

This paper not to be cited without prior reference to the author

FC 41 h

C.M.1964

International Council for the  
Exploration of the Sea

Gadoid Fish Committee  
No. 121

A study of age, growth and reproduction of Norway pout in the North Sea\*)

By

K. G. Christensen

Introduction

In recent years Raitt (1960, 1961 and 1963) has published several papers on his studies of the Norway pout, and the present study is in many respects complementary to his. It is hoped that it may contribute towards a more complete knowledge of this small gadoid, which, besides playing an important role in the ecologic balance of the sea, has also become of increasing importance for the industrial trawl fisheries.

The Norwegian fisheries for Norway pout are concentrated on the Egersund bank, the Patch and on the Fladen Gound. The material for this study, which comprises 18 samples from October 1960 to March 1962, are all derived from commercial catches taken in the Egersund area, except for one sample from the Patch.

The catches sampled were fished with ordinary herring trawl or with shrimp trawl, and the samples, containing 100 to 150 fish each were preserved in 4 per cent formaldehyde. Total fork length was measured to the nearest cm and each fish was examined for sex and stage of maturity. Stomack contents were preserved from few fish of each sample.

The scales of Norway pout are very loosely attached, as already stated by Collett (1875) and Sæmundsson (1929), and for this reason scales were secured from only about two thirds of the fish sampled. For age determinations the otoliths have therefore been used throughout.

In most instances the otoliths show quite clear growth zones, and they

\*) This study was carried out at the Institute of Marine Biology, Oslo University.

are in general easy to read. An investigation of the change in otolith edge with season indicates that the hyaline zone is in most cases formed from September to March, and the opaque zone from April to August, as already concluded by Raitt (1961).

#### Age and growth

In the samples collected the age groups 0 to 4 are present, but the number of 3- and 4 year-olds amount to only 1.6 per cent of the total. The monthly distribution of the different yearclasses in the samples is recorded in Table 1 and shown on the graph of Fig. 1.

It is noted that the 1959 year-class dominated the catches from the time sampling was started to April 1961, and this year-class was still relative numerous during the following months until September. By that time the 0-group of the 1961 year-class started to appear in the samples and the relative abundance of this age group was substantially higher than that of the 1960-year-class the previous autumn. This tend to show that the 1960 year-class of Norway pout in the North Sea was less abundant than the year-classes from 1959 and 1961.

The monthly length distributions of the year-classes from 1959, 1960 and 1961, shown in Fig. 2, indicate that the growth season occurs in the period from March to November and that the increase in length is greater for the 1-year-olds than for the 2 year-olds. The growth curve derived from the present data are in Fig. 3 compared with the results of Sæmundsson (1929) and Raitt (1960). The mean lengths are in all three cases plotted for the month of March, and it would appear that the agreement between the three series of data is quite good.

A comparison has also been made between the mean lengths of males and females in the available material of the 1959 and 1960 year-classes. It was apparent that the females have a faster growth than the males. The difference in mean length was found to be significant already in October of the first year of life, and it appeared to increase with age.

#### Reproduction

The stage of maturity was determined according to a scale modified from that described by Sivertsen (1937) for cod, and the distribution of the various stages of maturity from January to April 1961 is shown in Fig. 4. It is clearly seen from this that the Norway pout in the area investigated were spawning from February to April, but mainly in March. The first

spawning normally occurs at an age of 2, when the fish are 15 to 16 cm in length, although occasionally some fish, and especially the males, may attain sexual maturity already in their first year of life. Thus, in the present material 20 one year-old first time spawners were observed, of which 16 were males.

### Discussion

In Sæmundsson's (1929) material from Icelandic waters the 2- and 3 year-olds were most abundant, and if a similar age distribution has persisted in the Icelandic area it would seem that the Norway pout at Iceland live longer than those in the North Sea, where the normal life span according to this and other investigations is approximately 3 years.

In the Irish Sea Gokhale (1953) failed to find older fish than 2 year-olds, and he suggested a northward migration of the older fish in connection with the spawning. Mason (1960), however, found no evidence to support the theory of an active migration of the older fish from the North Sea area, and the present author would support Raitt's (1960) suggestion of a high natural mortality rate as the main cause of the lack of older fish. Presently in the North Sea area exploitation by man may have caused a significant increase in the total mortality rate, and thus aggravated the difference in age distribution between this area and Icelandic waters.

