REVISION OF THE DUNG BEETLE GENUS *TEMNOPLECTRON* WESTWOOD (COLEOPTERA: SCARABAEIDAE: SCARABAEINI)

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Temnoplectron Westwood is revised and five new species described, four from North Queensland: *cooki*, *finnigani*, *lewisense*, *monteithi*, one from New Guinea: *wareo*. *Temnoplectron reyi* Paulian is removed from synonymy with *T. politulum* Macleay, *Temnoplectron laevigatum* Matthews is placed in synonymy with *T. boucomonti* Paulian, *T. heurni* Paulian and *T. howdeni* Paulian are synonymised with *T. atropolitum* Gillet, and *T. major* Paulian is recognised in Australia for the first time. All known species are redescribed. A key is provided for the 19 species of *Temnoplectron* and new distribution records are noted. A cladistic analysis of the genus is presented, the results of which suggest at least two origins for flightlessness in the genus. The biogeography of *Temnoplectron* is discussed with reference to isolation of rainforest blocks during periods of maximum aridity. ❐ *Coleoptera, Scarabaeidae, Temnoplectron, Australia, New Guinea.*

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The scarabaeine fauna of Australia is one of the best known speciose beetle groups on this continent, thanks to taxonomic revisions of all the genera by Matthews (1972, 1974, 1976). These works were partly based on surveys of pastoral country prior to the introduction of exotic species (Bornemissza, 1976) and collections by Matthews himself. The rainforests of north Queensland were relatively under-explored for scarabaeines until systematic collecting by Ross Storey, Geoff Monteith (Queensland Museum) and others, from 1976. Some material from these collections has been described (Storey, 1977, 1984, 1986, 1991; Matthews & Stebnicka, 1986; Storey & Weir, 1990; Storey & Monteith, 2000; Reid, 2000), but many new species remain undescribed, especially in the larger genera.

Temnoplectron Westwood is a genus of Scarabaeini with 16 described species prior to this revision; 10 in Australia (Matthews, 1974) and 6 in New Guinea (Paulian, 1985). The genus is well-defined and probably monophyletic, although it is possible that *Temnoplectron* is paraphyletic with respect to *Monoplistes* Lansberge and *Diorygopyx* Matthews (Matthews, 1974). The last two appear to be sister-taxa. The current revision is concerned with attaching names to species, preparatory to forthcoming phylogenetic analysis of the Australian Scarabaeini, which may result in changes to the generic concepts. More than 7,500 Australian specimens of *Temnoplectron* have been examined, collected from all of the major rainforest blocks in north Queensland. This recent collecting has discovered four new flightless montane species and several cryptic-species complexes, which are described here. Nineteen species are now recognised in the genus, 16 in Australia and 5 in New Guinea. A key to the species is presented.

The species of *Temnoplectron* are confined to the tropics and subtropics, as far south as the Brisbane area. The feeding and nidal behaviour of *Temnoplectron laevigatum* Matthews was described by Matthews (1974), and the biology of *T. involucre* Matthews has been examined in detail by Agnes Rortais, James Cook University, Townsville (1999, unpubl. PhD). To this can be added published studies of altitudinal range (Monteith, 1985), perching (Howden, Howden & Storey, 1991), seasonality in two species (Hill, 1993), edge effects (Hill, 1995), habitat fidelity, diel activity and diet (Hill, 1996). These studies show that, for the commoner species in the southern part of the Wet Tropics, collecting *Temnoplectron* is best within rainforest, between December and April, at night, using dung baits. *Temnoplectron* species are also attracted to liver, mushroom and banana baits (Hill, 1996). Other species occur in open woodland or dry forest (Matthews, 1974).

MATERIALS AND METHODS

MORPHOLOGY. The morphology of *Temnoplectron* was studied in detail to obtain as many characters as possible for phylogenetic analysis. Most terms for external characters should be obvious or self explanatory. The microsculpture is described as seen under 50× magnification. Several ratios are used in the descriptions as convenient short-hand descriptors of attributes, but it should be noted that many specimens are asymmetric and therefore the ratios can vary for a single specimen. The eye width is the width of the dorsal part of the eye at its widest point, which may be basal or medial, and is compared with the shortest dorsal distance between the eyes to give the interocular ratio. The hypomeral stria is the ridge and groove from the base of the hypomeron, parallel to the lateral margin (Fig. 4); it is compared with the length of the hypomeron to the posterior edge of the femoral excavation, at that point, to give the hypomeral ratio. The subtle greenish colour of the elytra is best seen by comparison with the pronotum (always black), under strong lighting. Striae 8-10 do not reach the basal edge of the elytra but are always abbreviated by short distances which are useful for diagnosing species. These distances are most conveniently measured against the length of the mesepimeron, where it touches the epipleuron. The outer margin of the fore tibia has three large major teeth, and an indeterminate number of minor teeth (Fig. 7). The length of the male hind tibial spine (Fig. 14) is often diagnostic (in fresh specimens) and is best compared with the width of the tibia at the base of the spine, which gives the tibial spine ratio.

Male genitalia were prepared by immersion in dilute KOH for several hours then rinsing in water. The endophallus was removed by cutting the membrane between the parameres and basal piece and separating these. In all species it is a simple tube without lateral lobes. The endophallus was pulled apart to expose the sclerites. A nomenclature of male endophallic sclerites in Coprini was provided by Génier (1996), which was modified for *Coptodactyla* Burmeister (Reid, 2000) and this system is appropriate for *Temnoplectron* species. In the latter, there are 4 endophallic sclerites (Fig. 20, flagellum omitted), in a single ejaculatory sac, which form the sperm pump when everted: the flagellum, almost uniformly shaped, with broad, trilobed and ridged base and single whip-like apex; the basal sclerite, an irregular folded plate or almost solid sclerotised lump adjacent to the flagellum; the ring sclerite, a sclerotised ring at or beyond the tip of the flagellum; the median sclerite, a deeply folded irregular shape in the middle of the endophallus. Other areas of sclerotisation may be present, but when observed through the inverted wall are poorly defined and generally only lightly sclerotised. The flagellum, being almost invariable, is not illustrated, the other sclerites are illustrated for almost all species.

Female genitalia were removed by tearing the softened integument along one side of the abdominal tergum and around the margins of the abdominal apex, freeing the genitalia plus gut from the abdominal walls. This unit was softened in dilute KOH, then water, and cleaned with removal of most of the gut, tracheae and glandular tissue. The spermatheca was examined in glycerol. The female genitalic system of *Temnoplectron* is unusual amongst Scarabaeinae in having the spermathecal duct opening directly to the external surface of the animal, not via the vagina, which is a separate ventrally situated duct (Fig. 23). There is often secondary sclerotisation around the entrance of the spermathecal duct, which may form a transverse or quadrate bar, the spermathecal sclerite. The characteristic sclerite between the female genitalia and the anus of *Coptodactyla* (Reid, in press) is absent, and the hemisternites are small and insignificant short quadrangular struts, internally placed on either side of the anus. The spermatheca, in common with many Scarabaeinae, has a transparent semi-circular window at the middle, on the inside margin of the point of inflexion (Fig. 24). The spermatheca showed little variation and is therefore not illustrated for all species, but the spermathecal sclerite, if present, is illustrated.

Descriptions are based on freshly emerged specimens, if available. Older specimens may have scratched dorsal surfaces, eroded fore tibial teeth (compare Figs 7G & H), tibial spurs, and hind tibial spines (compare Figs 15A & B), and the frontoclypeus may be blunted.

MATERIAL. Abbreviations for repositories are as follows: Australian Museum, Sydney (AMS); Australian National Insect Collection, Canberra (ANIC); Canadian Museum for Nature, Ottawa (CMN); Deutsches Entomologische Institut, Berlin (DEB); Hope Department of Entomology, Oxford (HDO); James Cook University, Townsville and Cairns campuses (JCU); Museo Civici, Genoa (MCG); Museum Zoologicum Bogoriense, Bogor, Indonesia (MZB); Natural

History Museum, Paris (MNHN); National Museum, Prague (NMP); Queensland Department of Primary Industry, Mareeba (DPIM); Queensland Museum, Brisbane (QM); South Australian Museum, Adelaide (SAM); University of Queensland Insect Collection, Brisbane (UQ), Western Australian Museum, Perth (WAM).

Abbreviations for collector's names (with more than two entries) are as follows: CB, C. Burwell; GB, G. Bornemissza; EB, E.B. Britton; JGB, J.G. Brooks; JDB, J.D. Brown; IC, I.F.B. Common; DC, D.J. Cook; DIC, D.J. & I. Cook; JD, J.T. Doyen; EE, E.D. Edwards; JF, J. Feehan; PF, P. Ferrar; GH, G.A. Holloway; HAH, H. & A. Howden; RH, R. Huppatz; HJ, H. Janetzki; EM, E.G. Matthews; DM, D.K. McAlpine; SM, S. Misko; GM, G.B. Monteith; GSM, G.B. & S.R. Monteith; MBM, M.S. & B.J. Moulds; SJP, S. & J. Peck; CR, C.A.M. Reid; IR, I. Reid; DR, D.C.F. Rentz; LR, L. Roberts; JS, J. Seymour; RS, R.I. Storey; RT, R.W. Taylor; GT, G.I. Thompson; MU, M.S. Upton; AWH, A. Walford-Huggins; AMWH, A. & M. Walford-Huggins; JW, J.L. Wassell; TW, T.A. Weir; DY, D.K. Yeates; PZ, P. Zborowski.

Abbreviations for geographic features: Bch, Beach; C, Cape; Ck, Creek; I., Island; Mt, Mount/Mountain; NP, National Park; Pt, Point; Ra, Range; R, River; Rd, Road; SF, State Forest; Tbld, Tableland.

DEFINITIONS OF SPECIES. A species is usually designated such by a taxonomist in ignorance of the full range of variation of the organism concerned. This morphological study, based on more than 7,800 specimens, has allowed a reasonable understanding of intra- and inter-population variation within species. Even the rarest Australian species is represented by 80 specimens.

Some of the new taxonomic decisions given here are the result of discovery of hitherto unknown morphotypes, or of cryptic species with distinctive male genitalia. These species are fairly obvious. However, *Temnoplectron* has a particularly difficult species-complex which was only partly resolved in the last revision (Matthews, 1974): the *rotundum* species-group. In this group, surface sculpture varies, perhaps clinally, so that fresh specimens from range extremes may have quite different punctation and microsculpture. This issue is further confused by the high frequency of old abraded specimens, as in species of *Coptodactyla* Burmeister (Matthews, 1976; Reid, 2000). As a rough guide to partitioning species in the *rotundum*-group we first relied on male secondary sexual characters on fresh major male specimens, arguing that these are important in mate-recognition and therefore species-discrimination by the organisms. We believe this is likely because in the *rotundum* species-group the primary male sexual organ, the aedeagus, shows little variation, whereas in the other species of *Temnoplectron* there is little or no development of secondary sexual characters but large and constant differences in aedeagal morphology (for example in the *politulum* species-complex, Fig. 19G, H). From this starting point, it became obvious that characters of the surface sculpture and elytral striae are too variable in the *rotundum* species-group to be used diagnostically, although these may be valuable characters in the other species-groups. On the other hand, there are excellent male leg characters which are diagnostic for each species. The results of our study of the *rotundum* species-group are some new synonymy and the recognition of a new species for the Australian fauna.

We have used the family name Laporte in place of Castelnau for the author of *Temnoplectron laeve*. Castelnau is an honorific title, for François Louis Nompar de Caumont Laporte, self-styled Compte de Castelnau (Musgrave, 1932).

Temnoplectron Westwood, 1841

TYPE SPECIES. *Temnoplectron rotundum* Westwood, by monotypy (Matthews, 1974).

DISTRIBUTION. Australia, from near Brisbane north and west to Cape York and the Kimberley Ranges, and New Guinea.

DIAGNOSIS. The genus was comprehensively described by Matthews (1974). Amongst Australian Canthonini it is identified by the following attributes: elytron without pseudepipleuron outside stria 7; each claw with sharp basal tooth; mid and hind tibial spurs not fused to tibial apex; pygidium without basal groove or depression.

A few minor additions or alterations need be made to the features listed by Matthews (1974): hypomeral stria present (minute in some specimens of *T. diversicolle* Blackburn); elytron with stria 8 present or absent; fore tibia of male not internally lobed at apex, with 3 large outer teeth and many small subsidiary teeth; mid tibia with two articulated spurs; hind tibia with prolongation (spine) present or absent; articulated spur present or absent; first hind tarsal segment as

long as or shorter than second; parameres symmetrical or asymmetric, apices not strongly deflexed ventrally; endophallus with four sclerites; female with entry to spermathecal duct externally exposed on ridge (often sclerotised) between vagina and anus; spermathecal duct long and tightly coiled.

The male can be distinguished by: apical fore tibial spur broader, ovate and bladelike (compare Fig. 9 parts E & F); pygidium longer; last ventrite medially foreshortened. Secondary sexual modifications may be present on the male pronotum, mid and hind femora and hind tibia. Most males have extended hind tibial spines in contrast to the unspined females (compare Fig. 13 parts E & F or 15B & C). Four species show sexual dimorphism in elytral surface sculpture.

The larval and pupal morphology is undescribed.

KEY TO SPECIES OF *TEMNOPLECTRON* WESTWOOD

Supplementary character states for a half couplet are given in brackets. Note that both states of couplet 12 are present in *T. cooki*, *T. lewisense* and *T. monteithi*. The couplets may appear cumbersome but appear to work for the thousands of specimens we have seen, including dwarf, deformed and teneral specimens.

1. Last two ventrites (5 and 6) separated by deep groove with row of large punctures (annular pits); head and pronotum impunctate, or extremely finely punctured (fronto-clypeal margin not produced between genal angle and median teeth; macropterous; ♂ posterior tibial spine short, flat and triangular, less than apical width of tibia, without spur; hind tarsi long, 0.35-0.5 length hind tibia; length 8-10mm; NG) . . . . . *atropolitum* Gillet

   Suture between last two ventrites not or weakly grooved, without row of punctures; head, and usually also pronotum, distinctly punctured 2

2(1). Larger, length 8-13mm; basal segment of labial palp much wider and 1.3-2 × longer than 2nd segment (eyes large, interocular ratio 4-7; lateral margins of pronotum complete; macropterous; 8th elytral stria present; ♂ posterior tibial spine elongate, as long as or longer than tibial width; hind tarsi short, <0.3 × length hind tibia; base of metasternal process without triangularly expanded margins) (*rotundum* species-complex). . . 3

   Smaller, length 3.5-7.5mm; basal segment of labial palpi as wide as and 1-1.5 × longer than 2nd segment (margins of frontoclypeus not rugosely punctured and not, or feebly, produced beside median teeth; ♂ mid femur not modified; ♂ hind tibia with articulated spur) 7

3(2). Clypeal margin almost straight between genal angles and median teeth, not expanded (Fig. 2A); basal margin of ♂ pygidium medially swollen (Fig. 16B); apex of ♂ hind tibia with small articulated spur (Fig. 14A) (hypomeral ratio 0.3-0.6; 1-2 minor teeth between major teeth of fore tibia; ♂ pronotum not medially depressed; 8th stria almost reaching base of elytra, abbreviated at base by ≤ length of mesepimeron; ♂ mid and hind femora broadest in apical half; ♂ hind tibial spine ratio 1.5-2, spine thick and blunt) 4

   Clypeal margin curved between genal angles and median teeth, convex near median teeth (Fig. 2B) (less obvious in worn specimens); ♂ pygidium with straight or evenly curved basal margin (Fig. 16A); apex of ♂ hind tibia without articulated spur (Fig. 14B) (if hypomeral ratio <0.6, 1-4 minor teeth between major teeth of fore tibia) 5

4(3). Frontoclypeus surface entirely finely punctate, or slightly rugose at anterior margins; venter of ♂ and ♀ mid femora evenly curved, not lobed or expanded at apex (Fig. 11A); parameres more elongate, almost symmetrical (Fig. 17A-B) (NQ) . . *bornemisszai* Matthews

   Frontoclypeus more strongly punctate and rugose towards the edges; ♂ mid femur with strong preapical ventral lobe (Fig. 11E), venter of ♀ mid femur slightly preapically expanded; parameres shorter, left thicker and less pointed than right (Fig. 17E) (NQ) . . *laeve* Laporte

5(3). Outer margin of fore tibia with 1-2 minor teeth between major teeth (Fig. 7B-D); inner margin fore tibia not emarginate; ♂ mid femur relatively flat, broadest in apical half, with large preapical ventral lobe and ♀ mid femur slightly ventrally expanded in apical half (Fig. 11B); ♂ hind femur broadest in apical half, ventrally narrowed at apex (Fig. 11H); ♂ hind tibial spine ratio 1.5-2, spine gradually tapered in profile (Fig. 14B-D); ♂ pronotum not antero-medially depressed (parameres asymmetric, left blunt, right narrower with sharp flat apical lobe) (S, C & NQ, NT, WA, NG). . . . . *boucomonti* Paulian

   Outer margin of fore tibia with 2-4 minor teeth between major teeth (Fig. 7E-H); inner margin fore tibia usually distinctly emarginate in basal half; ♂ and ♀ mid femora not expanded in apical half, broadest at middle (Fig. 11C-D); ♂ hind femur broadest in middle or in basal half (Fig. 11F, J); apical spine ♂ hind tibia long and thick, or short and flat; ♂ pronotum often antero-medially depressed 6

6(5). Outer face of hind tibia evenly contracted to base (Fig. 12B); inner margin of fore tibia emarginate about 0.3-0.4 length from base (Fig. 7E-F); hypomeral ratio 0.4-0.7; 8th elytral stria abbreviated by 0.5-1.5 × length of mesepimeron; pronotum and elytra dull, strongly and evenly microreticulate (except pronotal disc shining and not microreticulate in some Cape York Peninsula specimens); major ♂ pronotum deeply antero-medially depressed with lateral tubercles; ♂ mid femur without swollen external face; ♂ hind femur broadest at middle, evenly tapered to apex (also ♀) (Fig. 11J); apical spine of ♂ hind tibia massive and blunt, almost as thick as broad (Fig. 14F-G); parameres strongly asymmetric, left strongly curved, blunt, right with large flat apical lobe (Fig. 17G-H) (NQ & NG) . . . . . *major* Paulian

   Outer face of hind tibia abruptly contracted at base (Fig. 12C); inner margin of fore tibia emarginate 0.2-0.25 length from base (emargination rarely absent in ♀) (Fig. 7G-H); hypomeral ratio 0.6-0.9; 8th elytral stria abbreviated by 1-3 × length mesepimeron; disc of pronotum shining, not or shallowly microreticulate, in contrast to dull elytra; major ♂ pronotum shallowly depressed without lateral tubercles; ♂ mid femur broadest at middle, outer face swollen (less so in minor ♂); ♂ hind femur broadest before middle, with apex ventrally lobed (slightly so in ♀) (Fig. 11F); apical spine of ♂ hind tibia short, equal to apical tibial width, and flat in profile (Fig. 14H-I); parameres asymmetric, left thick and blunt, right with short flat lobe at apex (Fig. 17I-J) (NT, NQ) . . . . . *rotundum* Westwood

7(2). Basal quarter of elytra with 10 striae, 8th abbreviated by <2 × length mesepimeron, usually reaching apical half of elytra (eyes large, interocular ratio 3.5-4.5; pronotum shining, disc not or shallowly microreticulate, strongly punctured and lateral margin complete; elytra dark bronze-green; macropterous or almost so, wings extend beyond abdominal apex; ♂ hind tibial spine ratio 0.75-1.25; length 4-6.5mm). 8

Basal quarter of elytra with at most 9 striae, 8th abbreviated by >3 × length mesepimeron, usually confined to second quarter of elytra (*T. diversicolle*, *T. finnigani*, some *T. cooki*), or reduced to a few elongate punctures, or absent. 9

8(7). Right paramere without preapical dorsal notch in lateral view (Fig. 19B) (length 5-6.5mm; head strongly but sparsely punctured, dull and strongly microreticulate; ♂ elytra entirely dull and microreticulate, ♀ with intervals 5-10 or 6-10 shining, not obviously microsculptured except at extreme base; striae 1-7 with obvious foveolate punctures in apical half of elytra; fore tibia with 3-7 sharp minor teeth between major teeth) (NQ) . . . . . *aeneopiceum* Matthews

Right paramere with preapical dorsal notch (Fig. 19C) (length 4-5.5mm (5-5.5mm on Carbine Tbld); punctures and microsculpture of head usually uneven in density and size, with part (at least patch anterior to eye) or all of head shining; basal third to half of ♂ elytra shining and without microsculpture, apex microreticulate, ♀ with elytra entirely shining or only microreticulate on apical half of intervals 1-4; striae 1-7 not, indistinctly, or rarely distinctly, punctate in apical third; fore tibia with 2-5 minor, usually blunt, teeth between major teeth) (NQ) . . . . . *subvolitans* Matthews

9(7). Basal border of pygidium with middle strongly produced (Fig. 16D) (elytra dark bronze-green; lateral pronotal border complete; brachypterous, wing scale half elytral length; 8th stria present as impressed line on second quarter of elytra; interocular ratio 7-8.5; ♂ hind tibial spine ratio 0.65-0.75, spine blunt; parameres symmetrical, each with preapical fringe of long hairs) (NQ) . . . . . *finnigani* sp. nov.

Basal border of pygidium not medially produced, but straight or evenly curved (fig. 16C); without the above combination of characters 10

10(9). Lateral margin of pronotum partially or entirely effaced (Figs 4A-B,E,H) (anterior corners of metasternal process triangularly expanded) 11

Lateral margin of pronotum complete (Fig. 4C-D, F-G) (NQ) 17

11(10). Lateral margin of pronotum missing medially, at least present in apical and basal fifths, usually only effaced in middle quarter (Fig. 4E, H); brachypterous or wingless (Fig. 5D); eyes small, interocular ratio 8-12 (Fig. 3P-Q) (meso-metasternal margin with small triangular excision; NQ) 12

Lateral margin completely effaced, or only present in corners (Fig. 4A-B); macropterous; eyes larger, interocular ratio 3-6.5 (Fig. 3A-B) (length 4.5-5.5mm) . . 15

12(11). Size larger, length 5.5-7.5mm; ♂ hind tibia with long apical spine, equal to width of tibia (Fig. 15E-G) (linear segment of 8th stria usually partially present in second quarter of elytra) 13

Size smaller, length 3.5-4.5mm; ♂ hind tibia with short apical spine, less than half apical width of tibia (Fig. 13N-O) (8th stria absent or reduced to 2-3 punctures; pronotum strongly punctured, sides of disc with some interspaces equal to puncture diameters; elytra green) 14

13(12). Eyes smaller, interocular ratio 11-12 (Fig. 3P-Q); body less elongate, and more convex (Fig. 1B), length:width ratio 1.25-1.45; remnant of 8th stria shorter, present as short groove in elytral second quarter or reduced to punctures (Fig. 4H); elytra black (length 5.5-7.5mm) . . . . . *cooki* sp. nov.

Eyes larger, interocular ratio 8-9 (Fig. 3F); body more elongate, less convex (Fig. 1C), length:width ratio 1.40-1.65; 8th stria longer, at least throughout second quarter (Fig. 4E); elytra dark bronze-green (length 6-6.5mm). . . . . *diversicolle* Blackburn

14(12). Stria 9 deeply impressed, like stria 10, delineated by fine ridge, with at most 3-5 foveolate punctures in apical fifth; fore tibia with shorter, broader major teeth, separated by 3-5 convex or sharp minor teeth (Fig. 10F-H); base of upper epipleural margin not depressed; apices of both parameres concave, laterally depressed (Fig. 18E); apical spur of ♀ fore tibia evenly attenuated to curved tip (Fig. 10H) . . . . . *lewisense* sp. nov.

Stria 9 shallow, much shallower than stria 10 and not delineated by a ridge, with scattered foveolate punctures throughout; fore tibia with longer, narrower major teeth, separated by 2-3 feebly convex or flat minor teeth (Fig. 10B-E); base of upper epipleural margin depressed; apex of left paramere bluntly rounded, apex of right paramere triangularly produced (Fig. 18C-D); apical spur of ♀ fore tibia angulate on inner margin (Fig. 10C-E) . . . . . *monteithi* sp. nov.

15(11). Stria 1 strongly deepened in apical quarter of elytra; eyes larger, interocular ratio 3-4.5 (Fig. 3A-B); frontoclypeus slightly concave beside median teeth; ♂ hind tibia evenly curved, tibial spine ratio 0.6-0.75 (Fig. 13A-B); parameres symmetrical, with apico-ventral tooth (Fig. 19I-J) (NG). 16

Stria 1 not deepened at elytral apex; eyes smaller, interocular ratio 5.2-6.5 (Fig. 3C); frontoclypeus not concave beside median teeth; ♂ hind tibia slightly bent 0.25 from apex, tibial spine ratio 0.75-1.25 (Fig. 13C); parameres not symmetrical, without ventral tooth (Fig. 19E) (middle of pronotal disc finely and sparsely punctured; apex of elytra not produced; NQ) . . . . . *disruptum* Matthews

16(15). Elytra in profile evenly curved to apex of suture (Fig. 4A); frontoclypeus strongly punctured, including anterior to eyes; eyes smaller, more evenly narrowed anteriorly, interocular ratio 3.8-4.5 (Fig. 3A); pronotal disc more strongly and densely punctured . . . . . *aeneolum* Lansberge

Elytra in profile produced and slightly raised at apex of suture (Fig. 4B) (intervals 1-3 with subapical depression); frontoclypeus finely and sparsely punctured, anterior to eyes impunctate or almost so; eyes larger, abruptly curved anteriorly, interocular ratio 3-3.5 (Fig. 3B); pronotal disc more finely and sparsely punctured . . . . . *wareo* sp. nov.

17(10). Eyes larger, interocular ratio 3.5-4.5 (Fig. 3J-K); macropterous; hind body elongate, sides evenly tapering from prominent elytral humeri to almost truncate apex (Fig. 1F) (length 6-7.5mm; black; ♀ outer elytral intervals shining, contrasting with dull microreticulate inner intervals; ♂ hind tibial spine sharp, tibial spine ratio 0.85-1.25) 18

Eyes smaller, interocular ratio 7-12; hind wings vestigial; hind body broad and rounded, without prominent elytral humeri 19

18(17). Left paramere evenly attenuated to triangular tip (Fig. 19G); basal third of striae 5-6 very lightly impressed to almost invisible, less impressed than on second third of elytra, whole of stria 7 similar. . . . *politulum* Macleay

Left paramere sharply produced in profile, with flattened tip (Fig. 19H); basal two-thirds of striae 5-6 evenly impressed, stria 7 similar or more strongly impressed . . . . . *reyi* Paulian

19(17). Length 3.5-5mm; elytra distinctly bronzed or greenish; meso-metasternal border with small median transverse tubercle; ♂ hind tibia with short apical spine, tibial spine ratio <0.5; ♀ elytra shining and evenly shallowly microsculptured; one or both parameres concave, rounded or pointed in profile 20

Length 5.5-7.5mm; dorsum pure black; meso-metasternal border with flat triangular excision (Fig. 6B); ♂ hind tibia with long apical spine, tibial spine ratio 1-1.25 (Fig. 15F-G); ♀ outer elytral intervals shining, shallowly microsculptured, contrasting with dull inner intervals; both parameres with blunt or truncate apices in profile (Fig. 19D-E) (disc metasternum strongly punctured, mesosternum almost impunctate; wings straplike) . . . . . *cooki* sp. nov.

20(19). Stria 9 similar to stria 10, deeply impressed, delineated by a fine ridge, with at most 3-5 foveolate punctures in apical fifth; 2-5 sharp minor teeth present between major teeth of anterior border of fore tibia; base of upper epipleural margin not depressed; apical spur of ♀ fore tibia evenly attenuated to curved tip 21

Stria 9 shallow, much shallower than stria 10 and not delineated by a ridge, with scattered foveolate punctures throughout; fore tibia with longer, narrower major teeth, separated by 2-3 feebly convex minor teeth (Fig. 10B-E); base of upper epipleural margin depressed; apical spur of ♀ fore tibia angulate on inner margin (Fig. 10C-E) (apex of left paramere bluntly rounded, apex of right paramere triangularly produced; both parameres with short subapical row of setae) . . . . . *monteithi* sp. nov.

21(20). Elytra dark bronze-green, only slightly contrasting with pronotum, basal third of intervals 1-3 shining and usually without microsculpture; hypomeral stria convergent with side margin; interocular ratio 7-8, eyes broadest at base of dorsal portion (Fig. 3L); ♂ hind tibial spur 1.5 × length first tarsal segment (Fig. 13M); head, pronotum and metasternal median lobe usually finely and sparsely punctured; left paramere sinuate, with rounded apex, right paramere with angulate basal projection, neither with ventral setae (Fig. 18B) . . . . . *involucre* Matthews

Elytra brassy-green, contrasting strongly with black pronotum, strongly microreticulate throughout; hypomeral stria almost parallel to side margin; interocular ratio 8-10, eyes broadest near middle of dorsal portion (Fig. 3M); ♂ hind tibial spur as long as or shorter than first tarsal segment (Fig. 13N); head, pronotum and metasternal median lobe usually strongly and closely punctured; apices of both parameres concave, laterally depressed, with short ventral row of small setae (Fig.18E). . . . . *lewisense* sp. nov.

