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FURTHER INVESTIGATIONS ON NORWAY POUT FROM THE NORTH SEA

By

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INTRODUCTION

The large stocks of Norway pout, Trisopterus esmarkii (Nilsson 1855), occurring in the Northern North Sea and Skagerrak, have been commercially exploited for industrial purposes for more than one decade, particularly by Danish and Norwegian trawlers. Regular sampling of Norwegian catches was carried out from October 1960 to July 1964 and results have been presented to the ICES by Christensen (1964) and Lahn-Johannessen et al. (1964) respectively. The present paper is a supplement to the previous investigations and covers the periods from September 1964 to November 1965 and from April to November 1969. It deals with the fishery, describes characteristic traits of the exploited Norway pout and outlines how different year-classes have acted on the fishery.

MATERIAL AND METHODS

The Norwegian fishery statistics give records on commercial landings of Norway pout from 1959 to 1969. The annual landing figures from the North Sea and Skagerrak are plotted in Fig. 1 together with Danish data available from 1960 to 1968. Fig. 2 presents the average monthly landings of Norway pout given in per cent of the Norwegian annual landings during the years 1959 to 1969.

The regular sampling programme for industrial catches described by Lahn-Johannessen et al. (1964) followed the same pattern in 1964, 1965 and in 1969. From October 1964 to April 1965 additional data on sex and age distribution of Norway pout also were collected, and Fig. 3 shows the monthly length-frequency distributions of different year-classes during this period.

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Fig. 4 gives the bi-monthly length-frequency distributions of the species from September 1964 to November 1965 and again from April to November 1969. Relative abundance of different year-classes have been roughly estimated from available length/age and length distribution data.

Length measurements are given as total length to the nearest cm below. Age determinations are based on otolith readings.

THE FISHERIES FOR NORWAY POUT

The average international landings of Norway pout from the North Sea and Skagerrak constituted approx. 152.200 tons annually during the years 1960 to 1968, distributed as follows: Denmark 71.4, Norway 28.4 and Belgium 0.2 per cent of the quantity. Fig. 1 shows that the landing figures have fluctuated considerably from year to year. Danish records present peaks in 1962 (132.300 tons), in 1967 (183.100 tons) and in 1968 (428.300 tons), and Norwegian records in 1963 (99.800 tons). The comparatively low Norwegian landings in 1966 and 1967 were mainly due to reduced fishing effort during these years, as many industrial trawlers diverted towards the purse seine fishery for North Sea herring.

It may further be noticed that the Norwegian fishery statistics overestimate the true landings of Norway pout (Lahn-Johannessen et al. 1964). Estimates derived from samples of Norway pout catches indicate that the weight percentage of the species has come down from approx. 75 to 40 since 1962. Blue whiting, Micromesistius poutassou (Risso, 1810), previously forming the bulk of the by-catches, has in recent years tended to be more and more predominant and very often outweighs Norway pout.

Norwegian industrial trawling for Norway pout is mainly consentrated to the northern part of the North Sea, particularly on the fishing grounds bordering the Norwegian Deeps, where fishing usually is carried out in depths ranging from 175 to 275 metres. The most exploited grounds are: The Jaeren Riff, the Egersund Bank, the Patch Bank, the Viking Bank and the Fladen Ground. From 1961 to 1969 these grounds on an average yielded 23.5, 18.6, 16.2, 13.6 and 13.2 per cent of the landings respectively. Minor quantities, only 3 per cent, were landed from Skagerrak during the said period.

In the Norwegian Sea off the coast of Norway between lat. 62° and lat. 64° (Raitt 1966) a separate industrial trawl fishery for Norway pout is carried out in a smaller scale. As this fishery is based on coastal stocks which probably are not associated with those of the North Sea and Skagerrak, it will not be considered here.

Trawling for Norway pout in the North Sea and Skagerrak is pursued throughout the year with the best fishing season normally extending from April to October (Fig. 2). The lower landings recorded during the remaining periods are partly caused by reduced amount of fishing effort.

