

## ***Laubierpholoe indooceanica*, a new interstitial polychaete (Pholoidae) from South India and the Seychelles**

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**Abstract:** An interstitial pholoid, *Laubierpholoe indooceanica*, new species, is described from sand sediments of coral reef flats of the Indian island Krusadai and the Seychelles island Mahé. As in the other four species of the genus, embryos develop in brood pouches in each of two elytra. Features of chaetation, especially the presence of hook-like blades in some of the compound neurochaetae, are the distinguishing characters of the species.

**Résumé :** *Laubierpholoe indooceanica*, une nouvelle espèce de *Pholoidae* interstitielle, du sud de l'Inde et des îles Seychelles. Cette nouvelle espèce est décrite de sédiments sableux de platiers coralliens de l'île Indienne Krusadai et de l'île Mahé aux Seychelles. Comme dans les quatre autres espèces du genre, les embryons se développent à l'intérieur de poches incubatrices dans chacune des deux élytres d'une même paire. Les caractéristiques des soies, en particulier la présence d'articles en forme de crochet à quelques soies ventrales composées, constituent les caractères distinctifs de cette espèce.

**Keywords:** Polychaeta, scale-worms, meiofauna, external gestation.

### **Introduction**

Still ongoing investigations of meiofaunal polychaetes inhabiting littoral sediments throughout the world have revealed a remarkably wide geographical distribution of interstitial genera and even species (e.g., Westheide, 1977; Schmidt & Westheide, 2000). *Laubierpholoe* (Pettibone, 1992), with its spectacular brooding behavior, is one of such cosmopolitan taxa, comprising four species distributed in the North and South Atlantic and South Pacific oceans (Pettibone, 1992). On three sampling excursions by the

author to South India in 1988 (Westheide, 1990) and to the Seychelles in 1999 and 2000 (Westheide, 2000), a fifth species was discovered in the area of the Indian Ocean that can be clearly differentiated phenotypically from the others species. No difference could be detected between animals recorded from the Indian coast and those from the Seychelles island Mahé; in both localities they live in detritus-poor sands on coral reef flats.

### **Materials and Methods**

Extraction of animals was carried out with a solution of 8% MgCl<sub>2</sub> isotonic to sea water. Several of the specimens from Mahé were observed in living condition and photographed under a Leitz Dialux microscope.

*Material examined*

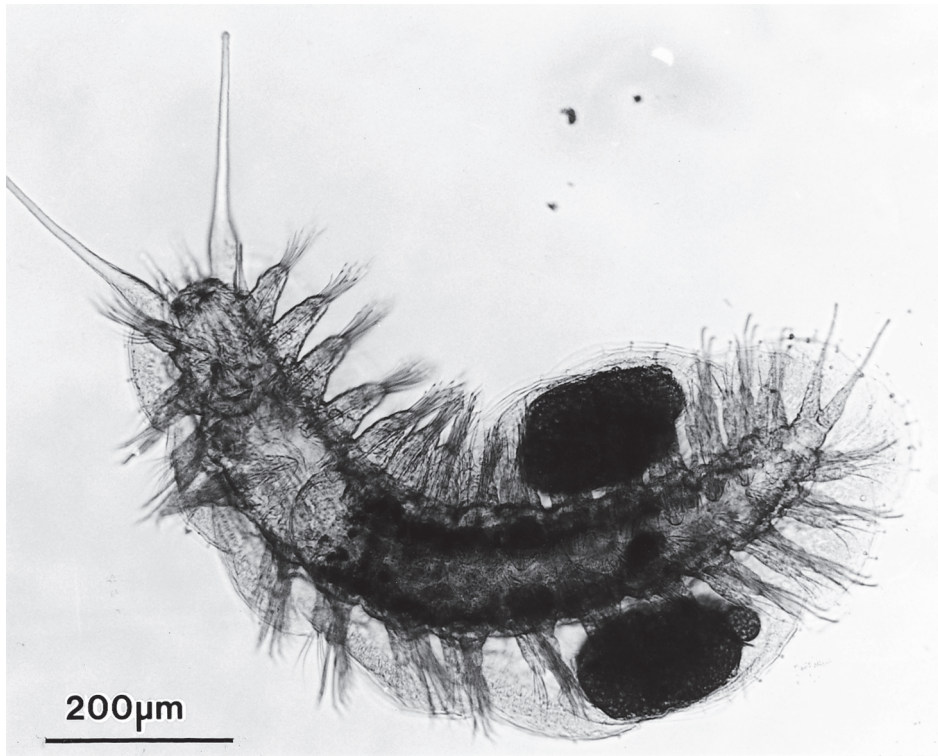
(1) South India, Tamilnadu, Gulf of Mannar; Krusadai Island, 6 km off Mandapam, ca. 9°14'N, 79°13'E, 3 Feb. 1988; reef flat in clean shelly and sandy sediments between dead corals: five complete formalin-fixed specimens. (2) Indian Ocean, Island of Mahé, Republic of Seychelles, 4°47'S, 55°31'E, reef flat in front of the beach "Anse Forbans", in extremely clean coarse coral sand, 22 Feb. 1999; 13 Mar. 2000: 15 complete Bouin's solution fixed specimens.

