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Revision of the genus *Lamprima* Latreille, 1804 (Coleoptera: Lucanidae)

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Abstract

The genus *Lamprima* Latreille, 1804 (Coleoptera: Lucanidae: Lampriminae: Lamprimini), is revised. Five species are recognised: one in New Guinea (*L. adolphinae* (Gestro, 1875)), two on isolated western Pacific islands (*L. aenea* Fabricius, 1792: Norfolk Island; *L. insularis* W.J. Macleay, 1885: Lord Howe Island), one in northeastern New South Wales (*L. imberbis* Carter, 1926) and a common widespread species in eastern and southern Australia, *L. aurata* Latreille, 1817. *Lamprima aurata* varies considerably morphologically and many of the different forms encompassed by this variation have been described as species. Our study of morphology does not support this classification. Therefore, *Lamprima aurata* is designated a senior synonym of the following 24 names: *L. cuprea* Latreille, 1817; *L. latreillii* W.S. MacLeay, 1819 (**new synonym**); *L. pygmaea* W.S. MacLeay, 1819 (**new synonym**); *L. fulgida* Boisduval, 1835; *L. micardi* Reiche, 1841 (**new synonym**); *L. rutilans* Erichson, 1842; *L. splendens* Erichson, 1842; *L. viridis* Erichson, 1842; *L. nigricollis* Hope in Westwood, 1845 (**new synonym**); *L. purpurascens* Hope in Westwood, 1845 (**new synonym**); *L. sumptuosa* Hope in Westwood, 1845 (**new synonym**); *L. tasmaniae* Hope in Westwood, 1845 (**new synonym**); *L. varians* Burmeister, 1847 (**new synonym**); *L. cultridens* Burmeister, 1847 (**new synonym**); *L. amplicollis* Thomson, 1862 (**new synonym**); *L. krefftii* W.J. MacLeay, 1871 (**new synonym**); *L. violacea* W.J. Macleay, 1885 (**new synonym**); *L. mandibularis* W.J. Macleay, 1885 (**new synonym**); *L. sericea* W..J Macleay, 1885 (**new synonym**); *L.nigripennis* W.J. Macleay, 1885 (**new synonym**); *L. minima* W.J. Macleay, 1885 (**new synonym**); *L. mariae* Lea, 1910; *L. coerulea* Boileau, 1913 (**new synonym**); *L. insularis* Boileau, 1913 (**new synonym**). *Lamprima adolphinae* is a senior synonym of *L. bohni* (Darge & Séguy, 1953) (new synonym). *Lamprima schreibersi* Hope in Westwood, 1845, is an unnecessary nomen novum for *L. aenea* redescribed by Schreibers in 1802 from the same material as Fabricius, and therefore an objective synonym of *L. aenea*. *Lamprima puncticollis* Dejean, 1833, *L. coerulea* Hope in Westwood, 1845, and *L. insularis* Hope in Westwood, 1845, are nomina nuda, the last two names first made available by Boileau in 1913. The five *Lamprima* species are redescribed and recommendations made for their conservation. Type specimens of the species of *Lamprima* described by William Sharpe MacLeay and William John Macleay are illustrated for the first time. Lectotypes are designated for *Lamprima insularis*, *L. latreillii*, *L. latreillii sericea*, and *L. mandibularis*.

Key words: stag beetle, synonymy, morphology, nomenclature, polymorphism, insect trade, island endemism, distribution

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Introduction

The Australopapuan genus *Lamprima* Latreille, 1804 (Coleoptera: Lucanidae: Lampriminae: Lamprimini), includes some of the most spectacularly coloured species of stag beetles worldwide, in a family of predominantly dowdy brown or black species. For this reason *Lamprima* is also a popular genus with collectors and the international insect trade. Despite, or perhaps because of, its popularity, the species are not clearly defined. Thirty-six species rank names have been used in *Lamprima*, of which 34 are available (Table 1). Most of these have been synonymised under three names. However, even these three species concepts are poorly defined and therefore considerable confusion still exists in determining the species of *Lamprima*. The purpose of our paper is to resolve the poor taxonomy of *Lamprima*.

Taxonomic history of *Lamprima*

The complicated taxonomy of *Lamprima* species is summarised in Table 1. The first species of *Lamprima* to be described remains one of the least known. *Lethrus aeneus* Fabricius, 1792, was described from remote Norfolk Island in the western Pacific shortly after the island was discovered by Europeans. The genus *Lamprima* was created for *L. aenea* 12 years later (Latreille 1804a) when this was still the only known species. However, Latreille (1804b: 239) noted that the Natural History Museum (Paris) had "plusieurs de ces insectes" from the naturalists accompanying Baudin to Australia. As Baudin only visited the south and west coasts of Australia, it is likely that Latreille's generic description is based on a combination of species. 13 years after that Latreille described two species, *L. aurata* Latreille, 1817, and *L. cuprea* Latreille, 1817, from Australian mainland material. Not long afterwards, William Sharpe ['W.S.'] MacLeay studied the classification of Lucanidae, describing two further species in the process, *L. latreillii* (commonly misspelt 'latreillei') W.S. MacLeay, 1819, and *L. pygmaea* W.S. MacLeay, 1819. Boisduval (1835) placed these species in synonymy, and also described a new species.

By the 1840s, a considerable area of Australia had been visited by collectors, producing plenty of specimens for European collections. Twelve new species were described during this decade (Reiche 1841; Erichson 1842; Hope in Westwood 1845; Burmeister 1847) and northern Queensland was the only forested area not explored entomologically by this time. During the next 30 years, Thomson (1862) and William John ['W.J.'] MacLeay (1871) added two Australian species and the single New Guinea species was discovered and described, but in its own monotypic genus, *Neolamprima* Gestro 1875. Hope in Westwood (1845), Parry (1864, 1870) and Harold (1868) catalogued the species of *Lamprima*, and each provided different combinations of synonyms.

In 1884 there were 23 Australian species names in *Lamprima*, but without a key for their identification. W.J. Macleay (1885a) reviewed the Australian species to make sense of the taxonomy, but in the process described a further six new species and one new subspecies, recognising 15 species. One of the new species was described in *Neolamprima*. W.J. Macleay's taxonomic work was partly a result of new collections from northern Queensland and Lord Howe Island. Macleay (1885c) later created the genus *Phalacrognathus* for *Lamprima muelleri* (W.J. Macleay, 1885). Arthur Lea added a subspecies from the Bass Strait islands (Lea 1910). Lea also noted that the species described by Macleay in *Neolamprima*, was variable, with some specimens showing strongly asymmetric mandibles combining the characteristics of *Lamprima* and *Neolamprima* (Lea 1910). Nagel (1922) synonymised these genera and Carter (1926) described one further Australian species. Nagel examined some of W.J. Macleay's type material and identified new synonyms, reducing the number of *Lamprima* species to eight (Nagel 1930). From then on, no further taxonomic novelties have been described from Australia but four colour forms of the New Guinea species (*L. adolphinae*) have been named (Nagel 1930; Kriesche 1940; Didier & Séguy 1952; Darge & Séguy 1953), three of which were synonymised with *L. adolphinae* by Krajcik (2001). The male genitalia of *L. aurata* have been described as part of wider systematic studies of Lucanidae (Holloway 1960; d'Hotman & Scholtz 1990). *Lamprima aurata* has been introduced to New Zealand, and has been described in detail as part of that fauna (Holloway 2007).

Benesh (1960) and Moore & Cassis (1992) closely followed Nagel in their catalogues of the world and Australian lucanids respectively, but they also listed the older synonymic names ignored by Nagel. Moore & Cassis ignored the implicit or suggested synonymy of three species in popular guidebooks by Matthews (1984) and Moore (1986). Mizunuma & Nagai (1994) suggested that *L. aurata* and *L. latreillii* might be synonymous, but did not

formally make them so. The most recent catalogue of *Lamprima* names (Krajcik 2001) is similar to that of Benesh (1960). Popular works since then have maintained their separation (Fujita 2010; Hangay & de Keyzer 2017; Bartolozzi *et al*. 2017). The conflict between popular literature (now largely pursued online) and outdated taxonomic work has contributed to the continuing confusion over which *Lamprima* species are valid and their correct names.

Approximately 1200 specimens were examined by the authors for this revision. Label data from an additional 87 specimens in the Canadian Museum for Nature are also included, through the research associate Andrew Smith (18 March 2018). We have measured and dissected males and females of *Lamprima* from many localities, including many size and colour forms, and reached the conclusion that there are only two mainland species of *Lamprima*, one of which is known from a single specimen from New South Wales. The three species described from Norfolk Island, Lord Howe Island and New Guinea remain valid. All five species are redescribed below.

Methods and abbreviations

Morphological nomenclature follows Lawrence & Ślipiński (2013). All measurements were made with an eyepiece graticule. Figures 1–74 and Fig. 77 were imaged using either: Visionary Digital lenses and P-51 camlift system with a Canon EO5 7D body then processed with Helicon Focus 5.0 and Adobe Photoshop; or, a Leica MZ16 A, then processed with the Leica Application Suite V3. Figures 78–85 were taken by Cate Lemann, Australian National Insect Collection, using a Dun Inc. BK Imaging-Plus Lab System; source images were then aligned and stacked in Zerene Stacker v.1.0 and processed in Adobe Photoshop CS6 to obtain a fully-sharpened image. The placement of host plant genera in named families is derived from Stevens (2017). Authors for host plant genera and species can be found in the Australian Plant Name Index (Anonymous 2018).

The following collections are referred to: Australian Museum, Sydney (AMS); Australian National Insect Collection, Canberra (ANIC); Canadian Museum of Nature, Canada (CMNC); Hope Collection, Oxford University (OXUM); National Agricultural Insect Collection, Port Moresby (NAIC); Natural History Museum, London (BMNH); Queensland Museum, Brisbane (QMB); Queen Victoria Museum & Art Gallery, Launceston (QVMAG); South Australian Museum, Adelaide (SAM); Western Australian Museum, Perth (WAM).

In an earlier lucanid revision it was noted that William Sharp MacLeay spelt his surname with a capital 'L' and that his nephew William John Macleay spelt his name with a lower case 'l', in later works (Reid & Beatson 2016). In that review it was unecessary to use initials for each author as they were distinguished by the orthography of their surnames. However, in *Lamprima*, W.J. Macleay used a capital 'L' in his first paper dealing with this genus (MacLeay 1871). We have therefore indicated the authors by adding their initials.

There has been confusion over the authorship of the anonymous catalogue of the Hope collection of Lucanidae, usually cited as Hope & Westwood (1845). In the obituary of Hope, the writer notes "he also published catalogues of his collections of Lucanidae" (Anonymous 1862: 786), which suggests that Hope was the author of the catalogue, although the word published equally means 'enabled to be published'. Two contemporaries or near contemporaries, Parry (1864) and Macleay (1885a), both cite only Hope. Parry, who was a friend of Westwood, simply mentions the catalogue under Hope's name, as "Hope, Cat." (Parry 1864:7). Macleay is more specific: "described by the Rev. F. W. Hope in the year 1845, in a list of Lucanidae published by him in London, in pamphlet form" (Macleay 1885a: 135). However Boilieu, who visited OXUM and revised all of Hope and Westwood's type material, noted that several copies of the catalogue existed with 'by J. O. Westwood" handwritten by Westwood on the title page (Boilieu 1913: 213). There is no reason to doubt the sincerity of this attribution, as Westwood worked closely with Hope and owed his position at Oxford University to Hope. Therefore this definitively identifies Westwood as the author of the catalogue. Arrow's casual remark "Westwood, in his anonymously published 'Catalogue of the Lucanoid Coleoptera' (generally attributed to Hope)" (Arrow 1936) may have been due to Boilieu or to his own observations of the annotated catalogues. However, since Arrow's comment, the catalogue has generally been cited as "Hope & Westwood" (Benesh 1960; Moore & Cassis 1992; Mizunuma & Nagai 2004; Holloway 2007; Hangay & de Keyzer 2017), or Hope only (Bouchard *et al*. 2011). Paulsen (2005) corrected this citation and we follow him in citing Hope's species as Hope in Westwood, 1845.

Lamprima Latreille, 1804

Lamprima Latreille, 1804a: 150.
Type species. *Lethrus aeneus* Fabricius, 1792, by monotypy.
Neolamprima Gestro, 1875: 997; Nagel 1922: 16 (synonymy).
Type species. *Neolamprima adolphinae* Gestro, 1875, by monotypy.

Description. Length. Male 13–60 mm (usually 20–45 mm) including mandibles, mandibles 10–38% of overall length (Figs 1–14); female 13–27 mm including mandibles, mandibles 5–9% of overall length (Figs 15–20). Dorsal surface without scales or visible setae; venter setose, setae simple.

Head. Male without dorsal tubercles on head, anterior of head concave or truncate (Figs 21–32); genae well-developed anterior to eyes but not laterally expanded, at most slightly anteriorly angulate in males; female head not narrowed compared with male; temples short but slightly angulate, shallowly grooved or notched to accommodate anterior angles of pronotum; head deeply inserted into pronotum which almost reaches eyes (Figs 33–44); eyes undivided, reniform, with shallowly concave anterior and posterior margins, the anteroventral margin sharp and linear, forming the outer edge of the antennal groove; antennae not geniculate, with 10 antennomeres, with 3 antennomere club, the club antennomeres entirely densely setose and often closely appressed; antennomere 7 cupuliform, with thin lateral lobe and 6 slightly asymmetric (male) or with thin lobe (female); male mandibles as long as or longer than head and usually densely internally setose in male (not *L. imberbis*); male mandible without basal dorsal tooth; each female mandible with only one dorsal cusp, with large strongly incurved basal ventral tooth, overlapping at tips; penultimate labial palpomere angulate on inner margin in male, not angulate in female; labium broad, approximately one third width of head; mentum solid and punctate, apex truncate; pregula flat; lateroventral grooves present between eyes and sides of buccal cavity for retention of scape.

Thorax. Pronotum (Figs 1–44) convex with angulate (most males) to rounded sides, broadest slightly posterior to middle, without prominent anterior or posterior angles; anterior of pronotum broadly margined; middle of prosternal process concealed between procoxae, apex flat. Scutellum almost equilateral triangular. Elytra non-striate but may have irregular, shallow grooves, with scattered shallow simple concave punctures, surface of interspaces smooth and shiny to dull and wrinkled but always with finely microreticulate microsculpture, usually slightly granulose in males (Figs 54–57). Elytral humeri not spined. Elytral epipleurae hidden from above, transversely strigose. Hindwings fully developed. Anterior field of mesoscutum strongly and closely punctate; scutellum semicircular to heart shaped; mesanepisternum with sparse, large punctures; posterior half mesepimeron, visible parts of metanepisternum, metepimeron and sides of metaventrite with dense, small punctures (partly coalescent, interspaces less than diameters) and setae; mesoventral process almost parallel-sided to junction with metaventrite, abruptly elevated anterior to this (Figs 58–61); metanepisternum with elevated lobe at anterior angle locking into small depression on elytral epipleuron. Profemur without anterior ridge; male protibia (Figs 62–75) with expanded blade- or fan-like flat spur, except *L. imberbis* with narrowly elongate, triangular, curved spur; female protibial spur narrowly elongate triangular; male protibia without secondary teeth between major teeth; female protibia without subsidiary teeth between large teeth on outer edge; male metatibia without setose excavation on inner edge, usually with spines on outer edge; tarsal empodium prominent, with paired divergent thin tufts of apical setae.

Abdomen. Ventrites not laterally ridged and without basal transverse grooves.

Male genitalia (Figs 76–88; unique male of *L. imberbis* undissected). Phallobase fusiform or spindle-shaped and uniformly sclerotised, with the apical margins rounded laterally and with V-shaped excavations dorsally (shallower) and ventrally (deeper); apical half of dorsal surface with at least a few small raised spicules, which may form irregular oblique ridges. Parameres about 2/5 length phallobase, symmetrical, with preapical setal tuft on ventral surface and incurved pointed tip; ventral inner edge of parameres soft, irregularly ridged, with the surface either inflated towards the penis or collapsed laterally, depending on preservation of the specimen; penis symmetrical, in two visible parts: basal 2/3 darkly sclerotised, rigid and narrowly conical between parameres, obliquely ridged at base; apical third thinly sclerotised and usually translucent, as a thin straight cylinder; endophallus, if everted, of similar width to apex of penis but soft and flexible, apically contracting to long, thin flagellum.

Female genitalia (Figs 89–94; *L. imberbis* unknown). Tergite IX with acute to broadly rounded translucent apex; pleurite IX and sternite IX well developed as elongate sclerites; hemisternites flat and apical halves elongate

rectangular with truncate apices, gonostyli flat, inverted-trapezoidal in shape, inserted on middle of membranous apex of hemisternites; spermathecal duct coiled and convoluted, spermatheca sclerotised, variable in shape from tear-drop to hook; spermathecal gland smaller than spermatheca, glandular duct longer than spermatheca.

Larval diagnosis. The following diagnosis is based on published descriptions of *L. aurata* larvae (Alderson 1975 [as *L. varians*]; Lawrence 1981). The larva is similar to the lamprimine *Phalacrognathus* W.J. Macleay, 1885 (Wood *et al*. 1996).

Head: antenna with 3 antennomeres; second antennomere without setae or sensory spots, apex slightly produced beyond base of third antennomere, the latter elongate but much smaller than second. Left mandible without incisor teeth between 2–3 apical teeth and mola; epipharynx trapezoidal, with dense, long setae on apical margin and dense, short setae on sides, apex of median area with transverse row of 6 short, blunt pegs and row of 4 circular sensilla proximal to this, epitorma absent. Legs without distal claw, last 3 segments short and broad and densely setose; tibiotarsus reduced to an ovate lobe, length equal to width at base; mesocoxal stridulatory file (pars stridens) with a single line of about 50 quadrate to slightly transverse dense ridges, granulose towards base, and placed in a field of minute granules; metatrochanteral stridulatory file (plectrum) a single line of 45–60 closely placed transverse ridges or granules, increasing in size from base to apex. Anal area of abdomen with two adjacent pear-shaped and minutely but densely setose lobes, without ovate pads, their bases subtending about 90° in ventral view, separated from 10th segment by a dorsal lobe, which is triangular, glabrous and unsculptured; 10th abdominal segment not foreshortened dorsally, ventral apex triangularly excavate, raster confined to apical quarter, consisting of dense, minute, inwardly-directed setae.

Ecology and natural history. The following notes mostly concern the common and widespread species *L. aurata* (Fearn 1996, 2015, 2016) and the Lord Howe endemic *L. insularis* (Reid 2004). *Lamprima* adults are commonly diurnal and are often found on flowers, where they may mate. Adult males snip off the apical shoots of living plant material to provide sap flows. They have been recorded feeding on many genera, both native and exotic, listed by family as follows: Asparagaceae: *Lomandra*; Asteraceae: *Ozothamnus*; Casuarinaceae: *Casuarina*; Fabaceae: *Acacia*, *Virgilia*; Malvaceae: *Lavatera*; Myrtaceae: *Eucalyptus, Leptospermum*, *Melaleuca*; Pinaceae: *Pinus*; Proteaceae: *Banksia*; Rhamnaceae: *Alphitonia*; Rosaceae: *Photinia*, *Prunus*; Salicaceae: *Populus* (Fearn 1996, 2015; Hangay & de Keyzer 2017). Feeding by the males of *Lamprima* with elongated mandibles (most *L. adolphinae* and some *L. aurata*) has not been described. Female mandibles are apparently non-functional, therefore females fly to the male feeding sites to lap up sap released by males. Feeding sites are used for male-male aggression and for copulation. Fearn (1996) noticed a 3:1 male to female sex ratio in the field, which is corroborated by the male biased material of most species in collections. Olliff (1889) noted that male *L. insularis* were much more common than females. In contrast, the material available for *L. insularis* has a roughly 1:1 sex ratio, but were mostly collected by breaking open logs, so does not represent typical field activity of the species. Adults will also feed on soft fruits (Hangay & de Keyzer 2017). Oviposition is usually underground, the females tunnelling into soil around partly buried decaying wood. There is a great variety of larval host genera, including exotics: Araucariaceae: *Araucaria*; Arecaceae: *Howea*; Casuarinaceae: *Allocasuarina*, *Casuarina*; Celastraceae: *Elaeodendron*; Fabaceae: *Acacia*; Lauraceae: *Cryptocarya*; Myrtaceae: *Eucalyptus*, *Syzygium*; Oleaceae: *Olea*; Salicaceae: *Salix*(Fearn 1996; Reid 2004; Hangay & de Keyzer 2017). *Lamprima aurata* larvae are usually in decaying roots and buried timber in Tasmania (Fearn 1996) but they prefer standing timber in northern Queensland rainforest (Wood *et al*. 1996). *Lamprima insularis* larvae usually inhabit fallen timber on or above ground level in the subtropical rainforests of Lord Howe Island (Reid 2004). In wetter areas *Lamprima* larvae may be better able to survive above ground, or less able to survive below ground, but there may be a trade-off between humidity and temperature, as *L. aurata* avoids cool temperate rainforests in Tasmania (Fearn 1996). In logs and stumps the larvae generally bore upwards. Pupation is in a chamber, usually just beneath the wood surface but sometimes in adjacent soil (Fearn 1996). In Tasmania the entire life cycle is at least three years but it may be 1–2 years in Queensland (Hangay & de Keyzer 2017). In captivity, the life cycle of *L. adolphinae* is 9–14 months (Levet 2016).

There are numerous photographs and several videos of *Lamprima* species on the Internet (for example: Anonymous 2017a), showing: different colour varieties, mating, fighting between males, feeding, rearing methods, larvae and pupae. In copulation and precopulation the protibial spurs of the males have little function. They may scrape lightly over the pronotum of the female as the prothoracic legs are moved backwards and forwards, but this activity seems erratic and brief. In male-to-male combat, each male uses its mandibles to try to embrace the mandibles of the other, so longer mandibles provide a wider net for the embrace. Once one male has enclosed and

squeezed together the mandibles of its rival, it shakes the whole animal quickly to one side to unbalance it, then abruptly to the other side, letting go at the end of this second swing. The rival can be flung a few centimetres (see video by Kan 2016). The elongate mandibles of *L. adolphinae* allow males to grab wayward appendages of rivals rather than gripping the whole head. In fights, the protibial spurs may be used as braces against the substrate and this activity might be their primary function.

The international pet trade is heavily involved in rearing *Lamprima* species, with goals including production of enlarged mandibles and unusual colour varieties. This may extend the range of variation for each species given here, which is based on field-collected specimens.

Lamprima is widespread in Australia (Fig. 95), occupying almost the entire eastern edge of the continent from Cooktown in northern Queensland to Tasmania and most of the south coast from Mallacoota west to Perth, with an 850 km gap at the Nullarbor Plain. *Lamprima* occurs up to 400 km inland on the mainland. *Lamprima* also occurs on two oceanic islands, Norfolk and Lord Howe and a single species is widespread on mainland New Guinea (Fig. 95). In New Guinea it occurs up to 2800 m.

Conservation. Conservation status and threats are discussed under each species. In general *Lamprima* species are extremely popular with stag beetle collectors and most species are being, or have been, reared in commercial quantities in eastern Asia and probably Europe and North America. One species, *L. imberbis*, is of considerable concern as it has not been collected for 100 years.

Comparison with other genera of Lampriminae. There are four other genera of Lampriminae, all monotypic. The New Zealand genus *Dendroblax* White, 1846, is unmistakably different from *Lamprima*, with a dynastine-shaped body, densely punctate, non-metallic, reddish-brown upper surface, venter with long setae and minimal sexual dimorphism (Holloway 2007). The Australian endemic *Homolamprima* W.J. Macleay, 1885, is relatively easily distinguished from *Lamprima* by: mesometaventrite junction anteriorly bilobed; apex prosternal process elevated; male protibia with large narrow spines. *Homolamprima* is also much flatter than any *Lamprima* species (Macleay 1885b). The South American genus *Streptocerus* Fairmaire, 1850, is similar to *Homolamprima* but differs from it and all other Lampriminae by the antennal club having four antennomeres (Paulsen 2010).

Lamprima is morphologically most similar to the northern Australian endemic *Phalacrognathus* Macleay, 1885, although this is not supported by an analysis of four gene regions (Kim & Farrell 2015). Most species of *Lamprima* can easily be distinguished from *Phalacrognathus* by male protibia with spur expanded as a flat blade and female protibia without subsidiary teeth between large teeth on outer margin. In *Phalacrognathus*, the male protibia has a simple spur (as in female) and the female protibia has small subsidiary teeth present between the large teeth on the outer margin. However, *Lamprima imberbis*, with unknown female, is unusual in *Lamprima* for its male mandibles lacking internal setae, male protibiae with narrow spurs and without a setal tuft and elytra broadly explanate. It shares these characters with *Phalacrognathus*, but differs from that genus by: genae prominent anterior to eyes; eyes anteriorly concave; antennomere 7 with flat lateral lobe; temples prominent and notched to accommodate anterior angles of pronotum; male mandible without basal dorsal tooth; anterior of pronotum broadly margined; middle of prosternal process concealed by procoxae; sides of male elytra not crenulate; male protibia without secondary teeth between major teeth; protibial spur on a lobe. All of these characters are common to other male *Lamprima* and justify placement of *L. imberbis* in *Lamprima*.

Included species. The most recent peer-reviewed checklist of *Lamprima* species (Moore & Cassis 1992) lists seven in Australia (Table 1), of which *Lamprima insularis* is unique to Lord Howe Island and *Lamprima aenea* is unique to Norfolk Island. One non-Australian species of *Lamprima* is known, from New Guinea: *L. adolphinae*, as catalogued by Benesh (1960). The mainland Australian species listed by Moore & Cassis (1992) are *L. aurata*, *L. imberbis*, *L. latreillii*, *L. micardi* and *L. varians*. *Lamprima micardi* is supposedly endemic to Western Australia and *L. varians* was described from South Australia. The other species, *L. aurata*, *L. imberbis* and *L. latreillii*, were described from the eastern coastal region of Australia, from northern Queensland to Tasmania.

TABLE 1. History of all catalogued species rank names in *Lamprima* Latreille, 1804. Bold indicates that the name was considered valid by each authority and date (heads of columns). Abbreviations in type locality column: CQ = central Queensland; LHI = Lord Howe Island; NA = northern Australia; NG = New Guinea; NH = New Holland; NI = Norfolk Island; NQ = northern Queensland; NSW = New South Wales; SA = South Australia; SQ = southern Queensland; Tas = Tasmania; WA = Western Australia.

