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Distribution and abundance of witch flounder (*Glyptocephalus cynoglossus*)
in Subarea 2 and Divisions 3KLNØ in relation to the fishery

by

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This species has become increasingly important over the past several years especially to the Canadian inshore and near water fleet, particularly in Division 3K and to a lesser extent in the northern part of Division 3L because of the decline in the abundance of cod. The stock areas for this species were established in 1973 and were based upon the location of commercial catches and the general distribution of witch as reported in research vessel catches. It seemed probable that the witch fished by the Canadian inshore boats and by the European fleets belonged to the same population since catch composition was much the same. Powles and Kohler (1970) report seasonal movements in the witch from the Nova Scotian area, therefore, indicating a possible inshore-offshore movement. This species is generally found in deep water (beyond 140 fm) according to Bowering (1976) and as reported in the fishing logs of Canadian Commercial fishing vessels. This document will attempt to present some evidence as to where the stock boundaries of this area could occur.

Research catches

Distribution and relative abundance of witch flounder by $1/2^{\circ}$ latitude and 1° longitude rectangles giving average weights of fish caught per 30-minute tow per rectangle by the Canadian research ship A.T. Cameron for the years 1958-74 are shown in Figure 1 (Bowering 1976). The numbers of fishing sets used to plot the distribution are also given (Fig. 2). Witch were caught from Hamilton Bank southward to the southwest edge of the Grand Bank. In the north, greatest quantities were taken in the Hawke Channel region just to the north of Division 3K (Fig.1). Large catches to the east of Newfoundland occurred along the northeast Newfoundland shelf (Division 3K) with the largest catches along the 49° N latitude line. Similar catches were taken on the deep northern slope of the Grand Bank along the Division 3K-3L boundary, however, relatively few sets were made in these localities (Fig.2).

There were essentially no witch on top of the Grand Bank and very little evidence of witch along the eastern edge of the bank, however, substantial quantities were found along the deep muddy southwest slope of the Grand Bank (Division 3Ø) down to latitude $42^{\circ}30'$ approximately (Division 3N). In view of this information it appears that these fish concentrated in the Divisions 3K and L areas are quite separate from those in Divisions 3N and 3Ø at least geographically.

In 1973 a tagging program was carried out in Division 3K and 775 witch were successfully tagged (Fig.3). Unfortunately, only 6 returns were received, 4 from Canada and 2 from the Soviet Union. Over the 4 year period the maximum distance travelled from the tagging area was less than 200 nautical miles with most being recaptured within 50 to 100 miles from the tagging site. Even though these data are rather minimal it would appear to suggest that witch are a rather sedentary species, at least as adults and do not migrate over long distances. Other cases of tagged witch in the Scotian Shelf area have resulted in similar information and one fish tagged in the Sydney Bight area was retrieved 12 years later

less than 20 miles from the tagging area (unpublished data from St. Andrews Biological Station).

The commercial fishery in the Division 2J3KL stock area

Directed fishing in this area only began as recent as 1970 when the total catch reached 17,000 tons (Table 1). Very little witch (Table 1) has been reported from Division 2GH with most being reported during the last 3 or 4 years. In any case the amounts are small in comparison to the Divisions 2J3KL and should probably be included in the total area. In the Division 2J3KL stock area, the main catch is in Division 3K (Table 1) with the catches in this area making up an average of 63% of the total over the 1966-76 period with Division 2J accounting for 13% and Division 3L for 21%. This fishery is primarily a winter-spring fishery (Fig.4) except for some large catches in Division 2J and Division 3L in August, which are the result of the Canadian inshore gillnet fishery (Table 1), however, these are small in relation to the total. The winter-spring fishery for this area is generally a result of prespawning concentrations in Hawke Channel, Funk Island Deep (Division 3K) and northern Grand Bank area when the fish are more susceptible to the gear. During most of the year witch flounder apparently live in deep gullies of clay, muddy sand or pure mud and move up onto the banks to spawn. From Canadian commercial records and discussions with some commercial fishermen it is apparent that the fishery is concentrated in Division 3K or very close to both the boundaries between Divisions 3K and 3L and between Divisions 3K and 2J. In fact if the Divisions 3K-2J boundary was more north and the Divisions 3K-3L slightly more south, the entire Canadian fishery in the northern area would be in Division 3K.

