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SPAWNING OF HADDOCK (*Melanogrammus aeglefinus* L.) IN CAPTIVITY
New experiments i 1983.

By

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ABSTRACT

Maturing haddocks were caught between 20 January and 4 February
1983 and transferred to a spawning basin at Statens Biologiske
Stasjon Flødevigen, Arendal. The spawning took place from 22
February to 18 May, with a maximum in March and April. A calcu-
lated average of about 1420 ml eggs were spawned in several
batches from each female during the period. The egg diameter de-
creased from 1.50 to 1.25 mm during the spawning period. and the
overall average diameter of the eggs were 1.38 mm. The larval
length compared to egg diameter are given and also the number of
days from 50 o/o hatching till all larvae in the starving groups
were dead.

INTRODUCTION

As a part of a project of investigation on larval haddock, mature haddock were kept in a spawning basin to produce fertilized eggs during the whole spawning period. On the ICES meeting in 1982 a report (MOKSNESS and RIIS-VESTERGAARD 1982) were given on the spawning in 1982. This paper discusses the results obtained in 1983.

MATERIAL AND METHODS

Haddock were caught by long line near Arendal, Norway, from 20 January till 4 February 1983. the fishes were transferred to a 45 m^3 spawning basin (Fig. 1) at Statens Biologiske Stasjon Flødevigen, Arendal. The temperature varied between 4.7 and 6.2°C during the experimental period while the salinity were stable at 34.0 $\pm$ 0.2 o/oo. Photoperiod were kept on 15 hrs light and 9 hrs dark with 30 min. dimmed light in the morning and in the evening. Eggs were removed every morning from the egg collecting device (Fig. 1) and the egg diameter and spawned volume were measured. The egg volume of 1 ml were set to 400 eggs (MOKSNESS and RIIS-VESTERGAARD 1982). The haddock were treated with Mycostatin during the second week of February. They were fed shrimps every day.

The eggs were incubated in 280 liters cylindric tanks (Fig. 2) and the larvae were kept in the same tanks. Incubation time, mortality, standard length and dry weight of newly hatched larvae were measured. The larvae were conservated in 4 o/o formaldehyd, dried at 60°c for 24 hrs before determination of weight.

RESULTS

A total number of 93 haddocks, 54 females and 39 males (Table 1), were kept in the spawning basin. The spawning started 22 February and ended 18 May, with a maximum from about 10 March to 15 April (Fig. 3). A calculated average of about 1420 ml eggs per female were spawned in severeal batches, corresponding to

about 568 000 eggs (Table 2). The average egg diameter decreased
from 1.50 mm to 1.30 mm during the spawning period (Fig. 4).
while a mean of 1.38 mm (Table 3) were measured for all the eggs
spawned in the spawning period. As shown in Fig. 5 the fertili-
zation rate of the eggs from the spawning basin were mainly
above 80 o/o. In Table 4 are given data in the eggs and larvae
from eggs fertilized in the period from 4 March to 14 april. The
number of days from fertilization till 50 o/o hatching and from
50 o/o hatching to all larvae in the starving groups are dead
depends on the temperature. while there seems to be no
correlation between egg diameter and the length of larvae at 50
o/o hatching. There seems to be no changes in viability at the
larvae during the whole experimental period.

DISCUSSION

The spawning period of the captive haddock, the maximum spawning
period, the decrease in egg diameter and the overall egg dia-
meter are in accordance wiht the results from 1982 (MOKSNESS and
RISS-VESTERGAARD 1982 and Table 2). The fertilization rate of
the eggs corresponds to what was observed in the spawning basin
in 1981 and 1982 (unpubl. data).

The calculated number of eggs, 568 000 per female, is in accor-
dance with the mean fecundity of 618 700 eggs estimated by RAITT
(1933) from haddock with a length of 48.8 cm.

The number of days from fertilization to 50 o/o hatching are in
accordance with earlier work (DANNEVIG 1895, WALFORD 1938) and
the number of days from 50 o/o hatching to total deaths of
starving larvae are the same as observed in earlier experiments
in 1981 and 1982 (unpubl. data). The observed length of the
larvae are truly wrong since they were kept for one hour in
destilled water before measured.

