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Validation and Redescription of *Iais singaporensis* Menzies & Barnard, 1951, a Commensal with *Sphaeroma triste* Heller, 1865, from a Malaysian Coral Reef

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With 35 Figures

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Abstract

Iais singaporensis Menzies & Barnard, 1951 is redescribed based on material from the east coast of the Malayan Peninsula. It was found associated with the wood-boring isopod *Sphaeroma triste* Heller, 1865. Males of *I. singaporensis* and *I. californica* (Richardson, 1904) show a remarkable sexual dimorphism in the reduction of the fourth pereopods. Examination of the type material shows that *Iais singaporensis* is a distinct species and not conspecific with *I. californica* (Richardson, 1904) as generally stated.

Species of the janirid genus *Iais* Bovallius, 1886 are generally known as commensals of isopods in the family Spaeromatidae, particularly the genus *Sphaeroma* BOSC, 1802. The taxonomic history of the genus *Iais* is confusing, and detailed descriptions and figures do not exist for any of the nominal species.

While investigating the crustacean fauna of a fringing reef at Pulau Babi Besar, off Mersing, on the east coast of the Malayan Peninsula, many specimens of *Iais singaporensis* Menzies & Barnard, 1951 were collected by the senior author associated with the wood-boring isopod *Sphaeroma triste* Heller, 1865 in dead palm wood on the reef-flat. The identity of *I. singaporensis* is confirmed, and this species is found to exhibit a sexual dimorphism in the reduction of the 4th pereopods in mature males, a feature also noted in passing (but not figured) by Rotramel (1975) for *I. californica.* This feature may prove to be diagnostic of the genus *Iais*.

Iais singaporensis was considered conspecific with *Iais californica* (Richardson, 1904) by Hurley (1956). Our study of male and female paratypes of *I. singaporensis*, and the female holotype of *I. californica* (plus additional non-type material of this species from throughout Californica), revealed Hurley's decision to be incorrect. Distinguishing features for both species are provided below. Because the original published description of *I. singaporensis* did not show the critical features for its recognition, it is herein re-described in detail, including its remarkable sexual dimorphism.

Specimens of *Iais singaporensis* and *Sphaeroma triste* are deposited in the following collections: National Museum of Natural History, Smithsonian Institution, Washington, D. C. (USNM); San Diego Natural History Museum (SDNHM), Muséum national d'Histoire Naturelle; Paris (MNHN), Muséum d'Histoire naturelle, Genève (MHNG), Zoologisk Museum, Copenhagen (ZMC), Zoologisches Museum Berlin (ZMB), Senckenberg Museum, Frankfurt (SMF), and in the senior author's private collection (HGM).

Iais singaporensis MENZIES & BARNARD, 1951 (Figs. 1–28)

