

***Buckleyella ornata* n. sp. (Nematoda: Philometridae) from the abdominal cavity of the talang queenfish *Scomberoides commersonnianus* (Perciformes: Carangidae) off the northern coast of Australia**

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Summary

A new nematode species, *Buckleyella ornata* n. sp. (Philometridae), is described from female specimens found in the abdominal cavity (mesenteries) of the talang queenfish *Scomberoides commersonnianus* Lacepède (Carangidae, Perciformes) caught in Darwin Harbour, northern Australia. Based on light and scanning electron microscopical examination, the new species mainly differs from the only other congeneric species *B. buckleyi* Rasheed, 1963 in having a markedly shorter oesophagus (2.04 – 2.75 mm long), by the absence of a cephalic mound around the mouth aperture, by the presence of four submedian cephalic papillae of the inner circle, and by a somewhat different arrangement of cuticular ornamentations on the body surface. Three protruding oesophageal teeth and large, dome-shaped cephalic papillae of the external circle present in the smallest gravid female of *B. ornata* are atrophied in larger conspecific gravid females. *Buckleyella ornata* is the first known nominal species of a philometrid parasitizing carangid fishes in Australian waters.

Keywords: Parasitic nematode; new species; Dracunculoidae; marine fish; Darwin Harbour

Introduction

The present knowledge of philometrid nematodes (Philometridae) parasitizing marine fishes in Australian waters is relatively poor (Johnston & Mawson, 1940; Rasheed, 1963; Moravec & Rohde, 1992; Hesp *et al.*, 2002; Moravec & Diggles, 2014). During parasitological investigations on some marine fishes in Darwin Harbour, northern Australia carried out in 2013, philometrid nematodes (only females) were found in the mesenteries of the talang queenfish *Scomberoides commersonnianus* Lacepède (Carangidae, Perciformes). Close examination revealed that they represented a new species of the hitherto monotypic genus *Buckleyella* Rasheed, 1963, which is described be-

low. *Scomberoides commersonnianus* (maximum body length 120 cm, maximum weight 16 kg) is a tropical marine commercial and game fish which occurs throughout the tropical and subtropical Indo-West Pacific region. Adult queenfish inhabit coastal waters, frequently near reefs and offshore islands (Froese & Pauly, 2014).

Materials and methods

Queenfish (n = 36, mean fork length (FL) 47.6 cm, range 30.4 – 76.1 cm, mean weight 1.2 kg, range 0.308 – 4.8 kg) were collected using a gill net from Darwin Harbour (12°29' S, 130°49' E) in October 2013 and both Darwin Harbour and Bynoe Harbour (12°41' S, 130°34' E), in March 2014. They were euthanased by brain destruction (iki-jime), placed in a sealed plastic bag and stored on ice for transportation back to the laboratory for further examination. At the laboratory the fish was measured (length/weight) and examined externally by eye for lesions. The paired fins (pectoral/pelvic), operculum and gill arches on the left side of each fish were then excised and examined under a dissection microscope. The fish was then cut open and all internal organs were grossly examined for parasites and then were fixed in 4 % formalin.

The philometrid nematodes obtained were washed in physiological saline and were then fixed and preserved either in 4 % formalin or 70 % ethanol. Formalin-fixed viscera of the infected fish specimen were also thoroughly examined for a possible presence of conspecific philometrid males, but no males were found. For light microscopical examination, the nematodes were cleared with glycerine. Drawings were made with the aid of a Zeiss drawing attachment. Specimens used for scanning electron microscopy (SEM) were postfixed in 1 % osmium tetroxide (in phosphate buffer), dehydrated through a graded acetone series, critical-point-dried and sputter-coated with gold; they were examined using a JEOL JSM-7401F scan-

ning electron microscope at an accelerating voltage of 4 kV (GB low mode). All measurements are in micrometres unless otherwise indicated. The fish nomenclature adopted follows FishBase (Froese & Pauly, 2014).

