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SPAWNING OF HADDOCK (*Melanogrammus aeglefinus*) IN CAPTIVITY

by

Erlend Moksness
State Biological Station Flødevigen
N-4800 ARENDAL Norway

and

Jørgen Riis-Vestergaard
Zoophysiological Laboratory A
Aug. Krogh Institute
Universitetsparken 13
DK-2100 KØBENHAVN Ø Denmark

ABSTRACT

Maturing haddocks were caught in late January 1982 and transferred to a spawning basin at the State Biological Station Flødevigen, Arendal. The spawning took place from February 26th to May 27th, with a maximum in March and April. A calculated average of about 1300 ml eggs were spawned in several batches from each female during the period. The egg diameter decreased from 1.50 mm to 1.30 mm during the spawning period. The dry/wet weight ratio of the eggs was 7.6%.

INTRODUCTION

As a part of a project on larval haddock, mature haddocks were kept in a spawning basin to produce fertilized eggs during the entire spawning period. This paper discusses the results obtained.

MATERIALS AND METHODS

Haddock were caught by longline near Arendal, Norway, in late January 1982. The fish were transferred to a 45 m^3 spawning basin (Fig. 1) at the State Biological Station Flødevigen, Arendal. The temperature increased from 4.0 to 7.0°C during the experimental period. Photoperiod was kept on 9 hrs light and 15 hrs dark with 30 min. dimmed light in the morning and the evening. Eggs were removed every morning from an eggcollecting device (Fig. 1) and the egg diameter and spawned volume was measured. A spawned volume of 1 ml eggs were counted to an average number of 400 eggs. No diseases were observed on the fish while being in the basin. They were fed shrimps every day.

On April 16th one male and one female (standard length 42 and 47 cm, respectively) were isolated in a 2 m^3 aquarium at temperature 6.0°C. Spontaneously spawned eggs were collected at the surface water outlet. At each spawning egg diameter and spawned volume was measured. Wet weight was found by shortly placing groups of 20 eggs on filter paper (to remove adhering sea water) and then transferring them to a preweighed strip of aluminium foil. The eggs were then weighed 4 times at 15 sec. intervals on a Cahn 25 Automatic Electrobalance, and the initial weight was found by linear extrapolation. Dry weight was found by reweighing the eggs after being dried for 24 hrs at 95°C.

RESULTS

A total of 51 haddocks, 28 females and 23 males (Table 1), were kept in the spawning basin. As shown in Fig. 2 the spawning started February 26th and ended May 27th, with a maximum from about March 15th to April 15th. A calculated average of 1300 ml eggs per female

were spawned in several batches, corresponding to about 520.000 eggs. The average egg diameter decreased from 1.50 mm to 1.30 mm during the spawning period (Fig. 3).

The isolated female spawned a total of 410 ml eggs in 3 larger and 3 smaller batches over a period of 14 days (Table 2). Both egg diameter (Fig. 3) and weight decreased throughout the observation period. The diameter decreased from 1.40 to 1.31 mm and the wet weight from 1.49 to 1.24 mg. The dry/wet weight ratio of these eggs was constantly 7.6 ± 0.1%.

DISCUSSION

The spawning period of the captive haddocks and the maximum spawning during March and April are in accordance with earlier results from field investigations (SAVILLE 1959). The results also correspond with that of another stock of haddocks kept in the same basin in 1981.

The calculated number of eggs, 520.000 per female, is in accordance with the mean fecundity of 470.000 eggs estimated by RAITT (1933) from haddocks with a length of 45.5 cm.

Several reports have been concerned with factors influencing egg size. It has been found for several euryhaline species, that eggs spawned in a low salinity are larger than those spawned in a high salinity (e.g., KÄNDLER and TAN 1965). SOLEMDAL (1971 and 1973) has shown for flounder that this is largely due to genetically fixed differences between populations within the species. GRAUMANN (1965) has found for Baltic cods, that the mean egg diameter decreases during the spawning season. She assumed that this was because the smaller females, known to produce smaller eggs, tend to spawn later than the larger females. The same argument may well apply to the results in Fig. 3. According to HAWKINS *et al.* (1967) the spawning period for a female haddock is about one month or less. Thus the actual "spawning population" in the basin must have included different females at different times, but it

has not been directly verified, whether the later spawners were the smaller ones, or whether egg diameter is related to the size of the female in haddock.

The results from the isolated female (Table 2) reveal another timerelated factor influencing the size of haddock eggs, namely the spawning time relative to the spawning period for each individual female. This female spawned 410 ml eggs after isolation, which is much less than the mean volume of 1300 ml per female. Presumably she had passed through most of her spawnings before being isolated. For this reason we cannot know, if the egg diameter is decreasing during the whole spawning period of a female or in the last few spawnings only.

The relative dry weight of the eggs is independent of egg size in Table 2. The absolute dry weight is reduced by 17%. It is to be expected, therefore, that the last spawned eggs will yield smaller larvae with smaller probability of survival.

