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## HORIZONTAL AND VERTICAL DISTRIBUTION OF PLANKTONIC PHASES OF *Trachurus trachurus* (L.) AND *Sardina pilchardus* (Walbaum), OFF NORTHWESTERN PORTUGUESE COAST

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### ABSTRACT

In March 1996, plankton sampling was carried out, on board of R/V "Heincke", off northwestern Portuguese coast, from Minho river to Lisbon. The samples were collected of five strata, from 200m depth to the surface, using a multiclosing net (200 $\mu$ m mesh size). Fish eggs and larvae were distributed between the bathymetrics of 107 and 2405m. The greatest concentrations of fish eggs and larvae, 1193.1 eggs/m<sup>2</sup> and 392.7 larvae/m<sup>2</sup>, respectively, were registered in the bathymetric of 152m. Twenty one fish families were identified in the samples. The three most abundant fish families were Gadidae (62.6%), with the great dominance of the species, *Micromesistius poutassou* (blue whiting), Clupeidae and Macrorhamphosidae (9.8%) represented by the species, *Sardina pilchardus* (sardine) and *Macrorhamphosus scolopax* (snipefish), respectively. The distribution of sardine and horse mackerel (*Trachurus trachurus*) eggs occurred offshore the bathymetric of 107m. The maximum concentrations of sardine and horse mackerel larvae were 20.7 and 45.5 larvae/m<sup>2</sup>. The percentages of the fish families, Myctophidae, Carangidae (*Trachurus trachurus*), Labridae, Ammodytidae, Gobiidae, Callionymidae, Bothidae and Soleidae varied from 1 to 5%.

## INTRODUCTION

Although many studies has been done during last years on distribution and abundance of fish eggs and larvae of the commercial important species for Portugal, few information is available on vertical distribution pattern of planktonic stages of these species. These data give information for a better understanding of eggs survival, larval drift, to estimate stock size and to study the relation with environmental parameters and biological processes in the water column.

This survey is an additional sampling carried out in March 1996 in northwest Portuguese coast and is included in the Project "Shelf Edge Fisheries and Oceanography Study" (SEFOS), task 2 - Distribution and Dispersal of Early History Stages (Phases 2 and 3).

The objective of the present work is to study the planktonic stages of horse mackerel and sardine based on horizontal and vertical distribution and abundance.

## MATERIAL AND METHODS

In March 1996, an additional plankton survey was carried out, on board of R/V "Heincke" between Minho river and Lisbon, northwestern Portuguese coast. The survey area was covered by a grid of 20 stations distributed by six transects (Fig. 1).

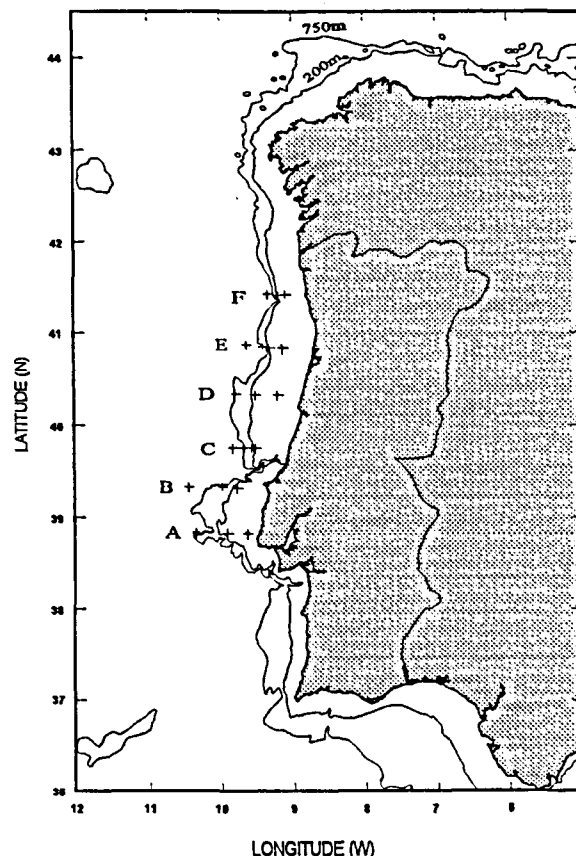


Figure 1 - Grid of plankton stations.

