many small fish. It is possible that juvenile witch are either in very deep water or that recruitment takes place in another area, possibly the Gulf of St. Lawrence. We have no real evidence to support this however.

Witch have roughly the same life span as American plaice and Pitt (1973) estimated M values of 0.25 for males and 0.20 for females for the latter species. Halliday (1973) assumed M values of 0.20 and 0.15 for males and females, respectively, in an assessment of Scotian Shelf witch although no estimates of this parameter were available. Values of 0.25 and 0.20 used here are probably maximal for this species.

The fishing level for 1962-71 reflected in the 1970-73 catch curve (Fig. 3) at 0.22 (assuming M = 0.25) and 0.20 for males and females, respectively, was at $F_{0.1}$ (Gulland and Boerema, 1972) for the females and below this point for the males (Fig. 4). The increase in catch was at least threefold from about 6400 tons for 1962-71 to approximately 20,000 tons for 1972-73. It seems highly likely that current values of F are well above the $F_{0.1}$ level.

Based on a review of witch landings 1962-71 (Pitt, 1973) a total allowable catch of 17,000 tons was recommended by STACRES in 1973. This was however increased by the Commission to 22,000 (19,500 in the Convention Area plus 2500 outside). With the apparent large increase in the fishing intensity si..e 1969 it would appear that the 1970-72 level at 16,000 to 17,000 tons should not be exceeded at least until more current values of F can be obtained.

References

Chekhova, V. A. 1973. The trawling survey of groundfish in the Newfoundland area. Intern. Comm. Northw. Atlant. Fish. Res. Doc. 73/70, Ser. No. 2979.

Gulland, J. A., and L. K. Boerema. 1972. Scientific advice on catch levels. Intern. Comm. Northw. Atlant. Fish. Res. Doc. 72/26, Ser. No. 2717.

Pitt, T. K. 1973. Trends in the witch fishery in Subarea 3. Intern. Comm. Northw. Atlant. Fish. Res. Doc. 73/80, Ser. No. 3032.

Ricker, W. E. 1958. Handbook of computation for biological statistics of fish populations. Fish. Res. Bd. Canada Bull. 110: 300 pp.

Table 1. Witch-ICNAF Divisions 2J, 3K and 3L (Southern Labrador-East Newfoundland)-Nominal catches

Year	Canada	F.R.G.	Poland(a)	USSR(b)	UK	GDR	Non-Mem	Total stock	Calculated no removed '000
1962	29	-	82	355	13	-	1	480	900
1963	17	-	269	254	7	-	2	549	1000
1964	103	-	752	854	24	-	543	2275	4100
1965	121	-	1876	1671	58	-	380	4106	7500
1966	187	-	559	1201	29	-	1160	3136	5700
1967	896	-	928	1561	9	-	529	3923	6900
1968	441	-	1990	4176	33	-	391	7031	12700
1969	1354	-	957	5907	-	546	-	8764	15600
1970	4020	-	3566	9934	-	508	-	18028	31600
1971	8030	75	5404	2018	9	508	-	16044	26500
1972	5520	7	4013	7016	225	645	-	17426	30000
(c)1973	3694	1324	11802	2883	133	2327	-	22163	39300

