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A brief statement on the present state
of the Norwegian mackerel fishery.
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Introduction.

Previous to the early ninetysixties, the Norwegian mackerel fishery
was mainly performed in coastal and inshore waters. The season started in
April and lasted to the late Autumn (Oct. - Nov.). Driftnets and hook and
line were the predominating gears in use, but some 30 % of the catch was
taken by other gears (small purse-seiners, trawlers and shore-seines).
On an average the yearly catch amounted to some 15 000 tons.

The purse-seine fishery for mackerel on a large scale, was started
in 1964, as a result of the introduction of the power block. In the sub-
sequent years the Norwegian fleet of purse-seiners catching mackerel (and
herring) in the North Sea and Skageraok increased very rapidly and counted
in 1967 416 vessels. Apart from a brake in Febr. - March, when the fleet
is engaged in the winter herring fishery, and a lean season in June - July
(spawning season), the purse-seine fishery for mackerel is carried out
throughout the year.

Catch statistics.

Table 1 gives an outline of the development of the mackerel fisheries
during the last years.

Table 1. Norwegian yearly catches of mackerel
in thousand tons by gears.

Years	Large purse-seiners	Other gears
1953-1963		14.9 (mean)
1964	31.1	20.4
1965	130.5	22.0
1966	382.5	23.0
1967	837.0	25.0

The Table clearly demonstrates the growing importance of the mackerel fishery of the open sea. It is noted that the heavy catches of the purse - seine fleet have so far not influenced the catches of the conventional gears. On the whole it may be concluded that prior to the purse seine fishery the stock was poorly utilized and that the purse-seiners started to fish upon a large accumulated mackerel stock.

Length frequency distributions of samples from purse-seine catches of the years 1965 to 1968 are shown in Fig. 1. Corresponding data of the six years period 1959-1964 have been included for comparison. The latter curve contain samples from seine catches only (shore seines and small purse seines)

The bulk of the catches contain fish above 32 cm, i.e. 3 years of age or above. The recruitment to the catchable stock in the North Sea seems therefore to start when the fish became mature (3 to 4 years of age). But the yearclass may be fully recruited on a some later stage.

Early in 1967 the purse-seine fleet discovered large concentrations of immature fish (age group I) in the Norwegian Channel between Oksøy and Egersund. This stock has later been fished occasionally during the period November - February, particularly when the weather prevent fishing on the more offshore grounds where the most valuable fish is available.

Another important fact which appears from Fig. 1 is that the purse - seine fleet has not so far discovered the areas inhabited by the other groups of immature fish.

Almost the whole purse-seine catch of mackerel is used for indistrial purposes.

Minimum size limit.

The minimum legal size limit of mackerel for reduction is at present 20 cm. This low size limit has practically no effect on the purse-seine fishery off the coast, but was in fact introdused in order to protect the O-age group of mackerel which occurs regularly in inshore waters during late Summer and Autumn.

The increased exploitation of the mackerel stock in general and the winter landings of immature fish in particular, have given raise to suggestion of a higher minimum size limit than 20 cm. The question has been considered by the Institute of Marine Research which has proposed to raise the minimum legal size of mackerel for industrial purposes to 30 cm, with 25 % allowance of under sized fish. The immediate effect of such a change in the minimum size limit, will in practice be that the purse-seine fleet has to stop fishing of the immature fish which may occure regularly in the Norwe - gian Channal during the Winter season.

This new minimum size level has thus been suggested more on a practical basis than on a scientificly founted assessment of the stock. But such a suggestion must in any case has as aim to increase the sustain yield of the stock at the existing level of exploitation. According to the method intro - duced by Allen (1953) and further develloped by Gulland (1961), the conditions which have to be fulfilled if an increase in minimum size shall give an increase in catch is expressed by the inequality:

$$E > \frac{l_c^3}{\overline{l^3}}$$

where l_c denotes the length of fish at first capture and $\overline{l^3}$ the mean of the cube values of l greater than l_o. E is the rate of exploitation which in the constant parameter case is equal to $\dfrac{F}{F + M}$.

Multiplied by $\overline{l^3}$ and converted to weight the inequality states that an increase in l_o will result in an increase in the catch as long as the weight of the fish released is less than the "expected" weight when caught later in life.

On the basis of the 1967 length frequency data, the values of $l_c^3/\overline{l^3}$ for some selected values of l_o have been computed and the figures are shown

in the Table below:

l_c	26	28	30	32	34	$cm.$
l_o^3/l^3	0.36	0.43	0.52	0.57	0.73	

The mackerel stock is certainly not yet in balance with the present level of exploitation (a steady state), and the above values of l_o^3/l^3 may therefore be regarded as minimum.

