International Commission for the Northwest Atlantic Fisheries

Serial No. 5030
(D.c. 3)

ICNAF Res. Doc. 77/VI/10

ANNUAL MEETING, 1977

An evaluation of the status of witch flounder (Glyptocephalus cynoglossus) from ICNAF Divisions 2J, 3K and 3L

by

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Publ. in ICNAF Sel. Papers No. 3: 23-28

Introduction

Previous to the early 1960's there was practically no fishery from this stock so that early catches were from the accumulated virgin stock. Catch rates in the inshore Canadian fishery that were relatively high in the early years have declined considerably. Thus, the inshore boats of Notre Dame, Bonavista, and Trinity Bays have been forced to move progressively offshore as the closer inshore stocks were depleted. The USSR and Poland particularly have been taking substantial quantities from the area south of Hamilton Inlet Bank to Funk Island, in some cases at least as by-catches of other fisheries (Table 1).

The fishery for various flatfish species has become of major importance to the N.E.coast Nfld. fishermen in recent years especially since the availability of the traditional cod fishery in this area has decreased. With the decline of the redfish stock in 4R and the reduction of the flatfish stocks on the Grand Banks, the Canadian offshore fleet has now moved some of their effort to the northern areas. For the early months of 1977, witch flounder from 3K has been a very important groundfish species for some of the Canadian offshore fleet.

Nominal catches in these divisions have increased (Table 1) from 4,400 tons in 1961 to 23,000 tons in 1973 and then declined to 11,000 tons in 1976 with Canada, Poland and the USSR accounting for most of the catch. On the basis of an assessment in 1974 (Bowering and Pitt, MS 1974), the TAC has been set at 17,000 tons annually for 1975-77 for this stock.

Materials and Methods

In preparing an assessment of this stock it was assumed that Canadian inshore and Canadian and European offshore boats were fishing the same population. Data used in the assessment were length and age samples from Canadian commercial gillnets in Division 3K, 1974-76, and Canadian offshore otter trawl from Division 3L for the years 1974-75 and from Divisions 2J, 3K and 3L for 1976 (Fig. 1 and 2). Offshore age samples were also available from Poland for Division 3K, 1976. Since the offshore samples did not include representative samples for all segments of the stock for each year and quarter, hence they were probably not entirely representative of the total stock. Consequently, it was difficult to calculate realistic values for total numbers at age for the entire stock.

Estimates of total mortality (Z) were made from catch curves of age data from 1974-76 gillnet and otter trawl samples separately. The numbers at age were then calculated from the landings by each gear and added together to give a weighted catch curve for both gears combined (Fig. 3), at least for the limited area sampled. Gillnets used by the Canadian commercial fishery have a mesh size of 165-203 mm and commercial otter trawl has a 130 mm mesh size in the codend.

Bowering and Pitt (1974) indicated values of M = 0.25 and 0.20 for males and females respectively but suggested that they are probably maximal. Halliday (1973) used values of M = 0.10 - 0.15 for both sexes for the Scotian Shelf witch. Considering the life span of this species, M = 0.25 is probably too high therefore values of M = 0.10, 0.15 and 0.20 were used in computing the yield curves

in this assessment.

The mean selection lengths (l_c) for males and females for the fishery were estimated by calculating the l_c for each year during 1974-76 for gillnet length frequencies and otter trawl length frequencies separately. The l_c for each of these gears was then weighted by catch for each gear to produce a weighted average l_c for the fishery during 1974-75. The average l_c for males = 47.80 cm and females = 46.91 cm.