CHARACTERISTICS OF THE EXPLOITED NORWAY POUT

From the available data presented in Table 1, Fig. 3 and Fig. 4 compared with previous observations made by Christensen (1964) and Lahn-Johannessen et. al. (1964), it appears that the Norway pout usually enters the fishery in September/October when the 0-group is approx. $\frac{1}{2}$ year old and from 9 to 11 cm long. For another half year the species is gradually recruited to the fishery, and the rate of exploitation is moderate. In the following spring, being approx. 1 year old and 10 to 15 cm long, the Norway pout seems to be fully recruited to the fishery and hence is exposed to full exploitation thereafter.

The relative abundance of a year-class **gradually** increases during the phase of recruitment and it usually outnumbers the older age-groups during the middle of next summer at an age of 1 1/4 to $1\frac{1}{2}$ year. In late autumn the year-class, by then $1\frac{1}{2}$ to 1 3/4 year old, predominates over the entering 0-group and remnants of older age-groups. It continues to predominate up to an age of 2 to 2 1/4 years, but tends to fade rather quickly away during the following months.

Fixing the 1st of January as an arbitrary "birthday" of the fish it is found that within a calendar year the II-group usually predominates in the catches untill the middle of the summer, whereas the I-group predominates in the remaining part of the year. In the first three quarters of a year the catches mainly consist of individual belonging to the I- and II-group, but in the last quarter the 0-group also will be represented.

The yield of the 0-group is considered to be rather low as the small fish is being gradually recruited to the fishery during a period coinciding with a reduced amount of fishing effort (Fig. 2). A year-class usually yields the maximum as I-group. It is fully recruited when the seasonal period of high fishing effort starts (Fig. 2), is being heavily exploited in the summer months and forms the bulk of the catches later in the year. The II-group yields considerably in the first half of the year, but much less in the latter half. The yield of older age-groups are usually negligible.

The suggestions presented above applies to an average year-class, and may be more or less modified by for instance fluctuations in year-class strength, the growth rate of the 0-group and the rate of recruitment to the fishing grounds and to the exploited stocks.

INDICES OF ABUNDANCE AND YIELD OF DIFFERENT YEAR-CLASSES OCCURRING IN COMMERCIAL CATCHES FROM 1960 TO 1969

Table 1 probably gives relevant informations as of important junctures and periods during the exploited phase of different year-classes of Norway pout, related to relative abundance and yield. The table is extracted from Fig. 3 and 4 and from corresponding data presented by Christensen (1964) and Lahn-Johannessen et al. (1964). The descriptions of the year-classes also

pay regard to the data given in Fig. 1 and 2.

The 1959 year-class: In Christensen's earliest samples from October-November 1960, the year-class constituted more than 90 per cent of the total numbers. It became outnumbered by the (very poor) 1960 year-class in April 1961, was still abundant during the summer, but quickly faded away from September onwards when the (very rich) 1961 year-class entered the fishery. Being abundant in 1961 and most likely also in 1960, the 1959 year-class probably produced a good yield. This is also confirmed by Fig. 1, bearing in mind that the amount of fishing effort was comparatively low but gradually increasing, during these years.

The 1960 year-class: Christensen suggested that this year-class was less abundant than those of 1959 and 1961. In fact it was poorly represented in the samples throughout its rather short period of exploitation. After being slowly recruited to the fishery from September-October 1960, the year-class outnumbered the older age-groups in April 1961, passed through a very short period of predominance anding in June (just exceeding 50 per-cent in numbers), and quickly disappeared from September 1961 when the 0-group entered. The yield of the 1960 year-class was principally restricted to 1961 and this year it probably yielded less than the 1959 year-class. The very poor yield of the 1960 year-class is also noticed in the reduced landing figures for 1961 compared to the previous years (Fig. 1).

