

## The Cirolanidae (Crustacea: Isopoda) of Australia: The Genus *Pseudolana* from the Queensland Coasts with Description of Three New Species<sup>1</sup>

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**ABSTRACT:** The cirolanid genus *Pseudolana* is fully described, as are 4 species, of which 3 are new to science, 1 having been previously described as *Cirolana concinna*. The relationship of the new genus to other cirolanid genera is discussed. Brief notes are given on the habitat and distribution of the members of the genus.

AN EXAMINATION of oceanic sandy beaches around Moreton Bay revealed the presence of 2 species of cirolanid isopod that at first glance appeared to belong to the genus *Cirolana* Leach. While collecting around Hinchinbrook Island off the North Queensland coast, I obtained a third species from the mobile sands of the mountain stream outflows where small tidal mangrove swamps form. The fourth species was obtained from the collections of the Queensland Museum.

Of the 4 species, 1 had previously been described and placed in the genus *Cirolana*. However, all 4 species show a combination of characters which prevent their inclusion in that genus and place them within the "group *Eurydice*" of Monod (1930). These species all conform to the genus *Pseudolana* Bruce, and the original diagnosis is here expanded.

### Genus *Pseudolana* Bruce

*Pseudolana* Bruce 1979: 112.

Cirolanidae with antennule peduncle 3 segmented, segment 1 tending to be at right angles to remainder of peduncle; antenna peduncle 5 segmented; flagella of both antennae of moderate length. Frontal lamina linear, clypeus freely projecting; cephalon with or without rostral point. Maxilliped

slender, endite with single coupling hook. Mandible with strongly produced anterior tooth and 3-segmented palp, segment 1 almost as long as segment 2. Pereiopods without natatory setae. Both rami of pleopods 1 and 2 elongate, 3-5 becoming broader posteriorly; pleopod 2 of male with appendix masculina arising midway along and extending beyond inner margin of endopod. Pleopods 3-5 of both sexes with endopod glabrous. Pleopods 1-5 with external margin of protopod formed into a lobe. Telson with posterior 2/3 depressed, posterior margin of telson and uropodal rami with fringe of long plumose setae. Protopod of uropod produced, margin of exopod of uropod with spines and setae. All pleon segments exposed with lateral margins free; lateral margin of pleon segment 1 not produced.

**DIAGNOSIS:** Cirolanidae with linear frontal lamina and freely projecting clypeus; anterior margin of cephalon without conspicuous rostral point; pleopod 1 with both rami elongate, pleopod 2 with appendix masculina arising midway, pleopods 1-5 with lobe on external margin of protopod, endopods of pleopods 3-5 glabrous.

**ETYMOLOGY:** From the greek *Pseudo* meaning false, and (*Ciro*) *lana*.

**GENUS TYPE:** *Cirolana concinna* Hale, 1925.

**RELATIONSHIPS:** This genus can be placed in the group of genera called "group *Eurydice*" by Monod (1930). This group includes the genera *Eurydice* Leach, *Exciorolana* Richardson (including *Pontogeloides* Barnard), *Pontogelos* Stebbing (Monod, 1972) and to

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which can be added the genus *Pseudaega* Thomson. Of these genera the closest to the new genus appear to be *Exciorolana* and *Pseudaega*. *Eurydice* occupies a place apart in having only the endopod of pleopod 5 glabrous and the protopod of the pleopods longer than broad as well as being further distinguished by having the antenna peduncle with only 4 segments, the protopod of the uropoda not produced, and the posterior pereopods natatory. *Pontogelos* Stebbing, 1910 is also somewhat isolated in having the appendix masculina attached basally and also has only the endopod of pleopod 5 glabrous. It is clear that the present genus is most closely related to *Exciorolana* and *Pseudaega*. *Pseudolana* can be distinguished from *Exciorolana* by the lack of a broad rostrum separating the antennules, by the point of insertion of the appendix masculina being more distally placed, by having spines and setae on the lateral margins of the uropodal exopod, and by the protopod being produced. It is difficult to find further points by which to separate *Pseudolana* from *Exciorolana* as the latter contains such a varied assemblage of species. In *Exciorolana* the setation of the pleopods and pereopods, the place of insertion of the appendix masculina, the form of the rostral point, and proportion of both pairs of antennae all vary considerably.

The genus *Pseudolana* also shows some similarity to the recently revised genus *Pseudaega* (Jansen, 1978), namely in the form of the appendix masculina and pereopods. The segmentation of the pleopods in *Pseudolana* is present to a variable degree, and for that reason is not included as a generic character. They do, however, differ from those of *Pseudaega* by never showing a complete suture across the exopods of pleopods 3–5. *Pseudaega* has several unique characters including a notched uropodal endopod, extended coxae on pereonite 4, and a process on segment 2 of the antennule by which it can easily be distinguished.

One species, other than those reported herein, could warrant inclusion in *Pseudolana*—*Cirolana arcuata* Hale (1925). I have examined the paratypes of this species and while the pleopods are similar, 3 points

prevent its inclusion in this genus. These are the frontal lamina being relatively broad and not produced ventrally, the appendix masculina not extending beyond the inner ramus of pleopod 2, and pleon segment 4 with the lateral margins extending to the posterior margin of pleon segment 5.

### *Pseudolana concinna* (Hale)

Figures 1, 2

*Cirolana concinna* Hale, 1925:152–153, fig. 12a–i; Bruce, 1979:112, *Non Menzies*, 1962:123, fig. 40 A–E.