*Type material*

The holotype is a whole mount of a mature specimen with two embryos, from Mahé, Seychelles. It is deposited in the Senckenberg Museum, Frankfurt (SMF 9805) together with four paratypes (in ethanol) from Mahé (SMF 9806) and three paratypes (in ethanol) from Krusadai (SMF 10033). The remaining specimens are in the author's collection.

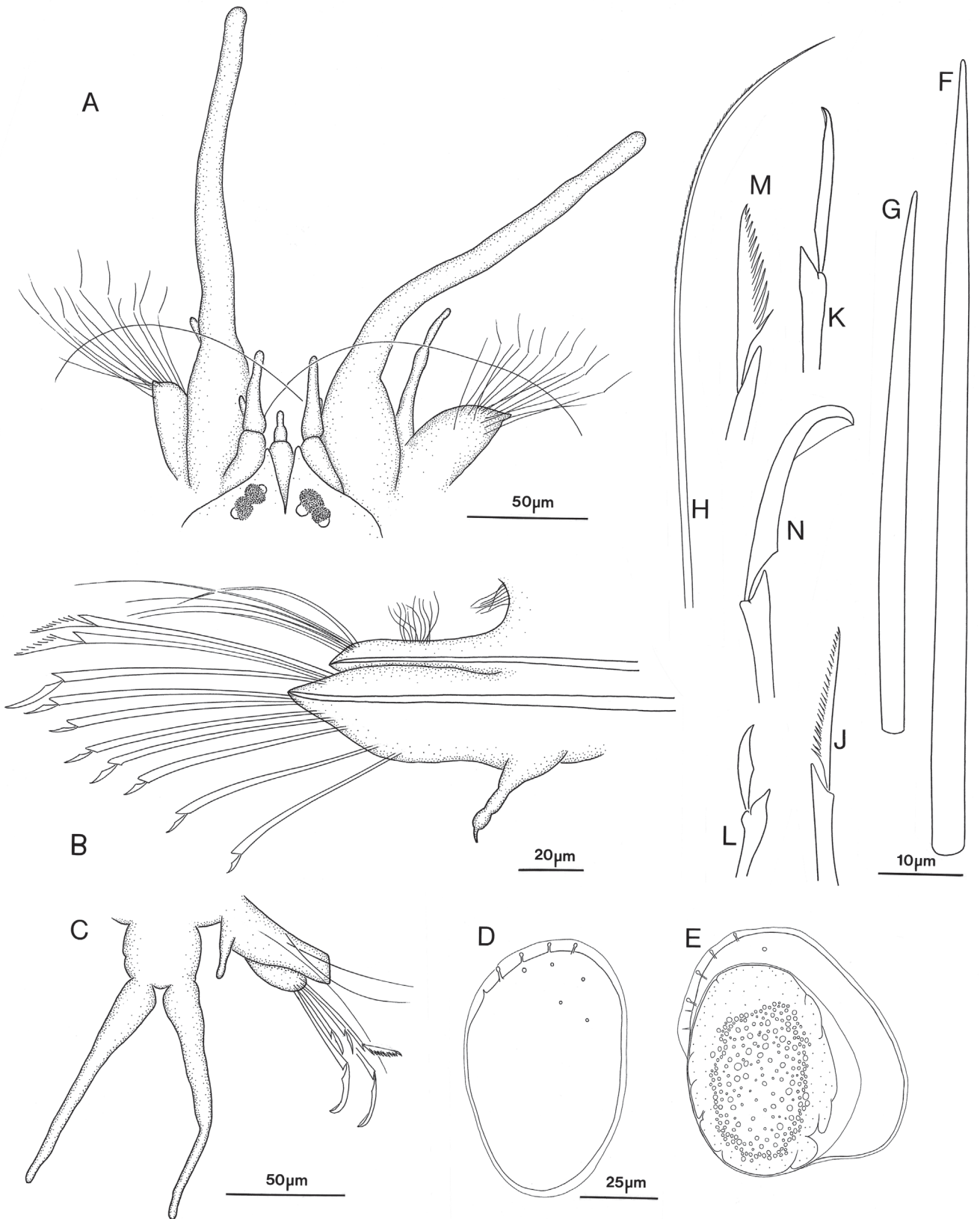
**Figure 2.** *Laubierpholoe indoceanica* sp.nov. **A.** anterior end, dorsal view; **B.** parapodium of chaetiger 9, posterior view; **C.** pygidium and parapodium of posteriormost segment, dorsal view; **D.** elytron from anterior half; **E.** 6<sup>th</sup> right elytron with developing embryo; **F.** neuropodial acicula; **G.** notopodial acicula; **H.** notopodial capillary chaeta; **J.** supraacicular compound neurochaeta, chaetiger 2; **K.** lowermost supraacicular neurochaetae, chaetiger 2; **L.** subacicular falciger; **M.** upper supraacicular notochaeta, chaetiger 5; **N.** hook-like supraacicular compound neurochaeta, posteriormost chaetiger. 10 µm scale bar for all chaetae (F-N).

