

A new species of scale-worm (Polychaeta: Polynoidae), *Levensteiniella plicata* sp. nov., from the East Pacific Rise

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Abstract: A new species of Macellicephalinae (Polychaeta: Polynoidae) from deep-sea hydrothermal vents is described. *Levensteiniella plicata* sp. nov. is found among the fauna associated with the mussel *Bathymodiolus thermophilus*, on the East Pacific Rise at 9°50' N. This large species was collected for the first time during the HOT'96 and HOPE'99 cruises.

Résumé : Une nouvelle espèce de Polynoidae (Polychaeta) *Levensteiniella plicata* sp. nov. de la ride du Pacifique oriental. Une nouvelle espèce de Macellicephalinae (Polychaeta : Polynoidae) des sources hydrothermales profondes est décrite. Il s'agit de *Levensteiniella plicata* sp. nov., trouvée parmi les animaux associés aux modioles *Bathymodiolus thermophilus*, sur la dorsale du Pacifique oriental, à 9°50' N. Cette espèce de grande taille a été récoltée pour la première fois au cours des missions HOT'96 et HOPE'99.

Keywords : Annelida, Polychaeta, Polynoidae, deep-sea, hydrothermal vents, East Pacific Rise.

Introduction

The sub-family Macellicephalinae has been revised by Pettibone (1976), one year before the discovery of deep-sea hydrothermal vents (Lonsdale 1977). Species of this sub-family are mostly from deep waters, including bathyal and abyssal depths. Since that time, Pettibone erected, in 1985, the genus *Levensteiniella* for *Levensteiniella kincaidi* Pettibone, 1985 from off western Mexico at 21°N and the Galapagos Rift. It belongs to the subfamily Macellicephalinae and is characterized by the presence of 11 pairs of elytra, on segments 2, 4, 5, 7, and alternate

segments to 21. It lacks lateral antennae, has a deeply bilobed prostomium, with triangular anterior lobes and frontal filaments. The median antenna has a short style, and is inserted in the median notch on a small ceratophore.

Since this first description, *L. kincaidi* has been reported from the Northeast Pacific Explorer and Juan de Fuca Ridges (Pettibone, 1988). Subsequently, it has been reported on the Gorda Ridge where it co-occurs with the new species *L. intermedia* Pettibone, 1990. At hydrothermal vents of the Mariana Back-Arc Basin in the western central Pacific, a new species in this genus has been described, *L. raisae* Pettibone, 1989.

The genus *Levensteiniella* is very closely related to *Lepidonotopodium* (subfamily Lepidonotopodinae) but differs in lacking the characteristic notopodial bracts of the Lepidonotopodinae.

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The description of *Levensteiniella plicata* sp. nov., from the deep-sea hydrothermal vents on the East Pacific Rise at 9°50'N forms the subject of the present paper.

Material and methods

Type locality: East Pacific Rise, 9°46'N, 104°21'W. Several specimens were found in the washings from the mussel *Bathymodiolus thermophilus* Kenk & Wilson, 1985 during the HOT 96 and HOPE'99 cruises.

Type material is deposited at the Muséum National d'Histoire Naturelle (MNHN), Paris and at the United States National Museum (USNM), Washington DC.

Holotype (MNHN n° POLY 44) from the site "BIOVENT" 9°46' N, 104°21' W, 2515 m depth (Shank et al. 1998), HOT 96 *Nautile* dive 1073.

Paratypes (MNHN n° POLY 44 ; USNM, n° 186553) from the same vent field [HOT 96 *Nautile* dives 1073 (2 specimens), 1078 (1 specimen), HOPE 99 *Nautile* dives 1373 (1 specimen), 1374 (1 specimen), 1375 (3 specimens), 1376 (2 specimens)].

Two specimens, fixed with 10% formalin in seawater, were prepared for SEM. The specimens were dehydrated, critical point dried with carbon dioxide, mounted, then sputtered with gold and examined with a Philips scanning electron microscope (XL30).

