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Larvae of the Ophichthid Eel Genus *Neenchelys* in the Indo-Pacific[1]

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ABSTRACT: Larvae of *Neenchelys* Bamber are rather short and deep bodied, reaching about 75 mm before metamorphosis. They have a relatively short gut which is pigmented and slightly swollen at intervals along its length, as in larvae of other myrophine ophichthids. *Neenchelys* leptocephali also have a conspicuous midlateral patch of pigment about midway between the anus and caudal tip, and develop ova before metamorphosis.

THE DANISH "Dana" Oceanographical Expedition Round the World (1928–30) collected huge numbers and many different species of eel larvae (leptocephali) in the Indo-Pacific. Included among these was one larval type of quite distinctive pigmentation, consisting principally of an obvious patch of deep and surface melanophores on the lateral musculature about halfway along the body (Figure 1*A*, 1*D*). This pigment patch is so conspicuous and so specific in shape and position that these leptocephali cannot be confused with any other eel larvae.

There were some 150 specimens of this larval type in the "Dana" collection, mainly from the central West Pacific, but also from as far west as the southern tip of Africa. Other collections yielded further specimens. The size range was 26–85 mm with most about 50 mm total length (TL). Some were metamorphic, but as the distinctive pigment patch disappears before metamorphosis is complete, an immediate identification was not possible without reference to other characters.

IDENTIFICATION

In overall body form the larvae are moderately deep bodied, with a rather acutely pointed head which is flexed downward in most specimens, although this may possibly be an artifact of preservation. The gut is relatively short, occupying the anterior third of the body, and is pigmented more or less regularly with groups of melanophores along its length. There are about four slight swellings along the length of the gut. In these characters, the larvae more closely resemble those of *Myrophis* (Ophichthidae, Myrophinae) as illustrated by Castle (1965) and Blache (1977) than any other leptocephali.

However, the characters of greatest significance in the identification of these larvae are the presence and location of accessory branchiostegal rays (jugostegalia of Parr 1930), which can be seen through the body wall of the branchial region in metamorphic and other specimens (Figure 1*B*, 1*F*), and the possession of a well-developed caudal fin even in the metamorphics. The accessory rays overlap and cross over in the ventral midline and are quite separate from the anterior branchiostegals which are attached to the hyoid arch. Among the ophichthid eels, this condition together with the complete, unabbreviated caudal distinguishes members of the Myrophinae from the Ophichthinae (McCosker 1977).

The most advanced metamorphic specimen ("Albatross" station D5456, Philippines, Figure 1*F*) has a rounded snout, simple, lateral, posterior nostril, and a moderately developed pectoral fin, which is relatively as large as that of premetamorphic specimens. While ventral movement and restriction of the posterior nostril to the upper lip (a position

