



A new *Laubieriellus* species (Annelida, Spionidae) from Western Australia

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Abstract

A new annelid species within the *Prionospio*-complex (Spionidae), *Laubieriellus cacatua* **sp. nov.**, is described from material collected from the continental slope off the western margin of Australia. *Laubieriellus cacatua* **sp. nov.** is distinguished by having dorsal crests from chaetigers 6 to 11 and ventral crests on chaetigers 2 to 11. Neuropodial hooded hooks are present from chaetiger 10, with 2 pairs of apical teeth above the main tooth. Ventral sabre chaetae are present from chaetiger 10. This is the first record of *Laubieriellus* in Australia.

Key words: Prionospio, taxonomy, new species

Introduction

The family Spionidae Grube, 1850 comprises benthic annelids characterised by a pair of grooved feeding palps, leaf-like neuropodia and notopodia, dorsal branchiae and a posteriorly-prolonged prostomium (Rouse and Pleijel 2001; Wilson 2000). Spionidae is one of the largest and most diverse annelid families and is widespread and abundant in coastal regions worldwide (Blake and Kudenov 1978). The family currently contains 600 species, with 113 species present in Australian waters (Hutchings and Yerman 2013; Read and Fauchald 2017).

Laubieriellus Maciolek 1981 belongs to a group of genera that also includes the large genus *Prionospio* Malmgren 1987, along with *Aurospio* Maciolek 1981 and *Orthoprionospio* Blake and Kudenov 1978 (*Aquilaspio* Foster 1971 and *Minuspio* 1971 were treated as separate genera within this grouping by some authors, but are now considered synonyms of *Prionospio* (Wilson 1990). *Paraprionospio* Caullery 1914 has also been treated as belonging to this group but differs in several respects from the other genera, including the form of the branchiae and having branchiae commence on chaetiger 1 (Blake and Kudenov 1978; Maciolek 1981a; Wilson 1990; Yokoyama 2007). Phylogenetic relationships between these genera have been investigated by Sigvaldadóttir (1998) and Yokoyama (2007), but the grouping, like the family Spionidae itself (Rouse and Pleijel 2001), is probably not monophyletic. Nevertheless, *Prionospio*-group genera are recognisably similar and are often treated together in taxonomic works.

The genus *Laubieriellus* can be separated from other *Prionospio*-group genera by having ventral crests and lacking notopodial hooded hooks (Maciolek 1981b). Species of this genus possess an anteriorly rounded prostomium, lacking an occipital tentacle, peristomium partly fused with chaetiger 1 and four pairs of branchiae from chaetiger 2. Neuropodial lamellae connect to form ventral crests and notopodial lamellae connect with dorsal crests on anterior chaetigers (Laubier 1970; Maciolek 1981b). *Laubieriellus* currently includes two species, *Laubieriellus grasslei* Maciolek, 1981 and *Laubieriellus salzi* (Laubier, 1970). *Laubieriellus grasslei* occurs at geothermal vents along the Galapagos Rift (2447–2518 m), in the East Pacific Ocean, and *L. salzi* from several locations in the Mediterranean Sea (0.2–5 m, Dagli 2013).

Materials and methods

Sources of material. The material reported in this report is part of a large survey documenting the fauna of the continental slope off the western margin of Australia (Poore *et al.* 2015). Among this material, grab samples from the north-west coast of Australia included specimens of Spionidae, with both dorsal and ventral crests and lacking hooded hooks, described here as *Laubieriellus cacatua* **sp. nov.** The holotype and paratypes are deposited in the collections of Museums Victoria, Melbourne, Australia (NMV). In the material examined list, “complete” refers to an entire specimen, “af” refers to posteriorly incomplete specimens (anterior fragment) and “pf” refers to posterior fragments of specimens.

