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An analysis of the witch flounder stock of ICNAF Subdivision 3Ps

by

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Introduction

The fishery for witch in ICNAF Division 3Ps began in Fortune Bay in the early 1950's. This fishery was made up primarily of Danish seiners with catches averaging 500-700 tons annually. Catches were reduced drastically for 1955 and the seiners were forced to move elsewhere. Although some Danish seining is still carried out in Fortune Bay, most witch in this area are caught by synthetic gillnets.

The main otter trawl fishery for witch in ICNAF Division 3Ps in recent years is now located on the southwest slope of St. Pierre Bank with some taken in the Burgeo Bank area primarily as a by-catch of other fisheries such as redfish, cod and American plaice. No directed fishery for witch occurs in this area. The largest catches were recorded during 1967-69 with annual yields of 4,000-5,000 tons, most of which was taken by Canadian and Soviet otter trawlers (Table 1). Since then however, the catches are almost entirely Canadian with removals averaging less than 2,000 tons annually. The first analytical assessment (Bowering, 1977) of this stock was presented at the ICNAF Annual Meeting in 1976 and a total allowable catch (TAC) of 3,000 tons was agreed to by the Commission for 1977.

Materials and Methods

Sampling data were collected from Canadian commercial trawlers fishing the St. Pierre Bank area during 1975 and 1976. The growth rate was considered significantly different enough to warrant separation of the sexes sexes. Length and age compositions were plotted for 1975 and 1976 samples taken from the Canadian commercial trawler catches (Fig. 1 and 2) and von Bertalanffy growth curves were fitted to the age-length data from the same samples.

Catch curves were constructed by applying the commercial age-length keys for 1975 and 1976 to the total removals for each year and calculating the total numbers removed at each age for both years combined (Fig. 3). The Beverton and Holt (1957) yield-per-recruit model was applied to males and females separately using the following parameters as taken from Bowering (1977):

		Males	Females
W_∞	- asymptotic weight (kg)	1.701	2.970
K	- growth coefficient	0.0973	0.0732
t_o	- arbitrary age (yr) for l = o	0.41	0.25
t_p	- age at recruitment (yr)	7.0	7.0
$t_p{}^1$	- age at mean selection (yr)	9.2	9.8
t_λ	- age at last significant contribution to fishery (yr)	20.0	24.0

Yield-per-recruit curves were plotted for M = 0.20 and for fishing mortality (F) values up to 2.5 (Fig. 4).

Length and age distributions from random stratified research surveys on St. Pierre Bank were plotted for 1974-1976 (Fig. 5 and 6) to compare with commercial data. Length distributions were also available from research surveys conducted in Fortune Bay in 1974 and 1976 (Fig. 5).

Results and Discussion

Witch from this area enter the fishery at about age 7 (30 cm) with fish taken up to age 24 (60 cm) (Fig. 1 and 2). The main portion of the catches are comprised of 10-15 year old fish (32-46 cm). There is a definite difference in the size and age distribution from 1975 to 1976 in the commercial data (Fig. 1 and 2) although sampling in both years was taken in the same quarter. It is possible, however, that there could be a difference in fishing depths which could possibly account for the differences. Powles and Kohler (1970) showed that witch in different stages of life history possibly occupy different depths as well as showing some degree of seasonal migration.

Catch curves (Fig. 3) plotted from commercial age composition in Figure 2 provide estimates of instantaneous total mortality (Z) of 0.63 for males and 0.42 for females, with correlation coefficients (r) greater than 0.95. The estimate for males is somewhat lower than the previous estimate (0.75) presented in Bowering (1977) at the Annual ICNAF Meeting in 1976 and the estimate for females (0.42) was the same. The yield-per-recruit curves (Fig. 4) are essentially flat-topped as is usually the case with this species with no definitive F_{max} up to F = 2.5. The levels of F presented in Figure 4 are somewhat higher than $F_{0.1}$ for the females. These values are probably representative of fishing mortality during the 1970s when nominal catches averaged 2,000 tons annually.

Stratified random research surveys have been carried out in the St. Pierre Bank area since 1974 and in Figure 5 it can be seen that the length distributions from year to year have been very consistent. The major proportion of sizes in the research survey in 1975 is similar to the commercial distribution however 1976 is different which may indicate that the 1976 commercial data is unusual as stated earlier. The age distributions (Fig. 6) for the St. Pierre Bank area since 1974 indicate rather normal distributions with no apparent fluctuations in year-class strengths. The major proportion of the age groups is also similar to that of the commercial groups presented in Figure 2.

