

Two new species of *Panesthia* (Blattodea: Blaberidae, Panesthiinae) from Queensland

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ABSTRACT

Two new species of wood-feeding *Panesthia* cockroaches are described from Queensland: *Panesthia juncta* sp. nov. and *Panesthia grayi* sp. nov. We also provide an updated key to the Australian *Panesthia*.

The blaberid genus *Panesthia* (Blattodea: Blaberidae, Panesthiinae) consists of large, heavy-bodied cockroaches known for their close ecological association with rotting wood, which is used as both a food source and a substrate for burrowing. Fifty-six species are recognised globally, spanning a distribution that includes Asia, Melanesia and Oceania (Roth, 1977, 1979a, 1979b, 1982; Wang et al. 2014). In Australia, the genus is represented by 11 species and two subspecies, with their diversity concentrated in the forests of the eastern seaboard.

Most of the Australian species were described in a period of concerted discovery during the late 19th and early 20th centuries, associated with the rapid expansion of European settlement (Brunner de Wattenwyl, 1865; Kirby, 1903; Shaw, 1918; Tepper, 1893; Walker, 1868). Cumulatively, these authors reported 13 species, which were revised to the 11 recognised today by Princis (1965) and Roth (1977). While little progress was made in the years immediately following these reviews, the last two decades have seen a renewal of targeted *Panesthia* collections, with excursions to numerous forest fragments across Queensland (J.A. Walker, H.A. Rose, pers. obs.). The authors recently undertook a taxon-rich phylogenetic study including samples from across the eastern seaboard (Adams et al. 2024), which suggested the presence of up to six additional unrecognised species.

Here we describe two new *Panesthia* species from Queensland, corresponding to *Panesthia* sp. Airlie Beach and *Panesthia* sp. Koombooloomba in the phylogeny of Adams et al. (2024). We also update Roth's (1977) key to Australian *Panesthia* species based on resultant morphological observations.

MATERIALS AND METHODS

Photographs were taken using a Canon 7D Mark 1 camera with Laowa 25 mm f/2.8 2.5-5x and Canon Macro EF 100 mm f/2.8 lenses, and were edited in Adobe Photoshop v.24.1.1 (Adobe Inc. 2022). To characterise internal anatomy, specimens were relaxed in warm water and the abdominal tissue dissected. Genitalia were viewed in 80% ethanol and examined using a Leica M250C stereomicroscope. We produced illustrations in Procreate v.5.2 (Procreate Team 2022).

All measurements are in millimetres. In descriptions of males, holotype measurements are given with paratype measurements in brackets, while female measurements are of paratypes. The number of paratypes measured is provided in parentheses. Genitalic terminology follows McKittrick (1964), as in Roth (1977).

Abbreviations:

Collectors: BG: B. Gray; DC: D. Cook; GBM: G.B. Monteith; HAR: H.A. Rose; JAW: J.A. Walker; JRW: J.R. Woodward.

Museums and collections: ANIC: Australian National Insect Collection, Canberra; HARPC: H.A. Rose private collection, Sydney; JAWPC: J.A. Walker private collection, Canberra; QM: Queensland Museum.

SYSTEMATICS

Order BLATTODEA

Family BLABERIDAE

Subfamily PANESTHIINAE

Panesthia (Serville, 1831: 38)

Proterodia (Costa, 1866: 5; synonymised by Princis, 1965: 309)

Dicellonotus (Butler, 1882: 387; synonymised by Roth, 1977: 12)

Type species: *Panesthia angustipennis* (Illiger, 1801)

Diagnosis (primarily following Roth, 1977, 1979b, as in Wang et al. 2014): Colour reddish brown, fulvous or black. Size ranging from 15 mm to over 50 mm. Body strongly sclerotised and punctate, with punctation density increasing posteriorly. Head typically punctulate, vertex with or without foveola; eyes large, ocelli may be fully developed, reduced or absent. Antennae moniliform. Pronotum convex to transverse, with or without anteromedial reflexed tubercle, anterior margin variably excised or entire. Anterior half variably depressed, surface punctate to granular with pair of oblique transverse grooves. Anterior cornua and posterior disc tubercles may be present, typically more pronounced in males. Tegmina and wings unicoloured or not; fully developed, reduced or absent, or tegmina reduced and wings absent. Fully developed or partially reduced wings and tegmina frequently mutilated