The commercial fishery in stock area Divisions 3NØ

The Canadian fishery for witch in this area was primarily as a by-catch of the haddock fishery in the 1950's and 1960's. The USSR began catching substantial quantities in 1966 (5713 tons) with an estimated catch of 16,000 tons in 1967, 13,000 in 1968 and about 15,000 tons in 1971, however, these figures may not be exact since they were derived from a breakdown of unspecified flounder catches and could include American plaice and yellowtail flounder. Good concentrations of witch were found on the southwest edge of the Grand Bank Divisions (3Ø) as a result of experimental fishing with Danish Seine in the early 1950's (Stewart 1956), however, fishing on a moderate scale began in the mid to late 1960's and a quota of 10,000 tons annually has been in effect for this area since 1974. Most of the fish taken by Canadian trawlers in this stock area is taken in Division 3Ø along the deep southwest slope of the Grand Bank with lesser amounts taken southward towards the tail of the bank (Division 3N) (Fig. 4). The fishery in this area is also a spring fishery probably related to prespawning concentrations forming on the southwest slope of the bank.

Age composition

The age composition (Fig. 5) of the Canadian commercial landings in 1974-77 for divisions 2J3KL ranged from 5-18 years for the males with the mode at age 9. Substantial numbers of 6-8 year olds were also taken. The females ranged from 5-25 years old with the mode at age 11. Substantial numbers of 7-10 year olds were also present in the catch.

The age composition for the Canadian commercial landings, 1974-77, for Division 3NØ (Fig. 5) was somewhat different than that of Division 2J3KL. The males ranged from 8-17 years with the mode at 13 years. Very few fish were taken below 9 years old. The females ranged from 8-19 years old and also peaked at age 13 with few fish being taken below age 9.

Summary

In view of the information presented here, it appears that the present stock boundary of Divisions 2J3KL is satisfactory, probably with the inclusion of Divisions 2GH. It is apparent from survey results and Canadian commercial records that the Divisions 3NØ stock and the Divisions 2J3KL stock are relatively independent of each other at least in the adult stages. Whether or not they actually interbreed or get mixed through larval drift is difficult to determine at this stage. Considering the incidence of localized prespawning concentrations the grouping of these ICNAF Divisions (ie. 2J3K3L) may even require further splitting. In any case this is only speculation and requires much more research to alleviate the problem. Investigations into stock discrimination of this species is already well advanced and should be available in the near future.

References

- Bowering, W.R. 1976. Distribution, Age and Growth, and sexual maturity of Witch Flounder (*Glyptocephalus cynoglossus*) in Newfoundland Waters. J. Fish. Res. Board Can. 33(7): 1574-1584.
- Powles, P.M. and A.C. Kohler. 1970. Depth distribution of various stages of witch flounder (*Glyptocephalus cynoglossus*) off Nova Scotia and in the Gulf of St. Lawrence. J. Fish. Res. Board Can. 27: 2053-2062.
- Stewart, T.N. 1956. Danish seining explorations in Newfoundland and Cape Breton areas. Bull. Fish Res. Board Can. 14: 899-924.

Table 1. Nominal catches (metric tons) of witch flounder 1966-76 for ICNAF Subarea 2 and Divisions 3KLN0.