Description of procedures. Temporary staining of tissue to increase contrast, including methyl green staining (Winsnes 1985) helped a little when viewing small structures. Width was measured at chaetiger 5, excluding parapodia, measurements and drawings were made using a Leica M125 microscope and camera and Leica Application Suite software. Attempts to remove hood of neuropodial hooks by ultrasonic treatment as used by Greaves *et al.* (2011) with *Laonice* proved unsuccessful, perhaps because these *Laubieriellus* specimens are much smaller: ultrasonic treatment caused disintegration of parapodia into unrecoverable fragments before hoods fell away from hooks. Images of hooded hooks were made with Olympus BH-T compound microscope with camera lucida and attached single lens reflex camera. Specimens for scanning electron microscopy were mounted on stubs, critical point dried, sputter coated, and viewed with the Leo Gemini 1525 scanning electron microscope.

Results

Systematics

Family Spionidae Grube, 1850

Genus *Laubieriellus* Maciolek, 1981

Type species. *Prionospio salzi* Laubier, 1970.

Description (emended from Maciolek, 1981b). Prostomium anteriorly rounded, or with slight medial incision, extended posteriorly as a caruncle, occipital tentacle absent. Peristomium distinct from chaetiger 1, partly fused to prostomium. Four pairs of branchiae from chaetiger 2; branchiae elongate, cylindrical, smooth and distinct from notopodial lamellae. Neuropodial lamellae connected by ventral crests from chaetiger 2. Post-branchial notopodial lamellae connected in dorsal crests. Anterior chaetae all capillaries, multidentate hooded hooks present in posterior neuropodia. Notopodial hooks absent. Pygidium with 2 short ventrolateral lobes and 1 dorsomedial cirrus, or 3 subequal lobes or an undifferentiated ring.

Remarks. The new species described here is accommodated by the description of Maciolek (1981b) except that *Laubieriellus cacatua* **sp. nov.** has a smooth pygidial ring, with no pygidial lobes and no dorsomedial cirrus. We have therefore modified the generic diagnosis.

Laubieriellus cacatua **sp. nov.**

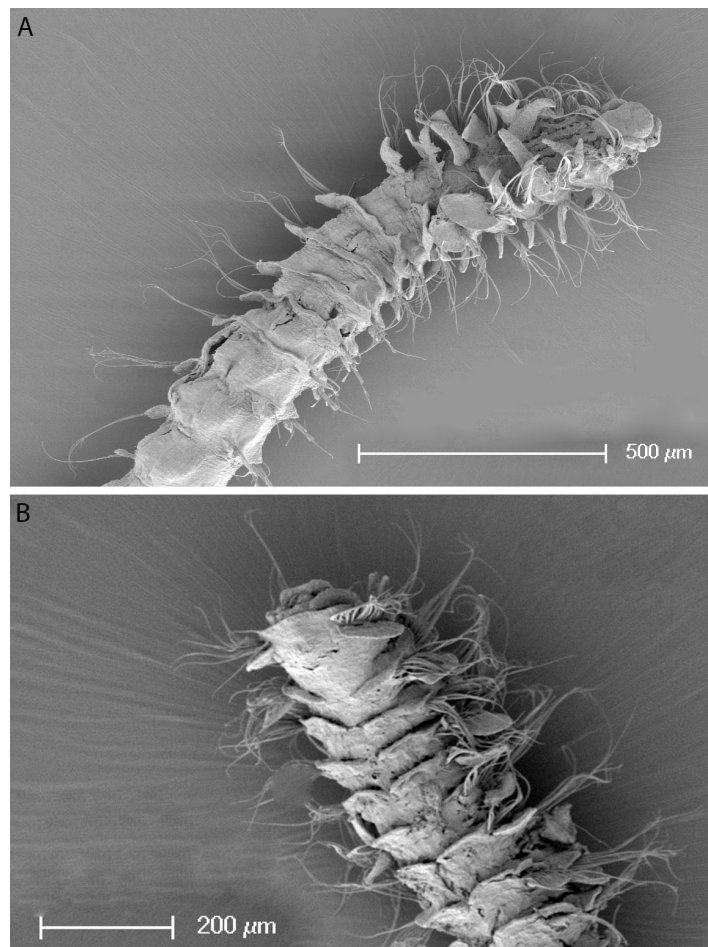
Figures A–L.