Description of *Levensteiniella plicata* sp. nov.

Holotype: length 57 mm for 28 segments, width 21 mm including chaetae.

The largest paratype has a length of 42 mm for 28 segments, the smallest a length of 11 mm for 28 segments.

The body is long, suboval in outline, flattened dorsoventrally, slightly tapered and rounded anteriorly and posteriorly. Living specimens are pinkish (Fig. 1a), they become light brown after preservation. Chaetae are straw coloured.

The eleven pairs of elytra are located on segment 2, 4, 5, 7, 9, 11, 13, 15, 17, 19 and 21. They are attached

eccentrically on prominent elytophores. The other segments bear dorsal cirri (Figs 1c-e). The elytra are smooth, thick and with a prominent longitudinal fold in their middle (Fig. 1b). They leave uncovered the middle part of the body (Fig. 1a). The last pairs of elytra do not cover the four last posterior segments (Fig. 1c).

The dorsal cirri, on segments lacking elytra, have short bulbous cirrophores on the posterodorsal side of the notopodia (Figs 1d, e). The tapering tip of the styles does not extend beyond the neurochaetae. Laterally, the epidermal surface of both the elytophorous and cirrigerous segments has folds and pits and also numerous ciliated ridges (Figs 1e, f).

The prostomium is trapezoid, deeply bilobed with frontal terminal filaments on the cephalic peaks (Fig. 1g). The ceratophore of the median antenna is short, cylindrical and inserted in the anterior notch. The style is shorter than the palps, tapering in a terminal filament. The lateral antennae and eyes are lacking. The palps are stout, short, each with an articulated terminal filament.