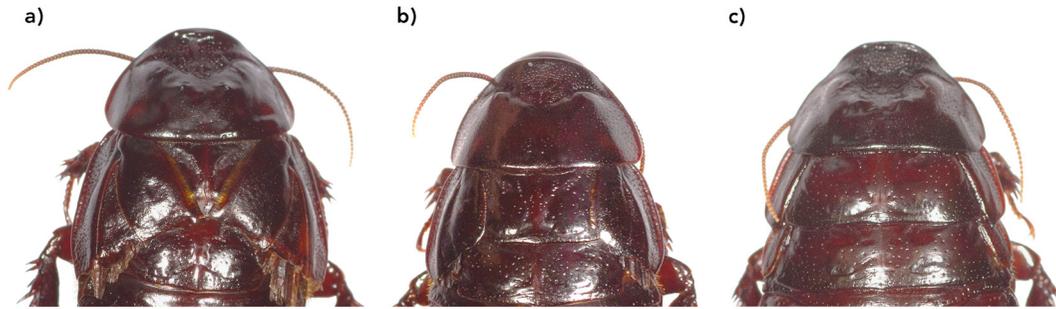


Figure 1. Representative images of cockroaches **A:** fully developed (macropterous) wings, post mutilation **B:** partially developed (brachypterous) wings, post mutilation **C:** highly reduced (micropterous) wings. Images are of the wing-polymorphic species *Panesthia cribrata*. Photographs by B.R. Jones.

terminally, leaving basal portions as remains. Tibiae strongly spined. Tarsi with five segments, pulvilli present on segments 1–4, hind metatarsus shorter than remaining segments combined; claws symmetrical and without arolia.

Abdominal terga usually hairless, hind margins entire and without teeth or tubercles. Anterolateral corners of tergites 3–7 with or without holes, holes usually without setae, size of the holes increasing posteriorly. Lateral margins of tergite 7 straight, weakly uneven, or concave on posterior half; laterocaudal angles often produced and directed caudad. Caudal angles of supra-anal plate obtuse, variably rounded; hind margin dentate, crenulate or entire. Posterior margin of sternite 7 concave, truncate or subtruncate in males, exposing subgenital plate; convex, entire in females, without subgenital plate. Cerci short, unsegmented, bulbous, ventrally setose, dorsoapically setose or glabrous. Both sexes lack styli. Paraprocts asymmetrical, apically setose, right with sclerotised, finger-like projection. Anterior and lateral margins of subgenital plate concave, posterior margin strongly sclerotised, rounded. Males with four genital phallomeres: first sclerite of left phallomere (L1) with two lobes separated by sclerotised cleft, rarely reduced or absent; second ventromedial sclerite of left phallomere (L2vm) strongly sclerotised, rod-like; second dorsal sclerite of left phallomere (L2d) posteriorly sclerotised, approximately triangular or blade-like, occasionally reduced or absent; second sclerite of right phallomere (R2) hook-shaped, rarely reduced to straight rod or absent.

Key to Australian *Panesthia* species

The following key has been modified from Roth (1977). In cases where the wings have been mutilated, wings are considered fully developed (macropterous) or partially reduced (brachypterous) if the terminal bases of the tegmina are separated by no more than the approximate width of the scutellum (Fig. 1A, B). Wings are considered highly reduced (micropterous) if the terminal bases of the tegmina are separated by nearly the entire width of the meso- or metanotum (Fig. 1C). The wing-polymorphic species *Panesthia cribrata* (Saussure, 1864) and *Panesthia australis* (Brunner de Wattenwyl, 1865) each occur twice in the key.

1. Tegmina and wings fully developed or partially reduced but reaching beyond the 1st abdominal segment, with tegmina relatively wide and not in the form of highly reduced lateral pads **2**
Tegmina in the form of highly reduced lateral pads, or completely absent **8**
2. Anterior half of tegmina with oblique yellowish band *Panesthia tepperi*
Tegmina without oblique yellowish band **3**
3. Hind margin of supra-anal plate toothed, denticles sometimes subobsolete **4**
Hind margin of supra-anal plate entire **5**
4. Dorsoapical portion of cercus densely setose. Anterolateral holes of abdominal segment 7 deep and widely excised. Lateral marginal hemline of supra-anal plate incomplete, subobsolete, or absent *Panesthia ancaudellioides*