Material examined. Australia. Northwestern Western Australia. **Holotype:** Stn SS07/2005 76, Indian Ocean, Carnarvon region, L5, 24° 35.18'S 112° 15.23'E, 405 m, 27 Jul 2005, 1 (complete, NMV F242821). **Paratypes:** Stn SS05/2007 191, Northwestern Australia, Ashmore L30 transect, 12° 30.93'S 123° 25.33'E, 407 m, 6 Jul 2007, paratypes: 2 (af, NMV F110695).—Stn SS05/2007 074, Northwestern Australia, Mermaid L24 transect, 16° 43.88'S 119° 15.36'E, 696 m, 17 Jun 2007, paratype: 1 (af, NMV F167451).—Stn SS07/2005 76, Indian Ocean, Carnarvon region, L5, 24° 35.18'S 112° 15.23'E, 405 m, 27 Jul 2005, paratypes: 4 (4 af, 1 pf, NMV F160691); paratypes: 1 (1 af, NMV F245555); paratypes: 1 (1 complete, NMV F245554).—Stn SS07/2005 173, Indian Ocean, Albany region, T6 100, 35° 20.37'S 118° 16.91'E, 101 m, 8 Aug 2005, paratype: 1 (complete, NMV

F158729).—Stn SS07/2005 182, Indian Ocean, Albany region, T6 150, 35° 21.32'S 118° 17.40'E, 153 m, 9 Aug 2005, paratypes: 2 (2 af, NMV F110702); paratypes: (1 complete, NMV F245553); paratypes: 1 (1 af, NMV F167427); paratypes: 1 (1 complete, NMV F245556).—Stn SS07/2005 183, Indian Ocean, Albany region, T6 200, 35° 21.50'S 118° 17.40'E, 193 m, 9 Aug 2005, paratypes: 3 (af, NMV F158701).

Description. *Holotype*. 0.3 mm wide at chaetiger 5, 6.9 mm long for 43 chaetigers. Yellow-white colour in alcohol, unpigmented. Prostomium broadly rounded with anterior margin slightly indented, extending as caruncle to the base of chaetiger 2 (Figure A, C, E). Peristomium fused with, and surrounding prostomium. Eyes absent. Occipital tentacle absent. Palps missing. Nuchal organs not observed. Notopodial lamellae elongated over dorsum; connected in dorsal crests on chaetigers 6–11, low crests on chaetigers 6 and 11 (Figure A, C, D). Neuropodial lamellae connected in ventral crests on chaetigers 2–11, crests largest on chaetigers 5–7 and low on chaetigers 10–11. Ventral crests incomplete with a small median gap, more so anteriorly, gap reducing posteriorly (Figure B). Branchiae numbering 4 pairs, on chaetigers 2–5 (1 branchia on chaetiger 4 is missing). Branchiae simple, unciliated and slightly longer than notopodial lamellae (Figure C, D, H). The first pair of branchiae are shorter than the following 3 pairs.

Chaetiger 1 with notochaetae and neurochaetae, shorter and thinner than those on following chaetigers. Anterior chaetae all capillaries, notochaetae and neurochaetae arranged in 2–3 rows, with longest chaetae in posterior row (Figure F). From chaetiger 10, neurochaetae are reduced to one row, with sabre chaetae in ventral-most position, followed by hooded hooks and finally several capillary chaetae in dorsal-most position (Figure I). Ventral sabre chaetae usually 1 per fascicle, 2 at most (Figure I). Neuropodial multidentate hooded hooks numbering up to 8 per fascicle; hooks with 2 pairs of apical teeth above main tooth (Figures K, L). Hood opening with serrated edges and almost completely encloses the chaeta (Figure J). Notopodial hooks absent. Chaetal arrangement is otherwise unchanged on posterior chaetigers. Pygidium a short, circular ring, not divided into lobes (Figure G). Pygidial cirrus absent or perhaps lost from all specimens (see Remarks below).