**Figure 2.** *Laubierpholoe indoceanica* sp.nov. **A.** extrémité antérieure vue dorsale ; **B.** parapode du sétigère 9, vue postérieure ; **C.** pygidium et parapode du segment le plus postérieur, vue dorsale ; **D.** élytre de la moitié antérieure ; **E.** 6<sup>e</sup> élytre droite avec un embryon en cours de développement ; **F.** acicule neuropodiale ; **G.** acicule notopodiale ; **H.** soie capillaire notopodiale ; **J.** neurochète composée supraaculaire du sétigère 2 ; **K.** neurochète supraaculaires inférieure du sétigère 2 ; **L.** neurochète falcigère subaculaire ; **M.** notochète supérieure supraaculaire, sétigère 5 ; **N.** neurochète composée en crochet supraaculaire du sétigère le plus postérieur. Echelle : 10 µm, pour toutes les soies (F-N).



**Figure 1.** *Laubierpholoe indoceanica* sp.nov. Photomicrograph of a living animal with two embryos brooded in pouches in each of two elytra.

**Figure 1.** *Laubierpholoe indoceanica* sp.nov. Photomicrographie d'un spécimen vivant incubant deux embryons dans les poches de deux élytres.



## Description

### *Laubierpholoe indooceanica* sp. nov.

Whitish-brown to colourless, almost transparent; some of the Indian specimens with yellowish-brown spots in the elytra. Lengths of mature individuals (with embryos) between ca. 600  $\mu\text{m}$  (13 chaetigers) and 875  $\mu\text{m}$  (15 chaetigers, maximum observed), without prostomial and anal appendages, but with elytra. Width in the mid-body region up to ca. 400  $\mu\text{m}$  (including elytra and parapodia), with parapodia (excluding elytra) 175-275  $\mu\text{m}$ , trunk without parapodia, 125-175  $\mu\text{m}$ , thus body outline almost oval. Eight pairs of elytra in specimens with 14 chaetigers, covering trunk and parapodia completely. Outline of elytra (Figs 2, 3D) irregularly oval, ornamented, but more or less smooth, with three to four short, capitate papillae along anterior margin and about three to five on surface of nearly the same shape. Each elytron of sixth pair with a ventrally protruding brood pouch (Fig. 1E), each containing one developing embryo.

