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(D.c.2)ICNAF Res.Doc.73/91ANNUAL MEETING - JUNE 1973Size-limits for herring; a comparison of the effects
of tolerance level criteria

by

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Size-limit regulations are accepted as an essential aspect of the management of herring resources in the north-west Atlantic. The ICNAF size-limit proposal (Special Meeting on Herring, January-February 1972, Proc. 4, App. IV) included a tolerance level of 10 per cent by weight for the season's catch of individual vessels, applied to a nine inch size-limit (22.9 cm). For practical reasons of enforcement Canada proposed that a tolerance level of 25 per cent by number and on a trip basis be considered as an alternative (Summary Document 73/1, p. 90) and agreed that data would be presented at this meeting to provide a basis for discussion at the Herring Working Group.

The data is presented and analysed here. The information is derived from sampling of the Canadian purse seine fishery on the Nova Scotia stock (in 4X and part of 4W).

The monthly length/weight relationships used are those described in Iles and Miller (this meeting).

Length frequency data are from samples from single landings from individual boats and are taken to represent herring caught in a single trip. They cover the period 1969-1972 inclusive.

The Canadian Nova Scotia purse seine fishery is an overnight fishery and a single landing is the result of an

average of a little more than two sets/nights fishing (Iles, 1971). It is not known to what extent different schools of herring are fished on average, although this is known to occur on some occasions.

For each sample the appropriate monthly length/weight data and the length frequency are combined to give the percentage number of fish below nine inches and the percentage weight of fish below nine inches.

Results

The data for 1969 are best considered separately. Figure 1 shows the relationship between percentage weight and number below nine inches for individual samples taken in 1969 and for the relevant range of each parameter. The relationship is approximately linear and a line fitted by eye meets the 25 per cent by number level at a point equivalent to about 12.5 per cent by weight.

The size mixture in samples (which is an important factor in determining the relationship) varies considerably from year to year because of variability in the relative abundance and availability of juvenile herring in the fishing area.

This determines the extent to which juvenile herring can be avoided. In 1969 the abundant 1966 year class was caught in considerable numbers as three-year-old fish in much the same areas as were adult fish.

Combined data for the years 1970-1972 are presented in Figure 2. There is more variability for these years and a considerable difference in the slope of the line fitted to it. The 25 per cent by number tolerance level is equivalent to about 7 per cent by weight.

Inspection of individual length frequencies shows that two-year-old fish are present in these samples as separate modes from that representing the adults. These two-year-old fish are, individually, only a fraction of the weight of the adults so that relatively large numbers account for relatively small proportions of the weight.

Considering the weight and count tolerance criteria per se, i.e. ignoring any effect of the per trip or per season alternative, it is concluded that in some years the

"by count" criterion is more stringent than the "by weight" and in others vice versa. The difference has not been large, in recent years, and on average the 25 per cent "by count" tolerance is about equivalent to a 10 per cent "by weight" criterion.

Table 1 lists for the same years, 1969-1972, the number of individual samples under four categories; those allowable (as satisfying the criteria) under both "by weight" and "by count" ("oversize") those satisfying neither criteria (undersize) and those satisfying one but not the other criterion.

Year	Oversize "by weight" & "by count"	Undersize "by weight" & "by count"	Oversize "by weight" Undersize "by count"	Oversize "by count" Undersize "by weight"
1969	135	25	0	6
1970	135	16	1	0
1971	53	2	0	0
1972	16	30	0	0
Total	339	73	1	6

Table 1. Analysis of sample data by weight and count criteria, Nova Scotia fishery, 1969-1972.

It is not possible to apply weighting factors to accurately estimate the proportion of the total season's catch in each of the categories. However, there is no reason to suppose that landings containing "undersize" fish are larger than those without.

Leaving out of consideration the 73 landings which were undersize by both criteria and which therefore do not affect the issue, a net five samples more would be allowable on the "by count" than on the "by weight" criterion, i.e. about 1.5 per cent of the total samples. This suggests that the quantitative difference between the two criteria would have been relatively small.

Using the data for 1969-1972 as the basis for a hypothetical application of size-limits over the period on a "per trip" basis, it is possible to estimate approximately the percentage of undersize fish landed each season. This is done by eliminating undersize landings and estimating the mean percentage of fish less than 9" in the remainder. The data are presented in Table 2.