FIGURES A–B. Scanning electron micrographs of *Laubieriellus cacatua* sp. nov. **A.** Anterior end, dorsolateral view, scale: 500µm (NMV F245553) **B.** Anterior end, ventrolateral view, scale: 200µm (NMV F245554).

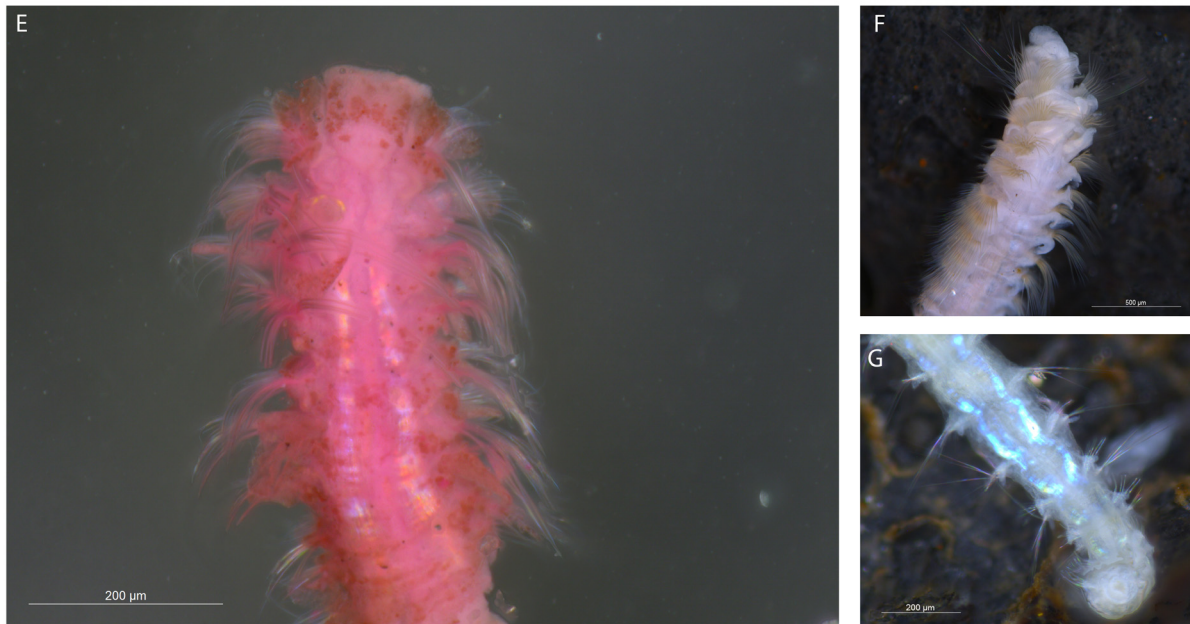
C



FIGURE C. *Laubieriellus cacatua* sp. nov., left branchiae missing from chaetigers 2 and 4, right branchiae missing from chaetiger 5. Branchial scars and other damaged or obscured structures are denoted by dashed lines. Some chaetae are shown to demonstrate their placement, but are not to scale. Scale: 250 μ m (NMV F245553).



FIGURE D. *Laubieriellus cacatua* sp. nov., scale: 200 μ m (holotype, NMV F242821).



