CONSEIL PERMANENT INTERNATIONAL POUR L'EXPLORATION DE LA MER

Zooplankton
Sheet 111

CHORDATA

SUB-PHYLUM ACRANIA
= (CEPHALOCHORDATA)
Family: Branchiostomidae

(By J. H. Wickstead)

1967

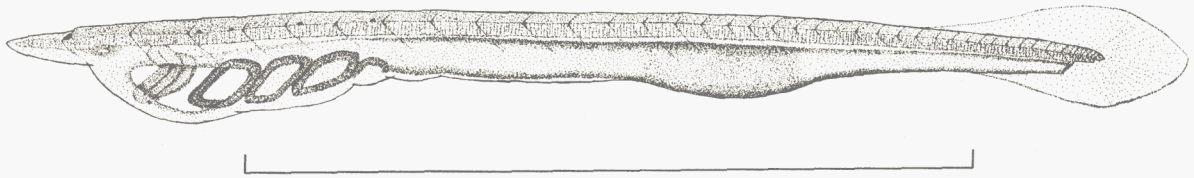

FIG. 1.

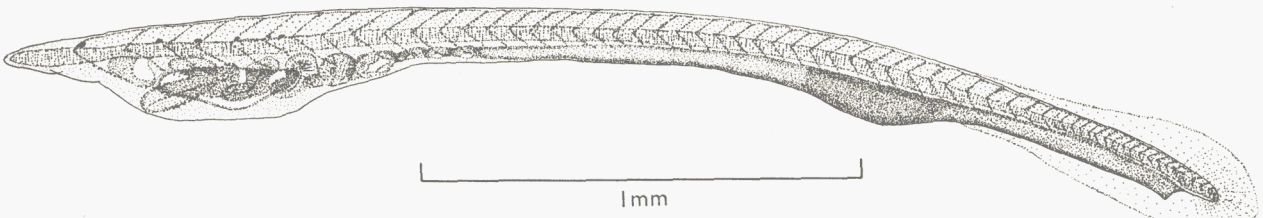

FIG. 2.

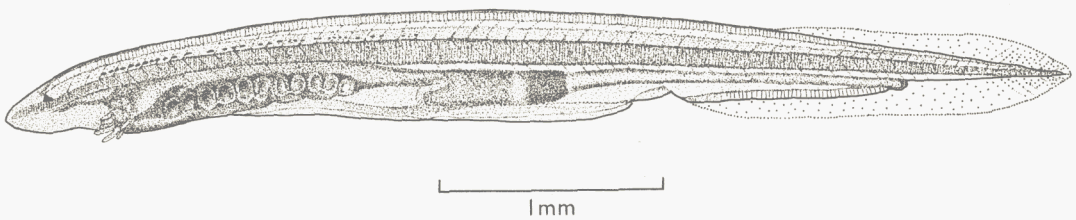

FIG. 3.

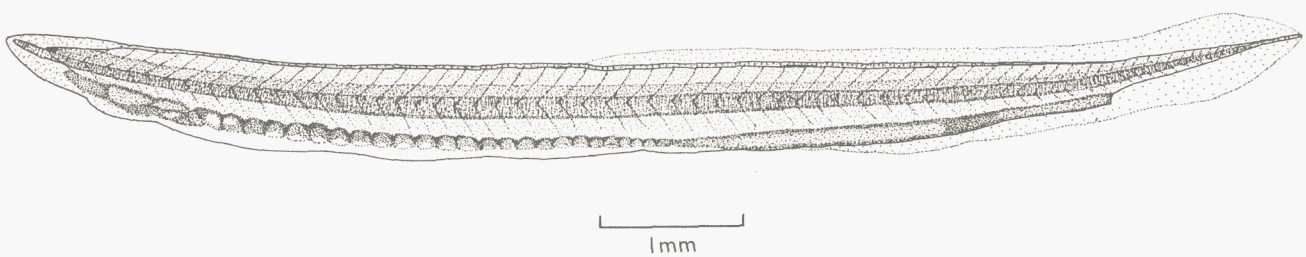

FIG. 4.

1. Young *Branchiostoma lanceolatum* larva with 3, + 1 developing, gill-slits. This is shown in an expanded condition as in life.
2. *B. lanceolatum* larva with 8 gill-slits. Branchial area and body are generally collapsed and the illustration presents the appearance commonly seen in preserved specimens.
3. *B. lanceolatum.* This is a very recently metamorphosed specimen drawn from life. Note that the gill-slits are reduced to 6, the development of secondary gill-bars, the "liver" diverticulum, development of the atrium and the buccal cirri.
4. *Amphioxides pelagicus*, appearance of a preserved specimen with 25 gill-slits. Note length and clear demarcation of the dorsal fin.

ACRANIA = CEPHALOCHORDATA

Primitive fish-like chordates with dorsal nervous system, axial notochord and myotomal musculature.

There are two families, the Branchiostomidae and Asymmetrontidae, the gonads of the former being symmetrically disposed. Adults live normally in bottom deposits, the characteristics of which largely determine their distribution.

Fertilisation is external, the eggs hatching as ciliated neurulae. Using the finest plankton nets it could be taken at this stage, although it has not yet been recorded. Development proceeds with the perforation of the first gill-slit and a growth period involving an increase in gill-slit and myotome numbers. The subsequent metamorphosis to the bottom living adult involves re-arrangement of the gill apparatus. The larvae are generally considered to be planktonic for at least a part of its developmental history.

Diurnal vertical migrations have been recorded, the larvae ascending towards the surface at about sunset. It is at this time, during the summer months, that the larvae are most likely to be found.