- Dorsoapical portion of cercus with few punctuations but not setose. Anterolateral holes of abdominal segment 7 typically small. Lateral marginal hemline of supra-anal plate narrow, but complete and distinct *Panesthia cribrata*
5. Dorsoapical surface of cercus non-setose. Posterolateral angle of abdominal segment 7 hardly produced, rounded. Vertex foveolate, anterior pronotal margin widely excised with a small, broad, triangular mesal elevation (male); vertex non-foveolate, anterior pronotal margin feebly concave, without a mesal elevation (female) **6**
 Cercus bulbous, dorsoapical half or more densely setose. Vertex non-foveolate, anterior pronotal margin with a V- or U-shaped emargination without a mesal elevation (male), or only slightly indented or entire (female) **7**
6. Lateral margin of abdominal segment 7 approximately straight. Body length typically ≤ 20 mm. Disc tubercles absent or subobsolete (male) *Panesthia parva*
 Lateral margin of abdominal segment 7 sinuous, concave on posterior half. Body length typically > 20 mm. Disc tubercles distinct, weakly produced (male) *Panesthia grayi* sp. nov.
7. Lateral margin of abdominal segment 7 straight or slightly concave on posterior half, caudal angle subacute *Panesthia australis*
 Lateral margin of abdominal segment 7 deeply concave on posterior half, caudal angle broadly rounded *Panesthia obtusa*
8. Tegmina present **9**
 Tegmina and hind wings absent **14**
9. Hind wings present **10**
 Hind wings absent **11**
10. Hind margin of supra-anal plate crenulate or subentire. Dorsal surface of cercus non-setose *Panesthia cribrata*
 Hind margin of supra-anal plate entire. Dorsal surface of cercus densely setose *Panesthia australis*
11. Anterior pronotal margin entire, subentire or subtruncate, reflexed tubercles on each side of the midline absent, small mesal marginal tubercle present (male) or absent (female). Pronotal disc shallowly or moderately depressed. Anterolateral corners of abdominal segments 6 and 7 with deep holes **12**
 Anterior pronotal margin narrowly excised, lateral corners of the excision forming small reflexed tubercles, mesal marginal tubercle absent (both sexes). Pronotal disc deeply excavated with pair of widely spaced tubercles. Anterolateral corners of abdominal segments 6 and 7 without deep holes *Panesthia tryoni tegminifera*
12. Hind margin of supra-anal plate crenulate or shallowly undulate. Anterior pronotal disc moderately depressed, somewhat granular, disc tubercles present (male). Anterolateral holes of abdominal segments 6 and 7 extending behind anterior margin of segment as sinuous grooves. Cercus bulbous, apically rounded, dorsoapical surface sparsely or densely setose **13**
 Hind margin of supra-anal plate entire. Anterior pronotal disc shallowly depressed, finely punctulate, disc tubercles subobsolete or absent (male). Anterolateral holes of abdominal segments 6 and 7 not extending behind anterior margin of segment as sinuous grooves. Cercus subrectangular, dorsoapical punctulate, non-setose *Panesthia lata*
13. Apex of tegmen typically fused with mesonotum. Anterolateral corner of abdominal segment 5 with small hole. Second dorsal sclerite of left phallomere broad, length approximately equal to width at base (male) *Panesthia juncta* sp. nov.
 Apex of tegmen never fused with mesonotum. Anterolateral corner of abdominal segment 5 without small hole. Second dorsal sclerite of left phallomere narrow, length greater than width at base (male) *Panesthia matthewsi*
14. Hind margin of supra-anal plate unevenly crenulate, teeth broad at base, tapering, closely spaced. Emargination of anterior pronotal margin narrow and angular *Panesthia tryoni tryoni*
 Hind margin of supra-anal plate dentate, teeth relatively slender, usually more widely spaced. Emargination of anterior pronotal margin wide and concave *Panesthia sloanei*

Remarks: The taxonomic key presented above follows Roth (1977) in including *Panesthia tepperi* (Kirby, 1903). *Panesthia tepperi* is unique among Australian *Panesthia* for the presence of a yellow band on its tegmina, as this morphology is otherwise observed exclusively in Asian taxa. Records of the species are exceptionally scarce, and it was described from a single specimen, reportedly collected from Port Darwin, Northern Territory. Tepper (1893) initially identified the specimen, which was collected by his brother circa 1874, as belonging to the pre-existing species *Panesthia transversa* (Brumeister, 1838). However, based on Tepper's (1893) morphological description, Kirby (1903) instead described the specimen as a new species (*P. tepperi*), highlighting the interrupted yellow band on the tegmina (versus uninterrupted in *P. transversa*). *Panesthia tepperi* was listed as a valid species in the taxonomic reviews of Princis (1965) and Roth (1977), though neither author examined the material, and similarly relied upon Tepper's (1893) original account of the holotype. Therefore, all previous taxonomic treatments of *P. tepperi* have been based on a single sample. The authors are only aware of two additional specimens, labelled as originating from Mitchell River, Queensland (date unknown). Two of the four authors (HAR and JAW) have conducted extensive surveys in likely habitats around Mitchell River and Darwin without detection of the species.