MATERIAL EXAMINED: A large series of samples was taken from beaches around Moreton Bay and also Hinchinbrook Island. A further 8 specimens were obtained from Tasmania, and the paratypes of Hale's species were borrowed from the South Australian Museum. The material designated as *C. concinna* by Menzies (1962) was also obtained on loan. As *C. concinna* is the type-species for the genus, a full description is given here.

DESCRIPTION OF MALE: Body smooth, about  $2\frac{1}{2}$  times as long as greatest width; cephalon with minute rostral point; eyes moderately large (Figure 1a). Clypeus produced into a freely projecting triangular lobe (Figure 1c), frontal lamina linear, very slightly broader anteriorly. Pereion segment 1 slightly longer than segment 2; segments 4, 5, and 6 subequal in length and longer than segments 2, 3, and 7; lateral part of pereion segments 4–7 with groove. Coxae (Figure 1b) without carina, those of pereion segments 4–7 moderately produced with posterior margins terminating in acute points. Pleon with all segments visible and not overlapped; pleon segments 2–5 with lateral margins produced into acute points. Short penes present on posterior ventral surface of pereonite 7.

Antennule (Figure 1d) with peduncular segment 1 very short, set at right angles to remainder of peduncle, segment 2 half as long again as segment 3; flagellum composed of 14 articles extending to hind margin of pereion segment 2. Antenna (Figure 1e) with first 2 peduncular segments short, their combined lengths equal to that of segment 3;

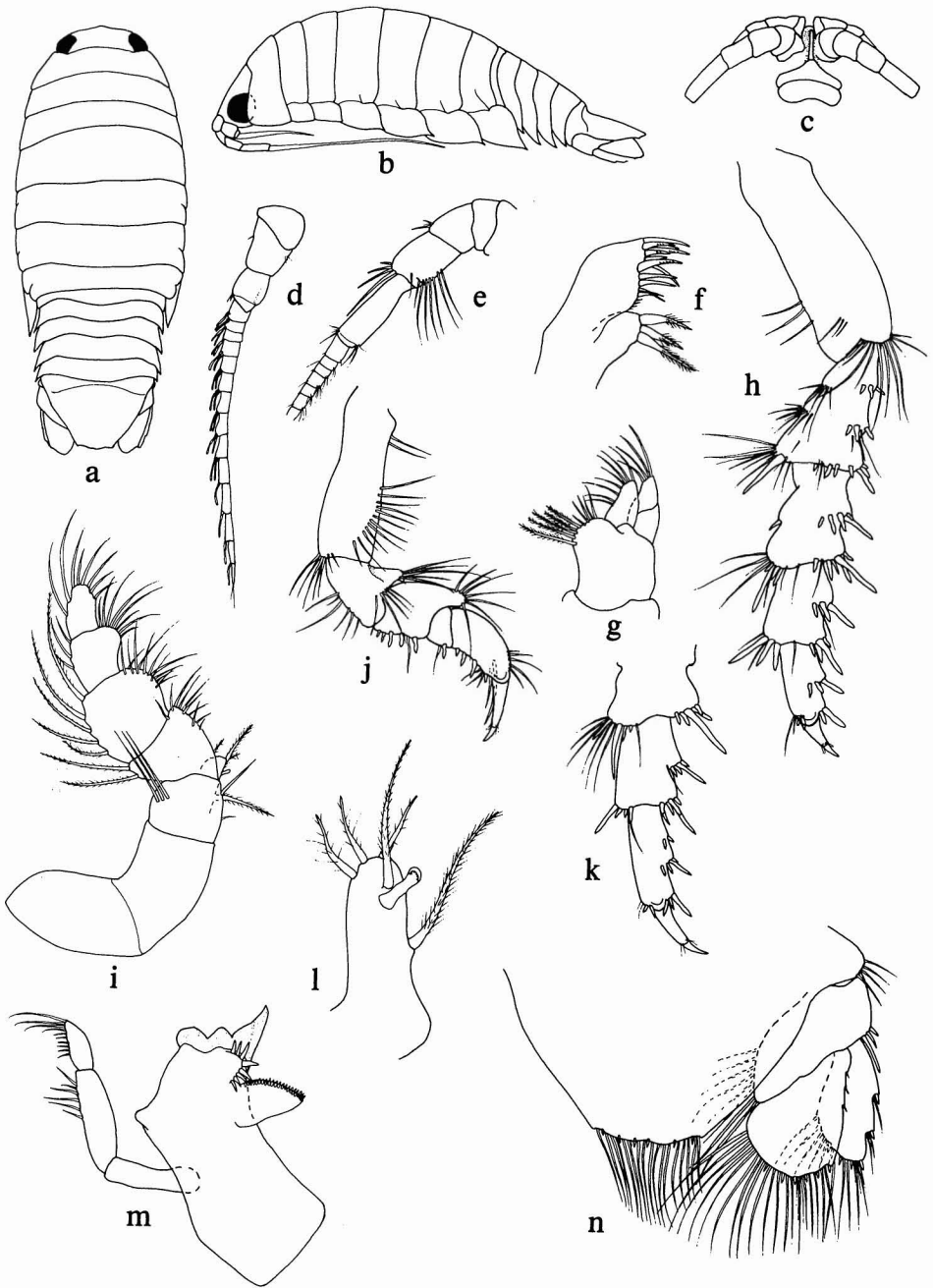


FIGURE 1. *Pseudolana concinna*. a, dorsal view; b, lateral view; c, anteroclypeal region; d, antennule; e, antenna; f, maxillule; g, maxilla; h, pereopod 7; i, maxilliped; j, pereopod 1; k, pereopod 6 (distal portion); l, endite of maxilliped; m, mandible; n, telson and uropod.