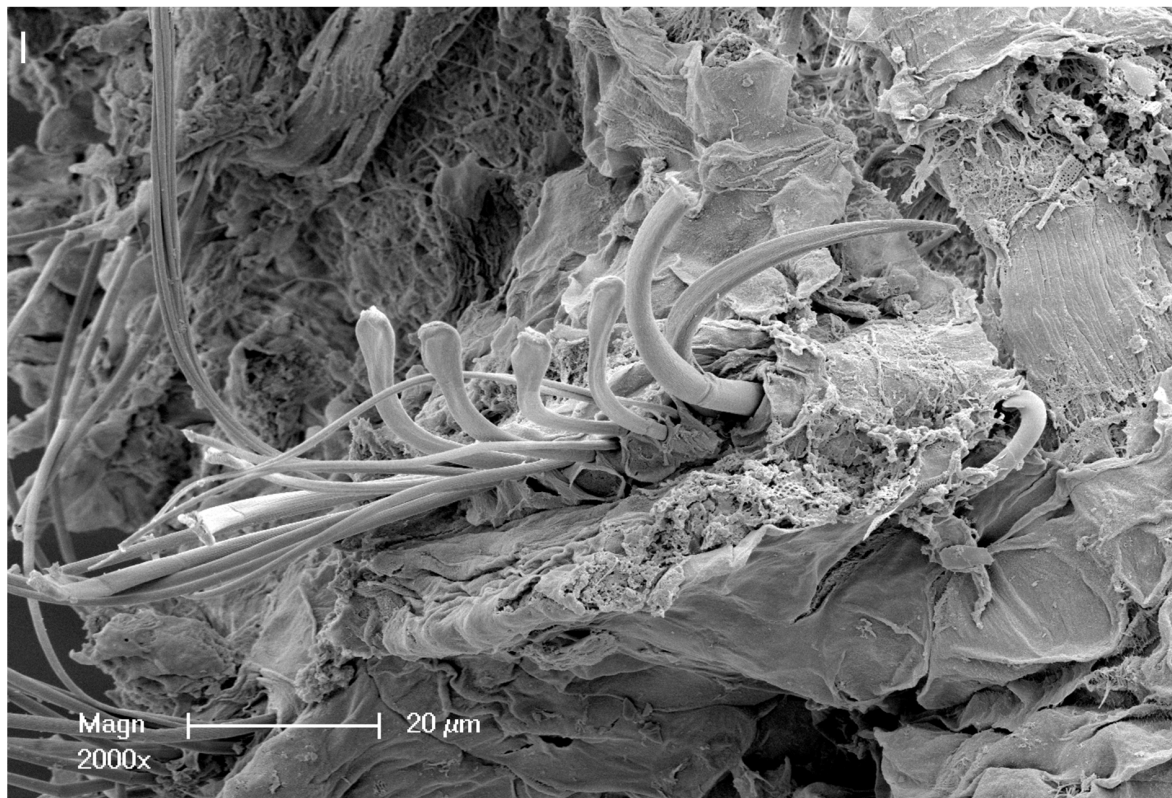
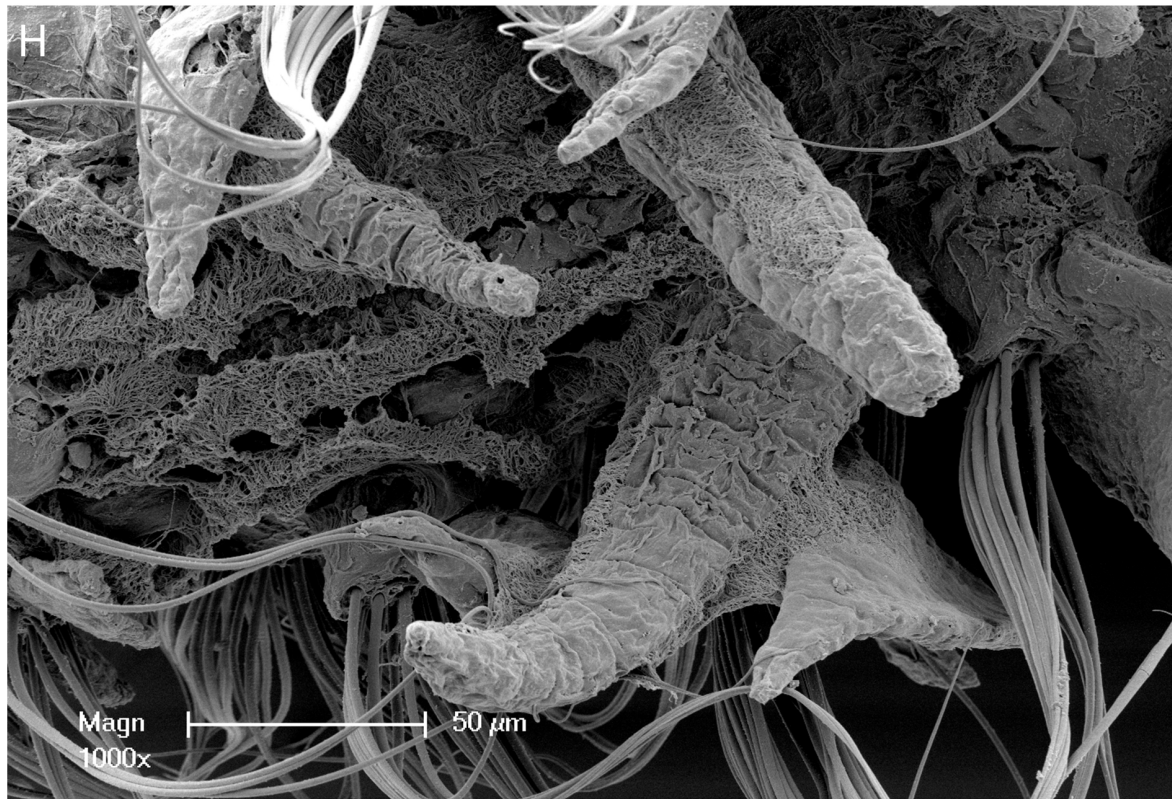
FIGURES E–G. *Laubieriellus cacatua* **sp. nov.** **E.** Anterior end, dorsal view, pigmented eye-spots visible, scale: 500 µm (NMV F245555) **F.** Anterior end, dorsolateral view, scale: 200µm (NMV F167451) **G.** Terminal view, pygidium, scale: 200µm (NMV F245556).