Lamprima species rank name	Author	Date	Type locality	Hope in Westwood 1845	Parry 1864, 1870	Harold 1868	Macleay 1885a	Boileau 1913	Nagel 1930	Benesh 1960	Moore & Cassis 1992	Krajcik 2001	This work 2017
L. adolphinae	Gestro	1875	NG	-	-	-	***L. adolphinae***	-	***L. adolphinae***	***L. adolphinae***	-	***L. adolphinae***	***L. adolphinae***
L. aenea	Fabricius	1792	NI	***L. aenea***	***L. aenea***	*L. aenea*	***L. aenea***	***L. aenea***	***L. aenea***	***L. aenea***	***L. aenea***	***L. aenea***	***L. aenea***
L. aenea	Fabricius *sensu* Schreibers	1802	NI	*L. schreibersi*	*L. aenea*	*L. aenea*	-	-	-	-	*L. aurata*	-	*L. aenea* & *L. aurata*
L. aenea	Fabricius *sensu* Donovan	1805	NI & NH	-	*L. aurata*	-	*L. aurata*	-	-	*L. aurata*	*L. aurata*	*L. aurata*	*L. aenea* & *L. aurata*
L. aenea	Boisduval	1835	NH	-	*L. latreillii*	*L. latreillii*	*L. latreillii*	-	-	*L. latreillii*	-	*L. latreillii*	*L. aurata*
L. amplicollis	Thomson	1862	SQ	-	*L. latreillii*	*L. latreillii*	*L. latreillii*	-	-	*L. latreillii*	*L. latreillii*	*L. latreillii*	*L. aurata*
L. aurata	Latreille	1817	NH	*L. aenea*	***L. aurata***	***L. aurata***	***L. aurata***	***L. aurata***	***L. aurata***	***L. aurata***	***L. aurata***	***L. aurata***	***L. aurata***
L. bohni	Darge & Séguy	1953	NG	-	-	-	-	-	-	*L. adolphinae*	-	-	*L. adolphinae*
L. chalcitidis	Didier & Séguy	1952	NG	-	-	-	-	-	-	*L. adolphinae*	-	*L. adolphinae*	*L. adolphinae*
L. coerulea	Donovan	1805	NH	*L. latreillii*	*L. latreillii*	*L. latreillii*	*L. latreillii*	MS name *L. latreillii*	-	*L. aurata*	*nomen nudum*?	*L. aurata*	*nomen nudum*
L. coerulea	Boileau	1913	not given	-	-	-	-	*L. latreillii*	-	-	-	*L. latreillii*	*L. aurata*
L. cultridens	Burmeister	1847	NH	-	*L. micardi*	***L. cultridens***	*L. varians*	-	-	*L. varians*	*L. varians*	*L. micardi*	*L. aurata*
L. cuprea	Latreille	1817	NH	*L. aenea*	*L. latreillii?*	*L. aenea*	*L. aurata*	-	-	*L. aurata*	*L. aurata*	*L. aurata*	*L. aurata*
L. fulgida	Boisduval	1835	NG[!]	-	*L. aurata?*	*L. aurata*	*L. aurata*	*L. aurata*	-	*L. aurata*	*L. aurata*	*L. aurata*	*L. aurata*
L. fulgida	Thomson	1862	NH	-	*L. splendens*	-	-	-	-	*L. latreillii*	-	*L. latreillii*	*L. aurata*

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TABLE 1. (Continued)

Lamprima species rank name	Author	Date	Type locality	Hope in Westwood 1845	Parry 1864, 1870	Harold 1868	Macleay 1885a	Boileau 1913	Nagel 1930	Benesh 1960	Moore & Cassis 1992	Krajcik 2001	This work 2017
L. imberbis	Carter	1926	NSW	-	-	-	-	-	***L. imberbis***	***L. imberbis***	***L. imberbis***	***L. imberbis***	***L. imberbis***
L. insularis	Hope	1845	WA	*L. micardi*	-	*nomen nudum*	-	*L. micardi*	-	*L. micardi*	-	*L. micardi*	*nomen nudum*
L. insularis	W.J. Macleay	1885a	LHI	-	-	-	***L. insularis***	-	***L. insularis***	***L. insularis***	***L. insularis***	***L. insularis***	***L. insularis***
L. insularis	Boileau	1913	not given	-	-	-	-	*L. micardi*	-	-	-	-	*L. aurata*
L. krefftii	W.J. MacLeay	1871	CQ	-	-	-	***L. krefftii***	-	*L. latreillii?*	*L. latreillii*	*L. latreillii*	*L. latreillii*	*L. aurata*
L. latreillii	W.S. Macleay	1819	NSW	***L. latreillii***	***L. latreillii***	***L. latreillii***	***L. latreillii***	***L. latreillii***	***L. latreillii***	***L. latreillii***	***L. latreillii***	***L. latreillii***	*L. aurata*
L. lulua	Kriesche	1940	NG	-	-	-	-	-	-	*adolphinae*	-	*L. adolphinae*	*L. adolphinae*
L. mandibularis	W.J. Macleay	1885a	NQ	-	-	-	***L. mandibularis***	-	*L. latreillii*	*L. latreillii*	*L. latreillii*	*L. latreillii*	*L. aurata*
L. mariae	Lea	1910	Tas	-	-	-	-	-	*L. aurata*	*L. aurata*	*L. aurata*	*L. aurata*	*L. aurata*
L. micardi	Reiche	1841	WA	***L. micardi***	***L. micardi***	***L. micardi***	***L. micardi***	***L. micardi***	***L. micardi***	***L. micardi***	***L. micardi***	***L. micardi***	*L. aurata*
L. minima	W.J. Macleay	1885a	SA	-	-	-	***L. minima***	-	*L. varians*	*L. varians*	*L. varians*	*L. micardi*	*L. aurata*
L. muelleri	W.J. Macleay	1885a	NA	-	-	-	***L. muelleri***	[not *Lamprima*]	[not *Lamprima*]	[not *Lamprima*]	[not *Lamprima*]	[not *Lamprima*]	[not *Lamprima*]
L. nigricollis	Hope in Westwood	1845	WA	***L. nigricollis***	*L. micardi*	***L. nigricollis***	*L. micardi*	*L. micardi*	-	*L. micardi*	*L. micardi*	*L. micardi*	*L. aurata*
L. nigripennis	W.J. Macleay	1885a	NH	-	-	-	***L. nigripennis***	-	*L. latreillii*	*L. latreillii*	-	-	*L. aurata*
L. olivacea	Nagel	1930	NG	-	-	-	-	-	*L. adolphinae*	*L. adolphinae*	-	*L. adolphinae*	*L. adolphinae*
L. puncticollis	Dejean	1833	NH	-	*L. latreillii*	*L. latreillii*	-	*L. aurata*	-	*L. aurata*	*L. aurata*	*L. aurata*	*nomen nudum*
L. purpurascens	Hope in Westwood	1845	WA	*L. micardi*	-	*L. micardi*	*L. micardi*	*L. micardi*	-	*L. micardi*	*L. micardi*	*L. micardi*	*L. aurata*

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TABLE 1. (Continued)

Lamprima species rank name	Author	Date	Type locality	Hope in Westwood 1845	Parry 1864, 1870	Harold 1868	Macleay 1885a	Boileau 1913	Nagel 1930	Benesh 1960	Moore & Cassis 1992	Krajcik 2001	This work 2017
L. pygmaea	W.S. MacLeay	1819	AUS	-	*L. latreillii*	*L. latreillii*	*L. latreillii*	-	-	*L. latreillii*	*L. latreillii*	*L. latreillii*	*L. aurata*
L. rutilans	Erichson	1842	Tas	-	*L. aurata*	***L. rutilans***	***L. rutilans***	-	*L. aurata*	*L. aurata*	*L. aurata*	*L. aurata*	*L. aurata*
L. schreibersi nom nov for L. aenea Schreibers	Hope in Westwood	1845	NH	***L. schreibersi***	*L. aurata*	*L. aurata*	-	*L. aurata*	-	*L. aurata*	*L. aurata*	*L. aurata*	*L. aenea*
L. sericea	W.J. Macleay	1885a	NQ	-	-	-	*L. latreillii*	-		*L. latreillii*	*L. latreillii*	*L. latreillei*	*L. aurata*
L. splendens	Erichson	1842	not given	-	*L. aurata*	***L. splendens***	***L. splendens***	-	*L. latreillii*	*L. latreillii*	*L. latreillii*	*L. latreillii*	*L. aurata*
L. subrugosa	Hope in Westwood	1845	not given	***L. subrugosa***	*L. aenea*	*L. aenea*	*L. aenea*	*L. aenea*	-	*L. aenea*	*L. aenea*	*L. aenea*	*L. aenea*
L. sumptuosa	Hope in Westwood	1845	WA	***L. sumptuosa***	*L. micardi*	***L. sumptuosa***	*L. micardi*	*L. micardi*	-	*L. micardi*	*L. micardi*	*L. micardi*	*L. aurata*
L. tasmaniae	Hope in Westwood	1845	Tas	***L. tasmaniae***	*L. latreillii*	*L. latreillii*	*L. latreillii*	*L. latreillii*	-	*L. latreillii*	*L. aurata*	*L. latreillii*	*L. aurata*
L. varians	Germar	1848	SA	-	*L. micardi* or *L. varians*	*L. micardi*	***L. varians***	-	***L. varians***	***L. varians***	***L. varians***	***L. varians***	*L. aurata*
L. violacea	W.J. Macleay	1885a	NSW	-	-	-	***L. violacea***	-	*L. latreillii*	*L. latreillii*	*L. latreillii*	*L. latreillii*	*L. aurata*
L. viridis	Erichson	1842	not given	-	*L. aenea*	*L. aenea*	?	-	*L. aurata*	*L. aurata*	*L. aenea*	*L. aenea*	*L. aurata*

There are good male characters for diagnosing *L. aenea*, *L. adolphinae*, *L. imberbis* and *L. insularis*. There remain the *Lamprima* species, excluding *L. imberbis*, described from mainland Australia and Tasmania. It has already been noted that Matthews (1984) treated *L. varians* and *L. aurata* as one species in South Australia (*L. aurata*) and Moore (1984, 1986) suggested that *L. aurata* and *L. latreillii* were variants ("overlapping subspecies") of one species in southeastern Australia, even though these were originally separated by dorsal punctation and structure of thoracic ventrites (Macleay 1885a). *Lamprima micardi* in Western Australia and *L. varians* from South Australia were originally distinguished from eastern Australian *Lamprima* by their narrower male protibial spurs (Reiche 1841; Burmeister 1847) but the presence of intermediates blurs their distinction. We have examined more than 400 specimens of *Lamprima* from throughout southern and eastern Australia and conclude that these represent just one species, *L. aurata*.

Key to species of *Lamprima* Latreille, 1804

1. Mandibles as long as or longer than head, without large ventrally directed basal tooth on inner edges (Figs 21–32); protibial spur usually flat, blade-like (Figs 62–75); apical ventrite truncate (males) 2
- Mandibles shorter than head, each with large anteroventrally directed basal tooth on inner edge, the teeth curved inwards and overlapping in repose (Figs 33–44); protibial spur always narrowly conical; apical ventrite rounded (females; *L. imberbis* unknown). 8
2(1) Mandibles with dense erect golden setae on inner surfaces (Figs 21–32), which may be abraded in old specimens; mandible apices blunt, with tips incurved and often subdivided; inner ventral edge of each mandible with prominent tooth or teeth; mandibles in lateral view gradually contracted from base to middle and pre-apical tooth close to apex or absent (Figs 45–51, 53); protibial spur flat and blade-like, with adjacent setal tuft on a short lobe (Figs 62–63, 65–75). 3
- Mandibles glabrous or almost so on inner surfaces (Fig. 3); mandible apices sharply pointed with straight tips, not subdivided; mandibles without prominent tooth on inner ventral edge; mandibles in lateral view strongly narrowed from base to middle and pre-apical tooth distant from apex (Fig. 52); protibial spur not expanded, without adjacent setal tuft or short lobe (Fig. 64) (dark bronze-brown; length 23 mm; northeastern New South Wales) . . . . . *L. imberbis* Carter, 1926
3(2) Mandibles elongate, length 27–37% body length, with short peg-like teeth on inner edge beyond ventral mandibular tooth (Figs 1, 25–26, 28, 102) 4
- Mandibles shorter, length 10–28% body length, without short peg-like teeth on inner edge beyond ventral tooth. 5
4(3) Upper surface relatively shiny, usually bright yellowish green (Figs 5, 102); upper edge of mandible in lateral view not evenly curved to apex, but with abrupt elevation before apex (Fig. 48); mesoventrite process rounded at sides; pronotum conspicuously punctate, at least at midline (Fig. 25–26); penis not extending beyond parameres (Figs 78–82, 84–88) (length 30–38 mm; Australia). . . . . *L. aurata* Latreille, 1817
- Upper surface relatively dull, usually brownish-bronze or dark green (Fig. 1); upper edge of mandible in lateral view evenly curved to apex (Fig. 45); mesoventrite process usually concave at sides; pronotal punctures obscured by dense microsculpture (Fig. 21); penis extending beyond parameres (Fig. 76) (length 30–60 mm; New Guinea) . . . . . *L. adolphinae* (Gestro, 1875)
5(3) Preapical dorsal mandibular tooth present (Figs 40, 42–44); if pronotum green, head not concolourous (Figs 25–32) 6
- Preapical dorsal mandibular tooth absent (Fig. 53); head and pronotum concolorous green or bronze-green (Fig. 24) (pronotum and elytra smooth and shiny, not densely microsculptured, not rugose (Fig. 4); length 18–33 mm; Lord Howe Island) . . . . . *L. insularis* W.J. Macleay, 1885
6(5) Elytra shallowly sculptured (Figs 5–14, 54–57); protibial spur variable, if narrow then protibiae narrow with long lateral teeth (Figs 62, 66–75); mandible apices blunt, usually subdivided (Figs 22, 27–32); preapical dorsal tooth usually large, acute in lateral view (Figs 46, 49–51) 7
- Elytra deeply sculptured, with irregular but relatively dense grooves and punctures (Fig. 2); protibial spur narrow (length 2x width) in contrast to broad flat protibiae with short blunt marginal teeth (Fig. 63); mandible apices strongly incurved, not subdivided (Fig. 23); preapical dorsal tooth small, obtuse in lateral view (Fig. 47) (length 26–30 mm; Norfolk Island). . . . . *L. aenea* (Fabricius, 1792)
7(6) Upper surface usually relatively shiny, green, coppery, bronze, blue, purple (Figs 7–14, 97–105); elytra conspicuously punctate against relatively even microsculpture (Figs 56–57); mandibles shorter, 10–23% of body length, edge smooth between ventral mandibular tooth and apex (except one specimen with a single secondary tooth); penis not extending beyond parameres (Figs 78–82, 84–88) (length 15–37 mm; Australia). . . . . *L. aurata* Latreille, 1817 (typical form)

Upper surface dull, usually brownish-bronze, rarely dark green, blue or purple (Fig. 22); elytra inconspicuously punctate against relatively uneven microsculpture (Figs 54–55); mandibles longer, 21–27% of body length, with some short irregular projections between ventral mandibular tooth and apex; penis extending beyond parameres (Fig. 76) (length 24–30 mm; New Guinea) . . . . . *L. adolphinae* (Gestro, 1875) (short mandible form)

8(1) Elytra more shallowly sculptured, without deep grooves (Figs 15, 17–20); spermathecal duct tightly coiled (Figs 89, 91–94) 9
- Elytra with irregular deep elongate, transverse and oblique grooves (Fig. 16); spermathecal duct loosely coiled (Fig. 90) (head colour variable but not strongly contrasting with pronotum; tergite IX with rounded translucent apex; length 23–27 mm; Norfolk Island) . . . . . *L. aenea* (Fabricius, 1792)

9(8) Head colour variable, usually contrasting with pronotum, but if green like pronotum, tergite IX with pointed translucent apex (Fig. 89) (length 15–26 mm) 10

- Head and pronotum dark green, not contrasting with each other (Fig. 35); tergite IX with rounded translucent apex (length 16–22 mm; Lord Howe Island) . . . . . *L. insularis* W.J. Macleay, 1885

10(9) Head and pronotum colours not strongly contrasting, head usually dark brown, almost black, and pronotum usually dark bronzy green, but both may be other colours (Fig. 33); punctures of frontoclypeus strong but generally well separated, without narrow ridges (Fig. 33); pronotal disc and elytral disc smooth and shiny, without microsculpture on disc, sides of pronotum duller due to micropunctures and microrugosity; lateral margins of pronotum generally less crenulate, basal half of border usually uninterrupted (Fig. 33); pronotum strongly punctate (punctures similar to head), but punctures rarely coalescent; elytra sparsely and finely punctate, rarely laterally strigose (Fig. 15); tergite IX with acutely pointed translucent apex (Fig. 89) (length 18–24 mm; New Guinea) . . . . . *L. adolphinae* (Gestro, 1875)

- Head usually coppery red or purple coloured, rarely green or black, almost always strongly contrasting with pronotal colour (Figs 17–19, 36–44); punctures of frontoclypeus usually denser, often only separated by narrow ridges (Figs 36–44); sides of pronotum shinier, if micropunctate then without other microsculpture; lateral margins of pronotum generally more crenulate, often partly crenulate in basal half (Figs 36–44); pronotum strongly punctate and punctures often coalescent; elytra often strongly punctate and laterally strigose (Figs 17–19); tergite IX with rounded to right-angled translucent apex (Fig. 91) (length 14–26 mm; Australia) . . . . . *L. aurata* Latreille, 1817

Lamprima adolphinae (Gestro 1875)

(Figs 1, 15, 21–22, 33, 45–46, 54–55, 62, 76, 89, 95)

Neolamprima adolphinae Gestro, 1875: 997 (type locality: Hatam, Arfak Mountains).

Lamprima adolphinae: Nagel, 1922: 16.

Lamprima adolphinae olivacea Nagel, 1930: 88 (type locality: Komba, Finisterre Mountains); Krajcik 2001: 25 (junior synonym of *L. adolphinae*).

Lamprima adolphinae lulua Kriesche, 1940: 39 (type locality: New Guinea); Krajcik 2001: 25 (junior synonym of *L. adolphinae*).

Neolamprima adolphinae chalciditis Didier & Séguy, 1952: 222 (type locality: New Guinea); Krajcik 2001: 25 (junior synonym of *L. adolphinae*).

Neolamprima adolphinae bohni Darge & Séguy, 1953: 252 (type locality: New Guinea); new synonym

Material examined (about 350; locality data only; * = specimen dissected). **Indonesia:** Arfak [1º09'S 133º58'E] (AMS, CMNC); 6 ♂, Irian Jaya, xii.2003 (AMS); Wissell Lakes (CMNC); **Papua New Guinea:** Aiyura, Eastern Highlands [6º20'S 145º54'E] (ANIC, NAIC); Bulolo, Morobe (AMS); Chuave, Simbu [6º10'S 145º45'E] (NAIC); Daulo, Eastern Highlands [5º59'S 145º19'E] (NAIC); Finschhaven (ANIC); Frigano [Habu River] (ANIC); Goroka (CMNC); Gumine, Simbu [6º11'S 144º54'E] (NAIC); Hagen, Western Highlands [5º51'S 144º14'E] (NAIC); Kage [Kerowagi], Simbu [6º13'S 144º45'E] (NAIC); Kainantu (ANIC); Kaironuk (ANIC); 1 ♂*, Komba [Kumbip], Morobe [6º07'S 147º07'E] (AMS, ANIC, CMNC); Lumi (ANIC); Mendi, Southern Highlands (AMS, ANIC); Menyamya (ANIC); Moke, Eastern Highlands [6º31'S 145º37'E] (NAIC); Monono [10º37'S 150º01'E?] (NAIC); Mount Giluwe, Southern Highlands (AMS); Mount Kaindi (CMNC); Okapa (CMNC); Sirunki (ANIC); Tari (ANIC); 1 ♀*, Tomba, Western Highlands (AMS); Wabag (ANIC); Wahgli, Western Highlands [5º40'S 144º30'E] (CMNC, NAIC); Wareo, Morobe (AMS); Wau, Morobe [7º20'S 146º23'E] (AMS, ANIC, CMNC, NAIC); Woitape, Central Province [8º33'S 147º15'E] (NAIC).

Description. Male: length 24−60 mm; cylindrical, pronotum slightly broader than elytra; colour: usually pronotum and elytra entirely dull metallic bronze or green, head bronze-black, antennae and tarsomeres darker, almost black, tibiae slightly lighter bronze coloured than femora, and all except base of outer margins of mandibles purplish black; less often pronotum and elytra yellowish green or bluish green; head purplish red, tibiae coppery red or purplish red; rarely pronotum and elytra blue. Pronotum minutely, densely, rugosely microreticulate; reticulations obscured by dense micropunctures and dull (with a metallic sheen but not shiny); elytra slightly shinier, microreticulate; reticulations flat and distinct; anterior half of head shallowly microreticulate, shiny, basal half often duller; upper surfaces of pronotum and elytra apparently glabrous, but each puncture with minute simple seta arising from anterior edge.

Head: sides and apex with sparse, inconspicuous setae; head length slightly less than half width; sides convergent, from small but angularly projecting temples, along feebly convex eyes, to usually slightly convex genae and right-angled (small males) to acute anteriorly projecting anterior angles (large males); projecting temples broadly grooved in lateral view. Anterior margin truncate to concave, vertically declivous to labrum; dorsum with

two smooth ridges from anterior angles to midline of base of head where they meet at about 100º; area subtended by these ridges strongly punctate, punctures varying greatly in density but not confluent; area between ridges and sides of head also strongly punctate. Antennomere 2 transverse to quadrate; 3–4 elongate (lengths 1.5–2.0x widths); 5 usually elongate, rarely quadrate; 6 transverse to quadrate, rarely ridged on anterior edge; 7 cupuliform with lateral extension about as wide as antennomere, Mandible length 21–37% of overall length; inner faces of mandibles almost entirely densely setose; mandibles straight sided in large males, slightly convex in small males, almost symmetrical, approximately equal in length; two types of mandible: small males (Figs 22, 46), with mandible mostly straight in lateral view, apical 1/3 turned upwards, upper edge sharply keeled, preapical dorsal acute tooth about ¼ from tip, apex bifid with two acute teeth, inner (lower) margin with broad acutely tipped lobe 1/3 from apex and irregular short projections between lobe and apex; large males (Figs 21, 45), with mandibles strongly curved from base to apex in lateral view, upper edge rounded in basal half, preapical dorsal tooth migrated to extreme apex of mandible, which therefore has 3 acute teeth, apical third of upper surface either smooth or irregularly toothed before apex, inner (lower) margin with small acute or blunt tipped lobe ½–1/3 from base, sometimes finely serrate edged just before lobe, and with 5–15 irregular, often partly fused, peg-like projections beyond this lobe; mandibles laterally smooth, finely punctate and setose at base; mentum flat, closely punctate and setose.

Thorax: pronotum strongly convex, faintly dimpled near lateral angles, shape typical for *Lamprima*, almost hexagonal but sides slightly concave anterior to greatest width at just behind middle; anterior margin truncate with slightly protruding anterior angles, basal margin strongly sinuate, anterior and posterior angles obtuse, anterior margin narrower than basal margin, margination complete, laterally without crenulation, Punctures of disc indistinct, much smaller than on head, more-or-less obliterated by surface sculpture, separated by about 3–6 diameters, punctures only distinct at margins. Hypomeron finely and closely punctate in posterior half, shallowly wrinkled in anterior half, with mostly recumbent setae; prosternum strongly and densely punctate, with mostly recumbent setae; scutellum semicircular to heart-shaped, with sparse, small punctures. Elytra with or without small tubercle at base of epipleural upper margin, slightly expanded posterior to humeri, then contracted to rounded apices, sides narrowly explanate in posterior 2/3; elytral base often distinctly bevelled to accommodate base of pronotum; elytral disc minutely and sparsely punctate, punctures similar to or smaller than on pronotal disc and separated by 5–10 diameters, and shallowly, irregularly strigose, the deeper grooves mostly longitudinal; meso-metaventral process with scattered, recumbent setae, and shiny, apex blunt, approximately 80º in lateral view, sides usually slightly concave. Protibia with pair of curved, elongate apical teeth, outer wider than inner, and external margin with 3–5 well-spaced triangular approximately right-angled teeth, confined to apical half of tibia in large specimens; inner lobe of protibia large and rounded, with basal dense tuft of convergent red setae and anterior greatly expanded spur (width 65–80% of length); upper surface of protibia with scattered punctures on inner half and an irregular line of punctures on outer half, short recumbent setae arising from punctures, plus tuft of elongate setae at tarsal insertion; mesotibiae and metatibiae with 0–5 minute, external teeth.

Abdomen: sides of ventrites I–V similar to pterothoracic venter, with dense, small punctures (partly coalescent, interspaces less than diameters) and setae; middle third of ventrites more sparsely punctate (insterspaces = several diameters), surface microreticulate, dull; apex ventrite V truncate to shallowly concave. Genitalia: apical half of phallobase dorsally with irregular short oblique ridges or tubercles either side of shallow median groove, apical margin with V-shaped notch, deepened at base; venter of phallobase smooth, apex more deeply notched; parameres setose dorsally, tips triangular but usually incurved; penis with oblique basal ridges, apex of penis beyond apices of parameres.

Female. As male, except: length 18−24 mm; pronotum and elytra brilliantly shiny, without evident microsculpture, bronze, dark brown, green, coppery or blue, head generally bronze-black or similar in colour to pronotum; pronotum more strongly and densely punctate, punctures almost as large as on head, interspaces 1–3 puncture diameters on pronotal disc; pronotum narrower than elytra; head with 75–90º anterior angles, apices of smooth ridges rounded not projecting. Antennomere 3 elongate, 4–6 transverse, 6 with sharp outer ridge; dorsally visible part of mandibles shorter than head; mandibles in dorsal view with elongate-rectangular (rarely triangular) dorsal tubercle from base to almost half mandible length, remainder of dorsal surface excavate with sharp outer edge; pronotum margins distinctly crenulate on apical half but basal half complete or with < 5 shallow notches. Outer edge protibia with 6–8 triangular teeth, generally increasing in size from base to apex, inner edge without internal lobe, spur elongate triangular; outer edges mesotibiae and metatibiae with 5–7 prominent spines; venter

shiny, otherwise similar to male; apex ventrite V rounded; apex tergite IX transparent, attenuated and sharp or narrowly rounded; gonocoxite transverse, with both inner and outer edges expanded from base; spermatheca tapered from blunt apex to base, slightly bent, spermathecal duct long and densely coiled.