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REFERENCES

DANNEVIG, H. 1895. The influence of temperature on the develop-
        ment of the eggs of fishes. Rep. Fishery Bd Scotl., 13:
        147-52

MOKSNESS, E. and J. RIIS-VESTERGAARD 1982. Spawning of haddock
        (*Melanogrammus aeglefinus*) in captivity. ICES C.M.
        Demersal Fish Committee, no 30

MOKSNESS, E. 1983. Sexual experience of cod (*Gadus morhua* L.)
        and haddock (*Melanogrammus aeglefinus* L.). ICES C.M.
        Demersal Fish Committee, no 39

RAITT, D.S. 1933. The fecundity of the haddock. Scient. Invest.
        Fishery Bd Scotl. 1932, 1

WALFORD, L.A. 1938. Effect of currents on distribution and sur-
        vival of the eggs and larvae of the haddock (*Melano-
        grammus aeglefinus*) on Georges Bank. Bull. Bur. Fish.,
        Wash., 49(29): 1-73.

Table 1. Number (N), mean standard length (S$\bar{L}$), standard deviation (SD) and range of the matured haddocks

	N	S$\bar{L}$ (cm)	SD	Range (cm)
♀	54	48.8	5.7	42-63.5
♂	39	47.5	5.2	38.5-61.0

Table 2. Totale volume (TV), mean volum per female (V/♀) and mean number of eggs per female (N/♀) spawned by the matured haddocks

TV (ml)	v/♀ (ml)	N/♀
88370	1420	568 000

Table 3. Mean diameter ($\bar{X}$), standard deviation (SD), range of eggdiameter and number of eggs measured (N) during the spawning period in 1982 and 1983

Year	N	$\bar{X}$ (mm)	SD	Range (mm)
1982	7661	1.39	0.08	1.12-1.73
1983	4951	1.38	0.08	1.13-1.62

Table 4. Fertilization date, number of days to 50% hatching (NE), number of days from 50% hatching to totale deaths fo the larvae (NL), mean eggdiameter (ED), mean standard length at 50% hatching (SL) and mean dry weight (DW), both for preserved larvae and mean temperature with standard deviation (t$^\circ$C$\pm$SD) during incubation and larvae period

Fertilization date	Eggs t$^\circ$C$\pm$SD	NE (days)	ED (mm)	SL (mm)	DW (mg)	Larvae t$^\circ$C$\pm$SD	NL (days)
04.03	7.0$\pm$0.8	12	1.49	3.93	0.071	8.7$\pm$2.2	12
10.03	7.1$\pm$0.5	11	1.37	3.69	0.064	6.8$\pm$1.1	15
14.03	8.1$\pm$0.8	11	1.39	3.65	0.062		
22.03	6.9$\pm$1.7	13	1.35	3.39	0.064		
02.04	6.8$\pm$0.6	12	1.38				
05.04	6.9$\pm$1.2	15	1.33	3.61	0.054	6.8$\pm$0.3	13
10.04	6.5$\pm$0.3	15	1.40	4.07	0.054	6.9$\pm$0.3	14
14.04	8.8$\pm$2.0	11	1.36	3.74	0.058		

WATER INFLOW

SPAWNING BASIN

WATER OUTFLOW

EGG -COLLECTING DEVICE

WATER- BATH

Fig. 1. Sketch of the spawning basin

WATER INFLOW

SANDFILTER

OVERFLOW

TAP

FILTRED WATER

INCUBATION TANK

FILTER (40 μm)