Paratypes. 0.2–0.4 mm wide, 2.9–6.9 mm long with 43 chaetigers. Eyes absent from most specimens, but a pair of lightly pigmented eye-spots can be seen in some specimens (Figure E). Dorsal crests commence on chaetigers 6–7 and end on chaetigers 9–11. Ventral crests start on chaetiger 2 and continue to chaetigers 6–12. Branchiae are present from chaetigers 2–4 to chaetigers 4–5. No specimen possesses a full set of branchiae, but we infer that the branchial distribution is from chaetigers 2–5. Neuropodial multidentate hooded hooks from chaetiger 10 and ventral sabre chaetae from chaetigers 10–11. No ontogenetic variability in taxonomically significant characters was observed within the size range of specimens studied.

Remarks. *Laubieriellus cacatua* **sp. nov.** can be distinguished from the other two species in this genus, *Laubieriellus grasslei* and *Laubieriellus salzi* as follows (Table A). The caruncle of *L. cacatua* **sp. nov.** is shorter and wider than that of the other species, extending to the anterior end of chaetiger 2. *Laubieriellus grasslei* and *L. salzi* have a longer, narrow caruncle extending to chaetiger 3. *Laubieriellus cacatua* **sp. nov.** possess simple, cirriform branchiae, lacking cilia and longest on chaetiger 5, but branchiae are heavily ciliated in *L. salzi* and *L. grasslei*. Branchiae are longest on chaetiger 2 in *L. salzi*, decreasing in size posteriorly. In *L. grasslei*, branchiae are equal in size or the anterior pair is slightly longer than posterior pairs. Dorsal crests are first present on chaetiger 6 in *L. cacatua* **sp. nov.**, but on chaetiger 7 in *L. grasslei* and *L. salzi*.