This combination of divergent morphology and unverified occurrence records raises significant doubts about the taxonomic status of *P. tepperi*, suggesting that the three putative specimens may represent mislabelled Asian or Melanesian material. Here we provisionally treat *P. tepperi* as an Australian species, however we emphasise the need for future genetic analyses of the specimens to determine whether they cluster with Australian or Melanesian taxa.

More broadly, molecular phylogenetic studies have shown that *Panesthia* is polyphyletic with respect to the genera *Caeparia* (Stål, 1877) and *Ancaudellia* (Shaw, 1925), as well as the Australian-endemic subfamily Geoscapheinae (Beasley-Hall et al. 2021, Lo et al. 2016, Maekawa et al. 2003). Therefore, there is a clear need for a substantial taxonomic

revision of Panesthiinae, although this undertaking is beyond the scope of the present study. Based on their close evolutionary affinity to the genus' type species *Panesthia angustipennis* (Illiger, 1801), as inferred from molecular data (Lo et al. 2016, Adams et al. 2024), we suggest that both species described here are likely to retain the generic epithet *Panesthia*. However, their placement should still be considered somewhat provisional, pending future taxonomic assessments.



Figure 2. *Panesthia juncta* sp. nov. holotype, in dorsal view. Photograph by B.R. Jones.

***Panesthia juncta* sp. nov.**

Etymology: From the Latin word for 'joined', referring to the fusion of the tegmen with the mesonotum.

Diagnosis: Tegmina reduced to lateral sclerotised pads, wings absent; cerci broadly rounded and dorsoapically setose; tergite 5 (T5) with minute anterolateral pit; male pronotum with well-developed disc tubercles. In most individuals, apex of tegmina fused with lateral margin of mesonotum.

Male: Head concealed below pronotum, vertex non-foveolate; dorsal surface glabrous, with frons weakly punctuate and gently wrinkled; ocelli oblique; interocular distance greater than between mesal margins of antennal pits (Fig. 2).

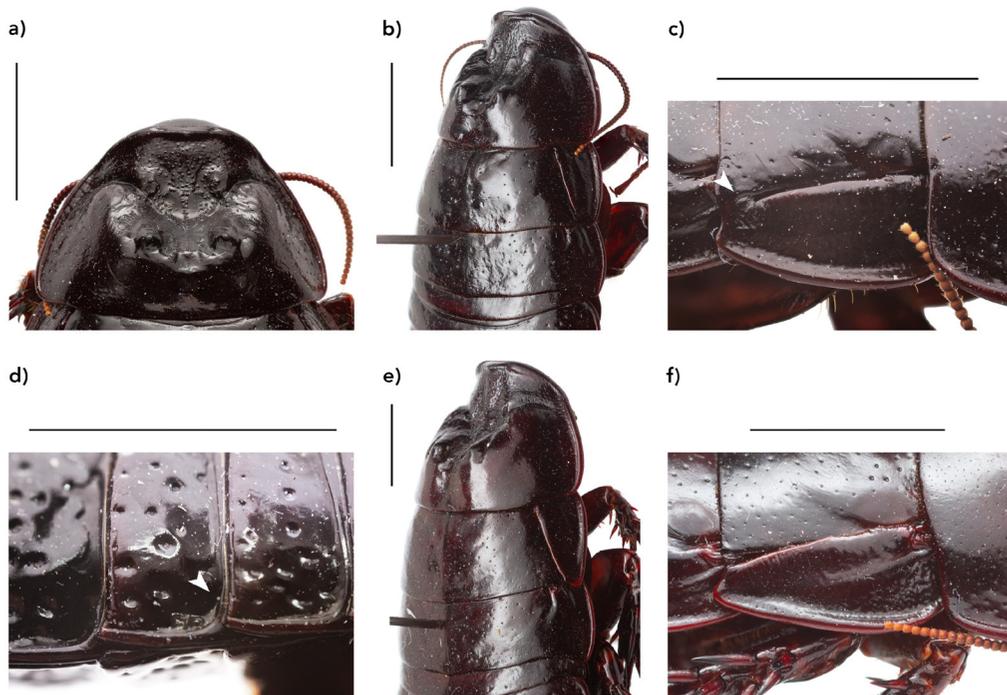


Figure 3. *Panesthia juncta* sp. nov.; **A–D** holotype; **A**: pronotum (dorsal) **B**: thorax (dorso-oblique) **C**: tegmen (lateral, arrow indicates fusion with mesonotum) **D**: T5 (lateral, arrow indicates anterolateral pit) **E–F** male paratype; **E**: thorax (dorso-oblique) **F**: tegmen (lateral). All scale bars represent 5 mm. Photographs by B.R. Jones.

