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SARDINE SPAWNING GROUNDS OFF THE NORTHERN ALBORAN SEA COASTS BASED ON A 1982 AND A 1984 ICHTHYOPLANKTON SURVEYS

A. GARCIA and J. PEREZ RUBIN

Instituto Espanol de Oceanografia,
Centro Costero de Fuengirola, Fuengirola, Malaga (Espana)

Two fish egg and larval surveys carried out in the month of March, 1982 and November, 1984, with the common objective of localizing sardine spawning grounds in the coastal waters of the Alboran Sea will be the basis of the present paper. Although both cruises have the sampling area limited to the west by the locality of Estepona (05°W),, the 1984 survey covers practically the whole extension of the Alboran Sea up to Cabo de Gata (02°10'W), whereas the 1982 survey is limited to the east by the locality of Motril (03°32'W) covering 60% of the aforementioned area (Fig. 1).

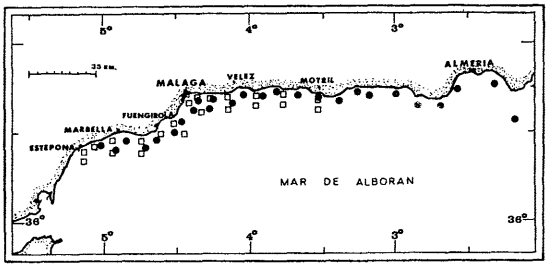

Fig. 1.- Station chart. (● November 1984; ▫ March 1982).

The following communication is based on the analisis of 22 ichthyoplankton samples from the 1982 survey and 27 samples from the 1984 survey, proceeding from stations along the coast, alternating close to shore stations with others offshore. In both surveys, the bottom depths range from aproximately 25-200 mts..

The samples were realized with a Bongo plankton net of 40 cm. mouth opening, equipped with a 250µ and 335µ meshes, General Oceanics 2031 flowmeters and a scuba depth recorder to obtain maximum depth reached in the tow.

Samples taken from the 250µ mesh were used to evaluate zooplankton biomass (dry weight and wet weight) and organic matter.

Although the most representative ichthyoplankton fraction in both cruises correspond to Sardina pilchardus, the November survey, coinciding with sardine's spawning commencement in these waters, shows a much higher predominance (89.8% and 27.9% of all eggs and larvae captured, respectively) than in the March survey (20.4%,17.4%). This may be attributed to a major specific diversity of spawners in spring, since a more generalized spawning of neritic species occurs from spring through summer.Sparids, for example, increased greatly in the March survey (68.7% and 12.7% of all eggs and larvae caught) where Boops boops larvae is the most representative species appearing with respect to that of November (1.1% and 3.4%), in which Pagellus acarne larvae is practically the only sparid appearing.

Myctophid larvae, which are very abundant in all the ichthyoplankton surveys conducted in our waters, are quite constant in their proportions in both cruises (43% and 46%).

Figs. 2-5 represent the egg and larval abundance spatial distribution of Sardina pilchardus in each of the cruises. In general, two main spawning areas have been observed, one localized in the western sector and another in the eastern sector.

An earlier spawning can be presumed to occur in the eastern area, since quite higher egg and larval abundances appear in that sector during the November survey at the begginning of the spawning period. Unusually high sardine egg abundances of 1,800 and 2,500 eggs/m2 appear in stations west to the bay of Almería. Analyzing egg stages, this can be due to the effect of crossing the sampling over spawning centers at their maximum spawning period.

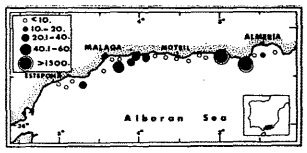

Fig. 2.- Sardine eggs/m^2 (November, 1984).

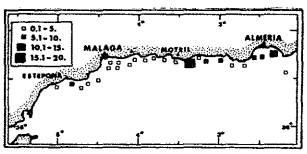

Fig. 3.- Sardine larvae/m^2 (November, 1984).

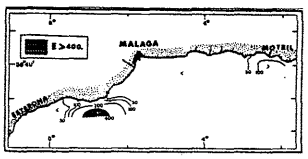

Fig. 4.- Sardine eggs/m^2 (March, 1982).

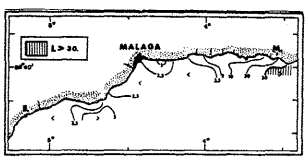

Fig. 5.- Sardine larvae/m^2 (March, 1982).

In the month of March, the western spawning area is located west to the bay of Málaga, off Punta Calaburras is clearly defined. Maximum sardine egg densities of 570 eggs/m2 have been observed. In the eastern part, off Motril, the margins of the eastern spawning area is detected, since egg and larval abundances present an increasing gradient towards the east.