Taxonomy. *Lamprima adolphinae* was first described in 1875. However, 40 years earlier, *L. fulgida* Boisduval, 1835, was described from the island of Waigeo, west of New Guinea. Since all records of *L. adolphinae* show that it is endemic to New Guinea and other species of *Lamprima* are unknown there, it might be assumed that *L. fulgida* is the oldest name for this insect. Reiche (1841) placed all hitherto described species of *Lamprima,* including *L. fulgida,* under the name *L. aenea*. Burmeister (1847) and Thomson (1862) accepted the validity of *L. fulgida*, but the latter did not follow the rule of priority. Parry (1864) queried the status of *L. fulgida*, suggesting it was a junior synonym of *L. aurata*. Following Parry (1864), *L. fulgida* has always been treated as a junior synonym of *L. aurata* (Harold 1868; Macleay 1885a; Boileau 1913; Benesh 1960; Moore & Cassis 1992). Type material of *L. fulgida* seems to be missing, except for a possible female syntype in the Hope collection, Oxford, examined by Boileau who identified it as *L. aurata* (Boileau 1913: 216). Boisduval's description of the male is in comparison with *L. aenea*. The male of *L. fulgida* was golden-green with a coppery-red head, larger and had shorter mandibles (Boisduval 1835: 231). This is much more like *L. aurata* than *L. adolphinae*, therefore we agree with the synonymy of *L. fulgida* with *L. aurata*.

Like other species of *Lamprima*, *L. adolphinae* shows some variation in colour and these variants have been named. These colour forms have no taxonomic validity and are therefore all treated here as junior synonyms of *L. adolphinae*. Krajik (2001) has already made the formal synonymy of three names. *Lamprima adolphinae* is also a senior synonym of *L. adolphinae bohni* Darge & Séguy, 1953.

Lamprima adolphinae in New Guinea has two male mandible forms, like *Lamprima* males in northern Queensland (Lea 1929). However both forms in New Guinea are distinguishable from their counterparts in northern Queensland by constant differences in the male mandibles and by the male genitalia. We have no doubt that *Lamprima adolphinae* is a valid species although the females are almost identical to those of *Lamprima aurata* and *L. insularis*.

Natural history and distribution. The major male appears to be the dominant form in collections, but this may reflect collector bias. Lea (1929) noted considerable variation in male mandible development in this species and the small mandible form occurs throughout its range. Levet (2016) provides notes on rearing *L. adolphinae*, recommending a temperature regime of 20–28 ºC.

Lamprima adolphinae is largely montane, from 500 m to high elevation, for example 2800 m on Mount Giluwe. Most sites are in the cloud forest zone, 1000–2500 m (Levet 2016). The few lowland sites may only indicate the lowland ports from which specimens have been supplied to collectors (*e.g.*, Fak Fak: Levet 2016). *Lamprima adolphinae* is widespread on the island of New Guinea (Fig. 95). On the distribution map we have included records of *L. adolphinae* from Ononge, Admisibil and Walmak, all photographed on a website (Anonymous 2017c).

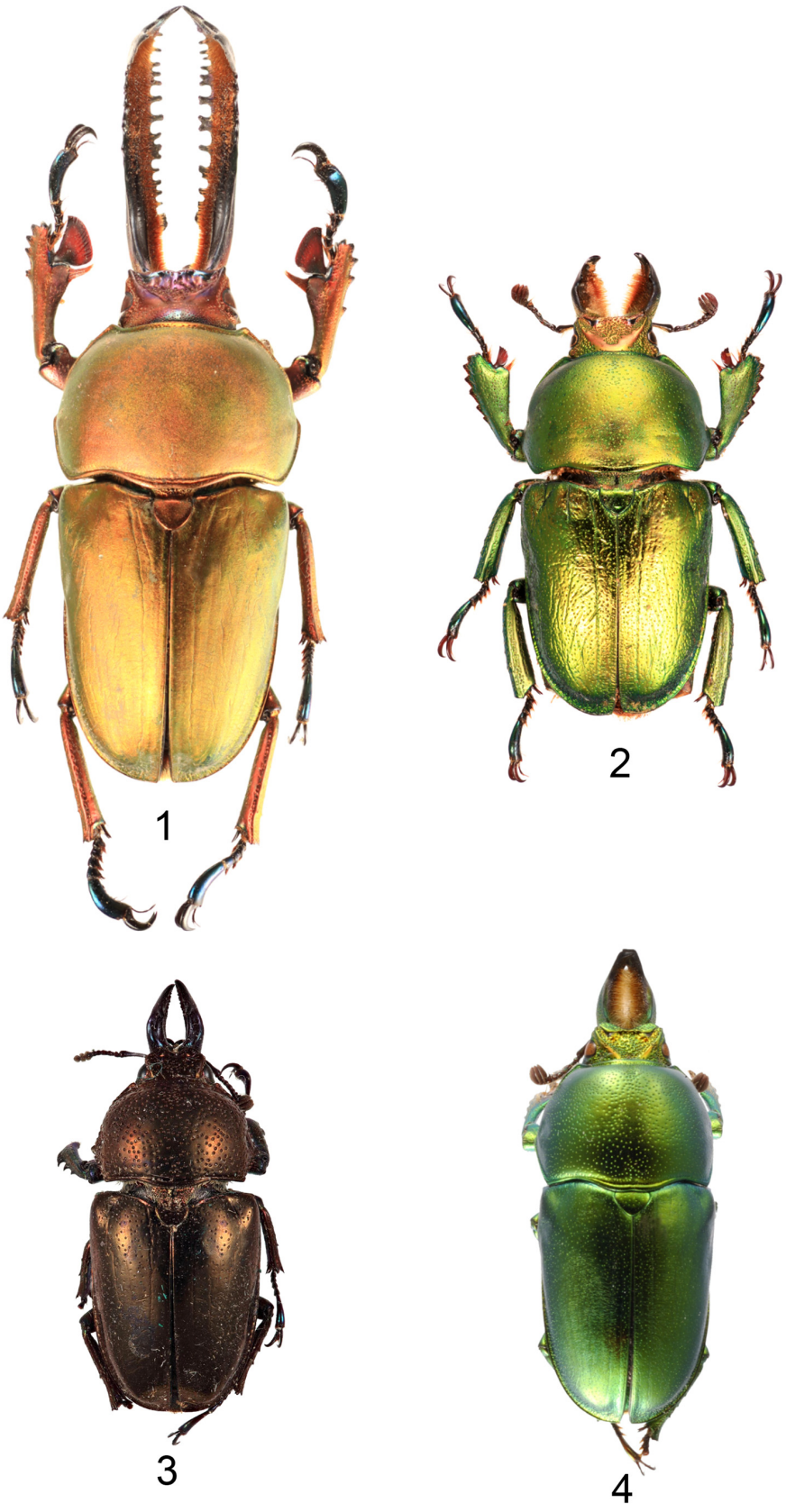
Conservation status. *Lamprima adolphinae* is widely distributed in New Guinea and does not appear to be under immediate threat, although it dominates the commercial trade in *Lamprima* species.

***Lamprima aenea* (Fabricius, 1792)**

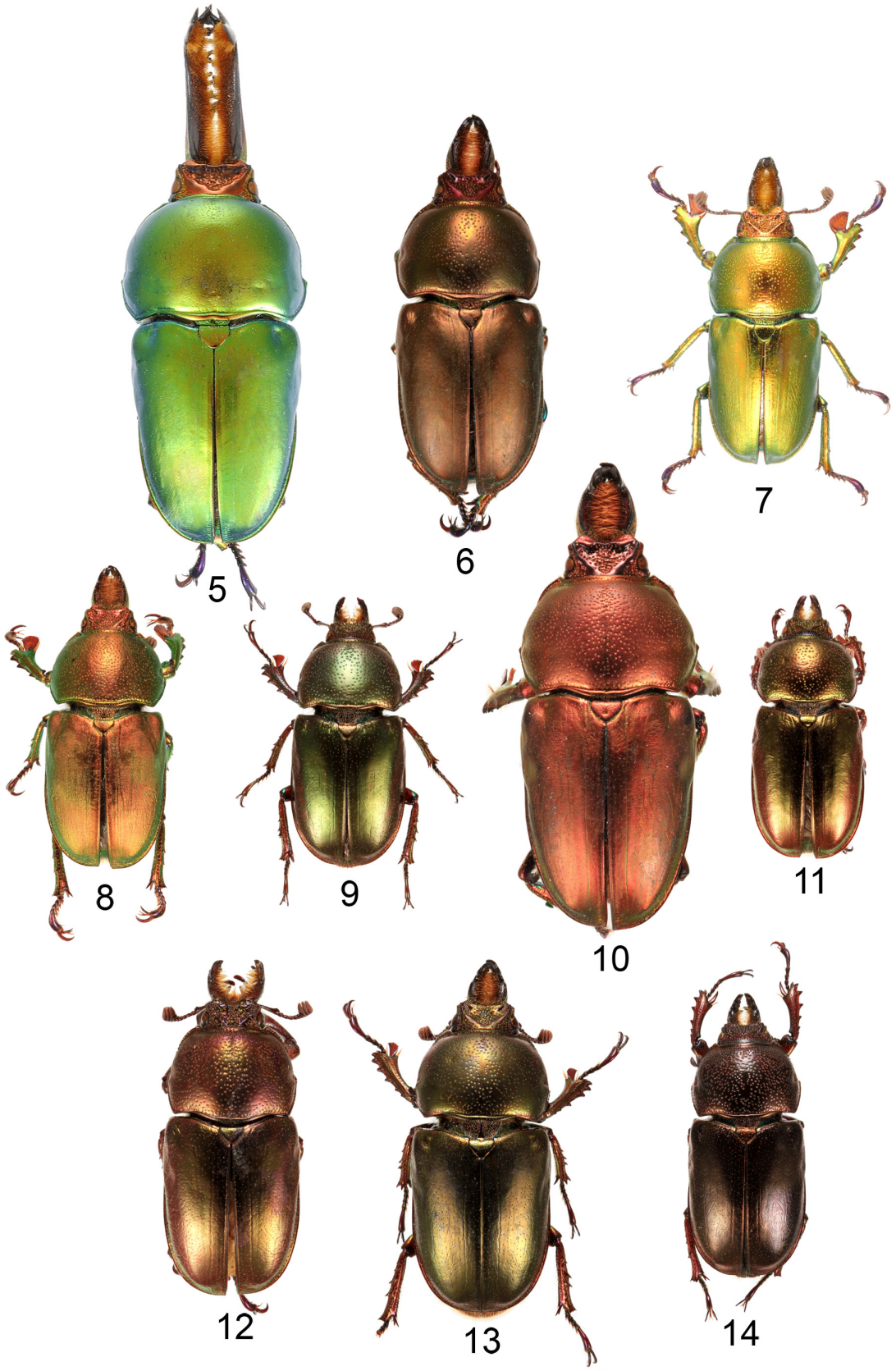
(Figs 2, 16, 23, 34, 47, 63, 77, 90)

Lethrus aeneus Fabricius, 1792: 2 (type locality: Norfolk Island); Fabricius 1801:2.
Lucanus aeneus: Schreibers 1802: 185.
Lamprima aenea: Latreille 1804b: 240.
Lamprima schreibersi Hope in Westwood, 1845: 3 (unnecessary replacement name for *L. aenea* Fabricius *sensu* Schreibers) (junior synonym *L. aenea*).
Lamprima subrugosa Hope in Westwood, 1845: 28 (type locality: New Holland [p. 3]); Thomson 1862: 393 (junior synonym *L. aenea*).

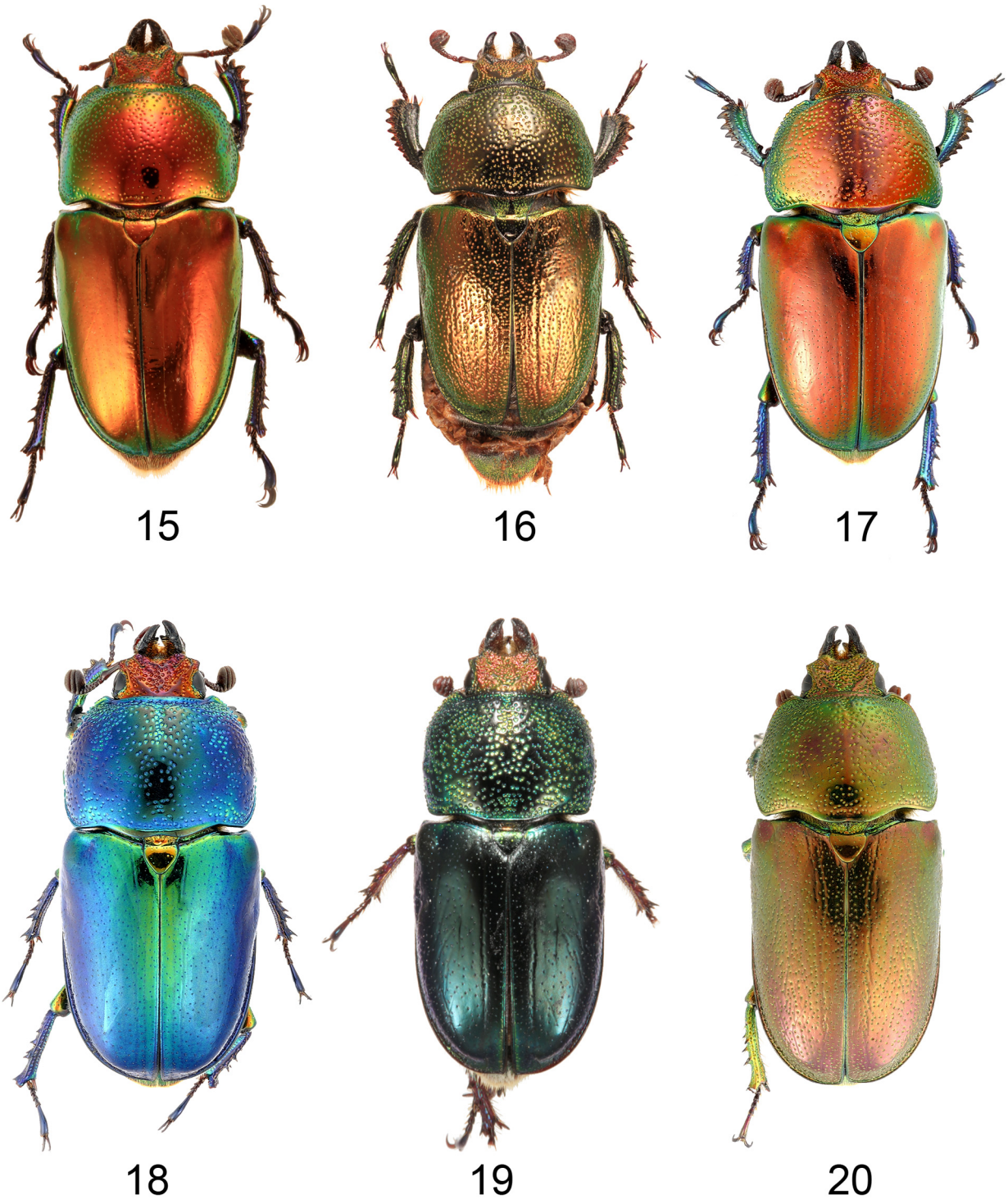
Material examined (* = specimen dissected). **Norfolk Island:** 1 ♂, 1 ♀ / ex Macleay Museum collection (ANIC); 1 ♂, 1 ♀ / xii.2010, ex collection R de Keyzer / (AMS); 2 ♂, 1 ♀, 1 ♀* / K27757 [Norfolk Island]/ (AMS); 1 ♂*/ ii.1947, Mrs A Greenwood / (AMS); 1 ♀ / Norfolk Island National Park, 29.02S 167.57E, berlesate, pine area, 8.iv.1984, J.E. Feehan (ANIC).



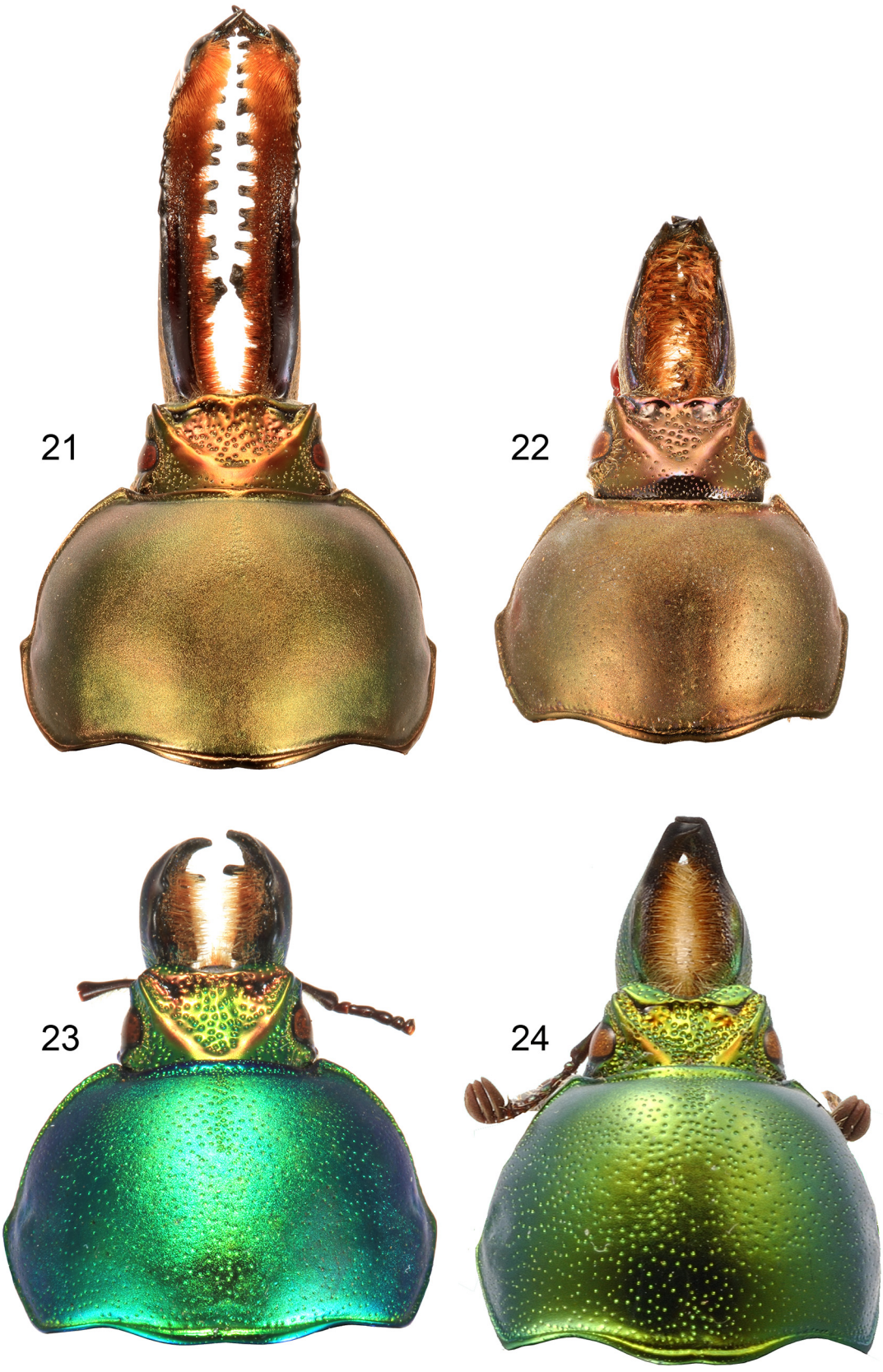
FIGURES 1–4. Male *Lamprima* species, dorsal view: 1, *L. adolphinae* (Gestro, 1875); 2, *L. aenea* (Fabricius, 1792); 3, *L. imberbis* Carter, 1926 (holotype); 4, *L. insularis* W.J. Macleay, 1885. Figure 3 courtesy Peter Hudson, South Australian Museum. All figures to same scale.



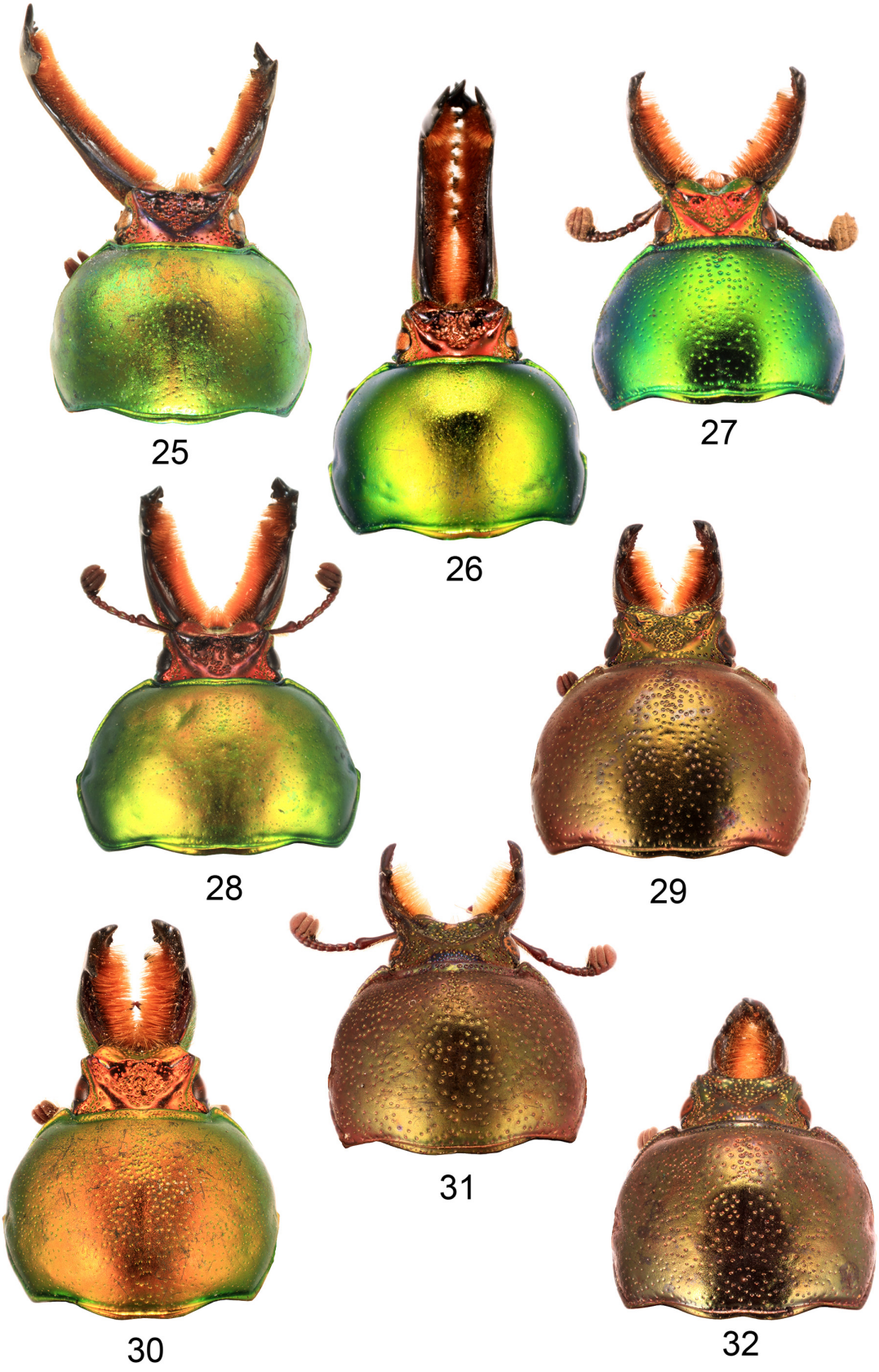
FIGURES 5–14. Males of *Lamprima aurata* Latreille, 1804, dorsal view: 5, Kuranda, northern Queensland; 6, Milmerran, inland southern Queensland; 7, Otford, coastal New South Wales; 8, Hobbys Yards, inland New South Wales; 9, Big Desert, Victoria; 10, Kingston Beach, Tasmania; 11, Adelaide, South Australia; 12, Kangaroo Island, South Australia; 13, Mount Barker, Western Australia; 14, Perth, Western Australia. All figures to same scale.



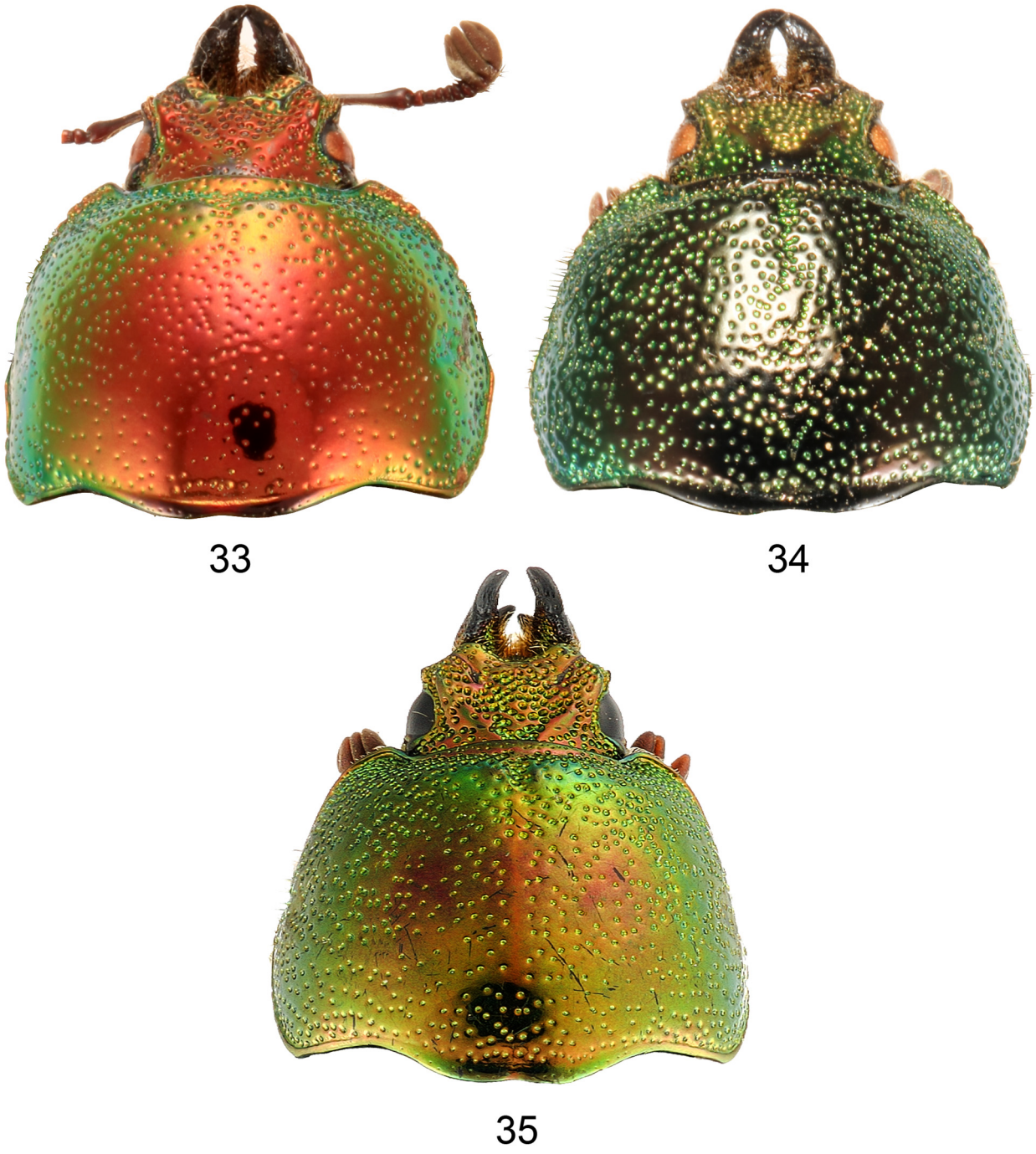
FIGURES 15–20. Female *Lamprima* species, dorsal view: 15, *L. adolphinae* (Gestro, 1875); 16, *L. aenea* (Fabricius, 1792); 17, *L. aurata* Latreille, 1804, Sydney, New South Wales; 18, *L. aurata*, Sydney, New South Wales, blue form; 19, *L. aurata*, Western Australia; 20, *L. insularis* W.J. Macleay, 1885.



