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Estimation of numbers caught at each age for stocks of cod, American plaice and yellowtail under quota regulation in 1973

by

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Methods of estimating numbers caught at each age up to 1970 for the cod, plaice and yellowtail stocks in Subareas 2 and 3 are given in previous Research Documents to ICNAF Annual Meetings. The present document records the method of estimating numbers caught in 1971.

American plaice

ICNAF Divisions 3LNO

The method of estimating the numbers caught at each age in 1971 was similar to that outlined in ICNAF Research Document 72/14 (Serial No. 2698).

Yellowtail

ICNAF Divisions 3LNO

The method of estimating the numbers caught at each age in 1971 is outlined in ICNAF Research Document 73/5 (Serial No. 2905).

Cod

ICNAF Divisions 2J-3L

The method of estimating the numbers caught at each age in 1971 was similar to that outlined in Research Documents 71/10 (Serial No. 2573) and 72/16 (Serial No. 2700).

ICNAF Divisions 3NO

No commercial age or length samples were published for 1971. The only available data resulted from two research cruises by Canada (Nfld.) during each of the first and second quarters. These surveys were with a lined codend such that virtually all cod greater than 2 years of age would have been retained by the gear. The selection curve from a 5-inch mesh was then applied to the original research length frequency with a lined codend and the resulting frequency with a 5-inch mesh size gear (the regulation mesh size in 1971) was obtained. However, experience with research length frequencies adjusted in this manner has shown that the proportion of smaller cod is overestimated in relation to the commercial length frequencies and a further adjustment is necessary. Since the landings in the first quarter

represented only about 10% of the total of the first and second quarters, only the second quarter frequency was further adjusted. The procedure was to select all the years when the second quarter contained both research and commercial length frequencies. The research frequency was adjusted by a selection factor to the mesh size in force during the given year. The ratios between the commercial and research frequencies at each length were then computed for each year selected and these were averaged for all years used to produce average conversion factors at each length between adjusted research and commercial frequencies. These conversion factors were then used to adjust each length group of the 1971 research frequency to produce an estimated commercial length frequency for 1971. To test the accuracy of these length group conversion factors, the research length frequency for each year used adjusted to current mesh size was further adjusted by the average conversion factors derived in the manner described above and the resulting frequency compared with the actual commercial frequency in each year used (Fig. 1). The agreement obtained indicates that this method should produce a reasonable estimate of the length frequency for 1971. The only year where the difference was quite obvious was 1967 when the research adjusted to the current mesh size only was identical to the commercial frequency with no further adjustment. From the assessment on this stock presented in ICNAF Research Document 73/4 (Serial No. 2904), the fishing pattern was different in this year and the fleets concentrated on catching the younger fish of the abundant 1963 and 1964 year-classes and thus fishing was probably concentrated in depths inhabited by the younger fish moreso than in the earlier years.

Having estimated the commercial length frequency for 1971, the Canada (Nfld.) research survey age-length keys for the first and second quarters were applied to the catch frequencies for these quarters. The commercial age-length key for the first quarter in 1969 was also applied to the catch frequencies for the first and second quarters in 1971 and these were then averaged with the age-distribution derived from research age-length keys. The resultant age-distribution for the first and second quarters was then adjusted to the total year to produce the estimate of numbers caught at each age for 1971.

ICNAF Division 3Ps

Only 2800 commercial length measurements and 94 otoliths were published in the 1971 Sampling Yearbook for February and March. When these were adjusted to the numbers caught in the usual manner and the results compared with previous years, it was concluded that they were not representative of the 3Ps stock as a whole and the much slower-growing fish in the age-length key derived from the 94 otoliths suggests that they may have been part of the West Newfoundland stock which in some years mixes with the St. Pierre Bank stock in the western part of 3Ps in winter. Also, 1617 measurements derived from research vessel data by France (St. Pierre) were not considered representative of the commercial catches in the area.

Instead, the numbers caught in the offshore fishery in 1971 (which accounted for about one-half the total weight caught) were estimated by three methods as follows:

a) The average ratios between numbers caught at successive ages for the entire fishery during 1967-70 were obtained and were used to estimate the numbers at each age in 1971 from the 1970 numbers.

b) The average ratios between numbers caught at successive ages for the offshore fishery only during 1967-70 were obtained and were used to estimate the numbers at each age for the offshore fishery in 1971 from the 1970 offshore numbers. These were then combined with the inshore numbers to produce the numbers at each age for the total fishery in 1971.

c) The ratios of the offshore to the inshore numbers at each age were computed for each year of the fishery from 1959-70 and these were averaged at each age for the period. These average ratios were then used to estimate the offshore numbers at each age from the inshore numbers for 1971 and were combined with the inshore numbers to produce the numbers for the total fishery in 1971. The inshore numbers at each age for the inshore fishery were estimated from Canada (Nfld.) sampling as in previous years.

All three estimates were then averaged to produce the estimates used in the updating of the assessment. Table 1 indicates the range in estimates obtained by the three methods.