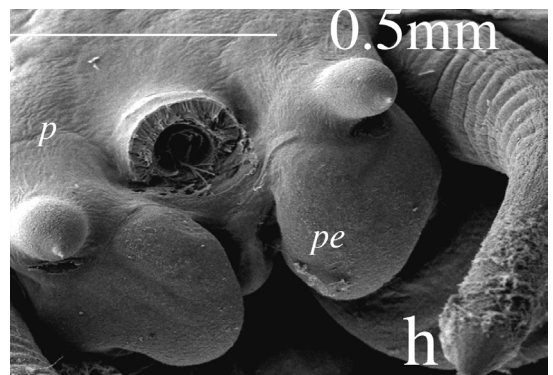
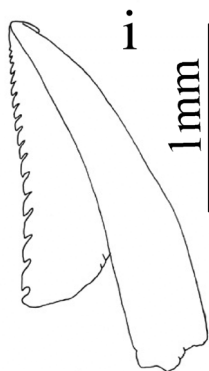
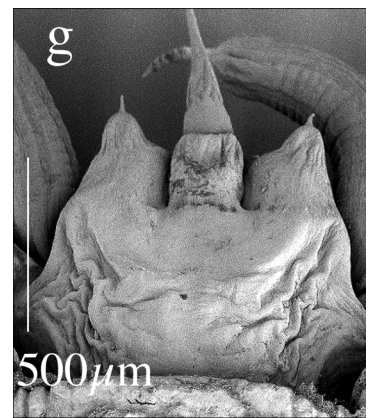
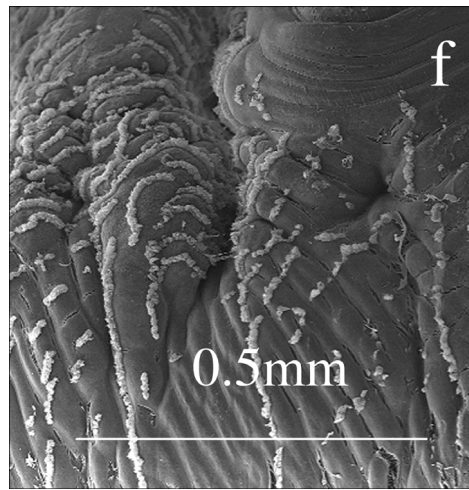
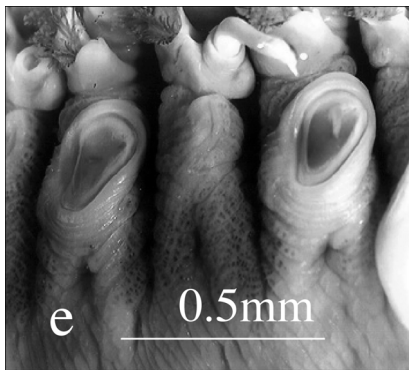
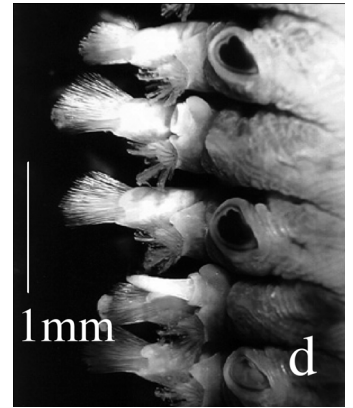
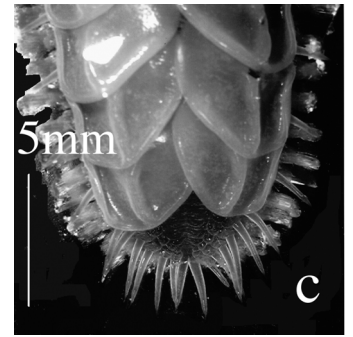
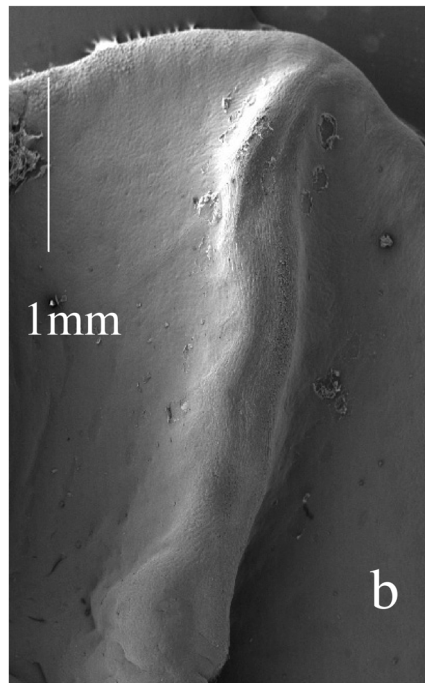
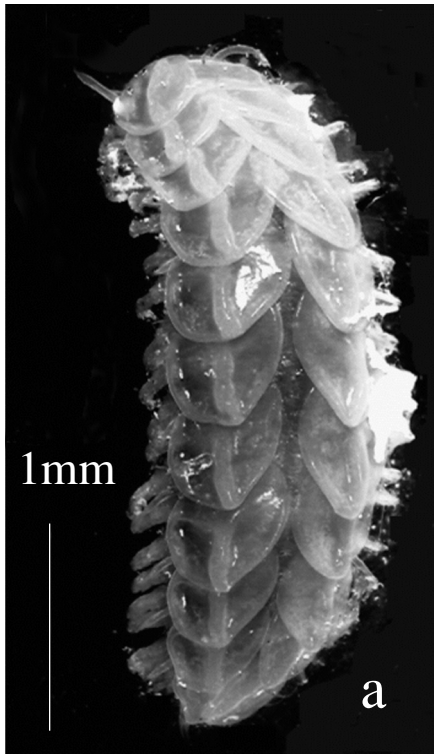
The peristomium, medially slit, forms two lateral lips (Fig. 1h). It is not distinct dorsally and lacks chaetae. The tentaculophores located laterally have each a pair of tentacular cirri longer than the palps, except the ventral ones which are shorter. Both cirri are tapered, ending with terminal filaments.