Prostomium anteriorly bilobed. Two pairs of pigmented, lensed eyes of nearly identical size (Figs 1, 2A). Median antenna ca. 30  $\mu\text{m}$  long, with ceratophore and small style, in anterior notch, considerably shorter than dorsal tentacular cirri; style with a distinctly narrower distal part. Tentaculophores prominent, dorsal cirri ca. 45  $\mu\text{m}$  long; ventral cirri much shorter, generally not visible in dorsal view. Palps stout, representing longest body appendages (200-250  $\mu\text{m}$ ), lateral to tentaculophores (Figs 1, 2A, 3A, B).

Chaetigers with biramous parapodia. Ventral cirri (= buccal cirri) of chaetiger 1 (= second segment) smooth ca. 55  $\mu\text{m}$  long and thus much longer than dorsal tentacular cirri (Figs 2A, 3B) and also longer than and different from ventral cirri of following parapodia (ca. 30  $\mu\text{m}$ ). Notopodium and neuropodium both conical lobes (Fig. 2B), the former shorter and smaller than the latter. Each with one prominent tapering acicula (Fig. 2B, F, G). Notochaetae exclusively slender, slightly curved capillaries, with minute serrations along convex edge, four to eight (Fig. 2H). Neurochaetae exclusively compound, with blades of several kinds: in chaetiger 1, all blades of about 8-10 chaetae minutely serrated, no large differences in length. From chaetiger 2 on there are clear differences between supraacicular and subacicular chaetae. Chaetigers 2 and 3 with two uppermost supraacicular chaetae with distinct serration (Fig. 2J), lowermost chaeta with blade appearing smooth (Fig. 2K). Subacicularly, a bundle of 10-17 falcigers (Fig. 2L) with short blades of almost identical length and also appearing smooth. In chaetiger 4 and following ones, serration of two or three supraacicular chaetae distinctly more prominent (Fig. 2M). Additional hook-like type of blades (Figs 2N, 3D) in the five posteriormost segments. All

blades unidentate. Distal ends of all shafts minutely spinose (not shown in figures). Pygidium rectangular, distinctly separated from last chaetiger, with two long (125-135  $\mu\text{m}$ ) gradually narrowing anal cirri; oriented like a posteriorly open V (Figs 1, 2C, 3C, D).

Prominent muscular pharynx reaching backwards into chaetiger 8; when everted showing nine dorsal and nine ventral terminal papillae; with two pairs of jaws.

*Remarks.* The majority of specimens collected carried two large vitellogenic oocytes in the middle of their trunk or two developing embryos inside the 6<sup>th</sup> pair of elytra (Figs 1, 3C), indicating that the specimens described are adult and probably no considerably larger ones may occur.