Percentage undersize (by weight)

	0	1	2	3	4	5	6	7	8	9	10	11	12	14+	Mean
1969*	50	39	11	8	4	3	7	5	2	3	1	1	1	4	2.0
1970	119	26	0	2	1	0	0	1	0	0	0	0	0	0	0.2
1971	44	8	0	0	0	1	0	0	0	0	0	0	0	0	0.2
1972	8	2	1	4	1	0	0	0	0	0	0	0	0	0	0.8

Table 2. Frequency distribution of samples (= trips) at different levels of "percentage less than 9". Canadian Nova Scotia purse seine fishery.

The average percentage by weight for the four seasons is less than one per cent. This is to be compared with the season tolerance of 10 per cent.

Higher percentages of undersize fish might be recorded if there was a change of fishing tactics. The maximum number of sets made per night in this fishery rarely exceeds four and high set rates per night are usually associated with "blank" sets when no fish are caught. The possibility of diluting catches of small fish by catches of larger fish in the same trip is therefore limited, even if both large and small fish would be found and identified as such before catching. It is doubtful whether such tactics are feasible. However, the inability to land catches of small fish from single sets might encourage "dumping" with an unknown survival rate of dumped fish, and this possibility has to be carefully monitored. On the other hand, large concentrations of small fish unmixed with larger adult fish, as occurred in the Nova Scotia area in July and August 1972, would tend to be avoided.

With a seasonal tolerance, there is at least a feasibility that the full 10 per cent weight tolerance level could be reached (or a 25 per cent number tolerance). Indeed a situation which favours this already exists.

The size of the 1973 quotas for the Georges Bank (sub-division 5Z and SA6) and Jeffreys Ledge (5Y) stocks were determined very largely by the high expectation for the 1970 year class (Sum. Doc. 73/1, p. 35). As three-year-old

* Trips which satisfied the "by count" but not the "by weight" criterion are included. 0 = no fish less than 9"; 1 = more than 0 per cent but less than 1 per cent.

fish, this year class would not be expected, on average, to exceed the 9" limit until about July (Sum. Doc. 73/1, p.36) but would be exploited to a significant degree as under-sized fish before that in the expectation that catches later in the season would allow the total season's catch to fall within the tolerance limit.

It is concluded that the per trip criterion, applied to the Canadian Nova Scotia purse-seine fishery would result in a considerably smaller proportion of under-size fish being landed than if a seasonal tolerance is applied.

