

SOME ASPECTS OF THE REPRODUCTION PATTERN OF HAKE (*MERLUCCIIUS MERLUCCIIUS*) IN THE BALEARIC ISLANDS

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Hake (*Merluccius merluccius*) is one of the target species of the trawl fishery carried out on the continental shelf and slope off the Balearic Islands (OLIVER, 1993). The aim of the present paper is to provide new information about the reproductive cycle (spawning time and size at first maturity) of this species in the area. Parameters which, used together with fecundity, determine the potential reproduction of the stock and the optimum age for first capture, both very important aspects for the application of the fisheries analysis programmes in the regulation of fishing activity.

The material used in this study comes from monthly biological sampling of the trawl fishery carried out between January 1990 and December 1992 by the Balearic Oceanographic Centre (I.E.O. - Centro Oceanográfico de Baleares). A total of 2831 specimens were sampled, with a length range between 10 and 66 cm : 1382 females, 1210 males and 239 unidentified.

The stages of maturity were determined by macroscopic observation of the gonads using a five-point scale proposed by HOLDEN and RAITT (1975). Monthly changes in the percentage of mature specimens by sexes were calculated by grouping maturity stages 3, 4 and 5. The size at attainment of maturity (length at which 50% of the specimens had become mature) was determined separately for the sexes using the programme LIONOR (J. LLEONART, unpublished). In 1992, the monthly Gonosomatic Index (GSI = gonad weight*100/gutted body weight) was calculated for 365 females and 257 males from March to December.

In both sexes, reproductive activity occurred all the year round (Table 1). The maximum percentage of mature females was obtained in March, May, September and December and, for males, in May, June and September. These results are similar to those obtained with the GSI monthly evolution (Fig. 1), which shows three peaks in both sexes.

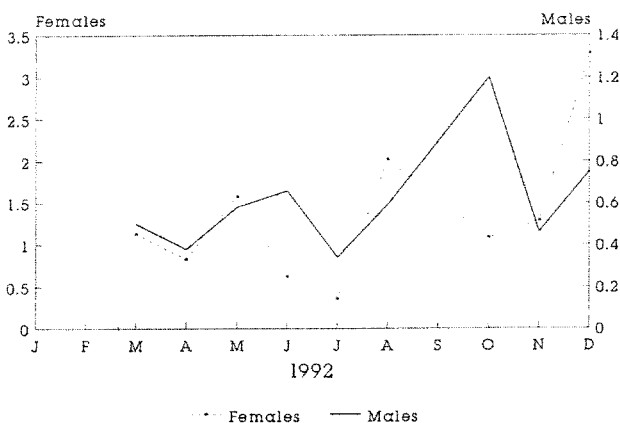
Results indicate a prolonged spawning period for the species, with maximum reproductive activity in the spring, the end of summer and winter, which agrees with the reproductive cycle described by BOUHLAL (1973) in Tunisia. It confirms the existence of a spring spawning peak found by BRUNO *et al.* (1979) in Majorcan waters, which has not been found along the Catalan coast (RECASENS, 1992).

The size at attainment of maturity was 36 and 27 cm for females and males, respectively, with a maturity range between 23 cm (below which all specimens are immature) and 43 cm (above which all individuals are mature). These values fall within the range indicated for hake in the western Mediterranean (OLIVER and MASSUTI, 1994). Although the size at first maturity obtained for females is slightly higher than that indicated by BRUNO *et al.* (1979) in the same area.

Table 1.- Percentage of maturity by sexes and length. n: number of fish sampled each month.

length (cm)	J	F	M	A	M	J	Jl	A	S	O	N	D
Females												
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	20.0	21.7	31.8	0.0	43.8	0.0	13.0	3.7	15.8	9.1	0.0	45.7
35	61.3	56.3	65.2	20.8	62.5	14.3	23.8	38.5	58.8	44.4	15.0	85.2
40	90.0	60.0	92.3	40.0	50.0	53.6	70.6	85.7	85.7	62.5	40.0	75.0
45	50.0	100.0	0.0	66.7	75.0	60.0	22.2	100.0	75.0	75.0	70.0	50.0
50	60.0	-	0.0	100.0	50.0	50.0	33.3	100.0	100.0	66.7	85.7	15.7
55	100.0	-	0.0	50.0	-	-	-	-	-	50.0	100.0	66.7
60	66.7	100.0	0.0	100.0	-	0.0	66.7	-	-	-	100.0	100.0
n	177	133	96	120	90	126	132	114	116	113	107	95
Global (%)	27.7	25.6	36.5	10.8	34.4	11.1	18.9	16.1	43.1	16.8	24.3	52.9
Males												
20	5.9	7.0	17.0	6.3	11.4	11.1	6.7	3.6	28.6	23.3	2.0	5.3
25	7.7	40.0	28.6	9.5	51.9	51.4	34.3	9.1	40.5	59.4	9.1	70.0
30	33.3	36.4	50.0	37.5	96.2	74.1	75.0	46.7	50.0	50.0	0.0	93.8
35	50.0	20.0	-	25.0	80.0	50.0	33.3	100.0	100.0	50.0	0.0	50.0
40	0.0	0.0	-	-	-	-	100.0	100.0	-	100.0	40.0	-
45	-	-	-	-	-	0.0	-	-	-	-	-	-
n	91	123	122	120	112	100	97	88	84	109	86	79
Global (%)	7.7	22.8	24.6	15.8	42.9	43.0	33.0	19.3	38.1	41.3	4.7	31.7

Fig. 1.- Gonosomatic index of males and females from March to December.



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