Results

Family Philometridae Baylis et Daubney, 1926

Buckleyella ornata n. sp.
(Figs. 1 – 3)

Description: Female (2 complete and 3 fragmented specimens; measurements of holotype in parentheses): Body of live specimens red-coloured; fixed specimens yellowish with dark-brown intestine visible through cuticle, filiform, 40 – 180 (180) mm long; maximum width 390 – 1,170

(1,170) at region just posterior to oesophagus; body tapering at both ends. Width of cephalic end 286 – 367 (367), of posterior end 122 – 381 (381). Maximum width/length ratio of body 1:102 – 154 (1:154). Except for ends, body rectangular to nearly square-shaped at cross-section, with broad lateral fields formed by smooth, transversely wrinkled cuticle (Fig. 3F); cuticle of dorsal and ventral sides of body with numerous rod-like cuticular mounds situated on top of transversely elongated elevations of cuticle up to 272 (272) wide, appearing at body margin as small elevated bosses (Figs. 1F, I – K, 2C – G, 3C, E, F); these ornamentations arranged in patterns covering body surface from anterior to posterior ends in larger specimens, but starting at rather long distance posterior to cephalic extremity in smallest specimen (Fig. 2D). Cephalic end truncated. Oral aperture oval, surrounded by 8 medium-sized cephalic papillae of external circle arranged in 4 subme-

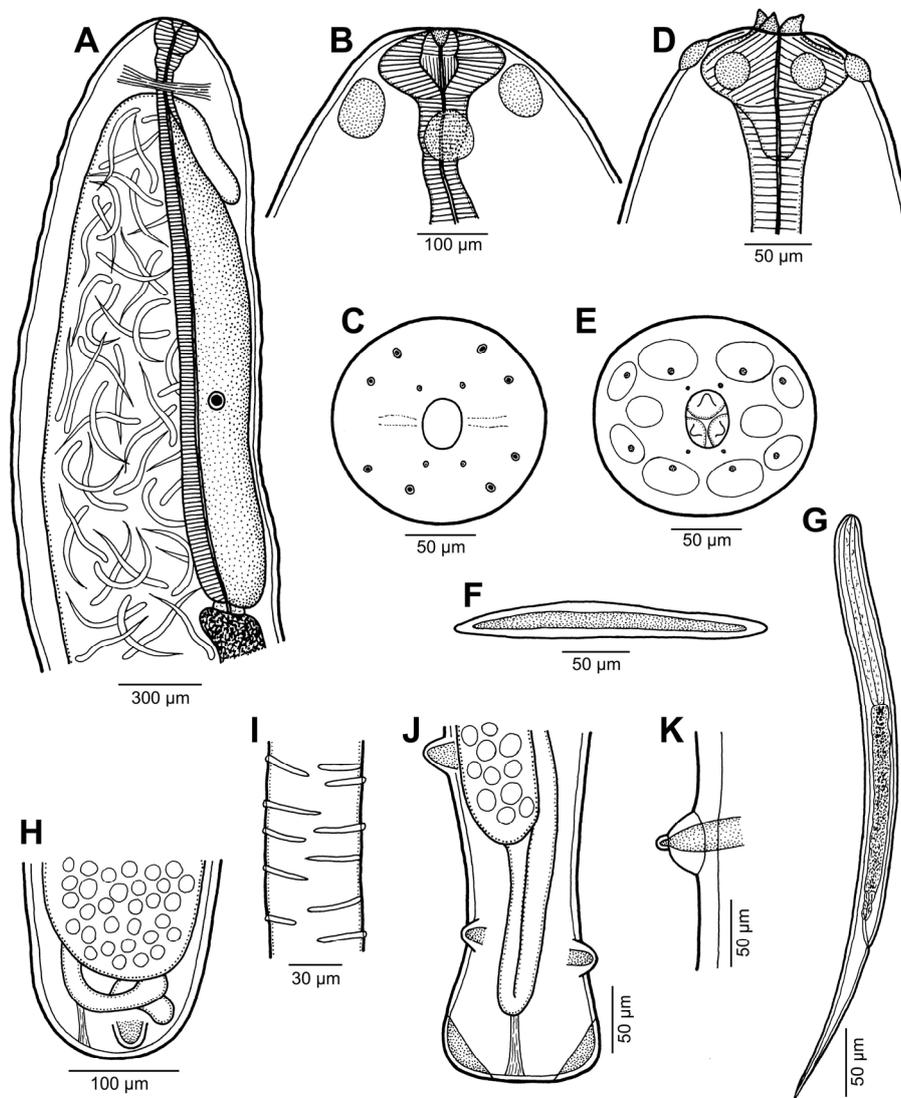


Fig. 1. *Buckleyella ornata* sp. n., gravid females. A – anterior end of larger specimen, lateral view; B, D – cephalic end of larger and smallest specimens, respectively, lateral views; C, E – cephalic and of larger and smallest specimens, respectively, apical views; F – rod-like mound on transversely elongated cuticular elevation; G – larva from uterus; H – caudal end of larger specimen, lateral view; I – dorsal cuticular ornamentations at mid-body of larger specimen; J – caudal end of smallest specimen, dorsoventral view; K – cuticular ornamentation, lateral view