(a) 1963-69 landings from recent data provided by Poland to ICNAF Secretariat.
(b) 1963-69 catch based on USSR 1970 and 1971 breakdown of plaice and witch applied to "unspecified flounder".
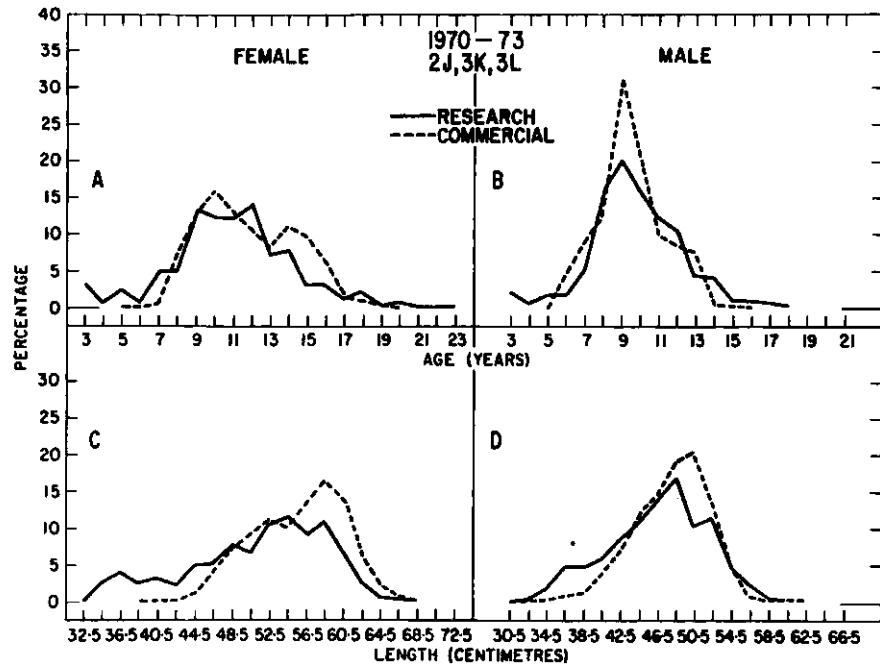(c) 1973 figures not final for the whole year.

Fig. 1. Age and length frequencies of research and commercial witch for Divisions 2J-3KL. Commercial data collected from gill net catches.
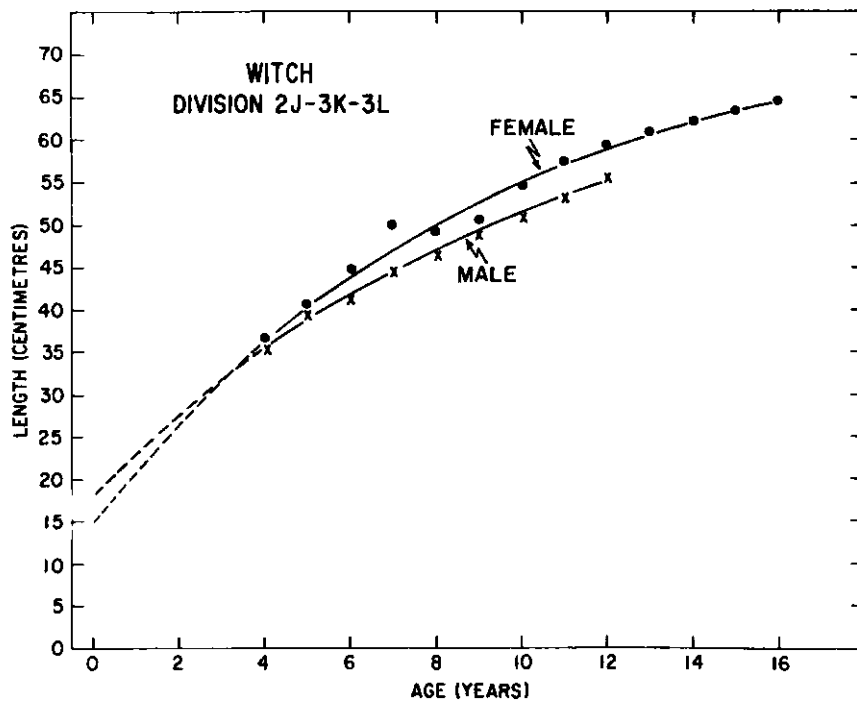