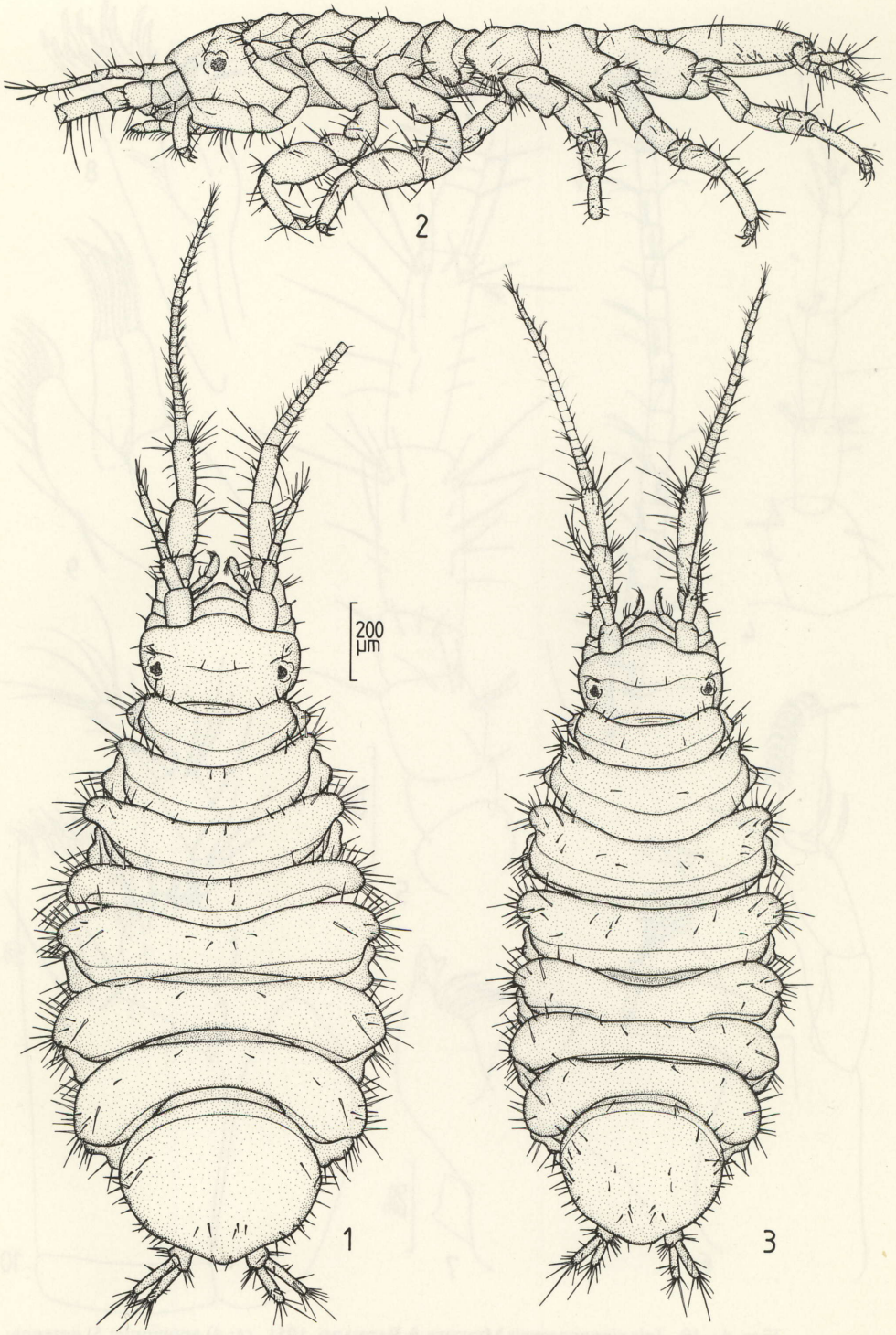
Iais singaporensis MENZIES & BARNARD, 1951: 144, PLS. 46–48. – HURLEY, 1956: 715, 717 [text].

Material examined. – Paratypes: 2 ♂♂, 3 immature adults, 1 ovigerous ♀ (Los Angeles County Museum, LACM 50–73.1), Singapore; Seletar and Punggol; leg. Raffles Museum, May – June 1950.

Additional material: 44 ♂♂, 44 ♀♀ (27 ovigerous, 10 larvigerous), 3 immature adults, deposited as follows. – 10 ♂♂, 10 ♀♀ (8 ovigerous, 1 larvigerous) (USNM); 9 ♂♂, 5 ♀♀ (2 ovigerous, 2 larvigerous), 1 immature adult (SDNHM); 17 ♂♂ (1 dissected), 20 ♀♀ (10 ovigerous, 6 larvigerous) (ZMB); 3 ♂♂, 4 ♀♀ (3 ovigerous, 1 larvigerous), 2 immature adults (MNHN); 2 ♂♂, 2 ovigerous ♀♀ (HGM); 1 ♂, 1 ovigerous ♀ (SMF); 1 ♂, 1 ovigerous ♀ (MHNG); 1 ♂, 1 ♀ (ZMC); Malaysia, fringing reef at Pulau Babi Besar; in dead palm wood on reef-flat, associated with *Spaeroma triste* HELLER, 1865, lower intertidal zone; collected by H.-G. Müller, 7 April 1991.

