BASE STUDY FOR MONITORING THE RESERVE EFFECT IN THE CABRERA NATIONAL PARK, BALEARIC ISLANDS. AN INDICATOR SPECIES EXAMPLE : *EPINEPHELUS GUAZA* (L.)

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During the summer 1993, two years after the establishment of the Cabrera National Park, a survey of principal fishery species was conducted using visual methods. Here we present the results obtained for the density and sizes distribution of *E. guaza*. The biological and ethological features of this species, together with the irregularity of its recruitment, north of latitude 41°5N (CHAUVET & FRANCOUR, 1990; GARCIA & ZABALA, 1994) and its high commercial value, have caused the stocks of *E. guaza* to decline notably in several parts of the Mediterranean.

In Balearic waters where the species shows a high recruitment, the fishing pressure has been reflected in the scarcity of adult individuals. At present, the artesanal fishery is the only way of exploitation permitted around Cabrera. The selection of sampling zones has been based on the different regulations which will be enforced on the artesanal fisheries once the management for the park will be operational.

The following sampling stations have been studied : 3 stations on rocky blocks at 5-10 and 20-25 m depth (photophilic algae benthic community : P.A), 2 stations on vertical underwater cliffs at 5 and 15 m (P.A), 2 stations on rocky blocks at 40 m (sciaphilic algae benthic community) and 1 station on *Posidonia oceanica* meadow.

Censuses were carried out over transects 100-210 m long and 10 m width. Daily censuses were made for at least 6 consecutive days between 10.00 and 14.00 hours. In each transect, the number of individuals observed was noted and their size estimated. All divers had been previously trained in estimating fish size underwater using a method similar to that of BELL *et al.* (1985).

The greatest density of groupers was found at stations 5-10 and 20-25 m depth at zone 3 (Table 1). The richness of this zone, verified by the abundance of other species, can be linked to three principal factors: a) site exposed to all winds, b) high degree of complexity of bottom structure, and c) constant currents which may increase the production at different trophic levels. No groupers were observed at the stations on rocky blocks at 40 m depth or in *Posidonia oceanica* meadow.

Another notable feature is the segregation of small and large sizes in shallow and deep waters respectively (Fig. 2). The nature of these differences is probably due to two main factors: a) the recruitment occurrs in the first few metres depth, b) before 1991, the Cabrera area was intensively fished, especially by spearfishing. This kind of fishing is known to be depth selective. Bottoms at 5-10 m are more accessible than those at 20-25 m. Natural bathymetric distribution of *E. guaza* (CHAUVET, 1991) and results from other reserves (GARCIA & ZABALA, 1994) indicate that shallow waters of Cabrera have not been yet recolonized by big groupers.

Transects/Statistics	Mean	C.L. 95%	C.V
Zone 1. Blocks: 5-10m	6,24	(5,23-7,41)	17%
Zone 1. Blocks: 20-25m	3,57	(2,63-4,75)	27,8%
Zone 2. Blocks: 5-10m	4,21	(3,05-5,68)	35,45%
Zone 2. Blocks: 20-25m	0,97	(0,38-1,83)	53,33%
Zone 3. Blocks: 5-10m	7,17	(4,75-9,91)	33,93
Zone 3. Blocks: 20-25m	6,17	(4,15-9,07)	32,15%
Zone 2. Cliffs: 5m (0-10)	1,76	(1,09-2,43)	36,36%
Zone 2. Cliffs: 15m (10-20)	0,78	(0,14-1,42)	78,2%
Zone 3. Cliffs: 15m (10-20)	1,9	(0,41-3,38)	62,63%

Table 1. Mean density of *E. guaza*, 95% comfidence limits and coefficient of variation for a surveyed area of 1000 m².

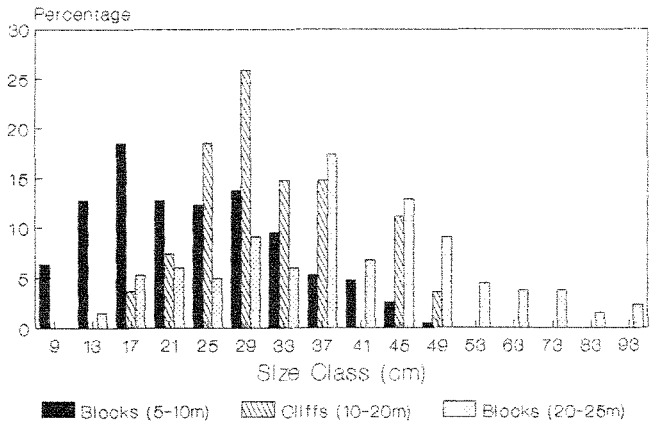

Figure 1. Sizes distribution of *Epinephelus guaza*.