The three species may also differ by the number of teeth present on the neuropodial hooded hooks. It seems that *L. cacatua* **sp. nov.** has two rows of accessory teeth on neuropodial hooded hooks, as is the case in many species in the *Prionospio*-complex (Blake and Kudenov 1978). Scanning electron microscopy failed to reveal the arrangement and number of accessory teeth, since they are always concealed under the hood, which is opaque under SEM. Despite many light microscopy preparations, we were unable to observe any views of the hooded hook other than the lateral view. The hood itself, even though slightly translucent under the light microscope, still obscures some detail of the apical accessory teeth. Figure K shows all the detail that is visible under light microscope. We were unable to observe the hood in frontal view, but we assume that the apical teeth are in pairs, as present in the other species, so we have drawn what is visible in lateral view. We observed at least two apical teeth above the main tooth, but it is plausible that there is a third, even smaller pair of teeth at the apex of the hook. The number of rows of accessory teeth is also unclear in *L. salzi*: the text and figures of Laubier (1970) and Dagli (2013) contradict one another. According to the original description by Laubier (1970), *L. salzi* has 2 pairs of accessory teeth, although on some chaetae a third pair of minute teeth are visible dorsally. Dagli (2013) states that *L. salzi* has 4 pairs of accessory teeth. It is not surprising that these details of hooded hooks are ambiguously described, the structures are extremely small and difficult to observe. We were unwilling to continue experiments

with destructive observation methods since the species can be distinguished using the easily observed characters listed above. In Australian samples, *Laubieriellus cacatua* sp. nov. is immediately recognisable as the only known Australian spionid with prominent ventral crests.



FIGURES H–I. *Laubieriellus cacatua* sp. nov. **H.** Scanning electron micrograph of simple branchiae, chaetigers 2–3. Chaetiger 2 missing 1 branchiae, scale: 50µm (NMV F245553) **I.** Scanning electron micrograph of chaetiger 11 neurochaetae; capillary chaetae, hooded hooks and sabre chaeta, scale: 20µm (NMV F245554).

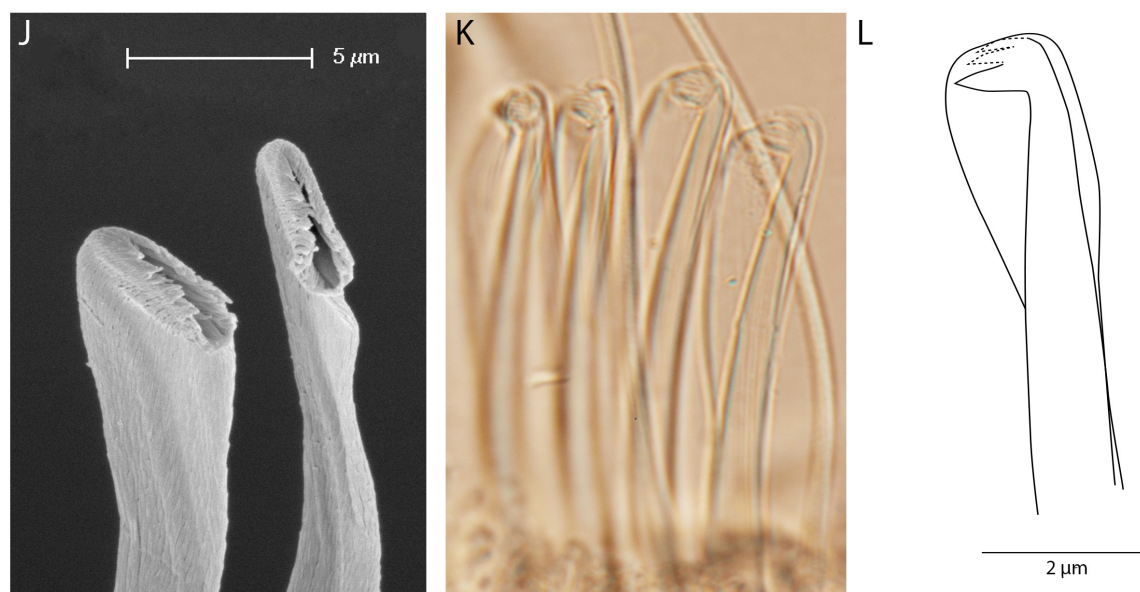
TABLE A. Selected characters of *Laubieriellus* species

Species	Caruncle	Dorsal lamellae on chaetiger 1	Branchiae
<i>Laubieriellus cacatua</i> sp. nov.	short, wide, extending to chaetiger 2	present	simple, cirriform, lacking cilia and longest on chaetiger 5
<i>Laubieriellus grasslei</i> Maciolek, 1981	long, narrow, extending to chaetiger 3	present	heavily ciliated, equal in length or anterior-most pair slightly longer
<i>Laubieriellus salzi</i> (Laubier, 1970)	long, narrow, extending to chaetiger 3	absent	heavily ciliated, longest on chaetiger 2

continued.