The 1961 year-class: The 0-group appeared in great numbers (47 per cent of the total) in September. A drop was noticed in November, but the year-class outnumbered the older ones already in December. It was predominant for 17-18 months till May/June 1963, and was abundant for one more year. The last available records are from February 1965. This very rich year-class yielded plentiful in 1962 and 1963, and fairly good also in 1961 and 1964, as indicated in Fig. 1.

The 1962 year-class: After a normal entrance in September-October 1962 the year-class slowly got recruited to the fisheries and finally outnumbered the older age-groups in July/August 1963. It was predominant for 7-9 months and slowly faded away from June 1964 onwards. The 1962 year-class produced a good yield, mainly in the latter half of 1963 and the first half of 1964. These years show also high landing figures (Fig. 1).

The 1963 year-class: Significant recruitment to the fishery commenced very late, this means in March/April 1964. The year-class outnumbered older age-groups in July, predominated for 6-7 months till February 1965, and then gradually disappeared. Principally yielding in 1964 only, and than probably less than the 1962 year-class, the yield of the 1963 year-class must be considered as poor or very poor. This compares well with the considerable decline in the landings from 1963 to 1964, despite high amount of fishing effort.

The 1964 year-class: Sufficient data are lacking for a detailed study, but the late entrance to the fishery in January/February 1965 compared with the low landings in 1965, most probably the year of best yield produced by the year-class, indicate that the 1964 year-class was a poor one. The fishing effort was still at a high level in 1965, but the annual landings were decreasing (Fig. 1).

The 1965-1967 year classes: No reliable informations are available regarding these year-classes. Moreover, the amount of fishing effort declined radically in 1966 and 1967 as mentioned earlier, so that the Norwegian landing figures do not give useful indications either.

The 1968 year-class: Observations are available from April to November 1969 only (Fig. 4). The year-class probably outnumbered the older age-groups in July/August, and was predominant for a few months till the succeeding year-class occurred in great numbers in November. Mainly yielding during 1969 only, and then less than the 1967 year-class, and morover following a similar pattern as the very poor 1960 year-class, the 1968 year-class most likely produced a poor yield. The level of fishing effort was considerably higher in 1968 and 1969 than in the two previous years.

The 1969 year-class: The year-class occurred abundantly in November 1969 and probably being the main contributor in 1970, which seems to yield a rich harvest of Norway pout, it is likely to be considered as a good or very good one.

The observations presented above compares fairly well with studies on relative abundance of different year-classes of Norway pout made by Poulsen (1966) and Raitt (1967). As Norwegian industrial trawlers mainly operate in the deeper regions of the North Sea, according to Poulsen (1964 and 1966), the percentage of older fish in these catches will be higher than in catches from shallower waters. It is then likely that great fluctuations in abundance of the 0-groups will not affect the stocks in deeper waters to the same extent as in shallower waters, and this may be one of the reasons why the Norwegian annual landings have fluctuated less than the Danish ones.

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Table 1. Norway pout 1959-1969. Important moments and periods during the exploited phase of different year-classes related to their relative abundance and yield.

Year-class	Exploitation starts	Length cm	Older groups outnumbered	Predominant period	Duration months	Years of highest yield 0-gr	I-gr	II-gr	Yield of the year-class
1959	-	-	-	? - Mar 61	?	-	60	61	Probably good
1960	Sep/Oct 60	9-10	Apr 61	Apr-June 61	3	-	61	-	Very poor
1961	Sep/Oct 61	9-11	Dec 61	Dec 61-May/June 63	17-18	61	62	63	Very good
1962	Sep/Oct 62	9-11	Jul/Aug 63	Jul 63-Mar/Apr 64	8-9	-	63	64	Good
1963	Mar/Apr 64	10-13/14	Jul 64	Jul 64-Jan/Feb 65	6-7	-	64	-	Poor or very poor
1964	Jan 65	12-15	Mar 65	Mar 65- ?	?	-	65	66?	Poor
1965	Nov 65	11-15	-	-	-	-	66	67?	Probably poor
1966	-	-	-	-	-	-	-	-	-
1967	-	-	-	? - Apr 69	?	-	-	-	-
1968	-	-	Jul/Aug 69	Jul/Aug-Sep/Oct 69	1-3	-	69	-	Probably poor
1969	Sep/Oct 69	(9)-12	-	-	-	-	70	-	Probably good or very good