The second or buccal segment bears the first pair of elytophores and biramous parapodia with the notopodium shorter than the neuropodium. The ventral buccal cirri are similar to the tentacular cirri and longer than the following ventral cirri. The proboscis, poorly muscular, has a rough external epithelium and has never been observed fully everted. Two pairs of straight jaws are present with up to twenty teeth increasing in size from the tip to the base of the jaw (Fig. 1i).

Both rami of the parapodia are well developed. The notopodia, shorter than the neuropodia (Fig. 1d), are rounded and the acicula project from the acicular lobes. The notopodia are rounded with a prominent acicular lobe on lower posterior side (Fig. 2a) from which the acicula

Figure 1. *Levensteiniella plicata* sp. nov., **a, c-e** light microscopy, **b, f-h** scanning electron microscopy. **a** dorsal view of a living specimen. **b** dorsal view of an elytron from mid-body. **c** dorsal view of the posterior end of a living specimen; note the last segments bearing only cirri. **d** dorsal view from S9 (bottom) to S13 (top). **e** close-up view of S9-S11, showing epidermal folds and pits on two segments with elytophores and a cirrigerous segment. **f** bands of cilia on both types of segments. **g** dorsal view of the prostomium with two cephalic peaks and a median antenna. **h** frontal view of the prostomium (*p*) and peristomium (*pe*), median antenna removed. **i** camera lucida drawing of a jaw.

Figure 1. *Levensteiniella plicata* sp. nov., **a, c-e** microscopie optique, **b, f-h** microscopie électronique à balayage. **a** vue dorsale d'un spécimen vivant. **b** vue dorsale d'une élytre provenant du milieu du corps. **c** vue dorsale de la partie postérieure d'un spécimen vivant ; noter les derniers segments du corps portant seulement des cirres. **d** vue dorsale de S9 (bas) à S13 (haut). **e** vue rapprochée de S9-S11, montrant les plis et creux sur deux segments à élytophores et un segment cirrophore. **f** bandes de cils sur les deux types de segments. **g** vue dorsale du prostomium avec deux prolongements céphaliques et l'antenne médiane. **h** vue frontale du prostomium (*p*) et du péri-stomium (*pe*), antenne médiane enlevée. **i** mâchoire, dessin à la chambre claire.