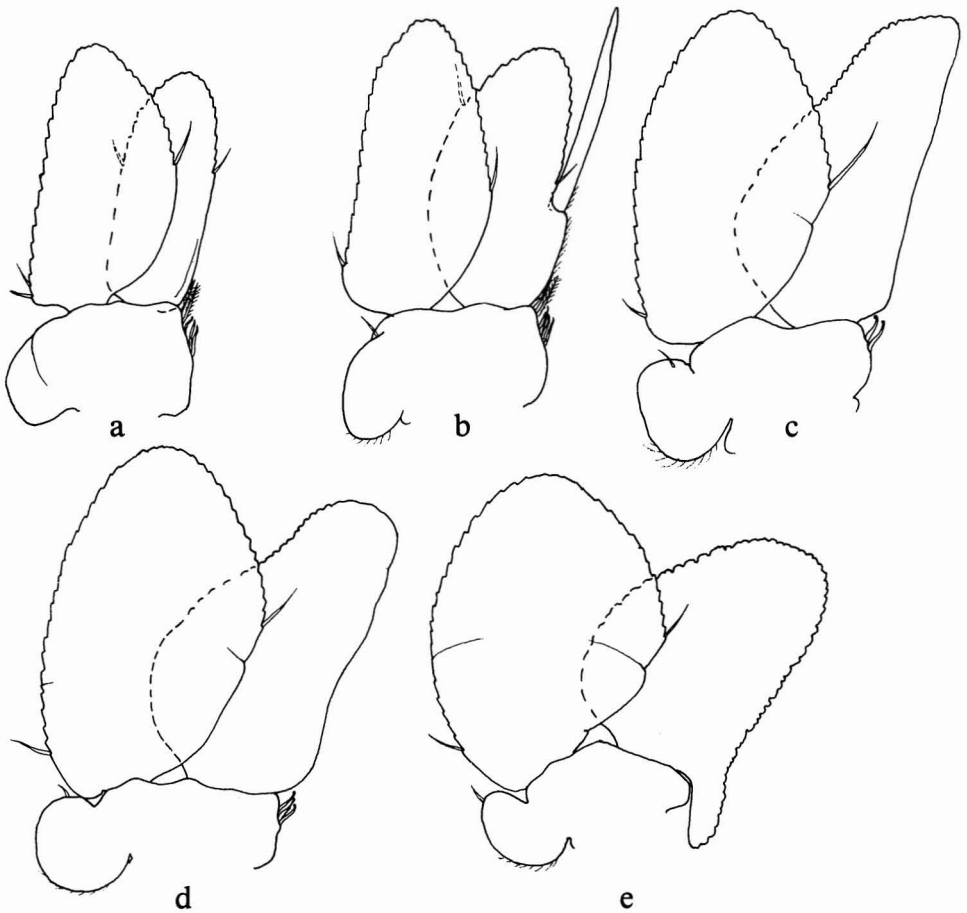


FIGURE 2. *Pseudolana concinna*. a-e, pleopods 1-5 respectively.

segment 4  $\frac{1}{3}$  as long again as segment 3 and  $\frac{2}{3}$  the length of segment 5, anterior distal margin of segment 4 with 4 spines, posterior margin with row of long setae.

Mouthparts: mandible with tricuspidate incisor, the anterior tooth strongly produced (Figure 1m); segments 1 and 2 of palp subequal in length and about twice the length of segment 3, segments fringed with feebly plumose setae. Molar with ca. 21 teeth on anterior margin, spine row with 8 spines. Maxillule (Figure 1f) with ca. 11 spines on gnathal surface of exopod and 3 stout plumose spines on endopod. Maxilla (Figure 1g) with 4 and 8 long setae on palp and exopod respectively, endopod with 5 long plumose

setae and 5 simple setae. Maxilliped (Figure 1i) slender, lateral distal margin of segment 1 of palp with 3 long setae, lateral margins of segments 2 and 3 with long plumose setae. Medial margins of all segments with numerous setae. Endite (Figure 1l) with 2 long and 3 short plumose setae, and single coupling spine.

Pereiopods 1-3 short, robust; pereiopods 4-7 long. Pereiopod 1 (Figure 1j) with fringe of setae on anterior margin of basis and a group of setae at the posterior distal angle; anterodistal angles of ischium and merus produced, armed with numerous setae; carpus very short, overlapped by merus; propodus with row of 5 setae on anterior distal

margin, and a long seta extending along dactyl. Posterior margin of ischium with 6 setae; merus, carpus, and propodus with 5, 1, and 4 spines respectively. Pereiopod 7 (Figure 1*h*) large, moderately broad, posterior margins, with numerous spines; anterior margins with groups of spines at distal angles of segments, groups of setae on ischium and merus, and with few setae on carpus and propodus. Propodus and carpus subequal in length, dactyl short, unlike pereiopod 6 (Figure 1*k*) which has propodus and dactyl longer than carpus.