Research surveys carried out in the Fortune Bay area during 1974 and 1976 indicate similar size distributions, however, there is a large shift from those in Fortune Bay to those in St. Pierre Bank, with much larger fish being caught in the Fortune Bay area.

Age data are not presently available for Fortune Bay witch for these years, however, Bowering (1975) has shown that beyond age 7 the growth rate of Fortune Bay witch and St. Pierre Bank witch are very similar, in fact very few fish below age 7 were taken in Fortune Bay. Considering these differences in size composition, the possibility does exist that witch in the Fortune Bay area may be a local stock being separate from that of St. Pierre Bank. It is intended, in 1977-78, to undertake a project at the Nfld. Biological Station on a biochemical basis to investigate this possibility.

References

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Table 1. Nominal catches of witch flounder, ICNAF Division 3Ps, 1963-76

YEAR	CANADA	FRANCE	USSR	UK	PORTUGAL	TOTAL
1963	771	131	-	22	-	924
1964	963	-	-	48	-	1,011
1965	555	-	-	15	-	570
1966	1,344	-	79	21	-	1,444
1967	3,790	-	982	33	-	4,805
1968	2,561	106	1,464	-	-	4,131
1969	2,309	95	1,691	1	-	4,096
1970	2,591	111	-	-	-	2,702
1971	2,193	57	-	-	-	2,250
1972	1,517	69	8	-	-	1,594
1973	2,341	112	443	10	-	2,906
1974	1,699	2	-	-	40	1,741
1975	1,370	40	4	-	13	1,427
1976						