FIGURES 21–24. Male *Lamprima* species, dorsal of head and pronotum: 21, *L. adolphinae* (Gestro, 1875), elongate mandible form; 22, *L. adolphinae*, short mandible form; 23, *L. aenea* (Fabricius, 1792); 24, *L. insularis* W.J. Macleay, 1885.



FIGURES 25–32. Males of *Lamprima aurata* Latreille, 1804, dorsal of head and pronotum: 25, Kuranda, northern Queensland, teratological specimen with two mandible forms; 26, Kuranda, northern Queensland (elongate mandible form); 27, Gayndah, central Queensland (holotype of *L. krefftii* MacLeay, 1871); 28, Lilyvale, central New South Wales; 29, Little Desert, Victoria; 30, Launceston, Tasmania. 31, Mount Lofty, South Australia; 32, Mount Barker, Western Australia.



FIGURES 33–35. Female *Lamprima* species, dorsal of head and pronotum: 33, *L. adolphinae* (Gestro, 1875); 34, *L. aenea* (Fabricius, 1792); 35, *L. insularis* W.J. Macleay, 1885.

Description. Male. Length 26−30 mm; relatively flat compared with other *Lamprima* species, pronotum slightly broader than elytra; entirely metallic bronze, green or bluish green, except antennae and tarsomeres darker, almost black, and inner faces, upper margins and tips of mandibles dark purple; if pronotum green head usually more bronzed or coppery; pronotum and upper surfaces of tibiae distinctly reticulately microsculptured and relatively dull (with a metallic sheen but not shiny), head and elytra shinier with indistinct microsculpture; upper surfaces of pronotum and elytra apparently glabrous, but each puncture with minute simple seta arising from anterior edge.

Head: sides and apex with scattered, erect setae; head length approximately half width; sides convergent from small but angularly projecting temples, along feebly convex eyes, then parallel-sided to obtuse anterior angles;

projecting temples notched in lateral view; anterior of clypeus transversely ridged before concave margin; dorsum with two smooth ridges from anterior angles to midline of base of head where they meet at about 100º; area subtended by these ridges strongly and closely punctate, except two smooth tubercles at sides of anterior margin; area between ridges and sides of head also strongly punctate. Antennomere 2 quadrate, 3–4 elongate, 5 quadrate to slightly elongate, 6 transverse and ridged on anterior edge, 7 cupuliform; mandible length 11–13% of overall length; inner faces of mandibles almost entirely densely setose; mandibles relatively curved, almost symmetrical, right usually slightly longer than left; upper surfaces with small, blunt tooth about 2/3 along dorsolateral ridge, tips bent inwards and strongly upwards; mandibles laterally smooth and finely punctate; ventral surface of mandibles with single prominent elongate blunt tooth or lobe 1/3 from apex and sometimes 1–2 small secondary teeth beyond this; mentum convex, closely punctate and setose.

Thorax: shape of pronotum typical for *Lamprima*, almost hexagonal but sides slightly concave anterior to greatest width at just behind middle, anterior margin truncate with slightly protruding anterior angles, basal margin strongly sinuate, anterior and posterior angles obtuse, anterior margin narrower than basal margin, lateral margination complete, without crenulation; distinctly punctate, punctures much smaller than on head and separated by 1–4 diameters, anterior of disc more closely punctate than posterior. Pronotal disc even convex, each side with a small dimple; hypomeron coarsely and densely punctate, with mostly recumbent setae; prosternum strongly and densely punctate with erect setae; scutellum semiovate with sparse small punctures; base of epipleural upper margin simple. Elytra slightly expanded posterior to humeri, then contracted to rounded apices, sides narrowly explanate in posterior 2/3; elytra usually distinctly bevelled at base to accommodate base of pronotum; elytral surfaces irregularly, longitudinally, transversely and obliquely grooved, but usually with one distinct longitudinal groove near suture from base of elytron almost to apex; surface between grooves distinctly punctate, punctures larger than on pronotal disc but smaller than on head, and separated by 1–4 diameters; meso-metaventral process with scattered recumbent setae and shiny, apex blunt, 80–90º in lateral view. Protibia with pair of curved apical teeth, inner elongate, outer much wider, and external margin with 5–7 well-spaced, triangular and approximately right-angled teeth diminishing in size to base; protibia expanded from base to apex, inner margin almost straight to abrupt contraction at dense tuft of convergent, red setae and narrowly expanded blade-like spur (width 32–42% of length), spur with 1–3 small denticles on outer edge; upper surface of protibia with dense, small punctures on inner half and an irregular line of small punctures on base of outer half, short recumbent setae arising from punctures, plus tuft of elongate setae at tarsal insertion; mesotibiae and metatibiae with 0–4 tiny, external teeth.

Abdomen: sides of ventrites I–V similar to pterothoracic venter, with dense, small punctures (partly coalescent, interspaces less than diameters) and setae; middle third of ventrites more sparsely punctate (interspaces 1–3x diameters), surface microsculpture as dorsum; apex ventrite V truncate. Genitalia: phallobase dorsally almost evenly smooth and convex, apical half slightly with a few microspicules beside shallow median groove, apical margin with V-shaped notch deepened at base; venter of phallobase with scattered microspicules, apex more deeply notched; parameres setose dorsally, tips triangular but incurved; penis with oblique basal ridges, thinly sclerotised apex not reaching apices of parameres (80% length of parameres).

Female. As male, except: length 23–27 mm; upper surfaces shiny, colour dark bronze, green or blue, with head usually brassier, pronotum sometimes black; head with approximately 100º anterior angles; antennomeres 4–5 transverse; dorsally visible part of mandibles shorter than head; mandibles in dorsal view with slightly elongate-rectangular or triangular dorsal tubercle from base to about third mandible length, remainder of dorsal surface excavate with sharp outer edge. Pronotum conspicuously strongly and densely punctate, interspaces 0.5–2.0x puncture diameters on pronotal disc, shiny, not distinctly microsculptured; pronotum not broader than elytra; pronotum lateral margins entirely crenulate, basal half may be more irregularly notched. Elytra with grooves and punctures deeper and denser; protibiae narrower, outer edge with 8–10 triangular teeth, generally increasing in size from base to apex; outer edges mesotibiae and metatibiae with 4–7 prominent spines; apex ventrite V rounded; apex of tergite IX transparent and evenly rounded; gonostylus transverse, inner edge convex, as long as basal width, outer edge strongly expanded; spermatheca with blunt apex, strongly bent, spermathecal duct short and loosely coiled.

Taxonomy. Fabricius first described this species from Norfolk Island specimens in the Joseph Banks collection (Fabricius 1792: 2). Norfolk Island had been visited by Cook and his naturalist George Forster in 1774, but was first settled by Europeans in 1788. Schreibers (1802) redescribed this species to correct errors in Fabricius' original description and to place it in the genus *Lucanus* Scopoli, 1763. Schreibers' description was partly based on

the same material as Fabricius (in the collection of Joseph Banks) and was not the description of a new species, although he also noted and illustrated an unnamed variety. Hope, in Westwood (1845), wrongly provided a *nomen novum* (*L. schreibersi*) for Schreibers' description. Parry (1864) compounded this error by placing *L. schreibersi* as a junior synonym of *L. aurata*, an action followed by Benesh (1960), who wrongly attributed the synonymy to Macleay (1885a). Moore & Cassis (1992) correctly noted that *L. schreibersi* was an unnecessary *nomen novum*, but they placed it under *L. aurata* instead of *L. aenea*. *Lamprima schreibersi* is hereby reaffirmed an objective junior synonym of *L. aenea*.

Donovan (1805) noted that this species (as *Lucanus aeneus*) was abundant in the "environs of the English settlement at New South Wales" [*i.e.*, Sydney], as well as Norfolk Island. His two illustrations of the species (Donovan 1805: plate 1) clearly show a male of *L. aenea* and a male of *L. aurata*. Latreille (1817) was the first to formally separate the two species. *Lamprima viridis* Erichson 1842, a species lacking a type locality, was synonymised with *L. aenea* by Reiche (1853), an action followed by Parry (1864), Harold (1868), de Lisle (1975) and Moore & Cassis (1992), but rejected by W.J. Macleay (1885a), Nagel (1930) and Benesh (1960). However, Reiche (1841; 1853) was of the opinion that all *Lamprima* species with expanded male protibial spurs formed a single species, *L. aenea*, including *L. viridis*. We reject synonymy of *L. aenea* with any other species from the Australian mainland or Tasmania. The description of *L. viridis* indicates that it is a junior synonym of *L. aurata* (q.v.). *Lamprima subrugosa* Hope in Westwood, 1845, had only a short existence as a valid species, being synonymised with *L. aenea* by Thomson (1862), an action accepted by all subsequent authors including ourselves. Boileau confirmed the synonymy by examining the male holotype in OXUM (Boileau 1913: 217).

Natural history and distribution. Nothing has been recorded about the natural history of this species. *Lamprima aenea* is endemic to Norfolk Island, 1400 km east of the Australian mainland.

Conservation status. Norfolk Island is 35 km^2 in area but has largely been cleared for agriculture (Green 1994). Approximately 13% of the main island is reserved as National Park (460 ha), with a few small reserves outside this. *Lamprima aenea* is found in this park, but its distribution on the rest of island is unknown, unlike that of *L. insularis* on Lord Howe Island (Fig. 73), and therefore the adequacy of the current reserve system is also unknown. *Lamprima aenea* is rare in Australian collections. However, it has been illegally harvested by Japanese dealers (the two dealers convicted in 2004 of illegally harvesting 900 *Lamprima insularis* from Lord Howe Island had visited Norfolk Island on a previous trip to Australia) and *L. aenea* is established in the Asian “pet” trade (Hangay & de Keyzer 2017). We strongly recommend that a survey is made of *L. aenea* on Norfolk Island, to provide a management plan for the species. The species should be regarded as vulnerable (International Union for Conservation of Nature 2012) based on endemicity to a small island, fragmentation of habitat and harvesting pressure.

Lamprima aurata Latreille, 1817

(Figs 5–14, 16–19, 25–32, 36–44, 48–51, 56–61, 66–75, 78–82, 84–88, 91–93, 95, 97–111)

Lucanus aeneus sensu Schreibers 1802 partim, nec Fabricius 1792; Donovan 1805: [unpaginated]; Erichson 1842: 109 (*L. fulgida* Boisduval); Parry 1864: 69 (*L. latreillii*).

Lamprima aurata Latreille, 1817: 278 (type locality: New Holland); Boisduval 1835: 230 (junior synonym *L. aenea*); Reiche 1841: 51 (variety of *L. aenea*); Parry 1864: 69 (valid).

Lamprima cuprea Latreille, 1817: 279 (type locality: not given); W.S. MacLeay 1819: 101 (junior synonym *L. aurata*); Hope in Westwood 1845: 3 (junior synonym *L. aenea*); Parry 1864: 69 (junior synonym *L. latreillii*); Harold 1868: 944 (junior synonym *L. aenea*); W.J. Macleay 1885a: 131 (junior synonym *L. aurata*).

Lamprima latreillii W.S. MacLeay, 1819: 101 (type locality: not given); Boisduval 1835: 231 (junior synonym *L. aenea*); Reiche 1841: 51 (variety of *L. aenea*); Erichson 1842: 108 (valid); new synonym

Lamprima pygmaea W.S. MacLeay, 1819: 101 (type locality: not given); Boisduval 1835: 231 (junior synonym *L. aenea*); Reiche 1841: 51 (variety of *L. aenea*); Parry 1864: 69 (junior synonym *L. latreillii*); new synonym

Lamprima fulgida Boisduval, 1835: 231 (type locality: Waigeo); Reiche 1841: 51 (variety of *L. aenea*); Erichson 1842: 108 (valid); Reiche 1853: 83 (junior synonym *L. latreillii*); Thomson 1862: 393 (valid); Parry 1864: 69 (junior synonym *L. aurata*); Harold 1868: 944 (junior synonym *L. aurata*).

Lamprima micardi Reiche, 1841: 51 (type locality: Swan River); new synonym

Lamprima viridis Erichson, 1842: 109 (type locality: not given); Reiche 1853: 83 (junior synonym *L. aenea*); W.J. Macleay 1885a: 131 (not junior synonym *L. aenea*); Nagel 1930: 88 (junior synonym *L. aurata*); de Lisle 1975: 265 (junior synonym *L. aenea*).

Lamprima rutilans Erichson, 1842: 109, 170 (type locality: Vandiemensland); Reiche 1853: 83 (junior synonym *L. latreillii*); Thomson 1862: 393 (valid); Parry 1870: 105 (junior synonym *L. aurata*); Macleay 1885a: 134 (valid); Nagel 1930: 88 (junior synonym *L. aurata*).
Lamprima splendens Erichson, 1842: 108 (type locality: not given); Reiche 1853: 83 (junior synonym *L. latreillii*); Thomson 1862: 393 (junior synonym *L. fulgida*); Parry 1864: 69 (valid); Parry 1870: 105 (junior synonym *L. aurata*); Macleay 1885a: 133 (valid); Nagel 1930: 88 (junior synonym *L. latreillii*).
Lamprima latreillei: Erichson 1842: 108 [misspelling].
Lamprima tasmaniae Hope in Westwood, 1845: 27 (type locality: Van Dieman's Land); Parry 1864: 69 (junior synonym *L. latreillii*).
Lamprima tasmanniae: Hope in Westwood, 1845: 3 (misspelling).
Lamprima nigricollis Hope in Westwood, 1845: 28 (type locality: Western Australia); Parry 1870: 105 (junior synonym *L. micardi*); new synonym
Lamprima purpurascens Hope in Westwood, 1845: 28 (type locality: Western Australia); Harold 1868: 944 (junior synonym *L. micardi*); new synonym
Lamprima sumptuosa Hope in Westwood, 1845: 28; Parry 1870: 105 (junior synonym *L. micardi*); new synonym
Lamprima varians Burmeister, 1847: 415 (type locality: Adelaide); Reiche 1853: 83 (junior synonym *L. micardi*); Thomson 1862: 393 (junior synonym *L. fulgida*); Parry 1864: 70 (valid); Harold 1868: 944 (junior synonym *L. micardi*); Parry 1870: 105 (valid); new synonym
Lamprima cultridens Burmeister, 1847: 416 (type locality: ?Western New Holland); Reiche 1853: 83 (junior synonym *L. micardi*); Harold 1868: 943 (valid); Macleay 1885a: 133 (junior synonym *L. varians*); new synonym
Lamprima amplicollis Thomson, 1862: 410 (type locality: Moreton Bay); Parry 1864: 69 (junior synonym *L. latreillii*); new synonym
Lamprima krefftii W.J. MacLeay, 1871: 173 (type locality: Gayndah); Nagel 1930: 87 (variety of *L. aurata*); Benesh 1960: 48 (junior synonym *L. latreillii*); new synonym
Lamprima violacea W.J. Macleay, 1885a: 138 (type locality: Botany Bay); Nagel 1930: 88 (junior synonym *L. latreillii*); new synonym
Lamprima mandibularis W.J. Macleay, 1885a: 139 (type locality: Herbert River, Queensland); Nagel 1930: 87 (junior synonym *L. latreillii*); new synonym
Lamprima latreillei [sic] variety *sericea* W.J. Macleay, 1885a: 132 (type locality: Herbert River, Queensland); Benesh 1960: 48 (junior synonym *L. latreillii*); new synonym
Lamprima nigripennis W.J. Macleay, 1885a: 137 (type locality: New Holland); Nagel 1930: 88 (junior synonym *L. latreillii*); new synonym
Lamprima minima W.J. Macleay, 1885a: 138 (type locality: South Australia); Nagel 1930: 88 (junior synonym *L. varians*); Krajcik 2001: 26 (junior synonym *L. micardi*); new synonym
Lamprima aurata mariae Lea, 1910: 131 (type locality: Maria Island, Tasmania); Nagel 1930: 87 (junior synonym *L. aurata*).
Lamprima coerulea Boileau, 1913: 216, plate 9 (type locality: not given; junior synonym *L. latreillii*); new synonym
Lamprima insularis Boileau, 1913: 217 (type locality: not given; junior synonym *L. micardi*); new synonym

Nomina nuda associated with *L. aurata*

Lamprima puncticollis: attributable to Dejean 1833: 173.
Lamprima coerulea: attributable to Hope in Westwood 1845: 3; described by Boileau (1913: 216).
Lamprima insularis: attributable to Hope in Westwood 1845: 3; described by Boileau (1913: 217).

Material examined. Types (Figs 97–105): *Lamprima krefftii* (holotype: Fig. 97): 1 ♂ "/ K27894 / *Lamprima kreffti* [sic] McL.W. Gayndah [Masters handwritten label] / holotype /" (AMS); *Lamprima latreillii* (lectotype, here designated, two paralectotypes: Fig. 98–99): 1 ♂ "/ syntype / *Lamprima latreillei* [sic] W S Macleay Sydney [Masters handwritten label] / on permanent loan from Macleay Museum, University of Sydney / lectotype *Lamprima latreillii* Macleay, designated Reid, Smith & Beatson 2018" (ANIC); 1 ♀ "/ syntype / *Lamprima latreillei* [sic] W S Macleay Sydney [Masters handwritten label] / on permanent loan from Macleay Museum, University of Sydney / paralectotype *Lamprima latreillii* Macleay, designated Reid, Smith & Beatson 2018" (ANIC);1 ♂ "/ N S Wales / syntype / *Lamprima latreillei* [sic] W S Macleay N S Wales [Masters handwritten label] / on permanent loan from Macleay Museum, University of Sydney / paralectotype *Lamprima latreillii* Macleay, designated Reid, Smith & Beatson 2018" (ANIC); *Lamprima latreillii* var *sericea* (lectotype, here designated, one paralectotype: Figs 100–101): 1 ♂ "/ Queensland / syntype / *Lamprima latreillei* [sic] var *sericea* Herbert River [Masters handwritten label] / on permanent loan from Macleay Museum, University of Sydney / lectotype *Lamprima latreillii* var *sericea* Macleay, designated Reid, Smith & Beatson 2018" (ANIC); 1 ♂ "/ Queensland /

syntype / *Lamprima latreillei* [sic] var *sericea* Herbert River [Masters handwritten label] / on permanent loan from Macleay Museum, University of Sydney / paralectotype *Lamprima latreillii* var *sericea* Macleay, designated Reid, Smith & Beatson 2018" (ANIC); *Lamprima mandibularis* (lectotype, here designated, one paralectotype: Figs 102–103): 1 ♂ "/ Queensland / syntype / *Lamprima mandibularis* Macleay Herbert River [Masters handwritten label] / on permanent loan from Macleay Museum, University of Sydney / lectotype *Lamprima mandibularis* Macleay, designated Reid, Smith & Beatson 2018" (ANIC); 1 ♀ "/ Queensland / syntype / *Lamprima mandibularis* Macleay Herbert River [Masters handwritten label] / on permanent loan from Macleay Museum, University of Sydney / paralectotype *Lamprima mandibularis* Macleay, designated Reid, Smith & Beatson 2018" (ANIC); *Lamprima minima* (holotype: Fig. 104): 1♂ "/ S Australia / holotype / *Lamprima minima* Macleay S Australia [Masters handwritten label] / on permanent loan from Macleay Museum, University of Sydney /" (ANIC); *Lamprima nigripennis* (holotype: Fig. 105): 1♂ "/ Australia/ holotype / *Lamprima nigripennis* Macleay Australia [Masters handwritten label] / on permanent loan from Macleay Museum, University of Sydney /" (ANIC).

Other material (414: all males have normal short mandibles unless otherwise indicated; * = dissected specimen): Australia: 3 ♂, 4 ♀, no data (AMS); 1 ♂, unknown locality H.W. Brown (AMS); **Australian Capital Territory:** 1 ♂, 1 ♀, Canberra, in roots of *Pyracantha*, 16.iii.1957, K.H.L. Key (CMNC); 1 ♂, Cook, 35°15'S 149°4'E, on grass, 17.ii.1984, J. Ninham (AMS); 1 ♀, Ferrer, Canberra, 35°22 'S 149°5 'E, 15.xii.2001, D.C.F. Rentz (AMS); 1 ♂, Glendale, 7.xii.2001, A Polak (AMS); 1 ♀, Mount Majura, 27.xi.1977, G. Daniels (AMS); **New South Wales:** 2 ♀, ex Macleay Museum (AMS); 1 ♂, K27890 [between Sydney & Warrego], Helys Expedition, 1852 (AMS); 1 ♀, Albury, A.H. Elston (AMS); 1 ♂, Bathurst, 21.iii.1930, Wright (AMS); 1 ♀, Bega, C. Deane (AMS); 1 ♀, Bellingen, Gumhof Kalang Road, 19.5 km southwest, 12–20.xii.1987 J.R. & H.R. Paxton (AMS); 2 ♂, 1 ♀, Bendalong, 23.xii.1967, G. Daniels (AMS); 1, Bendalong, 25.i.1990, G. Daniels (AMS); 1 ♂, Bexley, 19.vi.1939, O. Fraser (AMS); 1 ♀, Bexley Park, Sydney, 16.i.1976, Lynn (AMS); 1 ♂, Blayney, i.1927, K Salter (AMS); 1 ♀*, Bombala, i.1930, A.J. Barrett (AMS); 1 ♂, Bondi, Sydney, i.1954, F.T. Fricke (AMS); 1 ♂, Bowenfels, 12.i.1920, J.M. / (AMS); 1 ♂, 1 ♀, K27190[Bowral] (AMS); 1 ♂, Breadalbane, 1.x.2002, C. Kilby (AMS); 1 ♂, Burren Juck (AMS); 1 ♂, Cambatine Creek, near Mount Kippata, 10 miles west Kempsey, in rotting log, 31.viii.1969, G.S. Hunt (AMS); 1 ♂, Chaelundi Campground, Guy Fawkes River National Park, 17.xi.2005, R. de Keyzer (AMS); 1 ♂, Chaelundi Campground, Guy Fawkes River National Park, 30.xi.2016, R. de Keyzer, A. Scott / (AMS); 1 ♂, Coffs Harbour, 23.i.1971 (AMS); 1 ♂, 1 ♀, Como, xii.1950, F.T. Fricke (AMS); 1 ♂, Como-Jannali, 5.xii.1936, G.M. Stoyles (AMS); 1 ♂, Como-Jannali, on eucalypt, 13.xi.1938, B.L.C. Stoyles (AMS); 1 ♀, Cooks River, 14.i.1932 (AMS); 1 ♀, Coonabarabran, xi.1941, G.M. Stoyles (AMS); 1 ♀, Coonabarabran, xii.1955, F.T. Fricke (AMS); 1 ♀, Cooyal, 35 km north Mudgee, xi.2009, D. Anderson (AMS); 1 ♀, Dolls Point, Sydney, 4.i.1946, F.T. Fricke (AMS); 1 ♂, 1 ♀, Dorrigo, xii.1955, F.T. Fricke (AMS); 1 ♀, Earlwood, 9.i.1932 (AMS); 1 ♀, Earlwood, 27.xii.1932, Stoyles (AMS); 2 ♂, 1 ♀, Earlwood, 30.xii.1932, Stoyles (AMS); 1 ♂, 2 ♀, Earlwood, 4.i.1934, Stoyles (AMS); 1 ♂, Earlwood, i.1934, B.L. Stoyles (AMS); 1 ♂*, Eastlakes, xii.1969, G. Daniels (AMS); 3 ♂, 1 ♀, 1 ♀*, Eastwood, 18.ix.1955, F.R. Stocks (AMS); 1 ♀, Galston, Dumbrell (AMS); 1 ♀, Gerroa, 24.xii.1974, H. & A. Howden (CMNC); 1 ♀, Gerroa, on beach, 29.xii.1974, H. & A. Howden (CMNC); 1 ♂, Gerroa, on beach, 31.xii.1974, H. & A. Howden (CMNC); 1 ♂, Glenbrook, i.1952, F.T. Fricke (AMS); 1 ♂, 2 ♀, Glenorie, 12.xi.1968, G. Daniels (AMS); 1 ♂, Gordon, 10.i.1948, A. Musgrave (AMS); 1 ♀, Grafton, xii.1955, F.T. Fricke (AMS); 1 ♀, Heathcote, xii.1963, R. Witchard (AMS); 1 ♀, Helensburgh, 16.viii.1992, R. de Keyzer (AMS); 1 ♂, 2 ♀, Hobbys Yards Public School, 27.x.1947 (AMS); 1 ♂, Jannali, 26.xii.1932, Stoyles (AMS); 1 ♂, Jannali, 2.i.1933, Stoyles (AMS); 1 ♂, 1 ♀, Jannali, xii.1938, B.L.C. Stoyles (AMS); 1 ♀, Jannali, 17.xii.1942, B.L.C. Stoyles (AMS); 1 ♂, 1 ♀, Jannali, xii.1950, F.T. Fricke (AMS); 1 ♂, J[annali], 4.xii.1937, B. Stoyles (AMS); 1 ♂, Kangaroo Valley, 4.x.2004, J Rebbeck (AMS); 1 ♀, Kurnell, 16.i.1955, R.H. Mulder (AMS); 1 ♂, 1 ♀, Kurnell, 6.ii.1955, R.H. Mulder (AMS); 4 ♂, 2 ♀, Lakemba, S. Young (AMS); 1 ♂, Lawson, Blue Mountains, ix.1964, F.A. Higgison (AMS); 1 ♂, Lilyvale, 17.vii.1971 D.A. Doolan (AMS); 1 ♀, Lilyvale, 31.xii.1971, D.A. Doolan (AMS); 2 ♀, Lilyvale, 1.i.1972, D.A. Doolan (AMS); 1 ♀, Lilyvale, 29.i.1972, D.A. Doolan (AMS); 1 ♂, 1 ♀, Lilyvale, 1.ii.1972, D.A. Doolan (AMS); 1 ♀, Lilyvale, 2.ii.1972, D.A. Doolan / (AMS); 1 ♂ [teratological specimen], Lilyvale, ex pupa, 3.ii.1972, D.A. Doolan (AMS); 1 ♂, Lithgow, xii.1898 (AMS); 1 ♂, Maclean, in rotting log, 9.i.1957, C.S. Shannon (AMS); 1 ♂, Manning River (AMS); 1 ♀, Megalong Valley, Blue Mountains, xii.1961, F.T. Fricke / (AMS); 1 ♂, Middle Harbour, Sydney, W.E.J. Paradise (AMS); 1 ♂, Moruya, 31.xii.2015 (AMS); 2 ♂, 1 ♀, Mount Coricudgy, 700 m, decaying logs in wet sclerophyll forest, 29.ix.1984, G Hangay (AMS); 1 ♂, The Gib [Mount Gibraltar], Bowral, K27190 (AMS); 1 ♀, Mount Irvine, Blue Mountains, W. Smart (AMS); 1