YEAR	2G		2J			3K			3L			3N		3P	
	TOTAL CATCH	2H TOTAL CATCH	TOTAL CATCH	CANADIAN CATCH	CAN % OF TOTAL	TOTAL CATCH	CANADIAN CATCH	CAN % OF TOTAL	TOTAL CATCH	CANADIAN CATCH	CAN % OF TOTAL	TOTAL CATCH	TOTAL CATCH		
1966	4	16	563	-	0.0	509	21	4.13	198	166	83.84	1443	2235		
1967	-	53	222	4	1.80	90	42	46.67	929	854	91.93	534	2375		
1968	-	6	23	4	17.39	253	37	14.63	565	404	71.50	75	1446		
1969	-	-	1	-	0.00	79	79	100.00	1275	1275	100.00	75	410		
1970	-	2	5380	-	0.00	9669	1665	17.22	2465	2355	95.54	6121	642		
1971	-	8	1978	-	0.00	8462	2646	30.62	5613	5384	95.92	9091	5874		
1972	-	14	1443	-	0.00	11801	2056	17.42	4074	3464	85.03	2529	6648		
1973	25	1	1048	9	0.86	17624	1055	5.99	4949	2697	54.50	755	5936		
1974	-	942	3497	-	0.00	10550	504	4.78	1916	1364	71.19	2221	5824		
1975	76	430	1185	1	0.08	9621	433	4.50	1399	918	65.62	2554	3614		
1976	253	710	683	13	1.90	7533	619	8.22	2409	1449	60.15	2428	3607		
Average annual catch		32.6	198.4	1457.4	2.8	6926.5	832.5		2344.7	1848.2		2529.6	3510.1		
Average annual Canadian % of total				0.19			12.02			78.82					
Average annual catch for 2+ 3KL = 10,959.6												Average annual catch for 3N = 6039.7			
% of mean annual catch for 2 + 3KL												% of mean annual catch for 3N			
	0.30	1.81	13.30			63.20			21.39			41.88	58.12		