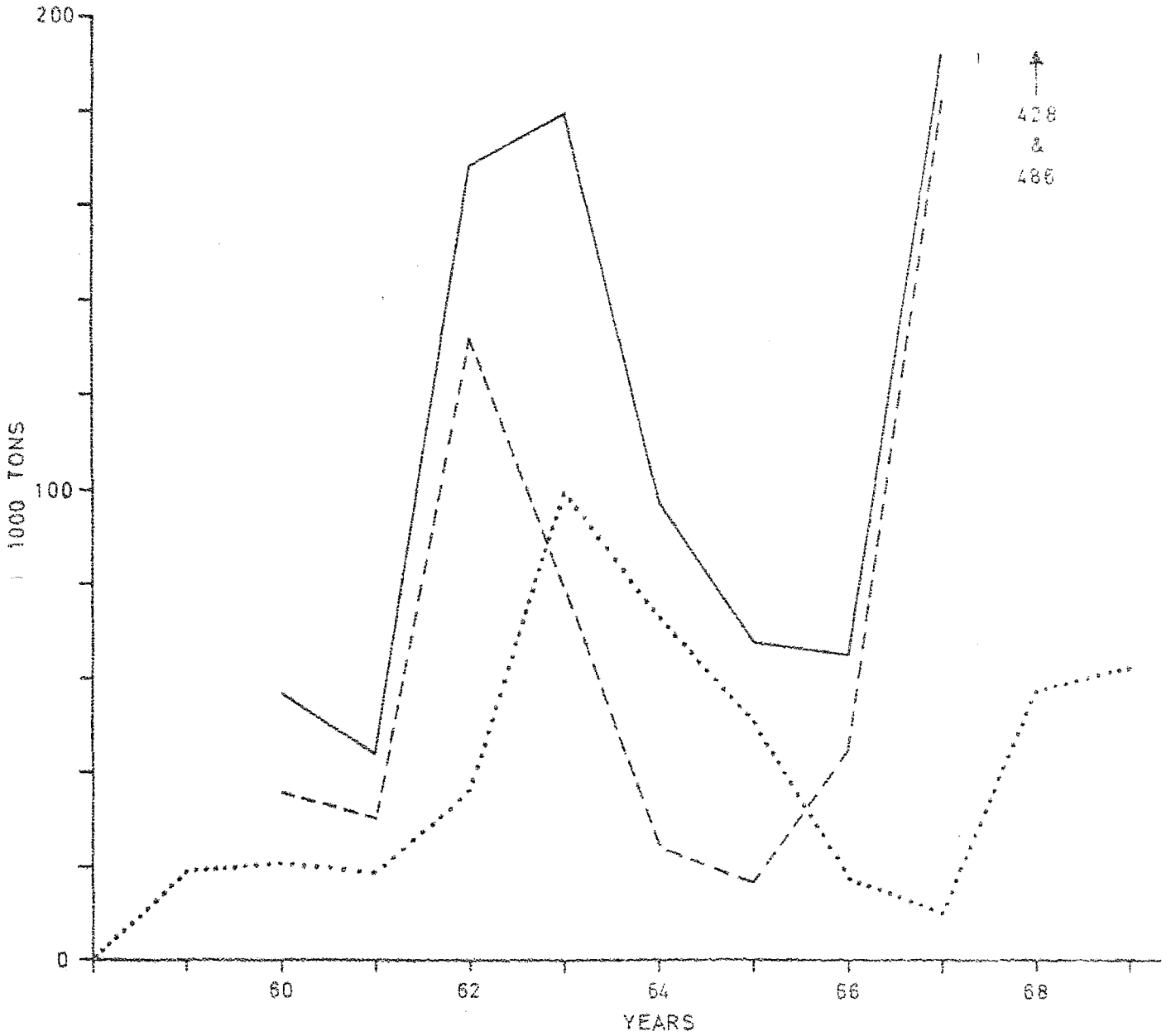


Fig. 1. Annual landings of Norway pout from the North Sea and Skagerrak from 1959 to 1969. (Norway: dotted line, Denmark: broken line, Total: full line.)