At each station, vertical hauls at five strata (200-150m, 150-100, 100-50m, 50-25m and 25-0m), with multiclosing net (200 $\mu$ m mesh size) were undertaken, at a constant speed of 3 knots. For the calculations of the filtered water volume, a digital "Hydro-Bios" flowmeter was used. The plankton samples were preserved in 4% formalin/seawater solution buffered with borax (ph>8.5). Plankton volumes were measured by displacement and all fish eggs and larvae were sorted.

## RESULTS

Data of the horizontal distribution on temperature and salinity values of the additional grid are described by Kloppmann *et al* (1996).

The distribution and abundance of fish eggs/m<sup>2</sup> and larvae/m<sup>2</sup> are presented in Figure 2. Fish eggs were recorded all over the surveyed area and highest abundances were registered inshore the slope of the continental shelf. The minimum (1.8 eggs/m<sup>2</sup>) and maximum (1193.1 eggs/m<sup>2</sup>) concentrations occurred in the bathymetrics of 2392 and 152m, respectively. Fish larvae were collected in all stations, with concentrations between 0.6 and 392.7 larvae/m<sup>2</sup> in the bathymetrics of 1343 and 152m, respectively.

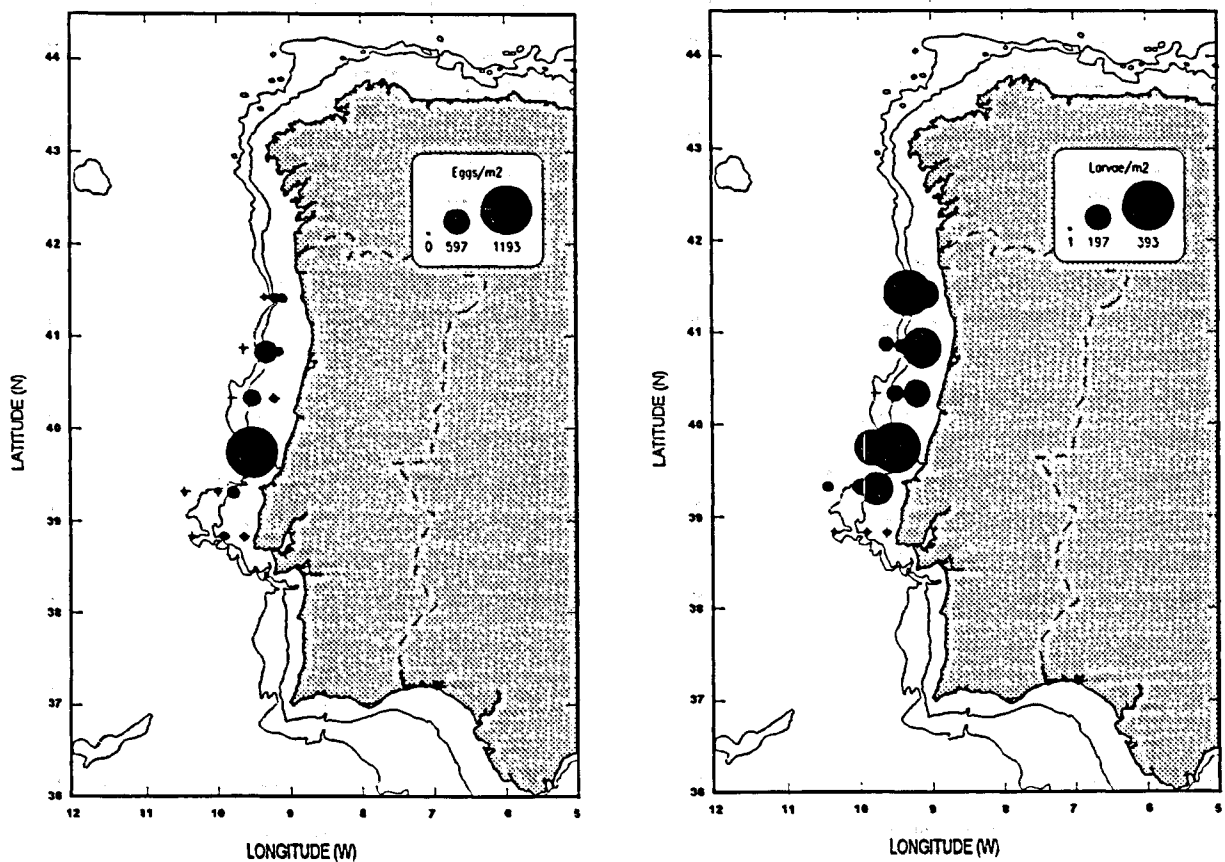


Figure 2 - Geographical distribution and abundance of total fish eggs and larvae.

Horse mackerel eggs, represented by 2.8% of the total fish eggs, were collected between the bathymetrics of 107 and 380m. The maximum abundance, 14.2 eggs/m<sup>2</sup> (Fig. 3), was registered in the bathymetric of 152m. Figure 4 shows the vertical distribution of horse mackerel eggs recorded in all sampled strata and highest concentrations occurred mostly from 25 to 200m of the water column. Horse mackerel larvae were distributed between the bathymetric of 107 and 213m and maximum concentration was 45.5 registered in the bathymetric of 181m (Fig.3). *T. Trachurus* was recorded in two transects (B and F) and the highest abundances occurred between 100 and 200m of the water column (Fig. 4).