As a final note, in estimating F-values in the present updating with the virtual population technique, projected catches at each age for several years after 1971 were calculated using average ratios of successive ages for several years prior to 1971. These were used as the older ages in the virtual population model.

Table 1. Comparison of estimates of 1971 numbers caught at each age obtained by three methods, ICNAF Division 3Ps cod.

| Age	Method (a)	Method (b)	Method (c)	Average	% Difference lowest to highest
3	(3,276)	(2,794)	2,582	2,884	27
4	5,315	5,915	8,103	6,444	52
5	10,629	7,464	7,629	8,574	42
6	6,458	8,588	6,751	7,266	33
7	7,225	9,218	8,210	8,218	28
8	3,378	3,413	2,602	3,131	31
9	1,154	1,368	1,302	1,275	19
10	548	515	560	541	9
11	77	80	99	85	29
Total	38,060	39,355	37,838	38,418	
Actual catch	60,000	60,000	60,000	60,000 MT	
Calculated catch	65,000	69,000	63,000	66,000 MT	
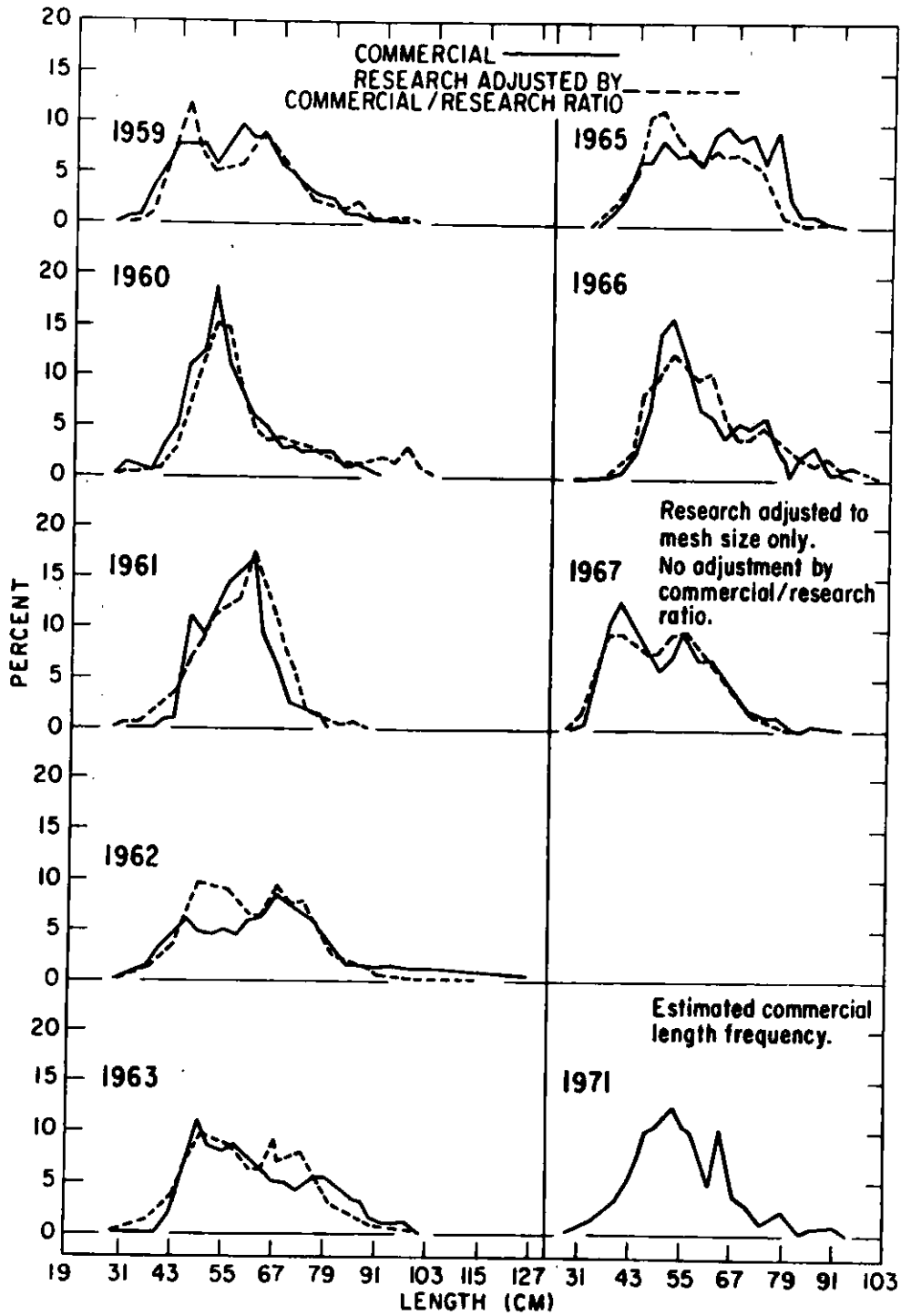
Fig. 1. Comparison of research length frequencies adjusted by commercial/research ratio for various years and estimated 1971 length frequencies, 3NO cod.