Temnoplectron aeneolum Lansberge
(Figs 3A, 4A, 8A, 13A, 19J, 21E, 23L, 24D, 25)

Temnoplectron aeneolum Lansberge, 1885: 375; Paulian, 1934: 285; Paulian, 1985: 224.

TYPE. Not seen (in MCG). The species is recognisable from the redescription of the type material given by Paulian.

MATERIAL. (5) PAPUA NEW GUINEA: 5, 34mi E Port Moresby, Kokoda Trail, 2200', dung traps, 14-18.vii.1974, S. Peck (CMN, DPIM)

DESCRIPTION (male). *Colour.* Body black, appendages reddish-brown.

Length: 4.5-5.5mm.

Head (Fig. 3A). Strongly but sparsely punctured, anterior, genae and middle of frontoclypeus more finely punctured and microreticulate than base; eyes large, evenly narrowed anteriorly, interocular ratio 3.8-4.5; anterior margin frontoclypeus strongly upraised and curved anteriorly from rounded genal angles, but slightly excavate before narrow apical teeth; first segment of labial palpi 1.2-1.5 × length second segment.

Thorax (Figs 4A, 8A, 13A). Pronotum: shining, not microreticulate except extreme lateral margins; pronotal disc strongly and closely punctured, not medially depressed; lateral margin pronotum entirely effaced, or almost so, at least 75% absent; hypomeral stria weakly expressed, hypomeral ratio 0.25-0.3; elytra entirely microreticulate, but shallowly and irregularly in basal third; elytra strongly arched in profile, highest at middle; stria 1 deepened in apical half, with 0-2 punctures; stria 8 reduced to a few elongate punctures in second elytral quarter, stria 9 abbreviated by 1.5-2 × length mesepimeron; base of epipleuron not constricted; macropterous; meso-metasternal border slightly raised, with narrow transverse median tubercle; median lobe of metasternum shining, without microsculpture except at extreme apex, finely but closely punctured, with margins triangularly expanded in apical corners; outer margin fore tibia with 2-4 convex minor teeth between three acute major teeth, inner margin slightly concave; mid and hind femora elongate-ovate; hind tibia with short apical spine, tibial spine ratio 0.75, with prominent articulated spur; hind tarsi long, 0.4 × length hind tibia, segment 1 ventrally lobed, 2, 3 and 4 elongate rectangular, decreasing in length, segment 5 almost equal length segments 3+4.

Abdomen (Figs 19J, 21E). Suture between last two ventrites simple, not deeply grooved and punctured; basal margin of pygidium evenly curved, without prominence in middle; parameres almost symmetrical, short and broad with triangular tooth on venter of apices, which are reflexed and overlapping, without fringe of

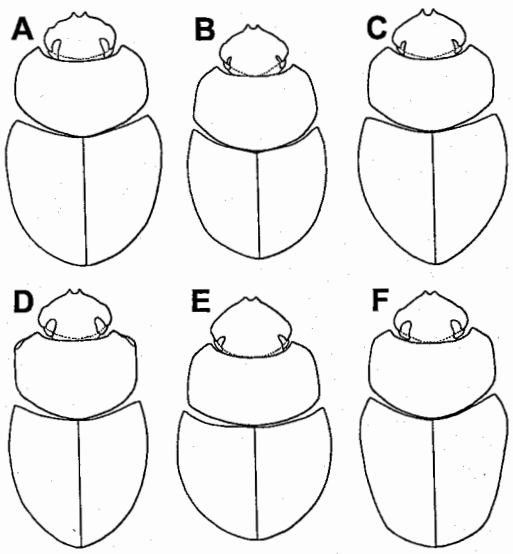

FIG. 1. *Temnoplectron* species, body outline; A, *boucomonti* Paulian; B, *cooki* sp. nov.; C, *diversicolle* Blackburn; D, *atropolitum* Gillet; E, *lewisense* sp. nov.; F, *reyi* Paulian. Not to scale.

setae; endophallus with roughly C-shaped basal sclerite and appendage, short and narrow ring sclerite without appendage, strongly lobed median sclerite.

Female (Figs 23L, 24D). Spermathecal sclerite divided into two feebly sclerotised smooth ridges, separated by base of spermathecal duct; spermatheca falcate, gradually narrowed to pointed apex.

REMARKS. Contrary to Paulian's observations (1985: 224), this is a typical member of *Temnoplectron*, sharing many character states with several Australian congeners and *T. wareo* sp. nov.

DISTRIBUTION AND BIOLOGY (Fig. 25). *Temnoplectron aeneolum* was described from Fly River (Lansberge 1885), from material collected by D'Albertis in either November-December 1875 or May-July 1876, within 580km of the mouth of the Fly River (Goode 1977). This area is a mosaic of swamp forest and savannah woodland. It also occurs in a similar range of habitat at 3-700m altitude near Port Morseby (Paulian 1985).

Temnoplectron aeneopiceum Matthews
(Figs 3D, 5A, 8G-H, 13D-F, 19B, 21C, 23C, 24F, 26)

Temnoplectron aeneopiceum Matthews, 1974: 157; Cassis & Weir, 1992: 170.

TYPE. Holotype: Paluma Dam Rd, Mt Spec, 30.iii.1968, EM (ANIC). Examined.

MATERIAL. (479) NORTH QUEENSLAND: Birthday Ck Falls (ANIC, BMNH); Bluewater Ra (QM); Boulder Ck, Tully (QM); 32km NW Cardwell (ANIC); Charmillin Ck (QM); 40km W Ingham (ANIC); 22km NE [sic, = NW?] Kennedy (ANIC); Kirrama Ra. (JCU, QM); Kjellberg Rd turnoff (QM); Lamins Hill (QM); Malaan Rd, 2km off H'way (QM); Malaan SF (QM); Millaa Millaa Falls (QM); Mt Father Clancy (QM); Mt Fisher (QM); Mt Graham, Cardwell Ra. (QM); Mt Halifax (JCU, QM); Mt Hugh Nelson (QM); 7km S Mt Kooroomool (QM); Mt Macalister (QM); Mt Spec (ANIC, JCU); 2 mi W Mt Spec (DPIM); Palmerston NP (QM); Paluma (ANIC, JCU); 3mi E Paluma (paratype; ANIC); 6km WNW Paluma (ANIC); 10km W Paluma (ANIC); 12km E Paluma (ANIC); Paluma Dam Rd (including 27 paratypes; ANIC, QM); Ravenshoe SF (ANIC); 11km & 18km SSW Ravenshoe, Tully Falls SF (DPIM); 9km NE Ravenshoe (DPIM); 18km SSW Ravenshoe (DPIM); Smoko Ck (JCU); Tully Falls (AMS, QM); Tully R Dam (QM); Tully R Xing (QM); 1.5km N Tully R Xing (QM); Upper Boulder Ck (QM); Wallaman Falls Rd (QM); Windy Post (ANIC); Wongabel, 6km S Atherton (DPIM); Wongabel, 7km S Atherton (ANIC); Yuccabine Ck (QM)

DESCRIPTION (male). *Colour.* Black, elytra dark greenish, appendages dark reddish-brown.

Length. 5.0-6.5mm.

Head (Fig. 3D). Strongly and almost evenly but relatively sparsely punctured, strongly microreticulate; frontoclypeus not rugosely punctured towards anterior margin, which is evenly shallowly curved between genal angles and median teeth; eyes large, broadest at middle, interocular ratio 4.5-5; first segment of labial palpi 1.25 × length of second.

Thorax (Figs 5A, 8G, 13D-E). Pronotum: strongly and closely punctured, disc shining, shallowly or not microreticulate, sides strongly microreticulate; disc not anteriorly depressed; lateral margins pronotum complete; hypomeral ratio 0.2-0.4; elytra entirely microreticulate, usually strongly and evenly so, rarely shallower in basal half; intervals moderately strongly punctured; apical half stria 1 punctate but not depressed; striae 1-7 with sparse foveolate punctures on apical half, rarely to base of elytra; basal third of elytra with 10 striae, 8th effaced in apical half, rarely apical 0.7; stria 8 abbreviated by 1-2 × mesepimeron length; base of epipleuron not constricted; macropterous; meso-metasternal margin with almost flat triangular median tubercle; metasternum strongly punctured throughout, shining except anterior of median lobe microreticulate, anterior corners of lobe with narrow triangularly expanded margins; fore tibia outer

margin with three acute major teeth separated by 3-7 sharp or convex minor teeth (varies within individuals), inner margin almost straight; mid femur elongate-ovate; hind tibia evenly curved, outer face abruptly or gradually contracted towards base, almost parallel-sided for apical half; hind tibial spine sharply pointed, tibial spine ratio 0.75-1.5, with apical spur as long as first tarsal segment; hind tarsi long, c.0.3 × length hind tibia, segment 1 ventrally lobed, 2, 3 and 4 elongate rectangular, decreasing in length, segment 5 almost equal length segments 3+4.

Abdomen (Figs 19B, 21C). Ventrites 1-5 with basal row of small sensory pits; last two ventrites with shallowly impressed impunctate boundary; basal margin of pygidium evenly curved or rarely with median swelling; parameres without setal fringe, roughly sinusoidal with deep ventral excavation towards base, but asymmetric, left with obliquely truncate apex, apex dorsally minutely toothed and ventrally produced; right paramere not dorsally notched, gradually constricted to blunt inwardly folded apex; endophallus: basal sclerite pear-shaped with angular lateral lobe and small adjacent sclerite; flagellum long, lobes not equidistant; ring sclerite with thick-walled narrow ring and laterally flared lobe; median sclerite triangular but split by median cleft.

Female (Figs 8H, 13F, 23C, 24F). As above, except: inner half of elytra (intervals 1-4, or 5) microreticulate and dull (intervals 1-4, or -5), contrasting with shining, non-microreticulate outer half (intervals 5- or 6-10); fore tibial spur slightly flattened, attenuated to curved apex; hind tibia with short apical lobe, less than half apical tibial width; genitalia: spermathecal sclerite a transverse weakly sclerotised, broad ridge, translucent around orifice; spermatheca small and C-shaped, with slightly swollen base and thin curved apex.

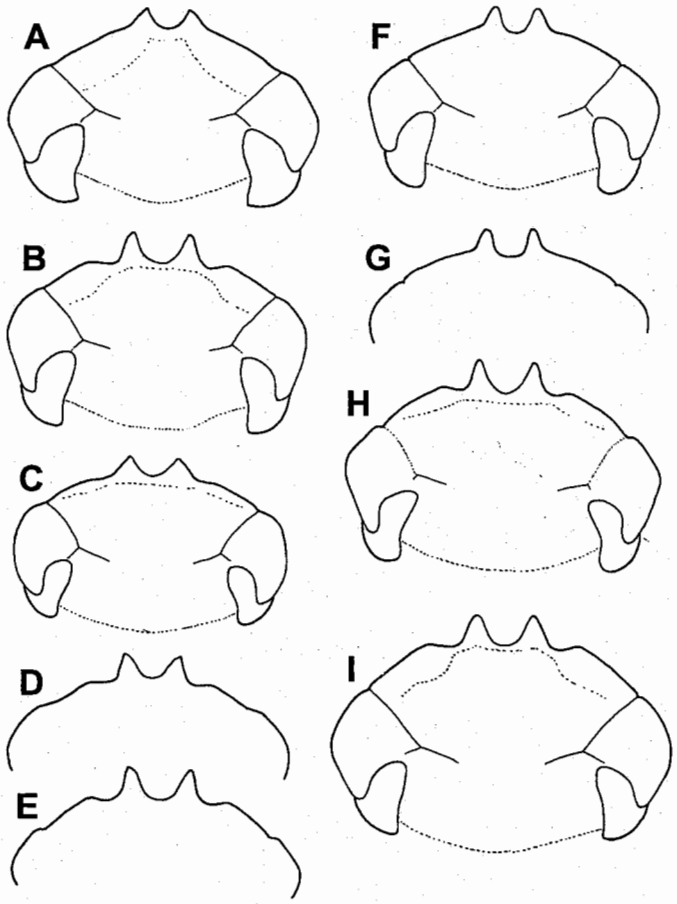

FIG. 2. *Temnoplectron* species, *rotundum* species group, dorsal view of head; A, *bornemisszai* Matthews; B, *boucomonti* Paulian (holotype *laevigatum* Matthews); C, *boucomonti* (worn specimen, Dimbulah); D, *boucomonti* (PNG); E, *boucomonti* (Cairns); F, *laeve* (Laporte) (Windsor Tbld); G, *laeve* (Paluma); H, *major* Paulian; I, *rotundum* Westwood. All to same scale.

REMARKS. A detailed description is given here because this species was not clearly distinguished from *T. subvolitans* when originally described (Matthews, 1974). Two paratypes of *T. aeneopiceum* (from Mount Lewis) belong to *T. subvolitans*.

DISTRIBUTION AND BIOLOGY (Fig. 26). Present all year, but most active or abundant during the wet season, from December to April (Hill, 1993). This species commonly perches low on vegetation at night and is attracted to light (Howden et al., 1991). Widespread and common in rainforest from Bluewater Range north to the southern end of the Atherton Tableland, where it

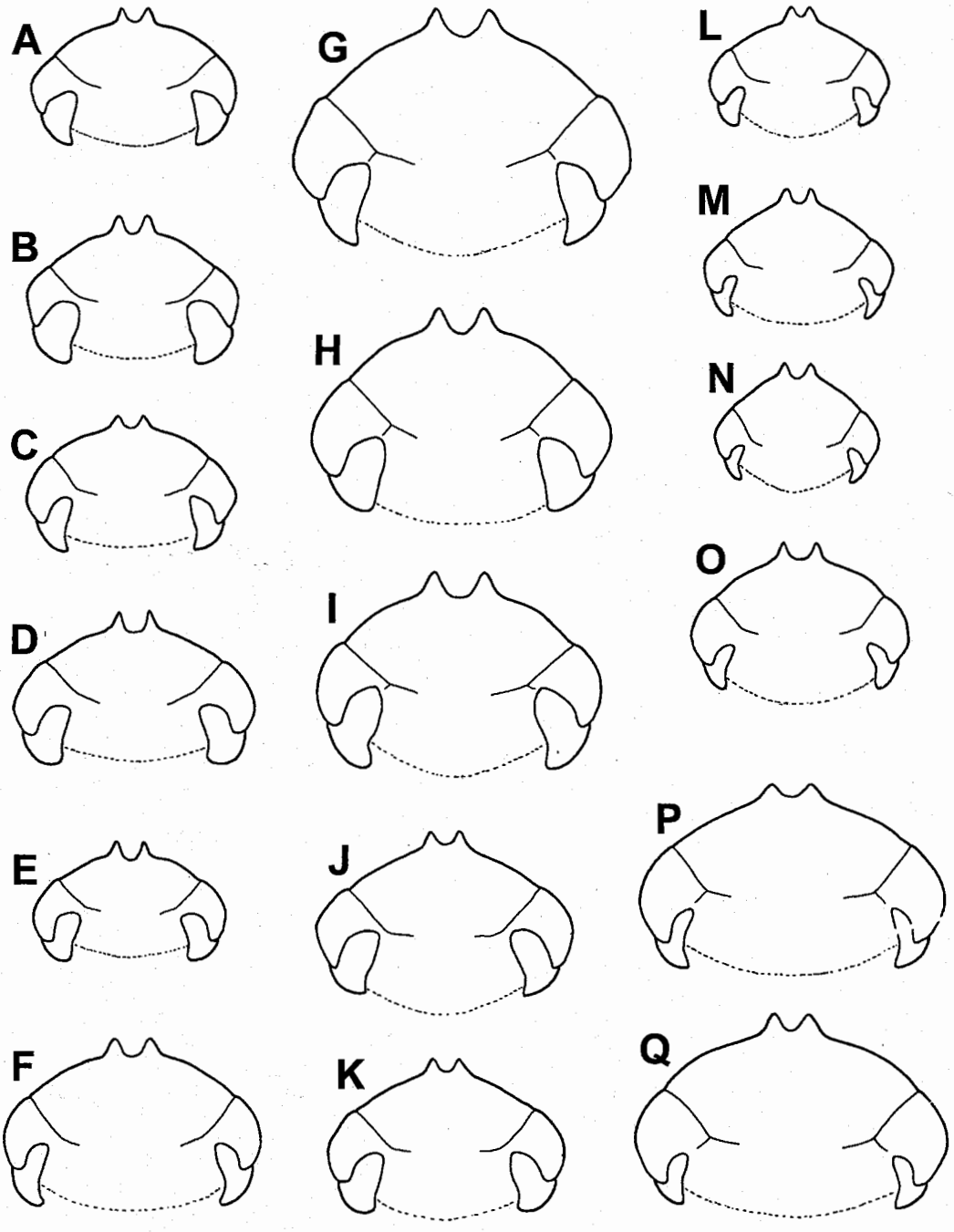

FIG. 3. *Temnoplectron* species, dorsal view of head; A, *aeneolum* Lansberge; B, *wareo* sp. nov.; C, *disruptum* Matthews; D, *aeneopiceum* Matthews; E, *subvolitans* Matthews; F, *diversicolle* Blackburn; G, *atropolitum* Gillet; H, *heurni* Paulian; I, *howdeni* Paulian; J, *politulum* Macleay; K, *reyi* Paulian; L, *involucre* Matthews; M, *lewisense* sp. nov.; N, *monteithi* sp. nov.; O, *finnigani* sp. nov.; P, *cooki* sp. nov. (Mt Spurgeon); Q, *cooki* (Mt Haig). All to same scale.

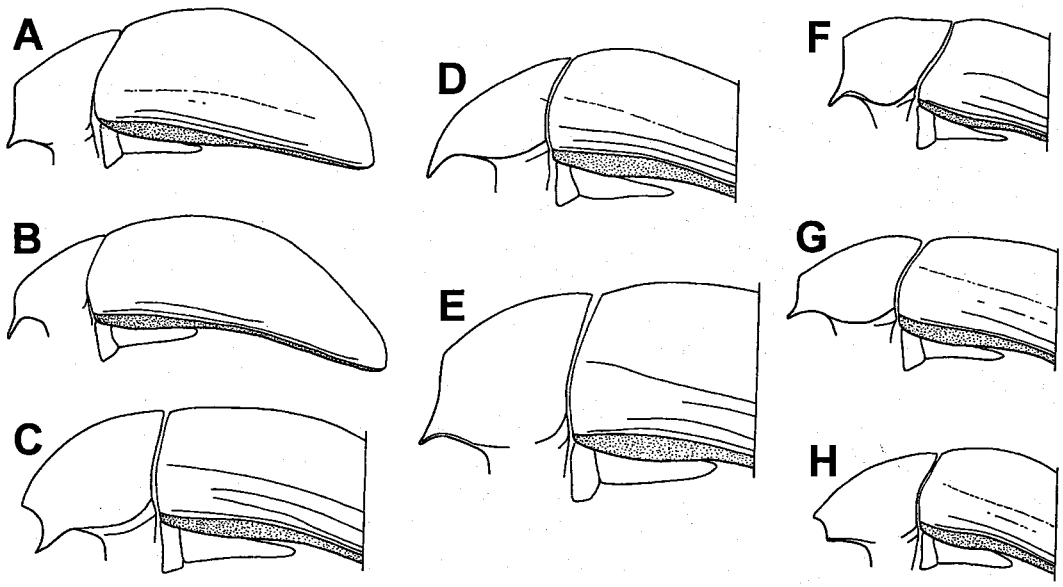

FIG. 4. *Temnoplectron* species, lateral view of thorax; A, *aeneolum* Lansberge; B, *wareo* sp. nov.; C, *boucomonti* Paulian; D, *laeve* (Laporte); E, *diversicolle* Blackburn; F, *atropolitum* Gillet; G, *finnigani* sp. nov.; H, *cooki* sp. nov.; epipleuron stippled. Not to scale.

overlaps slightly with its sister-species, *T. subvolitans*.

Temnoplectron atropolitum Gillet
(Figs 1D, 3G-I, 4F, 6A, 9A-D, 12D, 13I-K, 17K-M, 20A, 23B, 24C, 25)

Temnoplectron atropolitum Gillet, 1927: 252; Paulian, 1934: 285; Paulian, 1985: 224.
Temnoplectron heurni Paulian, 1985: 225; syn. nov.
Temnoplectron howdeni Paulian, 1985: 227; syn. nov.

TYPES. Lectotype of *T. atropolitum* (in DEB), designated by Paulian (1985) from Dormanpadbivak, not seen, but contemporary topotypic material examined. Holotype of *T. heurni* not examined (in DEB). Holotype of *T. howdeni* not seen (in CMN), but part of the same series (topotypic) examined.

MATERIAL. (336, only those examined in detail listed) INDONESIA: 4, Dormanpadbivak, 1410m, x.1920, W.C. van Heurn (ANIC, MZB); 1, Freeport Concession, Timika, 4.76145°S 136.86369°W[sic], inner mature mangrove, dung pitfall, 15m, 16.iii.1997, Ubaidillah (MZB); 1, ditto, except 4°39'43"S 136°53'50"E, peat swamp, 13-16.iii.1997 (MZB); 4, ditto, except 4°17'23"S 138°59'98"W[sic], open heath forest, 600m, 11-14.iii.1997 (MZB); 1, Jayawijaya, Kelila, Wurigelebur primary forest, pan trap, 1300m, 6-26.x.1995, E. Cholik, A. Suyanto, A. Saim (MZB); 2, ditto except 1500m (MZB); PAPUA NEW GUINEA: 3, Western Highlands, Mt Hagen, oak forest dung traps, 6000'[1800m], 5-8.vii.1974, S. Peck (CMN, DPIM).

DESCRIPTION (male). *Colour.* Black, appendages reddish-brown.

Length. 8-10mm. Body relatively elongate (Fig. 1D).

Head (Fig. 3G-I). Lemon-shaped, anterior margin of frontoclypeus evenly curved between genal angles and median teeth, except slight nick at base of clypeus; frontoclypeus impunctate or apparently so (sometimes minute punctures visible at ×50), densely and evenly finely microreticulate, shining but duller than pronotum; eyes large, interocular ratio 3.7-5.3; first maxillary palp segment 1.2-1.5× length of second segment.

Thorax (Figs 4F, 6A, 9A, 9C-D, 12D, 13I-K). Pronotum shining, shallowly or obscurely microreticulate, minutely and sparsely punctured; pronotal disc anteriorly slightly depressed or evenly convex; lateral margin of pronotum entire to completely obliterated from base to junction with femoral hollow, often with dorsal triangular thickened area at extreme lateral edge (abraded in old specimens?); hypomeral ratio 0.25-0.4; elytra shining, shallowly or obscurely microreticulate, intervals finely punctured; elytral striae 1-6 absent or feebly impressed on elytral disc, shallowly impressed in apical third or with scattered deep foveolate punctures, striae 5-6 sometimes almost entirely punctate; stria 7

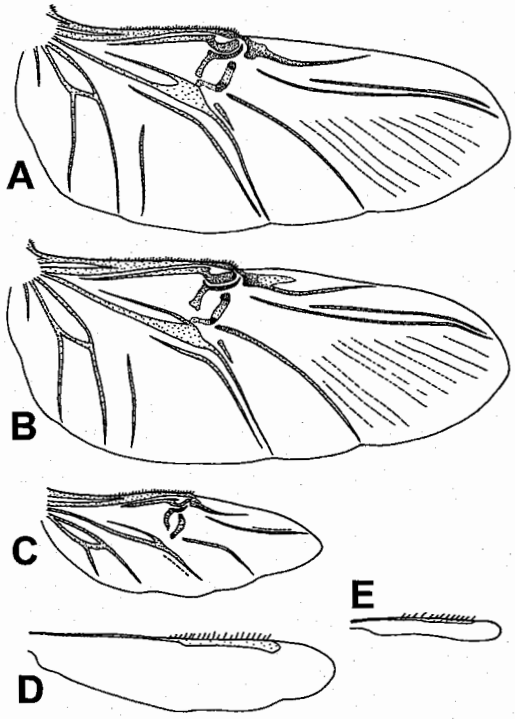

FIG. 5. *Temnoplectron* species, wings; A, *aeneopiceum* Matthews; B, *subvolitans* Matthews (Mt Spurgeon); C, *subvolitans* (Malaan SF); D, *cooki* sp. nov.; E, *finnigani* sp. nov.

absent or almost effaced, with vague foveolate depressions; stria 8 present in middle third of elytra as impressed groove with fine ridge, abbreviated from base by 3-5× length mesepimeron; stria 9 abbreviated by 2-2.5× length mesepimeron; base of epipleuron not constricted; macropterous; meso-metasternal suture without median tubercle; metasternum impunctate, margins of anterior lobe narrow, usually partly obliterated; inner margin fore tibia slightly expanded in middle and shallowly to somewhat abruptly excavate at base, with adjacent sharp ridge along apical half of outer face (abraded in old specimens); outer margin fore tibia with 2-3 broad and slightly convex minor teeth between acute major teeth; mid femur elongate-ovate; hind femur elongate-ovate, broadest about middle; hind tibia almost straight, slightly curved, with preapical swelling on inner margin; tibial spine short and triangular, without apical spur, tibial spine ratio 0.5-0.75; hind tarsi long, 0.45-0.5× length hind tibia, segment 1 ventrally lobed, 2, 3 and 4 elongate rectangular,

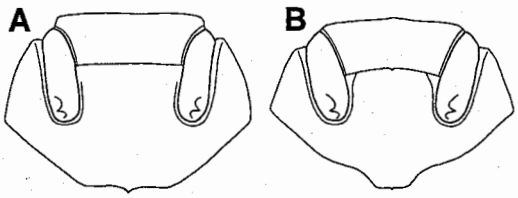

FIG. 6. *Temnoplectron* species, mesosternum, meso-coxae and metasternum; A, *atropolitum* Gillet; B, *cooki* sp. nov. Both to same scale.

decreasing in length, segment 5 almost equal length segments 3+4.

Abdomen (Figs 17K-M, 20A). Pygidium entirely shining or basal half shallowly microreticulate, basal margin evenly margined, not medially swollen; last two ventrites separated by deep groove with row of large punctures (sensory pits); parameres without setal fringe, asymmetric, sinuate, abruptly contracted at middle towards narrow apical half, apex left paramere rounded, apex right with prominent basal lobe; endophallus: ring sclerite with narrow diameter thick ring and large appendage; basal sclerite dense and opaque, feebly folded, roughly quadrate; median sclerite roughly triangular, irregularly lobed and deeply medially split.

Female (Figs 9B, 23B, 24C). Pronotal disc evenly curved, lateral margins never partly thickened; inner margin of fore tibia straight, without ridge on apical half of outer face; spermathecal sclerite absent, without smooth or darker areas around base of spermathecal duct; spermatheca falcate, with globular base, constriction before middle, and almost parallel sided apical lobe.

REMARKS. This species was described three times from small samples. The three species were supposedly distinguished by absence of lateral pronotal margins (*T. howdeni*), or elytra more (*T. heurni*) or less (*T. atropolitum*) strongly punctured (Paulian, 1985). We have seen 320 specimens recently collected between Timika and Kelila in central West Papua (ZMB), which show the full range of variation in the three described species. This variation is not linked to altitude or habitat. Male genitalia of all dissected specimens are almost identical and there are no obvious secondary sexual differences. We therefore feel justified in synonymising the three species.

A specimen from Adelbert Range (ANIC), north-central Papua New Guinea, differs slightly from all other material of *T. atropolitum*. It has

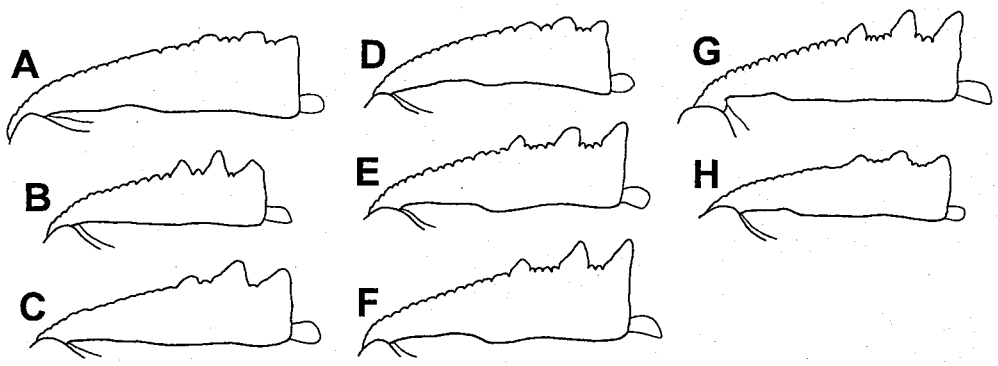

FIG. 7. *Temnoplectron* species, *rotundum* species group, ♂ fore tibia; A, *bornemisszai* Matthews; B, *boucomonti* Paulian; C, *boucomonti* Paulian (worn specimen); D, *laeve* (Laporte); E, *major* Paulian (Mt Spurgeon); F, *major* Paulian (Paluma); G, *rotundum* Westwood; H, *rotundum* Westwood (worn specimen). All to same scale.

more strongly punctured elytra and an entirely shining dorsal surface, but the eye shape (Fig. 3H), front tibia (Fig. 9C), hind tibia (Fig. 13J) and male genitalia (Fig. 17L) are typical of *T. atropolitum*. Specimens of *T. atropolitum* recorded from Aru Islands (Paulian 1985), not far from Timika, have not been examined but are probably correctly identified.