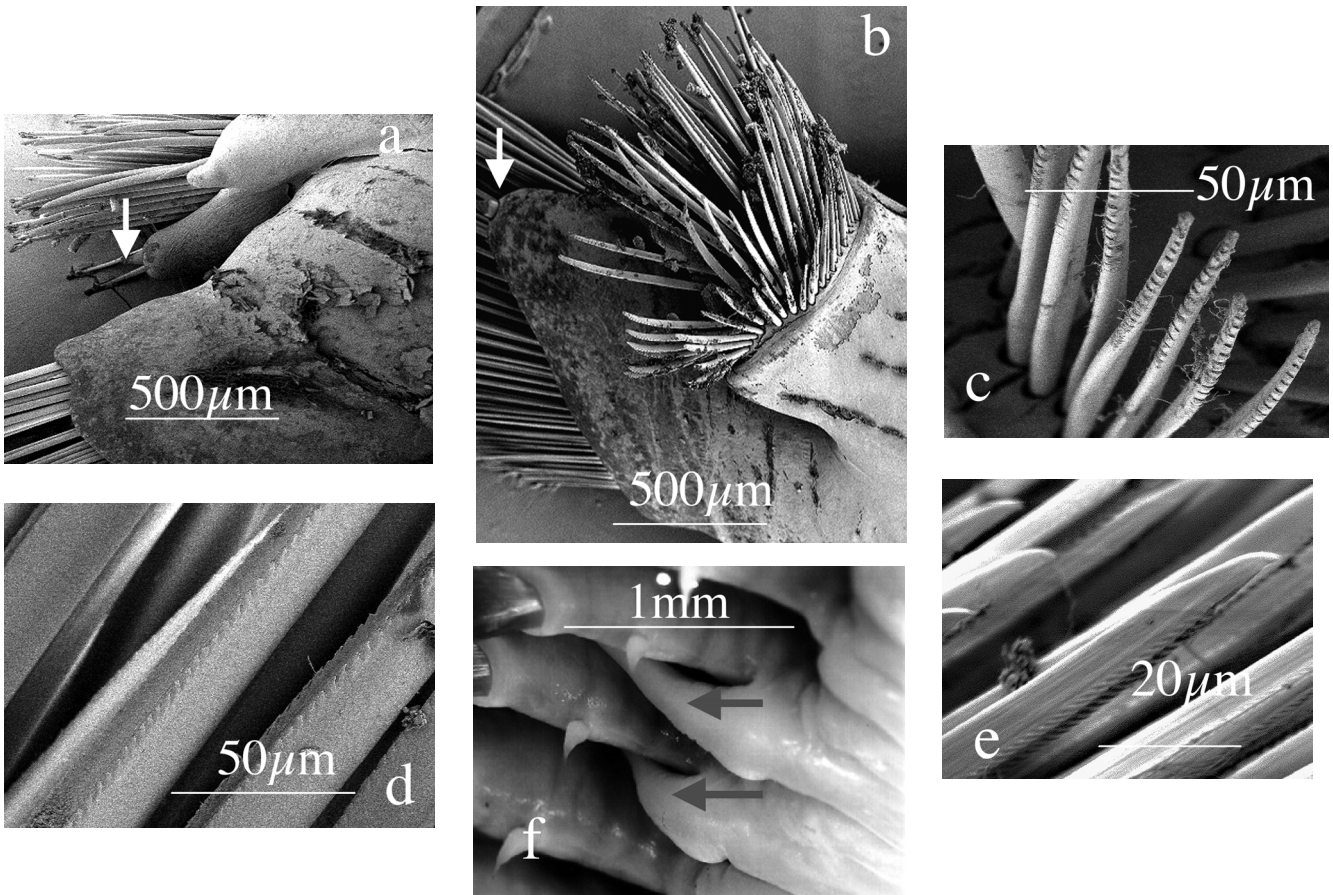


Figure 2. *Levensteiniella plicata* sp. nov., **a-e** scanning electron microscopy, **f** light microscopy. **a** elytriphorous parapodium. *Arrow* points to the projecting dorsal acicula. The postacicular lobe is visible at the top of the picture. **b** antero-dorsal view of a cirriferous parapodium showing the radiating bundle of notochaetae (bearing several epibiotic peritrich ciliates) and the ventral acicula (*arrow*) protruding from the acicular lobe of the neuropodium. **c** notochaetae. **d** lower neurochaetae. **e** upper neurochaetae. **f** ventral view of S11 and S12 with their elongated papillae (*arrows*).

Figure 2. *Levensteiniella plicata* sp. nov., **a-e** microscopie électronique à balayage, **f** microscopie optique. **a** parapode élytriphore. La *flèche* pointe sur l'acicule dorsal. Le lobe post-aciculaire est visible en haut de l'image. **b** vue antéro-dorsale d'un parapode cirriforme montrant les soies notopodiales en faisceau (portant de nombreux Ciliés Péritriches épibiotiques) et l'acicule ventral (*flèche*) sortant du lobe aciculaire du neuropode. **c** soies notopodiales. **d** soies neuropodiales inférieures. **e** soies neuropodiales supérieures. **f** vue ventrale de S11 et S12 avec leurs papilles allongées (*flèches*).

protrudes. A postacicular lobe is well developed on the elytriphorous parapodia (Fig. 2a), while it is fused to the cirriferous parapodia (Fig. 1e). The neuropodia have a short conical acicular lobe on the upper anterior side of the parapodium. The postchaetal lobe is slightly shorter than the prechaetal lobe and has a dorsal slit. The notochaetae are numerous, stouter than the neurochaetae, forming a radiating bundle (Fig. 2b). They are straight, flattened, tapering to blunt tips and with scales on one side (Fig. 2c). The neurochaetae are slender, numerous, forming a fan-shaped bundle. They have two longitudinal rows of spines on one side (Fig. 2d) and their tip is bare and straight. The lower neurochaetae are minutely denticulate

(Fig. 2d), the spines are bigger on the upper neurochaetae (Fig. 2e). The ventral cirri are short, tapered, attached on the middle of the parapodia (Fig. 2f).