Von Bertalanffy growth equations were fitted for males and females separately using the Ricker (1958) method (Fig. 4). The Beverton and Holt yield-per-recruit model was applied to males and females separately Fig.5 and the values computed up to F = 2.5, according to the following parameters:

	Males		Females	
W_∞-asymptotic weight	2.148	kg	2.675	kg
K -from von Bertalanffy equation	0.0679		0.0766	
t_0-from von Bertalanffy equation	-8.71	yrs	-6.83	yrs
t_p-age at recruitment	5	yrs	5	yrs
t_{pl}- age at mean selection length	11.52	yrs	8.45	yrs
t_λ-last age of significant contribution	20	yrs	23	yrs

Results

The length and age range (Fig. 1 and 2) for inshore and offshore gears appear to be about the same. However, there is a much higher percentage of females taken inshore. The offshore gear caught approximately equal numbers of males and females. Since the offshore gear was much less selective than gillnets and accounted for more than 80% of the total catch, it was felt that the estimates of total mortality (Fig. 3) for offshore alone were more representative of the total stock, therefore these values were plotted on the yield curves. Considering the possible differences in interpretation of ages and differences in areas sampled, the Canadian and Polish age compositions for 1976 offshore (Fig. 6) are not greatly different. However,since Polish age readings were grouped beyond age 15 for the males and age 17 for the females, these were not used in computing the catch curves (Fig. 3).

The yield curves were flat-topped and no maximum values were obtained for any values of M used up to F = 2.5. However, beyond F = 0.8, increments of yield-per-recruit were extremely small. Estimated levels of $F_{0.1}$ for the males were 0.27, 0.38, and 0.43, and for females 0.21, 0.27, and 0.32 for M values of 0.10, 0.15, and 0.20 respectively.

Estimates of total mortality (Z) from offshore otter trawl catches were 0.34 for males and 0.38 for females. These values are all below $F_{0.1}$ with the exception of females at M = 0.10. The estimates are probably representative of the catch over the past ten years when removals averaged 14,000 tons annually. For 1974-76 the average level of removals was approximately 13,000 tons.

Discussion

Data on which to present a more precise assessment of this stock using a more sophisticated model are presently lacking. Data on location of juvenile fish are generally unavailable for this stock. Research surveys both inshore and offshore have indicated very small catches of juvenile fish along the south coast (3Ps-3Pn) and in the northern part of 4R. None at all have been reported for the southern Labrador and eastern Newfoundland area. It is possible that 4R is a source of recruitment for the eastern areas but no evidence is available to support this.

In obtaining data to assess this stock it is important that sampling be done in all ICNAF Divisions. Bowering (1975) indicated growth patterns vary considerably between localities. Witch in the north (Div. 2J and 3K) apparently have a faster growth rate and are larger at comparable age than those from more southerly localities. It is because of this that offshore samples taken in Division 3L are not entirely representative of the total stock. Data on catch and effort are also lacking. Some information from the Canadian gillnet fishery is available but this represents only a small part of the total fishery. In any case, catch effort data may not be indicative of abundance since the gillnet fishery has moved progressively offshore as catch per unit of effort in the inshore areas declined.

The fishing level over the past ten years reflected in the 1974-76 catch curves (Fig. 3) are generally below the $F_{0.1}$ level for both sexes except for females at M = 0.10, however, this value is just slightly above $F_{0.1}$. The average annual catch over the period was 12,000-14,000 tons. The TAC for 1975-77 has been set at 17,000 tons annually based on an assessment by Bowering and Pitt (MS 1974) but the catches have been less than the TAC.

The decrease in landings, however, is possibly more indicative of weather and ice conditions and problems in the fishing industry rather than declining abundance. Until a more accurate assessment using more sophisticated models is completed, there appears to be no reason to change the TAC from 17,000 tons.

References

Bowering, W. R. 1975. Distribution, Age and Growth, and Sexual Maturity of Witch Flounder (Glyptocephalus cynoglossus) in Newfoundland Waters. J. Fish. Res. Bd. Can. 33-7, pp. 1574-1584.

Bowering, W. R. and T. K. Pitt. MS 1974. An assessment of witch (Glyptocephalus cynoglossus) for ICNAF Divisions 2J - 3KL. Intern. Comm. Northw. Atlant. Fish. Res. Doc. 74/48, Serial No. 3255, 6 p.