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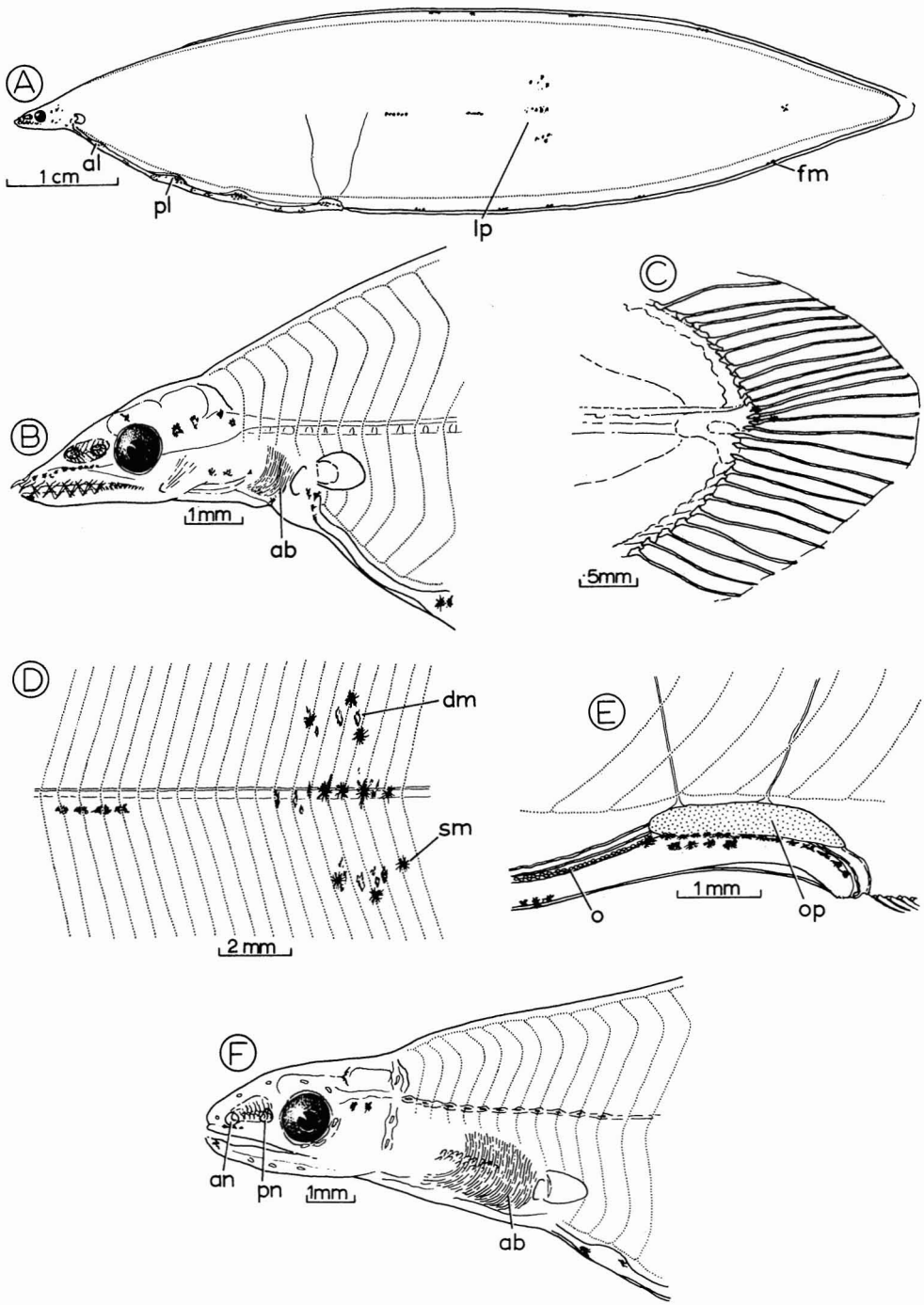

FIGURE 1. *A–E, Neenchelys microtretus*, leptocephalus, "Alpha Helix" station 25, 75 mm TL; *D*, detail of lateral pigmentation; *E*, detail of posterior part of intestine to show ova and pigmentation; *F*, "Albatross" station D5456, 67.5 mm TL; metamorphic. *ab*, accessory branchiostegal rays; *al*, anterior lobe of liver; *an*, anterior nostril; *dm*, deep melanophore; *fm*, melanophores on base of fin; *lp*, lateral pigment patch; *o*, ova; *op*, opisthonephros; *pl*, posterior lobe of liver; *pn*, posterior nostril; *sm*, superficial melanophore.

