ACOUSTIC SURVEYS IN THE SPANISH MEDITERRANEAN SHELF (1982-1993)

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Since 1982, the Spanish Institute of Oceanography (IEO) has been doing systematic hydro-acoustical surveys to evaluate coastal pelagics in the Spanish Mediterranean shelf (20-200 m depth), covering the area between Punta Europa and Cabo de Creus. Five zones have been considered : Alborán, Vera, Alicante, Valencia and Cataluña.

Although sardine (*Sardina pilchardus*) and anchovy (*Engraulis encrasicholus*) are the target species, other important species are round sardinella (*Sardinella aurita*), horse mackerel (*Trachurus trachurus; T. mediterraneus* and *T. picturatus*) and mackerel (*Scomber scombrus* and *S. japonicus*).

These species are mixed and the echograms and catches are normally multispecific, being sometimes very difficult to allocate the echointegration.

Acoustic surveys have been carried out on R/V "Cornide de Saavedra", a 67 m long, 2500 HP stern trawler. Prior to each survey, the SIMRAD echosounder system was calibrated using a 60 mm copper standard target sphere with a TS= -33.6 dB. Biological data were collected using a pelagic trawl gear with a 20 mm codend and provided with a Simrad FR-500 netsonder. The average values by sector and strate were elaborated by means of NAKKEN & DOMMASSNES method (1975). Table I summarizes the cruise characteristics.

SURVEY	TIME	ECHOSOUNDER+ ECHOINT.	GEAR OPENING	SURVEYED AREA(nm²)	TRACK MILES
1982	May	EK-400+QD	10 m	2890	795
1983	Sep-Oct	EK-400+QD	10 m	12504	1837
1984	Oct-Nov	EK-400+QD	10 m	16727	2177
1985	Oct	EK-400+QD	10 m	12504	1550
1987	Jul	EK-400+QD	10 m	9327	1628
1988	May-Jun	EK-400+QD	10 m	16199	3610
1990	Oct-Nov	EK-500	10 m	16163	3236
1991	Oct-Nov	EK-500	20 m	14352	2845
1992	Oct-Nov	EK-500	20 m	16199	3140
1993	Oct-Nov	EK-500	20 m	10709	1885

Table I. Acoustics surveys in Spanish Mediterranean shelf.

After 10 years, the method has been fully standardized and has therefore produced a time series of sardine and anchovy abundances comparable over the last years. The results of the evaluations (biomass) and the catches in these years are as follows :

SARDINE	1982	83	84	85	86	87	88	89	90	91	92	93
BIOMASS *(1000 TM)*	105(1)	109	419	174	—	273(2)	182	—	175	227	455	322(3)
CATCHES *(1000 TM)*	36	43	35	45	47	40	41	39	38	45	50	46

(1) Understimated, Valencia and Cataluña not surveyed
(2) Understimated, Cataluña not surveyed
(3) Understimated, Vera and Alicante not surveyed.

These data suggest a lack of pressure on this stock, which is probably due to low market demand. According to this, catches could be considered independent of existent biomass.

ANCHOVY	1982	83	84	85	86	87	88	89	90	91	92	93
BIOMASS *(1000 TM)*	60(1)	47	44	—	—	4(2)	28	—	34	24	23	18(3)
CATCHES *(1000 TM)*	50	38	25	12	16	14	20	17	17	20	19	17

This species is the target of the purse seiner fleet, and its commercial value is much higher than the sardine one. The table shows a high fishing exploitation in accordance with this high demand.

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ACOUSTIC ESTIMATION OF VOLUME AND DISTRIBUTION OF *APHIA MINUTA* (PISCES: GOBIIDAE) IN ALCUDIA BAY (MAJORCA ISLAND, SPAIN)

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A specialized fishery directed at pelagic gobiids is conducted off Majorca island during wintertime. The target species is the transparent goby (*Aphia minuta*, Risso 1810) and by-catch species are *Pseudaphia ferreri* and *Cristallogobius linearis* (IGLESIAS & MARTORELL, 1988). The main catches are taken into the bays; Alcudia Bay is the area where most of the fleet work. The importance of this fishery is due to the local appreciation and high market value of transparent goby.