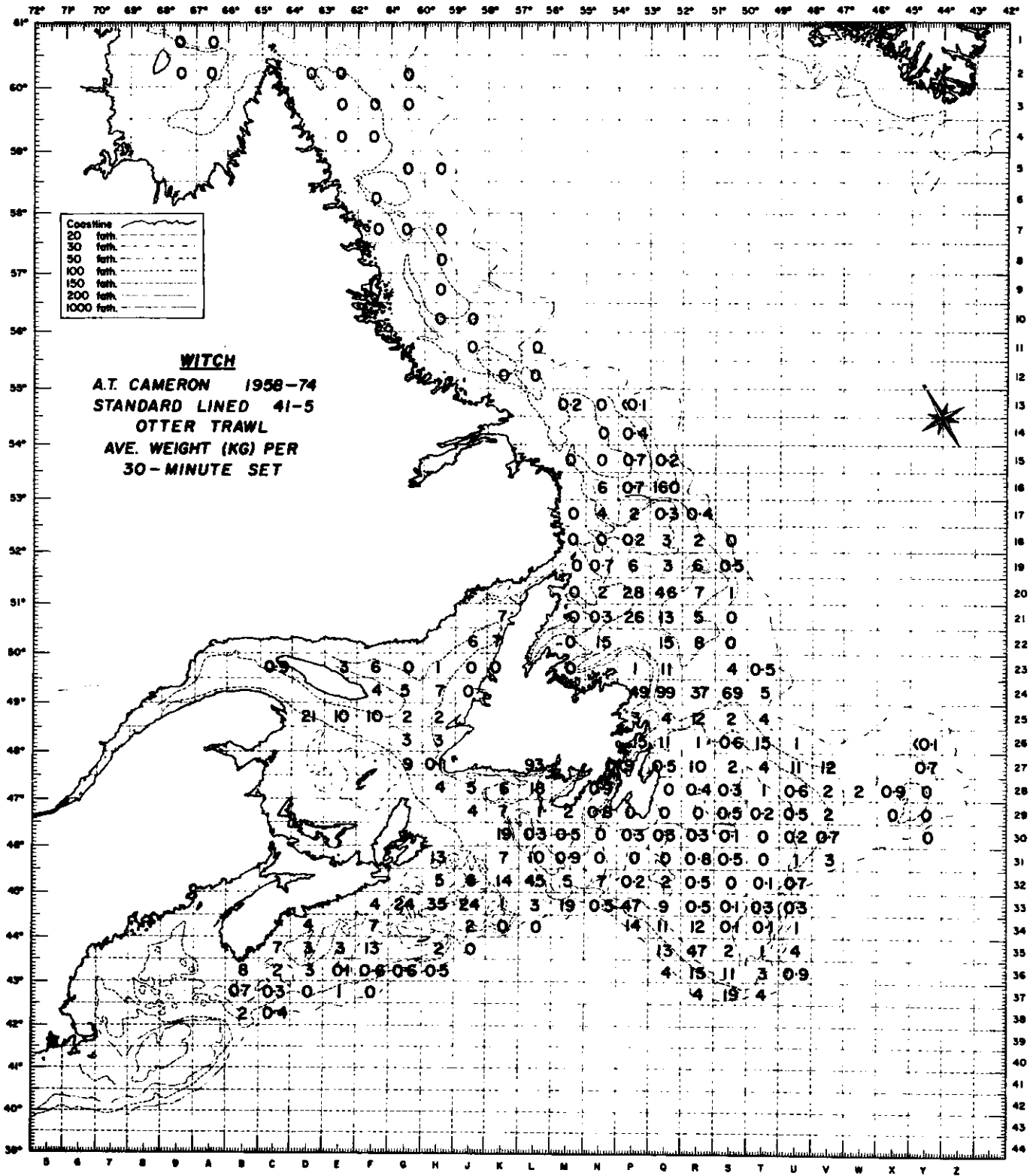


Fig. 1. Average catch of witch flounder (kg whole wt.) by 1/2° lat. 1° long. rectangles per 30-minute tow.

