LITTORAL FISH COMMUNITY OF CABRERA NATIONAL PARK (BALEARIC ISLANDS) : QUALITATIVE DATA

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Studies of marine reserves in the Mediterranean have been carried out by comparing protected with non-protected areas (BELL, 1983; GARCIA & ZABALA, 1991; FRANCOUR, 1989, 1991). However, comparing the same zone over a period of time would seem to be the best way to evaluate the changes which occur as a result of differing approaches to management in a protected area (ROBERT & POLUNIN, 1992). This study provides information about littoral fish populations of Cabrera National Park. These data will permit future evaluation of the changes produced by the management measures adopted. Visual censuses were used to evaluated the mean and total species richness in transects of 50 m long and 5 m wide. The following sampling stations have been studied : 3 stations of rocky blocks at 5 and 25 m depth and 2 stations over vertical cliffs at 15 m (photophilic algal community), 2 stations at 40 m (sciaphilic algal community) and 1 station over *Posidonia oceanica* at 15 m depth. During summer 1993, five replicates on consecutive days of each station were made between 10.00 and 14.00 g.m.t. Cluster analysis was applied to qualitative data from samples. The Jaccard index was chosen as measures of the similarity, and UPGMA was used as the aggregation algorithm (SNEATH & SOKAL, 1973). A total of 49 species from 20 families has been recorded. Labridae dominated the community with 10 species and other important families were Sparidae and Serranidae (Table 1). Greatest species richness has been seen at stations on shallow blocks and it is attributed to greater trophic abundance (HARMELIN, 1990). The structural complexity of the environment and the depth gradient, with distinctive associated benthonic communities, were the two discriminant factors shown by the samples.

The samples from blocks at 40 m depth are the first group to appear in the cluster analysis (Fig. 1) and they are characterized by the presence of species only seen in these transects (*A. anthias* and *G. vittatus*) and the corresponding absence of those with shallower distribution (*E. guaza, S. scriba, S. salpa, S. ocellatus, S. roissali, T. pavo, G. buchichi, T. delaisi* and *T. melanurus*). Secondly, the samples from the *P. oceanica* beds separate out. The last to separate are the cliffs and blocks of the photophilic algal communities. In this case, structural complexity of habitat is more important than depth or sampling place in the determination of the qualitative composition of the fish communities between 5 and 25 m.

BENTONIC COMUNITIES	Photophilic blocks						Photophilic cliffs		Sciaphilic blocks		Posidonia oceanica
Stations	1	2	3	1	2	3	4	5	4	5	6
Depth (m)	5			25			15		40		15
DASYATIDAE						1					
MURAENIDAE				1	1	1	1	1	1	1	
CONGRIDAE									1		
GADIDAE					1					1	
SERRANIDAE	2	3	2	3	2	4	3	2	2	2	1
APOGONIDAE	1	1	1	1	1	1	1	1	1	1	
CARANGIDAE		1									
SCIAENIDAE			1								
MULLIDAE	1	1	1	1	1	1	1	1			
SPARIDAE	5	5	7	5	3	3	2	1	1	2	
CENTRACANTIDAE			1	1	2	2			2	2	2
POMACENTRIDAE	1	1	1	1	1	1	1	1	1	1	1
LABRIDAE	10	10	6	7	9	8	4	4	4	6	6
GOBIIDAE		3		1	1	1		2	4	3	
BLENNIIDAE	1		1				1	2			
TRIPTERYGIIDAE	2	2	2	2	1	1					
SPHYRAENIDAE			1			1				1	
MUGILIDAE	1										
SCORPAENIDAE	1		1	2	3	2	1		1	1	
ATHERINIDAE											1
Mean S	18.8	19.0	17.2	18.0	17.0	17.8	11.4	11.0	11.4	13.0	8.4
(±SE)	0.85	0.94	1.02	0.54	0.89	1.07	0.40	0.70	0.51	0.54	1.35

Table 1. - Number of species by family and mean species richness.

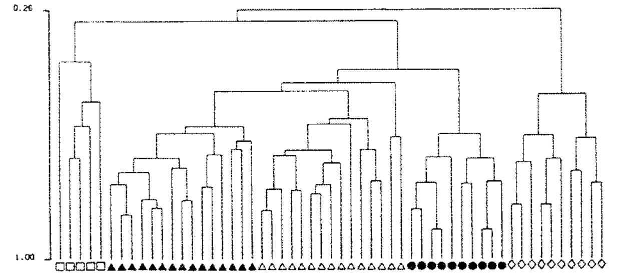

Fig. 1. - Dendogram of similarities between samples (⊓ : P. oceanica community; △ : Sciaphilic algal community blocks at 40 m depth; ▲ : Photophilic algal community blocks at 5 m depth; △ : Photophilic algal community blocks at 25 m depth; ● : Photophilic algal community cliffs at 15 m depth).

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SOME ASPECTS OF THE REPRODUCTION PATTERN OF HAKE (*MERLUCCIUS MERLUCCIUS*) 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 Oceanogràfico 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.

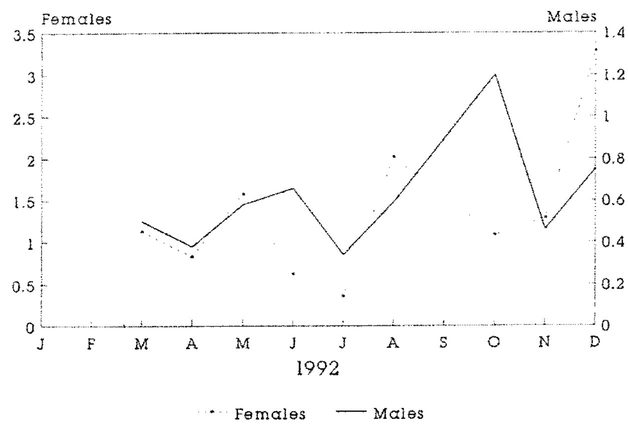
Results indicate a prolonged spawning period for the species, with maximum reproductive activity in the spring, the end of summer and winter, which agrees with the reproductive cycle described by BOUHLAL (1973) in Tunisia. It confirms the existence of a spring spawning peak found by BRUNO *et al.* (1979)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

The size at attainment of maturity was 36 and 27 cm for females and males, respectively, with a maturing 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	46.7
35	61.3	56.3	65.2	20.8	62.5	14.3	23.8	38.5	58.8	44.4	16.0	85.2
40	90.0	60.0	92.3	40.0	50.0	63.6	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	16.7
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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