Halliday, R. G. 1973. The flatfish fisheries of the Scotian Shelf. Intern. Comm. Northw. Atlant. Fish. Selected Papers, Part III, pp. 79-99.

Ricker, W. E. 1958. Handbook of Computations 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	FRG	Poland	USSR	UK	GDR	Others	Total Stock
1965	121	-	1,876	2,056	58	380	-	4,433
1966	187	-	559	1,868	29	1,045	-	3,688
1967	901	-	928	1,933	9	332	-	4,103
1968	446	-	1,990	7,834	33	358	-	10,661
1969	1,355	-	957	9,726	-	546	-	12,584
1970	4,020	-	3,566	9,934	-	508	-	18,028
1971	8,030	75	5,404	2,018	9	508	-	16,044
1972	5,520	7	4,013	7,016	225	645	-	17,426
1973	3,761	1.348	11,802	2,834	133	2,327	1,291	23,496
1974	1,868	1,082	5,302	6,917	29	272	485	15,955
1975	1,352	446	4,583	4,763	16	374	685	12,219
1976	2,085	1,321	4,029	4,597	2	110	-	12,144

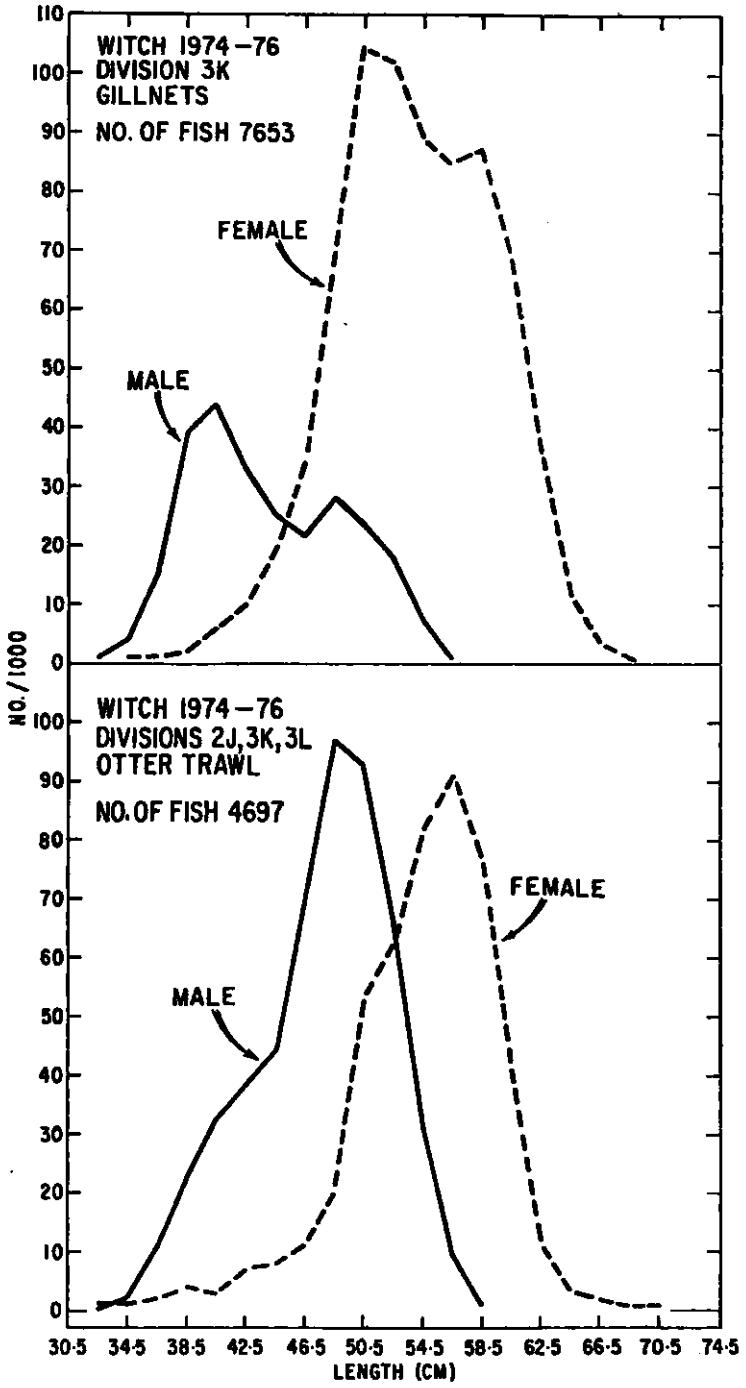

Fig. 1. Commercial witch length distributions for ICNAF Division 3K Gillnet and ICNAF divisions 2J, 3K, 3L otter trawl.