Pleopods (Figure 2*a-e*) with external margin of protopod produced into lobe; protopod of pleopods 1 and 2 as long as broad; internal margin with 3 coupling hooks on pleopods 1-4. Pleopod 1 (Figure 2*a*) with spine on proximal lateral angle of exopod, both rami fringed with long plumose setae as are both rami of pleopod 2 and the exopods of pleopods 3-5; the setae becoming shorter in the posterior pleopods. Pleopod 2 with appendix masculina arising midway along inner margin of endopod (Figure 2*b*), extending beyond pleopod by  $\frac{1}{4}$  of its length, distal  $\frac{1}{3}$  narrower than basal width. Pleopods 3-5 with endopod glabrous exopod with partial suture.

Telson (Figure 1*n*) twice as broad as long with bisinuate emarginate posterior border, fringed with plumose setae among which are set 6 spines and a few short simple setae. Uropods robust with broad endopod, the posterior margin of which is fringed with numerous long plumose setae and armed with 6 spines; lateral margin with 3 small spines. Exopod about  $\frac{2}{3}$  width of endopod, posterior margin with long plumose setae and 4 spines, exterior margin with 2 indentations anterior with a spine and a single seta, posterior with a spine and 2 setae. Protopod broad, not extending to posterior margin of endopod, medial margin with 8 plumose setae, outer distal margin with 3 stout spines.

**FEMALE:** Not differing from the male but for the sexual characters.

**COLOR:** Translucent with black chromatophores in life. White in alcohol.

**SIZE:** 3-7 mm in Queensland material.

Material from Hinchinbrook did not exceed 5 mm; Tasmanian specimens measured 5-7 mm, one female reaching 10 mm.

**REMARKS:** This species can be distinguished from all others in the genus by the emarginate hind margin of the telson, the shape and length of the appendix masculina, together with the comparative lengths of the antennule and antenna as well as the arrangement of spines and setae of the latter.

The material described differs in no significant details from the paratypes (Broughton Island). Specimens from Hinchinbrook correspond very closely to the Moreton Bay material, differing only in being rather smaller and in having the appendix masculina slightly less narrow apically. The material from Tasmania similarly varies very little, being slightly larger, and the appendix masculina not narrowing apically. The telson varies somewhat in shape from that illustrated here (Figure 1*n*) to the more pointed form figured by Hale (1925, figure 12*a*).

The material designated as *C. concinna* by Menzies (1962) is not this species at all. I have examined these specimens and it appears to be a species very similar if not identical to *Cirolana arcuata*.

**DISTRIBUTION:** Woorim, Bribie Island, Frenchmans Bay, Cylinder Beach, North Stradbroke Island, Ramsay Bay, North Hinchinbrook Island, Eddystone Point, Tasmania. Recorded from Cottesloe (West Australia) and Broughton Island (NSW) by Hale (1925).

### *Pseudolana elegans* sp. nov.

#### Figure 3

**MATERIAL EXAMINED:** In addition to the type-material, about 60 specimens from the type-locality.

**DESCRIPTION OF MALE:** Body smooth, 3 times as long as greatest width (Figure 3*a*). Anterior margin of cephalon (Figure 3*d*) bisinuate, with small rostral point. Eyes large, round. Clypeus triangular, freely projecting, frontal lamina linear, narrowing toward anterior (Figure 3*c*).