♀, Mount Irvine, Blue Mountains, 10–14.vi.1944, E.L. Troughton (AMS); 1 ♂, 1 ♀, Mount Keira, in timber, viii.2004, R. de Keyzer (AMS); 1 ♂, 1 ♀, Mount Tomah, Blue Mountains, 13.vi.1990, N.W. Rodd (AMS); 4 ♂, 4 ♀, Mount Wilson, Blue Mountains, 8.xii.1986 A. Sundholm & R. de Keyzer (AMS); 1 ♂, Munmorah State Recreation Area, 33°13'09"S 151°34'15"E, 16.xii.1996, L. Wilkie (AMS); 1 ♀, Murrarundi, i.1961, F.T. Fricke (AMS); 1 ♀*, Nadgee, 12.i.1967, J. Walsh (AMS); 1 ♂, Narooma, 20.xii.1930, A. Musgrave (AMS); 1 ♂, Neath, on *Leptospermum*, xi.1929, B.L.C. Stoyles (AMS); 1 ♀, Neville, xii.1960, F.T. Fricke (AMS); 1 ♂, North Rocks, Sydney, xii.1987, A. Anderson (AMS); 1 ♀, North Ryde, 25.v.1968, D.A. Doolan (AMS); 1 ♀, North Ryde, 16.xii.1978, C.E. Chadwick (AMS); 1 ♂, Old Holsworthy, 1.iv.1952, D.K. McAlpine (AMS); 1 ♂, Otford, 18.xii.1971, D.A. Doolan (AMS); 1 ♀, 1 ♀*, Ourimbah, 10.xii.1990, R. de Keyzer (AMS); 1 ♂, Pagewood, 15.i.2004, E. Jefferys (AMS); 1 ♀, Petersham, 25.i.1931, N.J. (AMS); 1 ♂, Port Macquarie, i.1955, F.T. Fricke (AMS); 1 ♂, Riverview, 5.xii.1961, B.B. Lowery (AMS); 1 ♂, 1 ♀, Rosebery, 8.i.1935 (AMS); 1 ♂, Roseville, 23.xi.1949 (AMS); 2 ♂, 2 ♀, [Royal] National Park, Sydney, H.W. Brown (AMS); 1 ♂, St Peters, 6.iii.2013, M Beatson (AMS); 1 ♂*, 1 ♀*, Snowy River near Jindabyne, i.1961 (AMS); 1 ♂, 1 ♀, South Coast, 17.xii.1933, C.E. Stoyles (AMS); 1 ♂, 2 ♀, Springwood, 12.xi.1931, Brown (AMS); 1 ♂, 1 ♀, K27888, Sydney (AMS); 1 ♀, Sydney, xii.1928, Wassell (AMS); 1 ♀, Sydney, 30.xii.1929, Wassell (AMS); 1 ♀, Sydney, 3.i.1930, Wassell (AMS); 1 ♂, Sydney, William Street, 24.i.1994, I. Loch (AMS); 1 ♂, Sylvania, iv.1934, K.K. S[pence] (AMS); 1 ♂, Tempe, Sydney, 15.i.2015, C. Beatson (AMS); 1 ♀, Upper Allyn, 13.xii.1969, J.V. Peters (AMS); 1 ♂, Woy Woy, ex telegraph pole, 22.ix.1939, A.V. Baldwin (AMS); 1 ♂, Yamba, 25.ix.1963 (AMS); 1 ♀, Yarrangobilly, 19.i.1987, G.J. & A. Hollway (AMS); 1 ♂, Yass, 25.v.2002, H. Graham (AMS); **Queensland:** 1 ♂* [elongate mandible form], K18436 (AMS); 1 ♂ [elongate mandible form], K27887 (AMS); 1 ♂ [elongate mandible form], K22957 (AMS); 1 ♂, Atherton, Hayes (AMS); 2 ♂, 1 ♀, Atherton, on *Hollandaea sayeriana*, 14.i.1989, B. Gray (CMNC); 1 ♀, Blackall Ranges, st[atio]n 125, 1974, N. Coleman (AMS); 1 ♀, Bribie, 11.iv.1920 (AMS); 2 ♂, Bunya Mountains 2000', 8.ii.1938, N. Geary (AMS); 2 ♂, 1 ♀*, Bunya Mountains 2000', 21.ii.1940, N. Geary (AMS); 1 ♂, Bunya Mountains 2000', x.1973, F.T. Fricke (AMS); 1 ♂, Caboolture, iii.2009, J. Koens (AMS); 1 ♂, 2 ♀, Cairns District, A.M. Lea (AMS); 1 ♂, Cape York, Deane (CMNC); 1 ♂, Cape York, i.2006, R. de Keyzer (AMS); 1 ♂, Cooktown (AMS); 1 ♀, Eidsvold, Bancroft (AMS); 1 ♀, Eungella National Park, 21°6'S 148°28'E, 22.iv.2006, J. Weiner (AMS); 1 ♀, Glastonbury State Forest, west Gympie, 26°13'S 152°29'E, 7.ix.1982, O. Griffiths (AMS); 1 ♂, Hinchenbrook Island, Rockhampton [sic], C. Cox, K27892 (AMS); 1 ♀, 1 ♀*, Indooroopilly, 20.i.1981, de Beer (AMS); 2 ♂, Jamboree Heights, near Brisbane, 30.xi.1980, G. Daniels (AMS); 1 ♂, 1 ♀, K18438 [Kuranda] (AMS); 1 ♀, K18437[Kuranda] (AMS); 2 ♂, Kuranda (AMS); 2 ♂ [one elongate mandible form], 1 ♀, Kuranda, 3.i.1948, J.G. Brooks (AMS); 1 ♂ [teratological specimen with both types of mandible], Kuranda 15.i.1948, J.G. Brooks (AMS); 3 ♂ [all elongate mandible form], 2 ♀, 1 ♀*, Kuranda, i.1949, J.G. Brooks (AMS); 1 ♂, Kuranda, viii.1961, R.H. Mulder (AMS); 1 ♂, 2 ♀, Kuranda, 30.xii.1969, R.E. Parrott (CMNC); 1 ♀, Kuranda, 9.i.1970, R.E. Parrott (CMNC); 20 ♂, 9 ♀, Kuranda, 10.i.1970, R.E. Parrott (CMNC); 1 ♂, 1 ♀, Kuranda, 11.i.1970, R.E. Parrott (CMNC); 2 ♂, 1 ♀, Kuranda, 20.i.1970, R.E. Parrott (CMNC); 1 ♂, 2 ♀, Lake Barrine, 28.i.1977, F.T. Fricke (AMS); 1 ♂, Little Freshwater Creek, Rainbow Beach, on *Banksia*, 19.v.1995 (QMB); 1 ♀, Mackay, H.W. Brown (AMS); 2 ♂, 1 ♀, Millmerran, 6.i.1926 (AMS); 1 ♂, 1 ♀, Mount Tambourine, 19.xii.1925, A. Musgrave (AMS); 1 ♂, Pine Mountain, xii.1973, F.T. Fricke (AMS); 1 ♂, 1 ♀, Polly Creek, Garradunga, 8.xi.1997, J. Hasenpusch (AMS); 1 ♂, Rockhampton, xii.1973, F.T. Fricke (AMS); 1 ♂, K27892 [Rockingham Bay] (AMS); 2 ♀, Silkwood, MacConnell (AMS); 2 ♀, S Johnstone R, H.W. Brown (AMS); 1 ♂*, Stanthorpe, E. Sutton (AMS); 1 ♂, Stanthorpe, i.1925, E. Sutton (AMS); 1 ♂, Stanthorpe, 1935, E. Sutton (AMS); 1 ♀, Stanthorpe, xii.1955, F.T. Fricke (AMS); 1 ♀, Sumner, Brisbane, 27°33'52.6"S 152°55'51.6'E, 20 m, 19.i.2008, G. Daniels (AMS); 2 ♀, Tambourine Mountain, xii.1955, F.T. Fricke (AMS); 1 ♀, Victoria Point, near Brisbane, 28.xii.1975, G. Daniels (AMS); 2 ♀, Wolfgram [sic = Wolfram] Camp, K19182 (AMS); **South Australia:** 1 ♂, South Australia (AMS); 1 ♂, 1 ♀, South Australia (AMS); 1 ♂, South Australia, K27896 (AMS); 1 ♂*, South Austalia (AMS); 1 ♂, Adelaide, A.H. Elston (AMS); 1 ♀, Barossa, A.H. Eslton (AMS); 1 ♀, Edwardstown, A.H. Elston (AMS); 1 ♂*, 1 ♀*, Kangaroo Island, A.H. Elston (AMS); 1 ♀, Lucindale, B.A. Feverheerdt (AMS); 1 ♂, Malinong (ANIC); 1 ♂, Mount Gambier (ANIC); 1 ♂, 1 ♀, Mount Lofty Range, A.H. Elston (AMS); 1 ♂, Nangwarry (ANIC); 1 ♀, Willalo, xi.1944, H. Mincham (AMS); 1 ♂*, Willalo, xii.1945, H. Mincham (AMS); **Tasmania:** 1 ♂, 1 ♀, K15062 (AMS); 1 ♂, 1 ♀, K27893 (AMS); 1 ♀*, Bridport, 26.i.1989, N.W. Rodd (AMS); 1 ♂, Hobart (ANIC); 1 ♂, Hobart, J.J. Walker (CMNC); 1 ♀, Kingston, 18.i.1949, A. Musgrave (AMS); 2 ♂, 2 ♂*, Kingston Beach, 2.xii.1946, J.R. Cunningham (AMS); 2 ♂, Launceston, A.H. Elston (AMS); 1 ♀, National Park,

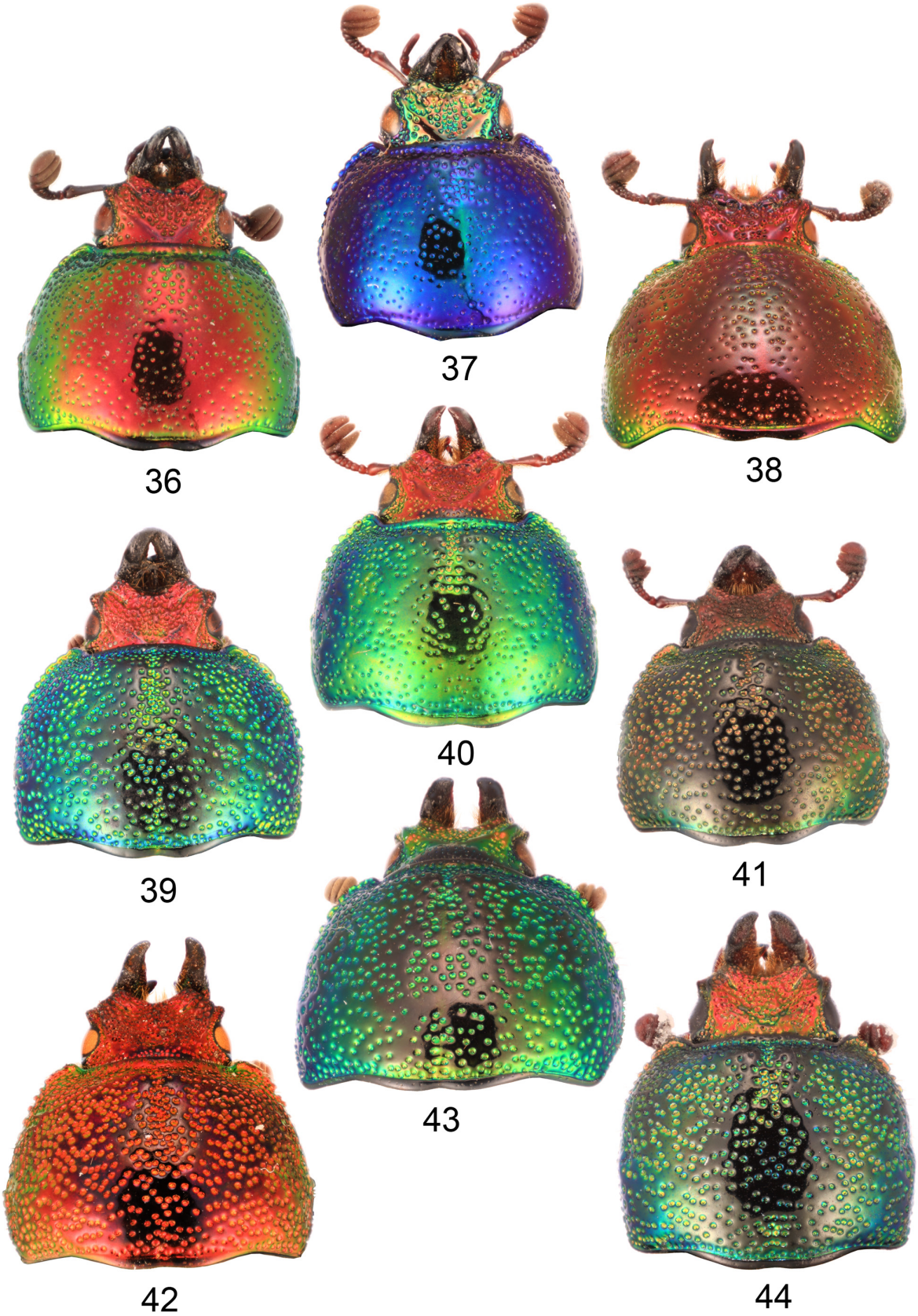
24.i.1932, K.C. McKeown (AMS); 1 ♂, Orford (ANIC); 1 ♂, St Helens (ANIC); 1 ♂, St Helens, 15.xii.1988 (QVMAG); 2 ♂, Scotts Lag, Flinders Island (ANIC); 1 ♂, Seven-mile Beach (ANIC); **Victoria:** 1 ♂, Victoria (AMS); 1 ♂, 1 ♀, Victoria Sullivan K27897 (AMS); 2 ♂, Big Desert, 3.xi.1993, F. Douglas (AMS); 1 ♂, Croydon, x.1931, R.T.M. Prescott (AMS); 1 ♂, 1 ♀, Gippsland Lakes District, V. Irwin-Smith (AMS); 1 ♂, Kiata (ANIC); 1 ♀, 3.5 km S Kinimakatka, Little Desert, ex *Eucalyptus leucoxylon*, 10.vi.1994, F. Douglas (AMS); 2 ♂, Kooweerup, 17.vii.1941, C. Le Soeuf (AMS); 1 ♂, Lakes Entrance (ANIC); 1 ♀, Lower Fern Tree Gully, 29.xii.1931, A. Musgrave (AMS); 1 ♂, Mallacoota (ANIC); 2 ♂, Melbourne, K15061 (AMS); 1 ♂, 1 ♀, K27891, Melbourne (AMS); 1 ♂, Melbourne (AMS); 2 ♂, 1 ♀, Melbourne, Deane (AMS, CMNC); 2 ♂, 1 ♀, Melbourne, 22.xii.1971, R. Parrott (CMNC); 1 ♂, Moe, 3.xii.1954 (CMNC); 2 ♂, Morwell (ANIC); 1 ♂*, Mount Buffalo, 4400 ft., 18.xii.1933, A. Musgrave (AMS); 1 ♂, near Mount Cobungra, xii.1938, A. Musgrave (AMS); 1 ♀, Mount Granya State Park, near Tallangatta, 38º08'S 147°16'E, 12.i.2000, C.J.R. Day (AMS); 2 ♂, 1 ♂*, 1 ♀, 1 ♀*, Murtoa, 2.iii.1932, J. Hill (AMS); 1 ♀, One Tree Lookout, 5 km northwest Ararat, reared, 30.ix.2002, R. Douglas (AMS); 1 ♂, 1 ♀, One Tree Lookout, Stawell, ex pupal cells, vii.2003, R. Douglas (AMS); 1 ♂, 1 ♀, Rokeby, 20.ii.1957, Carne (CMNC); 2 ♂, S Victoria, C. Deane (AMS); 1 ♂, Woodend, 18.xii.1972, R.E. Parrott (CMNC);1 ♀, Yallourn (AMS); **Western Australia:** 1 ♀, K27895 (AMS); 1 ♂, K27896 (AMS); 2 ♂, 1 ♀, Albany, 8.i.1974, K. & E. Carnaby (CMNC); 1 ♂, Albany, 16.xii.1972, K.M. Richards (CMNC); 3 ♂, Borden, on acacia, 4.xi.1940, H.W. Brown (AMS); 2 ♂, Boyup (ANIC); 1 ♂, 1 ♂*, Boyup Brook, 10.xii.1987, M. Moulds (AMS); 1 ♂, Boyup Brook, xii.1985, M. Moulds (AMS); 1 ♀*, Bunbury, 1957, A. Snell (AMS); 1 ♂, Bunbury, i.1965, D. Snell (AMS); 1 ♂, Canning Mills, Perth, 13.xii.2008, P. Hutchinson (AMS); 4 ♂, 1 ♂*, Cowaramup, 23.xii.1970, G. Holloway (AMS); 1 ♂*, Cue, H.W. Brown (AMS); 1 ♂, Geraldton, H.W. Brown / larger combs spec[imen] (AMS); 1 ♂, north of Gibson Soak, 4.xii.1988 (AMS); 1 ♀, Gloucester Tree Fire Station, near Pemberton, 14.xii.1970, G.A. Holloway (AMS); 1 ♂, Israelite Bay (ANIC); 2 ♂, Kalamunda, J. Clark (AMS); 3 ♂, Kalamunda, H.W. Brown (AMS); 1 ♂, Kalamunda, 25.iii.1944, H.W. Brown (AMS); 1 ♂*, Kalamunda, *Acacia*, G. Clark (AMS); 1 ♂, K[ing] G[eorge] Sound (AMS); 1 ♂, Margaret River, 15.i.1971, G.A. Holloway & H. Hughes (AMS); 4 ♂, Mount Barker, H. Brown (AMS); 1 ♂, Mount Barker, xi.1954, Armstrong (CMNC); 1 ♂, Norseman (ANIC); 1 ♂, Perth, 2014, R. de Keyzer (AMS); 1 ♂, Pemberton (ANIC); 1 ♂, Pinjarra (ANIC); 2 ♂, Swan River (AMS); 1 ♂, Wilga (ANIC); 1 ♂, Yallingup (ANIC). Western Australia (> 50; numbers and label data not recorded): Argyle (WAM); Augusta (WAM); Bassendean (WAM); Bokal (WAM); Bridgetown (WAM); Bullsbrook (WAM); Byford (WAM); Cannington (WAM); Deep Dene (WAM); Denmark (on *Leptospermum*) (WAM); Guildford (WAM); 6 miles east Kalamunda (WAM); Margaret River (WAM); Mundaring (WAM); Pemberton (WAM); Quininup (WAM); West Midland (WAM).

Description. Male: length 15−38 mm; cylindrical, pronotum slightly broader than elytra in large specimens, narrower than elytra in small; pronotum and elytra usually entirely relatively shiny, metallic yellowish green, green, bluish-green or coppery bronze, head purplish bronze, dark bronze or coppery bronze; colour of pronotum and elytra varying geographically (Fig. 86), with northern Queensland specimens almost always green to yellowish-green (or pronotum slightly bronzed) and South Australian and Western Australian specimens almost always dark olive-green (frequently dark purplish brown), areas in between more varied in colour; venter similar to pronotum and elytra; mandibles dark purplish black or bluish black with reddish-purple to bronze lateral basal area; antennae black; femora similarly coloured to pronotum, except reddish bronze to red in western and most South Australian specimens; tibiae usually contrasting with femora, coppery or bronze or reddish bronze to red in western and most South Australian specimens; tarsi usually bluish black or purplish black in the east of Australia (but claws sometimes red), usually purplish red or red in the west. Pronotal microsculpture geographically variable: usually densely micropunctate and therefore duller in north and east, microrugose, without smooth spaces between punctures; usually more sparsely micropunctate in west and therefore shinier, with small clusters of micropunctures separated by smooth interspaces; elytra slightly shinier, evenly microreticulate, reticulations flat and distinct; anterior half of head shallowly microreticulate, shiny, basal half duller, micropunctate; upper surfaces of pronotum and elytra apparently glabrous, but each puncture with minute simple seta arising from anterior edge.

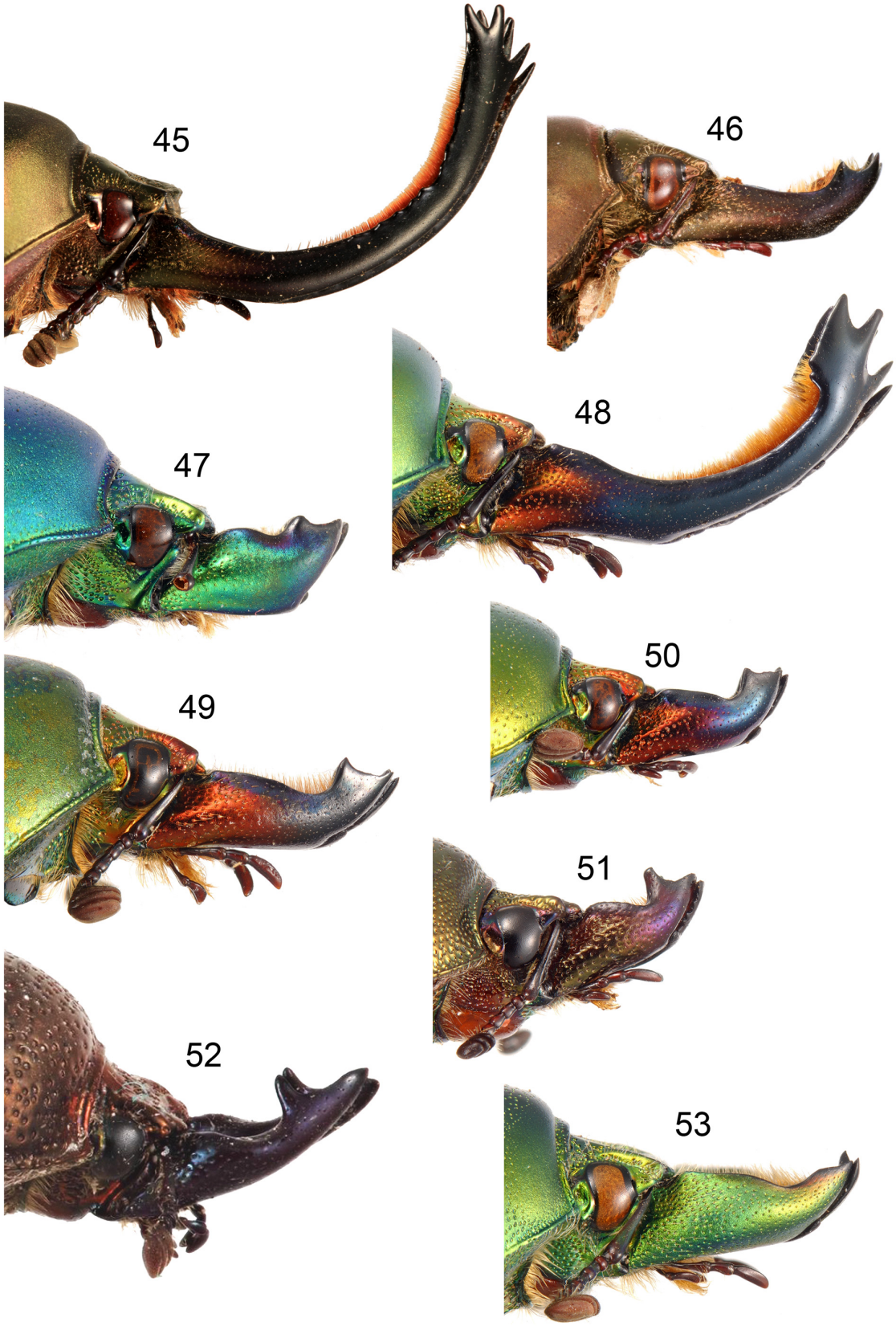
Head: sides and apex with sparse, inconspicuous setae; head length slightly less than half width (about 40%); sides approximately convergent, from small but angularly projecting temples, along feebly to moderately convex eyes, to usually straight sided (convex in specimens with elongate mandibles) genae and right-angled (usually small males) to acute anteriorly projecting anterior angles (usually large males); projecting temples broadly grooved in lateral view; anterior margin truncate to deeply concave, vertically declivous to labrum; dorsum with two smooth ridges from anterior angles to midline of base of head where they meet at about 100º; area subtended

by these ridges strongly punctate, punctures varying greatly in density and sometimes confluent; area between ridges and sides of head also strongly punctate. Antennomere 2 slightly transverse to slightly elongate; 3–4 elongate (lengths 1.3–1.8x widths); 5 elongate or quadrate; 6 transverse to quadrate, often ridged on anterior edge; 7 cupuliform with lateral extension about as wide as antennomere. Mandible length 10–32% of overall length, longer than head except some small males in south and west with mandibles and head about equal in length; inner faces of mandibles almost entirely densely setose; mandibles straight sided dorsal view in large males, to strongly convex in some males from south and west, almost symmetrical, approximately equal in length; two types of mandible (with intergradation in northern Queensland): males from south of 20ºS and smaller males in northern Queensland with mandible mostly straight in lateral view (Figs 49–51), apical 1/3 turned upwards, upper edge sharply keeled, with preapical dorsal acute to obtuse tooth about ¼ from tip and margin distal to this smooth edged (eastern specimens) to irregularly lobed (most western and some southern specimens), apex bifid with two acute teeth (most northern and eastern specimens) or truncate or simply incurved (most southern and western specimens), inner (lower) margin with broad acutely tipped lobe 1/3 from apex, without short projections between lobe and apex; large males in northern Queensland with mandibles strongly curved from base to apex in lateral view (Fig. 48), upper edge rounded in basal half, preapical dorsal tooth migrated to extreme apex of mandible, which therefore has 3 acute teeth, apical third of upper surface abruptly elevated before apex, inner (lower) margin with small acute or blunt tipped lobe ½–1/3 from base, sometimes finely serrate edged just before lobe, and with 5–12 irregular, often partly fused, peg-like projections beyond this lobe; mandibles laterally smooth, strongly punctate and setose at base; mentum flat, closely punctate and setose.