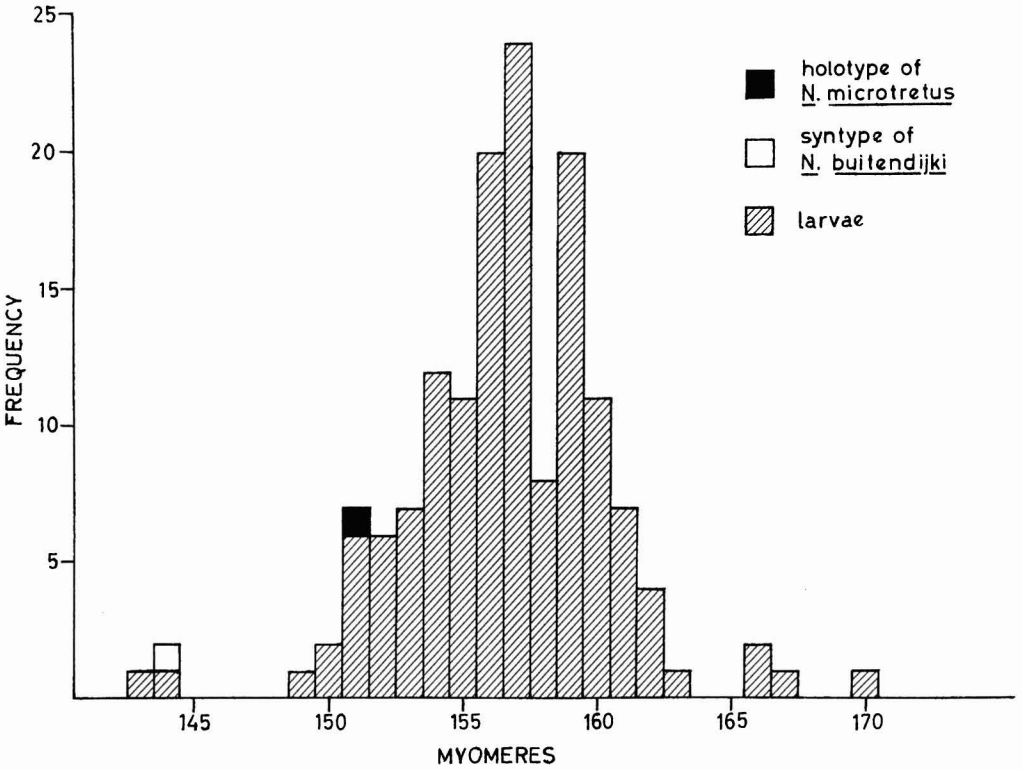

FIGURE 2. Number of myomeres in *Neenchelys* larvae and the type specimens of *N. microtretus* and *N. buitendijki*.

characteristic of many ophichthids) and possible regression of the pectoral fin cannot entirely be discounted, my knowledge of ophichthid larvae and my assessment of the present material suggest that neither of these changes would be likely to occur during subsequent growth.

The identification is thus restricted to the genera *Benthenchelys* Fowler, 1934, *Neenchelys* Bamber, 1915, and *Pseudomyrophis* Wade, 1946. *Benthenchelys* may be immediately excluded because it has a dorsal origin over the anus, i.e., around the middle of the body length (Castle 1972). In these larvae it is much further forward, at about myomere 28 of a preanal number of about 50. *Neenchelys* and *Pseudomyrophis* are closely similar (McCosker 1977), possibly even congeners (Nelson 1966; Böhlke, pers. comm.). *Pseudomyrophis* contains the elongate species *P. micropinna* Wade, 1946 from the eastern Pacific (holotype with 174 vertebrae: McCosker 1977) and *P. atlanticus* Blache, 1976 from the eastern Atlantic (with 168–181 vertebrae: Blache 1976). *P. nimius* Böhlke, 1960 from the Caribbean (with 212–216 vertebrae: McCosker 1977), also markedly elongate, is considered by Dean (1972) to represent a further, but monotypic, genus within this group. *Neenchelys* contains two species, neither of which is greatly elongate: *N. microtretus* Bamber, 1915 from the Red Sea (holotype with 151 vertebrae: Böhlke, pers. comm.) and *N. buitendijki* Weber and de Beaufort, 1916 from the Indian Ocean (with 145–148 vertebrae: Mohamed 1958; 142: Kotthaus 1968; syntype with 144: Böhlke, pers. comm.).