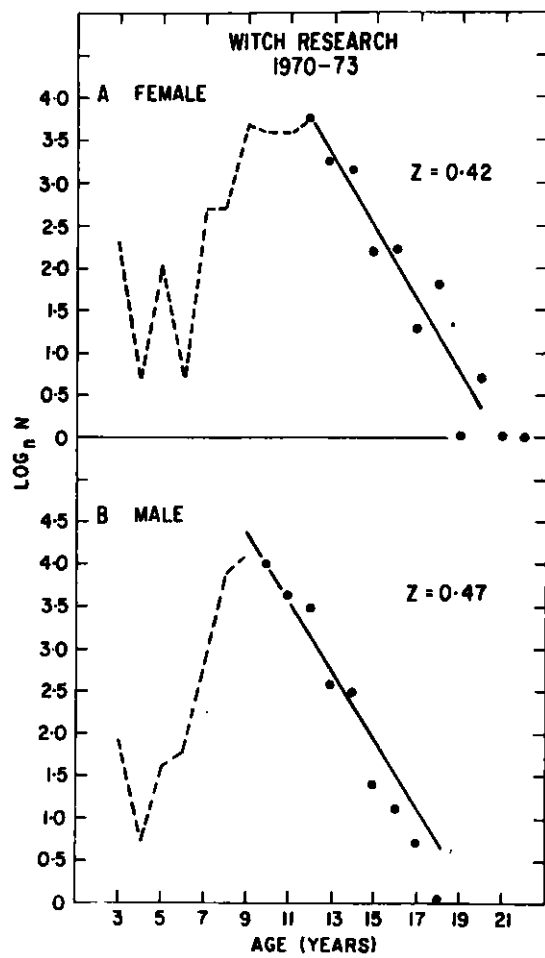Fig. 2. Growth curves of witch for Divisions 2J-3KL.

Fig. 3. Catch curves of witch from research vessel data 1970-73.
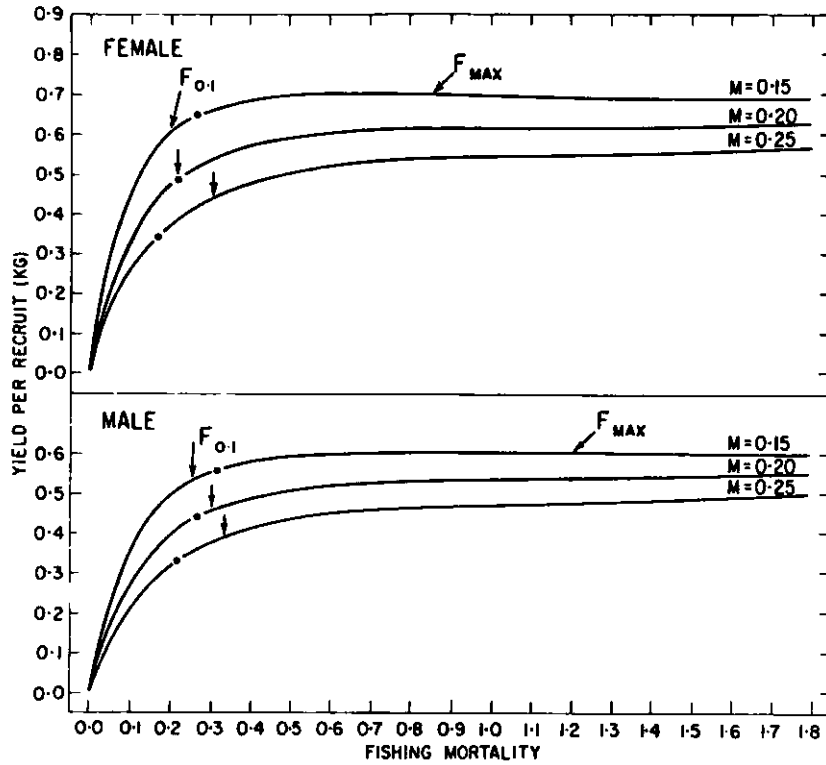
Fig. 4. Yield per recruit curves for male and female witch. Points on curves indicate fishing mortality estimate for 1970-73 research vessel catch curves.