The fishery is directed at the aggregations that these pelagic gobiids form near the bottom during its reproduction time, being shoals detected with the aid of fish finders. This characteristic allows the use of acoustic methods to determine its localization and abundance.

This study has been the first time that acoustic methods have been used to evaluate *Aphia minuta* abundance and distribution.

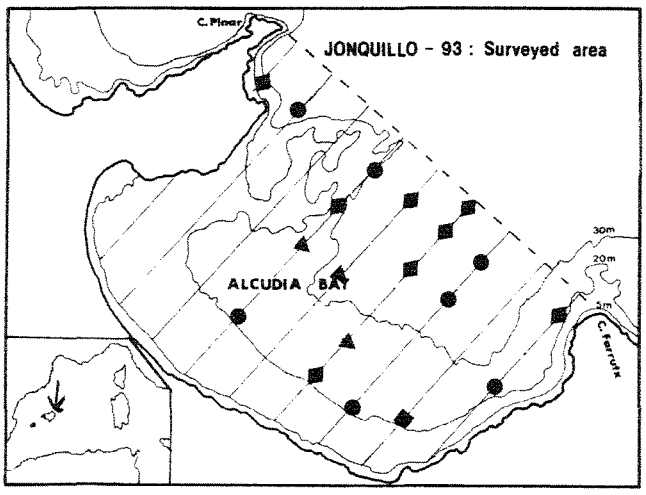
In January 1993, "Jonquillo-93" acoustic survey was carried out on R/V "Xarifa", a 7 m long, 9,9 HP boat, covering the area between Cape Pinar and Cape Farrutx (Alcudia Bay, figure I). A Skipper 815 paper echosounder with a towed body was used for data collection, using as the log interval one nautical mile. The survey consisted of nine tracks going from 5 meters depth near the coast to the mouth of the Bay (figure I). The number of nautical miles tracked was 54 and the covered area comprise 47.48 mn^2. The distance between tracks was one nautical mile.

Aphia minuta records on paper echosounder were identified by means of fishermen aid. The scrutinizing of echograms were made by four differents groups. Only the coincident readings were considered. The stock size of *Aphia minuta* was estimated by the method of enumeration and volume estimation of shoals recordings (FORBES & NAKKEN, 1972). A simply enumeration of number of shoals by nautical mile give a first relative index of abundance of this species in the area. Since size of shoals is very different, the estimation improves if we consider its volume.

Aphia minuta was abundant in January 1993 in Alcudia Bay with a total volume estimate of 12.902.751,44 m^3. This result agrees with the catches obtained during the fishing period 1992-1993. The distribution of *Aphia minuta* was related to depth and type of substrate, the shoals were concentrated on the center of the Bay where the bottoms are mainly flat rocks and sand. Also this area is characterized by clean waters. Shoals have been detected from 8 to 45 meters depth, being more abundant between 30 and 35 meters depth (65%). Volume of shoals runs from 12,7 - 84077,4 m^3, with the more abundant volumes between 0-1000 m^3 (60/%), followed by volumes between 1000-10000 m^3 (34%), 10000-50000 m^3 (3,4%) and bigger than 50000 m^3 (3%).

The acoustic evaluation of *Aphia minuta* by means of an echosounder has shown to be a valid method to determine its abundance and distribution. Further improvements of the method would require to use an echointegration method and to determine the TS (target strength) value of the species, which may allow to determine number and biomass of the species.

Figure I. Tracks survey and distribution of *Aphia minuta* in Alcudia Bay in January 1993



▲ 0- 1 000 m^3 ◆ 1 000 - 10 000 m^3
● 10 000- 50 000 m^3 ■ > 50 000 m^3

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