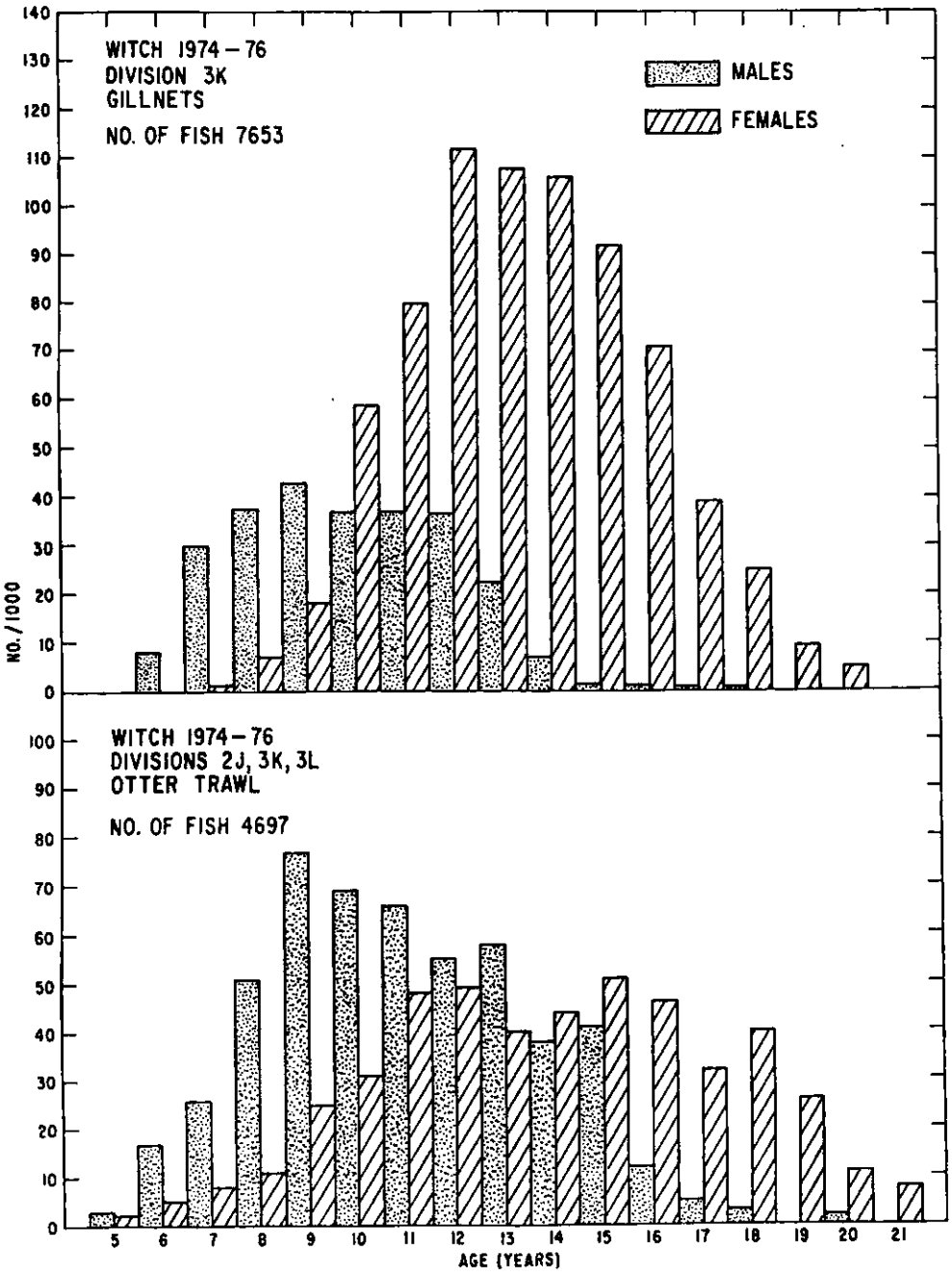

Fig. 2 Age composition for male and female witch for commercial Gillnets (3K) and commercial otter trawl (2J-3K-3L), 1974-76.