Pronotum convex, widest between laterocaudal corners (Fig. 3A). Anterior margin incassate, upturned, subtruncate, swollen laterally; medially with reflexed, raised triangular tubercle, apex bluntly rounded. Pronotum anteromedially depressed, roughened, with pair of oblique, arcuate grooves running to anterolateral margins; remainder punctate, punctures very fine posteriorly; posterior pair of round, blunt disc tubercles. Lateral margins incassate. Posterior margin slightly concave behind each laterocaudal corner. Tegmina reduced to lateral, triangular sclerotised lobes; apex typically fused with mesonotum, or rarely free and extending to before, at, or slightly after hind margin of mesonotum, apex rounded or abruptly truncate; costal margin incassate (Fig. 3B–C, E–F). Wings absent, relic of interstice between wing and metanotum sometimes remaining as minute sulcus behind anterior margin of metanotum. Meso- and metanotum subrectangular; laterocaudal corners rounded and slightly expanded; hind margin weakly

convex; surface with irregular, fine punctuations. Coxae and femora dorsoventrally flattened, surface glabrous except for fringing setae along anterior and posterior margins; tibiae narrow, spatulate. Anterior ventral margin of front femur with 2 (rarely 0, 1 or 3) basal spines and small distal spine, posterior margin with large distal spine; anterior spines occasionally located asymmetrically.

Tergites rectangular, non-setose, punctate, punctures increasing in size and density laterally and caudally. T5–7 with anterolateral holes, weakly developed on T5 (Fig. 3D); T6–7 holes extending as uneven grooves behind anterior margin of tergite, diminishing medially, margin undulate above the grooves. T7 lateral margin posteriorly somewhat concave, laterocaudal angle produced into an acute spine; hind margin straight. Hind margin of supra-anal plate weakly undulate with 7 (rarely 6 or 8) shallow, rounded denticles; lateral angles obtuse and broadly rounded, oblique, larger than denticles. Sternites 1–4 weakly punctate laterally; S5–6 weakly

punctate mesally and densely punctate laterally. S7 densely punctate; depressed laterally with shallow, transverse groove in anterolateral corner; posterior margin truncate or weakly concave, exposing subgenital plate, margin somewhat incrassate below cerci. Cerci bulbous, anterolaterally concave; dorsal surface basally glabrous and apically with few, fine setae; ventral surface covered by dense short setae, with few longer setae. All four genital phallomeres present and well developed (Fig. 4A–C); L1 weakly sclerotised, consisting of two ovoid lobes, more heavily sclerotised in cleft between lobes; L2vm elongate, rod-like, apically bulbous; L2d approximately triangular, apex rounded and heavily sclerotised, lateral margins variably concave, length approximately equal to length at base; R2 strongly sclerotised, hook-shaped.

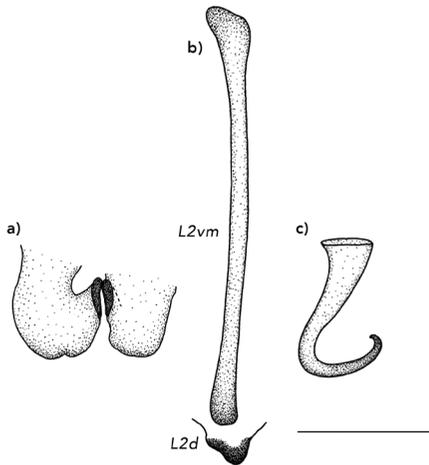


Figure 4. *Panesthia juncta* sp. nov. non-type: **A:** left phallomere (L1) **B:** median phallomere (L2vm and L2d) **C:** right phallomere (R2d). Scale bar represents 1 mm.

Size: Total length 33.1 (34.0–36.4); pronotal length × width, 7.4 × 11.1 (8.5–9.0 × 12.2–13.0) ($n = 2$).

Colour: Head black or dark brown, eyes dark, ocelli pale. Antennae dark brown basally, grading to tan distally. Clypeus fulvous, labrum pale dorsally and brown ventrally, mandibles brown. Labial and maxillary palpomeres brown or tan, with yellow ring around apical circumference. Pronotum dark brown to black anteromedially, fuscous laterally and posteriorly; meso- and metanotum fuscous to dark brown. Coxae and femora ferruginous to

dark brown; tibiae dark brown to black, spines black apically; tarsomeres ferruginous, pulvilli tan. Tergites fuscous to black. Abdominal sternites 1–6 ferruginous mesally and black laterally; cerci ferruginous to black, with pale setae. Dorsal and ventral surfaces lustrous; ventrally with sparse golden setae. Subgenital plate fuscous to dark brown, posterior margin paler.