Coxae on pereion segments 4-7 termi-

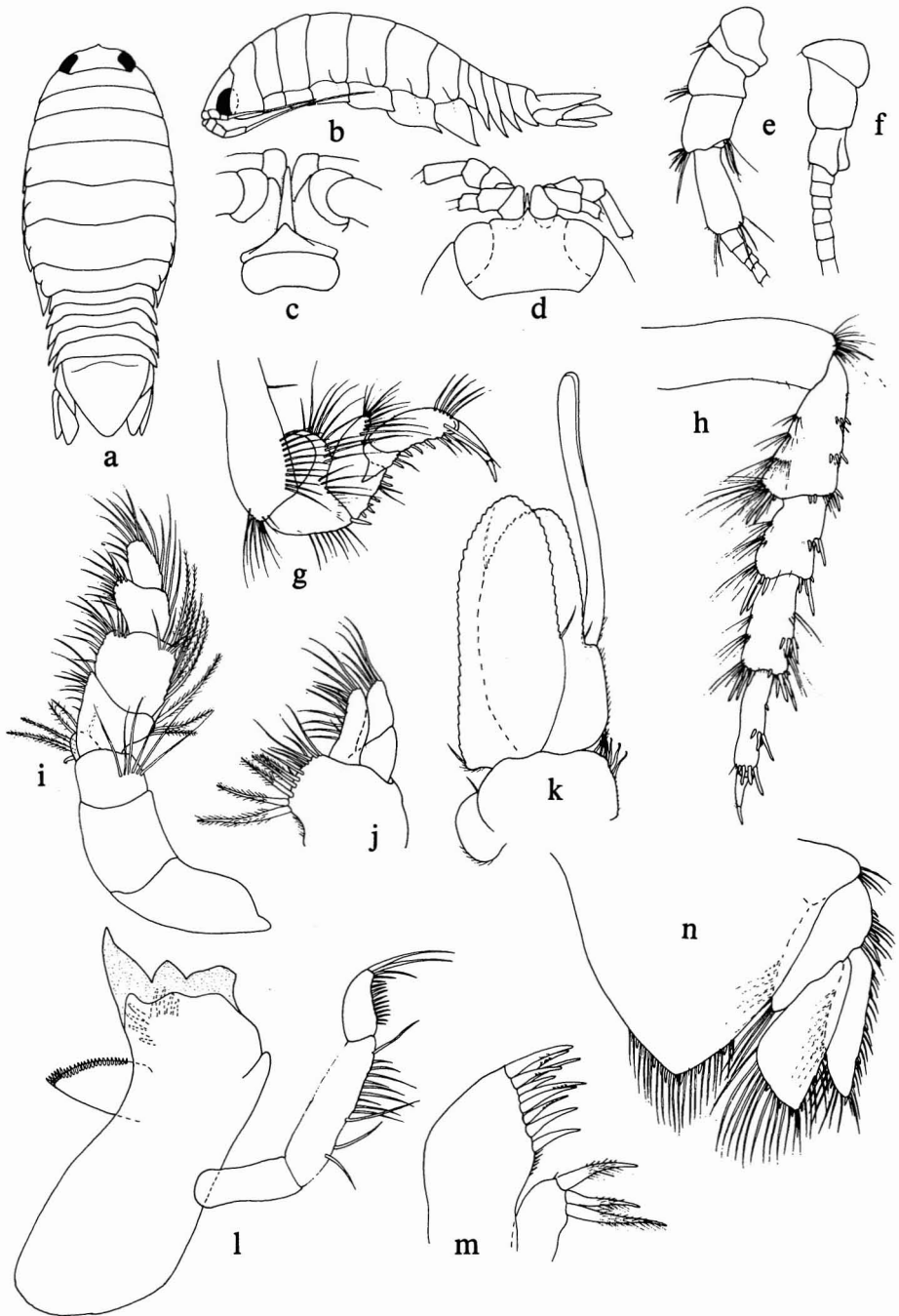


FIGURE 3. *Pseudolana elegans* sp. nov. *a*, dorsal view; *b*, lateral view; *c*, anteroclypeal region; *d*, dorsal view of cephalon; *e*, antenna; *f*, antennule; *g*, pereiopod 1; *h*, pereiopod 7; *i*, maxilliped; *j*, maxilla; *k*, pleopod 2; *l*, mandible; *m*, maxillule; *n*, telson and uropod.

nating in acute points (Figure 4b), those of pereion segments 6 and 7 being the most produced. Lateral margins of pereionites 4–7 with vertical groove.

Antennule (Figure 3f) with peduncular segment 2 longest, set at right angles to segment 1; segment 3 with posterior margin lobate. Flagellum extending to hind margin of pereion segment 3. Antenna (Figure 3e) of similar proportions to type-species, flagellum extending to midlength of pereion segment 5.

Mouthparts (Figure 3i, j, l, m) as for *P. concinna*. Maxilliped with 6 setae on outer distal angle of palp segment 1; endite with 3 apical setae of somewhat greater length. Segment 2 of mandibular palp with more setae on lateral margin.

Pereiopod 1 (Figure 3g) and 2 with ischium bearing a conspicuous recurved process on anterior margin, the process bearing long setae distally. Merus with anterior margin produced and bearing setae. Propodus with 5 long setae on anterior distal margin and a single long seta alongside the dactyl. Posterior margin of ischium with fringe of setae and a single spine; merus, carpus, and propodus with 6, 1, and 4 spines respectively, and a few simple setae. Pereiopod 7 (Figure 3h) with abundant setae on posterior margins and spines at the distal angles. Anterior margins with fewer setae but armed with numerous stout spines.

Pleopods as for the genus. Pleopod 2 (Figure 3k) with appendix masculina exceeding endopod by half its length, slightly broadening terminally.

Telson a little shorter than wide (Figure 3n) with gently rounded sides narrowing to a subacute apex, hind margin with long plumose setae among which are set 6 stout spines, terminal pair twice as long as the others. There is a central pair of short simple setae as well as others along the hind margin. Uropod with protopod extending halfway along inner margin of endopod, lateral distal angle with 3 spines and 7 setae, inner margin with 9 plumose setae. Endopod with hind margin fringed with plumose setae and armed with 3 spines, lateral margin straight, with 3 spines and 5 plumose setae; exopod slender,

narrowing distally, outer margin straight with 5 spines and fringed with short plumose setae, inner margin with 4 spines among plumose setae.

FEMALE: As for the male with the exception of sexual characters. Tendency to be slightly larger.

COLOR: Translucent with black chromatophores over body and pereionites. White in alcohol.

SIZE: Largest male 7.5 mm, largest female 9.9 mm.

TYPES: Holotype ♂ Queensland Museum reg. no. W 7825. Paratypes 5 ♂♂, 4 ♀♀, Queensland Museum reg. no. W 7826.

TYPE LOCALITY: Frenchmans Bay, North Stradbroke Island, 21 July 1978.

ETYMOLOGY: The specific name is derived from the Latin *elegantia*, meaning elegant or refined.

REMARKS: The unique process on the first two pairs of pereionites immediately separates this from all other species of the genus. Other distinctive features are the abundant setae on the posterior pereionites, the straight outer margin of the uropodal exopod, and the shape of the hind margin of the telson.

DISTRIBUTION: Known only from the type locality and the adjacent Cylinder Beach.

### *Pseudolana ovalis* sp. nov.

#### Figure 4

MATERIAL: From the Queensland Museum, 14 specimens, all from the type-locality.

