

### Mapping the nurseries of *Merluccius merluccius* in the Ligurian Sea : seasonal aspects of the distribution of recruits

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During trawl surveys in the Ligurian Sea financed by the Ministero della Marina Mercantile (1982-83; 1985-87) data were collected about the timing of recruitment of *M. merluccius* (Orsi Relini et al. 1986) and the location of its nurseries (i.e. the bottoms where the fish lives during its first year of life). These notes are concerned with the latter problem and their purpose is to give a brief account of the distribution of recruits recorded in different seasons in the years 1985-87.

In an area of about 915 square miles a total of 168 one-hour daytime trawls were effected, half in the period March-May and half in the period August-September. The hauls were divided into five depth strata (delimited by the levels 0; 50; 100; 200; 450; 700 m) in numbers proportionate to the extension of the bottoms in each stratum. The net had 500 meshes at the cod end of 7.5 mm side. Length frequency distributions of *M. merluccius* in each catch were used to identify the 0 group fish and more in general to assign it an age on the basis of a linear model of growth in this early phase (Orsi Relini et al. 1986). A total of 11,256 recruits were recorded in the first four strata. The fraction of weight due to the recruits was calculated using a specific length/weight relationship (Cappanera e Fiorentino 1986).

The numbers of recruits collected in one hour of trawling were very variable, varying from very few units to 2138 (cf. Pereiro and Fernandez 1983) and also the totals were very different for the three years (the 1986 values were double the others). However some general features in the overall distribution can be delineated (table 1): 1) the highest values of density were recorded in the summer sampling; this is due to the spring recruits (i.e. the fish which arrived at the bottom in April, May and June) which are the most abundant of the year. 2) The spring sampling produced considerably lower values, due to those fish which reached the bottoms in the period October-February. Among these the November recruits constituted half the number. In general the previously observed recruitment intervals of about six months (Orsi Relini

Table 1. Distribution of recruits of *M. merluccius* (numbers and percent.); recruitment index (number per hour of trawling) and incidence of recruits in the catch.

Strata	March - May				August - September			
	recruit number	percent. distrib.	recruitment index	percent. weight	recruit number	percent. distrib.	recruitment index	percent. weight
0-50	33	2.7	8.2	1.9	891	8.9	111.4	48.6
50-100	709	58.7	41.7	6.1	893	8.9	68.7	16.4
100-200	454	37.5	50.4	9.3	5364	53.3	536.4	73.4
200-450	13	1.1	0.5	0.4	2908	28.9	126.4	48.0
Totals	1209	100			10056	100		

et al. 1986) were confirmed. As a consequence of 1) and 2) the proportion of recruits in the total weight of *M. merluccius* in the catch was equal to 5.1% in spring and 41.3% in summer. 3) In spring the recruits were distributed mainly in the range 50-200 m (96%); in summer mainly between 100 and 300 (82%) table 1 and fig. 1).

These results show that the fish choose different bottoms according to the season in this early phase of life. Future research could examine several hypotheses about the causes of this seasonal variation in behaviour: these range from the influence of abiotic factors such as temperature and light to biotic factors such as food availability and competition with other fish: for example, *Phycis bleinnoides* of comparable size have their spring nurseries on epibathial levels (Fanciulli and Relini Orsi 1980).

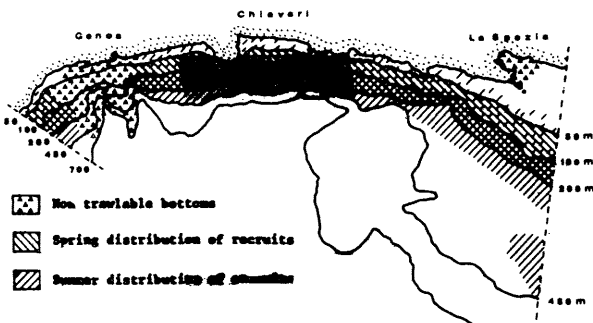


Fig. 1. Nurseries of the Hake (hatched areas) in different seasons.

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### Effects of meteorological parameters on Fish fry migration in the Lake of Fusaro (Naples) : first results

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**Text:** The preliminary results of data elaboration recorded in the development of a methodological test for a systematic investigation on the influence of environment conditions on fish fry migration are reported in this paper.

The area selected is the lake of Fusaro (Naples, Italy), due to previous data on this particular coastal lagoon available in literature (Carrada, 1973; Renzoni, 1963; Sacchi & Renzoni, 1962). The sampling station selected was the most efficient, in terms of water exchange, of the three mouths of the lake (fig. 1).

The sampling period started on January 17th, 1986 to March 3rd, 1986 with a weekly sampling rate, which could have given the possibility of evidencing tidal influences on fish fry migration in connection channels of coastal lakes and lagoons in general. An interval of 30 minutes was allowed for the samples (sampling time: from 10:00 A.M. to 4:00 P.M.).

To approximate the physical-chemical features of the whole channel all the data were collected at the depth of 60 cm. (depth of the station 120 cm.). A currentmeter with magnetic recording, supplied with a temperature and conductivity sensor (0.02 °C and mmhos/cm. respectively of precision), was employed to detect the values of direction and velocity of the stream, temperature, and conductivity of the water. Winkler's method was used to obtain oxygen data and cross-parallel analysis were carried out to consider also the probable presence of ferric and ferrous iron, organic substances and free chlorine in the water (Rodier, 1975).

The fish fry was caught by a hand trawl net which was modified in respect to the peculiarities of the sampling station and to the need of catching the fry present in the least time possible (5 sec. max).

The gathered material was composed mainly of Mugilidae that were identified using morphological characters (Ferrugio, 1977) after narcotization in situ. Number and form of the pyloric caeca (Perlmutter et al., 1957) were utilized in the uncertain cases.

With regard to the three species of the genus *Liza* (*aurata*, *ramada* and *saliens*) considered in this study, a quite consistent migration of their fry in the lake of Fusaro has been pointed out in the aforementioned period.

A preliminary analysis of hydrological data, reported in fig. 2 (a & b), in respect of Mugilidae fish fry abundance in the channel under observation, reported in fig. 3 (a & b) seems to reveal a consistent *L. ramada* fry migration in quite rapid incoming flow cases. For *L. saliens* fry, instead, a slow incoming flow seems to favour its migration.

Regarding the water temperature influence lower values seem to favour *L. ramada* fry migration, both in incoming and outgoing flow cases. For *L. saliens* instead lower values of water temperature seem to hinder its fry migration.

For the oxygen influence, finally, while in the incoming flow oxygen content of the water does not seem to influence *L. ramada* fry migration, in the outgoing flow a higher percentage of dissolved oxygen in the water of the channel seems to favour its fry migration.

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