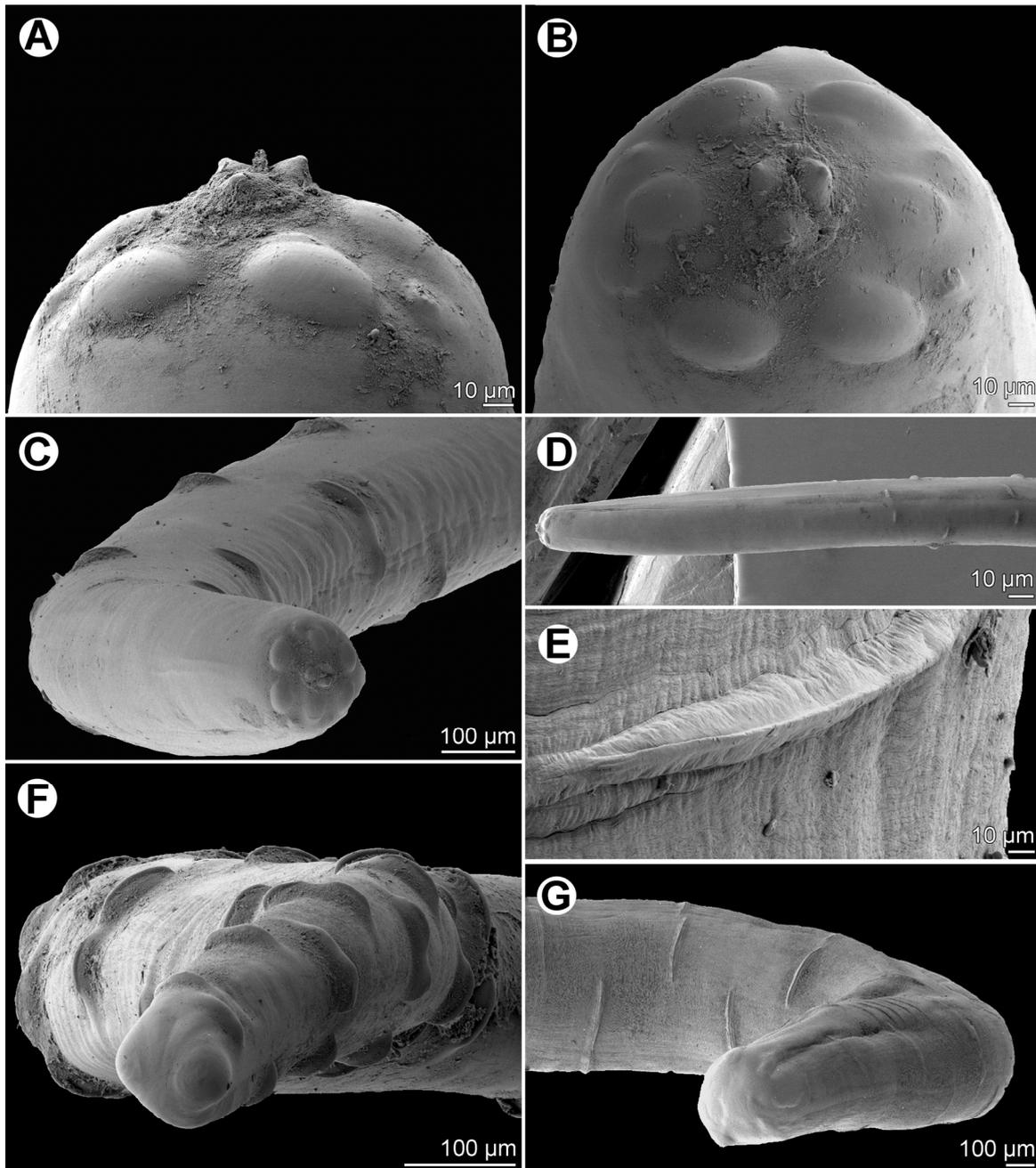


Fig. 2. *Buckleyella ornata* sp. n., scanning electron micrographs of gravid females. A,B – cephalic end of smallest specimen, dorsal and apical views, C,D – anterior end of smallest specimen, different positions, E – cuticular ornamentation, subapical view, F,G – caudal end of smallest and larger specimens, respectively

dian pairs, and 4 smaller submedian papillae of internal circle; each external papilla situated on top of large, dome-shaped elevation filled with glandular tissue in smallest specimen (40 mm long) (Figs. 1D,E, 2A,B); such elevations not discernible in larger specimens, but respective oval glandular formations still observable inside tissue surrounding anterior oesophageal bulb (Figs. 1B,C, 3A – D). Two large lateral dome-shaped elevations present in smallest specimen (Figs. 1E, 2A,B), probably representing amphids without outlets, are absent in larger specimens (Figs. 1C, 3A – D). Three conspicuous, conical oesophageal teeth 21 high protruding out of mouth in smallest specimen 232