DISTRIBUTION AND BIOLOGY (Fig. 25). Occurs from 15-1800m across New Guinea, from Timika to Mount Hagen and the Adelbert Range. It has been collected in peat swamp, heath forest, *Lithocarpus* forest and montane primary rainforest at human dung baited traps.

Temnoplectron bornemisszai Matthews
(Figs 2A, 7A, 11A, 11G, 14A, 17A-B, 20G, 24B, 27)

Temnoplectron bornemisszai Matthews, 1974: 149; Cassis & Weir, 1992: 170.

TYPE. Holotype: Yungaburra, 7.v.1969, GB, DIC (ANIC). Examined.

MATERIAL. (651, abbreviated localities only) QUEENSLAND: 6km (4mi) S Atherton (ANIC, DPIM); 21km NE Atherton (ANIC, QM); Baldy Mt (DPIM); Bartle Frere, west base (QM); Boar Pocket Rd (ANIC); 32km NW Cardwell (ANIC); Cedar Pocket (ANIC); Charmillin Ck (QM); Chujeba Peak (QM); Curtain Fig (ANIC, QM); 12km SE Daintree (ANIC); Danbulla Reserve (QM); Davies Ck (JCU, QM); Evelyn (QM); Gadgarra SF (QM); Kauri Ck (QM); Kenny Rd (QM); Kirrama Ra (DPIM, JCU, UQ); Lake Eacham (QM); Maalan SF (QM); Massey Ck (ANIC, JCU); Millaa Millaa (AMS); Millaa Millaa Falls (DPIM); Mossman Bluff (QM); Mt Boolbun South (QM); Mt Father Clancy (QM); Mt Formatine South (QM); Mt Haig (ANIC); 5-5.2km SSW Mt Haig (QM); Mt Hartley (QM); Mt Hosie (ANIC, QM); 16 & 22km up Mt Lewis Rd (QM); Mt Macalister (QM); Mt Murray Prior (QM); Mt Nomico (AMS); Mt Sampson (QM); Mt Smoko (QM); Mt Spurgeon (ANIC, QM); 2-3km SW Mt Spurgeon (QM); Mt Williams (QM); Palmerston NP (DPIM, UQ); Peeramon Scrub (DPIM); Quaid Rd, 11km from quarry (DPIM); Ravenshoe SF (ANIC); 9.5 & 18km SSW Ravenshoe (DPIM); Saddle Mt (QM); South Johnstone Forestry Camp (QM); The Crater (DPIM, UQ); Topaz (QM); Tully Falls SF (DPIM, QM, UQ); 1.5km N Tully R Crossing (QM); Upper Boulder Ck (QM); Upper Stewart Ck (paratype; ANIC); Windsor Tbld (ANIC, DPIM, QM); Windy Post (ANIC); Wongabel SF (QM); Yungaburra (2 paratypes; ANIC); 2mi S Yungaburra (DPIM, UQ); 13km NE Yungaburra (DPIM).

DESCRIPTION (male). *Colour.* Body and appendages black, except mouthparts, antennae and tarsi reddish-brown.

Length. 9.5-13mm.

Head (Fig. 2A). Frontoclypeus dull, strongly microreticulate, entirely finely punctate, or slightly rugose at extreme anterior margins; frontoclypeal margin straight, not convex or produced between genal angles and median teeth, but slight nick present at junction of frons and clypeus; eyes large, interocular ratio 3.3-4.0; basal segment of labial palp 1.5-2× length second segment.

Thorax (Figs 7A, 11A, 11G, 14A). Pronotum dull, strongly microreticulate and finely punctured, disc not medially depressed; lateral margins of pronotum complete; hypomeral ratio 0.4-0.5; elytra dull, strongly microreticulate, intervals with obscure punctation; striae 1-7 with minute slightly foveolate punctures, stria 1 not apically deepened; elytra of major male swollen at base of 5th interval; 8th elytral stria present, base of stria 8 abbreviated by 0.5-0.75× length mesepimeron, stria 9 similar; base of epipleuron not constricted; macropterous; meso-metasternal

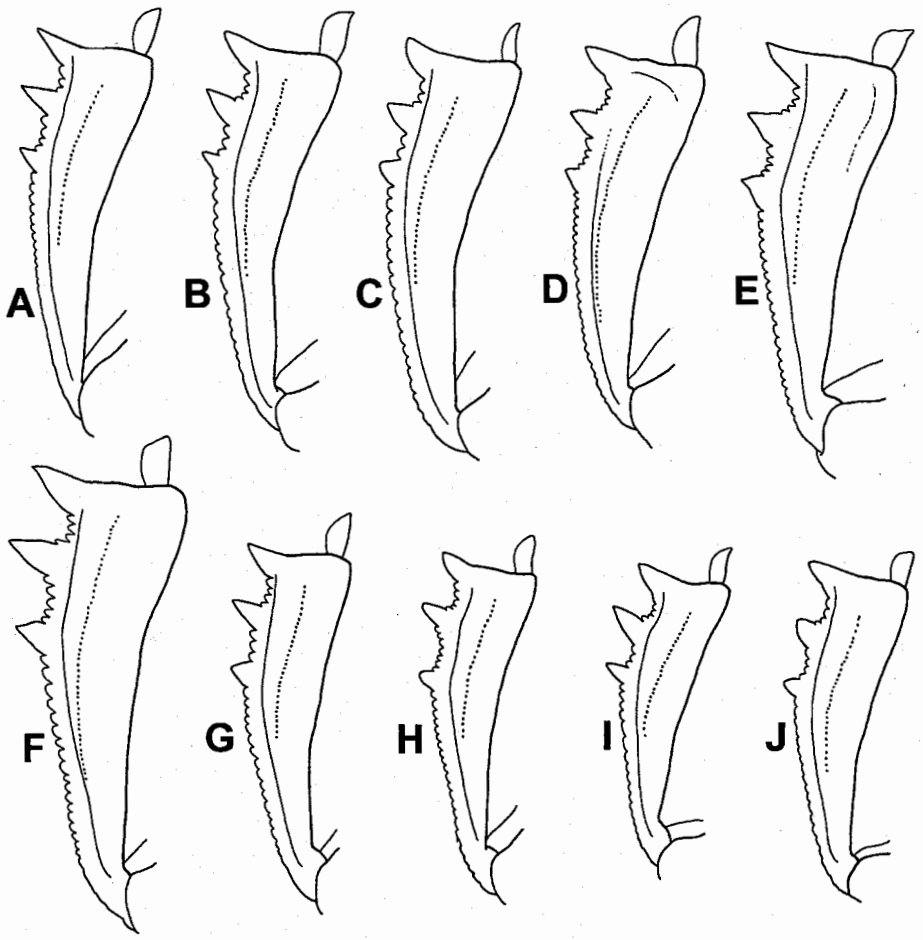

FIG. 8. *Temnoplectron* species, fore tibia (♂ unless otherwise noted); A, *aeneolum* Lansberge; B, *wareo* sp. nov.; C, *wareo*, ♀; D, *disruptum* Matthews; E, *diversicolle* Blackburn; F, *cooki* sp. nov., G, *aeneopiceum* Matthews (Cardwell Range); H, *aeneopiceum*, ♀ (Mt Kooroombool); I, *subvolitans* Matthews, ♀ (Bartle Frere); J, *subvolitans* (Mt Spurgeon). All to same scale.

suture without median tubercle; anterior of metasternal process without triangularly expanded margins; outer margin fore tibia with short and obtuse major teeth, separated by 1-2 convex minor teeth; inner margin fore tibia abruptly emarginate 0.3-0.5 from base; mid femora broadest in apical half, venter evenly curved, not lobed at apex; hind femora broadest in apical half, then gradually attenuated to apex; hind tibial spine elongate, equal to length of tarsal segments 1-3, thick and blunt, with small articulated spur present; tibial spine ratio 1.5-2; length hind tarsus c.0.25 × tibia, segments 1-2 ventrally lobed, length 1=2, 3=4, 5<3+4.

Abdomen (Figs 17A-B, 20G). Basal border of pygidium with median swelling; suture between last two ventrites not or weakly grooved; parameres without apical setal fringe, almost symmetrical, narrow and almost parallel-sided, apices bluntly rounded with short ventral teeth; endophallus: ridges of flagellum strongly lobed; basal sclerite roughly quadrate, opaque and feebly folded; ring sclerite with narrow thick ring and curved appendage; median sclerite irregular, strongly folded; apex of endophallus with patch of spinules.

Female (Figs 11A, 24B). Mid femur elongate-ovate, with evenly curved dorsal and ventral margins; genitalia: spermatheca C-shaped, with

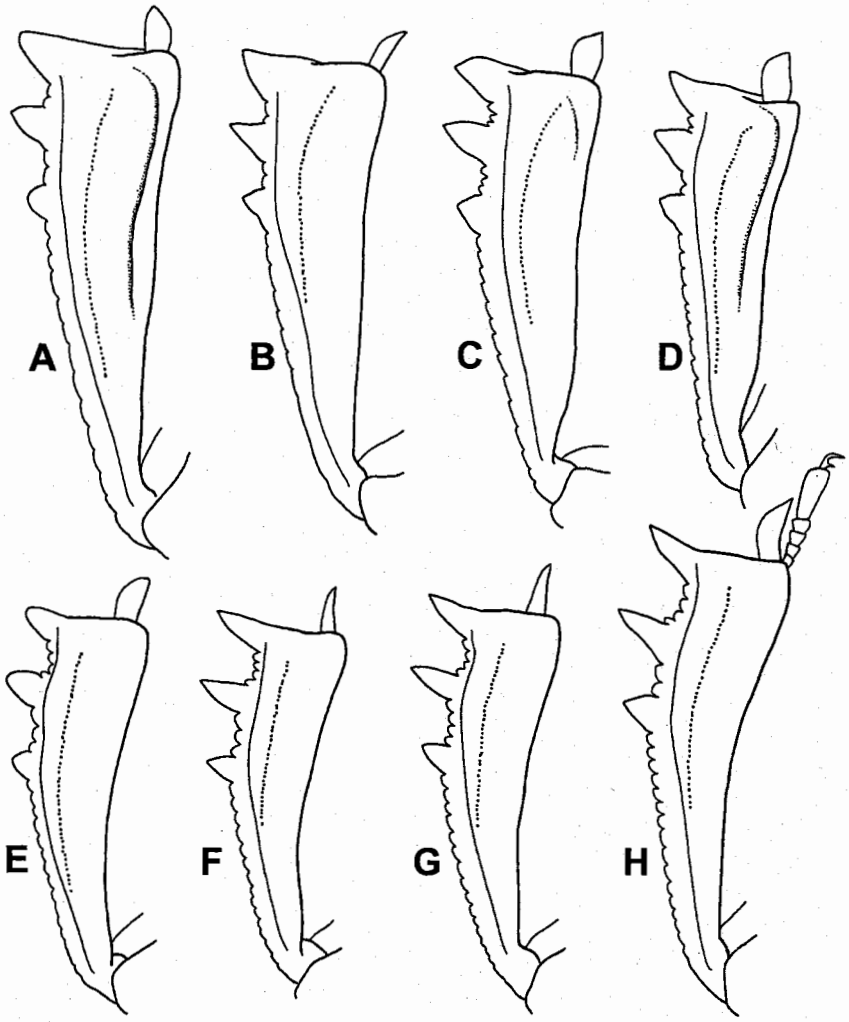

FIG. 9. *Temnoplectron* species, fore tibia (♂ unless otherwise noted); A, *atropolitum* Gillet (worn topotype); B, *atropolitum*, ♀ (worn); C, *atropolitum* Gillet (Adelbert Range); D, *atropolitum* Gillet (Mt Hagen); E, *reyi* Paulian (worn); F, *reyi*, ♀; G, *politulum* Macleay, ♀; H, *politulum*. All to same scale.

bulbous basal half; spermathecal sclerite narrow, a feebly sclerotised, ridge.

DISTRIBUTION AND BIOLOGY (Fig. 27). A common species from Cardwell Range to the Mount Finnigan region, north Queensland. It is confined to rainforest and is an active flier, attracted to light (Hill, 1996). It does not appear to perch, unlike other *Temnoplectron* species (Howden et al., 1991).

Temnoplectron boucomonti Paulian
(Figs 2B-E, 4C, 7B-C, 11B, 11H, 12A, 12F, 14B-D, 16A, 17C-D, 20C-D, 28).

Temnoplectron boucomonti Paulian, 1934: 285; Paulian, 1985: 224.
Temnoplectron yuleanum Balthasar, 1965: 15; Paulian, 1985: 224 (synonymy).
Temnoplectron laevigatum Matthews, 1974: 150; Cassis & Weir, 1992: 171; syn nov.

TYPES. Holotype of *T. laevigatum* Matthews: 1-17mi N Adelaide R, 12.ii.1968, EM (ANIC). Examined. Types of *Temnoplectron boucomonti* (in MNHN) and *T. yulearum* (in NMP) have not been examined but were adequately described for recognition of this species.

MATERIAL. (220, data reduced to locality, altitude, date, collector) AUSTRALIA: NEW SOUTH WALES: 1, Congo, 8km ESE Moruya, 30.xii.1981, MU (ANIC) [labelled: 'locality data incorrect']; NORTHERN TERRITORY: 3, Adelaide R, 4.iii.1972, 23.iv.1976, J. Wombey, K. & E. Carnaby (ANIC); 68 paratypes *T. laevigatum*, 1-17mi N Adelaide R, 12.ii.1968, EM (ANIC); 1, 17mi S Adelaide R, 7.iv.1971, TW (UQ); 2, 40mi S Adelaide R, 25.i.1971, TW & A. Allwood (UQ); 1, Berrimah, 3.xii.1973, R. Fox (UQ); 12, Black Pt, Coburg Peninsula, 29.i-23.ii.1977, TE, TW (ANIC); 2, Brook Ck, Burnside, 30.iii.1929, T.G Campbell (paratypes *T. laevigatum*; ANIC); 2, Cutta Cutta, iv.1987, S. Churchill (AMS); 4, Daly R Crossing, 22.i.1974, J.F. Hutchinson (ANIC); 4, Daly R mission, 22.i.1972, 10-20.v.1974, 8-24.vi.1974, J. Hutchinson (ANIC); 2, Darwin, 1945, S.R.E. Brock (ANIC); 35, 15-27mi S of Darwin, 29.i.1968, EM (paratypes *T. laevigatum*; ANIC); 2, Delamere, 20-25.v.1968, M. Mendum (ANIC); 1, Dingo Ck, Victoria H'way, 1.i.1992, MBM (AMS); 3, Groote Eylandt, N.B. Tindale (2 paratypes *T. laevigatum*; ANIC); 1, Howard Springs, 27-29.i.1968, EM (paratype *T. laevigatum*; ANIC); 1, Humpty Doo, 28.xi.1974, RS (DPIM); 10, 6km E Humpty Doo, 9.ii-4.iii.1987, 6-19.x.1990, RS (DPIM); 5, 2-4mi E Katherine, 8.ii.1968, EM (paratypes *T. laevigatum*; ANIC); 1, 15mi N Katherine, 8-9.iii.1978, Bainbridge (ANIC); 3, Mary R, Arnhem Highway, 27-29.xi.1978, RS (DPIM); 1, Mataranka Homestead, 16-18.xi.1974, RS (DPIM); 1, 7km W Pickertarimoor, Melville I., 16.i.1990 (SAM); 1, Port Darwin (AMS); 1, Smith Pt, Coburg Peninsula, 26.i.1977, EE (ANIC); 1, South Adelaide R, 23.iv.1976, Carnaby & Carnaby (DPIM); 1, Tindal, 5.xii.1967, W.J.M. Vestjens (ANIC); 1, Whitestone Stud, Adelaide R (ANIC); QUEENSLAND: 1, Bald Mt, Emu Vale, 17-22.v.1969, B.H. Kay (UQ); 1, Cairns, iv.1939, [JGB coll.] (ANIC); 1, Canungra Ck, 20-22.i.1987, GM (QM); 8, Carmila, i.1926, 1928, MacArthur (AMS); 1, Duaringa, 8.iii.1946, L.A. Smith (ANIC); 1, Eureka Ck, 9km SW Dimbulah, 20.xi.1981, J. Balderson (ANIC); 4, Forest Hill, Gatton, 4-12.xi.1976, M. Tichon (DPIM); 1, Mingela, 21.iv.1955, Norris & IC (paratype *T. laevigatum*; ANIC); 2, Mitchell R, 1927, J. Done (AMS); 1, Morehead R, Coen Rd, 10.vi.1960, C. N. Smithers (paratype *T. laevigatum*; AMS); 1, Pistol Gap, Byfield, 10.i.1970, EB, GH & SM (ANIC); 1, Sarina (ANIC); 2, Silver Plains HS, 28.xii.1968, JW (1 paratype *T. laevigatum*; ANIC); 1, Stewart R, i-ii.1927, Hale & Tindale (paratype *T. laevigatum*; ANIC); 2, Yenyorondi, S.R.E. Brock (ANIC); 4, Yeppoon, 14-15.xii.1964, 28.xii.1964, 1.xii.1965, J.C. Le Souef, IC (ANIC); WESTERN AUSTRALIA: 1, East Kimberley, M. Durack (paratype *T. laevigatum*; ANIC); 1, Ivanhoe Station, 1949 (WAM); 1, Kununurra, 22.xii.1991-6.i.1992, RS (DPIM); 2, Wyndham, ii.1954 (ANIC); PAPUA NEW GUINEA: 1, Aroa R (BMNH); 7, Mt Lawes, Port Moresby, 5.iii-12.v.1963, 1300', W.W. Brandt (ANIC); 1, Owgarra, coll. Meek (BMNH); 4, Rouku, Morehead R, 19.iii-28.v.1962, W.W. Brandt (ANIC); 1, Western Districts (UQ).

DESCRIPTION (male). *Colour.* Body and appendages black, except mouthparts, antennae and tarsi reddish-brown.

Length. 7.5-11.5mm.

Head (Fig. 2B-E). Eyes large, interocular ratio 5-6.5; basal segment of labial palpi 1.5-2× length of second segment; anterior margin of frontoclypeus with slight emargination at junction of frons and clypeus, and convexly produced (or concavely excised) lateral to median teeth; frontoclypeus dull, strongly microreticulate and punctured, becoming rugose towards anterior.

Thorax (Figs 4C, 7B-C, 11B, 11H, 12A, 12F, 14B-D). Disc of pronotum strongly punctured, shining, without obvious microreticulation or shallowly microreticulate, not medially depressed, without lateral tubercles; pronotal lateral margins complete; hypomeral ratio 0.7-0.9; elytral disc shining or dull, intervals finely or obscurely punctured and shallowly to strongly microreticulate; elytral striae 1-7 with small foveolate punctures, stria 1 not apically deepened; whole venter densely microreticulate; stria 8 present, abbreviated at base by 1-2× length mesepimeron, stria 9 similar; base of epipleuron not constricted; macropterous; whole venter strongly microreticulate; meso-metasternal border straight, without median tubercle, anterior lobe of metasternum with narrow margins; outer margin fore tibia with acute major teeth, separated by 1-2 convex minor teeth; inner margin fore tibia straight, or slightly angulate, but not emarginate; ventral margin of mid femur strongly lobed in apical third, lobe angulate or rounded, not swollen on outer face; hind femur broadest 2/3 from base, abruptly contracted to apex; outer face of hind tibia evenly contracted to base; hind tibia almost straight in basal 2/3, strongly curved in apical third which is produced in a long apical spine, equal in length to tarsal segments 1-4, spine thick at base, tapering to sharp apex, without articulated spur; tibial spine ratio 1.5-2; hind tarsi short, c.1/6 length hind tibia, segments 1-3 ventrally lobed, length segment 1=2=3=4, 5=3+4.

Abdomen. Basal margin of pygidium evenly curved; suture between last two ventrites not or weakly grooved, without row of punctures; parameres without apical setal fringe, asymmetric, left paramere thick, bluntly curved or feebly angulate ventrally; right paramere dorsally excavate, apex with prominent flat lobe (a unique specimen, which was examined for this study, with much thinner parameres, was illustrated by Matthews (1974); other specimens from the same population are normal); endophallus: ridges of flagellum not strongly lobed; basal sclerite roughly quadrate, opaque and feebly folded; ring

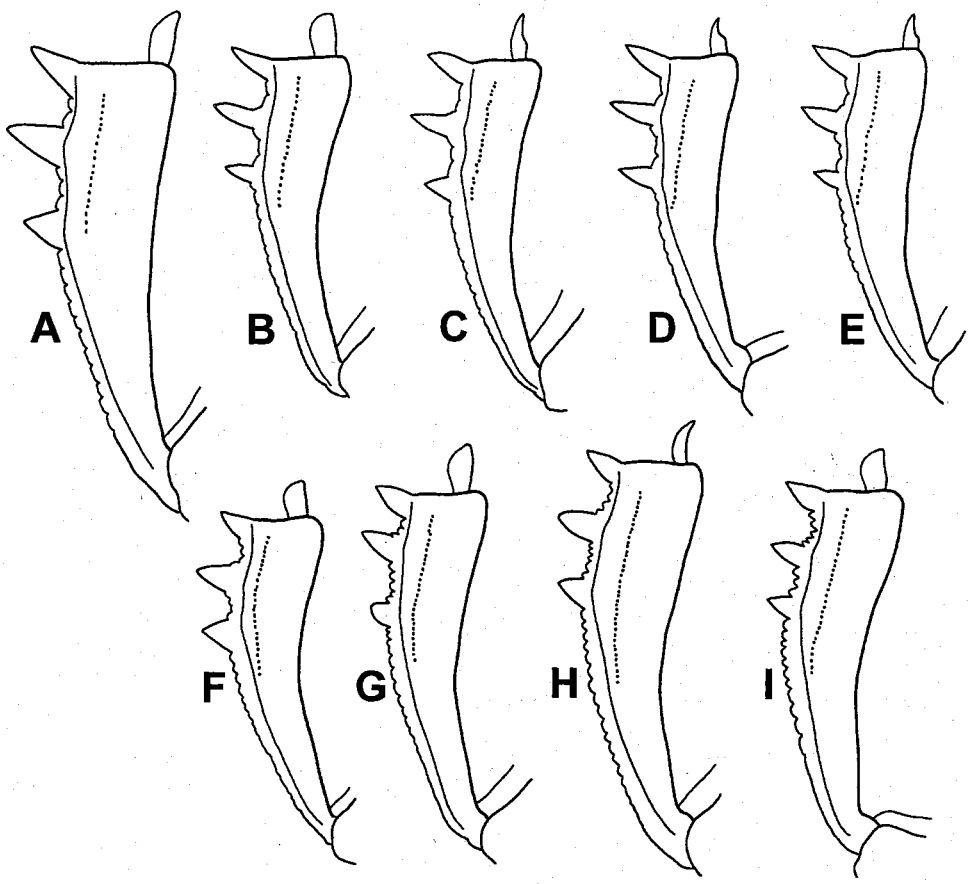

FIG. 10. *Temnoplectron* species, fore tibia (♂ unless otherwise noted); A, *finnigani* sp. nov.; B, *monteithi* sp. nov. (Cape Tribulation); C, *monteithi*, ♀ (Cape Tribulation); D, *monteithi*, ♀ (Mount Halcyon); E, *monteithi*, ♀ (Thornton Peak); F, *lewisense* sp. nov. (Devils Thumb); G, *lewisense* (Mt Lewis); H, *lewisense*, ♀ (Mt Lewis); I, *involucre* Matthews (Paluma). All to same scale.

sclerite with narrow thick ring and curved appendage; median sclerite irregular, strongly folded, almost split medially; apex of endophallus without spinules, but subapically with darker sclerotised patch.

Female (Fig. 11B). As above, except: mid femur broadest apically, with slight anterior expansion of ventral edge; spermathecal sclerite roughly straight-sided, but not sclerotised, width about 7× length; spermatheca constricted twice in basal half, base bulbous, apex relatively thin.

REMARKS. There is some variation in the shape of the clypeus (Fig. 2B-E) which has led to confusion of this species with *T. laeve*, but the anterior frontoclypeal margin in *T. boucomonti* is always convex. There is also variation in surface sculpture and development of secondary sexual characters, for example subapical lobe of the male mid femur, but the shape of the male hind tibia is diagnostic (Fig. 14B-D).

DISTRIBUTION AND BIOLOGY (Fig. 28). In Australia, widespread in the drier tropics and subtropics, from The Kimberleys in Western Australia to the Torres Strait and south to Canungra, Queensland, avoiding high rainfall areas of the Queensland coast. Its distribution generally encompasses that of *T. rotundum*, and overlaps slightly with *T. major*. *Temnoplectron boucomonti* is also widespread in the savannah woodland of SW Papua New Guinea, from Morehead River to Port Moresby area including Yule Island (Paulian, 1934; Balthasar, 1965), and at Owgarra, Anva River (Paulian, 1934).

Temnoplectron cooki sp. nov.
(Figs 1B, 3P-Q, 4H, 5D, 6B, 8F, 15F-G, 16C, 19D-E, 22C, 23F, 24I, 29)

ETYMOLOGY. Named for Doug Cook, Queensland Museum, an indefatigable collector of dung beetles.

MATERIAL. HOLOTYPE, Y, QMT59013: NEQ 17B07S 145°33E, Mt Haig, 5.2km SSW, 6-10 Feb 1998, 1070m, GM & DC, open for., dung pitfall (QM). PARATYPES. (188) QUEENSLAND: 1, Davies Ck, 19km WSW [sic] Mareeba, malaise trap, 21.xii.1984-7.i.1985, RS & Titmarsh (DPIM); 1, 16km up Davies Ck Rd via Mareeba, 18.ii-3.iii.1983, RS & Titmarsh (DPIM); 1, 29km SE Mareeba, 1100m, 14-15.xii.1982, JT (ANIC); 61, 5.2km SSW Mt Haig, 17°07S 145°33E, open forest, dung pitfall, 1070m, 6-10.ii.1998, GM & DC (ANIC, DPIM, QM); 2, Mt Spurgeon [c3km S summit], 16°27S 145°11E, tall primary wet sclerophyll forest, perching on low vegetation at night, 1150m, 19-22.xi.1997, CR (ANIC); 5, ditto, except: human dung trap, GM (QM); 18, ditto, except, sclerophyll forest, 19-23.xi.1997, GM, DC & CB (QM); 38, ditto, except: pitfall trap, 1100m, 19.xi.1997-8.ii.1998, GM & DC (DPIM, QM); 6, ditto, except: 1110m (ANIC); 7, ditto, except: open forest, 20-22.xi.1997, DC (DPIM, QM); 5, ditto, except: 19-22.xi.1997 (QM); 7, ditto, except: 16°28S 145°12E, 1140m, 20.xi.1997-8.ii.1998, GM & DC (QM); 13, ditto, except: 1100m, 20-22.xi.1997 (QM); 14, Mt Tiptree, 17°03S 145°37E, cow dung, open forest, 13.vii.1984, B. Halliday (ANIC); 7, Tinaroo Ck Rd, 20mi SE Mareeba, in fungus, 17.i.1974, AWH (ANIC, DPIM); 2, ditto except 20mi up Rd, AMWH (UQ).

DESCRIPTION (male). *Colour.* Upper surface pure black, not bronzed.

Length. 5.5-7.5mm. Body short-ovate and strongly arched in profile (Fig. 1B), length:width ratio 1.25-1.45.

Head (Fig. 3P-Q). Lemon-shaped, lateral corners angulate to rounded, anterior margin slightly nicked at frontoclypeal junction then evenly shallowly curved to median teeth; anterior of frontoclypeus more finely punctured and densely microreticulate than base; eyes small, interocular ratio 11-12; lengths of first two labial palp segments equal or almost so.

Thorax (Figs 1B, 4H, 5D, 6B, 8F, 15F-G). Pronotum shining, not obviously microreticulate, sides strongly punctured (similar to metasternum); disc evenly convex; basal 2/3 lateral margins of pronotum straight; base pronotum evenly curved; lateral margin of pronotum either completely bordered or up to middle third missing; hypomeral stria short, ratio 0.2-0.4; elytra shining but microreticulate; sides of elytra evenly curved from base to apex; striae 1-7 faint; stria 1 with several apical punctures but not deepened; stria 8 reduced to widely separated punctures, or short grooves in basal half, or complete between basal quarter and apical half of elytra; stria 9 deep, abbreviated by 1-2× length mesepimeron; stria 10 deep, abbreviated at length of mesepimeron from base; base of epipleuron not constricted; wing reduced to a narrow unfolded strip, 1/2-2/3 length elytra; mesosternum almost impunctate; meso-metasternal margin with small median triangular excision; median lobe metasternum finely and densely punctured (interspaces 1-2× puncture diameters), often more coarsely in posterior half, margins triangularly expanded at corners; metasternum with broad shallow depression close to posterior border; outer margin fore tibia with acute major teeth and 3-6 convex minor teeth between these, inner margin almost straight; mid femur elongate-ovate; hind femur with complete dorsal and ventral margins (ridges), almost parallel-sided but broadest c.1/3 from apex of trochanter; hind tibia almost evenly curved externally, with slight bulge 1/3 from apex on internal margin; apex of hind tibia produced, short spine equal to tarsal segments 1-2, pointed in dorsal view, with large subapical spur; tibial spine ratio 1-1.25; hind tarsi c.0.25 length of hind tibia, segment 1 ventrally lobed, 2, 3 and 4 elongate rectangular, decreasing in length, segment 5 0.75× length segments 3+4.