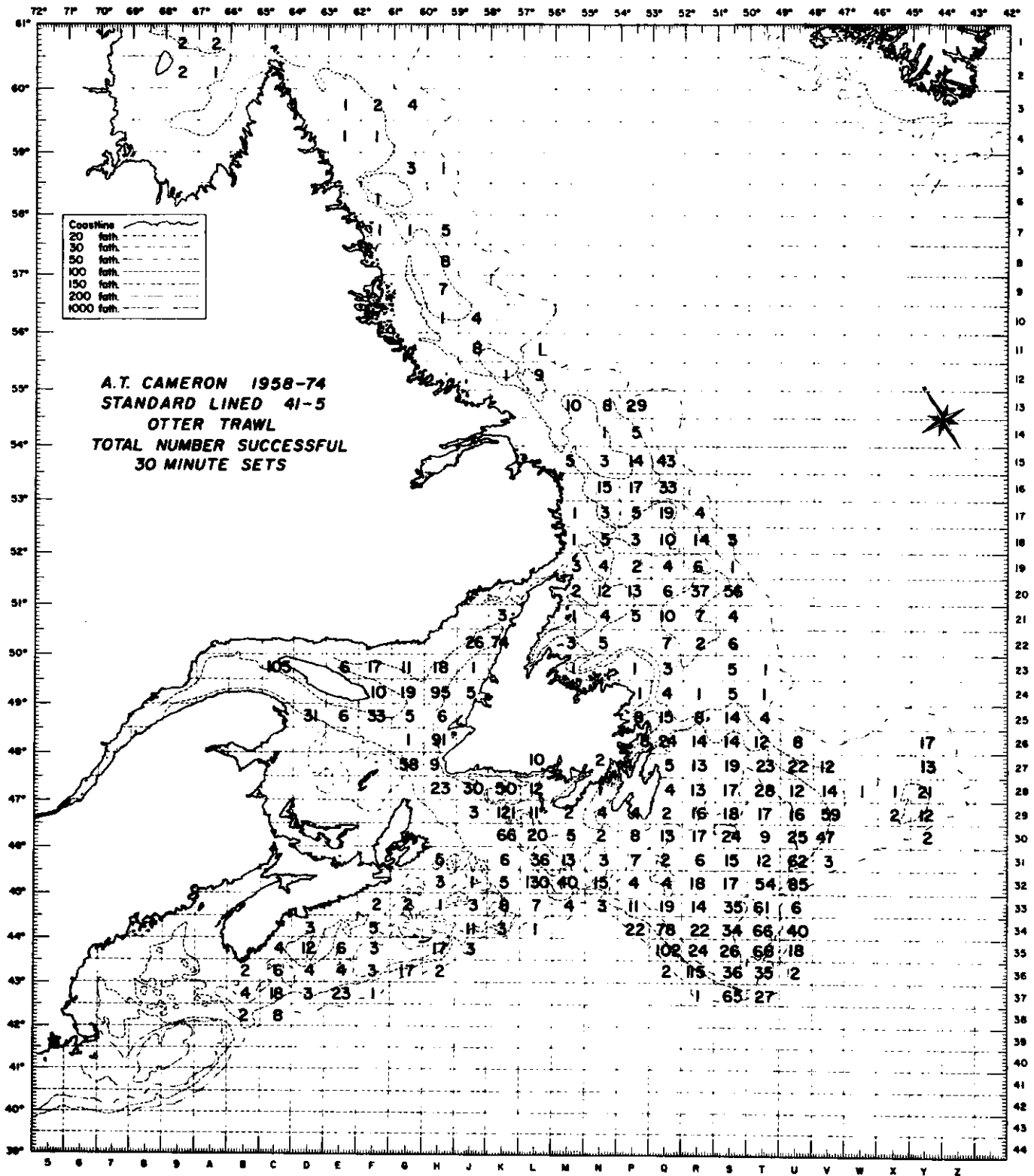


Fig. 2. Number of successful otter trawling sets of the research vessel A.T. Cameron 1958-74.