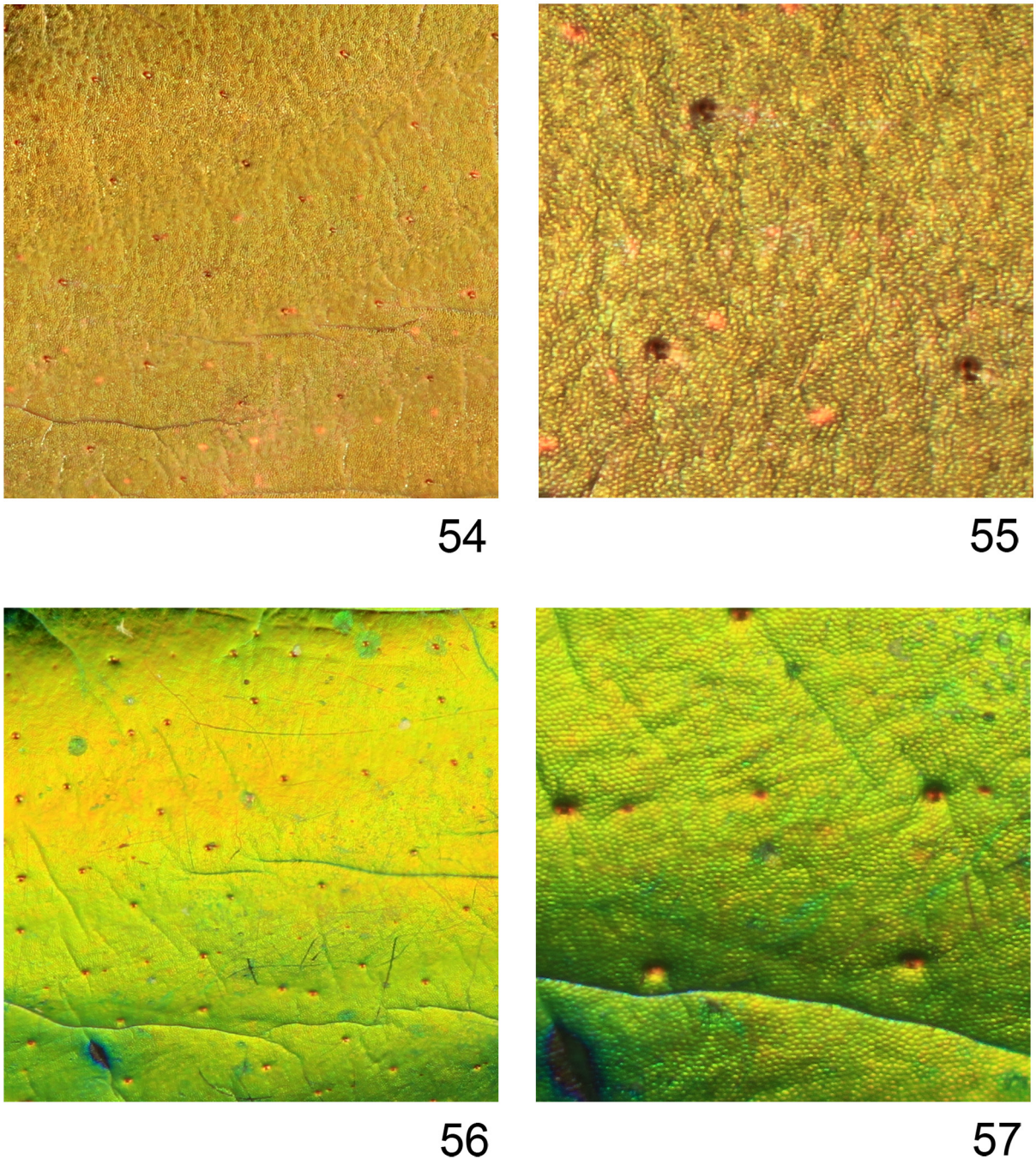
Thorax: pronotum strongly convex, usually distinctly dimpled near lateral angles, shape typical for *Lamprima*, almost hexagonal but sides slightly concave anterior to greatest width at just behind middle, anterior margin truncate with slightly protruding anterior angles, basal margin strongly sinuate, anterior and posterior angles obtuse, anterior margin narrower than basal margin, margination complete, laterally without crenulation, in eastern specimens, partially or entirely shallowly crenulate in small western and South Australian specimens. Pronotum usually broader than elytra in Queensland and New South Wales, usually narrower than elytra in Tasmania, South Australia and Western Australia (Fig. 101); punctures of disc small and relatively indistinct except at anterior of midline in large specimens from northern Queensland, otherwise distinct but much smaller than on head in large specimens and as large as on head in small specimens, separated by 0–6 diameters. Hypomeron finely and sparsely punctate in posterior half, shallowly wrinkled in anterior half, with mostly recumbent setae; prosternum strongly and closely punctate, with mostly recumbent setae; scutellum transversely semi-ovate to heart-shaped, with sparse small punctures or scattered large, basal punctures in some western specimens. Elytra with or without small tubercle at base of epipleural upper margin, slightly expanded posterior to humeri, then contracted to rounded apices, sides narrowly explanate in posterior 2/3; elytra usually distinctly bevelled at base to accommodate base of pronotum; elytral punctures always much smaller than on pronotal disc but geographically variable, minute and sparse in northern Queensland (in some specimens inconspicuous at x25 magnification), slightly more conspicuous south to Tasmania (separated by approximately 5–10 diameters), then increasing in breadth and depth to Western Australia where separated by 3–6 diameters; elytra shallowly irregularly strigose, with fewer longitudinal than oblique grooves, the latter variable in density, all strigosity deeper in some western and southern specimens; meso-metaventral process with scattered recumbent setae, and shiny, sides usually slightly concave, shape of apex geographically variable (Fig. 108), from sharp and prominent, 60–80º in lateral view, in northern Queensland, to at least right-angled and usually blunt and rounded, approximately 100º in lateral view, in most specimens from Victoria, Tasmania, South Australia and Western Australia, with intermediates in southern Queensland and New South Wales; mesanepisternum with sparse large punctures, Protibia with pair of curved elongate apical teeth, similar sized, and external margin with 3–5 well-spaced, triangular, acute, angled teeth, confined to apical half of tibia in some large specimens; inner lobe of protibia large and rounded, with basal dense tuft of convergent red setae and anterior expanded spur; protibial spur expanded, but geographically variable (Figs 66–75, 100), width 65–85% of length in specimens from northern Queensland to eastern Victoria and Tasmania, width 25–65% of length from western Victoria to Western Australia; puncturation of upper surface of protibiae geographically variable: almost always with two strongly punctate striae in Western Australia, South Australia and western Victoria (Figs 69–75), and usually with only one finely punctate stria in northern Queensland, with both types present in New South Wales, eastern Victoria and Tasmania (Figs 66–68); short recumbent setae arising from tibial punctures, and tuft of elongate setae at tarsal insertion; mesotibiae and metatibiae with 0–6 variably sized external teeth, generally larger in south and west, smaller in north and east.



FIGURES 36–44. Female *Lamprima aurata* Latreille, 1804, dorsal of head and pronotum: 36, Cairns, northern Queensland; 37, Garradunga, northern Queensland; 38, Mount Tambourine, southern Queensland; 39, North Ryde, central New South Wales; 40, Lilyvale, central New South Wales; 41, Little Desert, Victoria; 42, Kingston, Tasmania; 43, Colurandol, South Australia; 44, Pemberton, Western Australia.



FIGURES 45–53. Male *Lamprima* species, mandibles, lateral view: 45, *L. adolphinae* (Gestro, 1875), elongate mandible form; 46, *L. adolphinae*, short mandible form; 47, *L. aenea* (Fabricius, 1792); 48, *L. aurata* Latreille, 1804, elongate mandible form, northern Queensland; 49, *L. aurata*, New South Wales, large male; 50, *L. aurata*, New South Wales, small male; 51, *L. aurata*, Western Australia; 52, *L. imberbis* Carter, 1926, holotype; 53, *L. insularis* W.J. Macleay, 1885. Figure 52 courtesy Peter Hudson, South Australian Museum.



FIGURES 54–57. Male *Lamprima* species, elytral disc microsculpture, at low and high magnification: 54–55, *L. adolphinae* (Gestro, 1875); 56–57, *L. aurata* Latreille, 1804. Large punctures approximately 25 microns in diameter.

Abdomen: sides of ventrites I–V similar to pterothoracic venter, with dense small punctures (partly coalescent, interspaces less than diameters) and setae; middle third of ventrites more sparsely punctate (insterspaces = several diameters); surface ventrites microreticulate, dull; apex ventrite V truncate to shallowly concave. Genitalia: apical half of phallobase dorsally with irregular short oblique ridges or tubercles either side of shallow median groove, apical margin with V-shaped notch, deepened at base; venter of phallobase smooth or with scattered, minute spicules, apex more deeply notched; parameres setose dorsally, tips triangular but usually incurved; penis with oblique basal ridges, apex of penis shorter than apices of parameres.

Female. As male, except: length 14–26 mm; pronotum and elytra brilliantly shiny, with faint microreticulation on discs, and pronotum laterally micropunctate; colour geographically variable (Fig. 107), pronotum and elytra

bronze, dark green, green, coppery, dark purple, blue, elytra sometimes edged in different hue from disc, or rarely pronotum and elytra black with metallic punctures and sides, but blue more frequent in northern Queensland and southern and western specimens usually relatively dark; head almost always strongly contrasting with pronotum, usually coppery red or purple. Head strongly and densely punctate, at least anterior half, with most punctures separated by narrow ridges; pronotum strongly and densely punctate, punctures as large as on head or slightly smaller; interspaces 0–2 puncture diameters on pronotal disc, punctures often confluent in southern and western specimens; pronotum narrower than elytra at widest point; head with laterally prominent 75–90º anterior angles, apices of smooth ridges rounded not projecting. Antennomere 3 quadrate, 4–6 transverse, 6 with sharp outer ridge, sometimes also 4 and 5; dorsally visible part of mandibles shorter than head; mandibles in dorsal view with elongate-rectangular or triangular dorsal tubercle from base to almost half mandible length, remainder of dorsal surface excavate with sharp outer edge; pronotum lateral marginal crenulation geographically variable: usually entirely, distinctly crenulate in western and southern specimens, basal half often complete, or irregularly notched, in northern Queensland and New South Wales; meso-metaventrite process geographically variable (Fig. 109), usually pointed in northeastern localities and usually right-angled in southern and southwestern localities. Outer edge protibia with 6–8 triangular teeth, generally increasing in size from base to apex, inner edge without internal lobe; outer edges mesotibiae and metatibiae with 5–7 prominent spines; venter shiny, otherwise similar to male; apex ventrite V rounded; tergite IX usually with evenly rounded transparent apex (specimens examined from northern and southern Queensland, northern and central New South Wales, western Victoria, Tasmania, Western Australia) rarely with right-angled apex (specimen from Kangaroo Island). Gonocoxites transverse, inner edges slightly and outer edges strongly expanded from base; spermatheca variable, from narrow and strongly bent (J-shaped) to broad and straight; spermathecal duct long and densely coiled.

Taxonomy. *Lamprima aurata* is one of the most published species of Australian beetle and its taxonomic history is complex: 26 different species rank names have been used for this insect, 25 of which are available.

The earliest record of *L. aurata* is under the name *Lucanus aeneus*. Schreibers (1802) provided a remarkably detailed description of *Lucanus aeneus* with illustrations of two male mandible varieties (Schreibers 1802: plate 19, figures 1, 9). One of these is correctly identified as *L. aenea* but the other, unnamed by Schreibers, is *L. aurata*. Schreibers noted that *L. aenea* occurred in New Holland and Norfolk Island (Schreibers 1802: 188). Donovan provided colour illustrations of both types of male, noting that *L. aenea* was common at Sydney (Donovan 1805: [unpaginated] and plate 1). MacLeay in a catalogue written in Latin, listed this form as "var caerulea", the sky blue form, of Donovan (MacLeay 1819: 101). This statement in Latin by MacLeay has been misinterpreted by subsequent authors as notification of a formal name provided in Donovan's publication (which would predate Latreille's name *L. aurata* by 12 years). We have seen three copies of Donovan's work and all name *L. aeneus* only, as reported by Moore & Cassis (1992). In Westwood's catalogue, "*L. coeruleus* Donovan, 1805" is listed as a synonym of *L. latreillii*, with type locality Swan River. Significantly, Boileau (1913) was unable to find any Donovan type material in BMNH or OXUM. The name, as *L. aenea* variety *caerulea,* or *L. caerulea*, or *L. coerulea*, is listed as a junior synonym of *L. latreillii* by Parry (1864), Harold (1868) and Benesh (1960). However, Moore & Cassis (1992: 6) questioned the availability of this name. Since no description was given, this is a *nomen nudum* by Hope in Westwood, wrongly attributed to Donovan. However, Benesh and Moore & Cassis overlooked Boileau's description of *L. coerulea* in 1913, which gave the name availability, although being described as a junior synonym of *L. latreillii*.

Latreille placed *L. aenea* in *Lamprima* (Latreille 1804b) and later (Latreille 1817) seems to have been the first to separate the mainland and Norfolk Island species by name, but he described the male and female of the mainland form as two different species, *L. aurata* and *L. cuprea*. W.S. MacLeay (1819) redescribed *L. aurata* and *L. aenea*, synonymised *L. aurata* and *L. cuprea*, and described two new species: *L. latreillii* (Figs 78–79) and *L. pygmaea*. Boisduval (1835) redescribed *L. aenea*, synonymised it with *L. aurata*, *L. latreillii* and *L. pygmaea* and described *L. fulgida*, the first species to be described from the New Guinea archipelago. Boisduval's synonymy may have been preceded by Guérin-Méneville who accurately illustrated the male of *L. aurata*, but named it *L. aenea* (Guérin-Méneville 1832, plate 27; see Cowan 1971, for dating of this work). Reiche (1841) followed Boisduval in synonymising all previous *Lamprima* species, including *L. fulgida*, as varieties of *L. aenea*, but added *L. micardi*, distinguished by its narrow male protibial spurs. W.J. Macleay later commented "it is of course evident that M. Reiche had never seen true specimens of these insects" (W.J. Macleay 1885a: 132). Erichson (1842) rejected the synonymy proposed by Boisduval and Reiche, identified a new distinguishing character, the mesoventral process,

treated *L. latreillei* [sic], *L. fulgida*, *L. micardi* and *L. pygmaea* as valid, and described four new species: *L. splendens*, *L. fulgida*, *L. rutilans* and *L. viridis*.

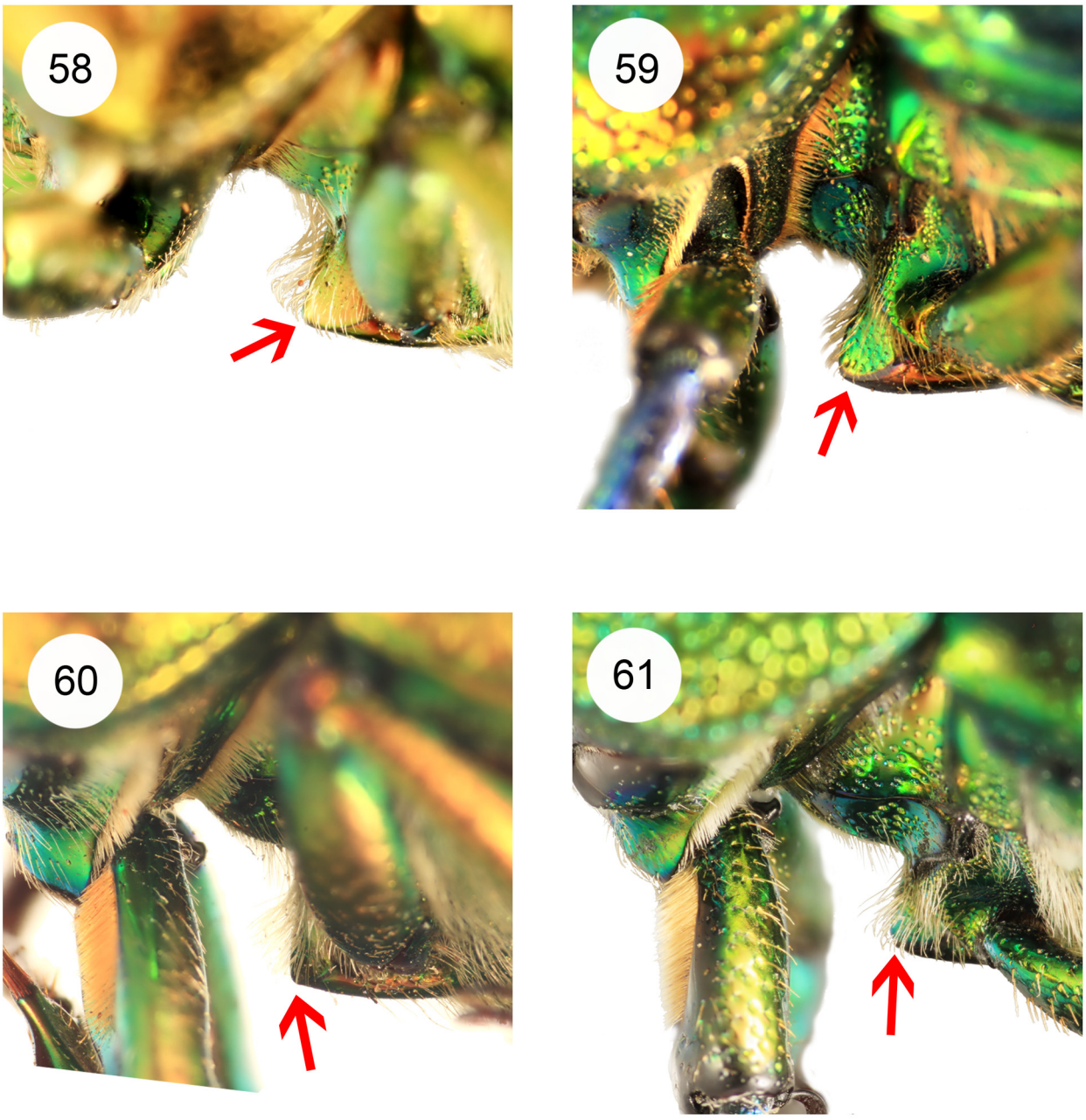
Westwood (1845) published the first of several lucanid catalogues in the mid nineteenth century. As noted by W.J. Macleay (1885a), this list of names makes little sense, as it includes unpublished manuscript names and omits species described in its own appendix. Westwood appears to recognise eight species as valid, including the described species *L. aenea* (with *L. aurata* and *L. cuprea* as junior synonyms), *L. latreillii* and *L. micardi*, and four new species: *L. tasmaniae*, *L. purpurascens*, *L. nigricollis* and *L. sumptuosa*. The catalogue also includes three *nomina nuda*: *L. coerulea*, *L. schreibersi* and *L. insularis*. The name *Lamprima schreibersi* is dealt with under *L. aenea* (q.v.). Burmeister (1847) reviewed *Lamprima*, apparently in ignorance of Westwood (1845). He split *Lamprima* into two formal groups: protibial spur fan shaped or narrow. Burmeister recognised nine species, seven described: *L. latreillii*, *L. rutilans*, *L. splendens*, *L. fulgida*, *L. aenea*, *L. viridis*, and the new species *L. varians* and *L. cultridens*. *Lamprima aurata* was ascribed to W.S. MacLeay, not Latreille, and placed in synonymy with *L. aenea* (Burmeister 1847: 414). Burmeister noted that *L. splendens*, for which Erichson had failed to give a type locality, was collected in northern New Holland (Burmeister 1847: 413). Germar (1848) redescribed *L. varians*. Reiche (1853) reviewed Burmeister and Erichson's works, rejecting them, and proposing that only three species of *Lamprima* were valid: *L. latreillii*, including *L. rutilans*, *L. splendens* and *L. fulgida*; *L. aenea*, including *L. viridis*; *L. micardi*, including *L. varians* and *L. cultridens*. Reiche also ignored or was unaware of the catalogue by Westwood. Thomson (1862) published a catalogue of his collection (so, not a comprehensive checklist), which included that of Reiche (Parry 1864: 3), in the process describing a feebly distinguished new species, *L. amplicollis*, and used the names of Westwood (1845), providing a different list of synonyms from everybody else. He listed *L. fulgida* as a senior synonym of *L. splendens* and *L. varians*.

A more serious attempt at cataloguing the Lucanidae was made by Parry (1864). He attempted to reconcile all names at that time, however he did not distinguish between available and unavailable names, listing several *nomina nuda*. There are also several tentative synonyms in this list, represented by question marks. Parry recognised eight species, none new: *L. latreillii* (including Thomson's *L. amplicollis*), *L. aurata*, *L. splendens*, *L. rutilans*, *L. aenea*, *L. micardi*, *L. varians*, *L. sumptuosa*. Parry's catalogue was shortly followed by that of Harold (1868). He listed nine species of *Lamprima*, largely copying Parry but without his question marks, except that *L. cultridens* and *L. nigricollis* are treated as valid, not synonyms of *L. micardi*, *L. purpurascens* and *L. varians* are listed as junior synonyms of *L. micardi*, and the *nomen nudum L. insularis* is listed under *L. micardi*. Parry (1870) revised his catalogue, reducing the number of species to five: *L. latreillii*, *L. aurata* (including *L. splendens* and *L. rutilans*), *L. varians*, *L. aenea*, *L. micardi* (including *L. nigricollis* and *L. sumptuosa*).

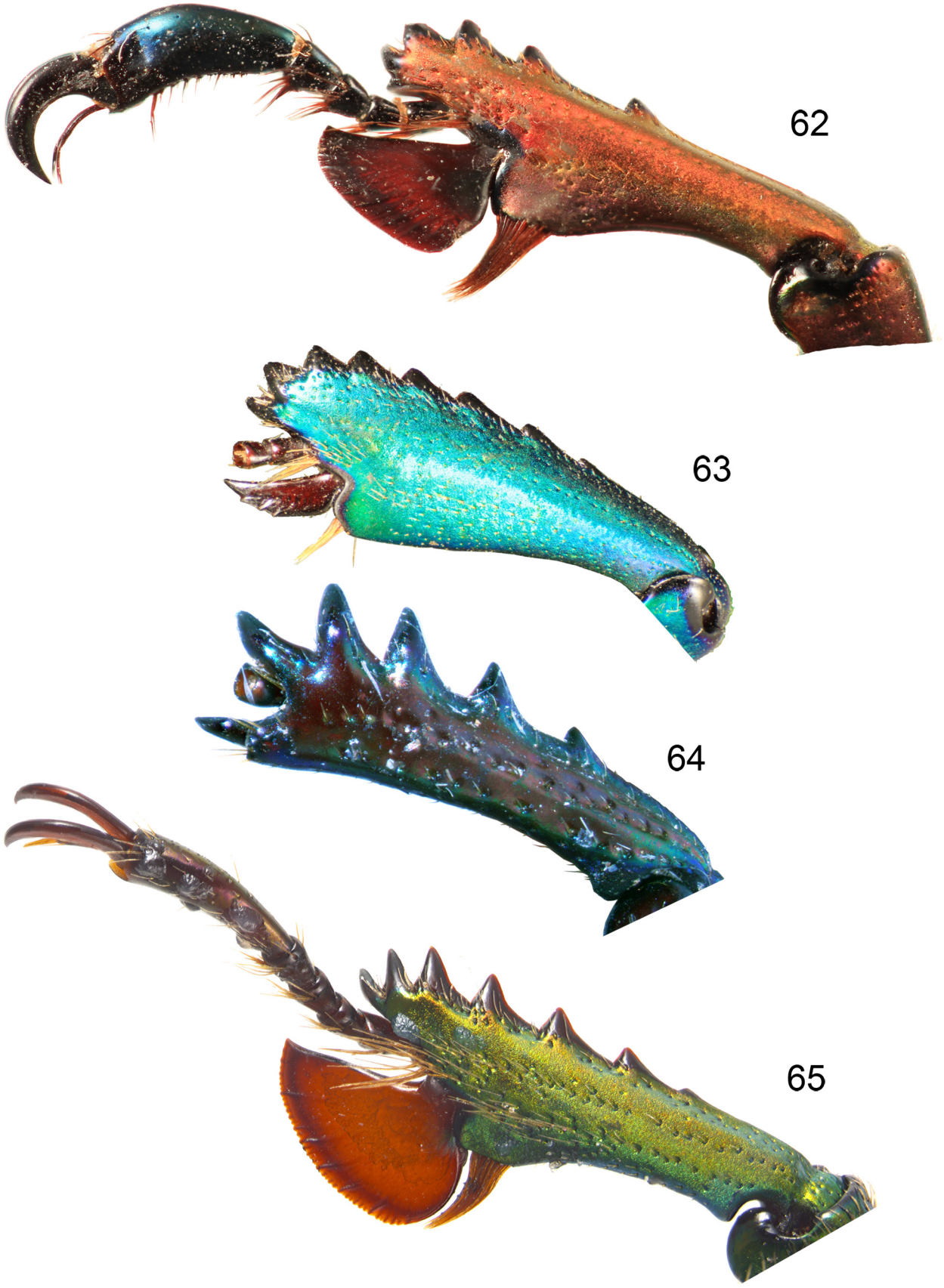
Until 1870, all taxonomic activity on *Lamprima* had been by non-Australian workers. The apparently stability of Parry's checklist was rudely shattered by the work of William Sharp MacLeay's cousin William John Macleay, based in Sydney, who in the space of 14 years described an additional seven species or subspecies (MacLeay 1871; Macleay1885a). Macleay revised all the described *Lamprima* species in 1885. He removed *L. cuprea* and *L. viridis* from synonymy with *L. aenea*, and *L. varians* from synonymy with *L. micardi* (overlooking Parry 1870), and described *L. latreillii sericea*, *L. nigripennis*, *L. violacea*, *L. minima* and *Neolamprima mandibularis*. In the same year, Macleay decided to remove *L. muelleri* from *Lamprima* and placed it in a new genus, *Phalacrognathus*, where it has remained (Macleay 1885c).