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OBSERVATIONS ON SURFACE TEMPERATURE AND ZOOPLANKTONIC BIOMASS REGISTERED DURING SARDINE ICHTHYOPLANKTON SURVEYS (MARCH, 1982 AND NOVEMBER, 1984) IN THE NORTHERN ALBORAN SEA COAST

A. GARCIA and J. PEREZ RUBIN

Instituto Espanol de Oceanografia,
Centro Costero de Fuengirola, Fuengirola, Malaga (Espana)

In order to acquire some knowledge on the environmental conditions, that could affect distributional patterns of sardine's egg and larval stages in the Alboran Sea coastal waters, data on surface temperatures and zooplankton biomass collected on March, 1982 and November, 1984 ichthyoplankton survey cruises, described in our previous paper, are analized in the present paper.

Figs. 1 and 2 shows the results of the distribution observed by superficial temperatures and zooplankton biomass expressed in terms of dry weight (mg/m3) in the month of March survey. Gil (1985) in the analysis of the physical data of this survey, appreciates clearly relatively warmer waters and of lesser salinities (between 36.7‰ and 37.0‰) in the proximities of Marbella, and although the survey coincides with the begginning of the spring season, this author finds in general, a vertical and horizontal homothermy in our coastal waters. Surface temperature range differences have not practically exceeded 1°C (14.5-15.6°C).

As to zooplankton biomass, the survey coincides with a zooplankton "bloom", typical of the spring season which Camiñas (1983) already pointed out in his zooplankton annual cycle study, that can surpass the strong summer peak as García and Camiñas (1985) found. The most western area registers lower biomass values, specially in offshore waters, with a minimum obtained of 12.05 mg/m3. However, an increasing gradient of these values is observed from the vicinities of Fuengirola towards the east up to the Bay of Málaga, where maximum zooplanktonic biomass values have been registered (57.8 mg/m3). In the easternmost area (Motril), high values are equally observed (maximum of 46.55 mg/m3),although there is a decreasing tendency of these towards the east.

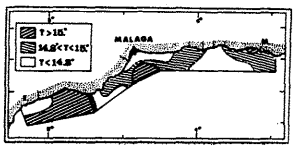

Fig. 1.- Surface temperatures (C°),(March,1982).

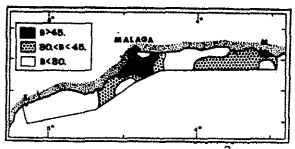

Fig. 2 - Zooplanktonic biomass (mg/m^3),(March,1982)

Figs. 3 and 4 describes the same parameters' distribution concerning the November 1984 survey. As can be observed, surface temperatures are relatively warmer in general in this period of the year in comparison to the spring survey. Temperature values range between a minimum of 15.7°C observed in the westernmost area and a maximum of 18°C observed in the most eastern area. Although coldest waters are in the western zone, a litoral band in the center of the sampling area of colder waters between 16.2°C and 16.5°C is localized between two areas of warmer characteristics.

Regarding zooplankton biomass, lowest values of this parameter are recorded in the winter season in these waters. Minimums are in the westernmost area (2.47 mg/m3) and maximums are localized in an area west to the bay of Almería (16.74 mg/m3).

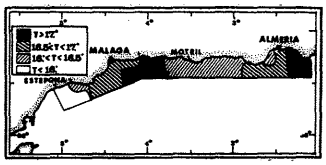

Fig. 3.- Surface temperatures (November, 1984).

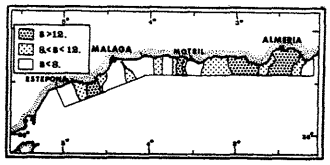

Fig. 4.- Zooplanktonic biomass (November, 1984).

In observing the general distributional pattern of sardine's ichthyoplanktonic components described in our previous paper together with the above analized environmental factors, some observations can be pointed out. November marks the begginning of the spawning period of sardine in our waters and in that period the temperature range optimum of 16.6°C to 17.3°C is where sardine spawning has been detected in the eastern and western sector. However, in this period of the year where zooplanktonic biomasses are rather low, maximum sardine egg and larval concentrations are localized in the eastern sector where higher biomasses are observed.

The month of March is characterized by a peak zooplankton production period where minimum values practically coincide with maximum values of November. Nutritional resources of sardine must be abundant. Nevertheless, no significant larval concentrations occur in the most western sector where zooplankton biomass is lower. Highest larval concentrations occurr east to the bay of Málaga in an increasing gradient toward the east where biomass values range from 30 to 35 mg/m3..

Surface temperatures seem to be more relevant a factor to consider, since in this period of the year where the Alboran Sea coastal waters are rather cold showing a general homothermy, the well delimitated spawning center in the western sector coincides with relatively warmer waters. Maximum egg abundances have occurred in the range between 15°C and 15.6°C.

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