Species	Dorsal crests present from chaetiger	Number of sabre chaetae present per neuropodium	Number of pairs accessory teeth present on neuropodial hooded hooks	Pygidium medial cirrus
<i>Laubieriellus cacatua</i> sp. nov.	6	usually 1	2	absent
<i>Laubieriellus grasslei</i> Maciolek, 1981	7	usually 2	3	present
<i>Laubieriellus salzi</i> (Laubier, 1970)	7	1	2–4*	present

*2–3 pairs according to Laubier 1970 and 4 pairs according to Dagli 2013.



FIGURES J–L. *Laubieriellus cacatua* **sp. nov.** **J.** Scanning electron micrograph of hooded hook sheath. Hooded hooks obscured by sheath, scale: 5µm (NMV F245554) **K.** Light microscope image of hooded hooks, scale: 25 µm (NMV F167451) **L.** Lateral view, multidentate hooded hook with 2 pairs of apical teeth above main tooth, one apical tooth of each pair shown, scale: 10µm (NMV F167451).

Laubieriellus cacatua **sp. nov.** has a simple pygidium without appendages, made of a continuous circular ring. It is possible that the pygidial cirrus is fragile and easily damaged, although some doubt remains (we have 29 specimens and 6 are complete posteriorly). In the original description of *L. salzi*, Laubier (1970) described a pygidium consisting of a short circle, without a medial cirrus. However in the Dagli (2013) description of the same species, he adds that the species does possess a medial cirrus. Similarly, the pygidium of *L. grasslei* is formed by 2 short, rounded ventrolateral lobes and one slightly longer, thinner dorsomedial cirrus, or 3 subequal lobes.

Laubieriellus cacatua **sp. nov.** also differs from *L. salzi* by the presence of notopodial lamellae on chaetiger 1,

which are absent from *L. salzi*. In addition, *L. cacatua* **sp. nov.** differs from *L. grasslei* by the number of sabre chaetae present per neuropodium. *Laubieriellus cacatua* **sp. nov.** usually possess 1 sabre chaeta per neuropodium, where *L. grasslei* usually possess 2.

Prionospio rugosa (Sigvaldadóttir 1997) also has ventral crests, but on chaetiger 9 (ventral crests commence on chaetiger 2 in *Laubieriellus*). *Prionospio rugosa* also has pinnate branchiae on chaetigers 2 and 5, and notopodial hooded hooks, neither of which are present in *Laubieriellus* species. Sigvaldadóttir (1997) conducted a phylogenetic analysis based on morphological characters to address the question of a possible close relationship between her new species and *Laubieriellus*; she found instead that *P. rugosa* is more closely related to other species of *Prionospio* than it is to *Laubieriellus*. To this result we would add our view that a ventral crest on chaetiger 2 cannot be homologous with a ventral crest on chaetiger 9. Sigvaldadóttir (1997) simply coded ventral crests as a single character (present/absent); treating the ventral crests of *P. rugosa* and *Laubieriellus* as different characters would remove an inferred parallelism between the two taxa and further distance *P. rugosa* from *Laubieriellus*.

Distribution. *Laubieriellus cacatua* **sp. nov.** occurs off the West Australian coast in the Indian Ocean (101–696 m).

Etymology. *Cacatua* is a genus of cockatoos, containing birds known for their expressive, feathered crests. The epithet ‘*cacatua*’ refers to the spionid’s ventral crests, a character that places this species in the genus *Laubieriellus*.

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