DESCRIPTION OF MALE: Body smooth, about twice as long as greatest width (Figure 4a). Anterior margin of cephalon rounded in dorsal view. Eyes moderately large, subrectangular in lateral view. Clypeus as for the genus, frontal lamina very slightly constricted in the mid region (Figure 4c).

Coxae of pereion segments 5–7 terminating in acute points (Figure 4b) with faint diagonal carina present.

Antennule (Figure 4d) with peduncular segments 2 and 3 subequal in length, segment 1 short; flagellum extends to pereion segment 2 and is composed of ca. 12 articles each with

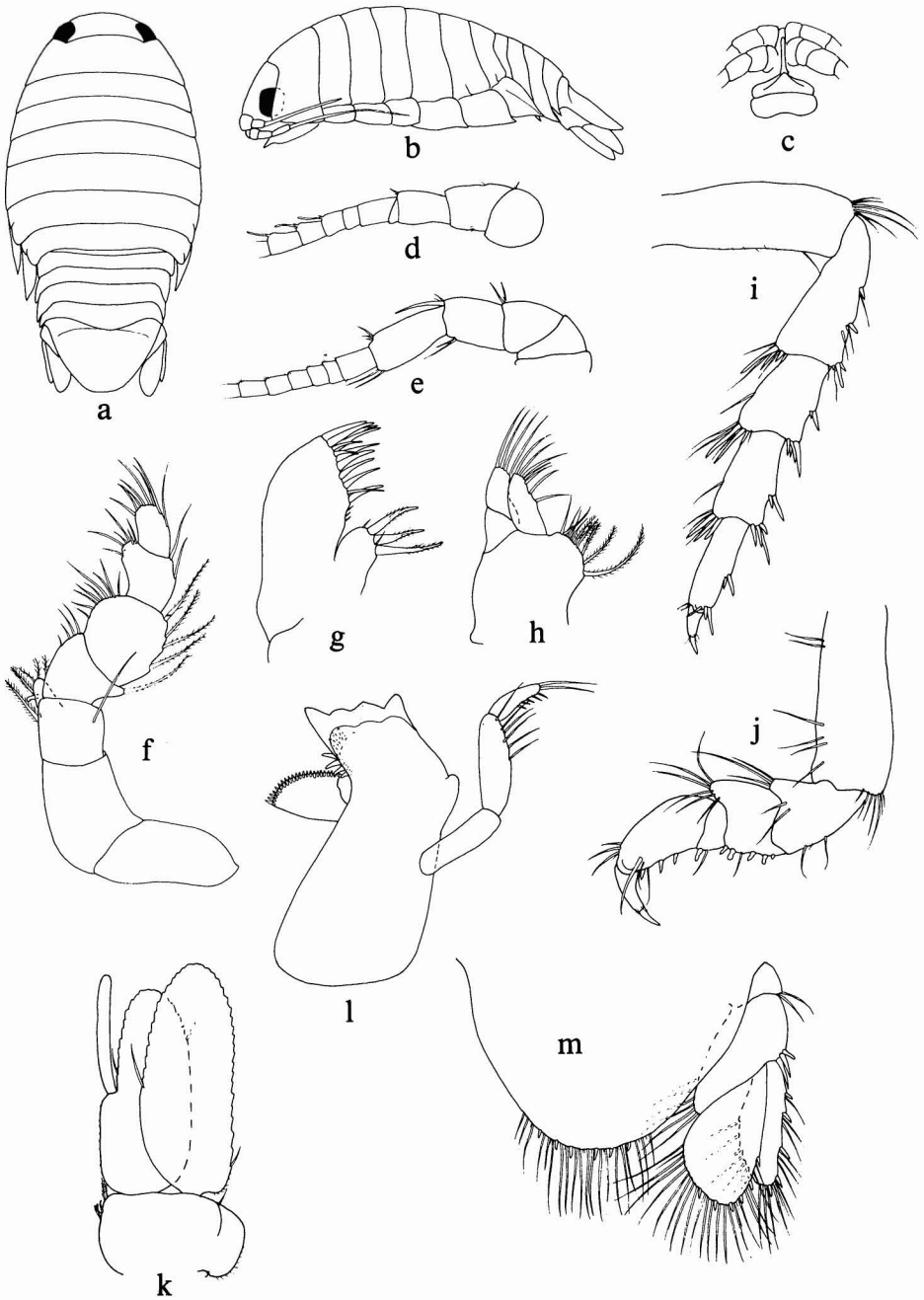


FIGURE 4. *Pseudolana ovalis* sp. nov. a, dorsal view; b, lateral view; c, anteroclypeal region; d, antennule; e, antenna; f, maxilliped; g, maxillule; h, maxilla; i, pereopod 7; j, pereopod 1; k, pleopod 2; l, mandible; m, telson and uropod.



a single aesthetasc. Antenna (Figure 4e) with peduncular segments 1 and 2 very short, segment 4 longer than segment 3 and shorter than segment 5; flagellum extending to posterior of pereionite 4.

Mouthparts (Figure 4f, g, h, l) as for the genus. Maxilliped with a single seta on outer distal margin of palp segment 1 (Figure 4f). Maxilla (Figure 4h) with 5 plumose setae on endite.

Pereiopod 1 (Figure 4j) with anterior margins of ischium and merus moderately produced, armed with 3 and 6 setae respectively. Posterior margins of merus, carpus, and propodus with 5, 1, and 3 spines respectively. Pereiopod 7 (Figure 4i) with spines and few setae on the hind margins of segments; anterior margin with groups of spines and setae at anterior distal angle of ischium, merus, and carpus.