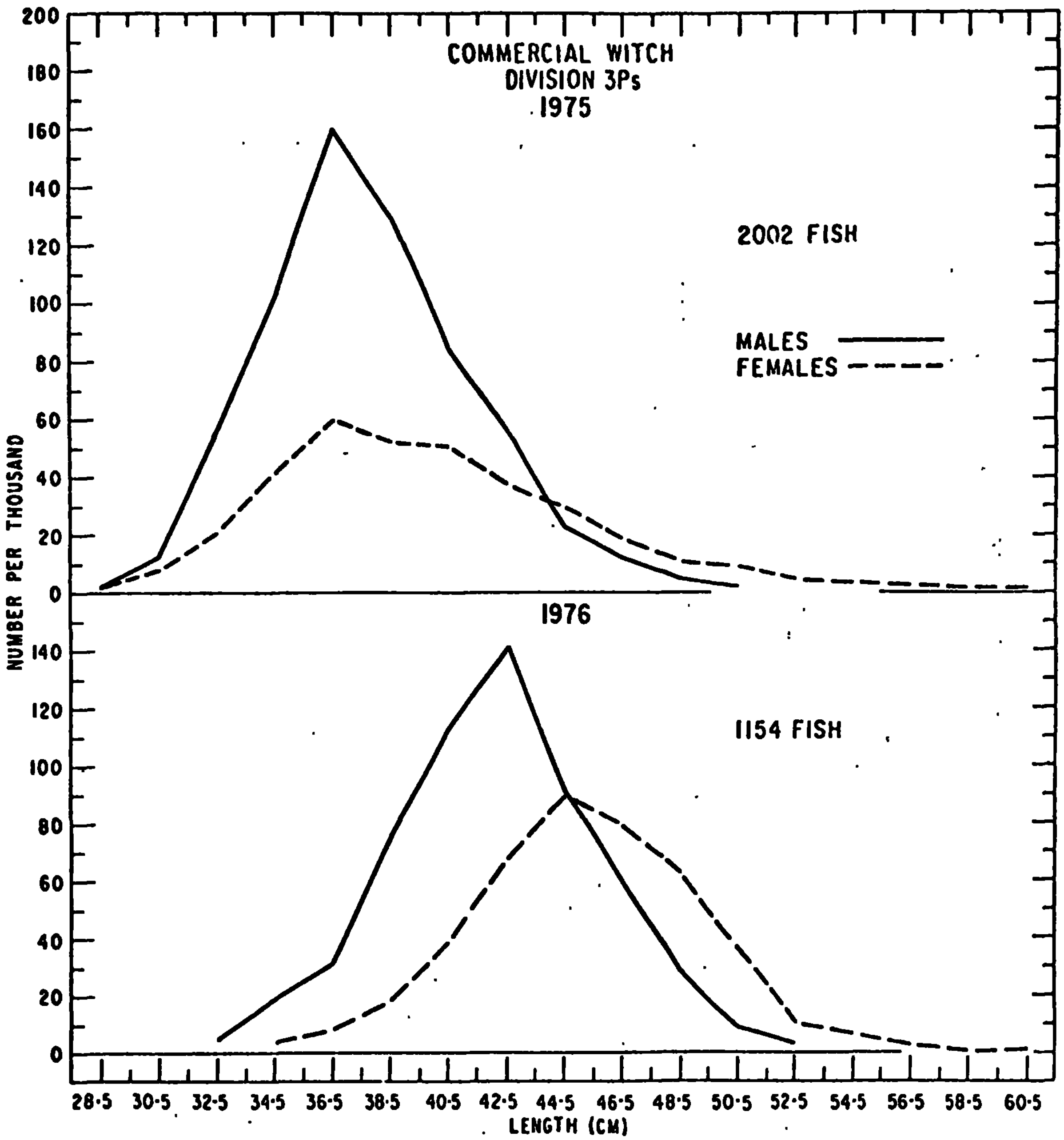

Fig. 1. Length frequencies from Canadian commercial catches of witch, 1975-76.