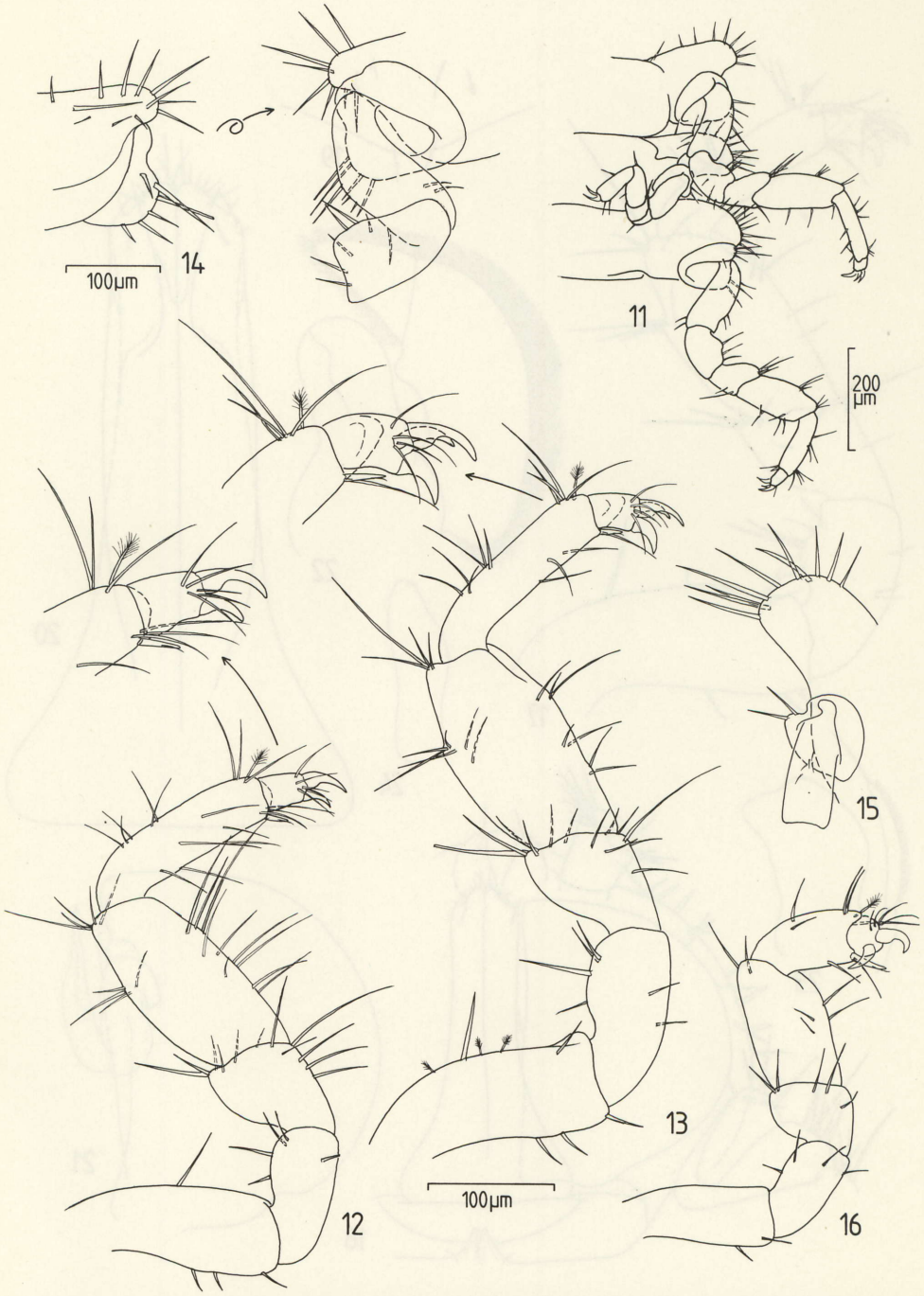
Description, ♂: Length (front of cephalon to apex of pleotelson) 1.3–1.7 mm; body colourless, twice as long as wide, widest at pereonite 6; relative lengths of body segments (along midline) C>1<2 = 3>4<5<6 = 7. All body segments with a fine transverse furrow. Dorsum of body with some short setae and spines; lateral margins of all segments with many slender spines. Cephalon 1.7 times wider than long, with slightly convex lateral margins, rounded anterolateral margins and broadly rounded frontal margin; dorsolateral eyes positioned in posterior half of cephalon, composed of what appears to be 3 relatively large, well pigmented ommatidia. Pereonites 2 and 3 with rounded, spinose anterolateral lobe; posteroventral margin of 7th pereonite with pair of short, triangular penes. Free pleonite very short, somewhat hidden beneath posterior margin of pereonite 7. Pleotelson 1.2 times wider than long, with convex lateral margins and narrowly rounded apex. Lateral lobes of anus not covered by distal part of first pleopods.