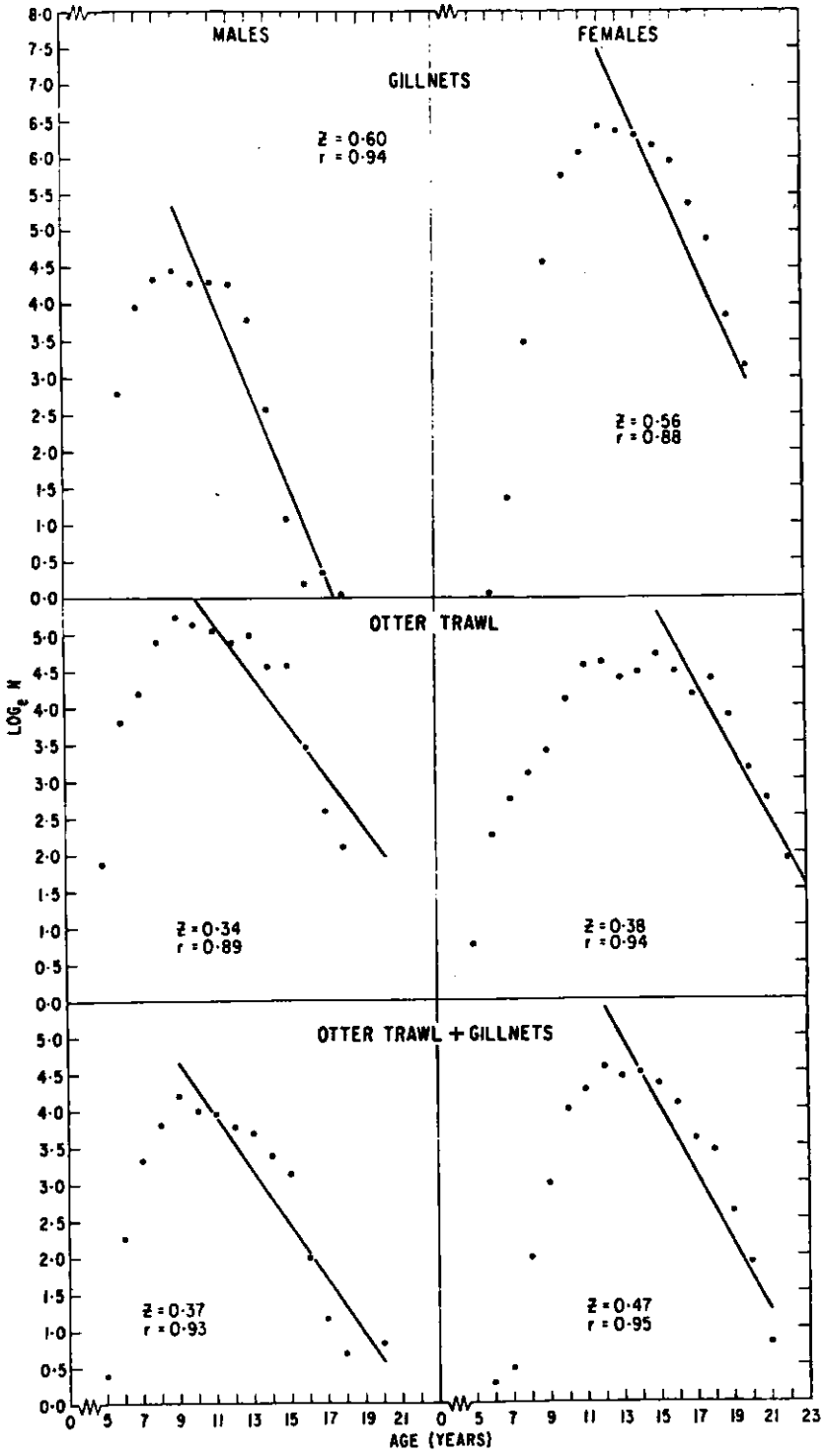

Fig. 3. Catch curves for male and female commercial witch for 1974-76 in areas 2J,3K and 3L.