Pleopods as for the genus. Pleopod 2 (Figure 4k) with appendix masculina exceeding inner ramus by about 1/6 of its length.

Telson (Figure 4m) slightly broader than long, hind margin evenly rounded, provided with 6 spines among ca. 20 plumose setae. There are a central pair of short simple setae, and further short setae along the posterior border. Uropoda with protopod extending halfway along endopod, inner margin with 6 plumose setae, outer distal angle, with 3 spines. Endopod broad, posterior margin rounded, fringed with plumose setae among which are set 3 spines; lateral margin with plumose setae and 3 spines. Exopod about half as wide as endopod, exterior margin with 4 spines and 6 plumose setae, inner margin with 3 spines among plumose setae.

**FEMALE:** As for the male, but lacking the sexual characters.

**COLOR:** Yellow brown in alcohol.

**SIZE:** Largest specimen 6.0 mm.

**TYPES:** Holotype ♂ Queensland Museum reg. no. W 7829. Paratypes 2 ♂♂, 2 ♀♀, Queensland Museum reg. no. W 7830.

**TYPE LOCALITY:** Serpentine Creek, Moreton Bay, 1975.

**ETYMOLOGY:** This is the modified Latin word derived from *ovatus* meaning ellipsoidal or egg-shaped.

**REMARKS:** The broad ovoid shape of the

body, the relative paucity of spines and setae on the posterior pereiopods, together with details and proportions of the antennule and antenna separate this species from other members of the genus.

*Pseudolana dactylosa* sp. nov.

Figure 5

**MATERIAL EXAMINED:** ca. 30 specimens from the type-locality.

**DESCRIPTION OF MALE:** Body smooth, about 3 times as long as greatest width, cephalon with small rostral point (Figure 5a). Frontal lamina slightly dilated anteriorly (Figure 5c, h).

Pereion segments 4–7 with lateral groove; coxae of segments 4–7 with posterior margins produced to an acute point (Figure 5b), coxae 6 and 7 with an oblique carina.

Antennule (Figure 5d) relatively slender, peduncular segment 2 longer than 3, flagellum long, extending to hind margin of pereion segment 4 and composed of ca. 25 articles. Antenna (Figure 5e) with peduncular segment 5 longer than 4 which is in turn longer than segment 3; segments 1 and 2 very short; flagellum composed of ca. 26 articles, extends beyond hind margin of pereionite 2.

Mouthparts (Figure 5j, k, l, o) as for the genus. Terminal setae of maxilliped endite relatively long; segment 1 of palp with 4 long setae on outer lateral surface.

Pereiopod 1 (Figure 5f) with anterodistal margin of ischium and merus only moderately produced, each with ca. 8 setae; posterior with 6, 1, and 4 spines respectively on the merus, carpus, and propodus. Dactyl about 3/4 length of propodus. Pereiopod 7 (Figure 5g) with numerous spines on posterior margins of segments 2–5, anterior margin with spines on distal angle only, dactyl less than half propodus in length. Pereiopod 6 (Figure 5i) proportionally more slender, propodus 1/4 as long again as carpus, and dactyl 2/3 length of propodus.

Pleopods not differing from genus type. Pleopod 2 (Figure 5n) with appendix masculina just reaching apex of endopod. Telson (Figure 5m) 1/3 broader than long, hind