Antennule, 1/5 length of body, 6-articulate; proximal article 1.2 times longer and 2 times wider than second article; 5th article elongate-slender, as long as articles 3 and 4 together; two distal articles each bearing one short aesthetasc. Antenna 2/3 length of body; peduncle 6-articulate, with 4 short proximal and two longer, setose distal articles; flagellum much longer than peduncle, of 24 setose articles. Mandible with 3-articulate palp; second article with 2 fringed spines and a seta near distal margin; distal article with 11 curved, fringed spines and a short proximal seta; incisor of left mandible 4-cuspidate, lacinia 6-cuspidate, spine-row of 4 combed spines; triturative molar large, relatively slender; incisor of right mandible 7-cuspidate, lacinia mobilis absent; spine-row of 5 combed spines. First maxilla, outer ramus with 11 strong combed spines; narrow inner ramus with 5 distal fringed spines and some

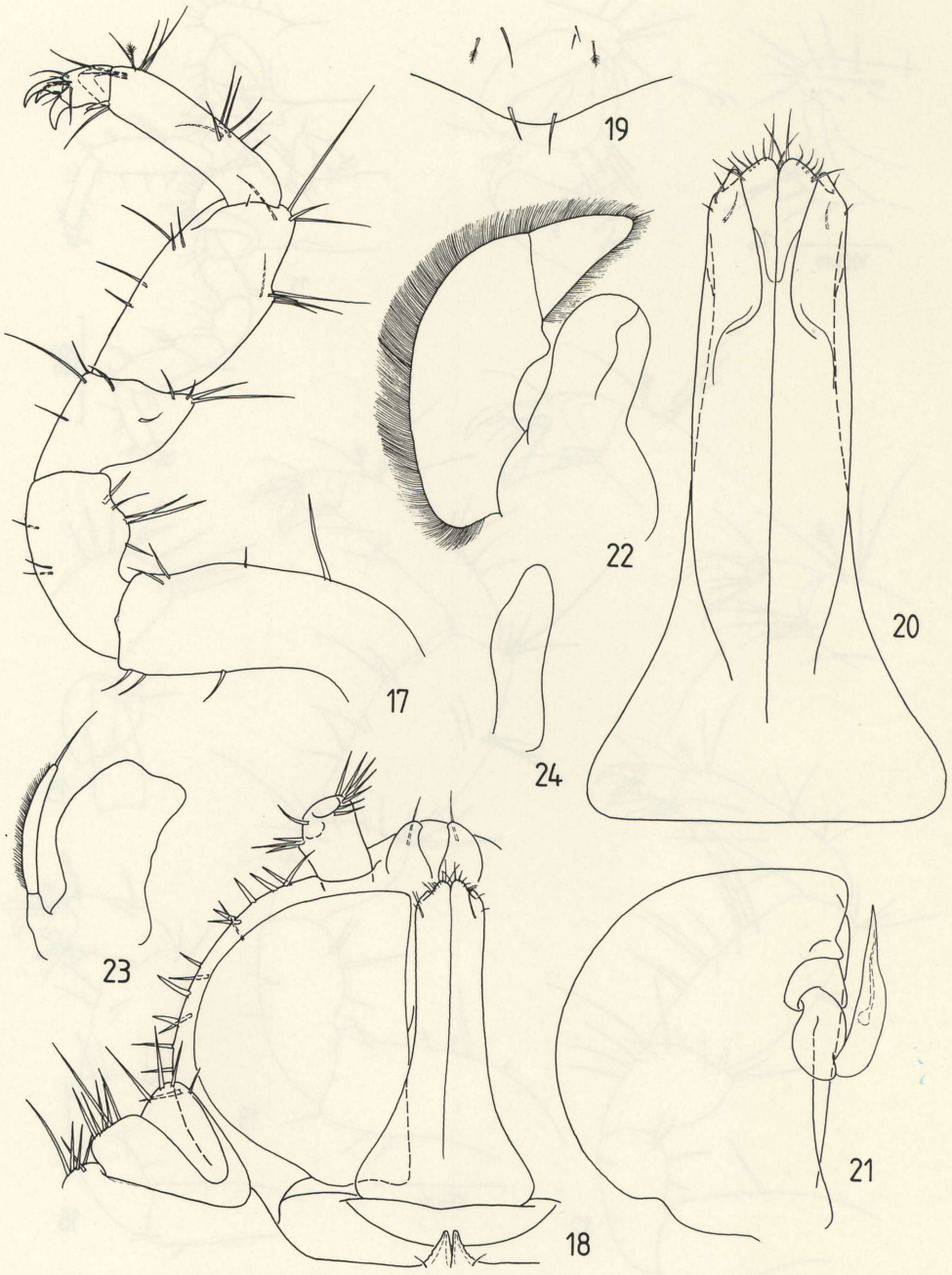


Figs. 1–3. *Iais singaporensis* MENZIES & BARNARD, 1951: 1) ♂, dorsal view; 2) ♂, lateral view; 3) ♀, dorsal view.

