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THE SPAWNING PERIOD FOR MACKEREL IN THE NORTH SEA

By

Erling Bakken[1)], Herman Bjørke[1)] and Maria Hortense Dias Afonso[2)]

ABSTRACT

The intensity and duration of the spawning of mackerel (*Scomber scombrus* L.) was studied by daily plankton sampling from late May to early July 1976 at a single locality in the central part of the spawning area in the North Sea. The main spawning, as indicated by the presence of newly spawned eggs, started in early June and probably ended in early July. Slight maxima in egg numbers were recorded in early and late June. On an average, about 25 newly spawned eggs per m^2 were found. The incubation time was estimated to 9 - 10 days. Newly hatched larvae occured from mid June, with a maximum number in early July.

1) Institute of Marine Research, Bergen, Norway
2) Instituto Nacional de Investigação das Pescas, Lisboa, Portugal

INTRODUCTION

Estimates of the North Sea stock of mackerel have been made by tagging methods (HAMRE 1975) and cohort analysis (ANON 1977). Attempts to estimate spawning stock size from egg surveys have also been made (IVERSEN 1973 and 1976, JOHNSON and DAWSON 1975). Such estimates require information on the spawning intensity and the egg development stages in relation to time, information which is scarce.

In the present report some data on the seasonal spawning of the North Sea mackerel stock are provided.

MATERIAL AND METHODS

Samples of mackerel eggs and larvae were collected from a stand-by boat at the Ekofish oil field in the North Sea (56° 34' N 03° 08' E) from 20 May to 8 July 1976. Two vertical hauls from 40 m depth to the surface were taken in succession at 1300 GMT daily with a Juday plankton net, 80 cm diam., 500 µ mesh size. Samples were obtained on 45 days.

Three stages of egg development were distinguished:

- I from spawning until the embryo starts to diverge from yolk
- II from latter stage until the embryo tail curls round to the head
- III from latter stage until hatching.

Newly hatched larvae, having a large yolk sac, were recorded together with total number of mackerel larvae.

Mean numbers of the two subsequent hauls are given.

RESULTS AND DISCUSSION

The sampling position is situated in the central part of the spawning area for the North Sea mackerel, and high egg densities have been found there (IVERSEN 1977).

Fig. 1 shows the mean number of mackerel eggs and larvae per m^2 surface during the sampling period. Eggs were present in significant numbers from the beginning of June until the sampling ended in early July. Generally, 50 - 150 eggs per m^2 were recorded during this period, with a maximum of about 250 in early June. Larvae occured from early June throughout the period. A maximum of about 50 larvae per m^2 was found on the first days of July.

Fig. 2 shows the number of eggs in each of the three development stages. The curve of stage I eggs indicates that the spawning in the central North Sea started in the first days of June and continued for at least 30 days. The sampling ceased too early to determine with certainty the end of the spawning period. The long period with presence of newly spawned eggs is likely caused by the mackerel being a serial spawner (MACER 1976).

From the peaks of the stage I and stage II curves in early June it seems reasonable to assume that the stage I period lasts for 2 - 3 days. This compares well with observations by IVERSEN (1973) and DANIELSSEN and IVERSEN (1977) who found that eggs without visible embryos were less than 2 days old.

The stage I curve in Fig. 2 may be regarded as an indication of the seasonal curve of spawning intensity of the North Sea mackerel stock. It is worth noting that the observations indicate a shape of the curve which is rather "square" or flat. The general curve shape is of importance when estimates of stock size are made by egg surveys, since the estimates often incorporate assumptions about the seasonal spawning intensity. Lacking further information, it seems better to assume constant intensity during a period of about 30 days rather than e.g. a normal curve of spawning intensity.

The curve for eggs in stage III, as shown in Fig. 2, has two dominant peaks. These peaks can be correlated to the two maxima of the stage I curve, indicating a time laps of 8 days between the two stages.

Daily measurments of temperature at the sampling locality have not been made. Observations from nearby areas, however, show that the temperature of the surface layer increased rapidly during the sampling period;

from 9° C at 8 June to about 12° on 20 June and up to 17° in the first week of July.

The spawning apparently commenced at a somewhat lower temperature than expected. ORTON (1920), JOHANSEN (1925) and DANNEVIG (1948) all report that the main spawning await a temperature of about 12° C. In 1976 the heating of the surface layer started later than normal, and the June temperatures in the central part of the North Sea were lower than in the previous years.

Fig. 3 shows the occurrence of newly hatched mackerel larvae. These young larvae have large yolk sacs, measure 3 - 5 mm, and are probably less than 3 - 4 days old. Higher number of larvae was found on 17 June and 2 July. Assuming that these maxima correspond to the peaks on the curve for eggs in stage I, the incubation time has been approximately 9 days. Similar length of time was found experimentally by DANIELSSEN and IVERSEN (1977) at a temperature of 12° C. The incubation time at higher temperatures is much shorter; only about 2 days at 20° C.

The observed peak larvae densities are only 2 - 5 % of assumed corresponding peak egg densities. This probably reflects a high mortality at the egg stages rather than a drift of egg out of the sampling locality.