Abdomen (Figs 16C, 19D-E, 22C). Suture between last two ventrites not or weakly grooved, without row of punctures; basal margin of pygidium evenly curved, not medially produced; parameres without apical setal fringe, asymmetric, excavated at base of venter, blunt tipped in profile, left paramere narrower and apex rounded, right paramere truncate, incurved at tip; endophallus: basal sclerite C-shaped, with an appendage; flagellum with three equidistant lobes; ring sclerite with thick narrow-diameter ring and large curved appendage; median sclerite, two strongly folded and irregular plates around median cleft.

Female (Figs 23F, 24I). Spermathecal sclerite not well defined, but vaguely darker square around vagina; spermatheca C-shaped, gradually contracted to blunt apex.

REMARKS. This species is similar to *diversicolle* Blackburn, but differs most obviously in its more rounded body shape. There are two discrete populations on mountain ranges in north Queensland, separated by 80km of lower, drier forest. Specimens of the northern population,

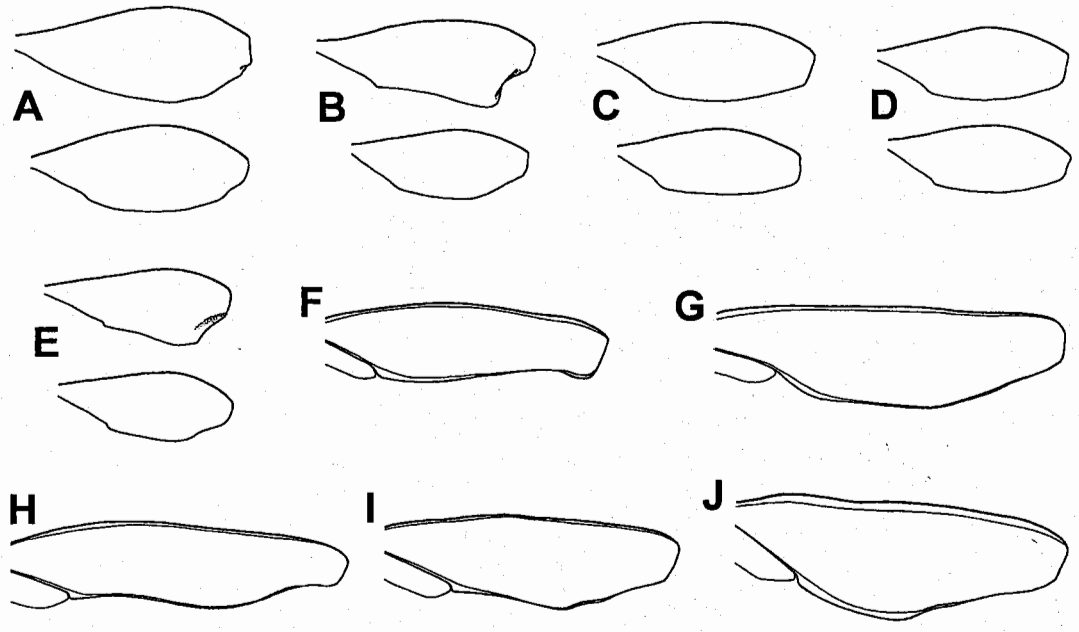

FIG. 11. *Temnoplectron* species, *rotundum* species group: major ♂ (above) and ♀ (below) mid femora; A, *bornemisszai* Matthews; B, *boucomonti* Paulian; C, *major* Paulian; D, *rotundum* Westwood; E, *laeve* (Laporte); major ♂ hind femora: F, *rotundum*; G, *bornemisszai*; H, *boucomonti*; I, *laeve*; J, *major*. All to same scale.

centred on Mount Spurgeon, are on average slightly larger, with the 9th stria less abbreviated at the base, and with the head more strongly punctured than the southern population. The eye size (Fig. 3P-Q), male legs (Fig. 15F-G) and male (Fig. 19D-E) and female genitalia are identical in the two populations, which are treated here as one species.

DISTRIBUTION AND BIOLOGY (Fig. 29). This appears to be a wet sclerophyll forest specialist, occurring commonly in two isolated areas dominated by *Eucalyptus grandis*. Geoff Monteith and Doug Cook have searched for it in similar habitat further south between Ravenshoe and Koombooloomba without success. It perches on low vegetation at night, less than a metre above ground (pers. obs.).

Temnoplectron disruptum Matthews
(Figs 3C, 8D, 13C, 19A, 22A, 23G, 29)

Temnoplectron disruptum Matthews, 1974: 154; Cassis & Weir, 1992: 170.

TYPE. Holotype in QM, examined.

MATERIAL. (105) QUEENSLAND: 8km NW Bald Hill (ANIC); 11km NW Bald Hill (ANIC); Coen (paratype, ANIC), Gordon's Mine area (QM); Iron Ra (holotype and paratypes, DPIM, QM); Leo Ck Rd (QM); 9km NNW Lockhart R (ANIC); 11km ENE Mt Tozer (ANIC); West Claudie R (QM).

DESCRIPTION (male). *Colour.* Black, appendages reddish-brown.

Length. 4.5-5.5mm.

Head (Fig. 3C). Microreticulate and sparsely punctured, genae and middle of frontoclypeus more finely punctured and strongly microreticulate than base; frontoclypeal margin evenly shallowly curved from genal angles to median teeth; eyes large, interocular ratio 5.2-6.5; basal segments of labial palpi equal sized.

Thorax (Figs 8D, 13C). Pronotum shining and shallowly microsculptured on disc, duller and densely microreticulate at sides and base; pronotum mostly extremely finely punctured to impunctate, but with two patches of strong and close punctures on either side of anterior half; pronotal disc not medially depressed; lateral margin of pronotum entirely effaced, or almost so, from base to femoral cavity; hypomeral stria fine and curved, hypomeral ratio 0.25-0.5; elytra entirely microreticulate, but more shining with shallower microsculpture on disc; elytra strongly arched in profile, highest in basal half; striae 1-7 shallowly impressed, almost effaced; stria 1 not deepened at elytral apex, with or without

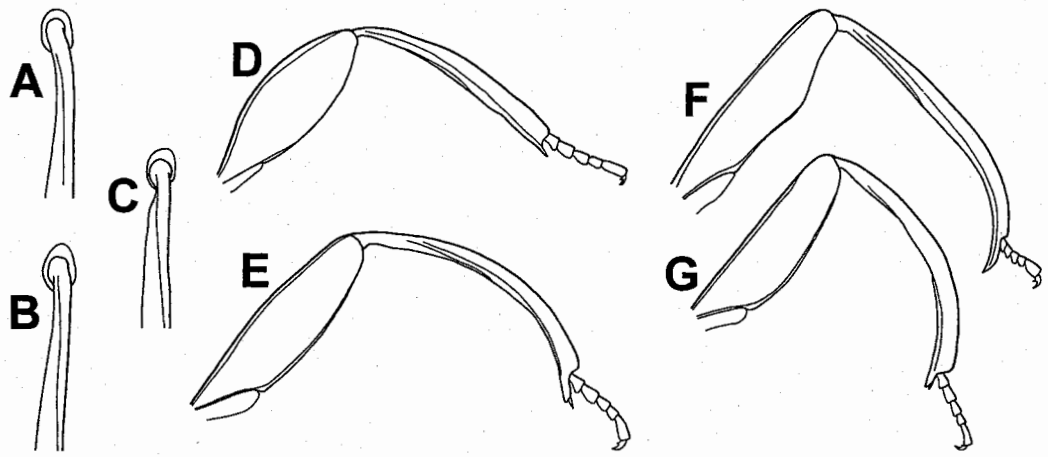

FIG. 12. *Temnoplectron* species: base of ♂ hind tibia, lateral; A, *boucomonti* Paulian; B, *major* Paulian; C, *rotundum* Westwood; whole hind leg: D, *atropolitum* Gillet; E, *reyi* Paulian; F, *boucomonti* Paulian; G, *finnigani* sp. nov.

scattered punctures; stria 8 absent, stria 9 abbreviated 2 × length mesepimeron, deep, with a bevelled edge for most of length; stria 10 deep, abbreviated 1 × length mesepimeron; upper margin of epipleuron not constricted at base; macropterous; meso-metasternal suture raised, with flat triangular tubercle at midpoint; median lobe of metasternum shining, without microsculpture except at extreme apex, finely and sparsely punctured, with margins triangularly expanded in apical corners; all femora elongate-ovate; anterior tibia with 3-5 convex minor teeth between acute major teeth, inner margin angularly bent one third from base; hind tibia curved, more strongly so in apical quarter, with elongate apical spine and prominent articulated spur, spine 1.5 × length first tarsal segment, tibial spine ratio 0.75-1.25; hind tarsi 0.3 × length hind tibia, segment 1 lobed, 2, 3 and 4 elongate rectangular, decreasing in length, segment 5 almost equal length segments 3+4.

Abdomen (Figs 19A, 22A). Suture between last two ventrites not or weakly grooved, without row of punctures; basal border of pygidium evenly curved, not medially produced; parameres without apical setal fringe, almost symmetrical, without ventral teeth, both abruptly attenuated before truncate inwardly curved apices, but right larger than left, with broader apex; endophallus: basal sclerite solid, elongate triangular, with appendage; flagellum short and trilobed; ring sclerite short and thick-walled, with sharply bent & twisted appendage; median sclerite strongly folded but not completely split.

Female (Fig. 23G). Spermathecal sclerite large and broad but weakly sclerotised; spermatheca C-shaped, gradually contracted to apex, with large median window.

DISTRIBUTION AND BIOLOGY (Fig. 29). Common in rainforest and vine-thicket at Iron and McIlwraith Ranges, Cape York Peninsula. Matthews (1974) noted that it was a nocturnal ball-roller in closed forest.

Temnoplectron diversicolle Blackburn
(Figs 1C, 3F, 4E, 8E, 15E, 19F, 22B, 23E, 24H, 29)

Temnoplectron diversicolle Blackburn, 1894: 204; Paulian, 1934: 285; Matthews, 1974: 154; Cassis & Weir, 1992: 170.

TYPE. Holotype, ♀ 'type/ 5215 T Nqu/ Temnoplectron diversicolle Blackb.' (BMNH). Redescribed by Matthews (1974), re-examined.

MATERIAL. (80) QUEENSLAND (localities only): McIvor R crossing (ANIC, DPIM, QM); Mt Webb NP (ANIC, DPIM, QM); 3km NE Mt Webb (ANIC).

DESCRIPTION (male). *Colour.* Black, elytra dark bronze-green and appendages reddish-brown.

Length. 6.0-6.5mm, body more elongate and less convex than *T. cooki* (Fig. 1C), length:width ratio 1.40-1.65.

Head (Fig. 3F). Lemon-shaped, lateral corners angulate to rounded, anterior margin slightly nicked at frontoclypeal junction then evenly shallowly curved to median teeth; dull, finely and sparsely punctured, disc more finely punctured and microreticulate than base; eyes moderately small, interocular ratio 8-9; first segment labial palp 1-1.3 × length second.

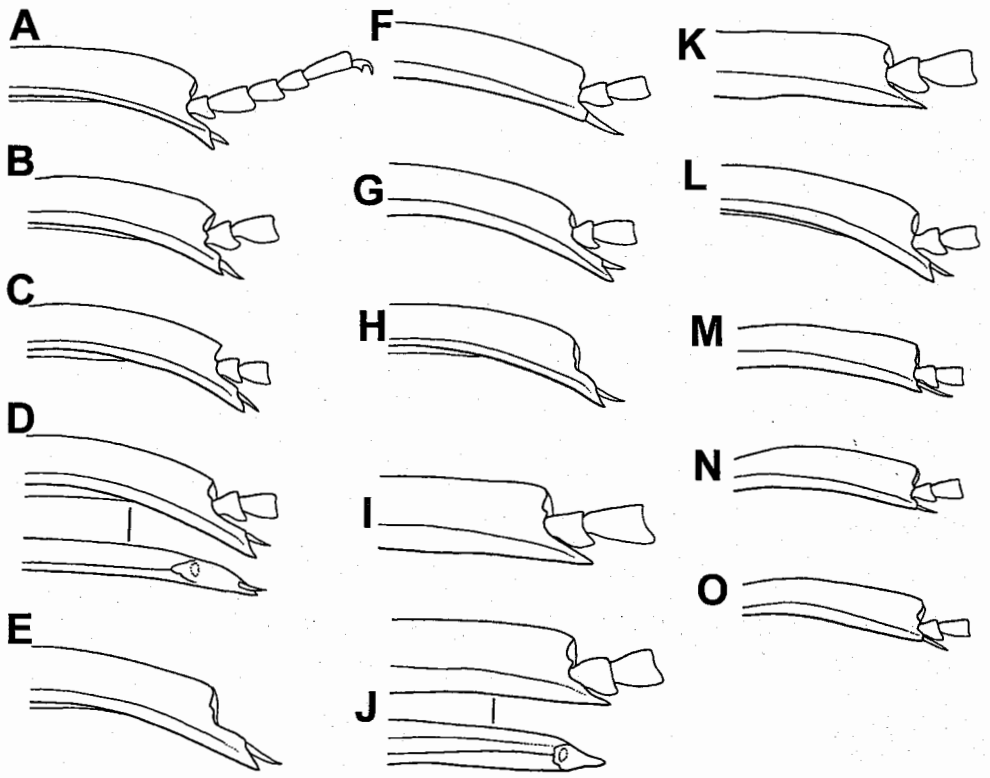

FIG. 13. *Temnoplectron* species, apices hind tibiae and first two hind tarsi, ♂ unless otherwise indicated; A, *aeneolum* Lansberge; B, *wareo* sp. nov.; C, *disruptum* Matthews; D, *aeneopiceum* Matthews (Paluma); E, *aeneopiceum* (Cardwell Range); F, *aeneopiceum*, ♀ (Cardwell Range); G, *subvolitans* Matthews (Mt Spurgeon); H, *subvolitans* (Bartle Frere); I, *atropolitum* Gillet; J, *atropolitum* Gillet (Adelbert Ra.); K, *atropolitum* Gillet; L, *finnigani* sp. nov.; M, *involucre* Matthews; N, *lewisense* sp. nov.; O, *monteithi* sp. nov. All to same scale.

Thorax (Figs 4E, 8E, 15E). Pronotum parallel-sided to apical third, without or with shallow median depression, basal margin evenly curved; lateral margin of pronotum effaced for middle 0.3-0.5; pronotal disc shining, finely and sparsely punctured and obscurely microsculptured, towards sides dull, more strongly microreticulate and less obviously punctate; hypomeral stria shallow, obliquely angled, hypomeral ratio 0.15-0.2; sides elytra evenly rounded; basal half elytra shining, finely punctured and feebly microreticulate, apical half duller, feebly punctured and strongly microreticulate; striae 1-7 feebly impressed, 7 only in basal half; stria 1 with punctures scattered throughout length, not apically deepened; stria 8 absent or present only on second quarter of elytra; stria 9 deep, abbreviated by 1.5-2× length mesepimeron; stria 10 deep, reduced by epimeron length; base of epipleuron not constricted; wing reduced to narrow unfolded strap but with at least 5 veins, 3/4 length of elytron; meso-metasternal margin raised but without or with minute median triangular tubercle; median lobe metasternum finely and sparsely punctured and margins triangularly expanded at corners, posterior of metasternum strongly and closely punctate; outer margin fore tibia with acute major teeth and 2-6 convex minor teeth between these, inner margin almost straight; mid femur elongate-ovate; hind femur with complete dorsal and ventral margins (ridges), almost parallel-sided but broadest c.1/3 from apex of trochanter; hind tibia almost evenly curved externally, with slight bulge 1/3 from apex on internal margin; apex of hind tibia produced, short spine 1.5× length first tarsal segment, pointed in dorsal view, with large subapical spur; tibial spine ratio 1-1.25; hind tarsi 0.25× length of hind tibia; hind tarsal segment 1 ventrally lobed, 2, 3 and 4 elongate rectangular,

decreasing in length, segment 5 almost equal length segments 3+4.

Abdomen (Figs 19F, 22B). Suture between last two ventrites not or weakly grooved, without row of punctures; basal margin of pygidium evenly curved, without median prominence; parameres without apical setal fringe, almost symmetrical but left smaller than right, both excavate at base of venter, apically truncate and incurved as rounded lobes; endophallus: ridges of flagellum not strongly lobed; basal sclerite folded and irregular, with appendage; ring sclerite with thick ring and curved appendage; median sclerite roughly triangular with median split.

Female (Figs 23E, 24H). Spermathecal sclerite reduced to quadrate area of sclerotisation around base of duct; spermatheca C-shaped with cylindrical base, medial constriction and gradually contracted apex.

DISTRIBUTION AND BIOLOGY (Fig. 29). Known only from a small area of lowland rainforest 45km north of Cooktown (the type locality). It is the only species of *Temnoplectron* confined to lowland rainforest.

Temnoplectron finnigani sp. nov.
(Figs 3O, 4G, 5E, 10A, 12G, 13L, 16D, 18A, 22D, 23J, 30)

Temnoplectron subvolitans Matthews, 1974: 158, partim.

ETYMOLOGY. Named from Mount Finnigan, at the core of this species' range.

TYPE. Holotype, ♂, QMT70079: 'NEQ 15°49S 145°17E Mt Finnigan summit, RF, 1100m, 20-21 Nov 1998, dung trap 8pm-8am, G. Monteith' (QM)

PARATYPES. (269) QUEENSLAND: 1, Big Tbld, 15°43S 145°17E, 700m, 19-20.xii.1990, ANZSES expedition (QM); 4, ditto, except: small pitfalls, 20-21.xii.1990 (QM); 2, Mt Finnigan, via Helenvale, 300-610m, 20-27.vii.1974, GM & DC (QM); 2, ditto, except: 760m (QM); 1, ditto, except: no altitude, 21.iv.1982, GM, DY & DC (QM); 23, ditto, except: rainforest, 850-1100m, 19-22.iv.1982 (ANIC, QM); 13, ditto, except: pitfall traps, 1050m (QM); 1, ditto, except: pitfall traps, 850-950m, 3-5.xii.1990, DC, GT & LR (QM); 2, ditto, except: 1050m (QM); 12, ditto, except: summit, 1050m, GM, GT, DC, Sheridan & LR (QM); 6, ditto, except: 850-950m (QM); 23, ditto, except: summit, 1100m, 28-30.xi.1985, GM, DC & LR (QM); 8, ditto, except: pitfall traps, rainforest, GM & DC (QM); 4, ditto, except: dung traps (QM); 47, ditto, except: 15°49S 145°17E, 20-22.xi.1998, GM, Bouchard & O'Toole (QM); 1, ditto, except: 15°48S 145°17E, pitfalls, 1060m, 4.xii.1990-17.i.1991, QM & ANZSES (QM); 1, ditto, except: 1050m (QM); 3, ditto, except: 1080m (QM); 1, ditto, except: flight intercept, 940m (QM); 1, Mt Finnigan east shoulder, 950m, 15°48S 145°18E, 14.i.1991, ANZSES expedition (QM); 57, Mt Hartley, 15°46S 145°19E, summit, pitfall traps, 750m, 8.xi.1995-16.i.1996, GM, DC & LR (QM); 2, ditto, except: 790m (QM); 17, ditto, intercept trap, (QM); 20, ditto, except: SW slope, 750m (QM); 15, ditto, except: pitfall traps (QM); 5, 2.5km SW Mt Hartley, 35km S Cooktown, 23-24.iv.1982, GM, DY & DC (QM); 5, ditto, except: rainforest pitfall traps (QM).

DESCRIPTION (male). *Colour.* Black, elytra dark bronze-green, appendages and often venter reddish-brown.

Length. 4.5-5.5mm.

Head (Fig. 3O). Lemon-shaped, genal angles evenly curved, anterior margin evenly curved from genal angles to median teeth; head finely and sparsely punctured, with patches of larger punctures around eyes and at base of clypeus, dull and microreticulate; eyes small, interocular ratio 7-8.5; first segment of labial palpi 1-1.2 × length second.

Thorax (Figs 4G, 5E, 10A, 12G, 13L). Pronotum evenly convex, with shining disc or finely microreticulate throughout, sides of disc strongly and closely punctured; lateral border of pronotum complete; hypomeral ratio 0.25-0.5, stria slightly convergent with side of pronotum; sides of elytra evenly curved from base to apex; elytra entirely microreticulate or disc shining without microsculpture, intervals finely or obscurely punctured; striae 1-7 faint, impunctate and feebly impressed; stria 8 present as an impressed line (may be broken) on second quarter of elytra; stria 9 deeply grooved, with 2-3 shallow impressions at apex, abbreviated by 2-3 × length mesepimeron; stria 10 abbreviated at length of mesepimeron from base; base of upper margin of epipleuron not depressed; wing reduced to narrow unfolded strip, 1/2 length of elytra; meso-metasternal border with small transverse median tubercle; metasternal anterior lobe finely and sparsely punctured, with margins triangularly expanded in corners; outer margin of fore tibia with large acute major teeth separated by 2-3 truncate minor teeth, inner margin almost straight; mid femur elongate-ovate; hind femora with complete dorsal and ventral margins (ridges), almost parallel-sided but broadest c.1/3 from apex of trochanter; hind tibia almost evenly curved externally, with slight bulge 1/3 from apex on internal margin, apical spine about length of tarsal segment 1, tibial spine ratio 0.75, with small articulated spur shorter than first tarsal segment; hind tarsi c.1/3 length of hind tibia; hind tarsal segment 1 triangular (ventrally lobed), 2, 3

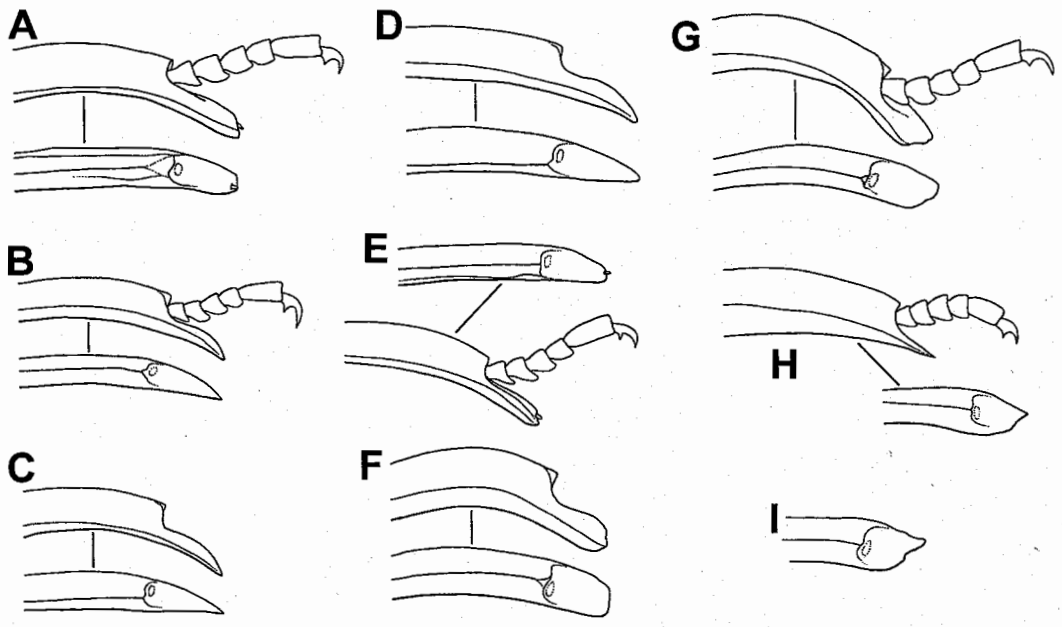

FIG. 14. *Temnoplectron* species, apices ♂ hind tibiae and tarsi, *rotundum* species group; A, *bornemisszai* Matthews; B, *boucomonti* Paulian; C, *boucomonti*; D, *boucomonti*; E, *laeve* (Laporte); F, *major* Paulian; G, *major*; H, *rotundum* Westwood (worn); I, *rotundum* (fresh). All to same scale.

and 4 elongate-rectangular, decreasing in length, 5 slightly shorter than segments 3+4.

Abdomen (Figs 16D, 18A, 22D). Last two ventrites without deep punctate groove between; basal margin of pygidium with median convexity; parameres almost identical to each other, sinusoidal, excavated at base of venter, blunt tipped in profile but with minute subapical tooth, only slightly incurved at apices, each with apico-ventral row of setae; endophallus: ridges of flagellum strongly lobed and splayed at base; basal sclerite solid, roughly pyramidal with irregular lobes; ring sclerite distorted, ring obscure with appendage drawn out into twisted irregular cylinder; median sclerite two sets of angular lobes with median split.

Female (Fig. 23J). Spur of fore tibia evenly attenuated to sharp curved apex; hind tibia without apical spine; genitalia: spermathecal sclerite broad and flat, transverse; spermathecal duct massive for two basal loops; spermatheca C-shaped with hooked tip and slightly swollen base.

REMARKS. The basal swelling of the pygidium easily distinguishes this species from other small flightless *Temnoplectron*.

DISTRIBUTION AND BIOLOGY (Fig. 30).A common flightless species of rainforest in a small area of upland between the Bloomfield and Annan Rivers, north Queensland.

Temnoplectron involucre Matthews
(Figs 3L, 10I, 13M, 18B, 22E, 24G, 29)

Temnoplectron involucre Matthews, 1974: 156; Cassis & Weir, 1992: 171.

TYPE. Holotype seen, in ANIC.

MATERIAL. (189, including holotype) QUEENSLAND (localities only): Bluewater Ra, N and S ends (JCU, QM); Mt Halifax (JCU, QM); Mt Spec (holotype and paratypes, ANIC, BMNH, DPIM, JCU); 2mi W Mt Spec (DPIM); Paluma (JCU, QM); 2.7mi W Paluma (BMNH); 6-7km WNW Paluma (ANIC, DPIM); 5-6km (3.6-4mi) W Paluma (ANIC, BMNH); 4.5km W Paluma (ANIC, BMNH); 9km W Paluma (ANIC, BMNH); 8mi W Paluma (ANIC); Paluma Dam Rd (QM); Uncle Tom's Cabin, Paluma (ANIC).

DESCRIPTION (male). *Colour.* Black, elytra dark-greenish (more obvious at apex), appendages reddish-brown.

Length. 3.5-5mm.

Head (Fig. 3L). Lemon-shaped; head finely and sparsely punctured to almost impunctate, dull and microreticulate throughout or basal third shining; anterior margin of frontoclypeus evenly

curved from genal angle to median teeth; dorsal portion of eyes small, broadest near base, interocular ratio 7-8; lengths of first two segments of labial palpi approximately equal.

Thorax (Figs 10I, 13M). Pronotum evenly convex, shining, without microsculpture or rarely sides microreticulate, finely and sparsely punctured, or rarely strongly and densely punctured at sides of disc; lateral margin pronotum complete; hypomeral ratio 0.2-0.4, stria convergent with sides of pronotum; disc of elytra (at least basal third of intervals 1-3) not microsculptured, shining, or rarely microreticulate; elytral intervals finely but distinctly punctured; striae 1-7 feebly impressed and impunctate throughout; elytral stria 8 absent or reduced to a few pits; stria 9 abbreviated at base by 1.5-2.5× length of mesepimeron; base of upper margin of epipleuron not depressed; wings reduced to narrow unfolded strip, c.0.5 elytron length; meso-metasternal margin with small transverse median tubercle; anterior process of metasternum shining, finely and sparsely to densely punctured, margins triangularly expanded at anterior corners; outer margin fore tibia with acute major teeth, separated by 3-5 sharp or convex minor teeth; inner margin fore tibia almost straight, not excavate in basal half; mid and hind femur elongate-ovate; hind tibia with extremely short and blunt apical spine, tibial spine ratio 0.3-0.4, with long apical articulated spur, longer than basal tarsal segment; hind tarsi 0.4× length hind tibia, segment 1 ventrally lobed, 2, 3 and 4 elongate rectangular, decreasing in length, segment 5 almost equal length segments 3+4.

Abdomen (Figs 18B, 22E). Last two ventrites not separated by deep punctate groove; pygidium with smoothly curved basal margin; parameres without apical setal fringe, asymmetric, left paramere sinusoidal, with blunt rounded apex, not incurved; right paramere similar but with apex projecting as a short flat incurved plate, giving pointed profile; endophallus: ridges of flagellum strongly lobed and splayed at base; basal sclerite solid, roughly cylindrical with irregular lobes; ring sclerite distorted, ring obscure with appendage drawn out into twisted irregular cylinder; median sclerite two sets of angular lobes with median split.

Female (Fig. 24G). Fore tibial spur evenly attenuated to sharp curved apex; genitalia: spermathecal sclerite distinct, a transverse and narrow ridge; spermatheca C-shaped, gradually attenuated from slightly bulbous base to apex.

