

Larval development of *Lepidorhombus boscii* (Risso, 1810) (Pleuronectiformes) in the Northwestern Mediterranean*

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SUMMARY: A description of the larval development of *Lepidorhombus boscii* in the western Mediterranean from the earliest stages to the premetamorphosis is presented. The description of larval development includes morphological and morphometric characters and pigmentation. All larvae were collected in April at depths ranging between 74 m and 487 m. The surface water temperature was 13 °C.

Key words: *Lepidorhombus boscii*, larval development, NW Mediterranean.

RESUMEN: DESARROLLO LARVARIO DE *LEPIDORHOMBUS BOSCI* EN EL MEDITERRÁNEO NOROCCIDENTAL. — En este trabajo se describe el desarrollo larvario de *Lepidorhombus boscii*, desde los estadios iniciales hasta la fase de premetamorfosis, a partir de ejemplares recolectados en el Mediterráneo noroccidental. La descripción incluye caracteres morfológicos y morfométricos y pigmentación. Las larvas se recolectaron en el mes de abril sobre fondos comprendidos entre 74 y 487 m, siendo la temperatura superficial del agua de 13 °C.

Palabras clave: *Lepidorhombus boscii*, desarrollo larvario, Mediterráneo NO.

INTRODUCTION

Lepidorhombus boscii (Risso, 1810) occurs in the Mediterranean and in the eastern Atlantic, from the British Isles to Cape Bojador (26 N) (NIELSEN, 1986). It is found over soft bottoms at considerable depths, generally over 1000 m (RUSSELL, 1976), though in the Mediterranean it is very common between 100 and 200 m (TORTONESE, 1975). According to NELSON (1984), the genus *Lepidorhombus*, together with the genera *Scophthalmus*, *Psetta* *Phrynorhombus* and *Zeugopterus*, belong to the subfamily Scophthalminae included in the family Bothidae. Nevertheless, some

authors (e.g. GREENWOOD *et al.*, 1966; NIELSEN, 1973; 1986) gave the family status to these genera.

With respect to the early stages of development, the eggs of *L. boscii* are unknown; but with a few exceptions the eggs of flatfish are pelagic (AHLSTROM *et al.*, 1984). Two larvae, of 7 mm and 10.4 mm, and a metamorphosing specimen of 17.0 mm were described by PETERSEN (1909), from the eastern North Atlantic. SARDOU (1986) mentioned the collection of a larva of 3.8 mm in Villefranche-sur Mer (NW Mediterranean) and suggested that it might belong to this species.

This paper describes the larval development of *L. boscii*, from the initial stages to the premetamorphosis, on the basis of specimens collected on the Catalan coast (NW Mediterranean).

* Received January 14, 1990. Accepted June 5, 1991.

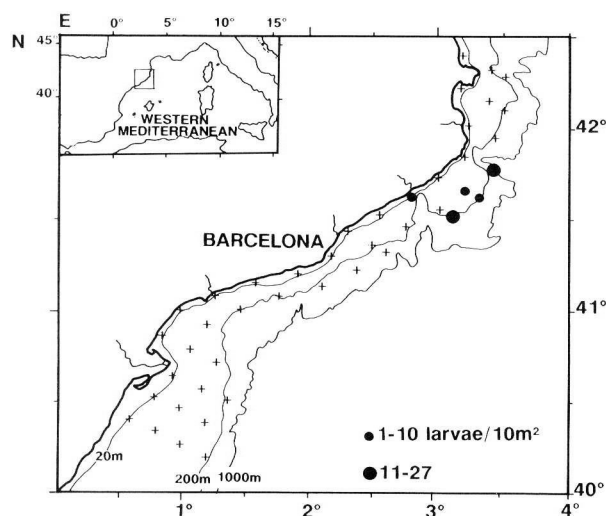


FIG. 1. — Sampling stations showing the locality of collection and abundance of *Lepidorhombus boscii* larvae.

MATERIAL AND METHODS

The larvae studied were obtained from plankton samples taken on the Catalan coast in April 1983, though sample collection took place monthly, from April to October 1983. Stations were located along 17 transects perpendicular to the coast covering the entire continental shelf (Fig. 1). Plankton hauls were made using a Bongo net with a mesh size of 333 μ m. Hauls were oblique, from near the bottom to the surface or from 200 m to the surface when bottom depth was greater. The samples were fixed in 4 % formol buffered with borax.

The number of larvae collected in each haul was converted to number of individuals per 10 m² of sea surface.

Measurements of the larvae were made to the nearest 0.1 mm and the parameters measured were: standard length (SL), the distance between the tip of the upper jaw and the end of the urostyle; preanal length (PA), the distance between the tip of the upper jaw and the anus; head length (HL), the length of the head from the tip of the upper jaw to the end of the operculum; body depth (BD), the depth of the body at its widest point; eye diameter (ED), the horizontal diameter of the eye.