## Discussion

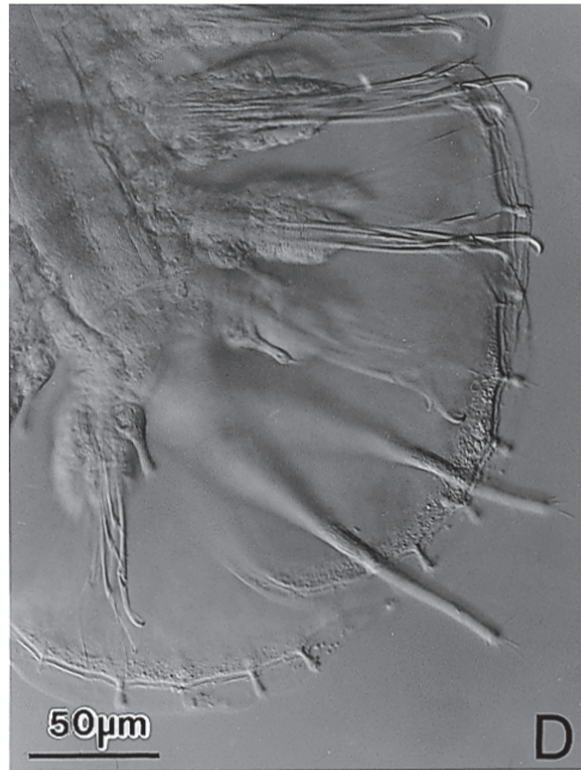
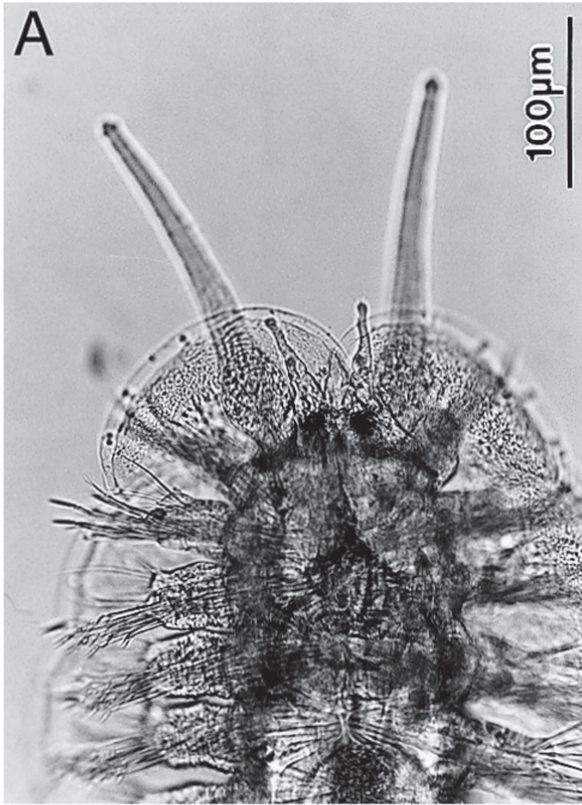
According to Pettibone (1992), *Laubierpholoe* contains four species. The convincing autapomorphic character of this generic taxon is the presence of brood pouches in each of two elytra and the fact that inside each of these pouches an embryo develops. [In *Taylorpholoe hirsuta* (Rullier & Amoureux, 1979) the young is brooded under the elytra (Wolf, 1984; Pettibone, 1992)]. Pettibone's (1992) use of the term "viviparity" for the situation in *Laubierpholoe* is probably not justified. When partially developed embryos are observed in some individuals, the most likely interpretation is not that juvenile animals are emerging from the body [as happens, e.g., in *Dentatisyllis*; see Ding et al. (1998), and in *Taylorpholoe*, see Wolf (1984: 25-12)] and moving to the elytra, but rather that fertilized, yolk-rich eggs have been expelled and are maturing here. It is for this reason that Laubier (1975) termed the phenomenon, which he describes in detail for *L. swedmarki* (Laubier, 1975), "gestation intra-élytrale". In fact it is a kind of external gestation, such as has been independently evolved in nerillids (Jouin, 1968) and syllids (Kuper & Westheide, 1998). It is associated with internal fertilization, and an extreme reduction in the number of oocytes produced which

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**Figure 3.** *Laubierpholoe indooceanica* sp.nov., micrographs of living animals. **A.** anterior half of body; **B.** anterior end, ventral side, focussed on ventral cirri of chaetiger 1; **C.** posterior half of body, dark areas represent two embryos; **D.** posterior end of body, Nomarski contrast, focussed on hook-like blades of compound neurochaetae and outer margin of elytra.

**Figure 3.** *Laubierpholoe indooceanica* sp.nov., micrographies de spécimens vivants. **A.** moitié antérieure du corps ; **B.** extrémité antérieure, face ventrale, mise au point sur les cirres ventraux du sétigère 1 ; **C.** moitié postérieure du corps, les aires sombres représentent deux embryons ; **D.** partie postérieure du corps, contraste Nomarski, mise au point sur les articles en crochet des neurochètes composées et sur le bord externe de l'élytre.



is considered to be one of the characteristic biological adaptations of interstitial polychaetes (see Westheide, 1984).

According to Pettibone (1992), all *Laubierpholoe* species are interstitial. *Laubierpholoe indooceanica* sp. nov. is the smallest of them, having about 15 segments and a length well below 1 mm. Other distinguishing characteristics are (1) the number of notochaetae, which is smaller than in *L. swedmarki* and larger than in *L. antipoda* Pettibone, 1992, *L. maryae* Pettibone, 1992, *L. riseri* Pettibone, 1992 and (2) the shape and relative sizes of the notopodia and neuropodia. Pettibone's (1992) illustration of the structure of the chaetae, unfortunately, is not adequate to permit detailed comparison. However, she presumably would not have failed to note the hook-like blades (Figs 2N; 3C, D), found in the present species. Laubier (1975), who made quite detailed drawings of the chaetae, also does not mention such a feature in *L. swedmarki*. This type of chaeta and other details of chaetation are therefore regarded as the most important autapomorphic characters for the new species.

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