DISTRIBUTION AND BIOLOGY (Fig. 29). Confined to rainforest and wet sclerophyll forest in the Paluma and Bluewater Ranges, where it is abundant. Present all year, but most active or abundant from December to July (Hill, 1993). *Temnoplectron involucre* occurs at wallaby, pig and human dung and is a ball-roller (Rortais, 1999).

Temnoplectron laeve (Laporte)
(Figs 2F-G, 4D, 7D, 11E, 11I, 14E, 16B, 17E-F, 20E, 27, 32)

Hyboma laeve Laporte, 1840: 72.
Temnoplectron laeve (Laporte): Paulian, 1938: 242; Matthews, 1974: 150; Cassis & Weir, 1992: 171.
Temnoplectron laeve Waterhouse, 1874: 175; Paulian, 1934: 286; Paulian, 1938: 242 (synonymy).

TYPES. Holotype of *Temnoplectron laeve* Waterhouse: female: /Queensland /Type /Temnoplectron laeve Waterh. Type /. Type of *Hyboma laeve* Laporte not examined and apparently lost (see below).

MATERIAL. (301: data reduced to locality, altitude, date, collector) QUEENSLAND: 1, Bluewater Ra, 50km WNW Townsville, 700m, 6-9.xii.1986, GM, GT & Hamlet (QM); 20, Brandy Ck, 150m, 20.xi.1992-14.iv.1993, GM & DC (QM); 2, Little Crystal Ck, 30.v.1969, DIC, RH (ANIC); 15, Mt Blackwood, 590m, 18.xi.1992-14.iv.1993, GM & DC (QM); 39, 0.5km NW Mt Dryander, 650m, 21.xi.1992-15.iv.1993, GM & DC (QM); 4, Mt Halifax, 13-19.xi.1991 (JCU); 16, Mt Halifax, summit, 21.iii-10.v.1991, DC, C. Hill (DPIM, QM); 7, ditto, except 1050m, 19-21.iii.1991, GM, DC (QM); 13, ditto, except i-20.iii.1991, A. Graham (QM); 5, ditto, except SE Ridge, 905m (QM); 3, ditto, except 4.xii.1990-8.i.1991 (QM); 22, Mt Hayward, 350m, 20.xi.1992- 14.iv.1993, GM & DC (QM); 3, Mt Spec, 880m, 26.xii.1977, 9.iii-6.iv.1995, RS, M. Cermak (ANIC, DPIM, JCU); 22, 1.5km SW Mt Spurgeon, 1100m, 21.xii.1988-5.i.1989, GM, GT (QM); 7, 3km S Mt Spurgeon, 1100m, 19-22.xi.1997, DC (QM); 1, North Queensland (ANIC); 20, Paluma, 880m, 5.xi.1992, iii.1993, anon., M. Gray, A. Rortais (ANIC, JCU); 2, 5mi W Paluma, 24.iv.1969, GB, DIC (ANIC); 1, 3mi E Paluma, 14.v.1969, GB, RH (ANIC); 2, ditto, except 5mi E Paluma (ANIC); 1, Paluma Dam Rd, Mt Spec, 30.iii.1968, EM (ANIC); 1, ditto, except 850m, 17.xi-8.xii.1990, GM, JS (QM); 1, ditto except 720m, 8.xii.1990-5.ii.1991 (QM); 1, Pine Mt, 600m, 14.x-17.xii.1999, DIC (QM); 2, Shute Harbour, 20m, 4-5.iv.1997, GM (QM); 30, Stony Ck, 260-280m, 19-20.iv.1998, 4.x.1999-23.iii.2000, DIC, GSM (QM); 43, Upper Cameron Ck, 6km NW Koumala, 100m, 18-19.iv.1999, 1.x.1999-23.iii.2000, GSM, DIC, CB, Evans (QM); 7, Upper East Funnel Ck, 230-250m, 16.xi.1992-15.iv.1993, GM & DC (QM); 9, Upper Hall Ck, via Carmila, 320m, 4.xii.1996-7.iv.1997, DC (QM); 1, Windsor Tbld, i.1981, I. Fanning (QM).

DESCRIPTION (male). *Colour.* Black, with reddish-brown head appendages and tarsi.

Length. 9-11.5mm.

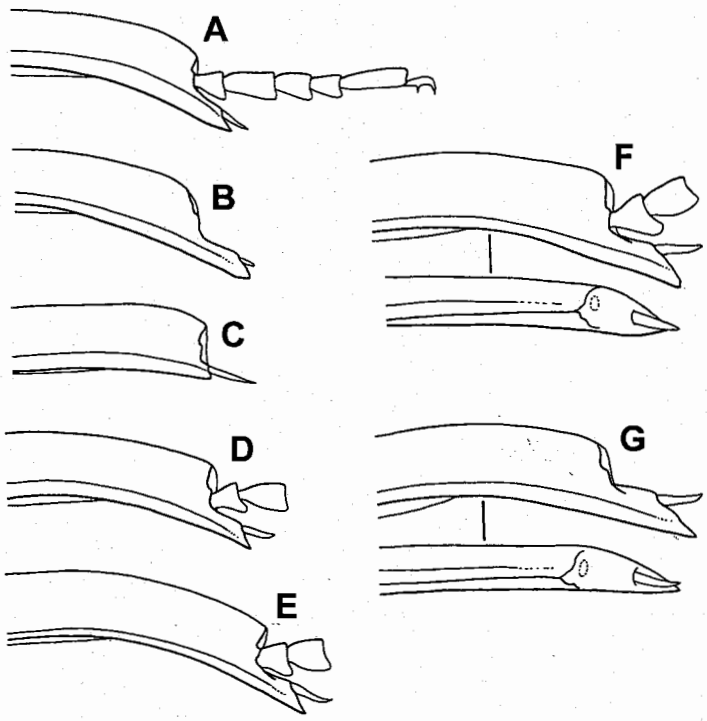

FIG. 15. *Temnoplectron* species, apices hind tibiae and hind tarsi, ♂ unless othewise indicated; A, *politulum* Macleay; B, *politulum* (worn); C, *politulum*, ♀; D, *reyi* Paulian; E, *diversicolle* Blackburn; F, *cooki* sp. nov. (Mt Spurgeon); G, *cooki* (Mt Haig). All to same scale.

Head (Fig. 2F-G). Lemon-shaped with rounded genal angles, anterior margin of frontoclypeus almost evenly curved from genal angles to median teeth, without swelling or excavation beside median teeth, but with small incision at junction of frons and clypeus; eyes large, interocular ratio 4-5; frontoclypeus dull, microreticulate, moderately punctured, becoming rugose towards anterior; first segment of labial palpi much broader than and 1.3-1.5 × longer than second segment.

Thorax (Figs 4D, 7D, 11E, 11I, 14E). Pronotum not anteriorly depressed; pronotal disc finely punctured, shining, not or shallowly microreticulate; elytra dull, strongly microreticulate and finely or obscurely punctured; striae 1-7 impunctate or almost so, without foveolate punctures, not deepened in apical half; hypomeral stria short, ratio 0.35-0.45; elytra not or feebly swollen at base of 5th interval; elytral stria 7 extremely faint; stria 8 present almost to elytral base, abbreviated by 0.3-0.5 × length mesepimeron; stria 9 separated from base by length of mesepimeron; stria 10 similar to stria 8, abbreviated at base by about 0.5 × length mesepimeron; base of epimeron not constricted; macropterous; meso-metasternal suture without median tubercle; metasternal anterior lobe with narrow margins; outer margin fore tibia with short and obtuse major teeth, separated by 1-2 convex minor teeth; inner margin fore tibia abruptly emarginate 0.3-0.5 from base, or angulate, not obviously emarginate; mid femur with broad blunt ventral lobe about 2/3 from apex of trochanter; hind femur relatively short and broad, ratio of length from apex of trochanter to greatest width = 5/2, greatest width about half length from apex of trochanter; hind tibia relatively short and curved, compared with *T. boucomonti*, curvature strongest about 1/3 and 2/3 from base; posterior tibial spine elongate, tibial spine ratio 1.5-2, thick and blunt, about equal to segments 1-3 of tarsi, with minute apical articulated spur; hind tarsi relatively short, combined length c.0.2 × length hind tibia; hind tarsal segments 1-3 ventrally lobed, 4 elongate rectangular, 1-4 approximately equal in length, 5 = segments 3+4.

Abdomen (Figs 16B, 17E-F, 20E). Last two ventrites not separated by deep punctate groove; basal margin of pygidium with rounded median tubercle; parameres without apical setal fringes, almost symmetrical, narrow and dorsally excised, with bluntly rounded apices and short flat apicoventral lobes, but left thicker than right, with smaller apical lobe; endophallus: ridges of flagellum strongly lobed; basal sclerite roughly quadrate, opaque and feebly folded; ring sclerite with narrow thick ring and curved appendage; median sclerite irregular, strongly folded; apex of endophallus with patch of spinules.

Female (Fig. 11F). As above, except: mid femur broadest apically, with slight anterior expansion of ventral edge; spermathecal sclerite broad, straight sided, but weakly sclerotised, enclosing vagina, width about 7 times length; spermatheca constricted just before middle bend, therefore base bulbous, apex relatively thin.

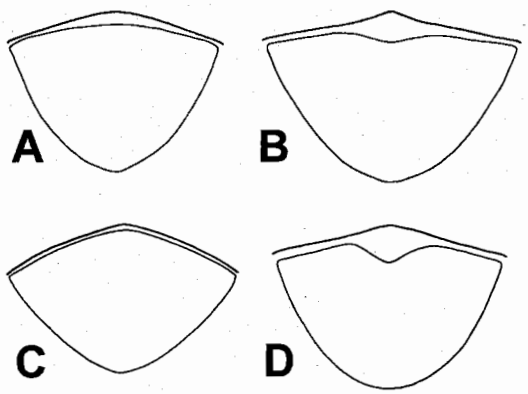

FIG. 16. *Temnoplectron* species, ♂ pygidium; A, *boucomonti* Paulian; B, *laeve* (Laporte); C, *cooki* sp. nov.; D, *finnigani* sp. nov. Not to scale.

REMARKS. Confused with *T. boucomonti* (as *T. laevigatum*) by Matthews (1974), which is separated by: eyes separated by 5-6 eye-widths; hypomeron ratio >0.8; elytral striae slightly deeper and 8 and 9 separated from base of elytra by 2× length mesepimeron; male hind femur relatively long and narrow, ratio of length from apex of trochanter to greatest width = 3/1, and hind tibia longer; left paramere without apico-ventral tooth; vaginal plate without well-defined transverse sclerite; spermatheca with sinuate bulbous base.

The type of *T. laeve* Laporte was borrowed from the Hope Department Collection, Oxford University by Paulian in the 1930s (Paulian, 1938) but is no longer present in that collection (G. McGavin, pers. com.) and is probably lost. The above synonymy is therefore possibly erroneous, but follows accepted practice (Matthews, 1974, Cassis & Weir, 1992).

DISTRIBUTION AND BIOLOGY (Figs 27, 32). Common in rainforest and wet sclerophyll on isolated ranges in northern Queensland: Windsor Tableland, Carbine Tableland, Paluma-Bluewater Range, Dryander-Conway Range, Mount Blackwood and the ranges south of Sarina to near Carmila. In the northern localities (mapped in Fig. 27) it is strictly montane (700-1200m) and apparently confined to wet sclerophyll forest, but further south occurs in rainforests down to sea-level and is occasionally taken in drier forest. It is most abundant during the wet season and rare or not active during the dry season (Hill, 1993).

Temnoplectron lewisense sp. nov.
(Figs 1E, 3M, 10F-H, 13N, 18E, 22F, 23K, 30)

ETYMOLOGY. Named from Mount Lewis, at the core of this species' range.

MATERIAL. Holotype, ♂, QMT59987: 'NEQ 16°34S 145°16E, Mt Lewis Rd, Windmill Ck, 18 Nov 1997, GM & DC, 900m, rainforest pitfall' (QM). PARATYPES. (371) QUEENSLAND: 25, Black Mt, 17km ESE Julatten, 800-1000m, 29-30.iv.1982, GM, DY & DC (QM); 1, ditto, except: pyrethrum knockdown (QM); 6, Carbine Tbld, above Fern Patch, Devils Thumb, pitfall traps, 1050m, 26-27.xi.1990, GM & HJ (QM); 6, Devils Thumb, area, 10km NW Mossman, 1000-1180m, 9-10.x.1982, GM, DY, GT (QM); 2, ditto, 12km NW Mossman, pitfalls, 1000m, 26-27.xii.1989, ANZSES (QM); 4, ditto, except: 16°23S 145°16E, 1100m, 30.vi-1.vii.1997, DC (QM); 4, ditto, except 1160m (QM); 1, Karnak-Devils Thumb, 8-12km NW Mossman, pitfall, 1080m, 26.xii.1989-15.i.1990, ANZSES (QM); 4, ditto, except: 1120m (QM); 2, ditto, except: 1160m (QM); 3, ditto, except: 1100m (QM); 4, ditto, except: Devils Thumb-Pauls Luck, 1240m, 27.xii.1989-15.i.1990 (QM); 2, ditto, except: 1300m (QM); 2, 12km WNW Mossman, Head of Roots Ck, pitfalls, 1200m, 28.xii.1989-11.i.1990, ANZSES (QM); 2, 11km NW Mossman, nr Plane Crash, pitfalls, 1200m, 10.i.1990, ANZSES (QM); 1, ditto, except: 1330m, 27-28.xi.1990, GM, GT, DC, Sheridan & HJ (QM); 1, Mossman Bluff track, 5-10km W Mossman, intercept, 1260m, 17-31.xii.1988, GM & GT (QM); 14, Mossman Bluff track, 5-10km W Mossman, pitfall, 1300m, 1-17.i.1989, GM & GT (QM); 2, ditto, except: intercept (QM); 4, ditto, except: pitfall, 20.xii-15.i.1990 (QM); 3, ditto, except: 1260m (QM); 1, ditto, except: intercept, 1300m (QM); 1, ditto, except: 1260m (QM); 9, ditto, except: 17-31.xii.1988 (QM); 6, ditto, except: pitfall (QM); 2, ditto, except: pitfall, 1180m (QM); 9, Mt Demi, north peak, 16°30S 145°19E, pitfall traps, 1050m, 17.xii.1995-25.i.1996, GM, GT & Ford (QM); 11, ditto, except: flight intercept (QM); 3, ditto, except: summit, 1100m (QM); 40, ditto, except, pitfall traps (QM); 9, ditto, except: 16-17.xii.1995, GM & GT (QM); 9, Mt Lewis, pitfalls, i-iii.1988, G. Wood (QM); 1, Mt Lewis, 970m, 29.iv.1973, RT (ANIC); 2, ditto, except: dung trap, 14-18.xii.1986, HAH (DPIM); 3, Mt Lewis, 16°35S 145°17E, berlesate, rainforest, 960m, 30.x.1976, RT & TW (ANIC); 1, Mt Lewis, 20km S Mossman, 1000m, 10.vii.1982, SJP (ANIC); 2, ditto, except 1.viii.1982 (ANIC); 7, Mt Lewis, 8km NW Julatten, 8.i-2.ii.1987, RS & H. Howden (ANIC); 3, 2km ESE Mt Lewis, 16°35S 145°18E, rainforest pitfall, 820m, 18.xi.1997-7.ii.1998, GM & DC (QM); 14, Mt Lewis Rd, Julatten, rainforest, 1.xii.1975, 30-31.x.1976, RS, AWH (ANIC, DPIM); 5, ditto, except: rainforest intercept, 1000m, 11.xi-25.xii.1987 (ANIC); 4, Mt Lewis Rd, 16°34S 145°17E, rainforest by Rd, FIT, c750m, 4.iv.1997, K. Abbott (ANIC); 4, 11km up Mt Lewis Rd from highway, pitfall, 1000m, 18.xii-13.i.1990, GM & GT (QM); 1, ditto, except: 16km, 950m (QM); 1, ditto, except: Old Barracks area, 1000m, 13.i.1990, ANZSES (QM); 8, 11km up Mt Lewis Rd, flight intercept, 9-23.xi.1982, 26.xii.1986-2.ii.1987,

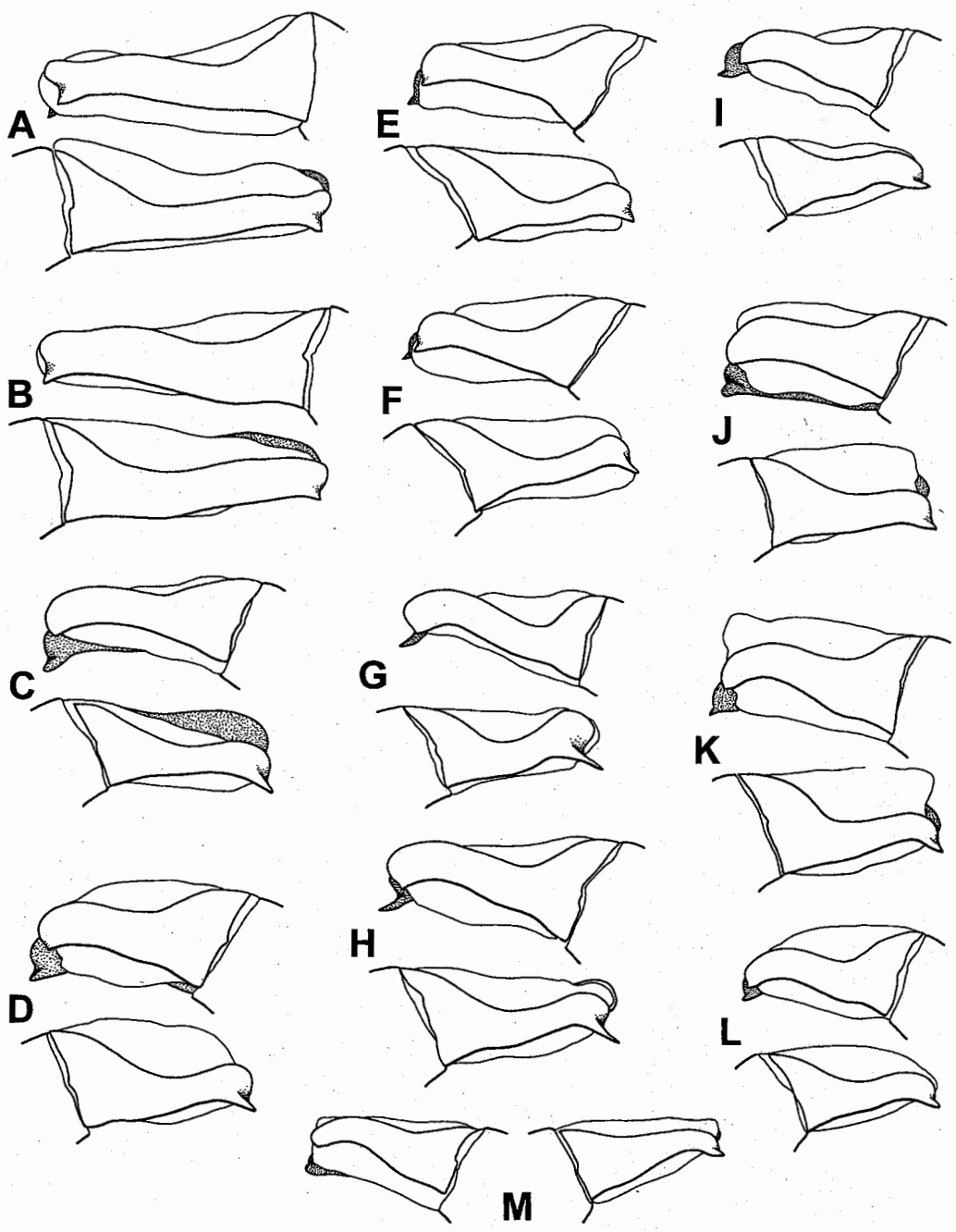

FIG. 17. *Temnoplectron* species, aedeagal parameres, left (above), right (below); A, *bornemisszai* Matthews (Yungaburra); B, *bornemisszai* (Windsor Tbld); C, *boucomonti* Paulian (PNG); D, *boucomonti* (Adelaide R.; holotype *laevigatum* Matthews); E, *laeve* (Laporte) (Mt Halifax); F, *laeve* (Mt Spurgeon); G, *major* Paulian (PNG); H, *major* (Forty Mile Scrub); I, *rotundum* Westwood (Yirrkala); J, *rotundum* (Mt Tozer); K, *atropolitum* Gillet (Dormanpadbivak); L, *atropolitum* Gillet (Adelbert Ra.); M, *atropolitum* Gillet (Mt Hagen). All to same scale.

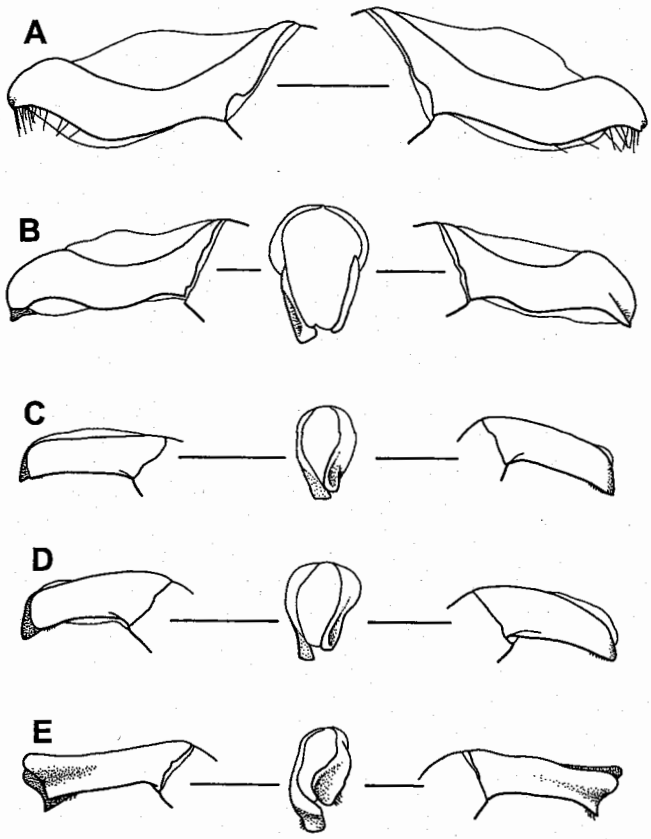

FIG. 18. *Temnoplectron* species, aedeagal parameres, left, apical, right; A, *finnigani* sp. nov.; 160, *involucre* Matthews; 161, *monteithi* sp. nov. (Mt Halcyon); 162, *monteithi* sp. nov. (Thornton Peak); 163, *lewisense* sp. nov. All to same scale.

11.xi-25.xii.1987, Morgan, JDB, AWH, Howden & RS (ANIC, DPIM); 10, 13km up Mt Lewis Rd, via Julatten, human dung trap, 29.iv-2.v.1976, RS (DPIM); 3, 18km up Mt Lewis Rd via Julatten, intercept trap, 9.xi-22.xii.1982, Morgan, JDB, RS (DPIM); 6, 22km up Mt Lewis Rd, 16°33S 145°17E, rainforest pitfall, 1000m, 29.xi.1997-7.ii.1998, GM & DC (QM); 5, 29km up Mt Lewis Rd, 16°31S 145°16E, rainforest pitfall, 1210m, 18.xi.1997-7.ii.1998, GM & DC (QM); 1, Mt Lewis, 17km W Julatten, 12.xii.1982, JT (ANIC); 10, Mt Spurgeon, 16°27S 145°12E, tall primary rainforest by track, human dung trap, 1150m, 19-22.xi.1997, CR (ANIC); 11, ditto, except: 2km SSE Mt Spurgeon, 1100m, GM & CR (QM); 1, ditto, except: GM, DC & CB (QM); 2, ditto, except: 3km S, 16°27S 145°11E, dung traps, open forest, DC (QM); 9, ditto, except: tall primary wet sclerophyll by track, bandicoot (?) dung (fruit), 1150m, CR (ANIC); 1, 2km SE Mt Spurgeon, rainforest pitfalls, 1100m, 20-21.xii.1988, GM & GT (QM); 1, ditto, except: 20.xii.1988-4.i.1989 (QM); 2, ditto, except: 16°27S 145°12E, 13-14.x.1991, GM, HJ & DC (QM); 1, 3.5km NNE Mt Spurgeon, 16°24S 145°13E, 1350m, 15-20.x.1991, GM, HJ, DC & LR (QM); 1, ditto, except: 2.5km NE, 16°25S, 1200m (QM); 2, ditto, except: 4km NNE, 1250-1300m (QM); 2, 7km N Mt Spurgeon, 16°22S 145°13E, 1200-1250m, 17-19.x.1991, GM, HJ, DC & LR (QM); 1, Pauls Luck, Carbine Tbld, pitfall traps, 1100m, 28-30.xi.1990, GM, HJ & DC (QM); 2, Pauls Luck, Platypus Ck, 13km W Mossman, pitfall traps, 1100m, 1-16.i.1990, ANZSES (QM); 2, ditto, except: 16°26S 145°14E, 25-26.vi.1997, DC (QM); 20, Roots/Saltwater Cks Divide, via Mossman, 16°25S 145°16E, dung baited pitfall trap, 1200m, 27-28.vi.1997, DC (QM); 17, Upper High Falls Ck, 16°24S 145°17E, flight intercept trap, 1000m, 25.i-12.ii.1996, R. Wertz (QM); 9, Upper Whitehall Gully, 16°25S 145°15E, dung baited pitfall, 1240m, 26-27.vi.1997, DC (QM); 7, Windmill Ck, Mt Lewis Rd, 16°34S 145°16E, rainforest pitfall, 900m, 18.xi.1997-7.ii.1998, GM & DC (QM).

DESCRIPTION (male). *Colour.* Black with brassy-green elytra, reddish-brown appendages and often brown pygidium and elytral apex.

Length. 3.5-5mm.

Head (Fig. 3M). Upper surface dull, entirely microreticulate, or basal quarter shining and not or shallowly microreticulate, or only apical quarter dull and microreticulate; fronto-clypeus moderately strongly punctured, at least in basal half; lemon-shaped, genal angles rounded, anterior margin evenly curved or almost straight to prominent median tubercles; dorsal portion of eyes moderately small, broadest near middle, interocular ratio 8-10; first segment of labial palpi about equal to second.