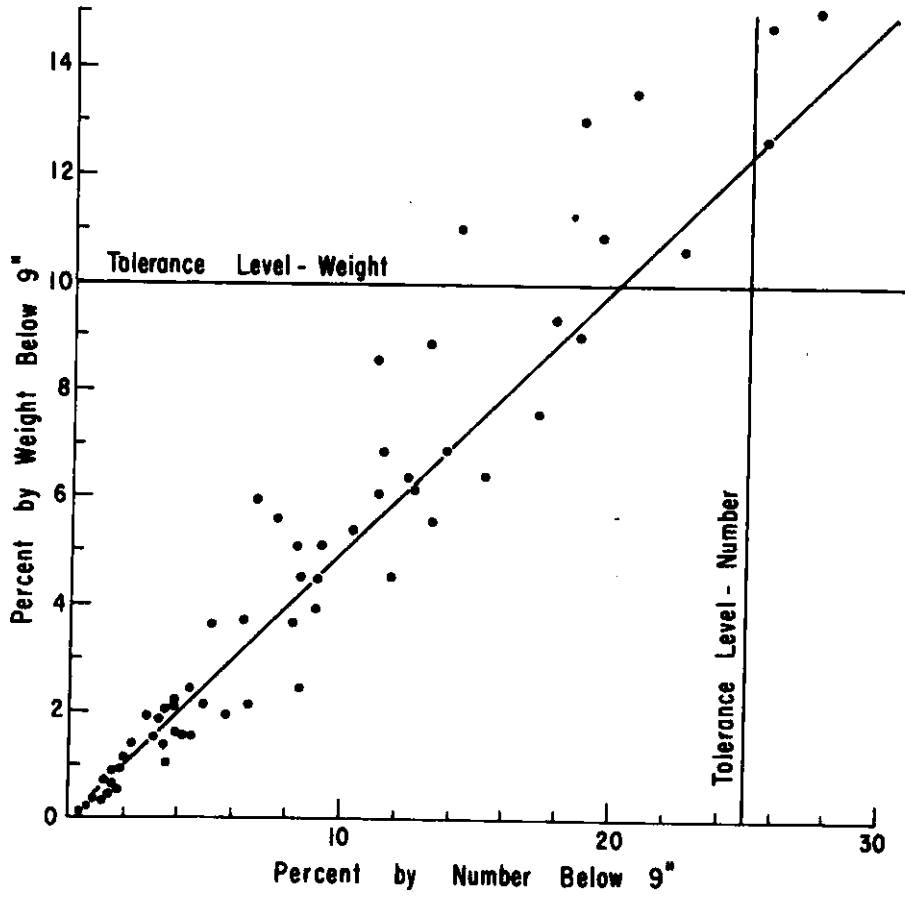


Fig. 1. Comparison of length and weight criteria. 1969 Nova Scotia fishery.

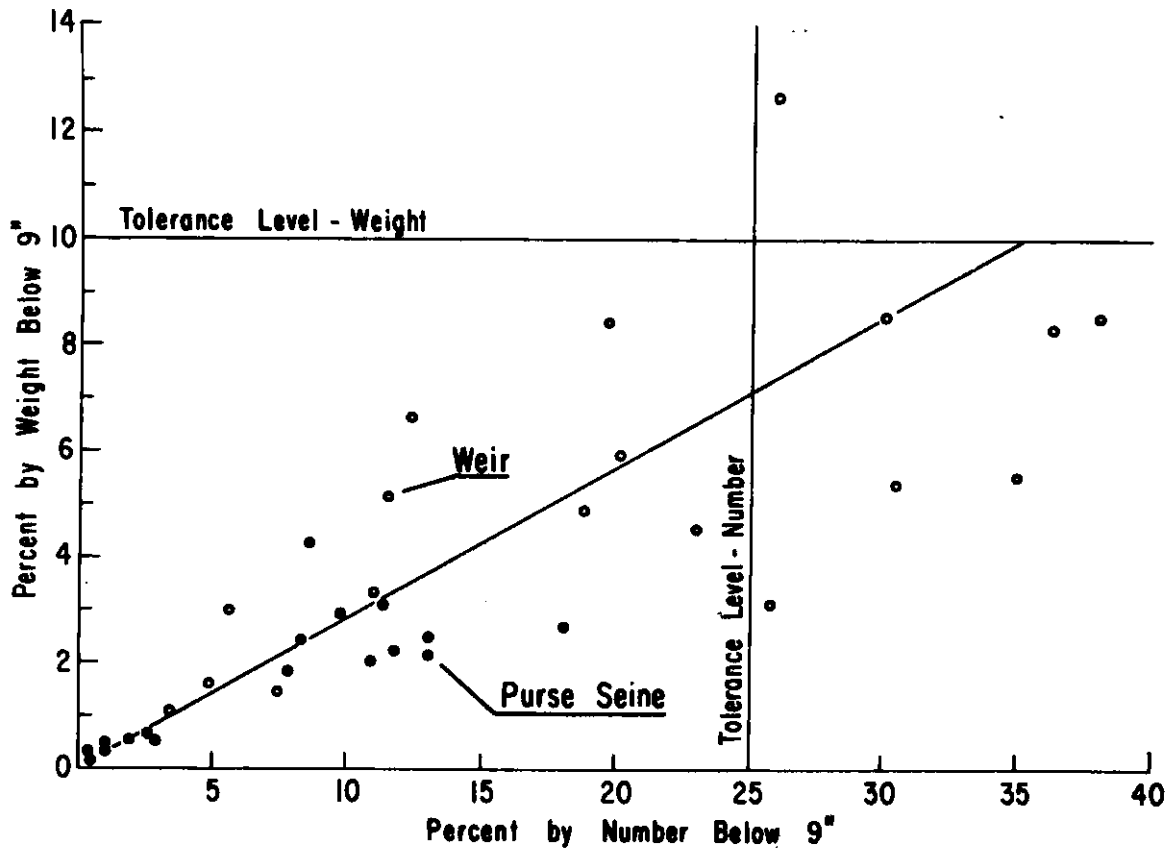


Fig. 2. Comparison of length and weight criteria. 1970-72 Nova Scotia fishery (included data from weirs).