WATER OUTFLOW
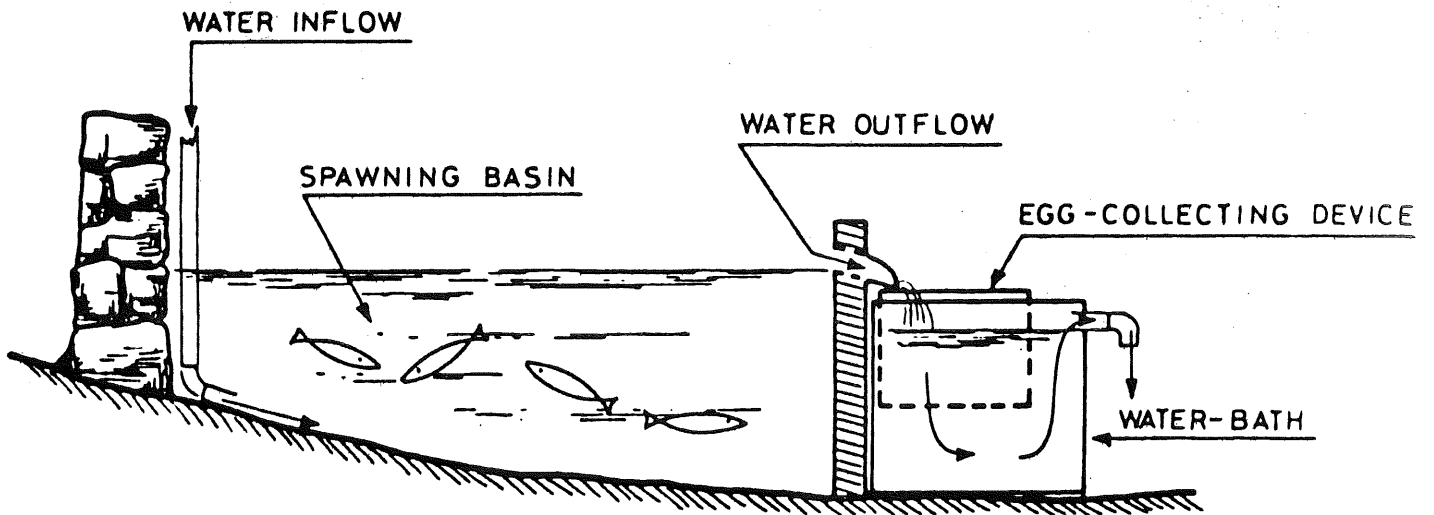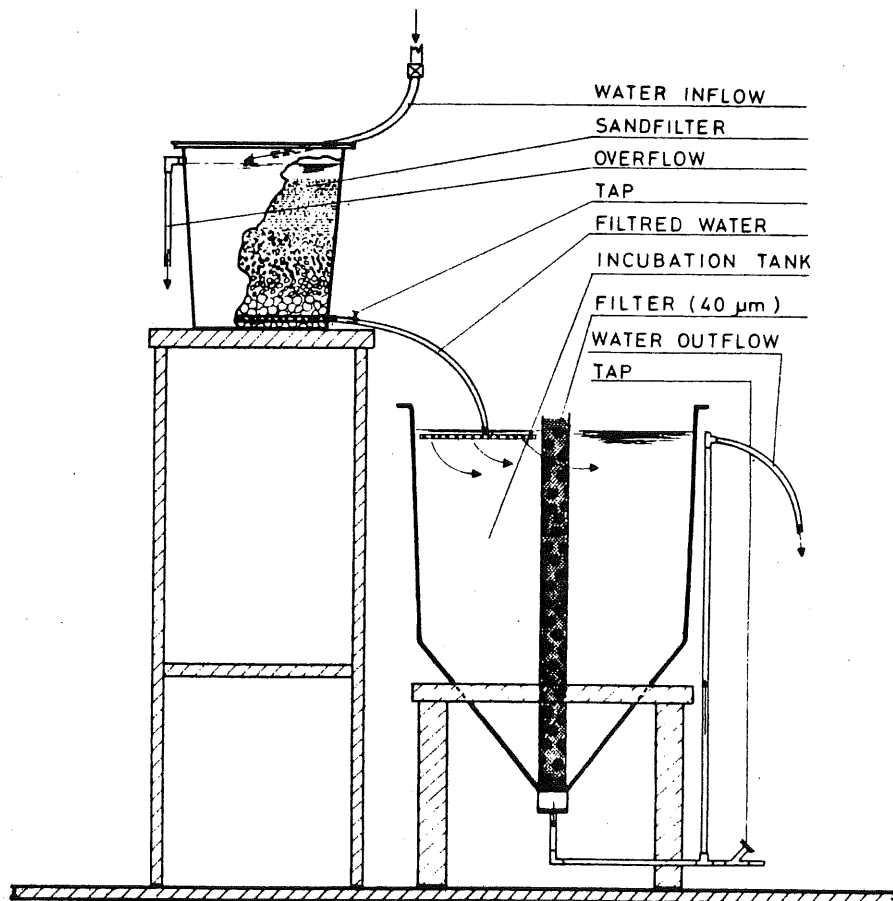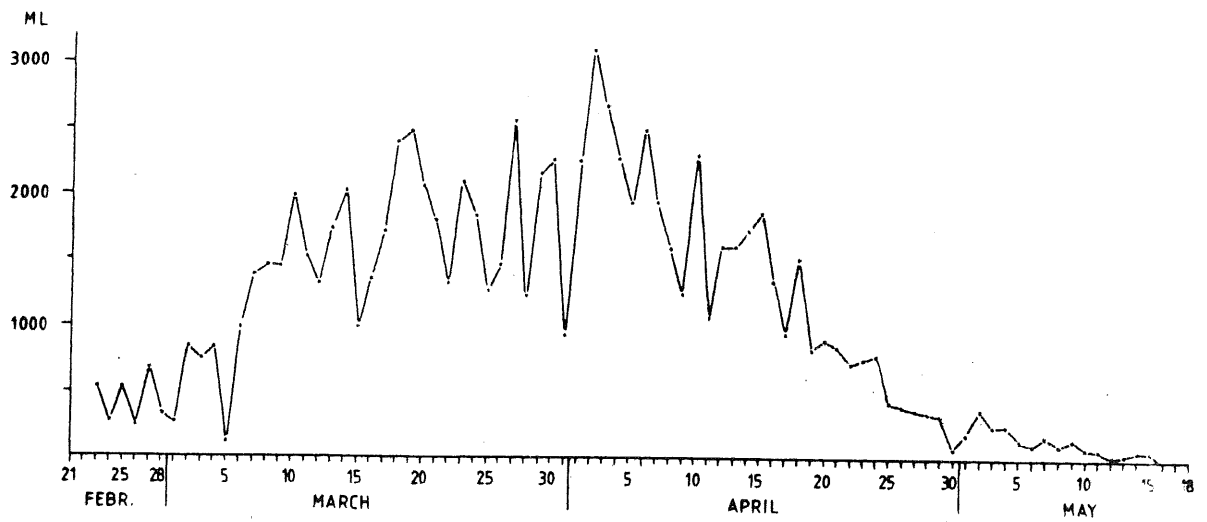
TAP