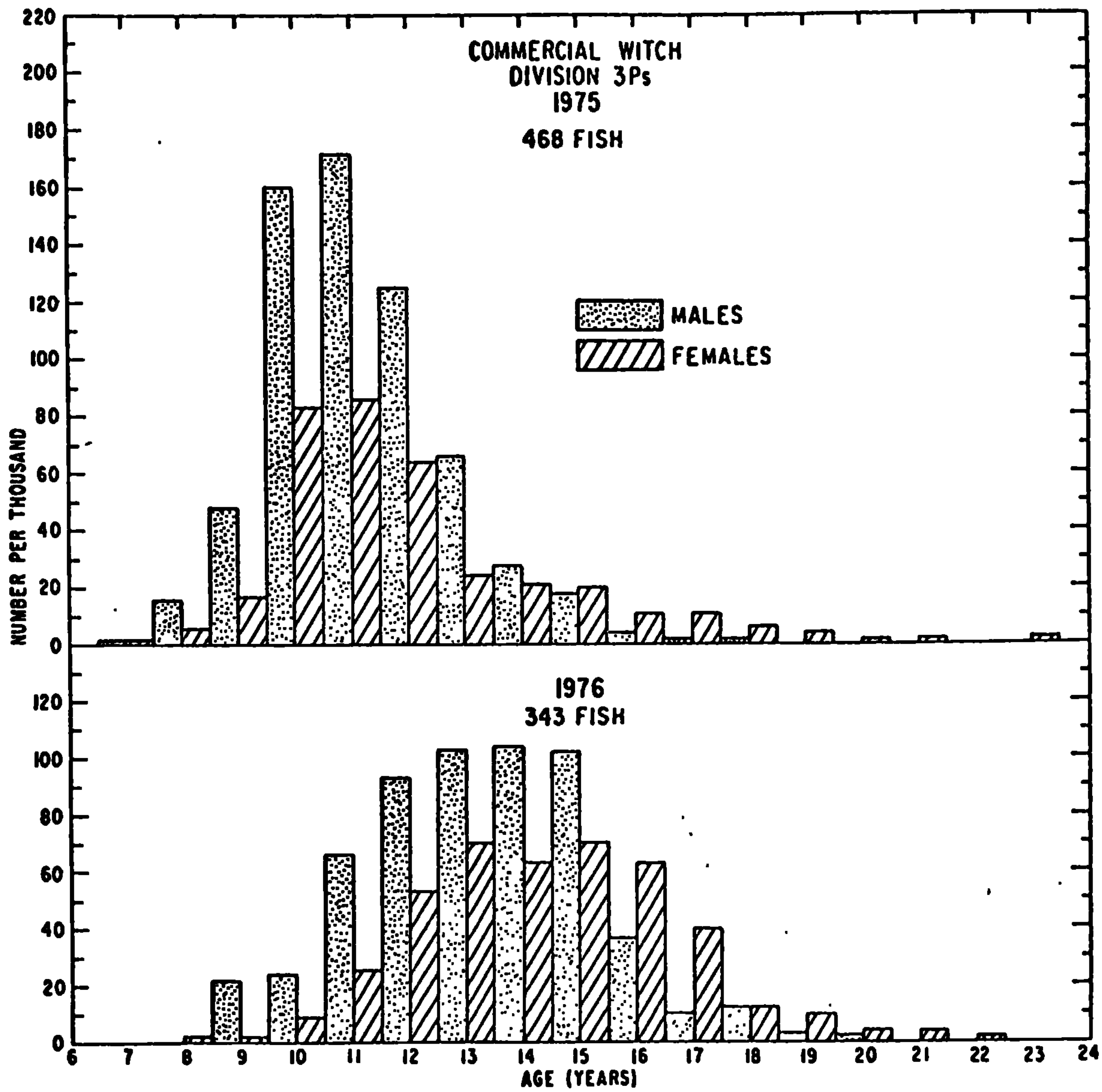

Fig. 2. Age frequencies from Canadian commercial catches of witch, 1975-76.