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INDIVIDUAL ESTIMATES OF RNA/DNA RATIOS OF ANCHOVY LARVAE (*ENGRAULIS ENCRASICOLUS*) OF THE NORTHWESTERN MEDITERRANEAN (CATALAN SEA AND GULF OF LIONS)

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The survival of young fish is conditioned to several factors; namely, predation, inanition and hydrographic entrainment to unfavourable areas, or through an interaction of several of these factors. Larvae under starving conditions are more vulnerable to predation (PURCELL *et al.*, 1987). Therefore, the nutritional state of fish larvae must play a key role in understanding recruitment variability. The use of RNA/DNA indices for studying larval condition in fish larvae is justified, taking in account that the total amount of desoxy-ribonucleic acid (DNA), per cell must be constant in individuals of the same species, and that it does not vary apparently with starvation or with environmental factors. However, the amount of ribonucleic acid (RNA) present in the cell is variable, because it is directly related to protein synthesis. Thus, RNA/DNA ratios is an index of the metabolic rate of the cell. Larvae under starving condition present lower RNA/DNA indices than well-fed larvae; decreasing linearly during periods of inanition (BUCKLEY, 1980; CLEMMESSEN, 1988).

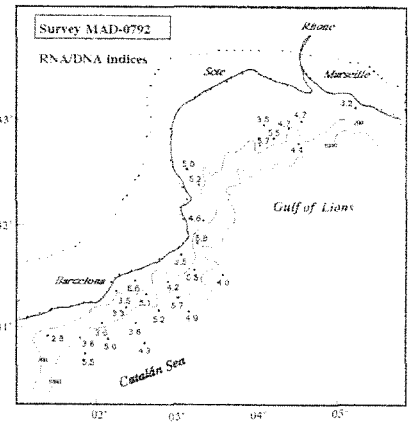
RNA/DNA ratios have been used for the first time, on individual larvae of anchovy (*Engraulis encrasicolus*), sampled in the northwestern Mediterranean Sea. RNA/DNA indices of 191 anchovy larvae from 28 stations, distributed between the Catalán Sea and Gulf of Lions were estimated (between the meridians 1°E and 6°E). The size length distribution of the analized larvae varied between 6 and 12 mm. The individual indices RNA/DNA varied between 1 and 7.8. The samples were collected during the anchovy egg and larval survey "MAD-0792", on board the R/V Garcia del Cid, during 27/6/92-26/7/92. Anchovy larvae were collected by Bongo 40 mouth opening plankton nets equipped with 200 µm. The RNA/DNA indices have been determined by measurements of fluorescence, using specific nucleic acid fluorescent dyes. Ethidium bromide was employed for the joint determination of the RNA and DNA, while the bisbenzimidazole was used exclusively for the determination of RNA following the method described by CLEMMESSEN (1988) with some modifications described in CORTÈS & RAMIREZ (1994). Larvae were sorted quickly from the plankton collectors and only the well conserved and good condition ones were destined to RNA/DNA analysis. These were measured on board through micronmetric eyepieces fitted on stereoscopic microscopes, set permanently at 10 X magnitude. Immediately after measurement these were stored in liquid nitrogen. The chemical reactants used in the extraction of nucleic acids and the analytical procedures are in the following table.

Tris buffer, pH=8.8	Chloroform/isoamylalcohol 24:1
Tris 0.5 M, pH=8	Ethidium bromide
Proteinase K	Bisbenzimadazol
SDS 20%	DNA standard (calf thymus)
Saturated phenol (pH=8)	RNA standard (yeast)

An ultrasonic generator Branson Sonifer 250 was used to homogenize the larvae. Fluorescence measurements were done with a Perkin Elmer LS-5 spectrofluorometer equipped with a data processing system, the Perkin Elmer 3600 Data station. For absorbance measurements in UV at 260 nm, the spectrophotometer Perkin Elmer mod. Coleman 55 was used. The maximum emission for DNA/RNA-EB is located at 589 nm for a wave length of excitation at 324 nm. The latter differs from that proposed by CLEMMESEN (1988). For DNA-Bis, the maximum emission is located at 447 nm for a wave length of excitation at 352 nm. The data for building the calibration curves were fit to a linear functions with the results as shown in the joint table.

DNA-Bis	y= 0.65354 + 33.733x	R = 0.99
DNA-EN	y = 1.033 + 31.044x	R = 0.99
RNA-EB	y = 0.029603 + 11.108x	R = 0.99

The total quantity of DNA is an index of the number of cells. This is assumed to be independent of environmental factors. The DNA content is aproximately constant for larvae of practically the same size. However, RNA values present variations, since these are dependent of the metabolic rate of cells. Nucleic acid content (DNA, RNA) varied exponentially with size. No differences have been observed in DNA content from larvae sampled in the Catalán Sea and Gulf of Lions. High RNA/DNA ratios (> 6) seem to related with the existing larval abundances (larvae/m²), differentiating the two areas studied. In the Catalán Sea, high values of RNA/DNA ratios (> 6) are associated with areas where larval abundances are in the range of 0 to 40 larvae/m². In the Gulf of Lions these high values (> 6), correspond to the abundances range 0 to 140 larvae/m². The stations with maximum values of RNA/DNA indices seem to be associated to the Ligur-Provençal-Catalán front. This front has some permanent hydrographic features (FONT *et al.*, 1988). Related with this front, maximum zooplankton abundances have been observed by (SABATÈS *et al.*, 1989), even when compared to the coastal areas. During summer, PALOMERA (1992) also found anchovy spawning grounds associated to this front. RNA/DNA ratios between 4.5 and 5.5 in the Catalán Sea are found in areas close to the slope, while in the Gulf of Lions these are in the shelf border (Fig. 1).



Spatial distribution of mean RNA/DNA indices by station

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