The frequency distribution of myomeres in the larvae is expressed in Figure 2. All specimens fall within the range 143–170. The vertebral number in the adults for all but a few of these larvae would therefore be well outside the range for any of the *Pseudomyrophis*

species. Further disagreements are that at least in *P. nimius* the dorsal origin is much further back, at about vertebra 49 (Böhlke 1960), and the pectoral is absent or virtually absent externally.

The larvae are therefore identified with *Neenchelys*. The 2 specimens with 143 and 144 myomeres are referred to *N. buitendijki* and those with 149–163 to *N. microtretus*. Two other specimens with 166, another with 167, and another with 170 myomeres appear to represent a third undescribed species of *Neenchelys*. Adults are not well enough known to provide detailed information on vertebral numbers. As far as I can determine, *N. buitendijki* is known from only 3 specimens, together with at least 15 described by Mohamed (1958), while *N. microtretus* is known only from the holotype.

Neenchelys larvae occur so frequently in collections of leptocephali and the biology of the species is so poorly known that a description of the material is warranted. In general, body form and pigmentation of the larvae of the 3 species are more or less identical and therefore a detailed description is given only for the most abundant, *N. microtretus*. There are differences in total myomere number and correlated differences in number of dorsal and anal fin-rays.

Neenchelys microtretus Bamber

Figures 1–3

Neenchelys microtretus Bamber, 1915, p. 479

Material Examined

One hundred fifty-four (20.5–80.5 mm) leptocephali from 40 collections. ZMUC: RR/S "Dana" station numbers 3676 (hauls III, IV, VIII), 3681 (IV), 3687 (III), 3689 (IX, X), 3712 (IV), 3714 (II, IV, V), 3715 (III), 3734 (IV), 3735 (IV), 3736 (VIII), 3753 (III), 3757 (I), 3759 (I, XIII), 3766 (XXI), 3768 (XV), 3774 (II), 3775 (II), 3778 (I, III, IV), 3796 (V), 3800 (III), 3809 (II), 3814 (II, III, IV, V, VI, VII), 3817 (VII), 3824 (VIII), 3826 (III, VI), 3830 (I, III, VIII), 3838 (I, III), 3840 (V), 3841 (II), 3842 (I), 3844 (III), 3874 (I), 3898 (I), 3971 (V); RR/S "Galathea" station number 298; R/S "Albatross" station numbers D5456, D5531; ORSTOM: HMAS "Diamantina" station number Dm 2-63-63; Cruise "Diaphus 10" station number 262. "Alpha Helix" Bioluminescence Cruise station numbers 22, 25. Locations of these stations are shown in Figure 3*A*.

Description

Total myomeres 149–163 ($n = 139$, $\bar{x} = 156.57$, $s = 2.96$), preanal 44–54, dorsal rays 293–326 (8 specimens), anal rays 240–247 (8 specimens), anterior margin of gall bladder at myomere 18–22 (100 specimens), dorsal origin at myomere 26–33 (100 specimens), last vertical blood vessel at myomere 48–55 (89 specimens).

The leptocephalus is relatively short bodied and deep, attaining about 75 mm at full growth, occasionally larger. The body tapers abruptly to a pointed head and rounded tail; the snout is acute; there is a well-developed pectoral and a forward dorsal origin. The gut is relatively short, so that the anus is placed well in front of the midlength, and is swollen slightly at 4 more or less equidistant points along its length. There are about 28 free branchiostegal rays supporting the throat. Pigmentation is in the form of melanophores distributed as follows: a row on the roof of the mouth, 1 or 2 on the tip of the lower jaw, several scattered deep on the brain and on the branchial region; groups of melanophores on the swellings of the gut, between which there are intermediate groups; widely spaced groups on the bases of the dorsal and anal fins behind the level of the anus; a prominent midlateral patch of somatic melanophores between the anus and the caudal tip, the pigment cells of which merging deeply with a group underneath the vertebral column, 1 of 4 such groups; a few melanophores on the base of the caudal fin.

Several of the larger specimens have distinct ova which form irregular chains of cells above the intestine in front of the opisthonephros.