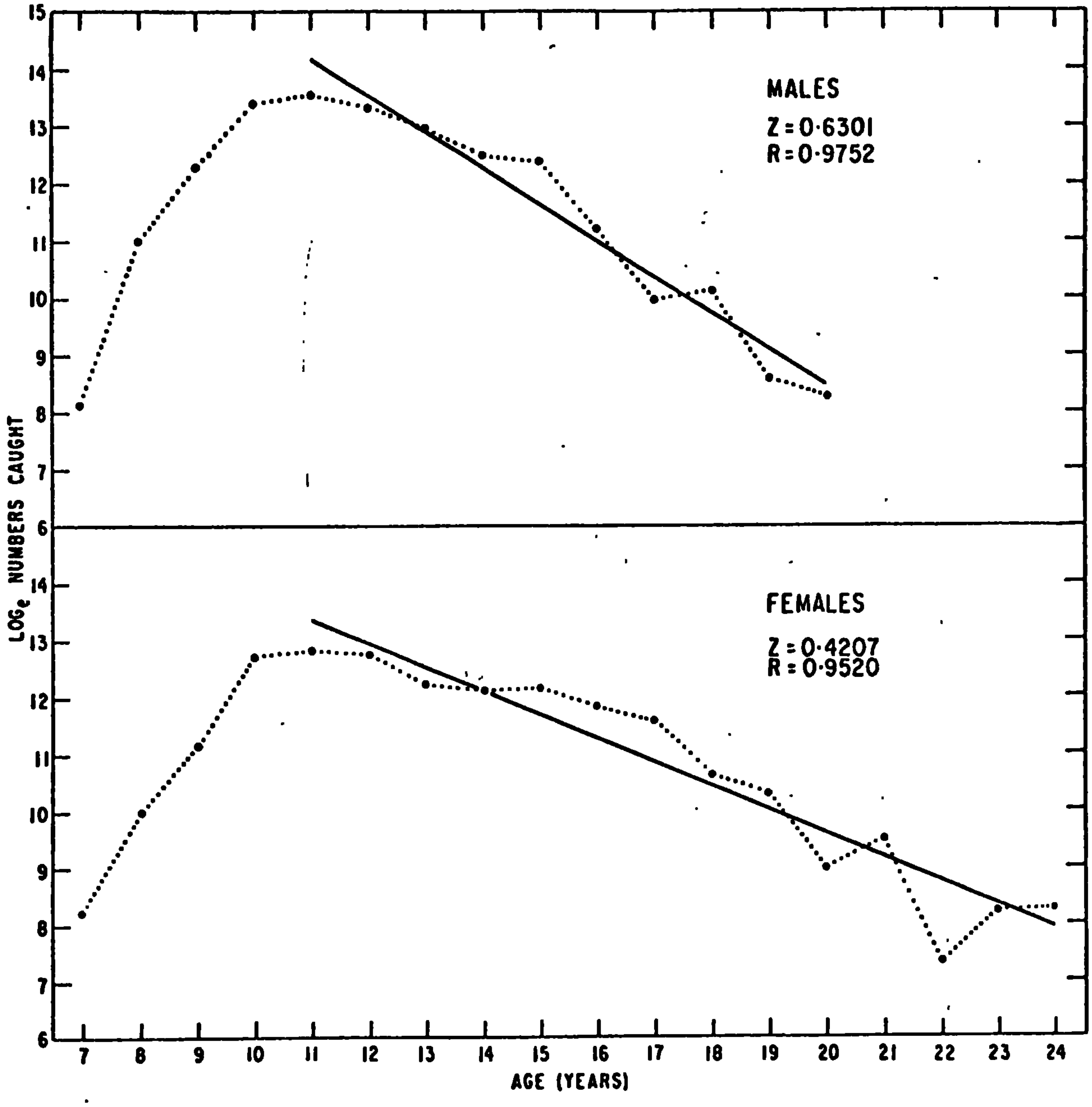

Fig. 3. Catch curves of commercial witch, 1975-76.