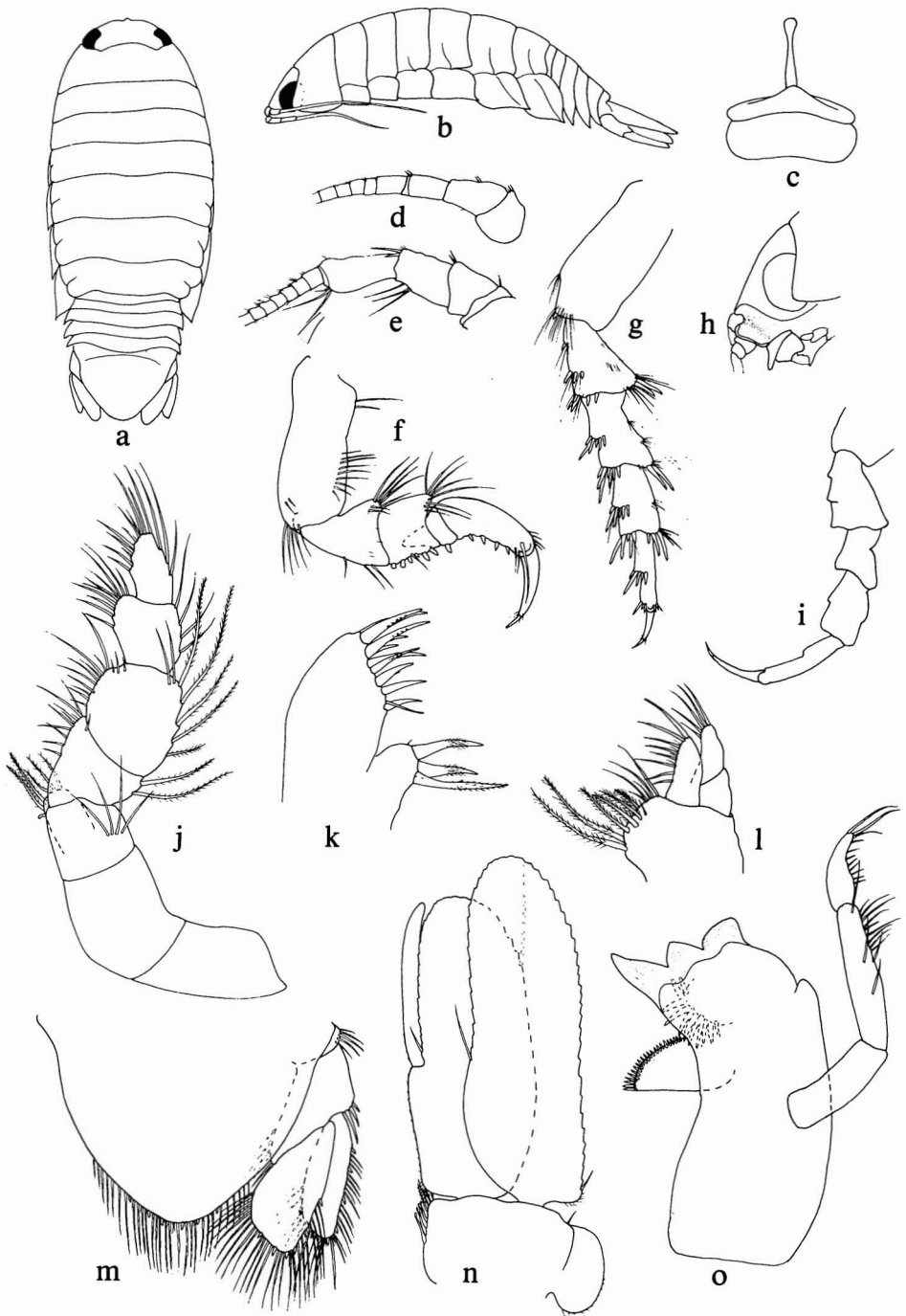


FIGURE 5. *Pseudolana dactylosa* sp. nov. *a*, dorsal view; *b*, later view; *c*, labrum, clypeus, and frontal lamina; *d*, antennule; *e*, antenna; *f*, pereiopod 1; *g*, pereiopod 7; *h*, cephalon in lateral view; *i*, pereiopod 6 (spines, setae omitted); *j*, maxilliped; *k*, maxillule; *l*, maxilla; *m*, telson and uropod; *n*, pleopod 2; *o*, mandible.

margin broad, armed with 6 stout spines and ca. 32 plumose setae among which are set a few short simple setae including a central pair. Uropod with protopod extending halfway along inner margin of endopod, outer distal angle with 3 spines, inner margin with 4 plumose setae. Endopod moderately broad, posterior margin with 3 spines and 6 plumose setae. Endopod narrow, sides subparallel, posterior margin with 3 spines and 11 plumose setae extending halfway along inner margin.

FEMALE: Differs only in sexual characters.

COLOR: Translucent. White with black chromatophores in alcohol.

SIZE: Longest male, 8.5 mm.

TYPES: Holotype ♂, Queensland Museum reg. no. W 7827. Paratypes 1 ♂, 5 ♀♀, Queensland Museum reg. no. W 7828.

TYPE LOCALITY: Little Ramsey Bay (Southern Creek), Hinchinbrook Island, 28 August 1978.

ETYMOLOGY: The specific name is based on the Latin word *dactylus* meaning a finger.

REMARKS: This is the only species of the genus in which the antennule exceeds the antenna in length, a cirolanid character otherwise shown only by the genera *Pseudaega* and *Pontogelos*. The straight outer margin of the uropodal exopod separates this species from *P. concinna* and *P. ovalis* sp. nov., while the short appendix masculina, rounder hind margin of the telson, together with pereopod details clearly separate this species from *P. elegans* sp. nov.

#### HABITAT

*Pseudolana* occupies a habitat similar to that occupied by *Excirrolana* and *Eurydice* on most coasts of the world (Brown 1973; Bruce and Jones, in press; Dexter 1977; Jones 1969, 1970, 1971, 1974) and by *Pseudaega* in New Zealand (Jansen 1978). *Pseudolana concinna* and *P. elegans* inhabit oceanic sandy beaches, though populations appear absent from many mainland beaches. *P. concinna* appears to occupy a zone from about mean tide level to high water, while *P. elegans* is

found lower on the shore toward low water springs level.

The habitat of *P. dactylosa* is somewhat different from this as it inhabits the creek outflows, which vary in salinity from pure freshwater at low tide to pure seawater at high tide, and furthermore are completely sheltered from any wave action. This species inhabits a zone on the steep sides of sand banks just around and below mean low water level.

There is little data on the habitat of *P. ovalis*. This too comes from a variable salinity habitat, though a less extreme one than the previous species. It was taken from a sandy bottom and appears to be subtidal.

#### ZOOGEOGRAPHY

This genus is confined to the Australian coastline, the one record from South America (Menzies 1962) proving to be erroneous. The genus appears to be absent from New Zealand, where it is replaced by the endemic *Pseudaega* (Jansen, 1978). It is possible that the genus has a wider distribution, as few studies on isopods have been carried out in the vicinity of Australia (Bruce 1980), and further species may be concealed within the genus *Cirolana*.

Of the species known, *P. concinna* has a wide distribution extending from north of Townsville down the eastern seaboard of Tasmania, and is also recorded from West Australia. All the others are known only from their respective type-localities.

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