One species only, *Branchiostoma lanceolatum*, has been recorded from the area covered by these sheets. The species is possibly divided into several races.

Branchiostoma lanceolatum (Pallas)

Limax lanceolatus Pallas 1774

Branchiostoma lubricum Costa 1834

Amphioxus lanceolatus Yarrell 1836

Distribution of adult

Widely distributed around the European coast and in the Mediterranean. There is evidence that the species has moved through the Suez Canal into the Indian Ocean. In Bagamoyo Bay, East Africa, there is a record of the "western" lancelet, *B. lanceolatum*, being found living in association with the "eastern" lancelet, *Branchiostoma belcheri* Gray.

Areas include English Channel, west coasts of Ireland and Scotland, North Sea, Skagerak, Kattegat, Norway coast, Heligoland, Mediterranean, South Arabian Coast, Portugese East Africa and North Madagascar.

The original specimen was taken on the south Cornwall coast of England, at Polperro. The classic studies of WILLEY (1891, 1984) were on specimens from the Messina area of the Mediterranean.

Recent evidence indicates that there is a large population of *B. lanceolatum* in the Bay of Bengal, off the coast of Madras (AZARIAH, in press). In addition a single specimen in the author's possession, taken in the Solomon Islands, does agree with *B. lanceolatum*. However, as indicated elsewhere, identifications based upon a single specimen must always be open to some doubt.

Larval identification

Criteria are length/dorsal fin length relationship, length/post-anal length relationship, myotome count and gill-slit count (see WICKSTEAD, 1964 a). Intra-specific variation is such that, in a locality which has several species, there can be inter-specific overlap. For this reason single larvae may be difficult to identify accurately. Although in fact only *B. lanceolatum* has been recorded from this area, and such larvae as are found in the area will, almost certainly, belong to this species, the possibility of another species being present must not be excluded. A further complication may arise concerning amphioxides larvae (see below).

Special note

The amphioxus larva illustrated in Figures 1–3 metamorphoses, usually, between 3·5 and 5 mm long, depending upon the area in which they are living, at which stage it has, usually, 12–14 gill-slits. There are other acraniate larvae, the so-called amphioxides larvae, which attain a greater length and have correspondingly more gill-slits: up to about 11 mm long, with up to 35 gill-slits. These were originally considered to be adult forms, but are now known to be larval. Some were reported as having developing gonads; it is doubtful if this can be considered to be conclusively established. Their status appears to correspond with that of giant larvae (WICKSTEAD, 1964b). The original view was that a single species of acraniate might possess two different types of larva.

A single specimen of an amphioxides larva that had 19 gill-slits and being 5 mm long was recorded from the North Sea (GOLDSCHMDT, 1906), this larva was assigned to *B. lanceolatum*. It is possible therefore that, within the area covered by these sheets, further specimens of amphioxides larvae will be found, including perhaps *Amphioxides pelagicus* GOLDSCHMIDT (Figure 4), the larva of *Asymmetron lucayanum* Andrews. This adult species has been recorded from many warm water areas, including Bermuda, and there is a possibility that, on occasion, larvae might be carried towards the more northern and eastern region of the Atlantic.

Larval ecology and appearance

Knowledge of acraniate larval ecology is limited, as it is mostly derived from observations on populations from the Mediterranean, West Africa and Singapore. It is possible that the larval populaton from the Mediterranean (*B.lanceolatum* was the adult in this case) was living in peculiar circumstances, and that elsewhere their mode of life might be different. In the North Sea acraniate larvae are apparently rare in the plankton although, being an animal which is restricted in time and space in its presence in the plankton, it is difficult to be sure of this. Observations from Singapore, in this case larval *B. belcheri*, indicate that acraniate larvae show a diurnal vertical migration, their appearance in the plankton being restricted to a short period of the day (dusk and just after sunset) and to a short period of the year during the breeding season (WICKSTEAD and BONE, 1959). Reasonably fine meshed nets are necessary to retain them, about $< 225\mu$. At Plymouth, although the adults are not uncommon in certain areas, the first positive record of pre-metamorphosed larvae was not until 1965 (WICKSTEAD, 1967).

Recognition, as opposed to identification, of living acraniate larvae should not be difficult. When living the larvae are transparent, but not completely so. The larvae from Plymouth were picked out easily by virtue of a band of bright iridescent green in the ilio-colonic ring area; this is the part of the gut shown as a darker area in the drawings. It is also present in the gill area, but to a lesser degree. This iridescent green has not been recorded in amphioxides larvae; these have been observed to be generally transparent and tinted a delicate rose-pink (WICKSTEAD, 1965).

The length of the larvae taken in plankton nets will be usually between 1·5 and 5 mm. They are not active swimmers generally, and in a living plankton sample will settle quickly to the bottom.

Preserved larvae are opaque and yellowy-white. The iridescent green disappears almost immediately on preservation, but the ilio-colonic ring can be seen as a more opaque area of the gut. The degree of collapse of the branchial area varies considerably. In Figure 1 the whole animal is shown in an expanded condition, as it could be seen in a living specimen. On preservation the branchial area is usually collapsed almost flat, as in the posterior part of the branchial area in Figure 2, and the gut diameter shrinks. The degree of collapse on preservation is usually very marked, but it can on occasion be almost nonexistent. Acraniate larvae settle out rapidly from an agitated preserved plankton sample.

On occasion small (about 6–8 mm long) post-metamorphosed animals will be taken in plankton samples, usually from near the bottom. These are easily recognized by the complex branchial basket, in which the secondary gill-bars are well developed, giving the animal an adult appearance.

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