The results presented here are based on very limited material, and a similar sampling programme was established also in 1977. It seems possible that the increasing number of fixed installations in the North Sea should be utilized more for egg and larvae studies. Continuous sampling from one or several platforms provides a time coverage which combined with vessel area surveys will give better estimates of total egg and larvae abundance.

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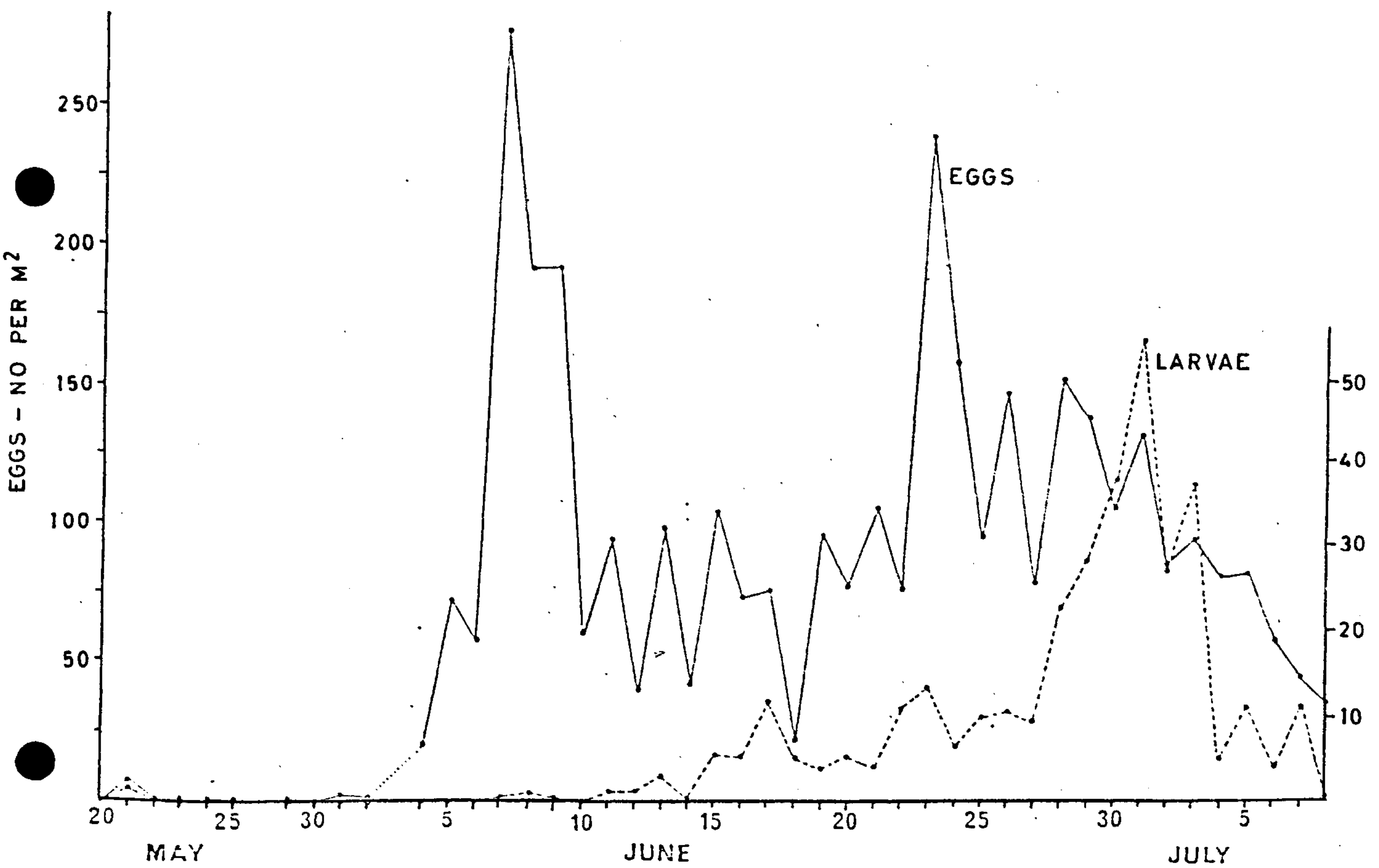

Fig. 1 Eggs and larvae of mackerel.
Ekofisk, central North Sea, 1976.