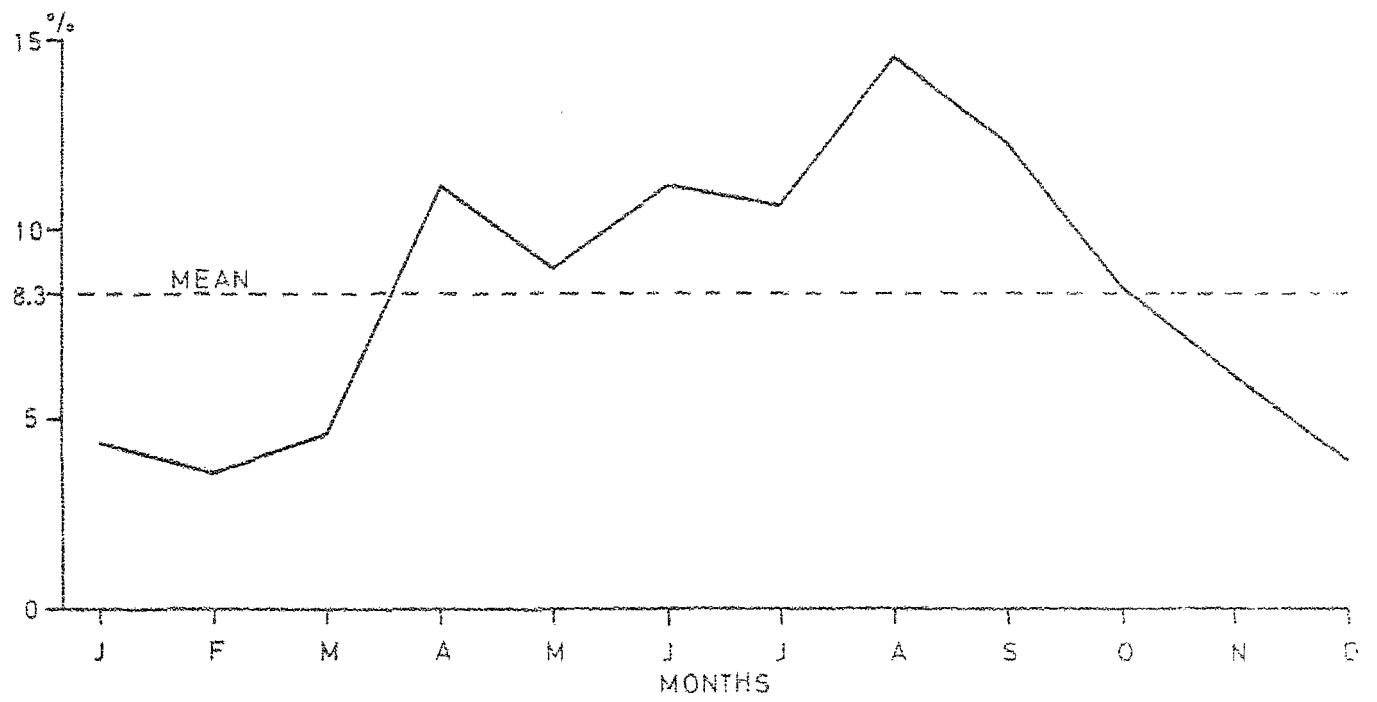


Fig. 2. Average monthly landings of Norway pout in per cent of the Norwegian annual landings from 1959 to 1969.