Four specimens out of eleven examined (but not the holotype), have two pairs of elongated ventral papillae on segments 11 and 12, inserted basally on the parapodia (Fig. 2f). Their tips extend towards the dorsal side between the parapodia S12-13 and S13-S14, respectively. Other segmental papillae are not obvious. Specimens possessing two pairs of elongated ventral papillae most probably correspond to males, others, without papillae, are most probably females.

Table 1. Characteristics of the four species of *Levensteiniella* known to date.
Tableau 1. Caractéristiques des quatre espèces de *Levensteiniella* connues à ce jour.

	<i>L. kincaidi</i>	<i>L. raisae</i>	<i>L. intermedia</i>	<i>L. plicata</i>
Reference	Pettibone, 1985, 1988	Pettibone, 1989	Pettibone, 1990	This paper
Number of segments	26	27	unknown	28
Position of ventral papillae, when present	2 pairs on segments 11 and 12	2 pairs on segments 11 and 12	single large pair on segment 11	2 pairs on segments 11 and 12
Elytra	filiform micropapillae on border (some with enlarged bases) and surface	macro- and micro-tubercle-papillae on surface and posterior border	thickened bulbous projections on posterior border and oval micropapillae on surface	smooth, a large median longitudinal fold
Jaws	No teeth	No teeth	unknown	ca. 20 teeth
Postsetal lobe	No	No	No	Yes

The pygidium is small, rounded, and bears two short anal cirri (Fig. 1c).

Etymology : *plicata* refers to the folded elytral surface, characteristic of this species.

Discussion

Levensteiniella was erected by Pettibone (1985) for *Levensteiniella kincaidi* from the hydrothermal rift-area off the Galapagos and western Mexico at 21°N. The genus *Levensteiniella* differs from other Macellicephalinae in having 11 pairs of elytra on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, 19 and 21. *Bathynotia perplexa* Levenstein, 1982 differs from *Levensteiniella* in having an unusual distribution of the 11 pairs of elytra (on segments 2,4,5,7, alternate segments to 17, 18, and 20). *Levensteiniella plicata* sp. nov. is a large species that exhibits a distribution of elytra typical of the genus *Levensteiniella*.

It is the fourth species in this genus, that comprises *Levensteiniella kincaidi* Pettibone, 1985, *L. raisae* Pettibone, 1988 and *L. intermedia* Pettibone, 1990. Segments are up to 26 in *L. kincaidi*, 27 in *L. raisae* and an unknown number in *L. intermedia* (Table 1). *Levensteiniella plicata* sp. nov. has 28 segments. As for *Levensteiniella kincaidi* and *L. raisae*, some specimens, most probably males, possess two pairs of ventral papillae on segments 11 and 12, while other specimens, most probably females, have no ventral papillae. In *Levensteiniella intermedia* only a single pair of papillae, on segment 11, has been observed (Pettibone, 1990).

Levensteiniella plicata sp. nov. differs mainly from the other species by the ornamentation of the elytra: these possess filiform micropapillae on their border and surface in *L. kincaidi*, macro- and microtubercle-papillae on their surface and posterior border in *L. raisae*, thickened bulbous

projections on their posterior border and oval micropapillae on their surface in *L. intermedia*. By contrast, in *Levensteiniella plicata* sp. nov. the elytra are smooth, with a conspicuous large folding running longitudinally. Jaws in *L. plicata* have ca. twenty teeth whereas they are smooth in the other species. The presence of the postacicular lobe is also a diagnostic feature of *Levensteiniella plicata*.

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