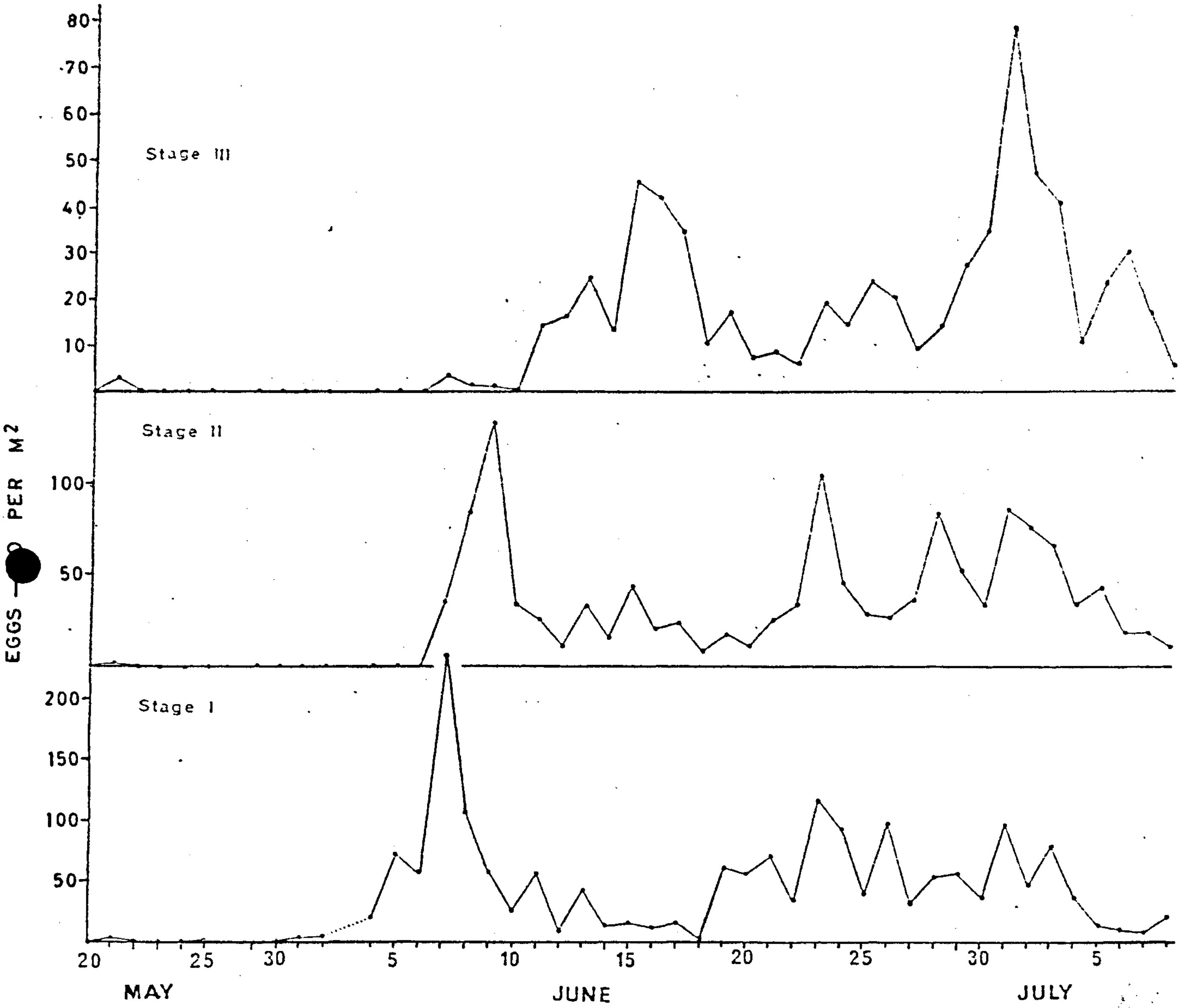

Fig. 2 Number of mackerel eggs in the different development stages. Ekofisk, central North Sea, 1976.

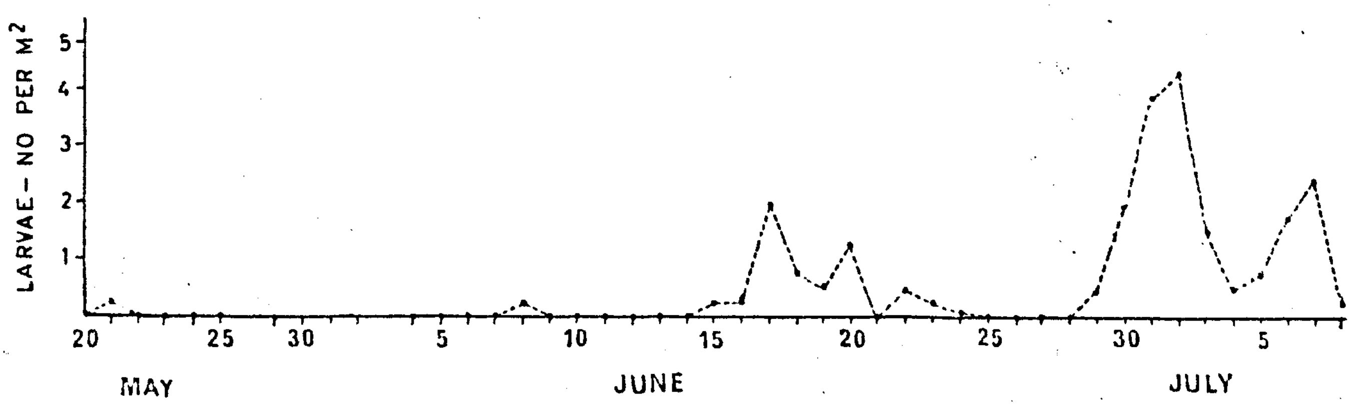

Fig. 3 Number of newly hatched mackerel larvae. Ekofisk, central North Sea, 1976.