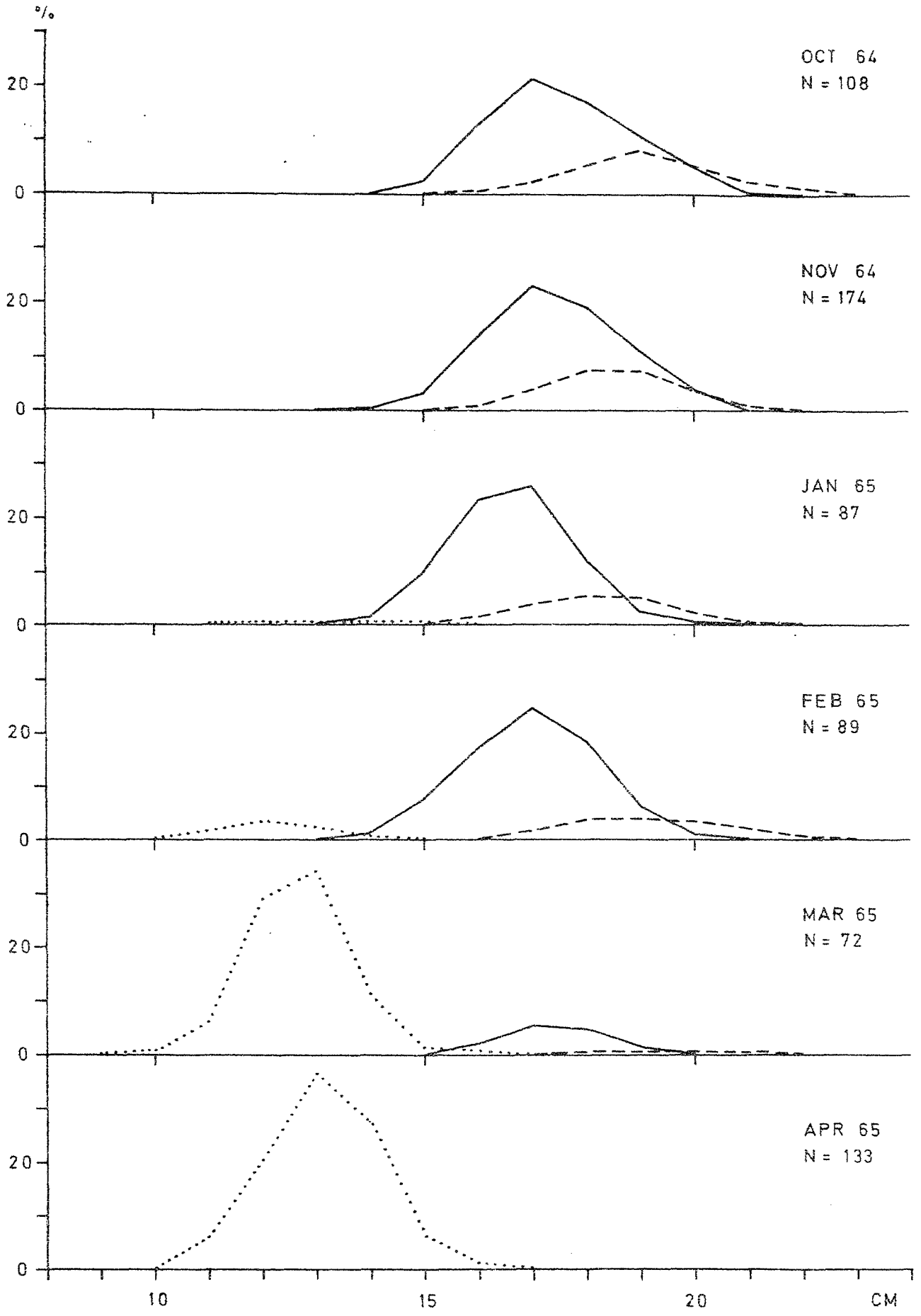