Although the scientific data on the mackerel stock are too scanty to provide precise estimates of E, the magnitude of E is no doubt far above 0.5 (F > M). Judging from all the information at hand it is reasonable to assume that the actual value of E is above 0.7, which means that even a further increase in l_c above 30 cm may increase the catch theoretically. This is, however, not practical due to the technical problems involved in selective fishing on the adult stock with the present gear.

References.

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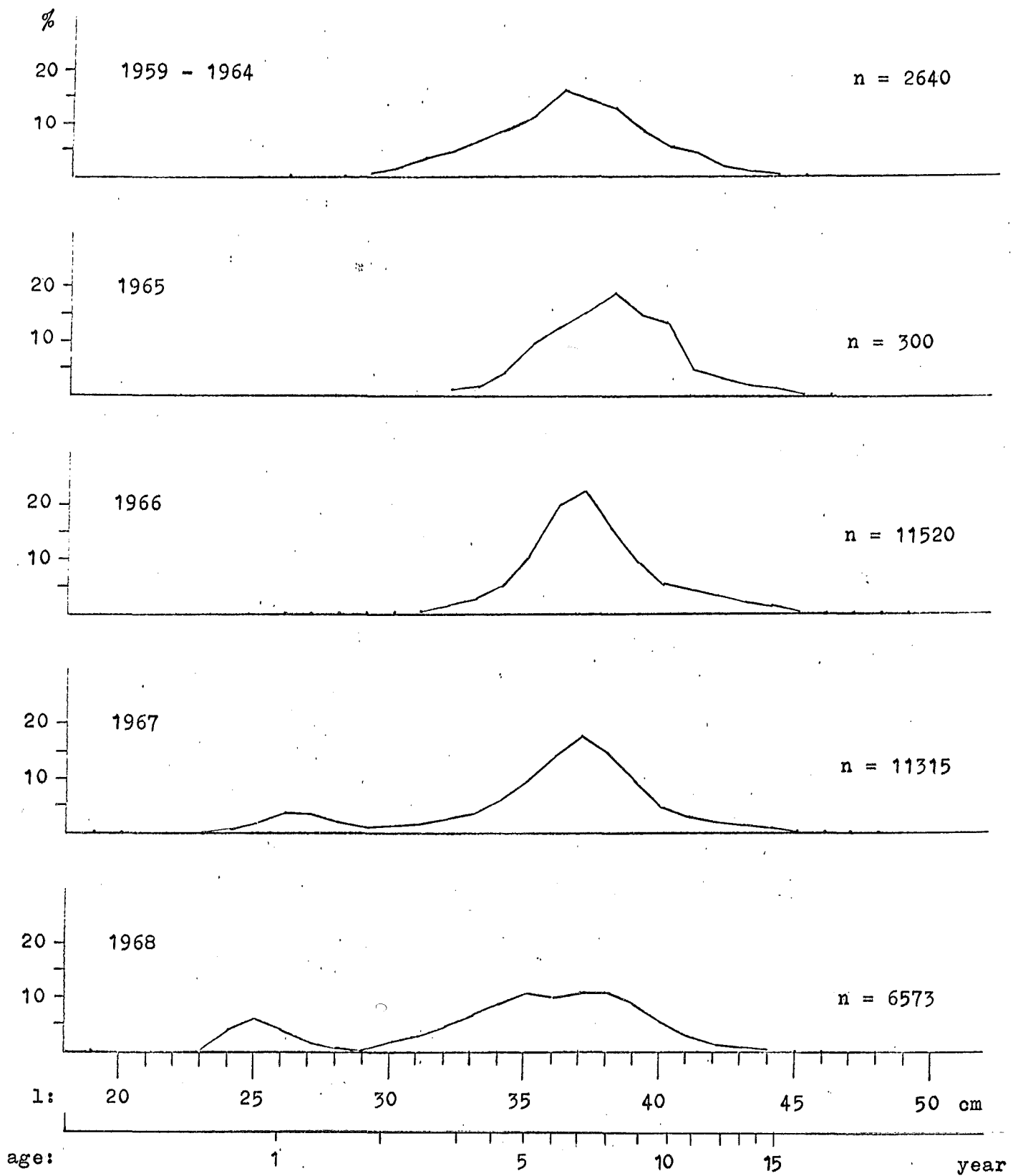
Fig. 1

Length frequency of Mackerel-samples from seines (1959 - 64)
and purseseine (1964 - 68) catches.