Sæmundsson's material was derived from catches taken with bottom trawl of a mesh size too large for catching Norway pout effectively. It is therefore reasonable to assume that his samples were biased towards older and larger fish, of which the females proved to be superior to the males both with regard to age and size. This difference in age and growth between the two sexes is also very apparent from the present investigation. It may therefore be concluded, in accordance with Sæmundsson, that the general feature of <sup>a</sup>lower growth rate and a shorter life span for males than for females, found in most gadoids which have been investigated, is also manifest in Norway pout.

Schmidt (1909) considered that a rich spawning of Norway pout occurs in the North Sea to the north of the Dogger Bank, and Mason (1960) suggested that little effective spawning takes place south of 59°N. This suggestion is supported by the present investigations. The abundance of Norway pout evidently decreases from south to north in the southern part of the North Sea, and since this fish, according to Sæmundsson and Schmidt, migrates

towards deeper waters in connection with the spawning, it is reasonable to assume a spawning migration towards north or in the direction of the Norwegian coast.

The present investigations indicate<sup>/a</sup> spawning season of approximately 3 months duration with the peak of spawning in March. This finding is in general agreement with most of the previous reports. It is conceivable, however, that time and duration of spawning is closely related to hydrographic conditions, and this might account for the late spawning in June at Iceland, reported by Ehrenbaum (1909).

Raitt (1961) found that the Norway pout in the North Sea spawn for the first time at an age of 2, while samples from Moray Firth and Shetland waters indicated that a large proportion (44%) of one year old females had attained sexual maturity, but only a few of the males. The present study generally confirms Raitt's findings, except that some few ripe one year olds were also observed. Most of these, however, were males, similar to that observed by Gokhale (1953) in the Irish Sea.

#### References

- Collett, R. 1875. Norges fiske, med bemerkninger om deres udbredelse. Forh. Vid. Selsk., Christiania 1874; Tillægsh., 109 - 110.
- Ehrenbaum, E. 1909. Eier und Larven von Fischen. Nordisches Plankton, Zool. Teil, 1 : 252 - 255.
- Gokhale, S.V. 1953. Part I: Bionomics of the Norway pout, Gadus Esmarkii, Nilsson, (Holt and Calderwood, 1895) in the Irish Sea. : 1-53.  
Part II: Seasonal histological changes in the gonads of the Whiting, Gadus merlangus, L. and the Norway pout, Gadus Esmarkii, Nilsson in the Irish Sea. : 1 - 62. Univ. L'pool. Ph.D.Thesis. (In manuscript).
- Mason, J. 1960. A report on the distribution of Gadus Esmarkii, Nilsson in the North Sea and Adjacent waters. I.C.E.S., C.M. 1964, paper no. 41.
- Raitt, D.F.S. 1960. Preliminary studies of the age and growth of Gadus Esmarkii (Nilsson). I.C.E.S., C.M.1960, paper no. 40.
- " 1961. Further studies on the age, growth and maturation of Gadus Esmarkii, (Nilsson). I.C.E.S. C.M.1961, paper no. 24.
- " 1963. Further observations on the age-composition and abundance of Trisopterus (Gadus) Esmarkii, (Nilsson) in the North Sea. I.C.E.S., C.M.1963, paper no. 127.

- Schmidt, J. 1909. The distribution of the pelagic fry and the spawning regions of the gadoids in the North Atlantic from Iceland to Spain. Rapp. Cons. Explor. Mer., 10 (B4) : 63 - 69.
- Sivertsen, E. 1937. Torskens gyting, med særlig henblikk på den årlige cyklus i generasjonsorganenes tilstand. Fiskeridir. Skr. Havundersøk., 4 (10) : 1 -29.
- Sæmundsson, B. 1929. On the age and growth of the coalfish (Gadus virens L.), the Norway pout (Gadus Esmarkii Nilsson) and the poutassou (Gadus poutassou Risso) in Icelandic waters. Medd. Komm. Havundersøg., serie Fiskeri, 8 (7) : 26 - 35.

Table 1. Monthly distribution (in numbers) of the year-classes 1957 to 1961 from October 1960 to March 1961.