*Sardina pilchardus* eggs were registered in three transects, from the latitudes of 39° 45' to 40° 50' N (Fig.3). Concentrations of sardine eggs varied from 0.2 to 3.1 eggs/m<sup>2</sup> and were obtained offshore the bathymetric of 121m. The vertical distribution indicate that sardine eggs occurred in the upper 100m of the water column (Fig. 5). Sardine larvae varied from 0.4 to 20.7 larvae/m<sup>2</sup> and occurred from the bathymetrics of 107 and 2255m (Fig. 3). Concerning vertical distribution of sardine larvae, they were collected in three deeper strata in transect B and was not collected in the strata 50-100m in the transect F (Fig. 5).

*Macrorhamphosus scolopax* eggs contributed with 86.6% of the total fish eggs and results of snipefish eggs are described by Lopes and Farinha, 1996. Some *Maurolicus muelleri* (1.1%), *Zeus faber* (0.4%), *Scomber spp.* (0.4%), *Arnoglossus spp.* (0.3%) and few Soleidae (0.2%) were also identified in the samples.

Figure 6 presents the percentages per station of twenty one fish families identified in the samples. The three most abundant fish families were Gadidae (62.6%), with the dominant species, *Micromesistius poutassou* (blue whiting), Clupeidae and Macrorhamphosidae (9.8%) represented by the species, *Sardina pilchardus* (sardine) and *Macrorhamphosus scolopax* (snipefish), respectively. Results of horizontal and vertical distribution of blue whiting and snipefish larvae were studied, respectively, by Kloppmann *et al* (1996) and Lopes and Farinha (1996). The percentages of other fish families were, Ammodytidae (4.7), Gobiidae (2.5), Labridae, Bothidae Myctophidae and Callionymidae with 2, Carangidae (*Trachurus trachurus*), Pleuronectidae and Soleidae with 1, Mugilidae, Serranidae and Paralepididae with 0.2 and Gonostomatidae, Sparidae, Trachinidae, Blenniidae, Carapidae and Triglidae with 0.1.

## DISCUSSION

According to the results of horse mackerel eggs, they occurred along the surveyed area and near the slope of the continental shelf. Although this period coincide with maximum abundances of horse mackerel eggs (Farinha and Borges, 1994), only some eggs were collected in the samples. Similar results are described by Solá *et al* (1996) indicating that the spawning peak occurs in February and decrease in March.