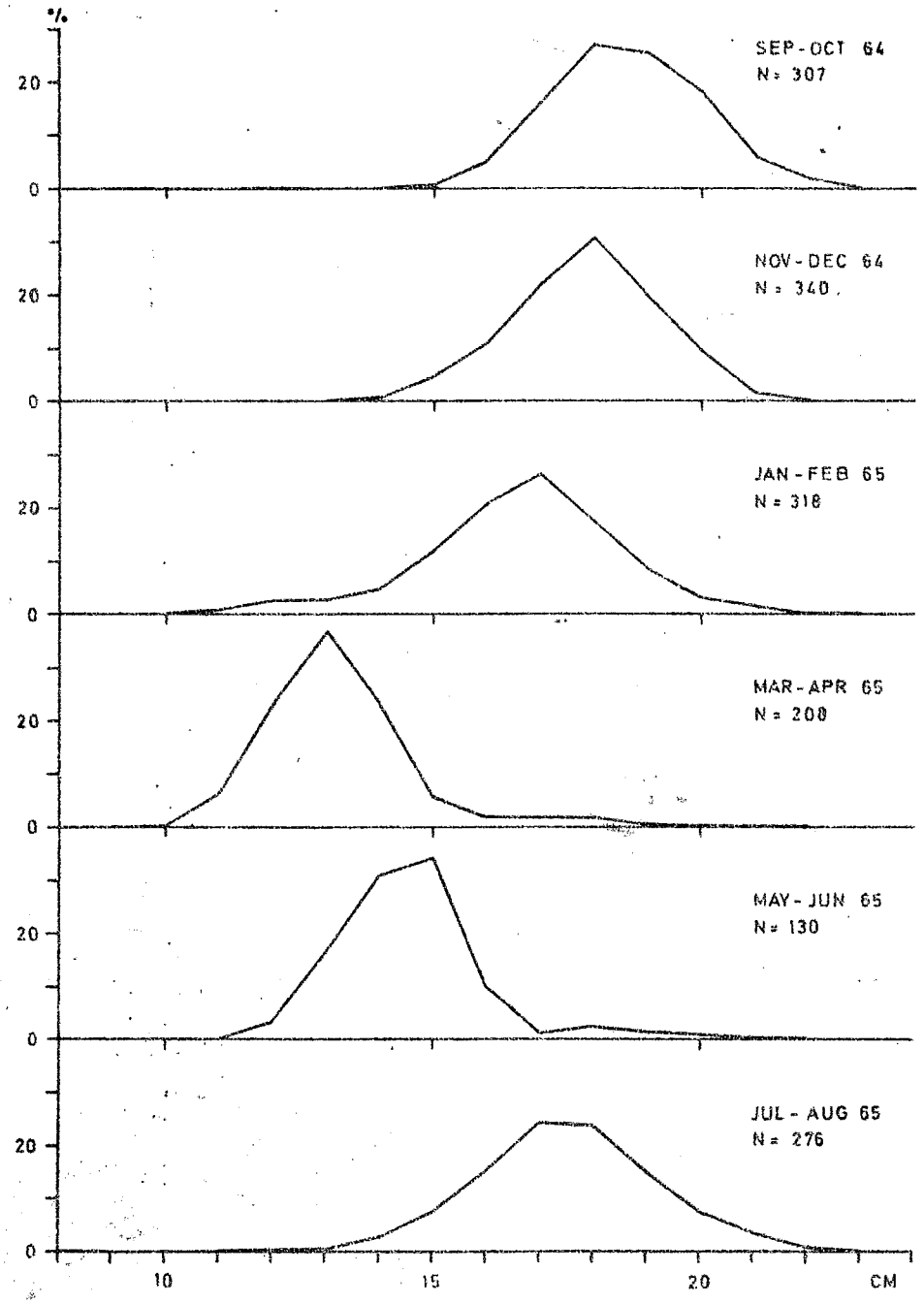