RESULTS

A total of six specimens of *L. boscii*, between 3.66 mm and 9.78 mm were collected. Figure 2 pre-

TABLE 1. — Morphometric characters of *Lepidorhombus boscii* larvae expressed as percentage of the total length.

Standard length (mm)	Preanal length	Head length	Body depth	Head depth	Eye diameter
3.66	49.2	20.5	20.2	23.7	9.01
4.95	46.3	28.3	31.3	27.5	8.28
6.00	44.0	29.2	30.8	30.5	8.50
6.96	44.1	31.9	42.5	32.8	8.04
8.90	40.4	32.3	43.7	33.2	7.96
9.78	40.9	31.1	44.2	33.1	7.80

sents the larval series of the species and morphometric data are listed in table. 1.

I— Description of *Lepidorhombus boscii* larvae

Morphology

During the first stages of development *L. boscii* larvae are relatively slender, body depth increasing considerably as development proceeds. BD averages 20.2 % of the SL in the smallest larvae identified (3.66 mm) and reaching 44.2 % by 9.78 mm.

In the smallest larvae, the digestive tract is elongate and extends to nearly the midpoint of the body (49.2 %). In the subsequent stages of development, the gut forms a bulge and PL decreases in relation to SL, being 40.4 % at 9.78 mm. The swimbladder is quite apparent in all the larvae examined.

HL increases progressively as development advances due to the progressive development of the jaws. It represents a 20.5 % of SL in the 3.66 mm larvae and a 31.1 % in the largest specimen.

The eyes are rounded and their relative sizes decrease slightly as development advances (from 9.01 % to 7.80 % of the SL).

The larvae develop spines on the head. At a length of 3.66 mm a small spine can be distinguished on the preopercular region and from 4.95 mm two rows of spines are visible: one, on the preopercular ridge and the other, with slightly larger spines, on the margin of the preoperculum. The number and size of these spines increase with size. By 6.00 mm, a small spine appears on the posttemporal region, behind the eye, and in the 9.78 mm larvae a cluster of small spines can be observed.

Notochordal flexion

The notochord tip is prominent, extending considerably beyond the body in postflexion larvae. In

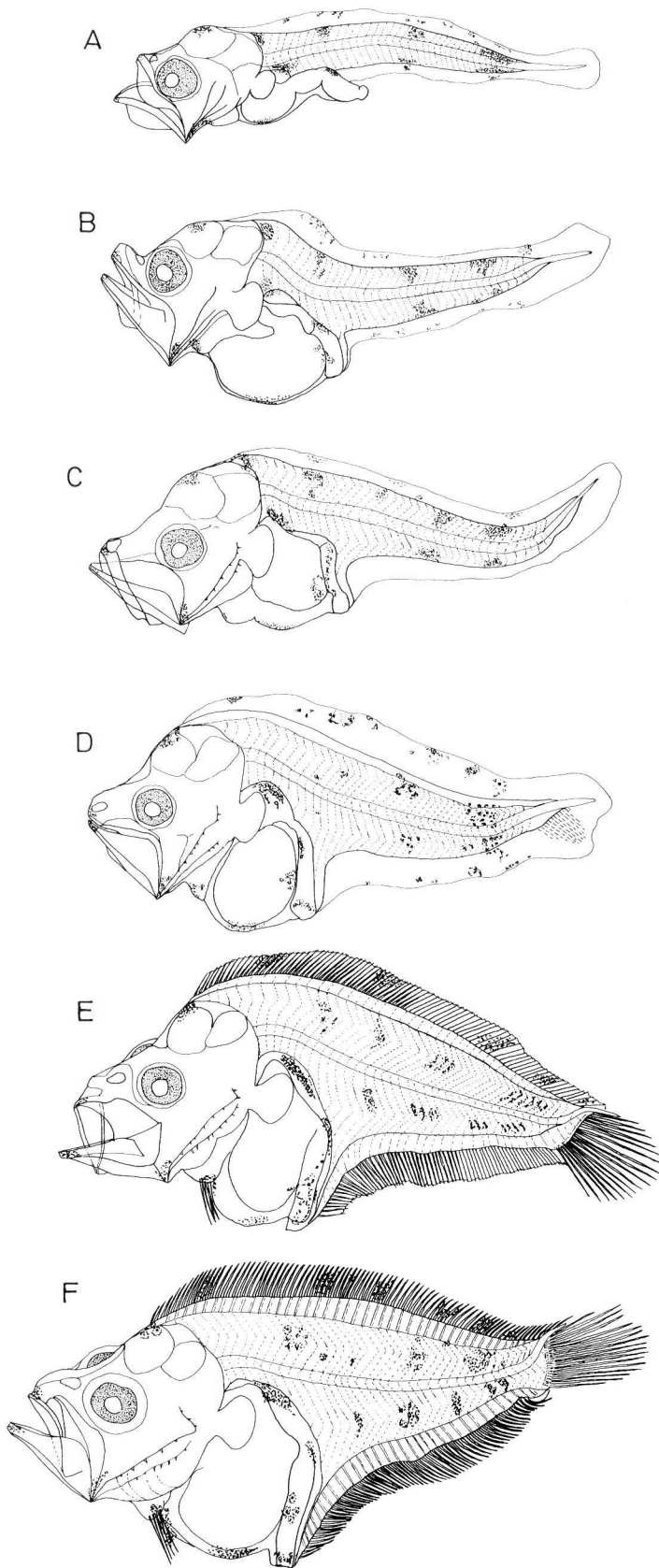


FIG. 2. — Larvae of *Lepidorhombus boscii* at a standard length of (A) 3.66 mm; (B) 4.95 mm; (C) 6.00 mm; (D) 6.96 mm; (E) 8.90 mm; (F) 9.78 mm.