Thorax (Figs 10F-G, 13N). Disc of pronotum not depressed, shining, not or feebly microreticulate, sides dull and microreticulate, or rarely shining (most specimens from Mt Demi); disc of pronotum strongly and closely to finely punctured; basal 2/3 of pronotal sides almost straight, basal margin evenly curved; circular depression at about 1/2 length sides of pronotum; lateral margins of pronotum completely bordered or middle 0.2-0.3 effaced; hypomeral ratio 0.2-0.5, stria not convergent with sides of pronotum; elytral sides evenly convex; elytra densely microreticulate, intervals finely punctured; striae 1-7 faint and impunctate, except stria 5 usually deeper on disc and partially finely ridged (not

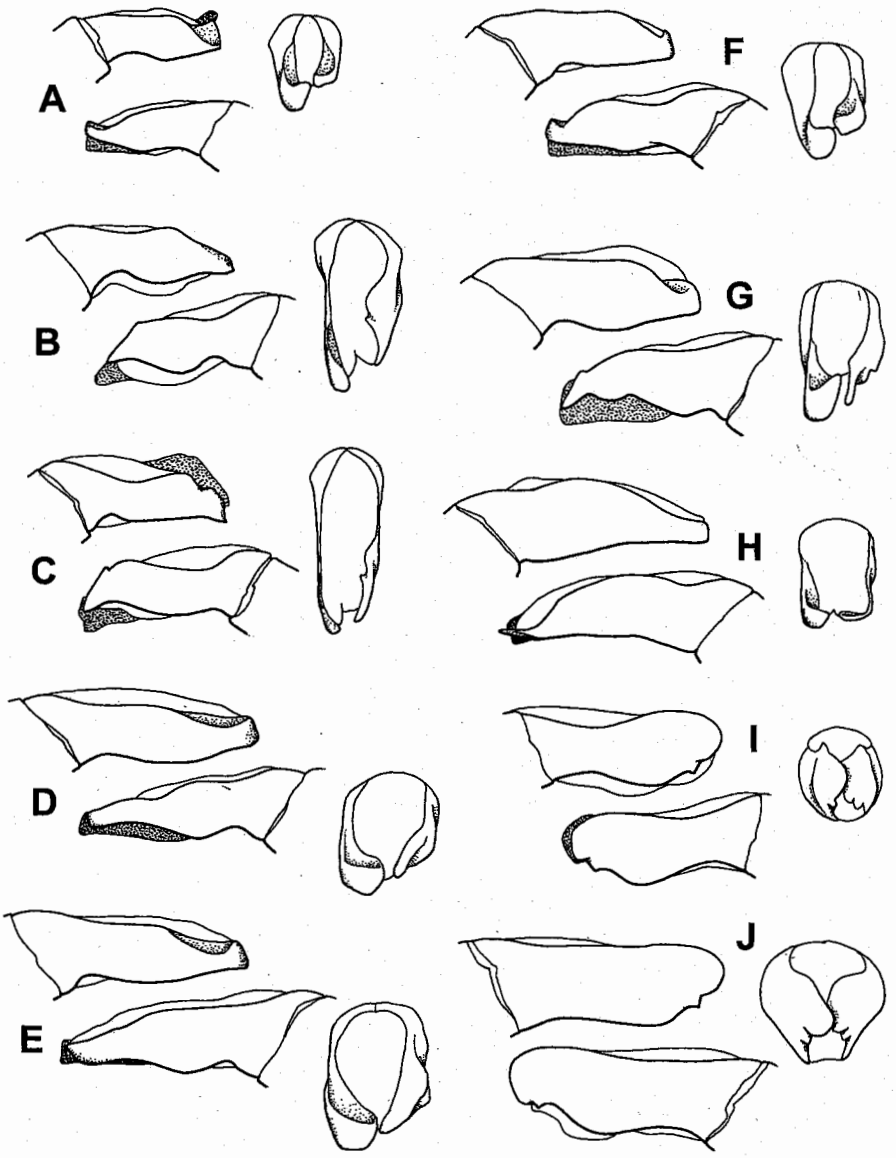

FIG. 19. *Temnoplectron* species, aedeagal parameres, left, apical, right; A, *disruptum* Matthews; B, *aeneopiceum* Matthews; C, *subvolitans* Matthews (Millaa Millaa Falls); D, *cooki* sp. nov. (Mt Tiptree); E, *cooki* (Mt Spurgeon); F, *diversicolle* Blackburn; G, *politulum* Macleay; H, *reyi* Paulian; I, *wareo* sp. nov.; J, *aeneolum* Lansberge. Not to scale.

small specimens from Devils Thumb); stria 8 absent; stria 9 abbreviated, separated from elytral base by 1.5-2× length mesepimeron; stria 9 deeply grooved, delineated by fine ridge, with at most a few foveolate punctures confined to apical fifth; stria 10 separated from base by about mesepimeron length; base of epipleural upper margin not depressed; wing reduced to minute unveined strap, 0.7mm long; metasternal median lobe usually strongly and moderately densely punctured (in parts interspaces 1-2 puncture diameters), more rarely finely and sparsely punctured; anterior of lobe separated from mid coxae by expanded triangular margins; middle of meso-metasternal border with small transverse tubercle; outer margin fore tibia with acute major

teeth separated by 3-5 sharp or at least convex minor teeth, inner margin almost straight, not basally excavate; mid femur elongate-ovate; hind femur almost parallel-sided for most of length, without ventral lobe; hind tibia feebly curved, with short blunt apical lobe, tibial spine ratio 0.3-0.4, and prominent articulated spur about as long as first tarsal segment; hind tarsi long, combined length almost half length tibia; hind tarsal segment 1 triangular (ventrally lobed), 2 and 3 elongate rectangular, 4 quadrate and small (2/3 length 3), 5 = segments 3+4.

Abdomen (Figs 18E, 22F). Last two ventrites not separated by deep punctate groove; basal margin of pygidium evenly curved, without median tubercle; parameres similar shaped, right with sharper flatter basal lobe; each with concave apex, longitudinally concave in apical third, and short row of small setae on lower surface; endophallus: ridges of flagellum lobed and splayed at base; basal sclerite solid, a flattened cone; ring sclerite distorted, ring thick-walled with appendage drawn out laterally and twisted; median sclerite three convex lobes.

Female (Figs 10H, 23K). As above, except: apical spur of fore tibia evenly attenuated to curved tip; spermathecal plate with thin transverse well-defined sclerite, width about 9 × length, curved at sides and encircling spermathecal duct; spermatheca falcate, gradually narrowed to apex, relatively small and thin.

REMARKS. This small globular species may be confused with *T. monteithi*; but the structure of stria 9, the fore-tibial teeth and female fore-tibial spurs separates them fairly easily. It is similar to large species of *Lepanus* Balthasar in the field.

DISTRIBUTION AND BIOLOGY (Fig. 30). An abundant small flightless species confined to rainforest at relatively high elevations on the Carbine Tableland, north Queensland, with a single outlying population 20km to the southeast at Black Mountain.

Temnoplectron major Paulian
(Figs 2H, 7E-F, 11C, 11J, 12B, 14F-G, 17G-H, 20B, 28)

Temnoplectron major Paulian, 1985: 226.
Temnoplectron rotundum sensu Matthews, 1974: 152 partim, nec Westwood, 1841.

TYPE. Holotype not seen (in CMN), but topotypic material examined.

MATERIAL. (180, data reduced to locality, altitude, date, collector) AUSTRALIA: Queensland: 7, Andoom, 5-8.ii.1975, GM (QM); 1, Bamaga, 18-25.iii.1987, GM (QM); 1, Edungalba, x.1980, E. E. Adams (UQ); 54, Forty Mile Scrub [NP], 31.v.1972, 19-20.iv.1973, 7.i.1976, 23.ii.1988, 6.xi.1991, 1.x.1993, x.1993-i.1994, i.1994, DM, Hasenpusch, Lawless, GM, Raven, DR, Shaw, RS (AMS, ANIC, QM); 17, Forty Mile Scrub, 23.x-22.xi.1985, 21.x.1985-10.i.1986, RS & Heiner (DPIM); 3, Gordon's Mine area, 12-18.ii.1976, GM (QM); 1, Hidden Valley, 15mi W Paluma, 30.v.1969, DIC & RH (ANIC); 1, Iron Ra, 15-21.iv.1977, RS (DPIM); 3, Iron Ra, 28.iv-4.v.1968, 26.v-2.vi.1971, GM (UQ); 3, nr Iron Ra Airport, 20.xii.1971, DM & GH (AMS); 2, 1km E Iron Ra, 100', 13.v.1971, J. A. Brooks & JGB (ANIC); 2, Isabella Ck, 32km WNW Cooktown, 230m, 22.v.1977, IC & EE (ANIC); 11, Lockerbie, 6-10.vi.1969, GM (UQ); 1, 3km E Lockerbie, 30.i-4.ii.1975, GM (QM); 5, 24km NW Mareeba, 24-25.xi.1981, J. Balderson (ANIC); 1, Millstream Falls, 5.i.1967, DM & GH (AMS); 2, 19km N Moreton, 15-16.vii.1975, GM (QM); 7, Mount Garnet, i.1990, J. Hasenpusch (AMS); 6, 65km SW Mt Garnet, 11.ii.1975, A. H. W. (ANIC); 1, 4mi NE Mt Lomond, Iron Ra, 8.i.1972, DM & GH (AMS); 1, 7km N Ooline Scrub, 12.xi.1996-i.1997, P. Lawless (QM); 1, 5km W Port Stewart, 25-27.vi.1976, GSM (QM); 14, 2km SW Ravenshoe, 880m, 8-9.ii.1999, GM (QM); 1, Rockhampton, 1911, [Froggatt coll.] (ANIC); 1, Rocky R, Silver Plains, 6.i.1960, JW (ANIC); 2, Rocky R, McIlwraith Ra, 16.vi.1958, 14-16.xii.1964, GM (UQ); 1, Station Ck, 370m, 3-11.ii.1999, GM & DC (QM); 21, Tolga, 22.x.1985, 23-30.x.1985, 31.x-6.xi.1985, 10.xii.1986, JDB (DPIM); 1, 7km NE Tolga, 19.xii.1986-3.i.1987, RS & De Faveri (DPIM); 1, Windsor Tbld, 900m, 23-25.xi.1997, GM (QM); 1, Windsor Tbld, 30km from main rd, 28.xi-20.xii.1985, RS & JDB (DPIM); PAPUA NEW GUINEA: 2, 18mi N Port Moresby, Brown R, 10', 14-15.vii.1974, SJP (CMN); 4, ditto, except 16-18.vii.1974 (DPIM).

DESCRIPTION (male). *Colour.* Black, tarsi and head appendages reddish-brown

Length. 9-12mm.

Head (Fig. 2H). Eyes large, interocular ratio 5-6; first segment of labial palpi 1.5-2 × length second segment; anterior margin of frontoclypeus with a small angular tooth at junction of frons and clypeus, and convexly produced (or concavely excised) lateral to median teeth; frontoclypeus dull, strongly microreticulate and punctured, becoming rugose towards anterior.

Thorax (Figs 7E-F, 11C, 11J, 12B, 14F-G). Major male with anterior of pronotum strongly depressed medially, with two lateral 'tubercles', minor male may have evenly curved pronotum, as female; pronotum dull as elytra, or more shining than elytra, disc finely punctured, strongly microreticulate; lateral margin of pronotum entire; hypomeral ratio 0.4-0.7; elytra dull, intervals finely or obscurely punctured, strongly microreticulate; elytral striae 1-7

impunctate or almost so, without foveolate punctures, not apically deepened; stria 8 present, abbreviated by 0.5-1.5× length mesepimeron; stria 9 similar; base of epipleuron not constricted; macropterous; meso-metasternal suture without median tubercle; anterior lobe of metasternum with narrow margins; anterior margin fore tibia with acute major teeth, separated by 2-4 convex minor teeth; posterior margin fore tibia abruptly emarginate 0.3-0.5 from base; mid femur elongate-ovate; hind femur broadest at middle, evenly tapered to apex, without subapical lobe; hind tibia not abruptly narrowed at base, ridges convergent; hind tibia slightly curved basally, very strongly curved in apical third; apical spine of hind tibia massive, almost as thick as wide and equal to first two to three tarsal segments, apex blunt, without articulated spur, tibial spine ratio 1.5; hind tarsus short, 0.25× length hind tibia, segments 1-2 lobed ventrally, segments 1-4 almost equal in length, segment 5 = 3+4.

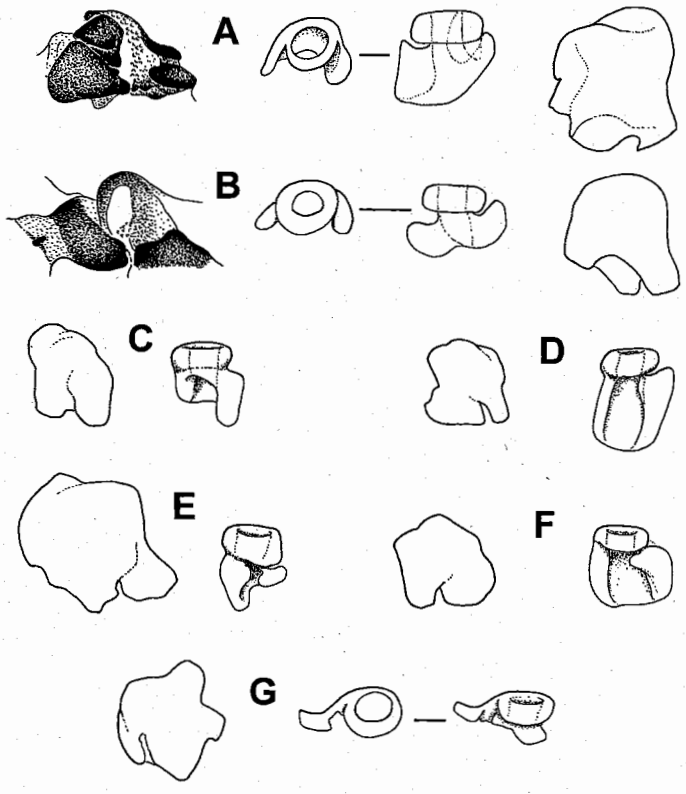

FIG. 20. *Temnoplectron* species, endophallic sclerites; A, *atropolitum* Gillet; B, *major* Paulian; C, *boucomonti* Paulian (Darwin); D, *boucomonti* (Cairns); E, *laeve* (Laporte); F, *rotundum* Westwood; G, *bornemisszai* Matthews. Not to scale.

Abdomen (Figs 17G-H, 20B). Without deep punctate groove between last two ventrites; basal margin of pygidium evenly curved; parameres without apical setal fringe, asymmetric, left strongly curved, with convex apex; right paramere dorsally excavate, with large flat apical lobe; endophallus: ridges of flagellum strongly lobed; basal sclerite solid, roughly quadrate, with trilobed apex; ring sclerite with thick ring and two curved appendages; median sclerite irregular, strongly folded, adjacent to poorly defined flat plate; apex of endophallus with patch of small spinules.

Female (Fig. 11C). As above except: ventral edge of mid femur almost straight; spermathecal sclerite absent, without any dark areas around base of duct; spermatheca falcate, with globular base, slightly thickened median bend and gradually contracted apical lobe.

REMARKS. Matthews (1974) considered this to be a male morphological variety of *T. rotundum*, noting that the two 'forms' generally occurred together. They occur sympatrically between Forty Mile Scrub and Bamaga, Queensland, but have rarely been collected together at any site and probably occupy different habitats. Only *T. rotundum* is known from Groote Eylandt west to the Kimberleys, Western Australia, and only *T. major* is known south of Forty Mile Scrub.

DISTRIBUTION AND BIOLOGY (Fig. 28). Widespread in eastern Queensland, from Bamaga south to Taroom, westwards to Forty Mile Scrub, and is known from one locality in New Guinea, 20mi[les] N Port Morseby [Paulian (1985) erroneously gives the type locality as 200km N of Port Morseby]. It is a common open forest species, taken at human dung.

Temnoplectron monteithi sp. nov.
(Figs 3N, 10B-E, 13O, 18C-D, 22G, 30)

ETYMOLOGY. Named for Geoff Monteith, Queensland Museum, initiator and principle collector for the Wet Tropics dung beetle project.

MATERIAL. Holotype, ♂,QMT40074: 'NE Qld, 3.5km W Cape Tribulation (site 7), 5-9 Jan 1983, 680m, GM, RF, baited pitfall traps' (QM). PARATYPES. (323) QUEENSLAND: 10, same data as holotype (QM); 60, 4km W C Tribulation, rainforest, flight trap, baited pitfall traps, 720m, 23.ix-7.x.1982, GM, DY & GT (QM); 19, 4.5-5km W C Tribulation, 760-780m, 27.ix-7.x.1982, GM, DY & GT (QM); 12, ditto, except: 4km W, 720m, 23.ix-7.x.1982 (QM); 1, ditto, except: 4.5km W, pyrethrum knockdown, 760m, 29.ix.1982 (QM); 9, ditto, except: baited pitfall traps, 5-9.i.1983, GM (QM); 4, ditto, except: 3km W, 500m (QM); 63, ditto, except: 4km W, 760m (QM); 20, ditto, except: 5km W, 780m (QM); 8, ditto, except: 20-23.iv.1983, GM & DY (QM); 10, ditto, except: 23.ix-7.x.1983, GM, DY & GT (QM); 26, C Tribulation transect, 16°05S 145°26E, site 8, dung trap, night, 18-19.xi.1998, GM (QM); 2 ditto, except 750m, GM, Bouchard, O'Toole (QM); 13, Mt Halcyon, 16°03S 145°25E, pitfalls, 870m, 22-24.xi.1993, DC, GM, HJ & LR (QM); 1 ditto, except pyrethrum fogging trees & logs, 23.xi.1993 (QM); 1, ditto, except: berlesate, 24.xi.1993 (QM); 13, Mt Hemmant, 16°07S 145°25E, pitfall traps, 1050m, 25-27.xi.1993, GM, DC, HJ & LR (QM); 5, Mt Pieter Botte, 16°04S 145°24E, pitfalls & intercept, 950m, 21.xi-8.xii.1993, GM, HJ, LR & DC (QM); 2, ditto, except: 900m, GM & HJ (QM); 3, Roaring Meg Valley, 16°04S 145°25E, pitfall trap, 680m, 20-22.xi.1993, GM, DC, HJ & LR (QM); 1, ditto, except: 600m, 7-9.xii.1993, GM (QM); 2, Thornton Peak via Daintree, 1000-1300m, 20-22.ix.1981, GM & DC (QM); 4, ditto, except: 24-27.ix.1984, GSM (QM); 31, Thornton Peak, 11km NE Daintree, dung trap in rainforest, 1100m, 30.x-1.xi.1983, GM, DY & GT (QM); 1, ditto, except: 1100-1200m (QM); 1, ditto, except: 900m (QM).

DESCRIPTION (male). *Colour.* Black with brassy-green elytra, reddish-brown appendages and often reddish pygidium and elytral apex (generally darker on Thornton Peak).

Length. 3.5-5mm.

Head (Fig. 3N). Frontoclypeus strongly and closely punctured (rarely finely and sparsely), apical third dull, strongly microreticulate, and basal third shining, not or feebly microsculptured; lemon-shaped, genal angles rounded, anterior margin evenly curved or almost straight to prominent median tubercles; dorsal portion of eyes moderately small, broadest near base, interocular ratio 8-10; length first segment labial palpi 1-1.3 × second segment.

Thorax (Figs 10B, 13O). Disc of pronotum evenly convex, shining, not or feebly microreticulate, sides shining not or feebly microreticulate; pronotal disc strongly punctured throughout, or median area finely punctured; basal 2/3 of pronotal sides almost straight, basal margin evenly curved; circular depression at about 1/2 length sides of pronotum; lateral margins of pronotum usually with middle 0.15-0.2 effaced (typical of Mount Pieter Botte area), or complete (typical of Thornton Peak and Mount Hemnant), rarely with 0.3-0.5 of middle effaced; hypomeral ratio 0.15-0.35, stria not convergent with sides of pronotum; elytra strongly microreticulate, intervals finely or obscurely punctured; sides of elytra evenly convex; striae 1-7 evenly shallowly impressed and impunctate; stria 8 absent; stria 9 abbreviated, separated from elytral base by 2.5-3.5 × length mesepimeron, shallow, not delineated by fine ridge, with foveolate punctures throughout; stria 10 shallow, separated from base by about mesepimeron length; base of epipleural upper margin depressed, elytra constricted at this point; wing minute, 0.7mm long, unveined and strap-like; metasternal median lobe moderately strongly to finely and sparsely punctured; anterior of lobe separated from mid coxae by expanded triangular margins; middle of meso-metasternal border with small transverse tubercle; outer margin fore tibia with acute major teeth separated by 2-3 truncate minor teeth, inner margin shallowly concave; mid femur elongate-ovate; hind femur almost parallel-sided for most of length, without ventral lobe; hind tibia feebly curved, with short blunt apical lobe, tibial spine ratio 0.3-0.4, and prominent articulated spur about as long as first tarsal segment; hind tarsi long, combined length almost 1/2 length tibia; hind tarsal segment 1 ventrally lobed, 2 and 3 elongate rectangular, 4 quadrate and small (2/3 length 3), 5 almost as long as segments 3+4.

Abdomen (Figs 18C-D, 22G). Without deep punctate groove between last two ventrites; basal margin of pygidium evenly curved, without median tubercle; parameres asymmetric, apex of left paramere bluntly rounded, apex of right paramere triangularly produced; a short row of small setae on lower surface of each; endophallus: ridges of flagellum lobed and splayed at base; basal sclerite solid, roughly trapezoid; ring sclerite distorted, ring obscure with appendage drawn out laterally and twisted; median sclerite, two smooth lobes with median split containing small angular lobe.

Female (Fig. 10C-E). As above except: apical spur of female fore tibia angulate on inner margin; genitalia: spermathecal sclerite distinct, a transverse and narrow ridge; spermatheca C-shaped, gradually attenuated from base to apex.

REMARKS. This small globular species may be confused with *T. lewisense*, but the structure of

stria 9, the depressed base of the epipleuron, the fore-tibial teeth and the female fore-tibial spurs separates them fairly easily.

DISTRIBUTION AND BIOLOGY (Fig. 30). *Temnoplectron monteithi* is confined to upland rainforest, at 600-1300m, on mountain massifs between the Daintree and Bloomfield Rivers, where it is abundant and the only small flightless *Temnoplectron* species. This species was listed as *Temnoplectron* sp. nov. in an altitudinal transect study undertaken on the Cape Tribulation ridge (Monteith, 1985).

Temnoplectron politulum
Macleay
(Figs 3J, 9G-H, 15A-C, 19G, 21B, 23H, 31)

Temnoplectron politulum Macleay, 1887: 221; Gillet, 1925: 4; Paulian, 1934: 285; Matthews, 1974: 155; Cassis & Weir, 1992: 171

TYPE. Lectotype, Cairns (*vide* Cassis & Weir, 1992) seen (in ANIC).

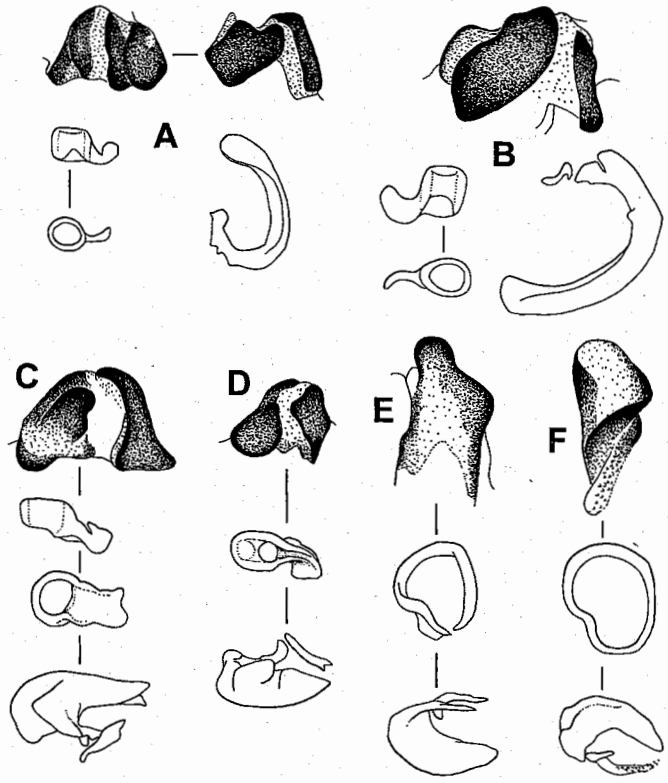

FIG. 21. *Temnoplectron* species, endophallic sclerites; A, *reyi* Paulian; B, *politulum* Macleay; C, *aeneopiceum* Matthews; D, *subvolitans* Matthews; E, *aeneolum* Lansberge; F, *wareo* sp. nov. Not to scale.

MATERIAL. (2016, including lectotype: abbreviated localities only) Lectotype, 3 paralectotypes (Matthews, 1974): Cairns, N Qld; QUEENSLAND: Atherton (AMS); 6km S Atherton (DPIM); 21km S Atherton (DPIM); 21km NE Atherton (ANIC); Baldy Mt (DPIM, QM); Bartle Frere, west base (QM); 2km S Beatrice R (QM); Bellenden Ker (QM); Boar Pocket Rd (DPIM); 3km W Bones Knob (QM); Boulder Ck (QM); Cardwell Ra, Kirrama and Windy Gap (ANIC, DPIM); Charmillin Ck (QM); Crater NP (QM); 18km up Davies Ck Rd (ANIC, DPIM, QM); Dianes Hill (ANIC); Douglas Ck (QM); 10km SE El Arish (ANIC); Figtree Ck (JCU); Forty Mile Scrub NP (DPIM); Gadgarra SF (QM); Graham Ra (QM); Heales Lookout (ANIC); Herberton Ra (ANIC); Hinchinbrook I. (QM); Hugh Nelson Ra (ANIC); Josephine Falls (ANIC); Kenny Rd (QM); Kirrama Ra (JCU, QM); Kjellberg Rd (QM); 10km S Koombooloomba (QM); 6km SW Kuranda (DPIM); Lake Barrine (ANIC); Lake Eacham (ANIC, QM); Lamins Hill (ANIC); Longlands Gap (ANIC); Maalan SF (QM); Malanda (ANIC); Malanda Falls (DPIM, QM); 3km S Malanda (ANIC); Massey Ck (ANIC, JCU, QM); Massey Ra (QM); McNamee NP (ANIC); Millaa Millaa Falls (ANIC, DPIM, QM); Millaa Millaa Lookout (QM); 9km W Millaa Millaa (ANIC); 14km SE Millaa Millaa (ANIC); Mission Bch (DPIM, QM); Mt Father Clancy (QM); Mt Fisher (QM); Mt Haig (ANIC); Mt Macalister (QM); Mt Nomico (AMS); Mt Smoko (QM); Mt Tyson (QM); Mt Williams (QM); Palmerston NP (ANIC, QM); Peeramon Quarry (JCU); Peeramon Scrub (QM); Pine Ck Tower (QM); Plath Rd (QM); Ravenshoe SF (ANIC); 9mi NE Ravenshoe (DPIM); 9.5, 11 & 18km SSW Ravenshoe (DPIM); Robson Ck (AMS, ANIC); Seaview Ra (QM); Sluice Ck (QM); South Johnston Forestry Camp & Research Station (DPIM, QM); Stone Ck (QM); 2km NNE Tarzali (ANIC); The Boulders (ANIC); The Crater (ANIC, DPIM, QM); 3km SE The Crater NP (ANIC); Tolga Scrub (ANIC); Topaz (QM); Tully (ANIC); Tully Falls (QM); Tully Falls Rd (QM); Upper Boulder Ck (QM); Upper Broadwater camp (QM); Upper Isley Ck (QM); Upper Plath Rd (QM); Wallaman Falls (DPIM, QM); Whitfield Ra (QM); Wongabel SF (ANIC); Yuccabine Ck (QM); 16km NE Yungaburra (ANIC).

DESCRIPTION (male). *Colour.* Black, tarsi and head appendages reddish-brown.

Length. 5.5-7.5mm.

Head (Fig. 3J). Lemon-shaped, genal angles evenly curved, anterior margin slightly angulate at frontoclypeal junction then evenly curved to prominent median tubercles; finely and moderately closely punctured (punctures separated by 3 diameters) near eyes, or entirely obscurely

punctate, dull and densely microreticulate; eyes large, interocular ratio 3.8-4.3; length first segment of labial palpi 1-1.2 × second segment.

Thorax (Figs 9H, 15A-B). Surface of pronotum as closely but often more strongly punctured than head, microreticulate throughout but usually shining on disc where microreticulation shallow and sparse; basal 2/3 pronotal sides almost parallel-sided, abruptly contracted apically; base evenly curved; lateral border of pronotum entire; middle of pronotal sides with shallow oblique depression; hypomeral ratio 0.25-0.35, stria curved parallel to side of pronotum; elytra entirely microreticulate, intervals moderately strongly (as pronotum) to obscurely punctured; elytra with prominent humeri, almost straight behind these; discal striae, including stria 7, distinctly impressed, but 7 shallower than 1-6, at least in basal third and absent on apical half of elytron; apical half of striae 1-6 with scattered punctures, but not deepened; stria 8 reduced to short row of punctures, or short grooves, about 1/3 from base of elytra; stria 9 abbreviated from base by 2-2.5 × length mesepimeron; stria 10 abbreviated by length of mesepimeron; base of upper margin of epipleuron not depressed; macropterous; meso-metasternal border with flat triangular tubercle; metasternal anterior lobe finely and sparsely punctured, with margins triangularly expanded in corners; outer margin of fore tibia with acute major teeth separated by 3-5 slightly convex minor teeth, leading edge of tibia without recurved ridge and inner margin almost straight; mid femur elongate-ovate; hind femur elongate-oblong, dorsal and ventral edges broadly margined (keeled); hind tibia evenly curved, with long apical spine, 1.5 × length first tarsal segment, tibial spine ratio 1, and long articulated spur; hind tarsi c.1/3 × length of hind tibia; hind tarsal segment 1 ventrally lobed, 2, 3 and 4 elongate rectangular, decreasing in length, segment 5 almost equal length segments 3+4.

Abdomen (Figs 19G, 21B). Last two ventrites without deep punctate groove between; basal margin of pygidium evenly curved; parameres without apical fringe of setae, asymmetric, not excavated ventrally; left paramere acutely pointed in profile, not flattened laterally; right paramere broad and bluntly truncate; endophallus: basal sclerite C-shaped, with an appendage; flagellum with three equidistant lobes; ring sclerite with thick narrow-diameter ring and large curved appendage; median sclerite, two strongly folded and irregular plates around a median cleft.

Female (Figs 9G, 15C, 23H). Middle of outer intervals of elytra (6-8) shining and without microreticulation; apex of hind tibia simple; vaginal plate with broadly sclerotised well defined trapezoidal or quadrangular sclerite around vagina; spermatheca C-shaped, gradually contracted to blunt apex.

REMARKS. *Temnoplectron politulum* and its sister-species *T. reyi* are only reliably separated by examination of the male genitalia.

DISTRIBUTION AND BIOLOGY (Fig. 31). Occurs only south of the Black Mountain Barrier, and is allopatric with respect to its sister-species, *T. reyi*. The published record from Malanda (Gillet, 1925) is therefore probably correct. It is the only small *Temnoplectron* species to occur in the drier rainforest of Forty Mile Scrub.

Temnoplectron politulum is confined to rainforest, avoids edges and does not penetrate narrow strips of riparian rainforest in agricultural areas (Hill, 1995); it is nocturnal, attracted to a variety of baits but primarily dung, active on the ground, and rarely taken in flight intercept traps (Hill, 1996). This species commonly perches on low vegetation at night (Howden et al., 1991).