Female: Pronotum without anterior development, disc less granular and more shallowly depressed, disc tubercles absent, with or without shallow pits in their place. Abdomen broader; hind margin of S7 entire; subgenital plate absent. An ootheca was dissected from one female (Dryander Forest, Queensland, 20.2751°S 148.5860°E), and consisted of 22 eggs arranged in a double row.

Size: Total length 29.4–35.2; pronotal length × width, 6.8–7.8 × 10.4–11.1 ($n = 2$).

Nymph: Male pronotum without anterior development; tegmina absent; early instars ferruginous dorsally and fulvous ventrally; late instars ferruginous to black dorsally, fulvous or reddish ventrally.

Material examined: *Holotype* ♂: QM T260326, QLD Dryander Forest, 15 km NNE of Proserpine, 20.2751°S 148.5860°E, 80 m, in rotten log, 6.v.2015, BG, HAR, JAW.

Paratypes (4): ANIC: 1♂ (ANIC 09-006304), 1♀ (ANIC 09-006305), QLD Brandy Creek, 8 km SW of Airlie Beach, 20.341°S 148.682°E, 165 m, in rotten log, 5.v.2015, BG, HAR, JAW. QM: 1♂ (T260327), 1♀ (T260328), same data as holotype.

Other material (176): HARPC: 3♂, 3♀, 2♂ nymphs, 3♀ nymphs, same data as holotype; 3♀, 1♂ nymph, 4♀ nymphs, QLD 12 km W of Airlie Beach, off Patullo Road, 20.2707°S 148.5822°E, 13.viii.2014, HAR, JRW; 1♀, 3♂ nymphs, 3♀ nymphs, QLD 7.3 km SSW of Airlie Beach, Brandy Creek Road 20.34103°S 148.6816°E, 12.viii.2014, HAR, JRW; 1♂, 2♀, 11♂ nymphs, 11♀ nymphs, QLD 7.3 km SSW of Airlie Beach, Brandy Creek Road 20.3411°S 148.6785°E, 14.viii.2014, HAR, JRW; 3♀, 2♂ nymphs, 1♀ nymph, same data as ANIC paratypes. JAWPC: 4♂, 6♀, 42♂ nymphs, 44♀ nymphs, same data as holotype; 5♀ nymphs, QLD 12 km W of Airlie Beach, off Patullo Road, 20.2707°S 148.5822°E, 13.viii.2014, HAR, JRW;

10♂ nymphs, 6♀ nymphs, QLD 7.3 km SSW of Airlie Beach, Brandy Creek Road, 20.34103°S 148.6816°E, 12.viii.2014, HAR, JRW, HARPC. QM: 1♂, 1♀, QLD Mt Dryander, 20.25°S 148.55°E, 650 m, 21.xi.1992–iv.1993, DC, GBM.

Distribution and remarks: This species is presently known from wet forest in the vicinity of Airlie Beach, Queensland. This habitat is characterised by high rainfall (~1800 mm p.a.) and relatively organic-rich soils (Hardy, 2003). Typical of the genus, *P. juncta* constructs resident galleries in decaying logs, and has been observed to form aggregations of approximately 5–10 individuals. While all specimens collected by the authors were from forest immediately adjoining National Park or State Forest, we expect this species to also be present within those reserves.

The fusion between the mesonotum and the tegmen observed in *P. juncta* is unique among all known panesthiine taxa. Similar, but not identical, wing structure has been observed in *Panesthia tryoni tegminifera* (Roth, 1977), as well as *Ancaudellia insularis* (Kirby, 1903). In these taxa, the tegmina and hind wings, respectively, are partially fused with the mesonotum along the entire length of the mesal margin, with a suture that incompletely cleaves the cuticle. In contrast, only the apex of the tegmen is fused in *P. juncta*, with most of the mesal margin completely detached. Interestingly, the extent of fusion varies intraspecifically: in some specimens examined, the apex of the tegmen is completely contiguous with the mesonotum; while in others there is only a thin (< 1 mm diameter) bridge of connecting integument. Additionally, in a minority of examined material (< 10%), one or both tegmina were completely free.

***Panesthia grayi* sp. nov.**

Etymology: After Bruce Gray, a naturalist who assisted in the discovery and collection of all currently recorded specimens.

