Relation between Ichtyoplankton and geostrophic currents in the vicinity of the Straits of Gibraltar (S.W. Spain), in July 1991

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Analysis of the icthyoplankton abundance and general distribution in the zone, and especially that of the anchovy (*Engraulis encrasicolus*), in relation to the surface currents.

The main objective of the " Ictio. Alboran 0791" survey (5-18 July 1991) was the study of the possible influence that the dynamic regime has over the transport of fish eggs and larvae, particularly that of the anchovy, in the Alboran Sea.

The icthyoplankton samplings were carried out using a Bongo net with a 40 cm diameter opening fitted with flowmeters and a depthmeter and equipped with 250 and 335 micron meshes. The trawlings, double-oblique type, were carried out to a depth of 100 m.

A CTD "Seabird" system was employed to study the mass fields as well as reversing bottles fitted with thermometers.

In this paper we are going to focus on the study of the first 21 sampling stations. 9284 fish eggs and 5254 larvae were caught in those stations with a 335 micron mesh.

The Atlantic water which flows into the Strait of Gibraltar moves towards the East, as a jet, and part of this recirculates forming the permanent gyre of the Western Alboran Sea. This jet is the motive power for all dynamics of this sea and creates a thermohaline front on its way. This front is of great importance when separating zones according to their different features, and its position causes a different dynamic situation.

This flow was identified and showed that it runs almost straight towards the East, up to 4º 20' W. The most intense flow was found in sampling stations 14,15, 9 y 10 (with velocities approaching 1 m/s in the Eastern component of the current).

The surface temperature range of the water in the study area varied from 17-22º C.

The following figures show the estimated icthyoplankton abundance and distribution together with the lines that indicate the most representative dynamic topography found in the zone (considering the level of 200 db as reference). The displacement that the icthyoplanktonic population experiences due to the dominant surface currents is clearly shown in the figures.

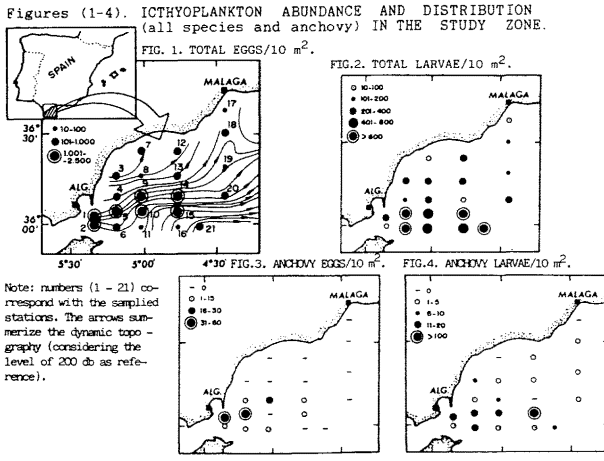
In the case of fish eggs (total species and anchovy, Fig.1 & 3), the maximum densities appear just in the sampling stations closer to the Strait.

The delayed development state found in these fish eggs shows that such sampling stations do not represent spawning sites and therefore, the icthyoplankton material collected from them is imported. Taking into account the direction and high velocity of the current, it can be assumed that they come from the atlantic part of the Strait.

In the particular case of anchovy fish eggs it has been proved that the majority of these are in advanced states (viii, ix & x) and, taking into account the temperature of the water, they are over 24 hours old (in such waters, the embryonic development of this species should take less than 48 hours).

With regard to anchovy larvae, a total of 135 specimens of sizes between 2 and 13 mm have been found (the sizes were taken from specimens kept in formaldehyde). 87 % of these specimens measure $\leqslant$ 5 mm in length (their approximate ages, after the eclosion, vary from 0 to about 5 days). The spatial distribution has been extensive (there were only 3 negative sampling stations). The largest concentrations were found in waters under direct influence from the jet. Particularly, station 15 gives the maximum (estimated) larval density of this species (107 larvae/10 m2). The only gilt sardine larvae (*Sardinella aurita*) found in the study zone appeared in the before mentioned sampling station. As this species is characteristic to more warm waters, its presence could only be due to the transport caused by the gyre from waters situated more to the South.

Figures (1-4). ICTHYOPLANKTON ABUNDANCE AND DISTRIBUTION (all species and anchovy) IN THE STUDY ZONE.



Note: numbers (1 - 21) correspond with the samplied stations. The arrows summerize the dynamic topo - graphy (considering the level of 200 db as reference).

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