Some authors are published studies concerning horse mackerel larvae, in Portuguese waters (Afonso and Lopes, 1994, Lopes and Afonso, 1995, Ré, 1979, Ré *et al.*,1982, Solá *et al.*, 1996)

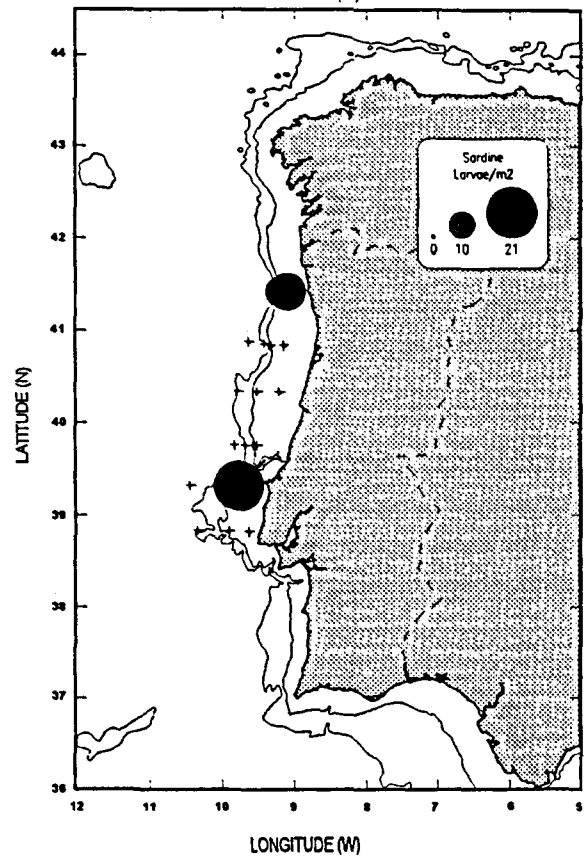
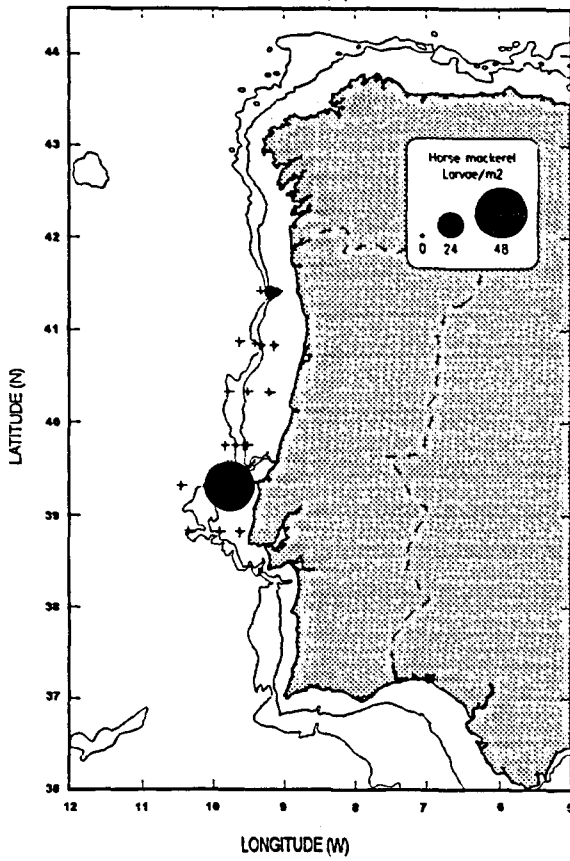
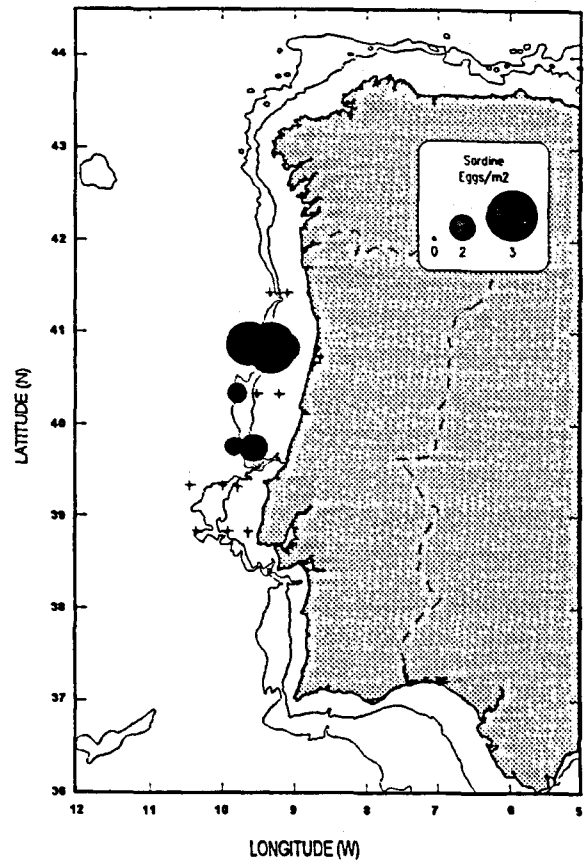
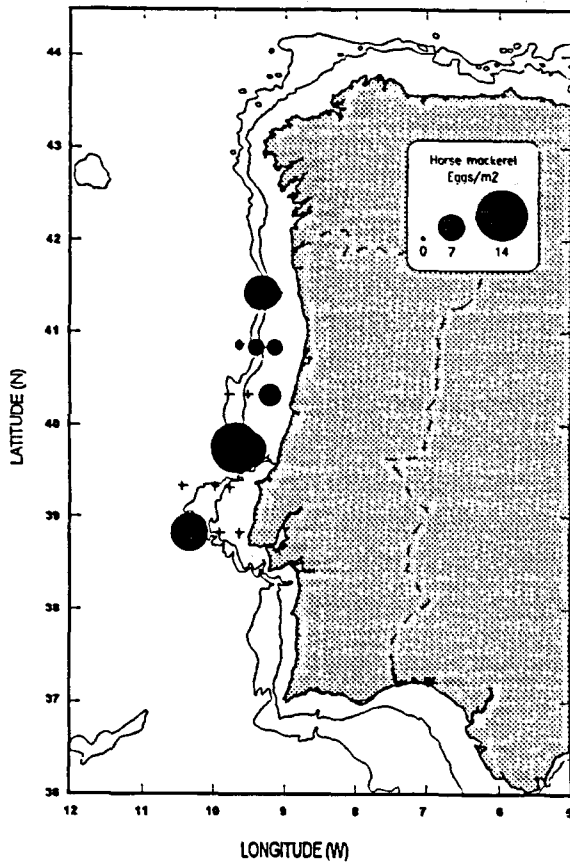