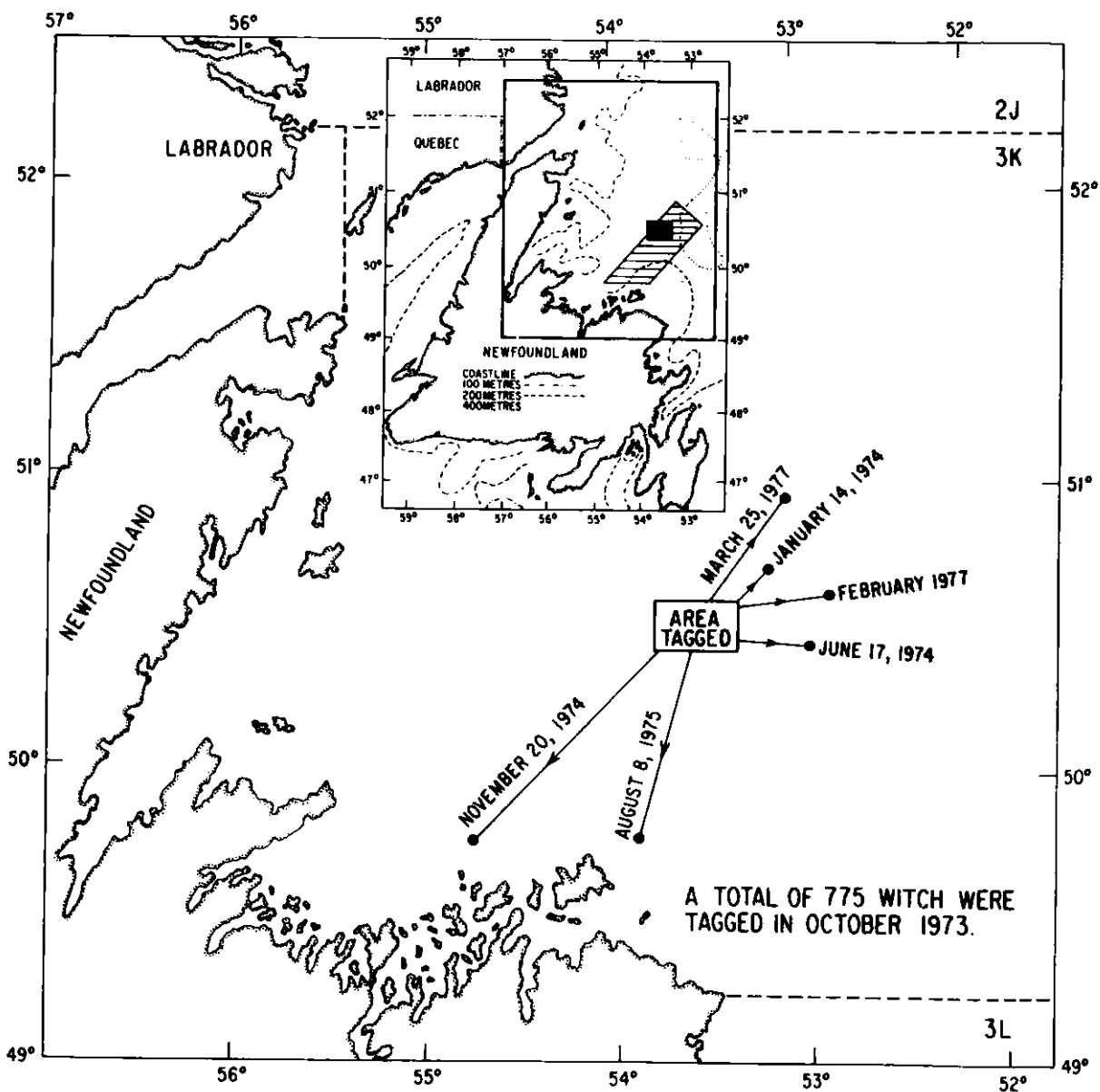


Fig. 3. Positions of tag returns from witch flounder tagging operations in 1973.

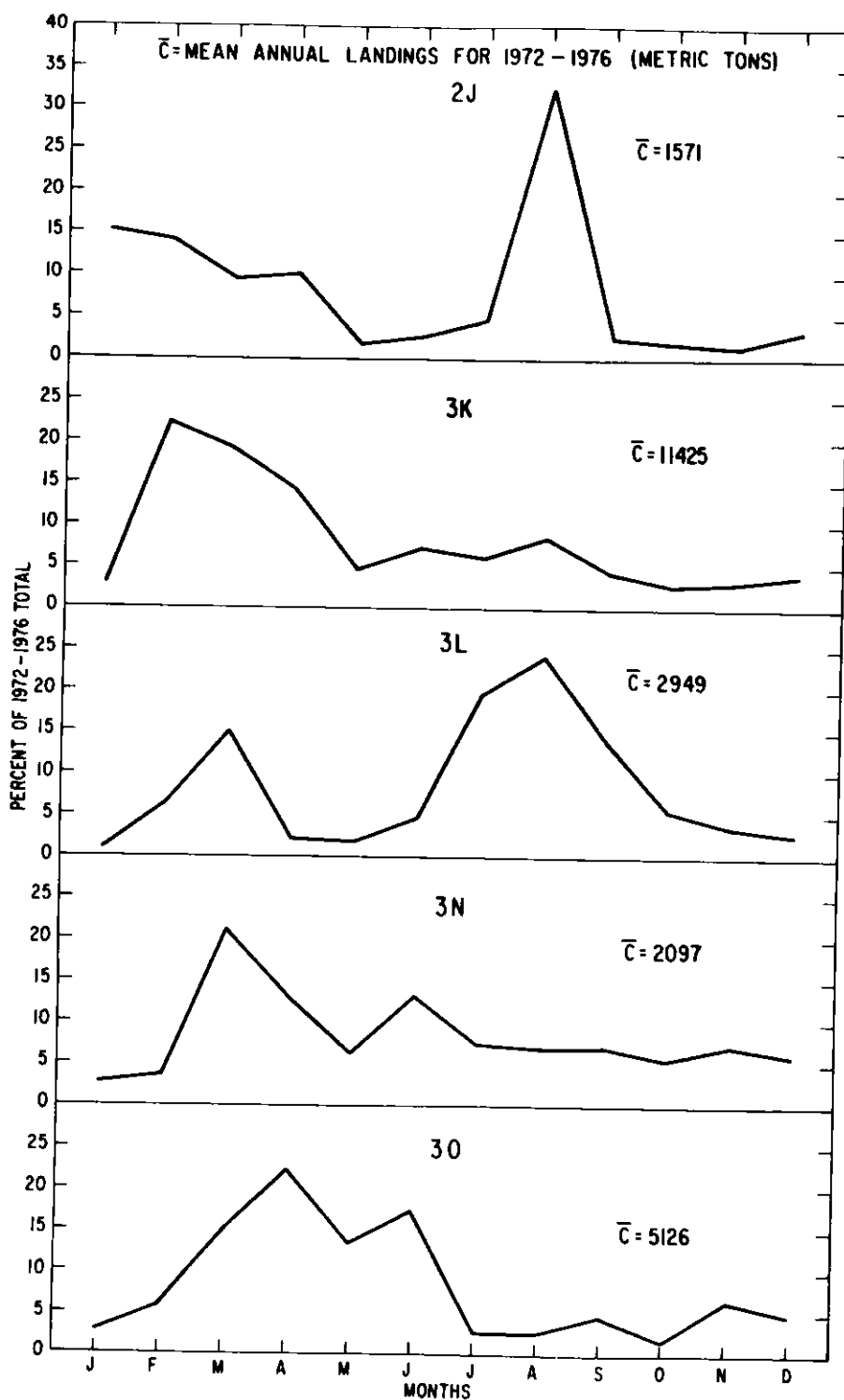


Fig. 4. Mean monthly catch of witch flounder for 1972-76 for ICNAF Divisions 2J3KLNØ.