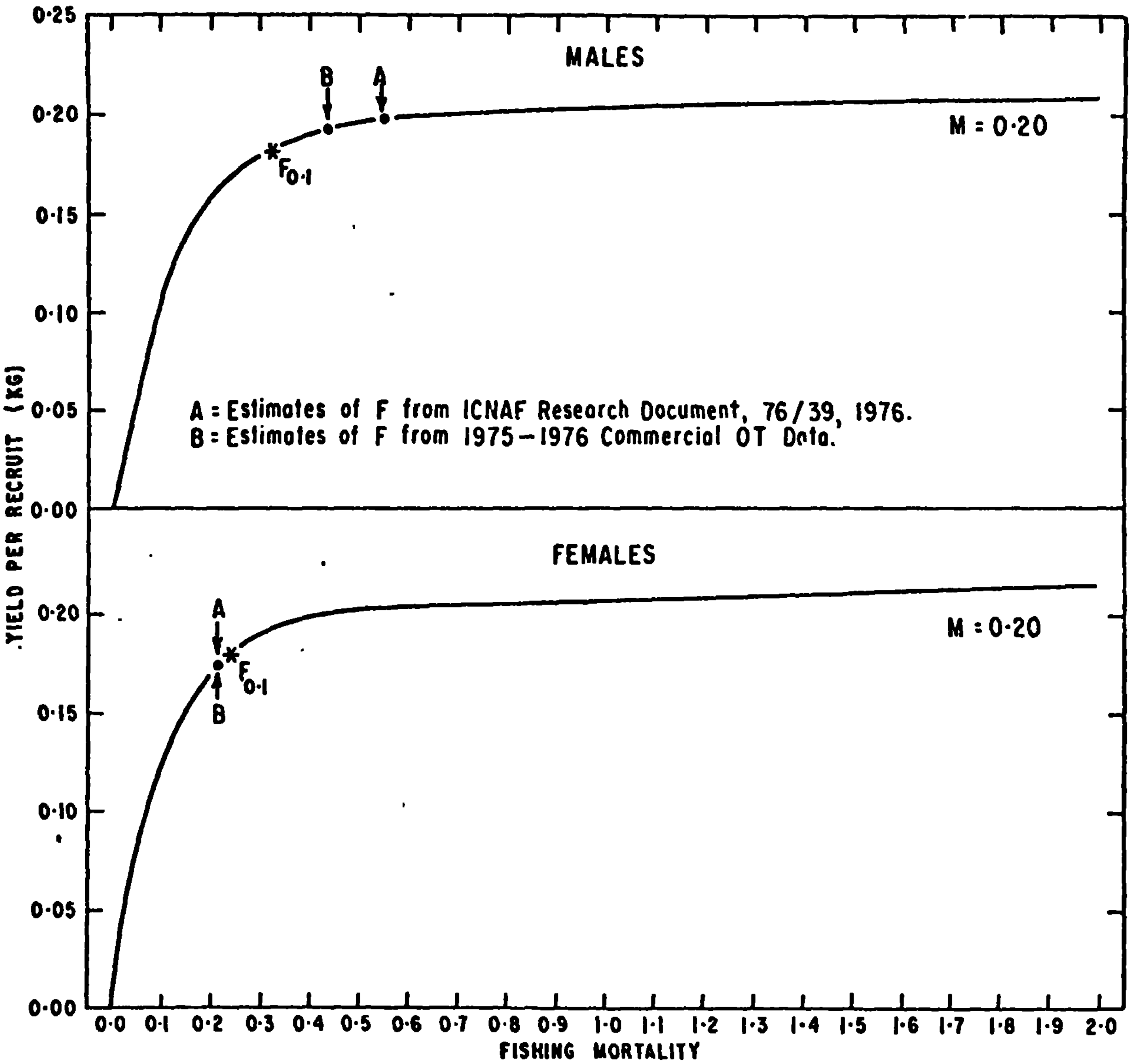

Fig. 4. Yield-per-recruit of witch for ICNAF Subdivision 3Ps.

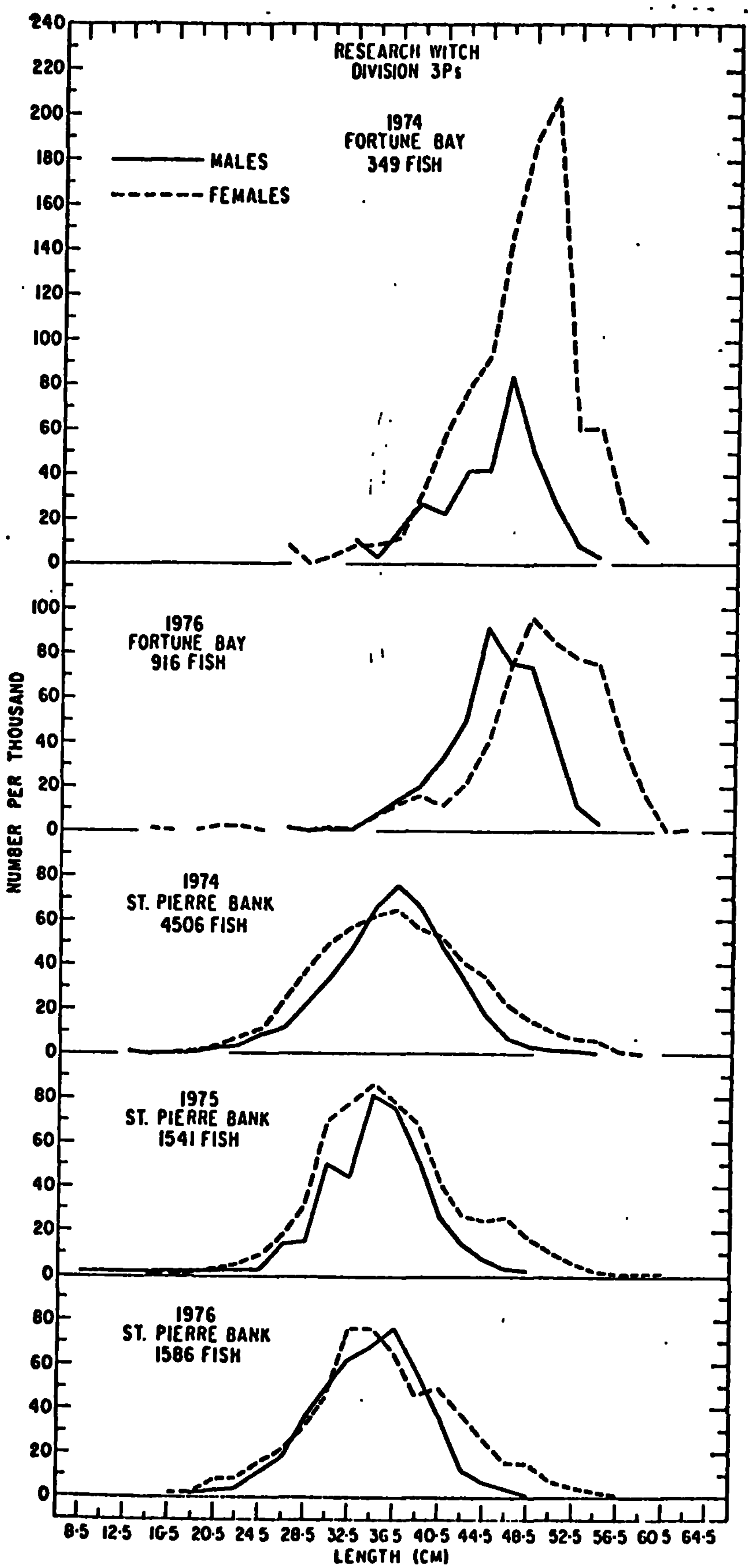

Fig. 5. Length frequencies of witch from research vessel catches for ICNAF Subdivision 3Ps