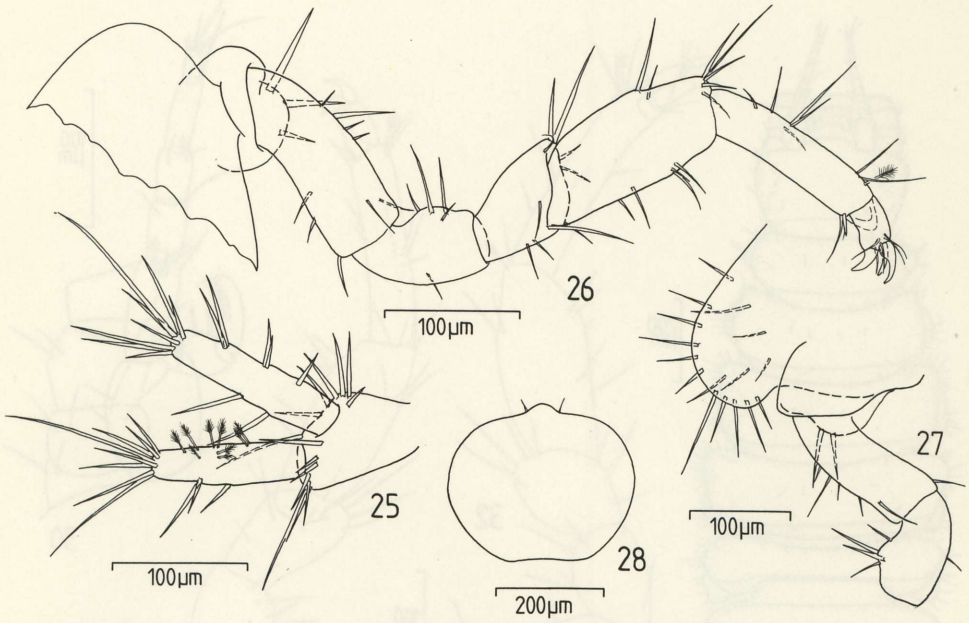
Figs. 4 – 10. *Iais singaporensis* MENZIES & BARNARD, 1951, ♂: 4) antennule; 5) antenna; 6) left mandible; 7) right mandible, palp omitted; 8) maxilla 1); 9) maxilla 2; 10) maxilliped.



Figs. 11–16. *Iais singaporensis* MENZIES & BARNARD, 1951, ♂: 1) left pereopods 2–4 and pereonites, ventral view; 12) pereopod 1; 13) pereopod 2); 14) right margin of pereonite 2 and coxa, dorsal and ventral view; 15) right margin of pereonite 3 and proximal part of pereopod, ventral view; 16) pereopod 4.



Figs. 17–24. *Iais singaporensis* MENZIES & BARNARD, 1951, ♂: 17) pereopod 5; 18) right distal margin of pereonite 7 and pleon, ventral view; 19) distal margin of pleotelson, dorsal view; 20) first pereopod; 21) pleopod 2; 22) pleopod 3, 23) pleopod 4; 24) pleopod 5.