Fig. 3. Monthly length-frequency distributions of different year-classes of Norway pout from October 1964 to April 1965. (1963 year-class: broken line, 1964: full line, 1965: dotted line.)



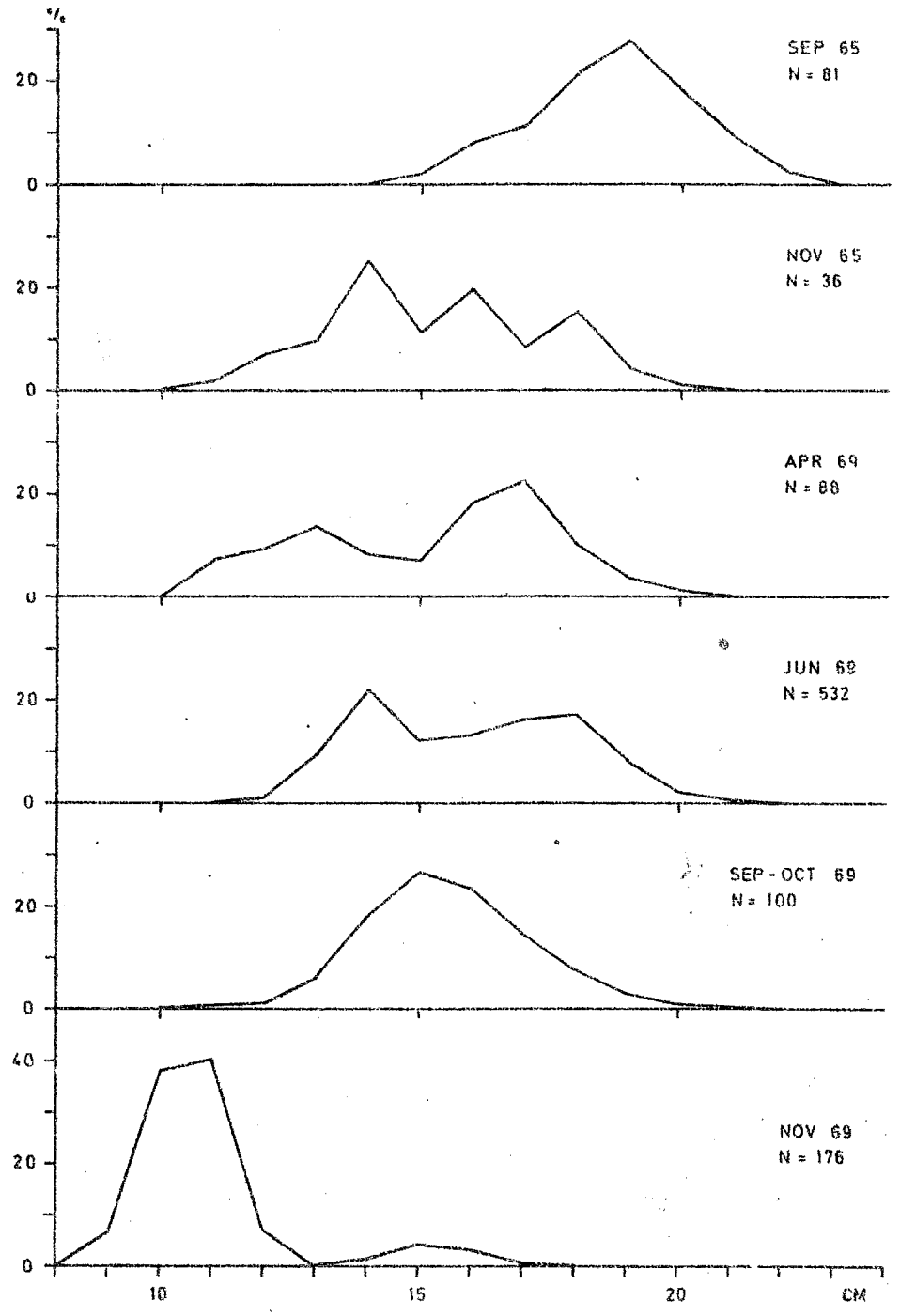


Fig. 4. Bi-monthly length-frequency distributions of Norway pout from September 1964 to November 1965 and from April to November 1969.