Three further species-rank descriptions complete the taxonomic history of *L. aurata*. Male mandible variation in *Neolamprima mandibularis* was described by Lea (1910), noting that small males were identical to *Lamprima* species. Lea (1910, plate 30) illustrated an unusual male specimen with strongly asymmetric mandibles, one typical of *Neolamprima* and the other typical of *Lamprima*. A similar specimen is in AMS (Fig. 18). In the same work, Lea described a new colour variety, *L. aurata mariae* (Lea 1910: 131). Boileau (1913) published a study of lucanid type material in BMNH and OXUM, in which he agreed with the synonymy of Parry. However, by providing descriptions for two hitherto *nomina nuda*, he inadvertently made the names available, with himself as author (*Lamprima coerulea* Boileau, 1913; *L. insularis* Boileau, 1913), although he described both as junior synonyms of other species (Boileau 1913: 216, 217). Nagel (1922) examined specimens of *Neolamprima mandibularis* supplied by Lea and synonymised *Lamprima* and *Neolamprima* based on this material. Nagel (1930) then revised the *Lamprima* species, especially those described by W.J. Macleay. He noted that *L. aurata mariae* was only a colour variety, without taxonomic status, *L. krefftii* was probably a junior synonym of *L. latreillii*, *L. mandibularis* and *L. nigripennis* were junior synonyms of *L. latreillii*, *L. minima* a junior synonym of *L. varians*.

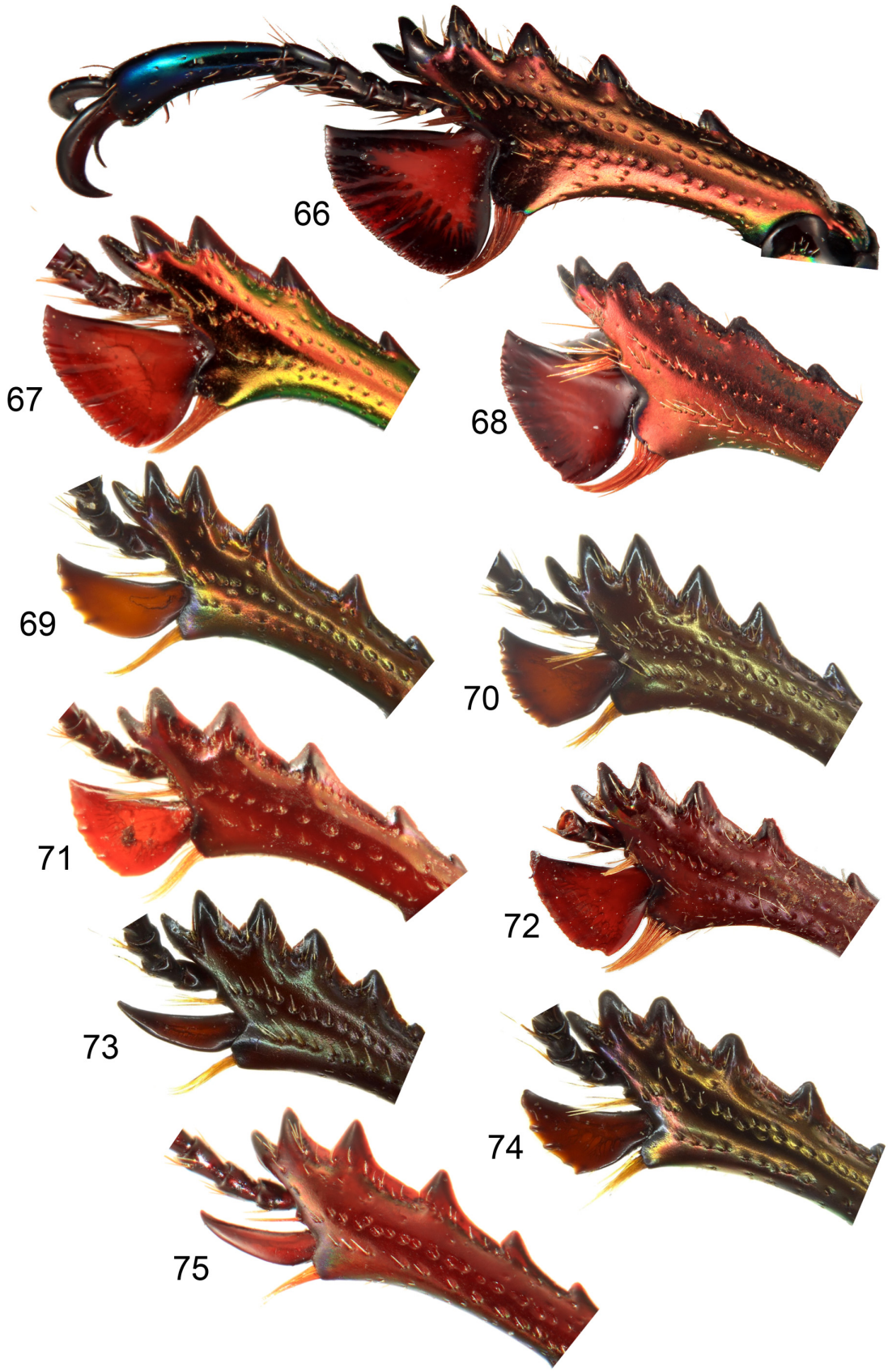
The only significant catalogue since that time has been that of Benesh (1960) in the Coleopterorum Catalogus series. Benesh included all previous names used in *Lamprima*, but did not distinguish *nomina nuda* from available names. His catalogue followed Nagel (1930). De Lisle (1975) stated that *L. viridis* was a junior synonym of *L. aenea*, claiming that this was a new synonym (in ignorance of Boisduval 1835 and Reiche 1841) and without providing evidence for this action. Most of the type material designated by the two Macleays was transferred from the Macleay Museum, Sydney, to the Australian National Insect Collection, Canberra, in the 1970s (Britton & Stanbury 1981). Photographs of syntypes or holotypes of six different W.S. and W.J. Macleay names are provided here, from ANIC and AMS (Figs 77–85). Moore and Cassis (1992) catalogued the Australian *Lamprima*, largely following Benesh, but including the change made by de Lisle (1975). They noted the problematic status of *L. coerulea* and *L. schreibersi* and overlooked the name *L. nigripennis*. The most recent catalogue (Krajcik 2001) also mostly follows Benesh (1960), as modifed by de Lisle (1975), but inexplicably places *L. minima* (type locality: South Australia) in synonymy with *L. micardi* (type locality: Western Australia).



FIGURES 58–61. *Lamprima aurata* Latreille, 1804, lateral view of mesoventrite process: 58, male, northern Queensland; 59, female, northern Queensland; 60, male, Victoria; 61, female, Victoria.

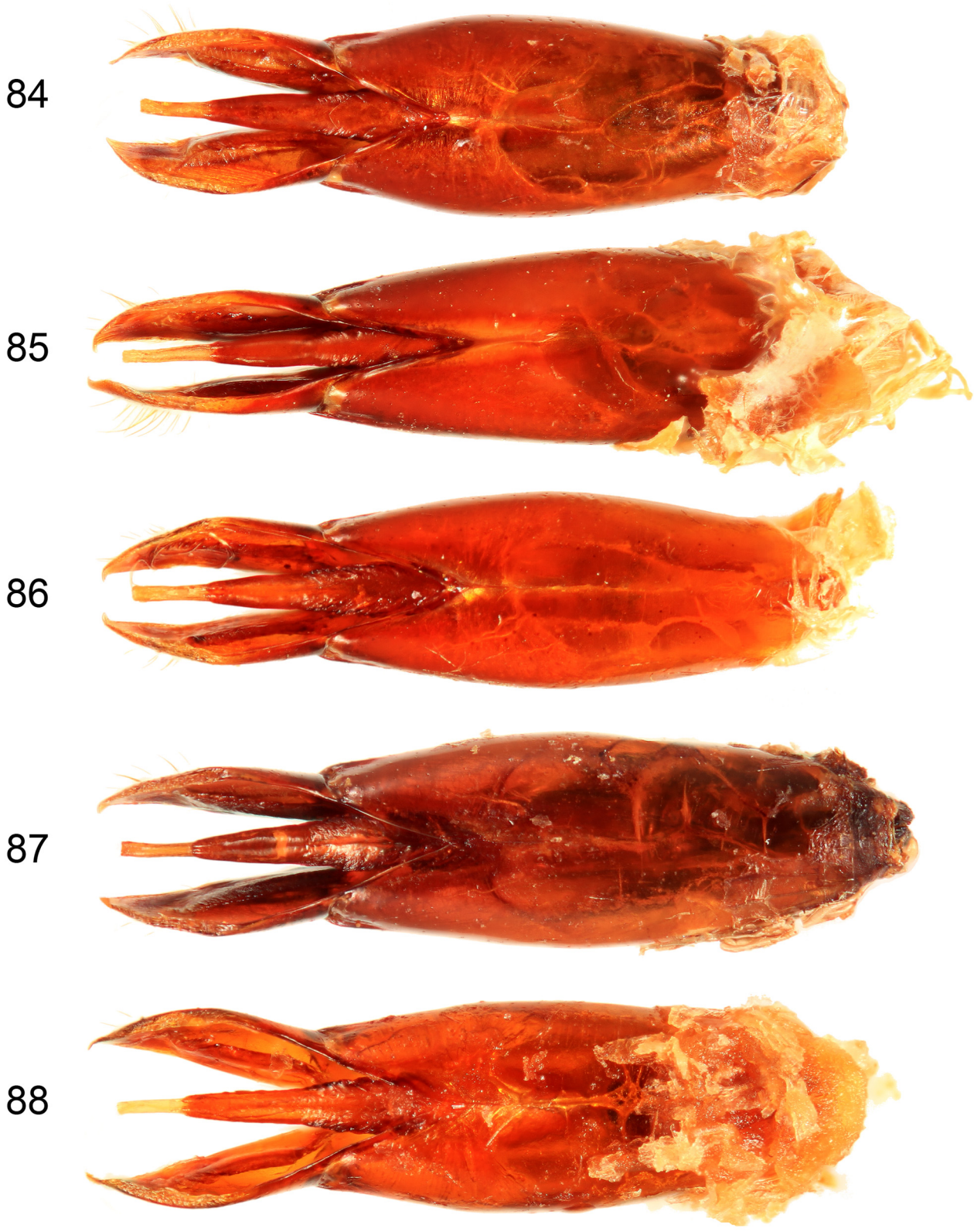


FIGURES 62–65. Male *Lamprima* species, protibiae: 62, *L. adolphinae* (Gestro, 1875); 63, *L. aenea* (Fabricius, 1792); 64, *L. insularis* W.J. Macleay, 1885; 65, *L. imberbis* Carter, 1926. Figure 64 courtesy Peter Hudson, South Australian Museum.



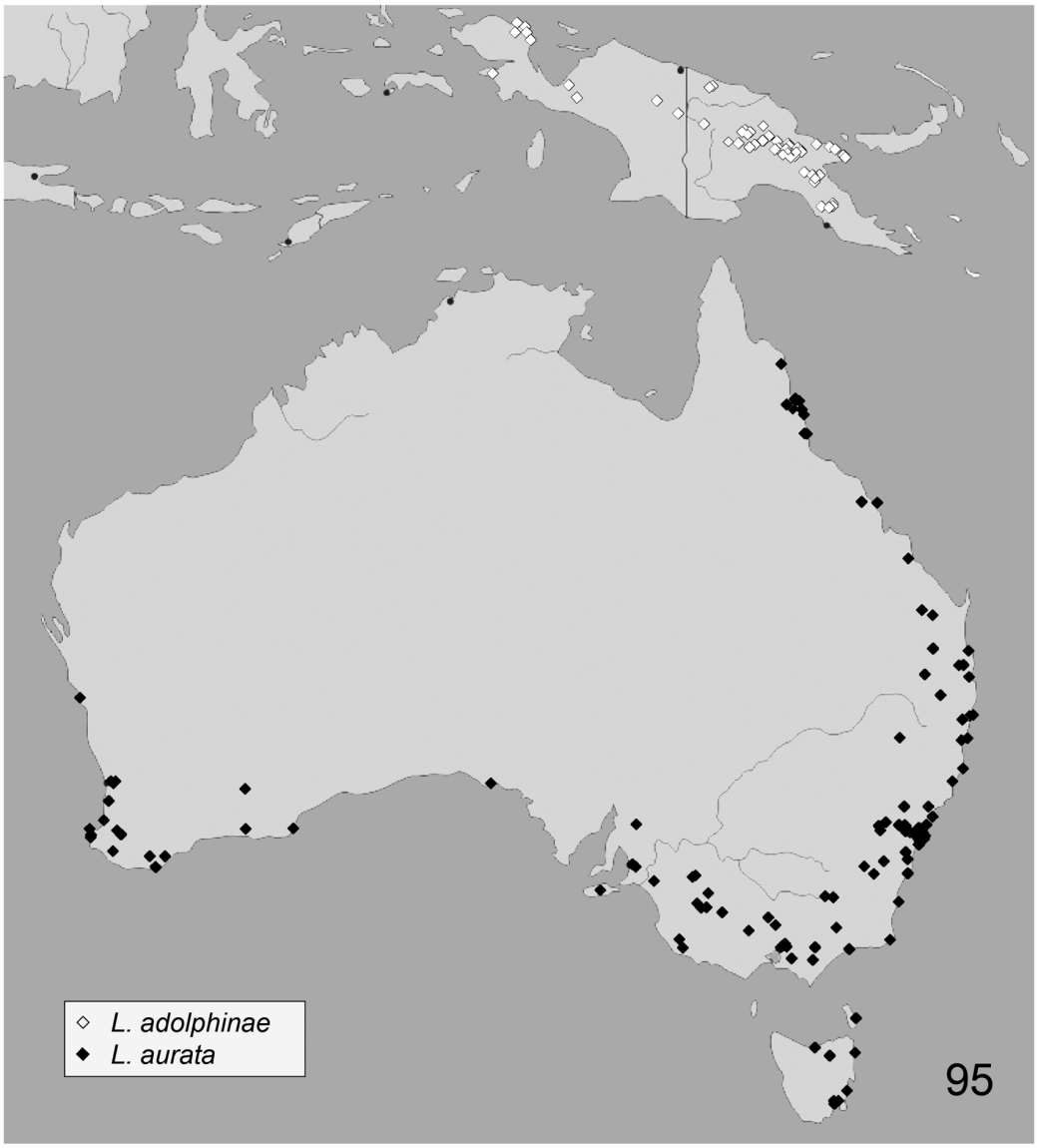
FIGURES 66–75. Male protibia of *Lamprima aurata* Latreille, 1804: 66, Milmerran, inland southern Queensland; 67, Hobbys Yards, inland New South Wales; 68, Kingston Beach, Tasmania; 69, Big Desert, Victoria; 70, Little Desert, Victoria; 71, Adelaide, South Australia; 72, Kangaroo Island, South Australia; 73, Mount Barker, Western Australia; 74, Mount Barker, Western Australia; 75, Perth, Western Australia.

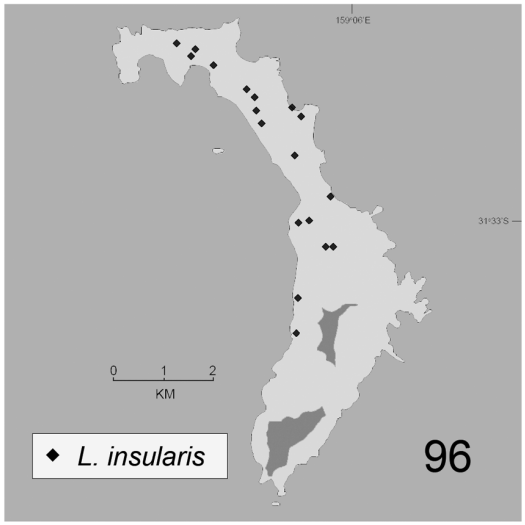
FIGURES 76–83. *Lamprima* species, aedeagi (ventral, lateral and dorsal): 76, *L. adolphinae* (Gestro, 1875); 77, *L. aenea* (Fabricius, 1792); 78, *L. aurata* Latreille, 1804, northern Queensland; 79, *L. aurata*, Snowy River, New South Wales; 80, *L. aurata*, Kingston, Tasmania; 81, *L. aurata*, South Australia; 82, *L. aurata*, Cue, Western Australia; 83, *L. insularis* W.J. Macleay, 1885.



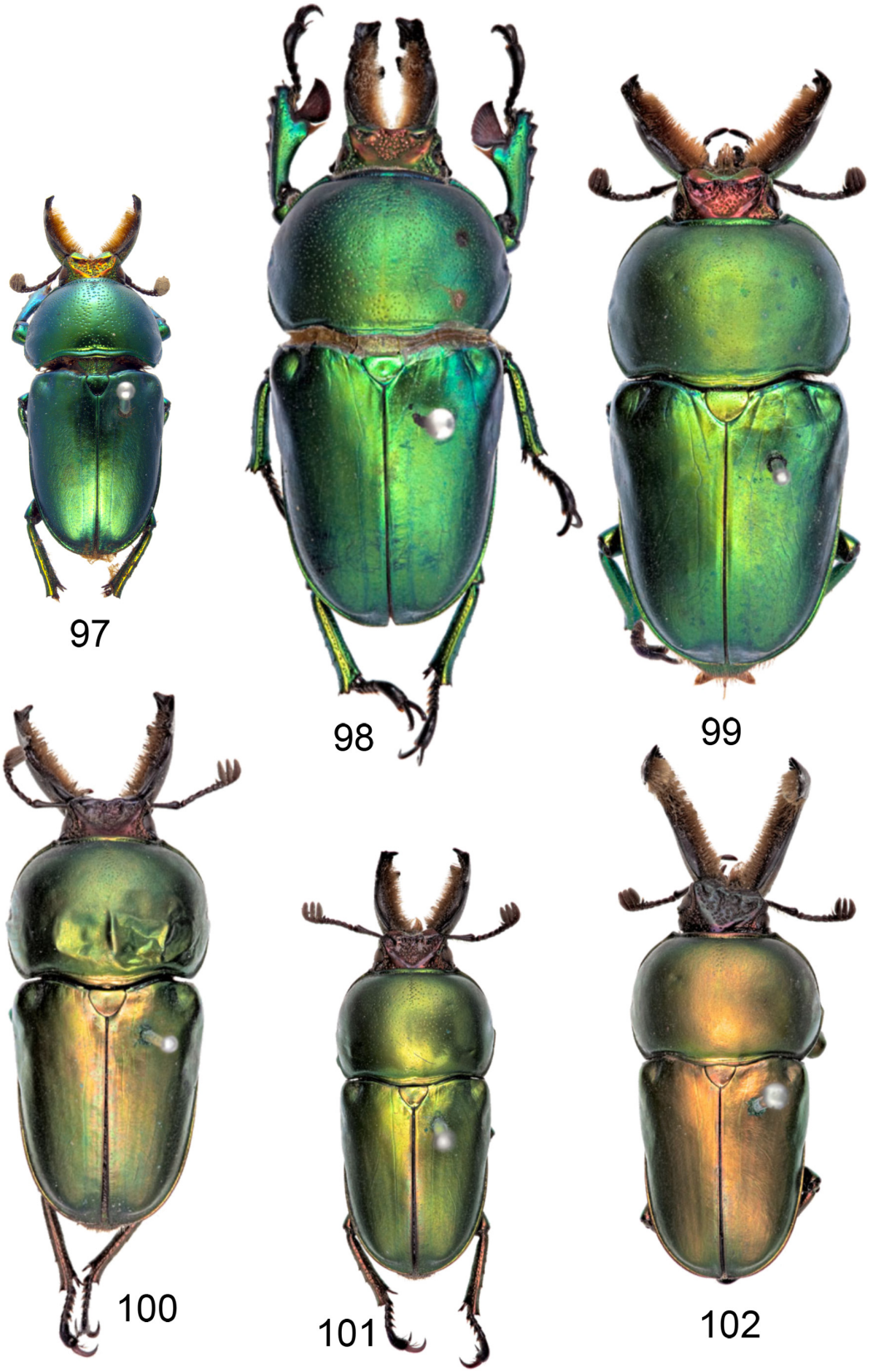
FIGURES 84–88. *Lamprima aurata* Latreille, 1804, aedeagi in ventral view: 84, Murtoa, Victoria; 85, Willala, South Australia; 86, Kangaroo Island, South Australia; 87, Kalamunda, Western Australia; 88, Carraranup, Western Australia.

FIGURES 89–94. *Lamprima* species, ovipositor and spermatheca: 89, *L. adolphinae* (Gestro, 1875); 90, *L. aenea* (Fabricius, 1792); 91, *L. aurata* Latreille, 1804 (Bridport, Tasmania); *Lamprima* species, spermathecae: 92, *L. aurata* (Ourimbah, central New South Wales); 93, *L. aurata* (Nadgee, south New South Wales); 94, *L. insularis* W.J. Macleay, 1885.

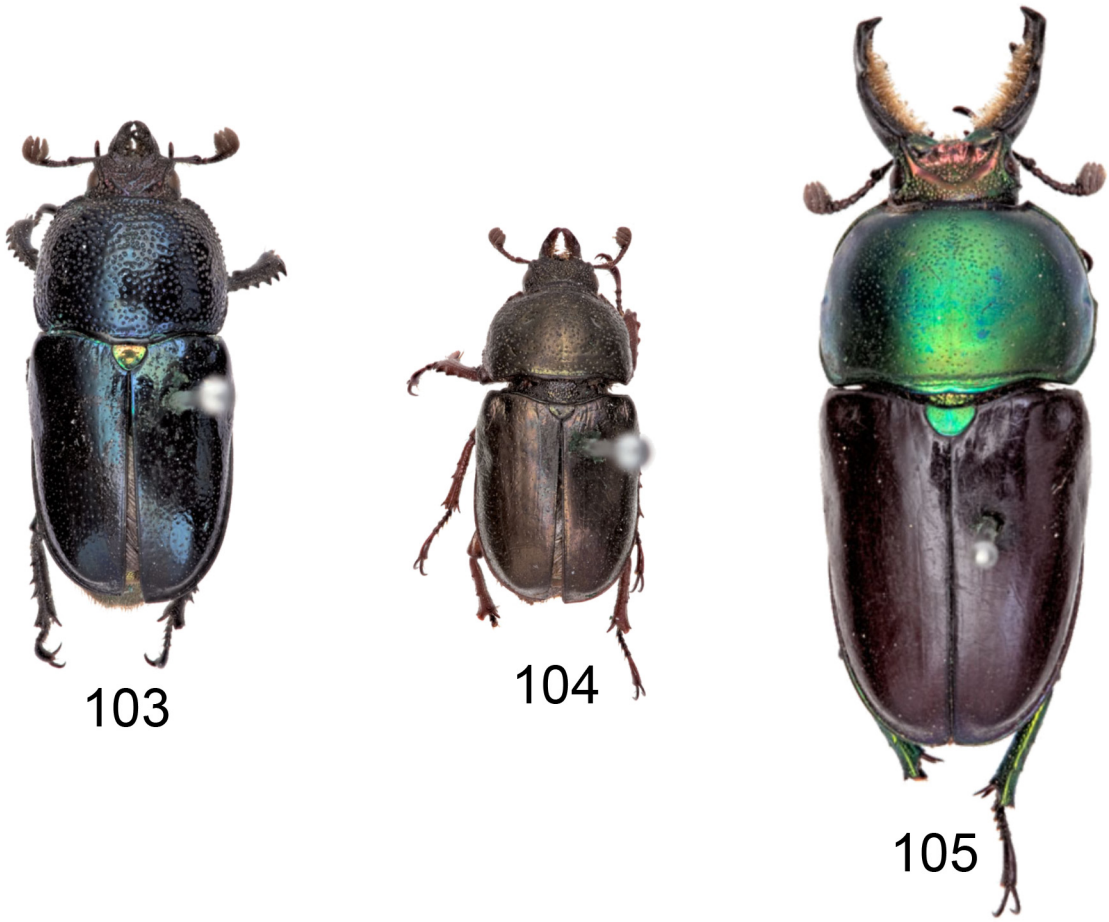




FIGURES 95–96. 95, Map of Australia and New Guinea to show *Lamprima* species: ◇= *L. adolphinae* (Gestro, 1875), ◆= *L. aurata* Latreille, 1804. 96, Map of Lord Howe to show distribution of *Lamprima insularis* W.J. Macleay, 1885 (shaded area = 500 + m)



FIGURES 97–102. Habitus photographs of *Lamprima* Latreille, 1804, type material in Australian collections: 97, *L. krefftii* W.J. MacLeay, 1871, holotype; 98, *L. latreillii* W.S. MacLeay, 1819, lectotype; 99, *L. latreillii* W.S. Macleay, paralectotype; 100, *L. latreillii sericea* W.J. Macleay, 1885, lectotype; 101, *L. latreillii sericea* W.J. Macleay, paralectotype; 102, *L. mandibularis* W.J. Macleay, 1885, lectotype. Figures 98–102 courtesy of Cate Lemann, Commonwealth Scientific and Industrial Research Organisation, 2017. All images to same scale.



FIGURES 103–105. Habitus photographs of *Lamprima* Latreille, 1804, type material in Australian collections: 103, *L. mandibularis* W.J. Macleay, 1885, paralectotype; 104, *L. minima* W.J. Macleay, 1885, holotype; 105, *L. nigripennis* W.J. Macleay, 1885, holotype. All figures courtesy Cate Lemann, Commonwealth Scientific and Industrial Research Organisation, 2017. All images to same scale.

Lectotypes are designated herein for *L. latreillii*, *L. latreillii sericea*, and *L. mandibularis*, to fix the identity of these names.