(Figs. 1D,E, 2A,B), but absent in larger specimens (Figs. 1A,B, 3A – D). Anterior end of oesophagus forms distinct onion-shaped bulb 204 – 258 (245) long and 204 – 258 (245) wide. Oesophagus muscular, provided with large oesophageal gland extending from its posterior end to level of nerve ring; oesophageal gland with large cell nucleus at middle (Fig. 1A). Entire oesophagus including anterior bulb 2.04 – 2.75 (2.75) mm long, representing 2 – 6 (2) % of body length; maximum width of oesophagus including oesophageal gland 204 – 367 (367). Small ventriculus 54 – 68 (68) long and 109 – 150 (150) wide present. Nerve ring and cell nucleus of oesophageal gland 272 – 381 (340) and

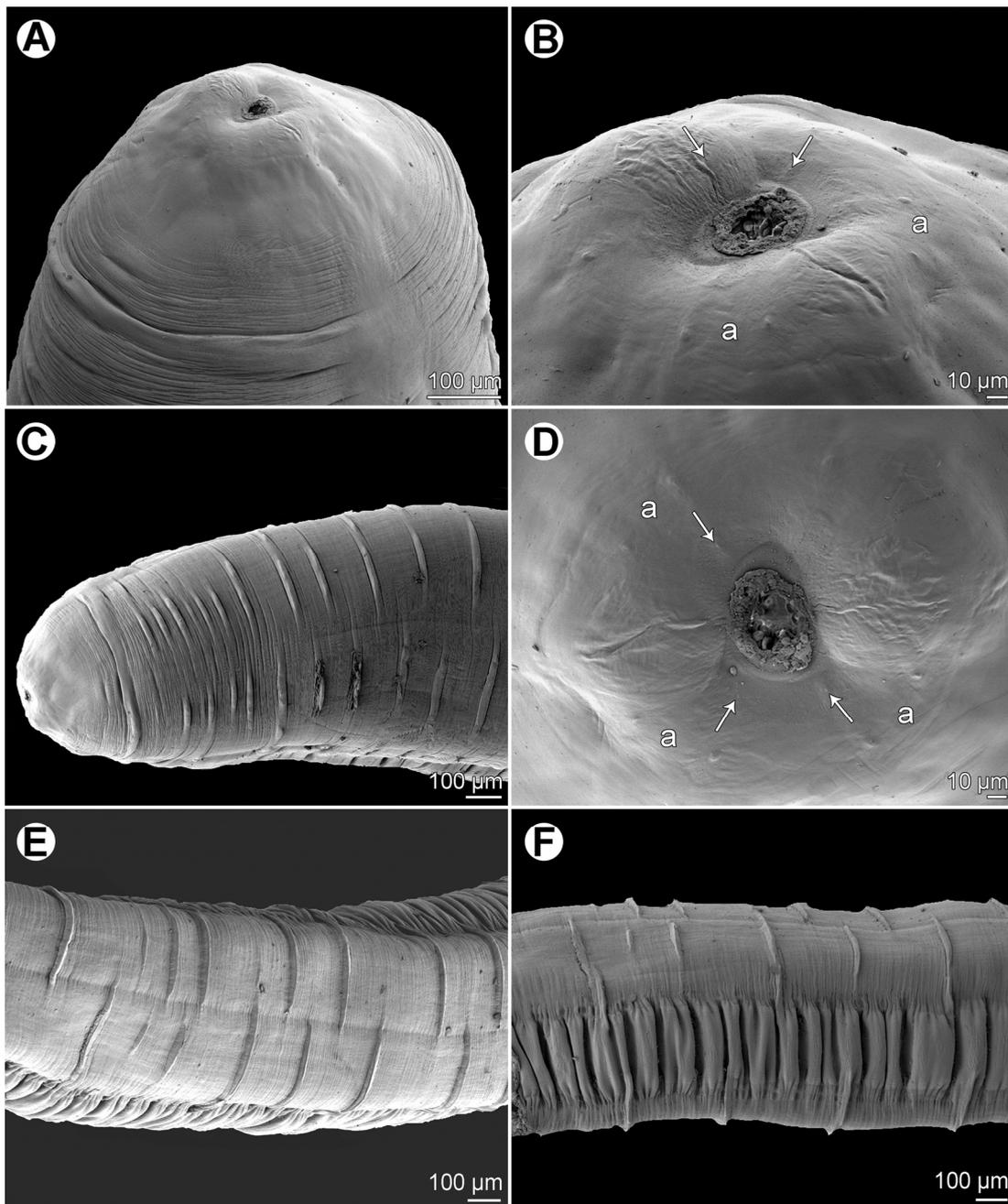


Fig. 3. *Buckleyella ornata* sp. n., scanning electron micrographs of larger gravid female. A,B cephalic end at different magnifications, sublateral view (arrows indicate internal cephalic papillae), C – Anterior end of body, dorsoventral view, D – cephalic end, apical view (arrows indicate internal cephalic papillae), E,F – middle part of body, dorsoventral and lateral views. Abbreviation: a – pair of external cephalic papillae

1.16 – 1.89 (1.89) mm, respectively, from anterior extremity (Fig. 1A). Intestine dark-brown, narrow, its posterior part attached by ligament to ventral body wall near posterior extremity. Ovaries reflexed, situated near body ends (Fig. 1A,H,J). Uterus occupying almost entire space of body, reaching anteriorly to level of nerve ring and posteriorly almost to body end in larger specimens. Vagina and vulva absent. Uterus contains numerous larvae at its anterior portion and many eggs at posterior part. Larvae (n = 5) 450 – 480 long and 15 – 18 wide, with rounded anterior and sharply pointed posterior ends (Fig. 1G); length of

oesophagus 135 – 156 (28 – 35 % of body length), of tail 108 – 126 (23 – 27 % of body length). Posterior end of body of adults narrow, rounded, with rather large rounded lateral caudal projections (Figs. 1H,J, 2F,G).

Male: Unknown.

Taxonomic summary

Type host: Talang queenfish *Scomberoides commersonianus* Lacepède (Carangidae, Perciformes); female, 76.1 cm (FL), weight 4.8 kg.

Site of infection: Abdominal cavity (mesenteries).

Type locality: Darwin Harbour, northern Australia (collected 9 October 2013).