Diagnosis: Vertex of head with foveola; pronotum with anteromedial reflexed tubercle; disc tubercles distinct, weakly developed; lateral margin of abdominal segment 7 sinuous, concave on posterior half; cerci dorsoapically glabrous. Adult body length typically > 20 mm.



Figure 5. *Panesthia grayi* sp. nov. holotype, in dorsal view. Photograph by B.R. Jones. Scale bar represents 5 mm.

Male: Vertex exposed, with broad, deep foveola; surface finely punctate; ocelli round; interocular distance less than between mesal margins of antennal pits (Fig. 5, 6C).

Pronotum transverse, widest slightly posterior of midlength, anterolateral margins incrassate (Fig. 6A). Anterior margin widely and deeply excised, separating two well-produced, broadly rounded, slightly reflexed marginal tubercles; medially with reflexed, raised triangular tubercle, apex rounded. Pronotum anteromedially depressed, finely granulate, with pair of oblique, gently arcuate grooves running to anterolateral margins; posterolaterally finely punctate. Disc laterally raised, posteriorly with pair of distinct, weakly-produced tubercles. Meso- and metanotum irregularly punctate. Tegmina and wings fully developed, extending beyond hind margin of abdomen when not mutilated (mutilated in all type material); costal area of tegmen strongly punctate, lateral margin upturned (Fig. 6B, E). Coxae and femora dorsoventrally flattened, surface glabrous except for fringing setae along anterior and posterior margins; tibiae narrow, spatulate. Anterior ventral

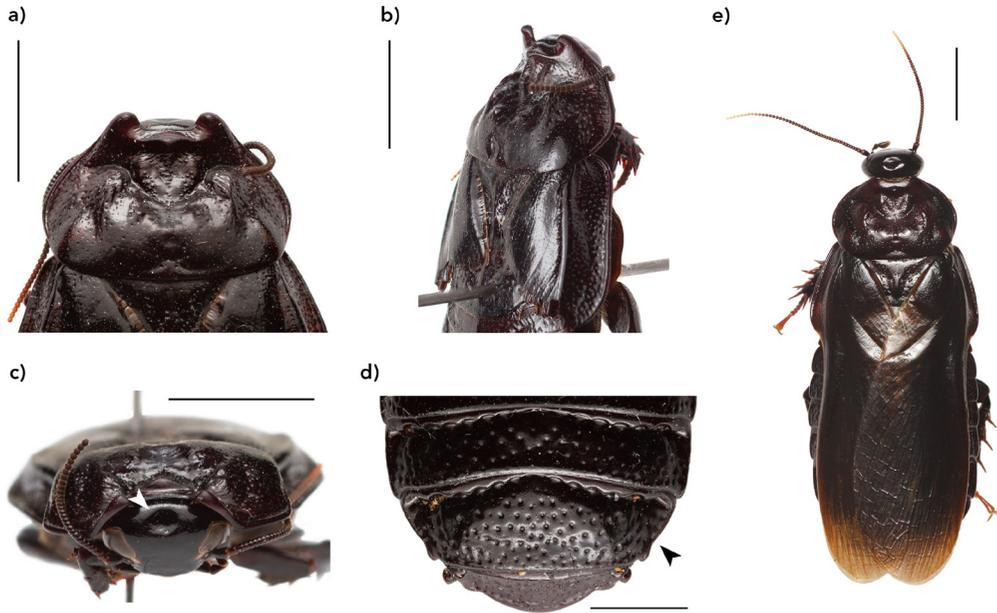


Figure 6. *Panesthia grayi* sp. nov.; **A–D** holotype; **A**: pronotum (dorsal) **B**: thorax (dorso-oblique) **C**: head (anterior, arrow indicates foveola) **D**: terminal tergites (dorsal, arrow indicates concave margin of tergite 7) **E**: female non-type, in dorsal view. All scale bars represent 5 mm. Photographs by B.R. Jones.

margin of front femur with 2 (rarely 1) basal spines and small distal spine, posterior margin with large distal spine; anterior spines occasionally arranged asymmetrically.

Tergites strongly, densely and almost uniformly punctate. T5–7 with anterolateral holes; weakly developed on T5; T6–7 holes extending as uneven grooves behind anterior margin of tergite, diminishing medially, margin undulate above the grooves. T7 lateral margin sinuous, weakly concave on posterior half, laterocaudal angle produced into a broadly rounded spine; hind margin straight (Fig. 6D). Hind margin of supra-anal plate entire, lateral angles broadly rounded. Sternites 1–5 weakly punctate mesally and more densely punctate laterally; S6–S7 densely punctate; depressed laterally with shallow, transverse groove in anterolateral corner; S7 posterior margin truncate, exposing subgenital plate, margin somewhat incrassate below cerci. Cerci broadly triangular, dorsally glabrous, ventrally setose. All four genital phallomeres present and well developed (Fig. 7A–C); L1 weakly sclerotised, consisting of

two ovoid lobes, more heavily sclerotised in cleft between lobes; L2vm elongate, rod-like, apically bulbous; L2d sclerotised apically, broadly rounded, shorter than length at base; R2 strongly sclerotised, hook-shaped.