Fig. 2. Sketch of the incubation tanks

Fig. 3. The daily volume of egg spawned by the captive haddock's

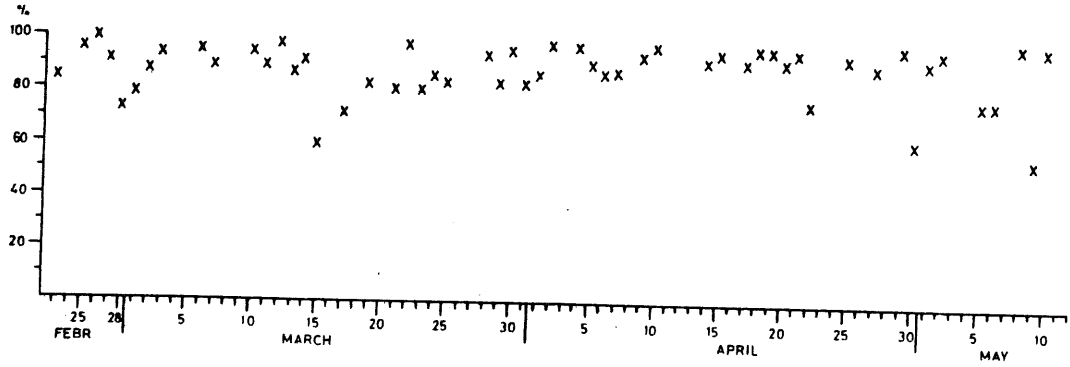Fig. 4. The daily mean eggdiameter during the spawning period, SD=0.05

Fig. 5. Fertilization of eggs at each spawning in percent