Figure 3 - Geographical distribution and abundance of horse mackerel and sardine eggs and larvae.

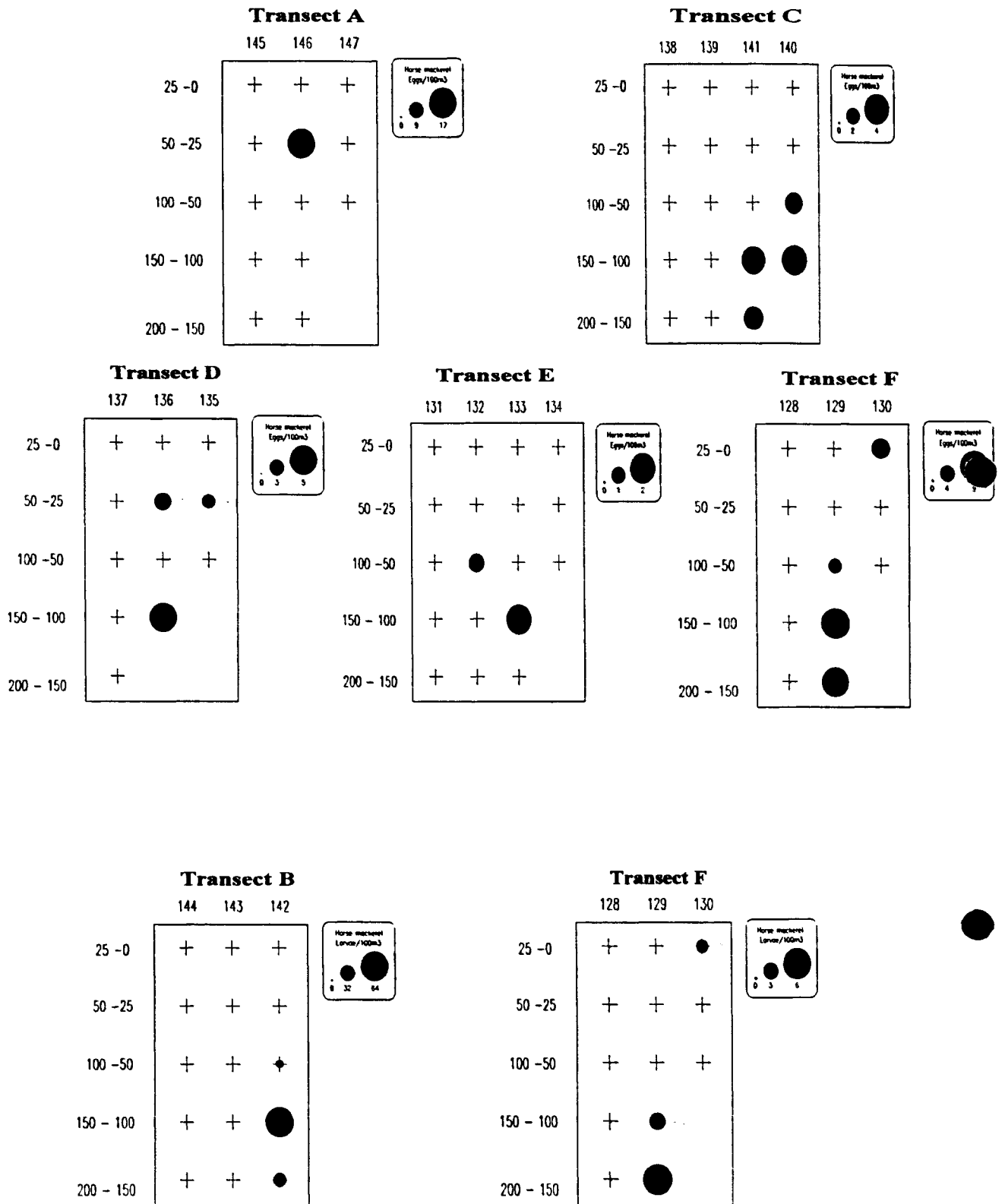


Figure 4 - Vertical distribution and abundance of horse mackerel eggs and larvae.