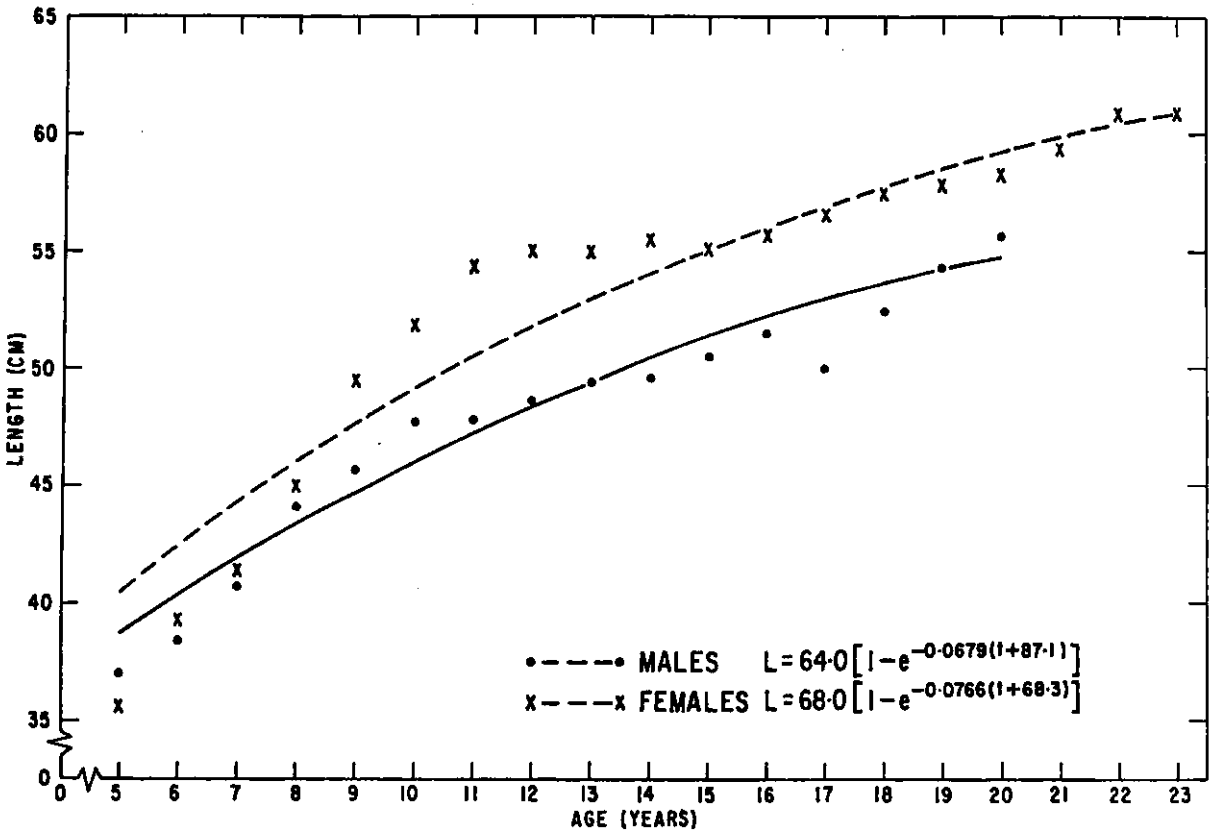

Fig. 4 Growth curves for male and female witch in ICNAF divisions 2J, 3K and 3L.