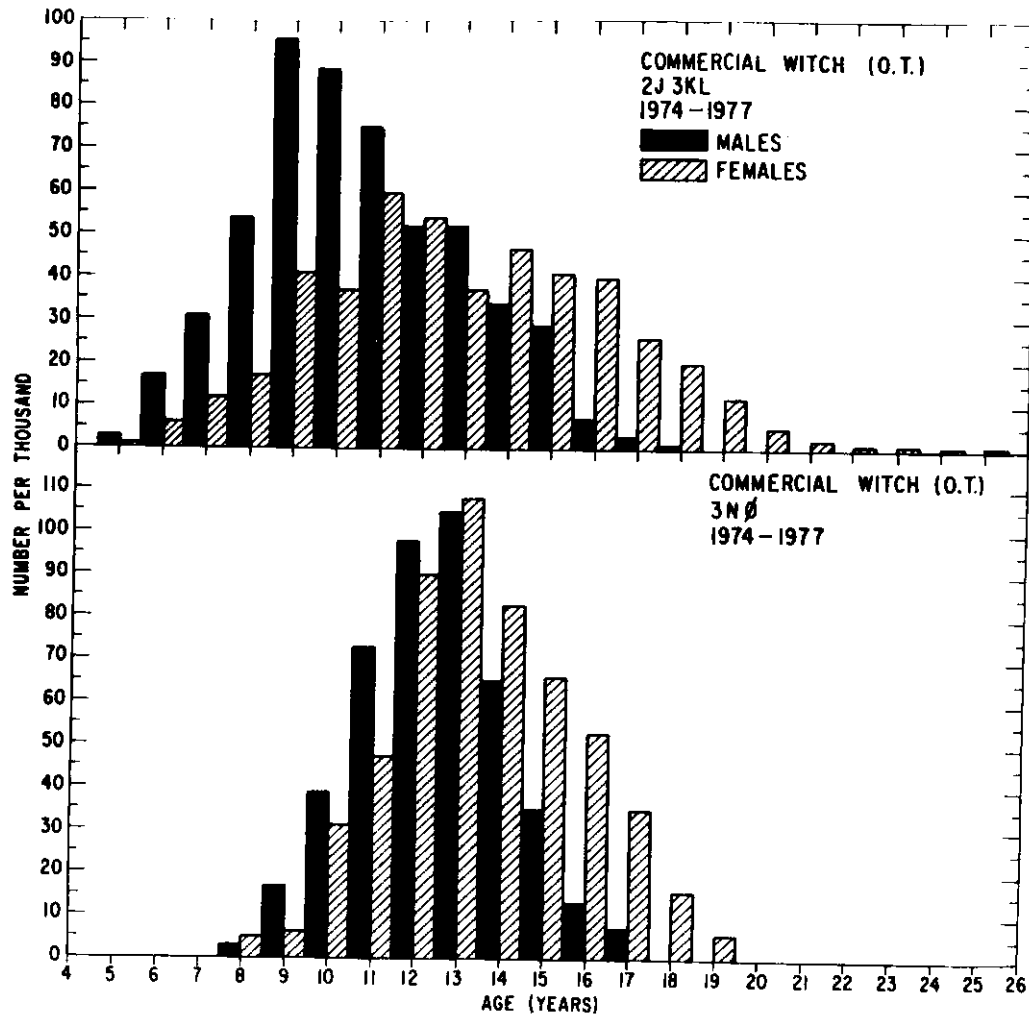


Fig. 5. Commercial age composition of witch flounder catches for 1974-77 for stock areas 2J3KL and 3NØ.