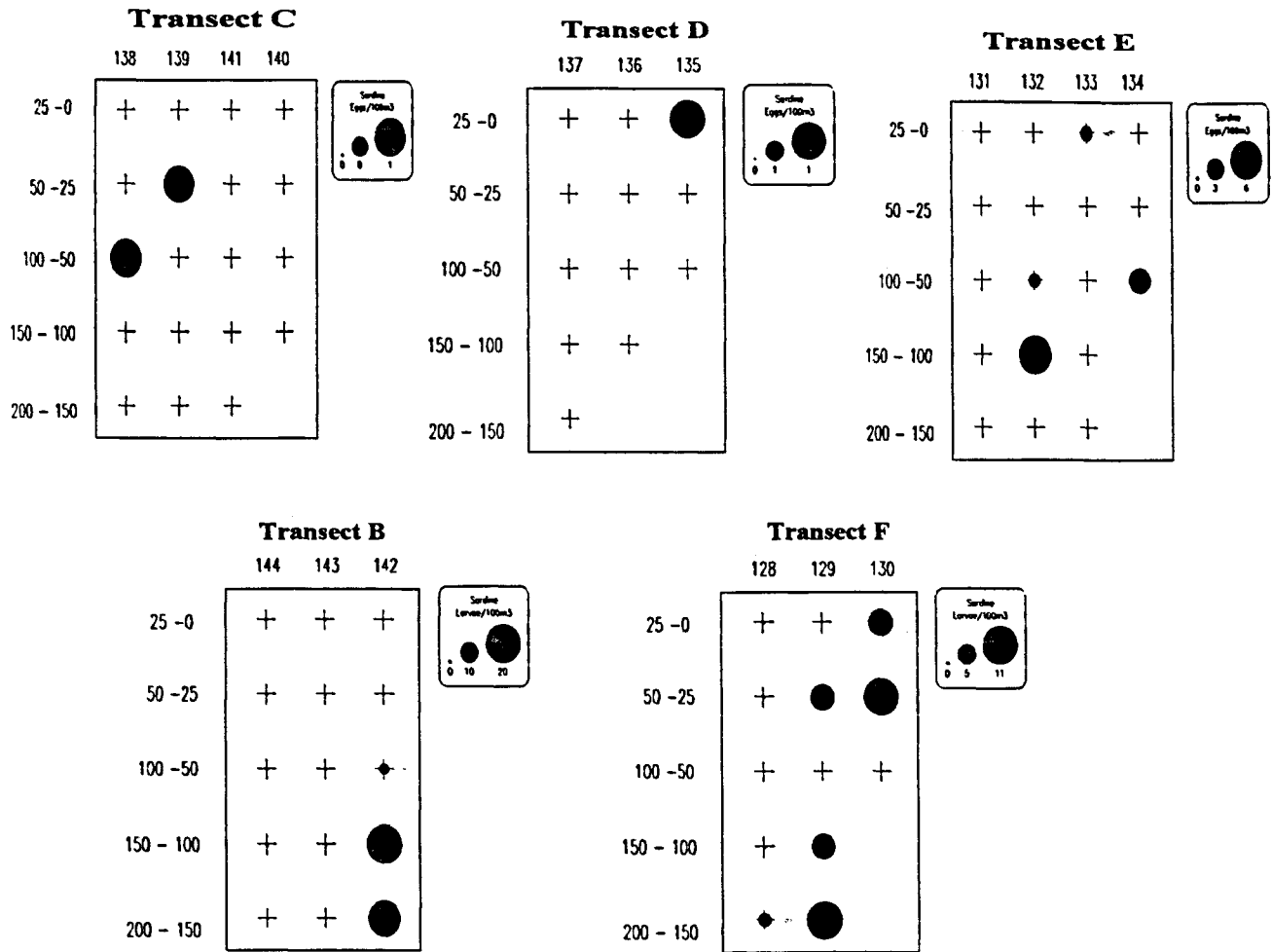


Figure 5 - Vertical distribution and abundance of sardine eggs and larvae.

and all refer that horse mackerel larvae are very scarce off Portuguese continental coast and were recorded from the bathymetrics of 20 to 200m. Most of the plankton samples were collected near the slope of the continental shelf and highest abundances of horse mackerel larvae, occurred from the bathymetrics of 181 to 213m.

In our samples some sardine eggs were collected from the bathymetrics of 107 to 2392m. Afonso and Lopes (1994) indicate that sardine eggs were recorded from the bathymetrics of 20 to 100m. In autumn 1991, highest concentrations occurred inshore the bathymetric of 200m (Lopes and Afonso, 1995).

As has been stated, sardine larvae were together with snipefish larvae the most abundant after blue whiting larvae. According to the geographical distribution, maximum concentration, 20,7 larvae/m<sup>2</sup>, of sardine larvae was recorded in the bathymetric of 181m.

The occurrence of some fish families identified in the plankton samples is common off Portuguese

coast although has been recorded in low percentages. Nevertheless, the sampling area, situated offshore the bathymetric of 107m, could justify the occurrence in small numbers of some fish families. Previous studies off Portuguese coast indicate higher percentages and the surveyed area was offshore the bathymetric of 20m.