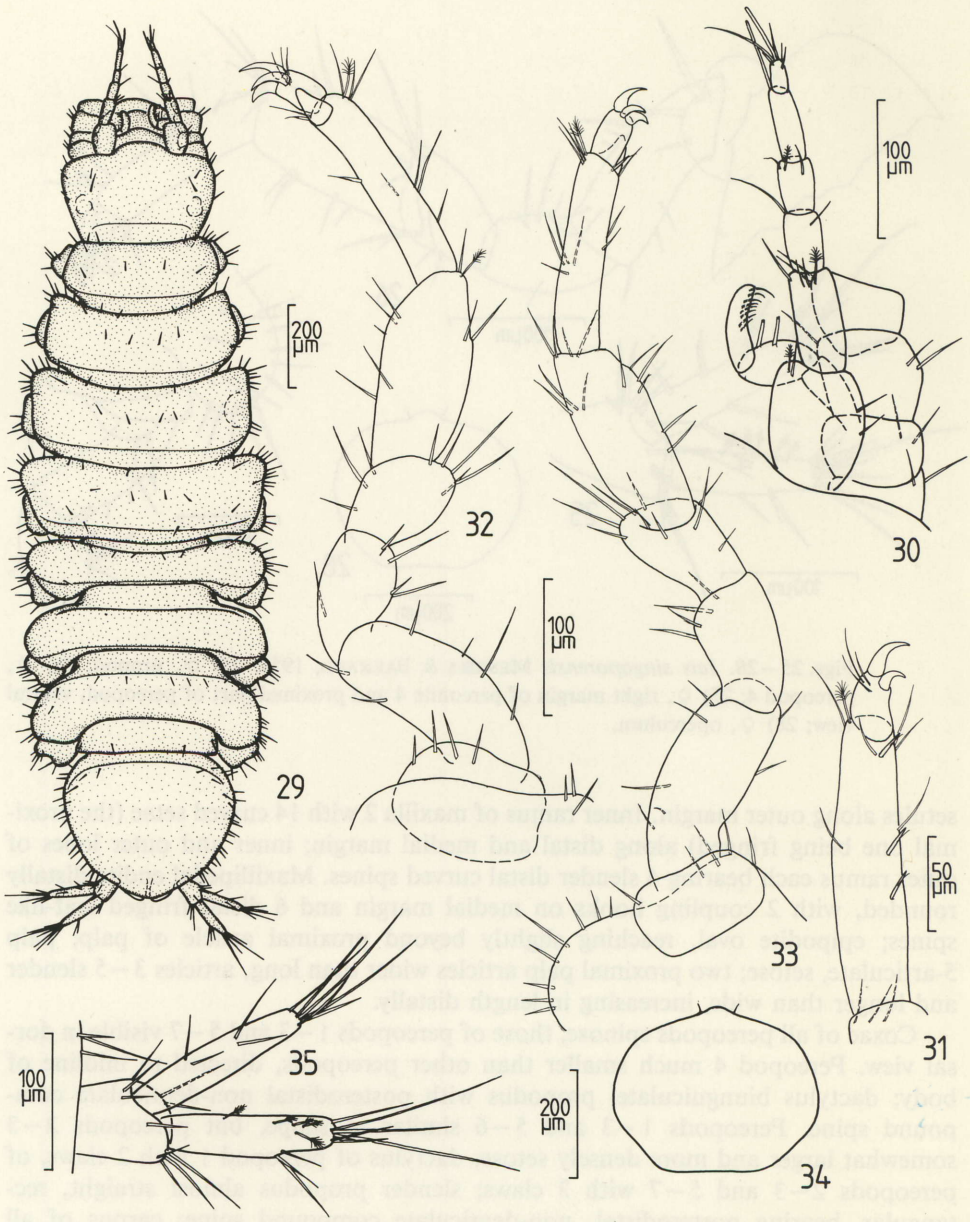


Figs. 25–28. *Iais singaporensis* MENZIES & BARNARD, 1951: 25) ♂, uropod, 26) ♀, pereopod 4; 27) ♀, right margin of pereonite 4 and proximal part of pereopod, ventral view; 28) ♀, operculum.

setules along outer margin. Inner ramus of maxilla 2 with 14 curved setae (the proximal one being fringed) along distal and medial margin; inner and outer lobes of outer ramus each bearing 4 slender distal curved spines. Maxillipedal endite distally rounded, with 2 coupling hooks on medial margin and 6 distal fringed leaf-like spines; epipodite oval, reaching slightly beyond proximal article of palp; palp 5-articulate, setose; two proximal palp articles wider than long, articles 3–5 slender and longer than wide, increasing in length distally.

Coxae of all pereopods spinose, those of pereopods 1–3 and 5–7 visible in dorsal view. Pereopod 4 much smaller than other pereopods, directed to midline of body; dactylus biunguiculate; propodus with posterodistal non-denticulate compound spine. Pereopods 1–3 and 5–6 similar in shape, but pereopods 2–3 somewhat larger and more densely setose; dactylus of pereopod 1 with 2 claws, of pereopods 2–3 and 5–7 with 3 claws; slender propodus almost straight, rectangular, bearing posterodistal, non-denticulate compound spine; carpus of all pereopods cylindrical, subequal in length to propodus but much more robust.