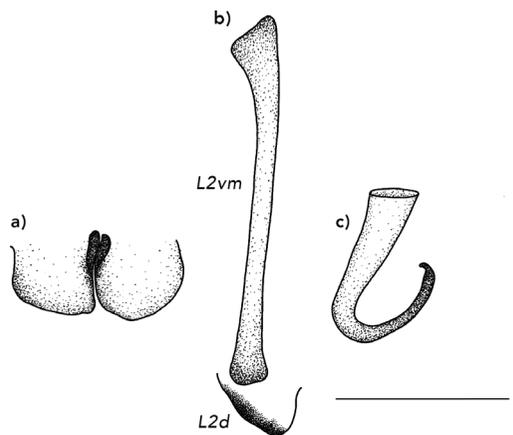


Figure 7. *Panesthia grayi* sp. nov. holotype; **A**: left phallomere (L1) **B**: median phallomere (L2vm and L2d) **C**: right phallomere (R2d). Scale bar represents 1 mm.

Colour: Head black, eyes dark, ocelli pale. Antennae dark brown basally, grading to tan distally. Clypeus fulvous, labrum pale dorsally and brown ventrally, mandibles brown. Labial and maxillary palpomeres dark brown or tan, paler apically. Thorax dorsally dark fuscous, almost black. Legs with coxae dark brown, tending to ferruginous apically; femora and tibiae ferruginous to dark brown, spines black apically; tarsomeres ferruginous, pulvilli tan. Abdominal sternites 1–5 ferruginous mesally, black laterally; S6–7 black; subgenital plate black; cerci dark, dorsal and ventral surfaces lustrous, ventrally with sparse golden setae.

Size: Total length 28.2 (23.6–30.2); pronotal length × width, 5.2 × 8.8 (4.8–5.8 × 7.8–9.2) ($n = 2$).

Female: Pronotum without anterior development, anterior margin weakly excised; disc less granular and more shallowly depressed, disc tubercles absent or subobsolete; hind margin of S7 entire; subgenital plate absent.

Size: Total length 22.9–29.0; pronotal length × width, 4.8–5.8 × 7.2–8.5 ($n = 2$).

Nymph: Male pronotum without anterior development; tegmina and wings absent; early instars ferruginous to fuscous dorsally and fulvous to tan ventrally; late instars ferruginous to black dorsally, fuscous to dark brown ventrally.

Material examined: *Holotype* ♂: QM T260329, QLD Kirrama Range, 27 km S of Ravenshoe, 847 m, 17.8838°S 145.5271°E, in dead standing tree, *Lophostemon suaveolens*, 10.x.2022, JAW, BG.

Paratypes (4). ANIC: 1♂ (ANIC 09-006302), 1♀ (ANIC 09-006303), QLD Kirrama Range, 27 km S of Ravenshoe, 847 m, 17.8838°S 145.5271°E, in dead standing tree, *Lophostemon suaveolens*, 5.ii.2023, JAW, BG. QM: 1♂ (T260330), 1♀ (T260331), same data as paratypes.

Other material (5): JAWPC: 2♂, same data as paratypes; 1♂ nymph, 2♀ nymphs, same data as holotype.

Distribution and remarks: The species is known only from its type locality in the Kirrama Range, Queensland, which consists of ecotonal wet sclerophyll on the margin of tropical rainforest. While *Panesthia* species are usually obligate

log-borers, *P. grayi* instead appears arboreal, having been collected exclusively from newly felled, dead standing trees. This life history strategy has also been observed by the authors in *Panesthia parva* (Shaw, 1918), *Panesthia obtusa* (Shaw, 1918) and a putative undescribed species from the Mount Windsor Tablelands (Adams et al. 2024).

DISCUSSION

The present descriptions raise the number of Australian *Panesthia* species to 13. Based on genetic results in Adams et al. (2024), at least two additional lineages from Cape Upstart and the Mount Windsor Tablelands in Queensland appear sufficiently divergent to be recognised as separate species. These are presently known from very few specimens, and we refrain from morphological description until additional material becomes available. Further, many tropical forest fragments remain unsampled for *Panesthia*, and we believe that future surveys may uncover additional species.

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