the 9.78 mm specimen it is almost assimilated into the body. Notochordal flexion begins when the larvae are about 6.0 mm SL, and is completed in 9.78 mm larva.

Pigmentation

During all stages of development, the pigmentation consist on small melanophores at the tips of the upper and lower jaws, on the angular region of the lower jaw, and above the head over the midbrain. In the abdominal region accumulations of melanophores over the dorsolateral and ventral surface of the gut are present and the gas bladder is also covered by melanophores. Larvae develop pigmentation on the cleithral symphysis.

In the earliest stages of development the body pigmentation consists on four clusters of melanophores on the dorsal margin of the body and three on the ventral margin, which spread towards the fin folds. In the subsequent stages, accumulations of melanophores are scattered over the lateral surface of the body and the number of these accumulations is variable in the different specimens.

The margins of dorsal and anal finfolds are pigmented by small accumulations of melanophores. When the dorsal and anal fin rays begin to ossify, marked bars of pigment, from the origin to the end of the fins, can be observed over them. Pelvic fins are also pigmented since their appearance.

Fin development

In small larvae only the pectoral fins can be distinguished, although the rays have not yet been formed. By 6.96 mm, pelvic fin buds appear and the rays of the caudal, dorsal and anal fins become visible. In 8.90 mm larvae, the rays of the dorsal and anal fins begin to differentiate in their anterior part. In the biggest specimen (9.78 mm) the rays of the caudal, dorsal and anal fins are well differentiated, excepting those situated close to the caudal peduncle. At this size, the dorsal fin base is located above the head, over the midbrain.

Migration of the eye

In specimen of 8.90 mm the right eye is beginning the migration to the left side.

II — Distribution of *Lepidorhombus boscii* larvae

All the larvae examined were collected in April, in the northern part of the area. The larvae were found in

five stations over the shelf break, and nearer the coast, in the Blanes canyon, where the depth is considerable (Fig. 1). Stations depth in which larvae were collected ranged from 74 m to 487 m. Surface water temperature in April, during the sampling was 13 °C.

DISCUSSION

Species of the subfamily Scophtalminae that occur in the Mediterranean are *Lepidorhombus boscii*, *Lepidorhombus whiffiagonis*, *Phrynorhombus regius*, *Psetta maxima* and *Scophthalmus rhombus*. Of these, the larval development of *S. rhombus*, *P. maxima* and *L. whiffiagonis* is well known from the works of PETERSEN, (1909), PADOA (1956), JONES (1970) and RUSSELL (1976). In addition, some stages of larval development have been described for *P. regius* (PETERSEN, 1909; RUSSELL, 1976). All these descriptions are based on specimens collected in the North-east Atlantic. The morphology, including the characteristic head spination, together with the pigmentation pattern of the larvae of these species clearly differentiable from the larvae described herein.

Comparing the *L. boscii* larvae collected in the Mediterranean with those described by Petersen (1909) from the Northeast Atlantic, some small differences can be observed. At a similar size, the body depth and head depth are higher in the Mediterranean specimens, and the preanal length is smaller. It seems that at a similar size, the Mediterranean specimens show a more advanced stage of development. This suggests that the larval development of the species in the Mediterranean is completed at a smaller size. With regard to this, DWIDEWI (1963) found significant differences meristic and morphometric characters of the adults between the Atlantic and Mediterranean populations.

L. boscii larvae examined were collected at considerable depth, in the northern part of the area sampled. This zone is characterized by a narrow continental shelf and the presence of two submarine which canyons approach to within a few miles of the coast. The site of collection of larvae confirms the hypothesis of PETERSEN (1909), in the sense that the spawning of this species probably takes place at considerable depths.

The spawning period of *L. boscii* is not well known. In the eastern North Atlantic, PETERSEN

(1909) mentioned that the occurrence of larvae in the plankton was apparently limited to May and June. In our study, the fact that the larvae were only collected in April, despite the long sampling period (from April to October), suggests that this month could represent the end of the spawning season in the Mediterranean. A surface temperature of 13 °C seems to represent the upper limit for the spawning of the species, taking into account that the surface temperature in the next month (May) was two degrees higher (15.5 °C).

ACNOWLEDGEMENTS

I wish to thank Dr. M. P. Olivar their help ful comments on the manuscript.

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