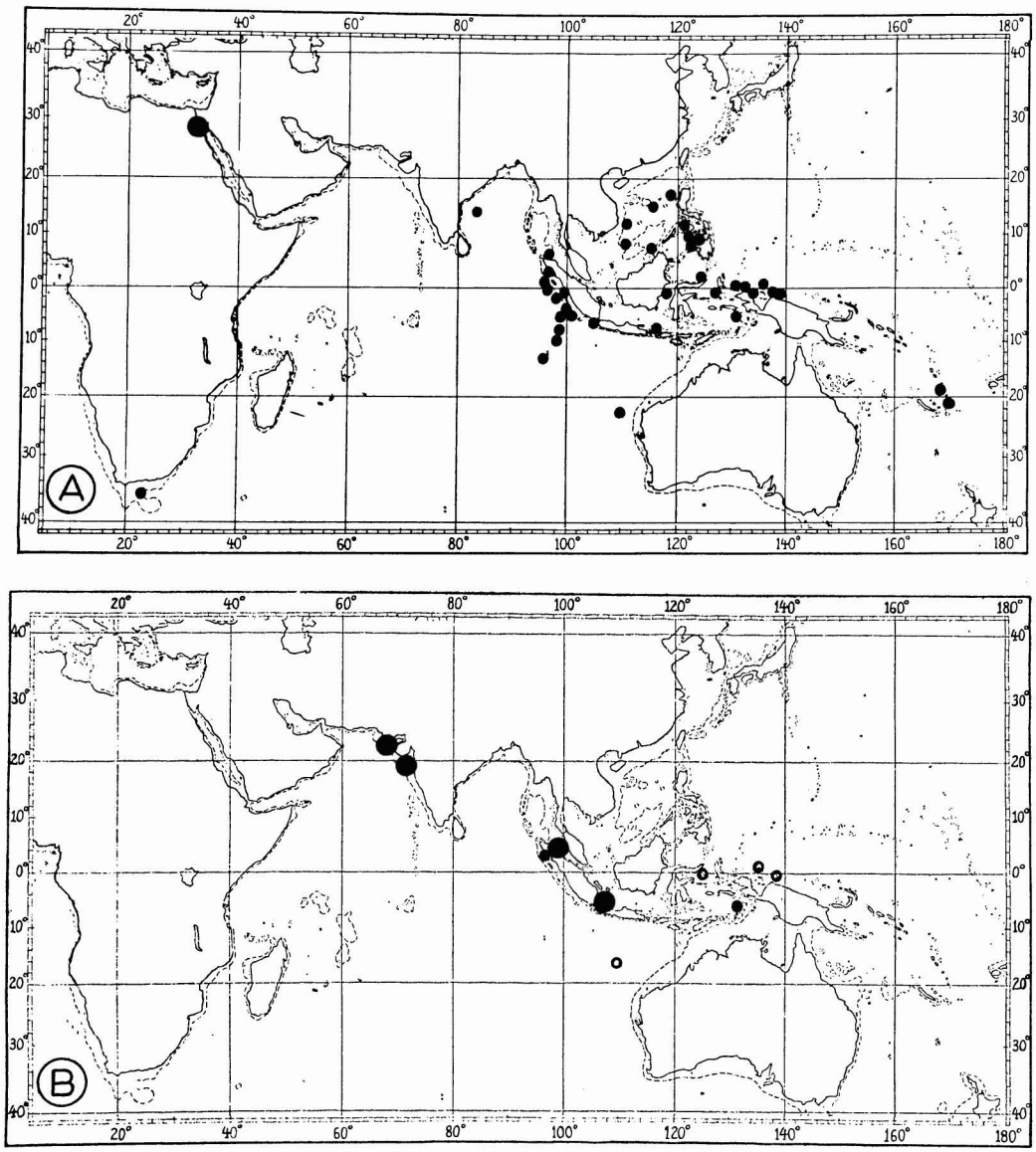

FIGURE 3. Distribution of *Neenchelys*. *A*, *N. microtretus* adult (holotype, large circle) and larvae (small circles); *B*, *N. buitendijki* adult (large filled circles: syntype-Weber and de Beaufort 1916; Hardenberg 1931; Mohamed 1958; Kotthaus 1968) and larvae (small filled circles); *Neenchelys* sp. larvae (small open circles).