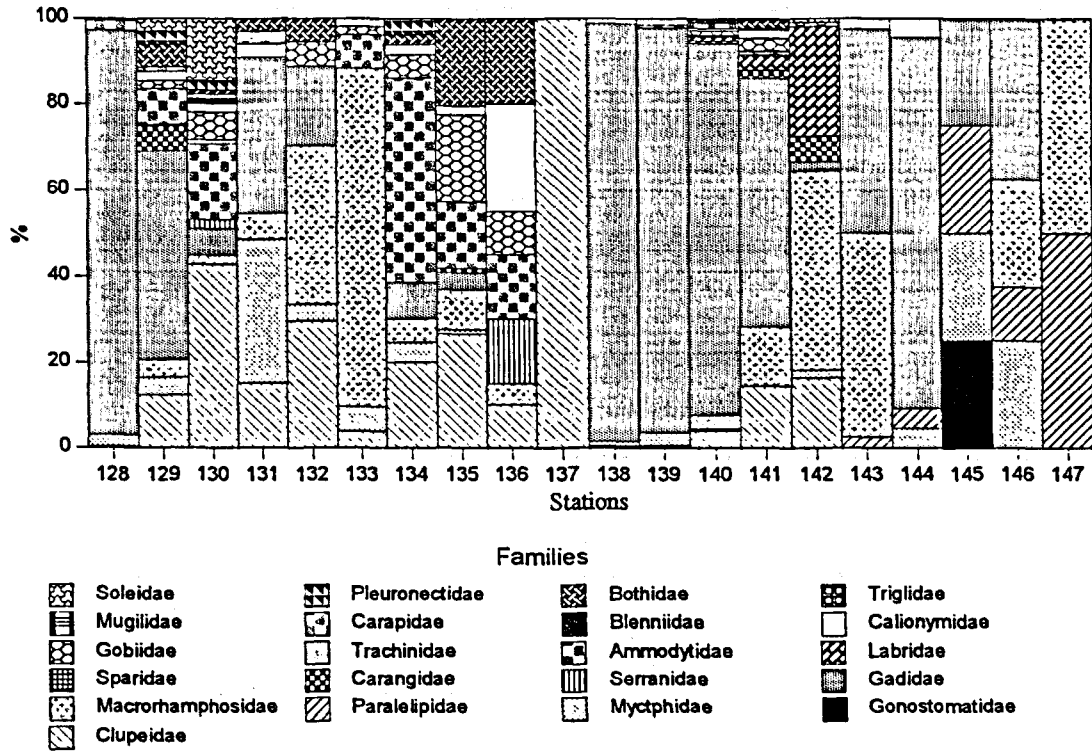


Figure 6. Percentages of fish families per stations

## ACKNOWLEDGMENTS

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## REFERENCES

Afonso, M. H. and Lopes, P. C., 1994. Study of the ichthyoplankton of commercial species off Portuguese continental coast. ICES C. M. 1994/L:16.



Farinha, A.; Borges, M. F., 1994. Daily egg production of horse mackerel (*Trachurus trachurus*, L.) in Portuguese area (Div.IXa). ICES C.M.1994/H:19, Ref. L.

Kloppmann, M.; Franco, C.; Lago de Lanzos, A.; Farinha, A.; Lopes, P. C.; Conway, D.; Wahl, E.; Hillgruber, N., 1996. Distribution of blue whiting (*Micromesistius poutassou*, Risso 1826) larvae along the western Iberian coast. Results from a joint research cruise to Spanish and Portuguese waters. ICES CM 1996/S:2.

Lopes, P. C. and Afonso, M. H., 1995. Ichthyoplankton abundance and larval diversity off the Portuguese continental coast. ICES C. M. 1995/L:22.

Lopes, P. C.; Farinha, A., 1996. Occurrence of the eggs and larvae of snipefish *Macrorhamphosus scolopax* (L. 1758) (Macrorhamphosidae) in the western coast of the Iberian Peninsula. ICES CM 1996/L:22.

Ré, P., 1979. The eggs and planktonic stages of Portuguese marine fishes. I- Ichthyoplankton from the coast of Algarve (May, 1977). Arq. Mus. Boc. (2ª série), 7(3):23-51.

Ré, P.; Farinha, A.; Meneses, I., 1982 . Ichthyoplankton from the coast of Peniche (Portugal) (1979/80). Arq. Mus. Boc. (Série A), I, 16:369-402.

Solá, A.; Lago de Lanzós, A.; Franco, C.; Sánchez, P.; Valdés, L.; Farinha, A., 1995. Mackerel & Horse mackerel distribution and daily egg production in ICES Division VIIIb,c and IXa in 1995. Working Document to the "Working Group on the Assessment of Mackerel, Horse mackerel, Sardine and Anchovy" Aberdeen 25-30 March 1996.