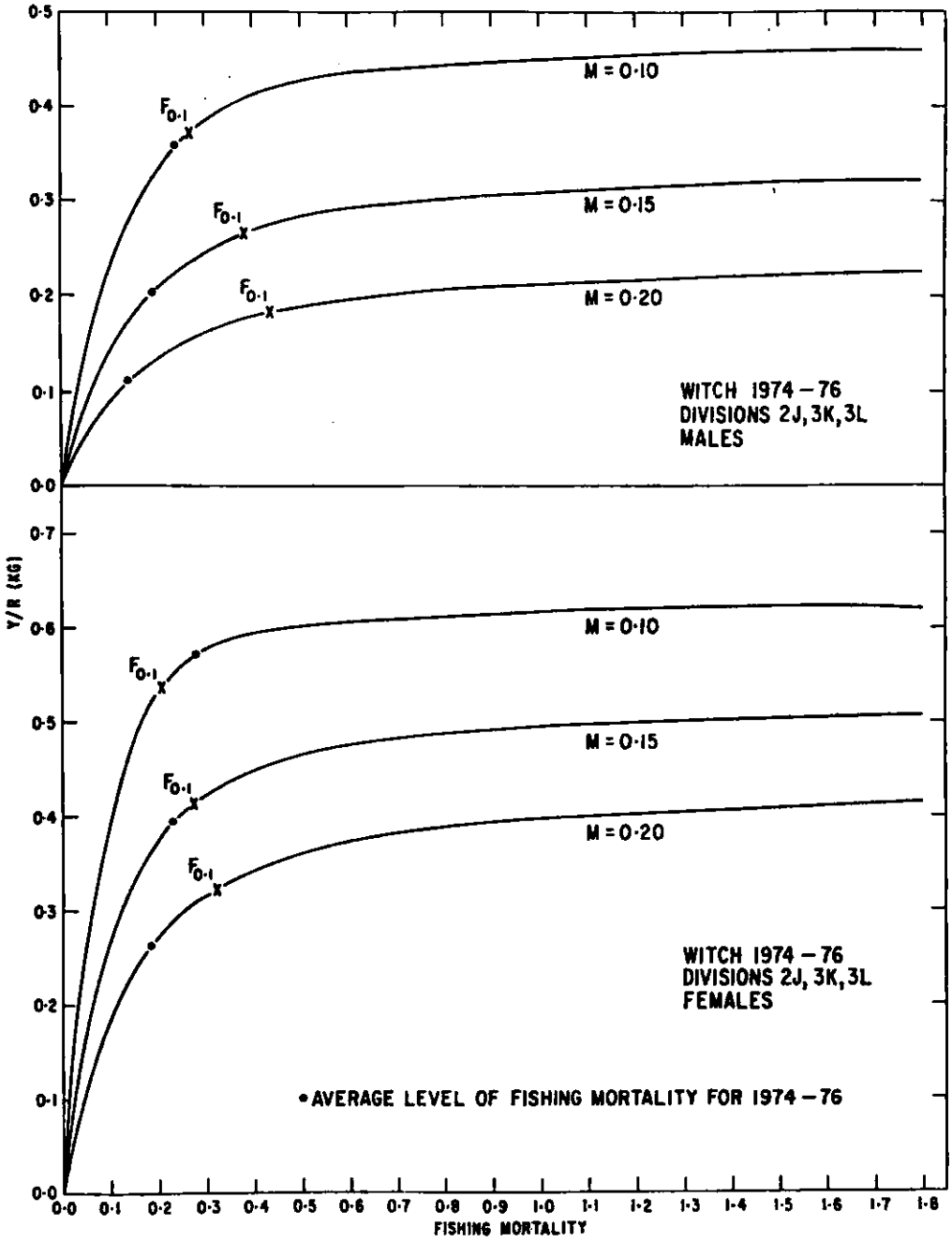

Fig. 5 Yield per recruit curves for male and female witch in ICNAF divisions 2J, 3K and 3L for 1974 - 76 commercial data.

