Larval fish aggregation areas in the Catalan coast associated with mesoscale hydrographic structures

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The dominant feature of the physical oceanography of the Catalan coast (Northwestern Mediterranean) is the presence of a permanent shelf-slope front (FONT *et al.*, 1988). The density gradient of the front is mainly associated with salinity differences. The slope water is characterized by salinities higher than 38.0, while the shelf water is less saline because of the influxes of inland water, and spatial and seasonal variability is high (see MASO and DUARTE, 1989).

The mesoscale spatial distribution pattern of fish larvae on the Catalan coast follows certain well defined overall patterns. The most salient feature is that the highest concentrations (800-5000 larvae $10m^{-2}$) are located over the edge of the shelf (see Fig. 1 corresponding to month of April 1983), because of the combined presence of the larvae of offshore species with the larvae of inshore-dwelling species in this region. This phenomenon of concentration seems to be related to the presence of the shelf-slope front. The front could act as a barrier to the dispersal of the coastal species offshore and, at the same time would favours the transport of mesopelagic fish larvae over the shelf. It is interesting to note the large concentrations of these larvae over the shelf (>100 larvae 10 m^{-2}) and occasionally close inshore, specially between the two northern canyons because of their significant role in the deflection of the southward current, inducing the advection of offshore waters towards the coast (MASO and TINTORE, 1991).

Mesoscale physical structures, can modify the general patterns observed in the larval distribution. The presence of inland fresh waters over the shelf may, on occasion, rapidly alter hydrodynamic conditions in the area, thereby affecting the structure of the epipelagic larval fish community.

In June 1983, there was a large outflow of inland fresh waters from the Rhône River (CASTELLON *et al.*, 1985) giving rise to a surface plume of freshwater (salinity reached a minimum of 29.5 % in the centre of the plume) with a distinct haline front at its southern edge. Large number of species (18) and individuals (around 1 000 larvae 10 m^{-2P}) were found along the southern edge of the plume in association with the haline front (Fig. 1), whereas, with the exception of certain species, larval fish concentrations in the area covered by the plume tended to be considerably lower than in the rest of the area.

In May 1983 an intense inverted density front was detected in the central part of the studied area originated by the presence of warmer and less saline water over the slope. A pronounced temperature front followed the shoreline, with the combined effects of temperature and salinity leading to the formation of a strong inverted density front. In this instance the density gradient confined larve in the inshoremost region (Fig. 1). This was the result of the combination of low abundance at the offshore stations (<50 larvae 10 m^{-2}) and exceptionally high abundance values inshore (>1000 larvae 10 m-2).

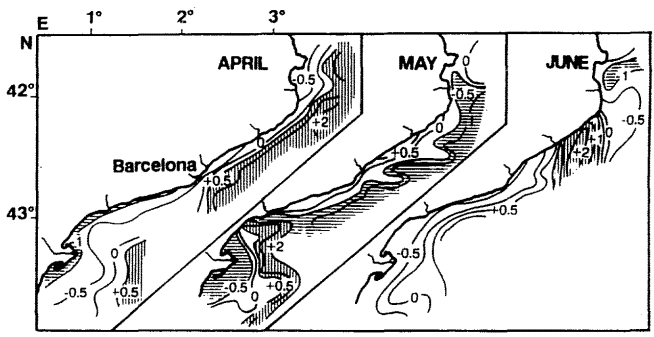

Fig. 1 A principal component analysis (PCA) was applied for each month in order to obtain an objective description of the distribution pattern of the larval population. PCA was performed on the species correlation matrix after smoothing of the species abundance data by a logarithmic transformation. The spatial plot of the sample scores for the first factor obtained in the PCA of April, May and June is presented in figure 1. In the three months, the most positive values (vertical hatched areas) correspond to areas with highest number of species and individuals, whereas the negative values correspond with lower concentrations of individuals (horizontal shaded areas).

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