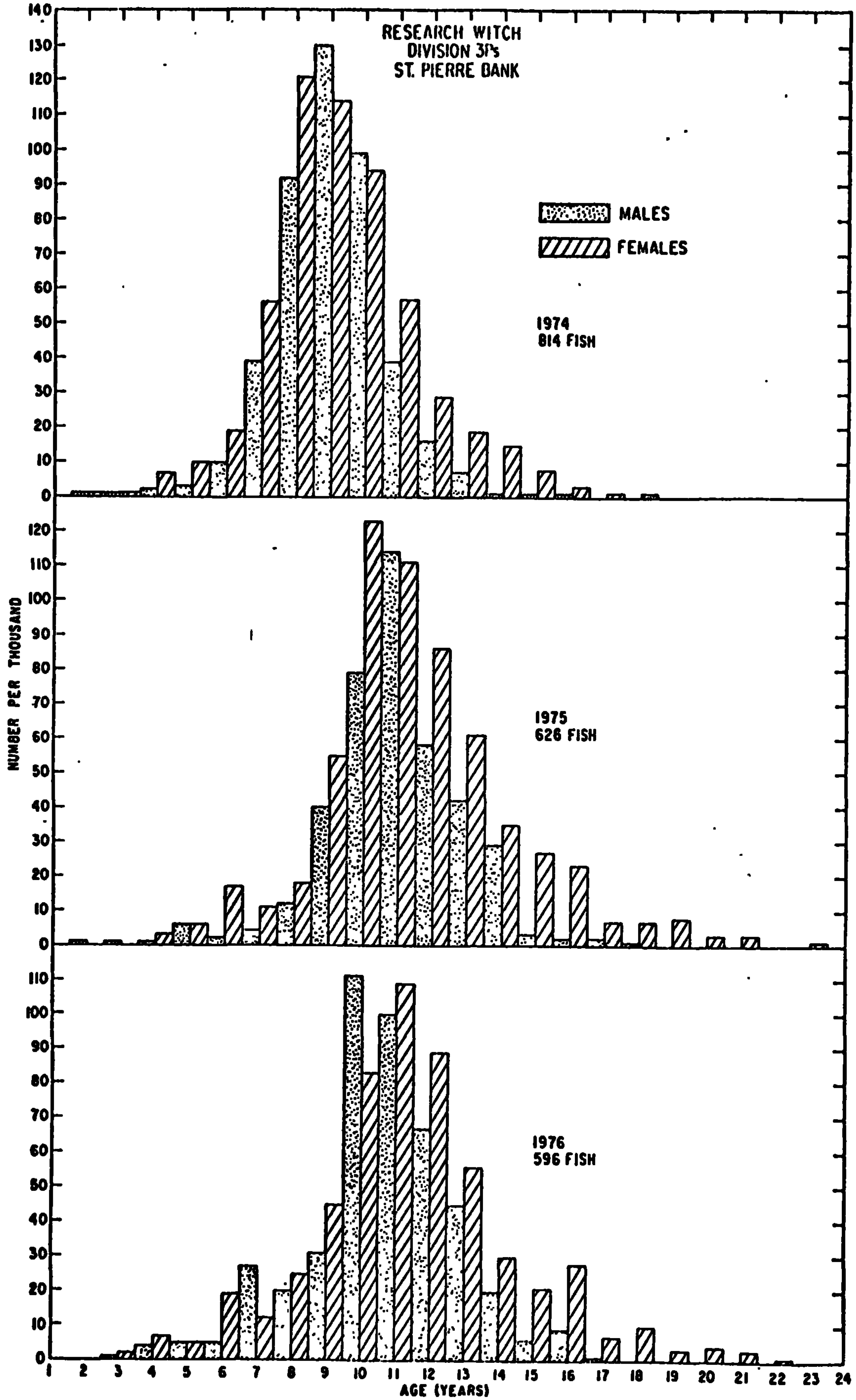

Fig. 6. Age frequencies of witch from research vessel catches for ICNAF Subdivision 3Ps.