First pleopods fused proximally; lateral margins almost straight along distal two thirds; inner lobe with rounded distal margin, much wider than triangular outer distal lobe; inner distal lobe with 7 submarginal setae; outer distal lobe with 1–2 setae. Basis of second pleopod 1.3 times longer than wide, with broadly convex outer margin; endopodite relatively short and robust, not reaching beyond distal margin of basis. Pleopod 3 with non-sectose, small endopodite and large biarticulate exopodite bearing dense fringe of marginal setae; triangular distal article of exopodite tipped



Figs. 29–35. *Iais californica* (RICHARDSON, 1904), ♀ holotype: 29) dorsal view; 30) anterolateral margin of cephalon, antennule, 4 proximal articles of antenna and mandibular palp, dorsal view; 31) distal part of pereopod 1; 32) pereopod 3; 33) pereopod 4; 34) operculum; 35) uropod.

with short seta. Pleopod 4 with non-setose, lobate endopodite; exopodite very slender, with fringe of setules along outer margin and a long, slender terminal seta. Pleopod 5 lobate, relatively slender and non-setose.

Peduncle of uropod robust, 1.3 times longer than wide, with fringe of slender distal spines; uropodal rami relatively short, expodite 1.2 times length of endopodite; lateral margins and particularly apex of uropodal rami bearing several slender spines; outer and dorsal margin of inner ramus with 9 small plumose sensory setae.

♀: Similar to ♂ in size and habitus. Length 1.4–1.7 mm. Body slightly more slender than ♂, 2.2 times longer than wide. Pleotelson 1.14 times wider than long.

Coxae of all pereopods visible in dorsal view. In contrast to ♂, pereopod 4 similar to remaining pereopods. Oostegites carried close to the body, present on pereonites 2–4; brood pouch containing 3–9 eggs.

Operculum roughly oval, 1.2 times wider than long; distal margin produced into short, rounded lobe with a short seta on either side.

Remarks: The specimens of *I. singaporensis* available from Pulau Babi Besar agree well with the 6 paratype specimens held by LACM (LACM 50–73.1; Singapore). HURLEY (1956 : 717) considered *I. singaporensis* a synonym of *Iais californica* (RICHARDSON, 1904), which certainly is not correct. The female holotype of *I. californica* (deposited at the Smithsonian Institution, USNM 86813) was examined and found in good condition, making it possible to prepare detailed drawings without dissection (Figs. 29–35). Additional male and female specimens of *I. californica* were examined from the SDNHM collections. One of the most obvious features to dinstinguish these two species is the more slender habitus of *I. californica* (body 3 times longer than wide, versus 2.0–2.2 times longer than wide in *I. singaporensis*). Correspondingly, in *I. californica* the cephalon is 1.1–1.5 times wider than long (1.7 times wider than long in *I. singaporensis*), and the first pereonite is 0.6–0.7 times the length of the cephalon (0.5 times length in *I. singaporensis*). Moreover, pereonites 2 and 3 of female *I. californica* do not have the rounded anterolateral projections characteristic of *I. singaporensis* (in male *I. californica* these projections are very small). Additionally, the free pleonite of *I. californica* is more clearly visible and not hidden beneath pereonite 7. MENZIES' and BARNARD's (1951) drawing of *I. singaporensis* (their plate 46 A) is almost certainly a male, rather than a female as the figure legend indicates. Similarly, their figure of a male (plate 48 A) is almost certainly a female.

MENZIES & BARNARD (1951) recognized that *I. californica* (and its host, *Sphaeroma quoyanum* H. MILNE-EDWARDS, 1840) also occur in New Zealand and southeast Australia. ROTRAMEL (1972) agreed with this assessment, hypothesizing maritime shipping, sometime between 1870 and 1903. HURLEY (1965) claimed that *I. californica* inhabits a variety of sphaeromatid hosts in New Zealand, although it is associated only with *S. quoyanum* in California. In California *I. californica* and *S. quoyanum* appear to be restricted to bays and estuaries, but they occur throughout the state, from San Diego County to Humboldt County.

Distribution. – Western Malaysia: Dungun, Trenganu; Sungei, Patani, Kedah; Pulau Babi Besar, Tioman Archipelago. Singapore: Seletar, Ponggel. – Philippines?

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