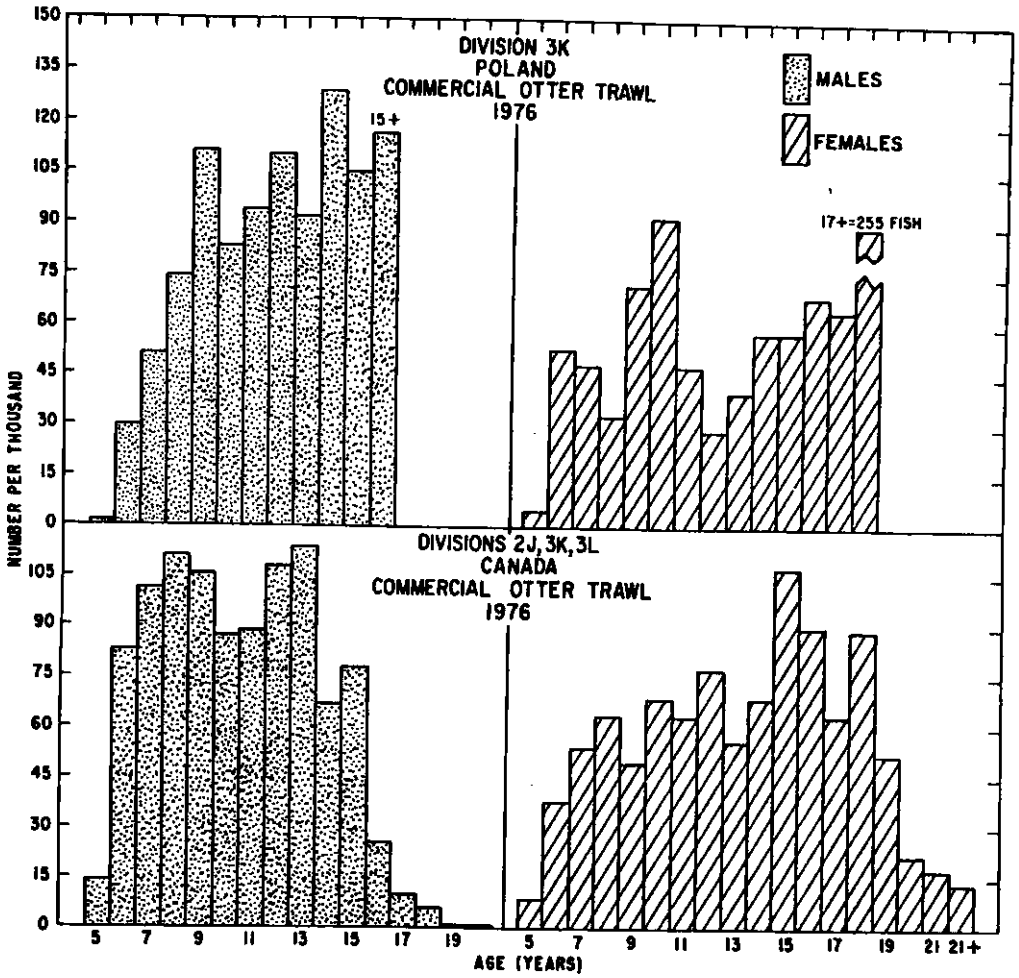

Fig. 6 Age distributions of Polish and Canadian commercial otter trawl catches for male and female witch in areas 2J, 3K, 3L for 1976.