Month	Year - class					Sum
	1957	1958	1959	1960	1961	
Oct.60		2	155	9		166
Nov.60		5	185	10		200
Jan.61	4	10	212	72		298
Febr61		3	104	43		150
Mar.61		5	79	16		100
Apr.61		1	147	150		298
June61		2	44	54		100
July61		2	68	29		99
Sept61			20	41	54	115
Nov.61	1	1	15	61	16	94
Dec.61			10	30	81	121
Mar.62					100	100
Total						1841

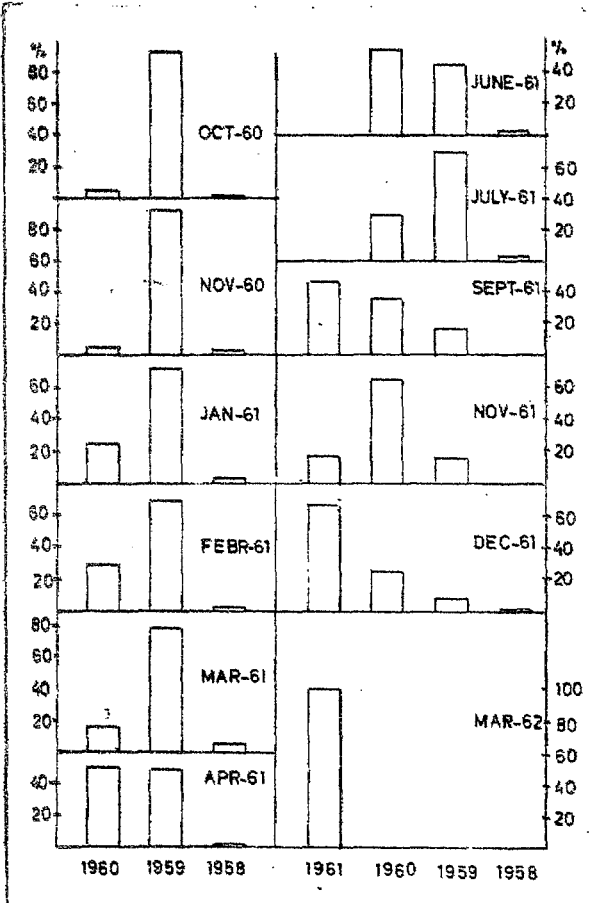


Fig. 1. The age distribution in the samples from Oct. 1960 to March 1962.