Prevalence and intensity: 1 fish infected/36 fish examined; 5 nematode specimens. These worms were found only in the largest female queenfish sampled, which had well developed, late stage gonads (gonad weight 185 g). They were not observed in other *S. commersonianus* (n = 59, mean FL 49.7 cm, range 26.0 – 76.0 cm) examined for internal nematodes from northern Australia during previous sampling events between August 2012 and March 2013 as described by Moravec and Diggles (2014), suggesting the overall population prevalence for this parasite may be around 1.05 % (1 fish infected/95 fish examined).

Type specimens: Holotype and paratypes (SEM stubs and body fragments in vials) in the Helminthological Collection of the Institute of Parasitology, Biology Centre of the Academy of Sciences of the Czech Republic, České Budějovice (Cat. No. N–1049).

Etymology: The specific name of this nematode is a Latin adjective (*ornata* = ornamental) relating to characteristic cuticular ornamentations on the body surface.

Discussion

In having typical cuticular ornamentations on the body surface (presence of transversely elongated elevations bearing rod-like formations) and a similar general morphology, these specimens belong to the hitherto monotypic genus *Buckleyella*. This is also supported by the fact that they were collected from a fish congeneric to the host of the only other species of this genus, *B. buckleyi* Rasheed, 1963, and the site of infection (mesenteries) of these two forms is identical. However, the presence of conspicuous oesophageal teeth and large dome-shaped cephalic papillae, diagnosed for *Buckleyella* by Rasheed (1963), were observed only in the smallest specimen, whereas these features were absent from available larger specimens. Probably the conical oesophageal teeth (three anterior oesophageal lobes protruding out of the mouth) and the dome-shaped elevations of cephalic papillae gradually disappear as the gravid female nematodes increase in size. The presence/absence of oesophageal teeth in conspecific philometrid gravid and subgravid females were also observed in *Philometra* sp. from the subcutaneous tissue of *Mycteroperca microlepis* (Goode et Bean) (Serranidae) in the Gulf of Mexico and in *Spirophilometra endangae* Dewi et Palm, 2013, a parasite of fins of *Epinephelus coioides* (Hamilton) (Serranidae) off Indonesia and Australia (Moravec *et al.*, 2010; Moravec & Diggles, 2014).