Remarks

The midlateral, postanal group of melanophores which is typically divided into three subgroups (as illustrated in Figure 1*D*) is a most characteristic feature of *Neenchelys* larvae. While the larvae resemble the leptocephali of *Myrophis* in the pointed head and simple gut with more or less regularly spaced groups of melanophores, *Myrophis* has no midlateral series, or if present, it is restricted to a midlateral row (Castle 1965;

Blache 1977). A feature of this larva is that the dorsal origin is always placed well forward, at about myomere 28, even in small specimens. The presence of ova in some specimens is a further example of their occurrence at the larval stage in some leptocephali, noted for other eels (Castle 1978) and possibly more common than hitherto suspected. Mohamed (1958) noted that his specimens of *N. buitendijki* of above 160 mm TL were maturing or mature.

Neenchelys buitendijki Weber and de Beaufort

Figures 2, 3*B*

Neenchelys buitendijki Weber and de Beaufort, 1916, p. 268

Material Examined

Two (39 and 61 mm) leptocephali from 2 collections. ZMUC: RR/S "Dana" station numbers 3676 (haul VIII), 3830 (III). Locations of these stations are shown in Figure 3*B*.

Description

Total myomeres 143 and 144, preanal 50 and 53, dorsal rays 329, anal rays 229, anterior margin of gall bladder at myomere 20, dorsal origin at myomere 26, last vertical blood vessel at myomere 51.

Remarks

These larvae differ from those of *N. microtretus* in having fewer total myomeres, although the difference is expressed specifically in the postanal number. Mohamed (1958) records 335–346 dorsal and 225–228 anal rays in *N. buitendijki* with which the present 2 larvae more or less conform.

Neenchelys sp.

Figures 2, 3*B*

Material Examined

Four (70–85 mm) leptocephali from 4 collections. ZMUC: RR/S "Dana" station numbers 3753 (haul III), 3767 (I), 3780 (III); ORSTOM: HMAS "Diamantina" station number D4-150-62. Locations of these stations are shown in Figure 3*B*.

Description

Total myomeres 166–170, preanal 53–56, dorsal rays 386–413 (3 specimens), anal rays 307–333 (3 specimens), anterior margin of gall bladder at myomere 18–19, dorsal origin at myomere 26–28, last vertical blood vessel at myomere 56–58.

DISCUSSION

Neenchelys is known from adults or postmetamorphic specimens from widely separated parts of the Indo-Pacific (Red Sea, India, Indonesia), but not as yet from the Atlantic. These are records from few specimens although Mohamed (1958) states that they may be locally abundant seasonally. As these eels almost certainly live in shallow water in fine sediments, it is possible that this distribution may merely reflect inadequate collecting.

Except for the single specimen collected off southern Africa, larvae of *N. microtretus* show a relatively restricted distribution in the central West Pacific (Figure 3*A*). In contrast, the only known adult is from Suez. The compact larval distribution is probably a fair representation, since many more hauls were made by the "Dana" elsewhere across the whole of the Indo-Pacific than the positive ones shown in Figure 3*A*. Of more than 7000 leptocephali collected in 600 hauls by ORSTOM (Nouméa) in the central Pacific during 1967–72 there was only a single specimen of *Neenchelys microtretus*. These observations suggest that the larval life of *Neenchelys* species is relatively short, so that extensive dispersal of the larvae does not normally occur.

No *Neenchelys* larvae have been taken in the Atlantic, where there has been even more extensive collecting for leptocephali than in the Indo-Pacific.

ACKNOWLEDGMENTS

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