ACKNOWLEDGMENTS

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Table 1. Number (n), mean standard length ($\overline{SL}$) standard deviation (SD) and range of the matured haddocks

	n	$\overline{SL}$ (cm)	SD	range (cm)
♀	28	45.6	5.9	37.0 - 65.5
♂	23	40.0	5.1	32.0 - 51.0

Table 2. Changes in size and weight of eggs during successive spawnings by a female haddock. Diameter is a mean value of 20 eggs, ± standard deviation. Weight is the mean value ± standard deviation of duplicate determinations of 20 eggs each

Date	Eggs (ml)	Diameter (mm)	Wet weight (mg)	Dry weight (mg)	Dry weight % of wet weight
18. April	112	1.40±0.03	1.49±0.01	0.114±0.001	7.64±0.03
21. "	108	1.39±0.03			
23. "	140	1.37±0.03	1.43±0.01	0.112±0.002	7.76±0.04
28. "	18	1.36±0.05	1.37±0.01	0.105±0.002	7.62±0.05
29. "	17	1.34±0.04			
1. May	15	1.31±0.05	1.24±0.01	0.094±0.001	7.55±0.02

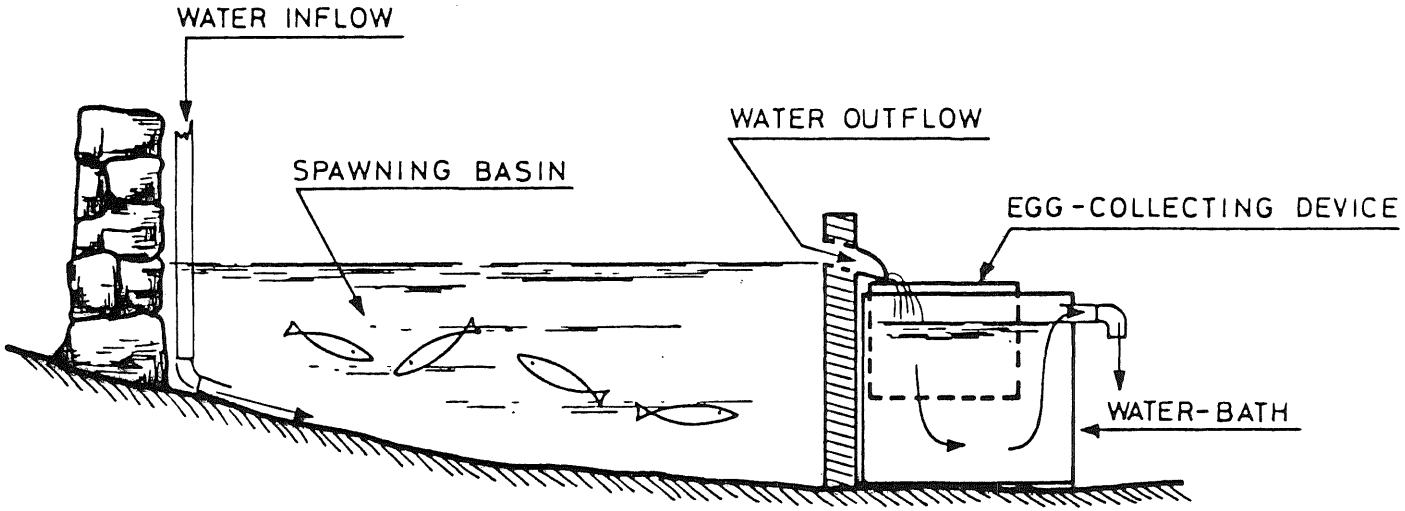

Figure 1. Sketch of the spawning basin

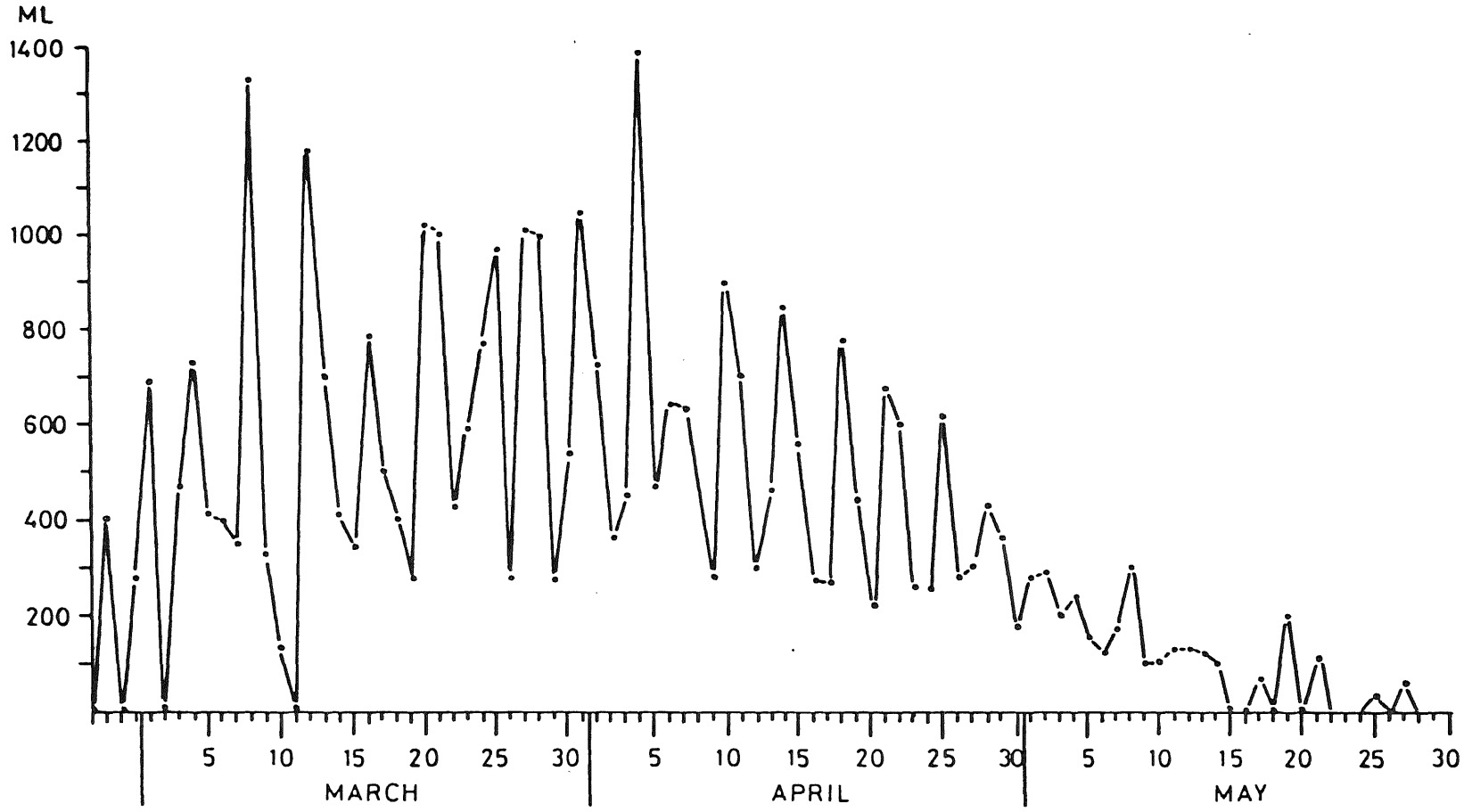

Figure 2. The daily volume of egg spawned by the captive haddocks

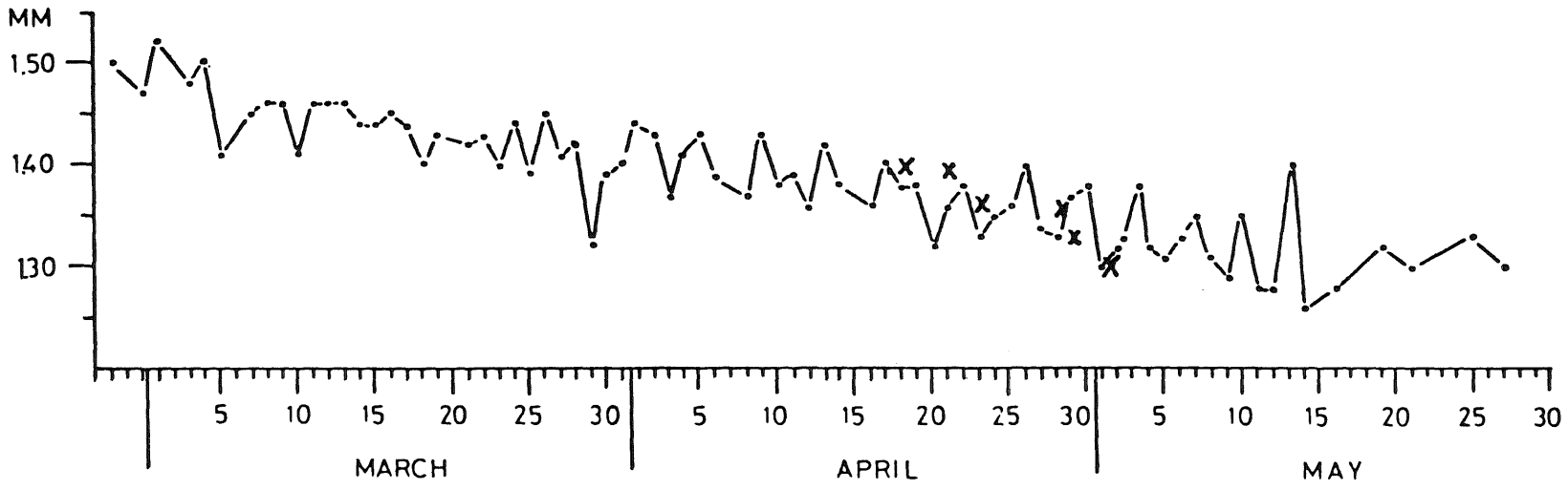

Figure 3. The daily mean egg-diameter during the spawning period (·———·), SD 0.05. The egg-diameter from the isolated female plotted (x)