The only species of *Buckleyella*, *B. buckleyi*, was described by Rasheed (1963) based on available female specimens collected from the mesentery of the carangid *Scomberoides tala* (Cuvier) (reported as *Chorinemus tala*) from off the coast of Pakistan. Later, *B. buckleyi* was reported by Parukhin (1966, 1971) from the type host and from *Scomberoides lysan* (Forsskål) from the Red and South

China Seas (see also Moravec, 2006). Type specimens of *B. buckleyi*, housed in the Natural History Museum, London, were re-examined by Moravec and Harris (2010), who had also examined by SEM one non-type specimen of Rasheed's original collection.

The general morphology and measurements of gravid females of *B. ornata* n. sp. are similar to those of *B. buckleyi*, but the former species distinctly differs from the latter in having a conspicuously shorter oesophagus (2.04 – 2.75 mm vs. 3.96 – 5.10 mm), although the specimens were mostly larger than *B. buckleyi* specimens described by Rasheed (1963). In addition, the oral aperture of *B. buckleyi* is surrounded by a marked cephalic mound separated from the rest of the body by a deep groove (Moravec & Harris, 2010), which is absent in the new species. *Buckleyella ornata* also differs in possessing four submedian cephalic papillae of the inner circle (not observed in *B. buckleyi*). Moreover, the anterior oesophageal bulb of *B. buckleyi* is distinctly broader (204 – 258 µm vs. 140 – 150 µm) and the distribution of cuticular ornamentations on the anterior end of body seems to be different (see Fig. 2C of Moravec & Harris, 2010 and Fig. 3C of the present paper); the presence of prominent broad lateral fields without characteristic ornamentations, extending along the body, were not reported for *B. buckleyi*. It can be expected that more interspecific features will be found when the so far unknown males of these two species are discovered and described.

The three large conical oesophageal teeth as in *B. buckleyi* and in the smallest specimen of *B. ornata* of the present material were also described in a few representatives of two other philometrid genera, *Caranginema americanum* Moravec, Montoya-Mendoza et Salgado-Maldonado, 2008, a subcutaneous parasite of *Carax hippos* (Linnaeus) (Carangidae) in the Gulf of Mexico (Moravec *et al.*, 2008), *Philometra sydneyi* Rasheed, 1963, a poorly known parasite of the subcutaneous tissue of an unidentified “large white fish” (a carangid?) from Sydney, Australia (Rasheed, 1963), and *Philometra tricornuta* Moravec et Ali, 2014 from the musculature of *Saurida tumbil* (Bloch) (Synodontidae) in the Persian Gulf (Moravec & Ali, 2014). Large conical oesophageal teeth, similar to those of *Buckleyella* spp., were also illustrated by Deardorff *et al.* (1986) for an unidentified *Philometra* sp. observed under the skin and in the musculature of *Caranx melampygus* Cuvier (Carangidae) off Hawaii.

As mentioned by Rasheed (1963), the cuticularized oesophageal teeth of *B. buckleyi* can be moved in and out of the mouth and are used primarily in the penetration of the blood vessels and the tissues. Although the author writes that “the cuticularized teeth are most certainly present in all the stages of development”, in fact she found two gravid specimens (out of about 30 examined) to be devoid of these teeth and possessing “smaller head papillae”. However, it can be deduced from the available specimens of *B. ornata* that protruding oesophageal teeth and large-sized external cephalic papillae occur in small-sized gravid females of this species; but gravid females continue to

grow considerably and their oesophageal teeth and large-sized external cephalic papillae are gradually atrophied during this process. The present data indicate that the gravid females of *B. ornata* may increase their body length 4.5 times (twice in *B. buckleyi*).

Fishes of the Carangidae are frequently found to be infected with philometrid species of *Buckleyella*, *Caranginema* Moravec, Montoya-Mendoza et Salgado-Maldonado, 2008, *Philometra* Costa, 1845 and *Philometroides* Yamaguti, 1935, which parasitize different organs of their hosts (Moravec, 2006; Moravec *et al.*, 2008; Moravec & Justine, 2014). *Buckleyella ornata* n. sp. is the first nominal species of the Philometridae known to parasitize carangid fishes in Australian waters.

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