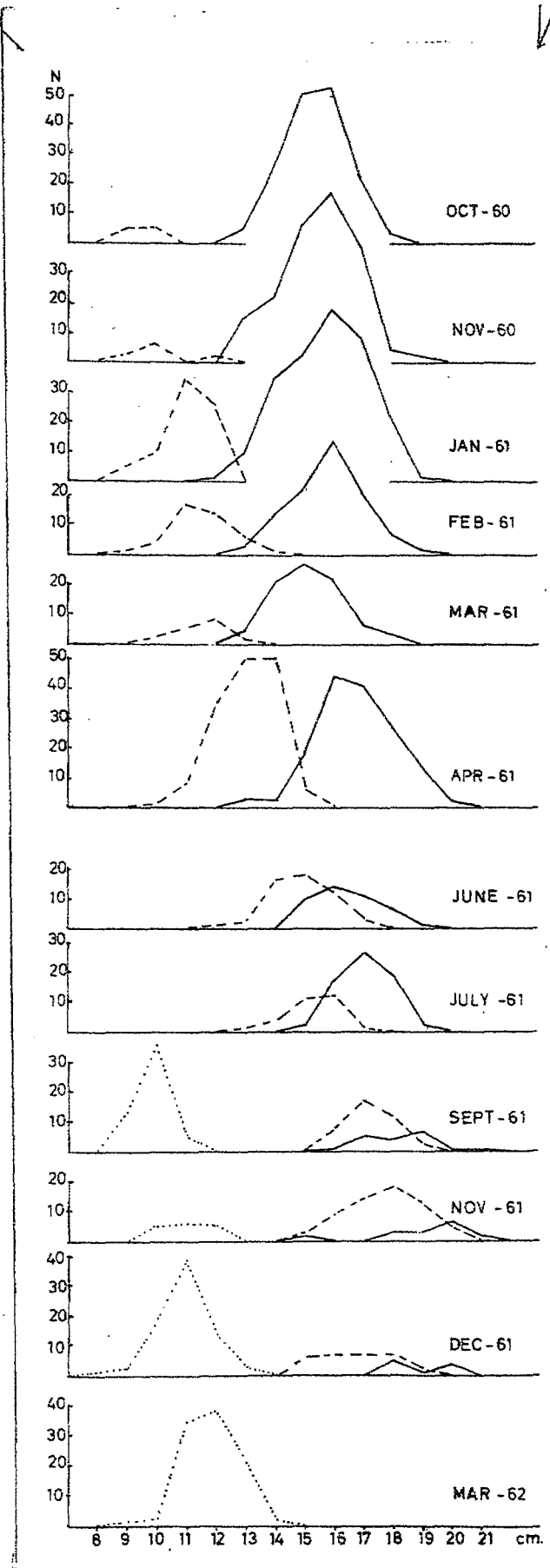


Fig. 2. The length distribution of the different year-classes from Oct. 1960 to March 1962.

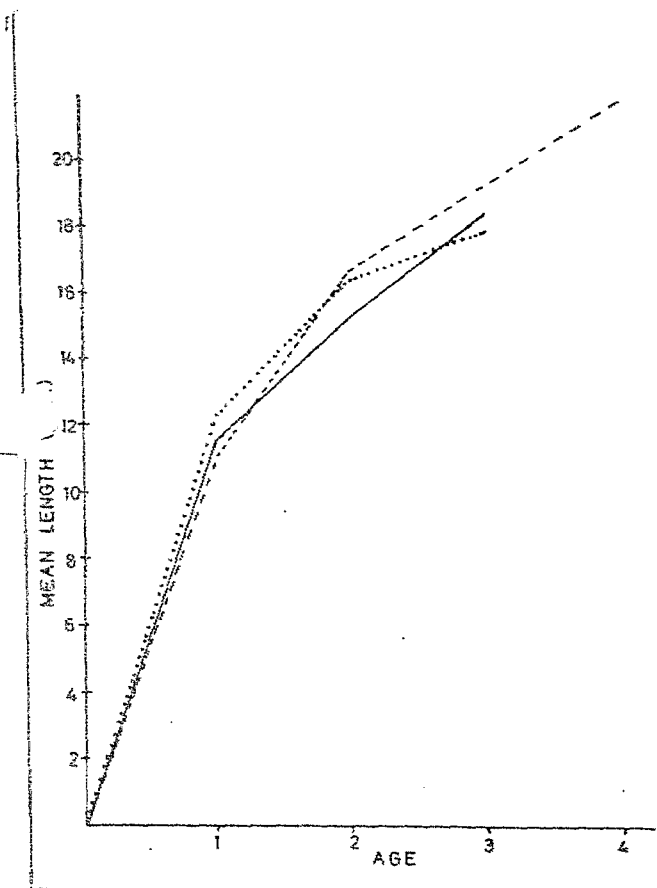


Fig. 3. Growth curves for Norway pout. Broken line: from Sæmundsson (1929) Points: from Raitt (1960) Solid line: from the present material

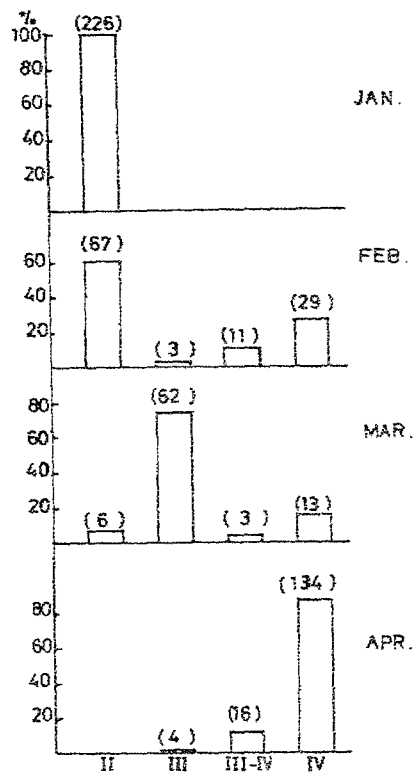


Fig. 4. Distribution of maturity stages, Jan. to April 1961. II- ripening III- ripe III-IV- ripe and running IV- spent