Temnoplectron reyi Paulian, stat. rev.
(Figs 1F, 3K, 9E-F, 12E, 15D, 19H, 21A, 23I, 31)

Temnoplectron reyi Paulian, 1934: 285.
Temnoplectron politulum sensu Matthews, 1974: 155 partim, nec Macleay, 1887; Cassis & Weir, 1992: 171.

TYPE. Holotype not seen (in MNHN).

MATERIAL. (1399: data reduced to locality, altitude, date, collector).QUEENSLAND: 1, Bakers Blue Mt, 900m, 11.ix.1981, GM & DC (QM); 2, Big Tbld, 618-740m, 20.xii.1990-8.i.1991, ANZSES (QM); 4, Black Mt Rd, Julatten, 21.xi-13.xii.1987, AWH (ANIC); 11, Bloomfield Ra, 24.xii.1979, RS (DPIM); 361, Bloomfield Rd, 20-27.vii.1974, 2.x.1974, 21-22.v.1975, GM, DC & Hancock (QM); 2, Cairns, E.W. Ferguson (ANIC); 332, 1.5-5km W-WNW C Tribulation, 50-780m, 23.ix-7.x.1982, 5-9.i.1983, 20-23.iv.1983, GM, DY, GT (QM); 1, 2km SSW C Tribulation, xi.1996, JS (ANIC); 1, Cedar Bay NP, 6.viii.1984, G. Morse (ANIC); 19, Cedar Pocket, 440m, 17-19.iv.1999, CR & IR (ANIC); 3, Cow Bay, 14-30.x.1987, AWH (ANIC); 1, Gold Hill, 550m, 1.xi.1976, RT & TW (ANIC); 2, Julatten, 29.x-30.xi.1987, AWH (ANIC); 16, 17-18km ESE Julatten, 400-1000m, 13-30.iv.1982, GM, DY & DC (QM); 1, Kuranda, 11.xi.1978, 'B.B.' (AMS); 5, 3km N Kuranda, 360m, 25.vi-3.viii.82, 27-31.vii.1982, SJP (ANIC); 3, 2km ENE Kuranda, 360m, 19-21.iv.1999, CR & IR (ANIC); 5, 7.5-8km NNW Kuranda, 20.xii.1984, 20.ii.1985, 29.ii.1988, RS, Halfpapp, DR (ANIC); 3, 13km NW Kuranda, 6.xii.1982, JT (ANIC); 1, Lake Eacham NP, 3-7.xi.1976, RT & TW (ANIC); 107, 5-10km W Mossman, 250-760m,

16.xii.1988-16.i.1989, 20.xii.1989-15.i.1990, 21.iv.1997, GM, GT, CB & Pavey (QM); 1, 8-12km NW Mossman, 300m, 26.xii.1989-15.i.1990, ANZSES (QM); 5, Mossman Gorge, 27.x.1966, EB (ANIC); 68, Mt Boolbun South, 850-950m, 4.xi.1995-11.i.1996, GM (QM); 2, 1.5km SE Mt Emmett, 100m, 23-24.iv.1999, CR (ANIC); 26, Mt Finnigan, 400-1100m, 20-27.vii.1974, 19-22.iv.1982, 1-2.vii.1982, GM, DC, DY, SJP (ANIC, QM); 12, 4km NE Mt Finnigan, 14-16.x.1980, TW (ANIC); 8, 5km ESE Mt Finnigan, 13-16.v.1981, A. Calder, JF & I. Naumann (ANIC); 5, Mt Halcyon, 870m, 22-24.xi.1993, GM, DC, HJ & LR (QM); 1, Mt Hartley, 1500-2000', 10.vi.1968, F. Parker (ANIC); 4, 2.5km S-SW Mt Hartley, 23-24.iv.1982, 8.xii.1993-2.ii.1994, GM, DY, DC & LR (QM); 4, 2.5km SW Mt Hartley, 1.i-5.iii.1994, LR (QM); 2, Mt Lewis, 900m, 26.vi-1.viii.1982, SJP (ANIC); 7, Mt Misery Rd, 730m, 6.xii.1990-17.i.1991, ANZSES (QM); 1, Mt Perseverance, 500m, 4.iv.1997, K. Abbott (ANIC); 1, Mt Pieter Botte, 900m, 21.xi-8.xii.1993, GM & HJ (QM); 7, Mt Sampson, 600-790m, 26-28.xii.1990-19.i.1991, ANZSES (QM); 72, 2-3km S-SSE Mt Spurgeon, 1100-1150m, 13-21.x.1991, 19-22.xi.1997, GM, HJ, DC, CB & CR (QM); 36, Oliver Ck, 10m, 4-7.iv.1974, 5-9.i.1983, DC & GM (QM); 23, Quaid Rd, 11.4km E quarry, 5.xii.1997-9.ii.1998, 17.iii-14.iv.1998, DeFaveri & Halfpapp (DPIM); 8, Reids Pocket, 420m, 17-19.iv.1999, CR & IR (ANIC); 11, Roaring Meg Valley, 680m, 20-22.xi.1993, GM, DC, HJ & LR (QM); 68, Saddle Mt, 640m, 3.xii.1995-7.ii.1996, GM & DC (QM); 1, Thornton Ra, 200m, 12-18.vii.1982, SJP (ANIC); 3, Upper Stewart Ck, 9.x.1969, RH (ANIC); 138, Windsor Tbld, 38, 39 & 46km from main rd, 850-1060m, 9.ix-25.xi.1976, 27.i.1980, 16.x.1983, 10.xi-26.xii.1983, 15.xii.1984, 20.xii.1985, 15.i.1986, 23.i.1988, 27.xii.1988-10.i.1989, 23-25.xi.1997, RS, JDB, Gough, Titmarsh, AWH, DR, GM & Schmidt (ANIC, DPIM, QM); 8, 1km NNW Yalbogie Hill, 420m, 19-21.iv.1999, CR & IR (ANIC).

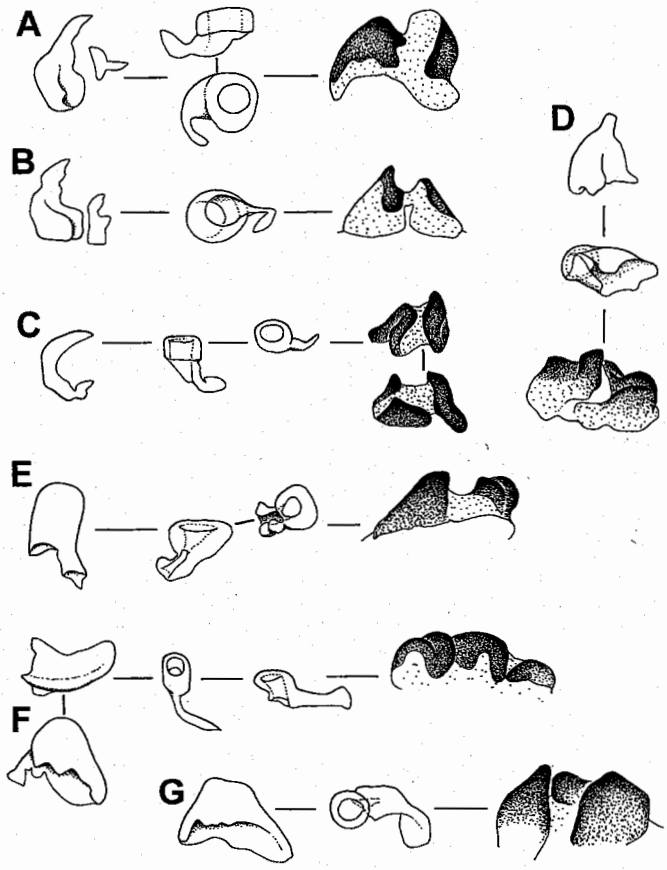

FIG. 22. *Temnoplectron* species, endophallic sclerites; A, *disruptum* Matthews; B, *diversicolle* Blackburn; C, *cooki* sp. nov.; D, *finnigani* sp. nov.; E, *involucre* Matthews; F, *lewisense* sp. nov.; G, *monteithi* sp. nov. Not to scale.

DESCRIPTION (male). *Colour.* Black, tarsi and head appendages reddish-brown.

Length. 5.5-7.5mm. Body shape relatively elongate (Fig. 1F).

Head (Fig. 3K). Lemon-shaped, genal angles evenly curved, anterior margin slightly angulate at frontoclypeal junction then evenly curved to prominent median tubercles; finely and sparsely or obscurely punctured, often more strongly near eyes, dull and densely microreticulate; eyes large, interocular ratio 3.8-4.3; length first segment of labial palpi 1-1.2 × second segment.

Thorax (Figs 9E, 12E, 15D). Surface of pronotum as closely but more strongly punctured than head, microreticulate throughout but more shining on disc where microreticulation shallow and sparse; basal 2/3 pronotal sides almost parallel-sided, abruptly contracted apically; base evenly curved; lateral border of pronotum complete; middle of pronotal sides with shallow oblique depression; hypomeral ratio 0.3-0.45, stria curved parallel to side of pronotum; elytra entirely microreticulate, intervals moderately strongly (as pronotum) to obscurely punctured; elytra with prominent humeri, almost straight behind these; discal striae, including stria 7, distinctly impressed, apical half of striae 1-6 with scattered punctures but not deepened; stria 7

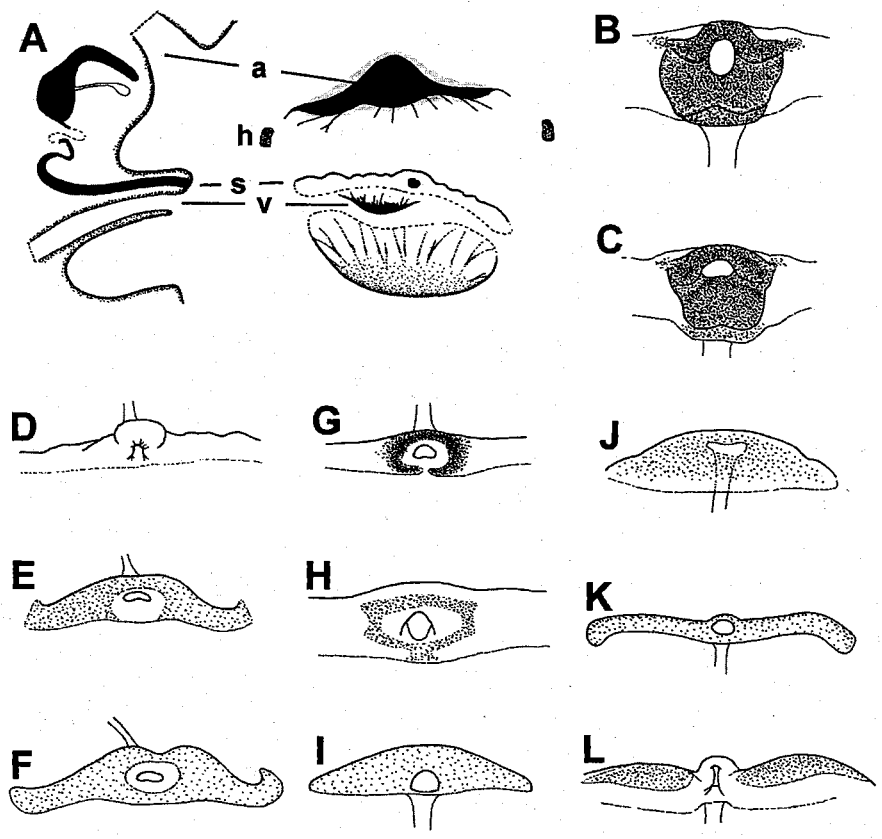

FIG. 23. *Temnoplectron* species; A, *rotundum* Westwood, apex of ♀ abdomen between tergite VIII and sternite VIII in section and apical view; spermathecal sclerite; B, *politulum* Macleay; C, *reyi* Paulian; D, *atropolitum* Gillet; E, *aeneopiceum* Matthews; F, *subvolitans* Matthews; G, *diversicolle* Blackburn; H, *cooki* sp. nov.; I, *disruptum* Matthews; J, *finnigani* sp. nov.; K, *lewisense* sp. nov.; L, *aeneolum* Lansberge. a = anus, h = hemisternite, s = spermathecal duct, v = vagina. Not to scale.

absent from apical half of elytron; stria 8 reduced to short row of punctures, or short grooves, about 1/3 from base of elytra; stria 9 abbreviated from base by 2-3 × length mesepimeron; stria 10 abbreviated by length of mesepimeron; base of upper margin of epipleuron not depressed; macropterous; meso-metasternal border with flat triangular tubercle; metasternal anterior lobe finely and sparsely punctured, with margins triangularly expanded in corners; outer margin of fore tibia with acute major teeth separated by 3-5 slightly convex minor teeth, leading edge of tibia without recurved ridge and inner margin almost straight; mid femur elongate-ovate; hind femur elongate-oblong, dorsal and ventral edges broadly margined (keeled); hind tibia evenly curved, with long apical spine, 1.5 × length first tarsal segment, tibial spine ratio 1-1.2, and long articulated spur; hind tarsi c.1/3 × length of hind tibia, segment 1 ventrally lobed, 2, 3 and 4 elongate rectangular, decreasing in length, segment 5 almost equal length segments 3+4.

Abdomen (Figs 19H, 21A). Last two ventrites without deep punctate groove between; basal margin of pygidium evenly curved; parameres without apical fringe of setae, asymmetric, not excavated ventrally; tip of left paramere incurved and flat in profile, tip of right incurved, narrow but truncate in profile; endophallus: basal sclerite C-shaped, without obvious appendage; flagellum with three equidistant lobes; ring sclerite with thick narrow-diameter ring and large curved appendage; median sclerite, two strongly folded and irregular plates around a median cleft.

Female (Figs 9F, 23I). Middle of outer intervals of elytra (6-8) shining and without micro-reticulation; apex of hind tibia simple; vaginal

plate with broadly sclerotised well-defined trapezoidal sclerite around vagina; spermatheca C-shaped, gradually contracted to blunt apex.

REMARKS. *Temnoplectron reyi* was synonymised with *T. politulum* by Matthews (1974). The two species are almost identical but differ by: etching of striae 6 & 7; left paramere shape, right paramere shape. The male genitalia show the only reliable differences. The hind legs and female genitalia of these two species are similar and the surface sculpture of the head, pronotum and elytra shows the same range of variation.

The unique male type specimen of *T. reyi* was not made available. The name *reyi* is here applied to the species described above on geographic evidence, being described from Kuranda, which lies within the range of the above species and not *T. politulum*.

DISTRIBUTION AND BIOLOGY (Fig. 31). A common rainforest species from the Mount Finnigan area south to the northern slopes of the Lamb Range. It is allopatric with respect to its sister-species, *T. politulum*, the two species approach to within 10km of each other in the Lamb Range. There is a single specimen of *T. reyi* from Lake Eacham. All other material from this locality belongs to *T. politulum*, therefore it is likely that this specimen has been mislabelled.

Temnoplectron rotundum Westwood
(Figs 2I, 7G-H, 11F, 12C, 14H-I, 17I-J, 20F, 23A, 32)

Temnoplectron rotundum Westwood, 1841: 51; Westwood, 1845: 118; Gillet, 1925: 3 [misdet.?]; Paulian, 1934: 285; Matthews, 1974: 152; Cassis & Weir, 1992: 171.

TYPE. Not seen (in HDO, examined by Matthews).

MATERIAL. (292: data reduced to locality, altitude, date, collector). NORTHERN TERRITORY: 1, Berry Springs, 9.i.1992, MBM (AMS); 4, Berry Springs Rd, 25-26.xi.1978, RS (DPIM); 6, Black Pt, Coburg Peninsula, 15-23.ii.1977, TW (ANIC); 1, ditto, except 29.i.1977, EE (ANIC); 1, Cahills Crossing, 29.v.1973, EM (ANIC); 2, Darwin, 2.iv.1916, GF. Hill (ANIC); 1, 8km S Darwin, 30.xii.1977, M. Bainbridge (ANIC); 2, 15-27mi S Darwin, 29.i.1968, EM (ANIC); 1, 30mi E Darwin, G F. Hill (ANIC); 8, Groote Eylandt, N.B. Tindale (AMS, ANIC, UQ); 1, Humpty Doo, 30.i.1959 (ANIC); 2, 6km E Humpty Doo, 9.ii-4.iii.1987, RS (DPIM); 1, Kakadu NP, 26.iii.1980, I. Naumann (ANIC); 25, Koongarra, 6-10.iii.1973, 27-28.xi.1974, RS, MU (ANIC, UQ); 2, Mudginberri, iii.1971, H.A. Standfast (ANIC); 2, Port Darwin, 1924 (AMS, WAM); 1, Smith Pt, Coburg Peninsula, 26.i.1977, EE (ANIC); 1, Snake Bay, Melville I., 4-6.ii.1968, EM (ANIC); 1, South Alligator R, 46mi WSW Mt Cahill, 20.v.1973, EM & MU (ANIC); 4, Wildman R, 30.xi.1978, RS (ANIC, DPIM); 19, Yirrkala, 1.ii.1968, EM (ANIC); QUEENSLAND: 70, Andoom, nr Weipa, 5-8.ii.1975, GM (QM); 1, Archer R Crossing, 17-18.vii.1975, GM (QM); 1, 7km S Batavia Downs, 4.iv-24.v.[no year], PZ & Roach (ANIC); 7, Cairns, 1918, Froggatt, Illingworth (AMS, ANIC, WAM); 7, Cairns (JCU); 4, Claudie R, nr Mt Lamond, 16.xii.1971, 7.i.1972, DM & GH (AMS); 2, 29km WNW Cooktown, 18.v.1977, IC & EE (ANIC); 3, ditto, except 31km NNW, 250m, 20.v.1977 (ANIC); 5, Davies Ck, 4-8.ii.1976, RS (DPIM); 6, Evans Landing, nr Weipa, 3-5.ii.1976, GM (QM); 1, 24km W Forsayth, 24.xii.1977, RS (DPIM); 10, Gordons Mine area, 12-18.ii.1976, GM (QM); 4, Hibberd Pt, 5-8.ii.1975, GM (QM); 23, Iron Ra., v.1961, 11.iv.1964, 28.iv-17.v.1968, 26.v-2.vi.1971, 12.vi.1971, JGB, Cantrell, IC, GM, MU, P. Ogilvie, JF (ANIC, QM, UQ); 4, nr Iron Ra Airport, 20.xi.1971, DM & GH (AMS); 4, 0.5mi S Iron Ra, 100', 14.v.1971, JGB (ANIC); 10, ditto, except 3mi[5km] S Iron Ra, 13-15.v.1971 (ANIC); 22, Lake

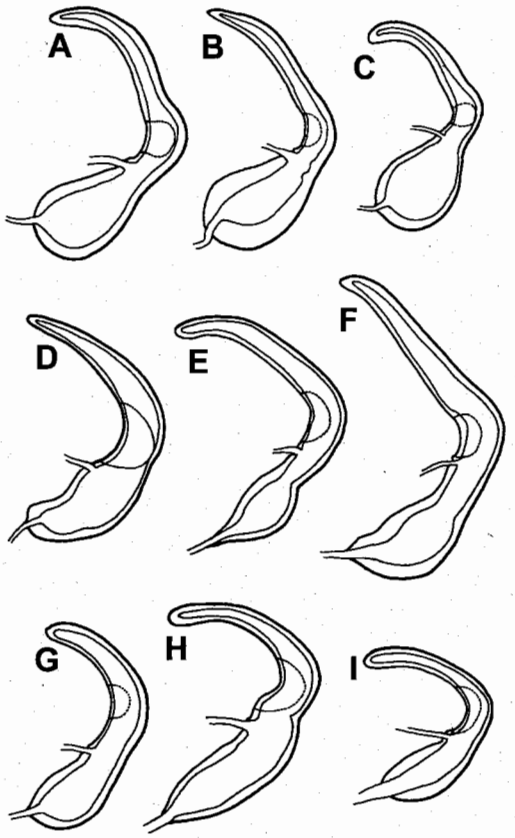

FIG. 24. *Temnoplectron* species, spermatheca; A, *major* Paulian; B, *bornemisszai* Matthews; C, *atropolitum* Gillet; D, *aeneolum* Lansberge; E, *subvolitans* Matthews; F, *aeneopiceum* Matthews; G, *involucre* Matthews; H, *diversicolle* Blackburn; I, *cooki* sp. nov. Not to scale.

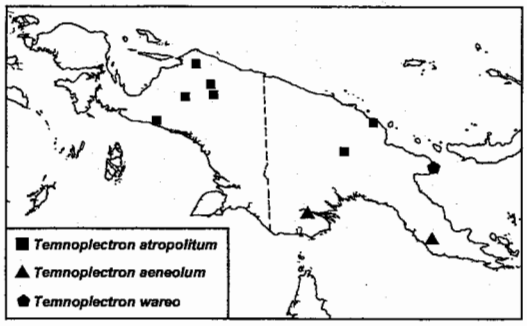

FIG. 25. Map of New Guinea showing distribution of *Temnoplectron* spp.

Boronto, 30.i-4.ii.1975, GM (QM); 12, Lockerbie, 31.iii-3.iv.1964, 13-27.iv.1973, IC, GM, MU (ANIC, UQ); 1, Lockerbie Scrub, 7-14.iv.1977, RS (DPIM); 3, Moreton Telegraph Station, 30.vi.1975, GM (QM); 2, 13km ENE Mt Tozer, 15.vii.1986, TW (ANIC); 5, ditto, except 14km ENE (ANIC); 1, ditto, except 9km NW, 2.vii.1986 (ANIC); 2, 1km N Rounded Hill, 5-6.x.1980, TW (ANIC); 1, Somerset, 16-17.iv.1973, GM (UQ); 1, Station Ck, Silver Plains, 26.ii.1959, JW (ANIC); 3, Watsonville, 18-25.v.1975, 22-27.iii.1980, RS (ANIC, DPIM, UQ); 1, Wenlock Crossing, 8.v.1986, F. Sattler (AMS).

DESCRIPTION (male). *Colour.* Black, tarsi and head appendages reddish-brown.

Length. 9-12mm.

Head (Fig. 2A). Eyes large, interocular ratio 4.5-5; length first segment of labial palpi 1.5-2 × length segment 2; anterior margin of frontoclypeus with a small angular tooth at junction of frons and clypeus, and convexly produced (or concavely excised) lateral to median teeth; frontoclypeus dull, strongly microreticulate and punctured, becoming rugose towards anterior.

Thorax (Figs 7G-H, 11F, 12C, 14H-I). Anterior of pronotum slightly depressed medially, but without lateral tubercles; disc of pronotum strongly punctured, shining, without obvious microreticulation or shallowly microreticulate, in contrast to dull elytra; sides of pronotum entirely margined; hypomeral ratio 0.6-0.9; elytral intervals finely punctured and strongly microreticulate; elytral striae 1-7 without foveolate punctures, shallowly impressed and almost impunctate throughout; stria 8 present, abbreviated at base by 1-3 × length mesepimeron, stria 9 similar; macropterous; meso-metasternal suture without median tubercle; metasternal anterior lobe with narrow margins; outer margin fore tibia with acute major teeth, separated by 2-4 convex minor teeth; inner margin fore tibia abruptly emarginate 0.25-0.3 from base; mid femur elongate-ovate but outer

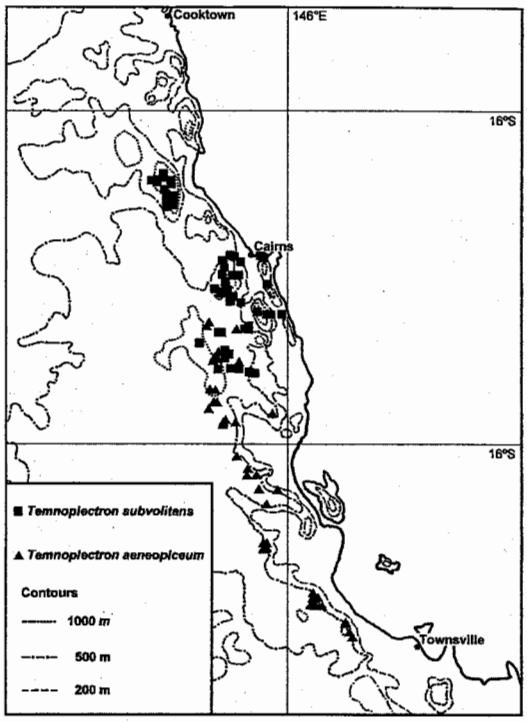

FIG. 26. Map of northeast Queensland, showing distribution of *Temnoplectron aeneopiceum* Matthews and *T. subvolitans* Matthews.

face medially swollen; base of elongate hind femur abruptly narrowed, weakly expanded near middle, apex of ventral surface expanded as a round lobe (overlapping excavate base of tibia); outer ridges of hind tibia divergent at base associated with abrupt constriction; hind tibia almost straight for basal 2/3, evenly curved in apical third; apical spine short and triangular, sharp and flat in profile, not obviously longer than apical tibial width, but as long as first two tarsal segments, without articulated spur; hind tarsus short, 0.25 × length hind femur, segments 1-3 lobed ventrally, segments 1-4 almost equal in length, segment 5 = 3+4.

Abdomen (Figs 17I-J, 20F). Without deep punctate groove between last two ventrites; basal margin pygidium evenly curved; parameres without apical setal fringe, slightly asymmetric, left paramere thick, apex bluntly curved to feebly pointed; right paramere thick with short thick apical lobe; endophallus: ridges of flagellum strongly lobed; basal sclerite irregular, roughly quadrate, solid; ring sclerite with thick ring and curved appendage; median sclerite irregular,

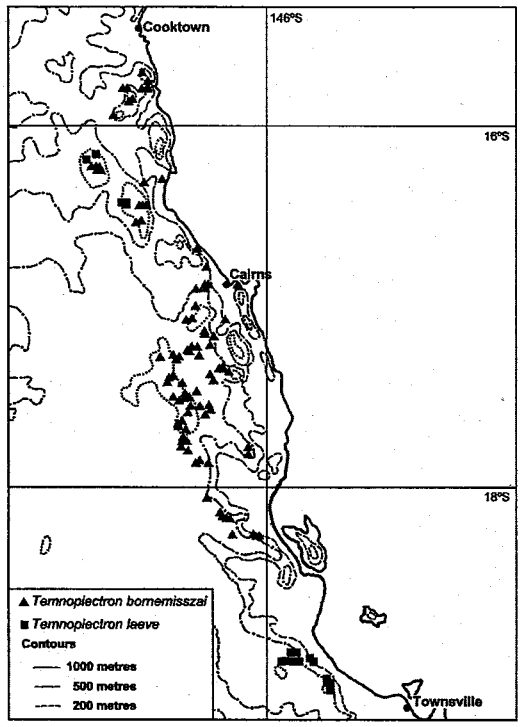

FIG. 27. Map of northeast Queensland, showing distribution of *Temnoplectron bornemisszai* Matthews and northern populations of *T. laeve* (Laporte).

strongly folded, adjacent to poorly defined flat plate; apex of endophallus with patch of large spinules.

Female (Figs 11D, 23A). As above, except: mid femur broadest near middle, lower edge shallowly curved; hind femur less elongate, base of hind tibia less strongly excavate; spermathecal sclerite feebly developed at base of spermathecal duct, but not darkened; spermatheca falcate, with bulbous base and apical lobe gradually contracted to apex.

DISTRIBUTION AND BIOLOGY (Fig. 32). Found from near Townsville, Queensland, north and west to Darwin, Northern Territory. The specimens from Cairns are old and may be from the northern Queensland region, rather than the city. The published record for Atherton (Gillet, 1925) may equally refer to *T. major* Paulian or *T. bornemisszai* Matthews. *Temnoplectron rotundum* and *T. major* are sympatric from Forty Mile Scrub to Bamaga, but rarely appear to be collected together (usually at light) and probably occur in different habitats or soils.

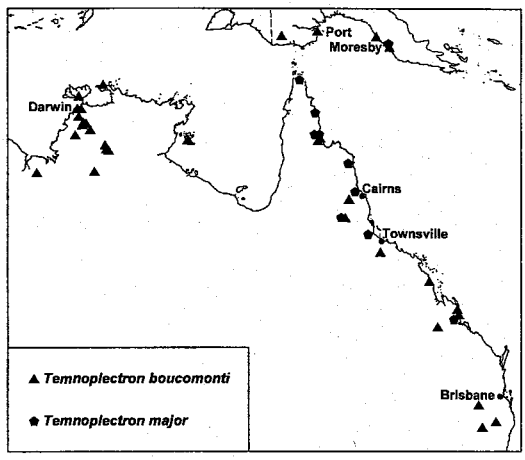

FIG. 28. Map of northern Australia and southern New Guinea, showing distribution of *Temnoplectron boucomonti* Paulian and *T. major* Paulian.

Temnoplectron subvolitans Matthews (Figs 3E, 5B-C, 8I-J, 13G-H, 19C, 21D, 23D, 24E, 26)

Temnoplectron subvolitans Matthews, 1974: 158; Cassis & Weir, 1992: 171.

TYPE. Holotype, Palmerston NP, 1.iv.1968, EM (ANIC); in ANIC seen.

MATERIAL. (722 abbreviated locality data given only). QUEENSLAND: Bartle Frere, west base (QM); Bellenden Ker, cableway (ANIC, QM); Boar Pocket Rd (ANIC, DPIM); Cedar Pocket (ANIC); Copperlode Falls (DPIM); Danbulla FR (ANIC, QM); Davies Ck (QM); Douglas Ck (QM); Graham Ra. (QM); Hugh Nelson Ra., 21km S Atherton (DPIM); Isley Hills (QM); Kauri Ck & 2km E (QM); Kjellberg Rd turnoff (QM); Lamins Hill (ANIC); Malaan Rd, 2km S highway (QM); Malaan SF (QM); 3-3.5km S Malanda (ANIC, QM); Massey Ck (JCU); Massey Ra (QM); Millaa Millaa Falls (ANIC, DPIM, QM); Mossman Bluff (QM); Mt Edith (JCU, QM); Mt Edith Rd, 2km from lake (ANIC); Mt Father Clancy (QM); Mt Haig (JCU); Mt Lewis (ANIC); 11, 13, 22, 23 & 29km up Mt Lewis Rd (ANIC, DPIM, QM); Mt Murray Prior (QM); Mt Spurgeon (ANIC, QM); Mt Williams (QM); North Bell Peak (QM); Palmerston NP (including 25 paratypes; ANIC); Pauls Luck (QM); Robson Ck (AMS, ANIC); Upper Isley Ck (QM); Upper Whitehall Gully (QM); Whitfield Ra (2 paratypes; ANIC); Windmill Ck (QM); Wongabel, 6km S Atherton (DPIM); 13km NNE Yungaburra (ANIC, DPIM).

DESCRIPTION (male). *Colour.* Black, elytra dark greenish, appendages and often apex of elytra, reddish-brown.

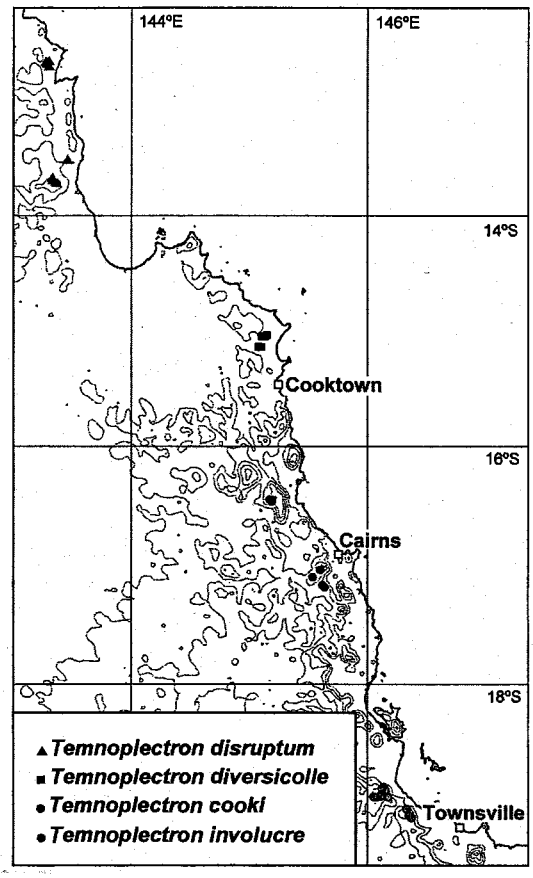

FIG. 29. Map of northeast Queensland, showing distribution of *Temnoplectron* species: *cooki* sp. nov., *disruptum* Matthews, *diversicolle* Matthews, *involucre* Matthews. Contours at 250m intervals.

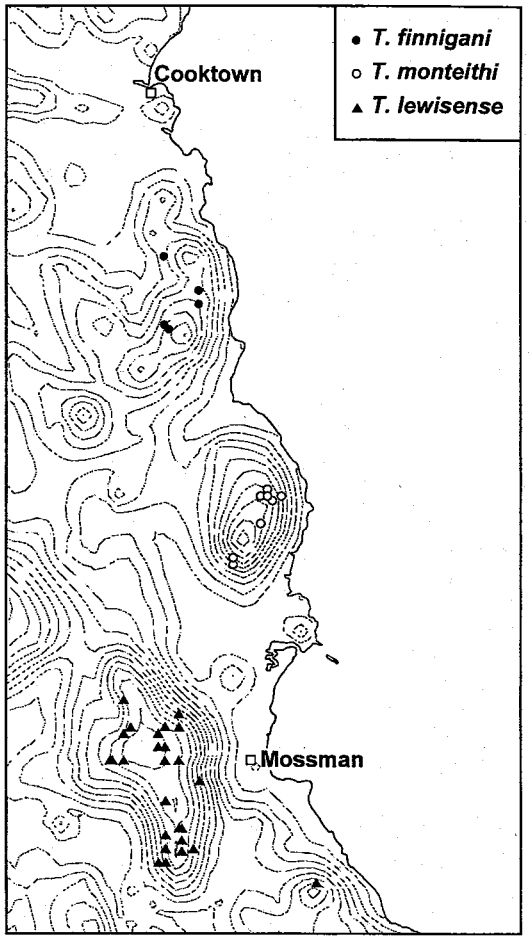

FIG. 30. Map of northeast Queensland, showing distribution of *Temnoplectron* species: *finnigani* sp. nov., *lewisense* sp. nov., *monteithi* sp. nov. Contours at 100m intervals.

Length. 4.0-5.5mm (Carbine Tableland population on average larger than southern population).

Head (Fig. 3E). Frontoclypeus not evenly punctured, middle less strongly and more densely punctured; head unevenly microreticulate, with shining areas or entirely shining, not rugosely punctured anteriorly, rarely head more evenly punctured and microreticulate; anterior margin evenly shallowly curved between genal angles and median teeth; eyes large, interocular ratio 4-4.5; first segment of labial palpi 1.25 × length of second.

Thorax (Figs 5B-C, 8J, 13G-H). Pronotum evenly convex, moderately strongly and closely punctured (more strongly so on Carbine Tbld), disc shining, not microreticulate, extreme sides strongly microreticulate; lateral margins pronotum complete; hypomeral ratio 0.2-0.4; basal 0.3-0.5 elytra shining, without obvious microsculpture, in contrast with dull microreticulate apex; intervals moderately strongly punctured; striae 1-7 without sparse foveolate punctures on apical third, or punctures present but usually obscure on apical third of striae 1-6 at most; basal third of elytra with 10 striae; striae 7-9 bevelled on lower edge; stria 8 effaced in apical half and abbreviated at base by 0.5-1.5 × length mesepimeron; stria 9 abbreviated by 1-2 × length mesepimeron; base of epipleuron not constricted; wings either macropterous (all northern and some southern material) or reduced in size, with some

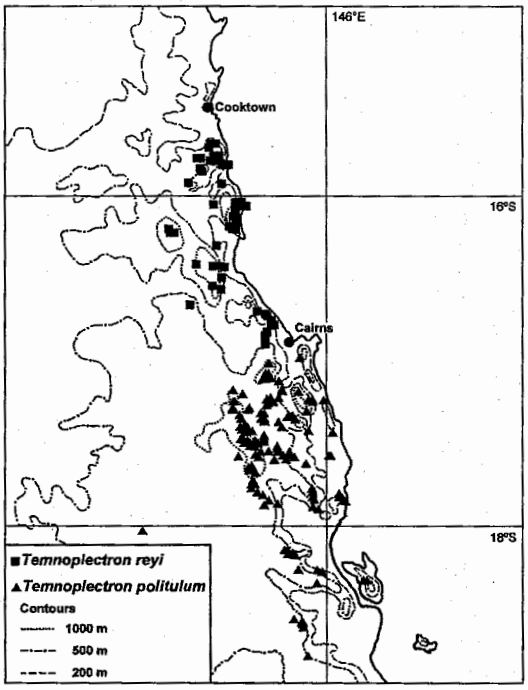

FIG. 31. Map of northeast Queensland, showing distribution of *Temnoplectron politulum* Macleay and *T. reyi* Paulian.

reduction of veins (some specimens at southern margin of range); meso-metasternal margin with almost flat triangular median tubercle; metasternum strongly punctured throughout, shining except anterior of median lobe microreticulate, anterior corners of lobe with narrowly triangular expanded margins; outer margin fore tibia with acute major teeth separated by 2-5 shallowly to sharply convex minor teeth (varies between tibiae), inner margin almost straight to shallowly sinuate; hind tibia evenly curved, almost parallel-sided for apical half; hind tibial spine sharply pointed, tibial spine ratio 0.75-1.25, with apical spur as long as first tarsal segment; hind tarsi long, c.0.35× length hind tibia, segment 1 ventrally lobed, 2, 3 and 4 elongate rectangular, decreasing in length, segment 5 almost equal length segments 3+4.

Abdomen (Figs 19C, 21D). Ventrites 1-5 with basal row of small sensory pits; last two ventrites with shallowly impressed impunctate boundary; basal margin of pygidium evenly curved; parameres without apical setal fringe, roughly sinusoidal with deep ventral excavation towards base, but asymmetric, left with obliquely truncate apex, apex dorsally minutely toothed and

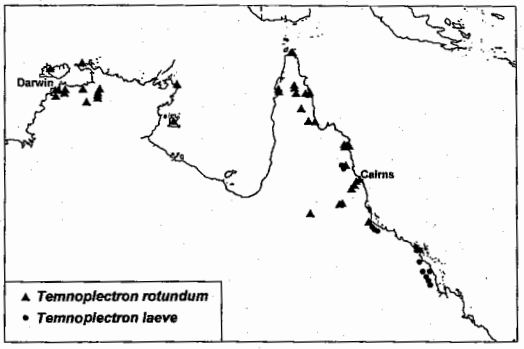

FIG. 32. Map of northern Australia, showing distribution of *Temnoplectron rotundum* and *T. laeve* Westwood.

ventrally produced, right paramere with preapical dorsal notch before rounded apex, which is flat and incurved; endophallus: basal sclerite pear-shaped with curved lateral lobe and small adjacent sclerite; flagellum long, lobes not equidistant; ring sclerite with thick-walled cylindrical ring and laterally flared lobe; median sclerite triangular but split by median cleft.

Female (Figs 8I, 23D, 24E). As above, except: elytra shining, microsculpture confined to extreme base and apex, or apical half intervals 1-4 microreticulate; fore tibial spur slightly flattened, attenuated to curved apex; hind tibia with short apical lobe, less than half apical tibial width; genitalia: spermathecal plate generally sclerotised, relatively broad; spermatheca small and C-shaped, with doubly swollen base and thin apex.

REMARKS. This species was not clearly distinguished from *T. aeneopiceum* when originally described (Matthews, 1974), and the original description also included *T. finnigani*. Two paratypes of *T. aeneopiceum* from Mount Lewis belong to *T. subvolitans* and seven paratypes of *T. subvolitans* belong to *T. finnigani*.

Specimens from Carbine Tableland are isolated by almost 100km from the southern populations and are generally larger and more strongly punctured, but there are no genitalic differences. Brachyptery is only present amongst the southernmost populations.

DISTRIBUTION AND BIOLOGY (Fig. 26). Widespread between Millaa Millaa Falls and Cairns, from the western edge of Atherton Tableland to the coast, and also common on the Carbine Tbld. This is a rainforest species which occurs at a variety of baits.

Temnoplectron wareo sp. nov.
(Figs 3B, 4B, 8B-C, 13B, 19I, 21F, 25)

MATERIAL. Holotype, ♂, 'Wareo, Finsch Haven, L. Wagner' (SAM). Paratypes (3), Papua New Guinea: 3, Finsch Haven, L. Wagner (SAM).

DESCRIPTION (male). *Colour.* Body black, appendages reddish-brown.

Length. 5-6mm.

Head (Fig. 3B). Anterior margin of fronto-clypeus strongly upraised, slightly concave before large sharp median teeth; head finely and sparsely punctured, impunctate or minutely punctured anterior to eyes; head shallowly microreticulate throughout; eyes large, almost touching base of clypeus, interocular ratio 3-3.5; lengths and widths of labial palp segments 1 & 2 equal or almost so.

Thorax (Figs 4B, 8B, 13B). Pronotum, shining, not microreticulate except extreme lateral margins; pronotal disc evenly convex, moderately finely and sparsely punctured; lateral margin of pronotum entirely effaced, or almost so; hypomeral stria absent or very short, hypomeral ratio <0.15; basal 0.5-0.75 elytra shining, not obviously microsculptured, contrasting with microreticulate apex and interval 8; elytra strongly convex in profile, but greatest height at or near base and apex almost truncate; apical half striae 1 and 2 deep, without punctures; intervals 1-3 depressed just before apex of elytra (or apices raised); stria 8 absent or reduced to 1-2 punctures, stria 9 abbreviated 2-2.5 × length mesepimeron; striae 9 and 10 with a few deep elongate punctures in basal third; base of epipleuron not constricted; macropterous; meso-metasternal suture with flat triangular median tubercle; anterior lobe of metasternum shining, sparsely punctured, with triangularly expanded corners; outer margin fore tibia with 2-4 convex minor teeth between acute major teeth, inner margin slightly concave; mid femur elongate-ovate; hind femur elongate-ovate, widest at middle; hind tibia evenly curved with short apical spine, tibial spine ratio 0.7; hind tarsi elongate, 0.4 × length of hind tibia, segment 1 ventrally lobed, 2, 3 and 4 elongate rectangular, decreasing in length, segment 5 almost equal length segments 3+4.

Abdomen (Figs 19I, 21F). Suture between last two ventrites not or weakly grooved, without row of punctures; basal margin of pygidium not medially swollen or produced; parameres without apical setal fringe, symmetrical or almost so, short and broad, with triangular tooth on venter of apices, which are reflexed and overlapping; endophallus: with roughly C-shaped basal sclerite and appendage, short and broad diameter ring sclerite without appendage, elongate and simply folded median sclerite.

Female(Fig. 8C). Spermathecal sclerite thin, poorly demarcated and split by duct; spermatheca C-shaped, evenly tapering to tip.

REMARKS. *Temnoplectron wareo* is similar to *T. aeneolum*, differing by larger eye size, more elongate elytra and the male genitalia.

DISTRIBUTION AND BIOLOGY (Fig. 25). Known only from old specimens collected on the Huon Peninsula, Papua New Guinea. The biology is unknown.

TABLE 1. Checklist of *Temnoplectron* Westwood species.

Temnoplectron Westwood 1841: 51
aeneolum Lansberge 1885: 375
aeneopiceum Matthews 1974: 157
atropolitum Gillet 1927: 252
= *heurni* Paulian 1985: 225; syn. nov.
= *howdeni* Paulian 1985: 227; syn. nov.
bornemisszai Matthews 1974: 149
boucomonti Paulian 1934: 285
= *yuleanum* Balthasar 1965: 15
= *laevigatum* Matthews 1974: 151; syn. nov.
cooki Reid & Storey, sp. nov.
disruptum Matthews 1974: 154
diversicolle Blackburn 1894: 204
finnigani Reid & Storey, sp. nov.
= *subvolitans* Matthews 1974: 158, partim
involucre Matthews 1974: 156
laeve (Laporte 1840: 72)
?= *laeve* Waterhouse 1874: 175
lewisense Reid & Storey, sp. nov.
major Paulian 1985: 226
= 'rotundum morph B', Matthews 1974: 153
monteithi Reid & Storey, sp. nov.
politulum Macleay 1887: 221
reyi Paulian 1934: 285; stat. rev.
rotundum Westwood 1841: 51
subvolitans Matthews 1974: 158
wareo Reid & Storey, sp. nov.

PHYLOGENETIC ANALYSIS

METHODS. Thirty informative characters (Table 2) were scored for each of the 19 *Temnoplectron* species plus two outgroup taxa (Table 3) and the data analysed using PAUP (Swofford, 1993), with character examination by MacClade (Maddison & Maddison, 1992). The outgroup taxa were *Monoplistes* and *Diorygopyx*, which in

TABLE 2. Character list for phylogenetic analysis of *Temnoplectron* species.

1. length. ***0.*** <8mm. ***1.*** 8+mm.

Head

2. eyes. ***0.*** small, ID 7+. ***1.*** large, ID <7.

3. frontoclypeus. ***0.*** evenly punctured. ***1.*** rugose towards margins.

4. clypeal margin. ***0.*** evenly curved to median teeth. ***1.*** expanded then concave beside teeth.

Thorax

5. lateral pronotal margin. ***0.*** complete. ***1.*** partially or entirely effaced.

6. elytra. ***0.*** black. ***1.*** greenish.

7. female elytra. ***0.*** microreticulate. ***1.*** without microsculpture in outer intervals at least.

8. stria 1. ***0.*** shallowly impressed at apex. ***1.*** strongly deepened at apex.

9. stria 8. ***0.*** present on most of basal half. ***1.*** reduced to short stria in second quarter. ***2.*** reduced to row of punctures or absent.

10. wing development. ***0.*** macropterous. ***1.*** wings partly reduced. ***2.*** reduced to single veined scale.

11. metasternum anterior lobe. ***0.*** with narrow margins. ***1.*** triangularly expanded margins.

12. major fore tibial teeth. ***0.*** acute. ***1.*** reduced (in fresh specimens) and obtuse.

13. minor teeth between major teeth of fore tibia. ***0.*** >1. ***1.*** 1-2 only.

14. fore tibia minor teeth. ***0.*** sharp or convex. ***1.*** truncate.

15. inner margin male fore tibia. ***0.*** straight or angulate. ***1.*** excavate in basal half.

16. male mid femur. ***0.*** evenly curved. ***1.*** with strong preapical lobe.

17. male posterior tibial spine. ***0.*** short and blunt, like female. ***1.*** elongate and thickened. ***2.*** flat and triangular.

18. male posterior tibial spine. ***0.*** with articulated spur. ***1.*** without spur.

19. lobed hind tarsal segments. ***0.*** absent (outgroup) or 1 only. ***1.*** 1-2. ***2.*** 1-3.

22. meso-metasternal suture. ***0.*** simple. ***1.*** with median triangular lobe.

30. major male pronotum. ***0.*** evenly convex. ***1.*** anteriorly depressed.

Abdomen

20. basal margin, male pygidium. ***0.*** simple. ***1.*** swollen medially. ***2.*** with deep transverse groove.

21. ventral margin of parameres. ***0.*** without row of fine hairs. ***1.*** with row of fine hairs.

23. spermathecal base. ***0.*** gradually attenuated. ***1*** abruptly swollen.

24. spermathecal plate. ***0.*** absent. ***1.*** semicircular. ***2.*** sclerotised ring. ***3.*** thick and quadrate. ***4.*** transverse strip. ***5.*** two transverse strips split by ostiole.

25. basal sclerite of endophallus. ***0.*** flat & C-shaped. ***1.*** solid, cuboidal or pyramidal. ***2.*** solid C-shaped, with concave face.

26. ring sclerite. ***0.*** thin & circular. ***1.*** thick, with thick-walled extension. ***2.*** ring extended as elongate twisted shute or almost right-angled lobe.

27. median sclerite. ***0.*** a simple folded plate. ***1.*** more complex.

28. tip of left paramere. ***0.*** evenly curved or with small basal lobe. ***1.*** truncate and incurved, with excavate upper surface. ***2.*** acute and straight.

29. tip of right paramere. ***0.*** evenly curved or with small basal lobe. ***1.*** truncate and incurved, with excavate upper surface.

combination are considered to be the sister-taxon to *Temnoplectron* (Matthews, 1974).

RESULTS. With all characters included, 16 minimum-length trees, 79 steps long, were found from 50 randomly seeded analyses. These trees belonged to two groups: (a) 12 trees showing (*atropolitum* + *rotundum*-group) sister to all other species, with the following structure: ((*aeneolum* + *wareo* + *disruptum* + (flighted species + flightless species))); (b) 4 trees showing non-monophyly of brachypterous species: ((*involucre* etc) + ((*atropolitum* + (*rotundum* species group) + (((*aeneopiceum* + *subvolitans*) + (*politulum* + *reyi*)) + ((*aeneolum* + *wareo*) + (*disruptum* + (*cooki* + *diversicolle*))))))). The formation of this last clade (*disruptum* + (*cooki* + *diversicolle*)) was perhaps the most important difference between the two resolutions. The strict consensus of these trees is shown (Fig. 33). The same result was obtained if the outgroup was *Diorygopyx* only (76 steps), but if the outgroup was *Monoplistes*, only 4 trees were obtained, identical to cluster (b).

If the character for wing-length (#10) was excluded, with OG = *Diorygopyx* + *Monoplistes*, or *Monoplistes* only, 4 minimum-length trees were obtained, as in cluster (b). With #10 excluded and OG = the flightless *Diorygopyx* only, 121 trees were obtained with little internal resolution. In the analyses using all characters, consistent resolved clades include: (*bornemisszai* + *laeve*), (*major* + *rotundum*), (*atropolitum* + the *rotundum* species-group), (*aeneolum* + *wareo*), (*aeneopiceum*, *subvolitans*, *politulum* and *reyi*) and (*involucre* + (*lewisense* + (*finnigani* + *monteithi*))).

DISCUSSION

Intense collecting of scarabs in the last 20 years means that we can be relatively certain of the accuracy of our knowledge of species' ranges in the Wet Tropics and therefore it is possible to

TABLE 3. Data matrix.

Taxa	Character Numbers																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
T. aeneolum	0	1	0	0	1	0	0	1	2	0	1	0	0	0	0	0	1	0	0	0	0	1	0	5	2	0	0	0	0	0
T. aeneopiceum	0	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0	1	0	0	0&1	0	1	0	1	2	2	1	2	0	0
T. atropolitum	1	1	0	0	0&1	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	1	0	1	1	1	0	0	0
T. bornemisszai	1	1	0	0	0	0	0	0	0	0	0	1	1	0	1	0	1	0	1	1	0	0	1	4	1	1	1	0	0	0
T. boucomonti	1	1	1	1	0	0	0	0	0	0	0	0	1	0	0	1	1	1	2	0	0	0	1	0	1	1	1	0	0	0
T. cooki	0	0	0	0	0&1	0	0	0	1&2	2	1	0	0	0	0	0	1	0	0	0	0	1	0	2	0	2	1	1	1	0
T. disruptum	0	1	0	0	1	0	0	0	2	0	1	0	0	0	0	0	1	0	0	0	0	1	0	1	2	2	1	1	1	0
T. diversicolle	0	0	0	0	1	1	0	0	1&2	1	1	0	0	0	0	0	1	0	0	0	0	0&1	0	2	2	2	1	1	1	0
T. finnigani	0	0	0	0	0	1	0	0	1	2	1	0	0	1	0	0	1	0	0	1	1	1	0	1	1	2	1	0	0	0
T. involucre	0	0	0	0	0	1	0	0	2	2	1	0	0	0	0	0	0	0	0	0	0	1	0	4	1	2	1	0	1	0
T. laeve	1	1	1	0	0	0	0	0	0	0	0	1	1	0	1	1	1	0	2	1	0	0	1	4	1	1	1	0	0	0
T. lewisense	0	0	0	0	0&1	1	0	0	2	2	1	0	0	0	0	0	0	0	0	0	1	1	0	4	1	2	1	?	?	0
T. major	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0	1	0	1	1	1	0	0	1
T. monteithi	0	0	0	0	0&1	1	0	0	2	2	1	0	0	1	0	0	0	0	0	0	1	1	0	4	1	2	1	1	1	0
T. politulum	0	1	0	0	0	0	1	0	2	0	1	0	0	0	0	0	1	0	0	0	0	1	0	3	0	2	1	2	1	0
T. reyi	0	1	0	0	0	0	1	0	2	0	1	0	0	0	0	0	1	0	0	0	0	1	0	3	0	2	1	?	1	0
T. rotundum	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	2	1	2	0	0	0	1	0	1	1	1	0	0	1
T. subvolitans	0	1	0	0	0	1	1	0	0	0&1	1	0	0	0	0	0	1	0	0	0	0	1	1	1	2	2	1	2	1	0
T. wareo	0	1	0	0	1	0	0	1	2	0	1	0	0	0	0	0	1	0	0	0	0	1	?	5	2	0	0	0	0	0
Monoplistes	0	0&1	0	0	0	0	0	0	2	0	1	0	0	0	1	0	0	0	0	2	0	0&1	0	0	?	?	?	?	?	0
Diorygopyx	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	0	0	0	2	0	0	0	0	?	0	?	0	?	0

discuss allopatry and sympatry with some confidence.

The fully resolved parts of all the minimum-length trees are remarkable for the number of allopatric sister taxa, including some volant species: (i) (*monteithi* + *finnigani*); (ii) (*lewisense* + i); (iii) (*involucre* + ii); (iv) (*aeneolum* + *wareo*); (vi) (*politulum* + *reyi*). Even the species pairs (*aeneopiceum* + *subvolitans*) and (*bornemisszai* + *laeve*) are almost allopatric, each overlapping in small regions where they may be separated by altitude or habitat. Furthermore, there are additional allopatric sister-taxa, depending on which resolution provides a more accurate phylogenetic hypothesis: from clades (a) (*diversicolle* + (*involucre* etc)), or from clades (b) (*cooki* + *diversicolle*) and (*disruptum* + (*cooki* + *diversicolle*)). However, none of the dry forest or woodland species, *T. rotundum*, *T. major* and *T. boucomonti*, shows allopatric relationships, although they may be separated by differences in preferred microhabitat or soil type (which may explain the diversity in fore and hind tibial morphology shown by this group). For example, all three of these species occur in the vicinity of Forty Mile Scrub and are relatively widespread.

Flightlessness has at least two origins, in clade (*aeneopiceum* + *subvolitans*) and ancestral to (*involucre* + (*lewisense* + (*monteithi* + *finnigani*))). It may also have occurred independently in (*disruptum* + (*cooki* + *diversicolle*)), if this clade is considered in preference to (*cooki* + (*diversicolle* + (*involucre* etc))). In (*aeneopiceum* + *subvolitans*), flightlessness only occurs in a small part of the range of *T. subvolitans*, where this overlaps with its sister-species, *T. aeneopiceum*. This curious form of habitat partitioning may have resulted from hybridisation of the two species, but among 100s of specimens examined we have been unable to find any specimens with other traits that might be expected for hybrids, for example intermediate genital morphology. Aside from *T. subvolitans*, every flightless species occupies a separate block of forest except the Carbine Tableland (two, but they are easily separated by size and habitat preference) (Figs 29-30). It is likely that such a pattern is due to ancient aridity events causing the loss of forest corridors connecting each block (Nix et al., 1991; Moritz et al., 1995). Speciation is therefore by vicariance rather than dispersal. This explanation is supported by the variation of tibial morphology in the clade (*involucre* + (*lewisense* + (*monteithi* + *finnigani*))), in which the currently geographically and sexually isolated species appear to preserve the longitudinally clinal range of variation of a widespread ancestor. In this clade, flightlessness is a precursor to speciation.

If the allopatric sister-taxa listed above have formed due to vicariance events, precise geographic sites of such barriers include the following: Daintree River valley; Bloomfield River valley; Barron River Valley. If the ancestor to (*lewisense* + (*monteithi* + *finnigani*)) was evenly spread through the region now occupied by these species, the phylogeny indicates the northern break at the Bloomfield River was more recent than the southern at Daintree River. At times of greater aridity, such broad valleys were reduced to dry forest or woodland (Hopkins et al.,

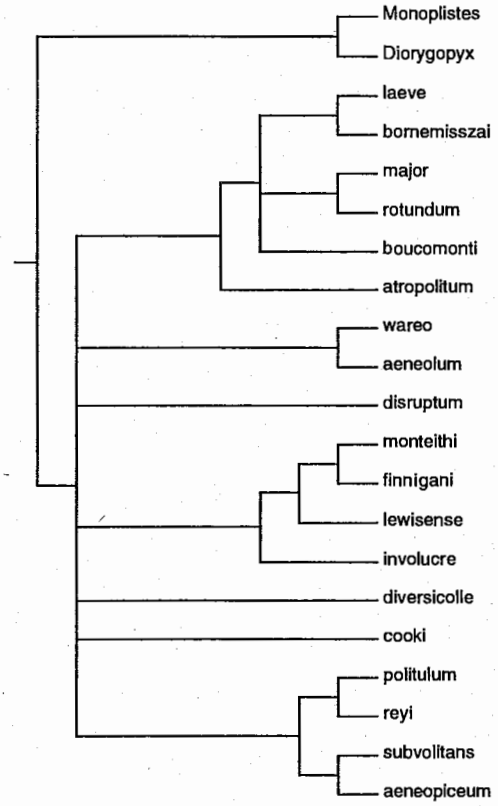

FIG. 33. Strict consensus tree of 16 minimum-length trees for *Temnoplectron* species from analysis of 30 characters.

1996). However, three species have isolated populations on either side of such barriers, *T. cooki*, *T. laeve* and *T. subvolitans*, which have failed to morphologically diverge as a whole, although showing differences in average sculpture and size. Failure to diverge may be due to relatively recent isolation of these populations, or the slowness of their particular 'morphological clocks' (although there may be considerable molecular divergence). Such populations are certainly incipient species, given the semi-permanent nature of the modern culturesteppe.

There are three species characteristic of drier habitat (vine thicket and woodland in the monsoon belt), which probably belong to a single clade (*boucomonti* + (*major* + *rotundum*)). It is therefore likely that the presence of *Temnoplectron* species in drier habitat than rainforest is due to a single event.

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