Geographic variation and justification for synonymy. The complex taxonomic history of *L. aurata* is partly explained by poor taxonomy, which has been focussed on variation in trivial features such as colour, size, body proportions and surface sculpture. These characters are all continuous variables in *L. aurata* but also appear to vary geographically. The genitalia of *Lamprima* are not particularly helpful for resolving this issue as they show little variation within the genus, but all specimens of *L. aurata* have a short penis relative to the length of the parameres (Figs 78–82, 84–88). This distinguishes *L. aurata* from *L. adolphinae*. The aedeagus of *L. aenea* is almost identical to that of *L. aurata* but differs by the much smoother surface of its basal piece (Fig. 77). The aedeagi of *L. insularis* and *L. aurata* are essentially identical except that the apex of the penis of *L. insularis* may reach the apices of the parameres. In contrast to the conservatism of the male genitalia, the spermatheca of *L. aurata* is variable in shape, even within populations.

Lamprima aurata avoids the wettest and driest vegetated habitats in Australia. It is absent from the wettest forests of northern Queensland and western Tasmania and is also absent from the monsoonal tropical woodlands and vine-thickets of the Northern Territory, Western Australia and northwestern Queensland. *Lamprima aurata* has not penetrated deeply into the continent, but occurs up to 400 km inland in the semi-arid shrublands of South Australia, Victoria and Western Australia, and in areas with less than 400 mm rainfall per annum (Anonymous 2017d), most of which falls in winter. Although widespread on the eastern and southern coasts of Australia, *L. aurata* is only recorded at Mackay in the 700 km gap between Rockhampton and Ingham, and is absent from the 850 km long Nullarbor Plain. The arid and treeless Nullarbor is relatively recent in origin, as it was woodland only

250,000 years before present (Prideaux *et al*. 2007), so the isolation of the Western Australian population of *L. aurata* may be a relatively recent phenomenon. The isolation of Tasmania from mainland Australia is even more recent (14,000 years before present; Lambeck & Chappell 2001); it is therefore not surprising that there is no evidence of morphological divergence between the Tasmanian and Victorian populations.

The wide distribution of *Lamprima aurata* and almost continuous variation in morphological characters suggest that at least some variation is linked to climatic variables, as roughly correlated by state distribution, from northern Queensland south to Tasmania and from Tasmania west to Western Australia. Charts of selected variables versus distribution are presented here, based on examination of the collection in AMS. In male (Fig. 106) and female (Fig. 107) *L. aurata*, colour varies both longitudinally, from northern Queensland to Tasmania, and latitudinally, from Victoria to Western Australia. However the variations in distribution are not correlated between the two sexes. Variation in mesosternal process shape differs strongly by latitude in males (Fig. 108) but much less so in females (Fig. 109). Male protibial spur shape is almost invariable latitudinally on the east coast of Australia (Figs 66–68, 110), but varies significantly longitudinally along the south coast (Figs 68–75). Even simple body part ratios, such as width of pronotum against elytra in males, varies both longitudinally and latitudinally (Fig. 101). There is therefore evidence suggesting clinal variation in several morphological attributes of *Lamprima*. The golden green, elongate-mandibled, broad-spurred form (*L. mandibularis*) is the northern extreme of variation, and the dull brown, small-mandibled and narrow-spurred form (*L. micardi*) is the western extreme of variation. Previously, the extremes of variation have been treated as if they are geographically or morphologically disjunct, leading to the description of the numerous synonyms of *L. aurata*.

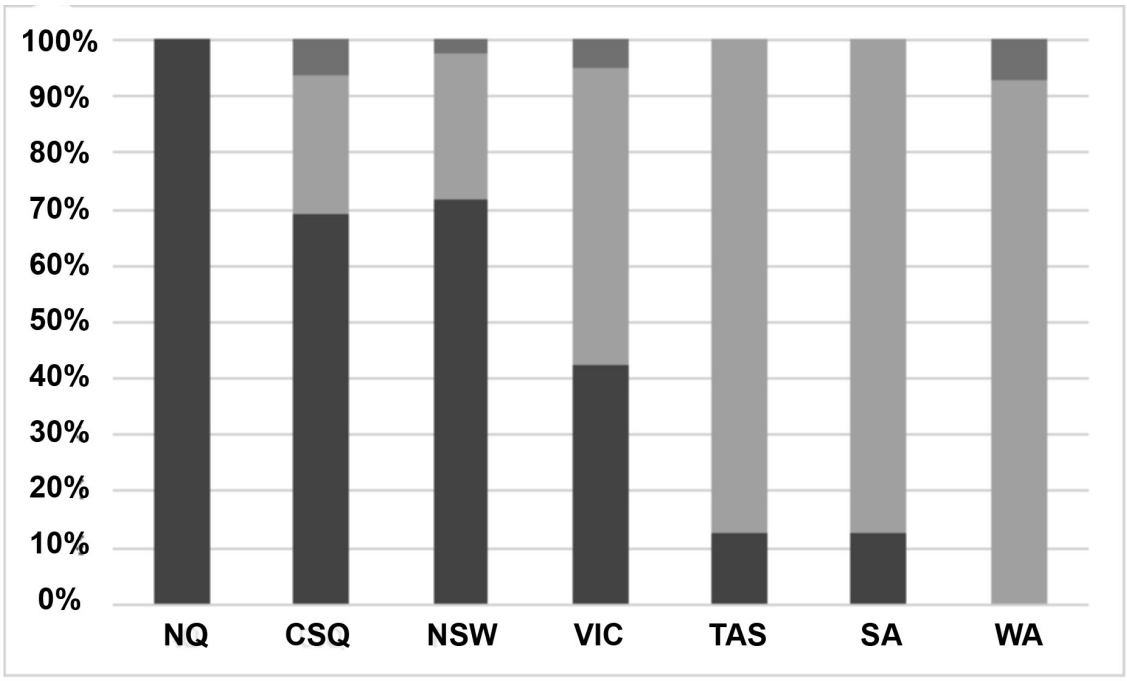
In summary, *Lamprima mandibularis* was described for the large-mandibled males in northern Queensland, *L. latreillii* for specimens with acutely pointed mesosternal processes (predominant in Queensland), *L. varians* for the brown form in South Australia and *L. micardi* for the narrow-spurred form in Western Australia; other names for mainland and Tasmanian *Lamprima* refer to colour varieties, dwarf individuals, presumed isolated populations, or females.

The validity of *L. mandibularis* was undermined when specimens combining both mandible forms were discovered (Lea 1910; Fig. 25). This form has not been considered a valid species since Nagel (1930). Apart from the male mandibles it has all the attributes of *L. aurata*, including protibial spur, head colour, surface sculpture and male genitalia.

The shape of the mesosternal process was supposedly a diagnostic feature for separating *L. aurata* and *L. latreillii* (Macleay 1885a), but Moore (1986) suggested that *L. aurata* and *L. latreillii* "probably deserve no more than subspecific rank" (Moore 1986: 101). As noted above mesosternal shape is a continuous variable that varies as a proportion of populations by latitude (Figs 108–109), furthermore the shape distribution differs by sex. It does not define geographic areas and there is considerable variation in shape in New South Wales and Victorian populations. There are no other features to support separation of *L. latreillii*: male mandibles, male prothoracic legs and genitalia are identica to *L. aurata*. *Lamprima aurata* and *L. latreillei* are therefore placed in synonymy.

The synonymy of *L. aurata* with *L. varians* was implicit in Matthews' review (Matthews 1984) of the South Australian Scarabaeoidea, where only *L. aurata* was listed and *L. varians* (supposedly endemic to South Australia) was ignored. South Australian *Lamprima* specimens (*L. varians*) lack any diagnostic features separating them from *L. aurata* in Victoria. Males are predominantly but not always brown (Fig. 106) and females greenish black (Fig. 107) but neither colour is unique to the region. Male protibial spur shape varies considerably in South Australia (Fig. 110) and is not uniquely shaped. The male genitalia and mandibles are identical to those of *L. aurata*. *Lamprima aurata* and *L. varians* are therefore placed in synonymy.

The population of *Lamprima* in Western Australia is the most isolated in mainland Australia. Several species names have been applied to *Lamprima* from this region (Table 1), of which *L. micardi* is the oldest. *Lamprima* from this area are supposedly distinguished by the narrow, blade-like, male protibial spur and their brown colour in both sexes. Brown or brownish-black colour is widespread in the southern half of Australia (Figs 106–107) and is not useful. The shape of the protibial spur is uniquely narrow in some specimens (Figs 73, 75, 110) but varies, even within single populations (Figs 73–74, two males in a sample from Mount Barker). This variation overlaps with specimens from South Australia and western Victoria (Fig. 69). The mandibles, female morphology and male genitalia of Western Australian *Lamprima* are indistinguishable from those of *L. aurata* from elsewhere (compare Figs 5–14, 25–32, 36–44, 66–75, 76–88). *Lamprima micardi* lacks any uniquely identifying characteristic and is therefore placed in synonymy with *L. aurata*.



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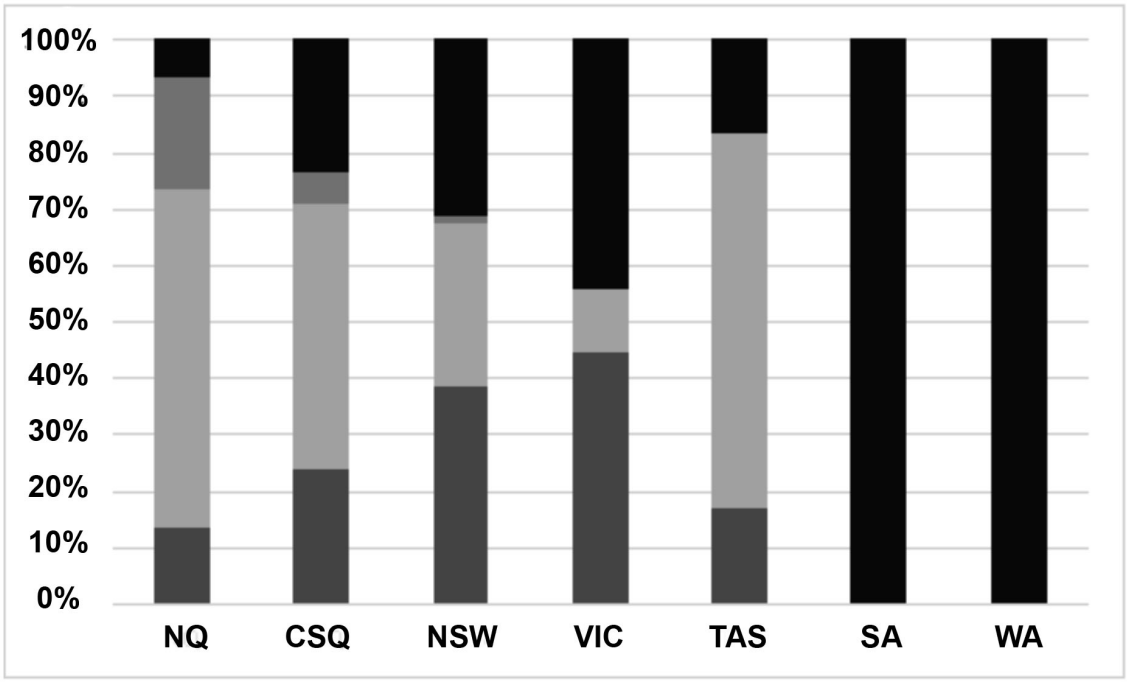
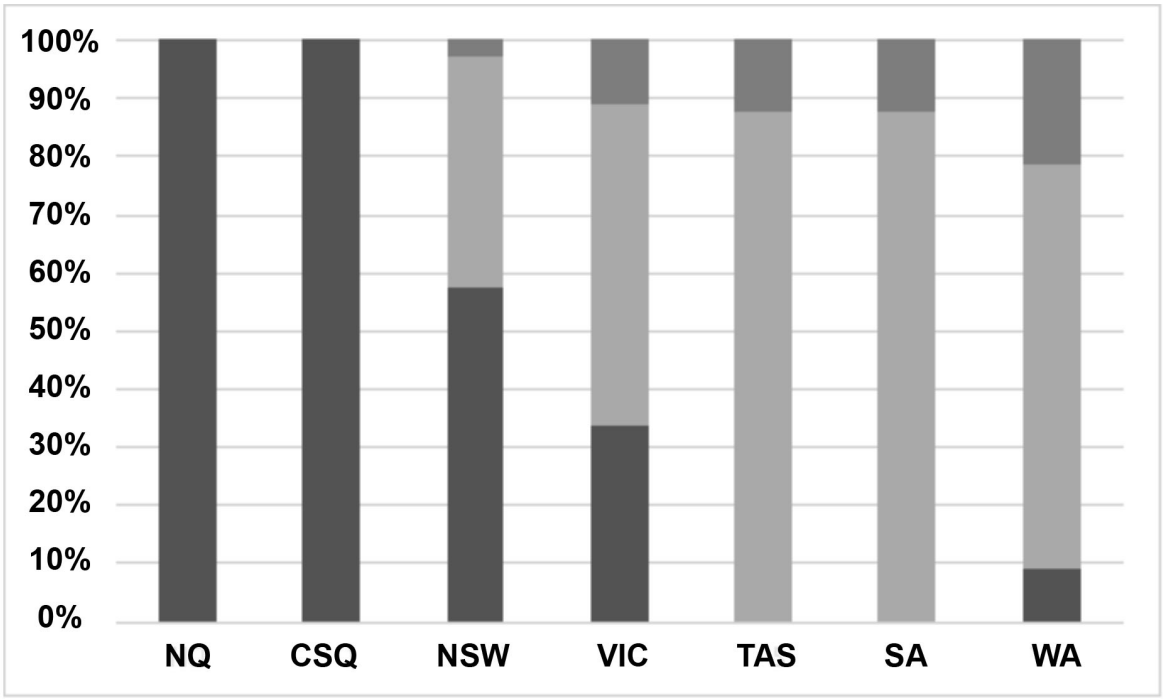


107

FIGURE 106–107. 106, Chart of male colour forms of *Lamprima aurata* Latreille, 1804, against distribution by State. Dark grey = predominantly green; pale grey = predominantly brown; grey = predominantly purplish black. NQ = northern Queensland; CSQ = central and southern Queensland; NSW = New South Wales; VIC = Victoria; TAS = Tasmania; SA = South Australia; WA = Western Australia. 107. Chart of female colour forms of *Lamprima aurata* Latreille, 1804, against distribution by state. Dark grey = predominantly green; pale grey = predominantly brown to ruby-red; grey = predominantly blue; black = predominantly greenish black. NQ = northern Queensland; CSQ = central and southern Queensland; NSW = New South Wales; VIC = Victoria; TAS = Tasmania; SA = South Australia; WA = Western Australia.



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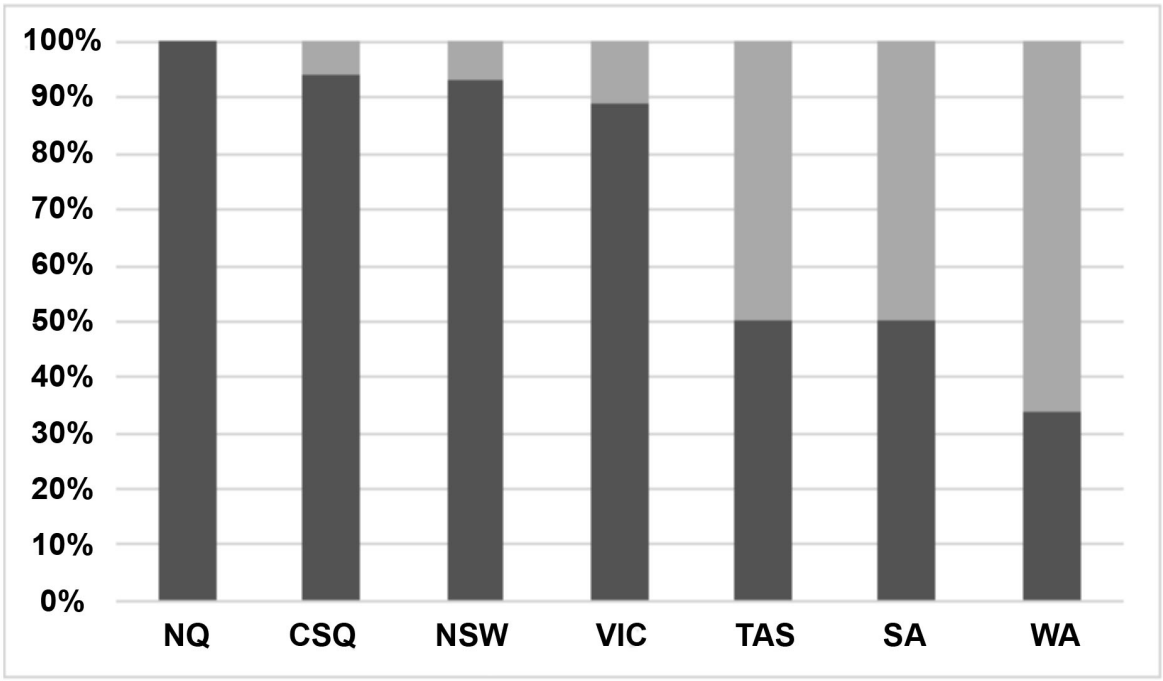
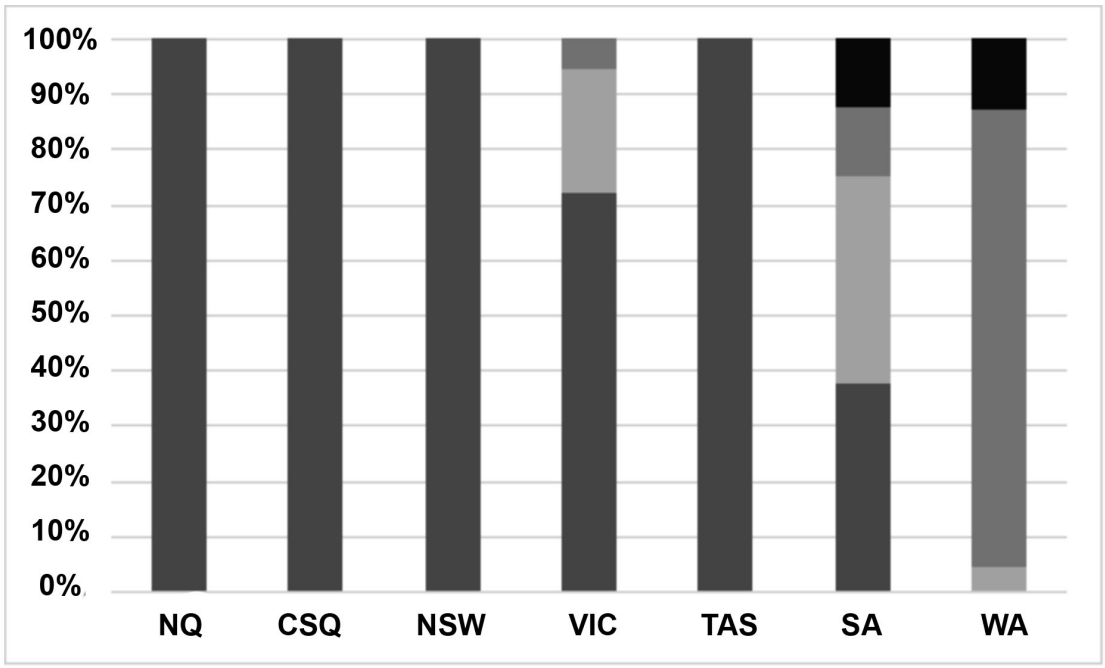
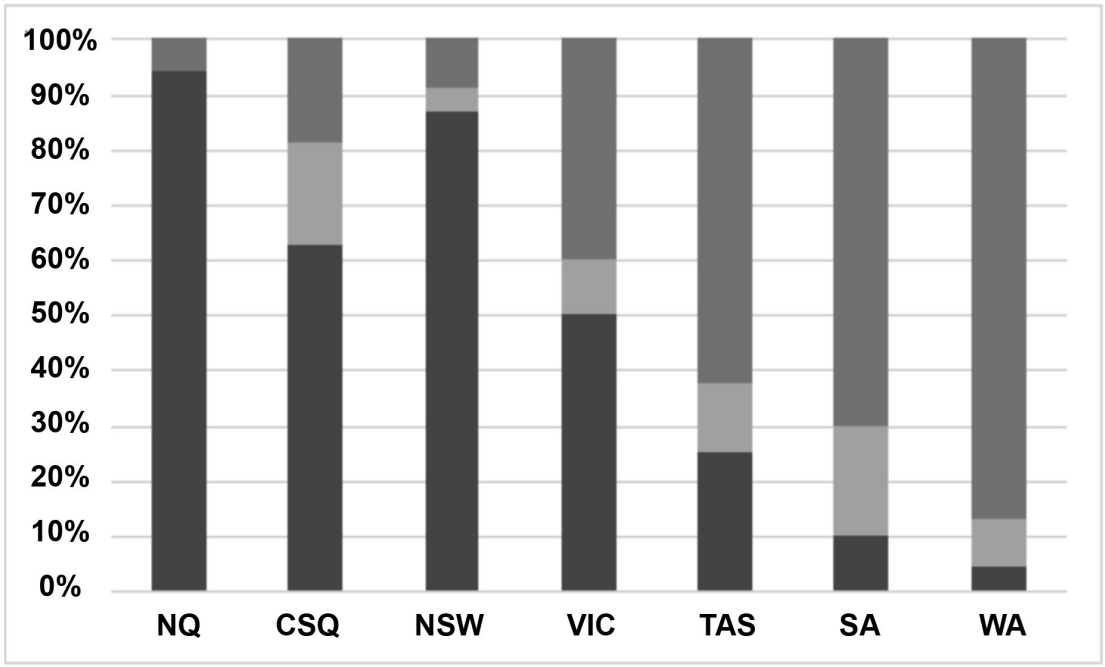


109

FIGURE 108–109. 108, Chart of male mesoventral process shape in *Lamprima aurata* Latreille, 1804, against distribution by state. Dark grey = acute or projecting; pale grey = right-angled; grey = rounded. NQ = northern Queensland; CSQ = central and southern Queensland; NSW = New South Wales; VIC = Victoria; TAS = Tasmania; SA = South Australia; WA = Western Australia. 109, Chart of female mesoventral process shape in *Lamprima aurata* Latreille, 1804, against distribution by state. Dark grey = acute or projecting; pale grey = right-angled. NQ = northern Queensland; CSQ = central and southern Queensland; NSW = New South Wales; VIC = Victoria; TAS = Tasmania; SA = South Australia; WA = Western Australia.



110



111

FIGURE 110–111. 110, Chart of male protibial spur shape in *Lamprima aurata* Latreille, 1804, against distribution by state. Dark grey = width at least 71% length; pale grey = width 51–70% length; grey = width 31–50% length; black = width < 31% length. NQ = northern Queensland; CSQ = central and southern Queensland; NSW = New South Wales; VIC = Victoria; TAS = Tasmania; SA = South Australia; WA = Western Australia. 111, Chart of male body proportion in *Lamprima aurata* Latreille, 1804, against distribution by state. Dark grey = pronotum wider than elytra; pale grey = pronotum and elytra equal in width; grey = elytra wider than pronotum. NQ = northern Queensland; CSQ = central and southern Queensland; NSW = New South Wales; VIC = Victoria; TAS = Tasmania; SA = South Australia; WA = Western Australia.

There has been interest amongst the amateur community in the species status of specimens from Rainbow Beach, southern Queensland, collected in 1995 by an unknown collector (in QMB). We have examined a male from the original series. It is dull blue-green, with bluer pronotum and almost black head. The mandibles have short stubble-like internal setae and obtuse preapical dorsal teeth. Otherwise it appears to be a normal male *L. aurata*. Closer examination shows that this specimen is remarkably worn: the preapical dorsal teeth of the mandibles are chipped, the mandibular setae are clogged with dirt, the protibial spurs are worn, the tarsal empodia are all damaged and setae are abraded or missing from the venter and legs. This damage is consistent with a waterlogged and abraded strandline specimen of *L. aurata*.

In AMS there is a remarkable teratological male specimen from Lilyvale, Sydney, 37 mm long, which was reared from a pupa. This has additional squared teeth on apical half of lower edge of each mandible, a broad gap between the procoxae, and a broad and blunt mesoventrite process.

A comprehensive molecular study of all forms of *L. aurata* would be useful, but is beyond the scope of this study.

Natural history and distribution. The natural history of *L. aurata* is discussed above in the notes following the description of *Lamprima* (and also in Hangay & de Keyzer (2017). Fearn (1996, 2015, 2016) has studied *L. aurata* in Tasmania, where larvae breed in *Acacia*, *Banksia*, *Eucalyptus*, *Pinus*, *Populus*, *Salix* and *Virgilia*. We have seen *L. aurata* reared from *Banksia*, *Eucalyptus* and *Virgilia* in Victoria. Fearn also found larvae in fence posts, telegraph poles and old sawdust heaps. There is a specimen in AMS reared from a telegraph pole near Sydney. Fearn noted that larvae were almost always in buried wood. In contrast, *L. aurata* in northern Queensland is usually found in dead standing timber (Wood *et al*. 1996). The wide host range suggests that the wood type is less important than the fungus rotting it. Wood *et al*. (1996) noted that *L. aurata* required wood infected by white-rot fungi.

Adult hosts include a wide variety of trees and shrubs, including exotics: *Alphitonia*, *Eucalyptus*, *Hakea*, *Leptospermum, Lomandra, Malva, Ozothamnus, Photinia, Prunus* (Fearn 1996, 2016; Suzuki 2012; Hangay & de Keyzer 2017). An adult has also been recorded feeding on a strawberry fruit (Fearn 1996). Males commonly aggregate at the tips of young shoots, snipping them off to create sap flows. Females then fly in to feed and males compete to mate with them.

Lamprima aurata is widespread in Australia (Fig. 75), from Cooktown in northern Queensland to Hobart in Tasmania, and from Lakes Entrance in Victoria to Geraldton in Western Australia. It is absent from the dry tropics and from most of arid and semi-arid Australia, except areas with winter rains. It also appears to be absent from western Tasmania (Anonymous 2017e).

Two anomalous records on the digital map of *Lamprima* records provided by the Atlas of Living Australia (Anonymous 2017e) need to be corrected: the record placed on Emerald, central western Queensland, is based on a Museum of Victoria specimen labelled “Central Highlands, Queensland”. This is much more likely to be from the central highlands of the Gympie area, where there are nearby records. Another wrongly placed record is a specimen in Museum Victoria labelled “Patterson, New South Wales”, which has been mapped near Narrandera in central western New South Wales. There are no settlements with that spelling in New South Wales, but the almost identical Paterson is a small town in the Hunter Valley, where *Lamprima aurata* is abundant. This is much more likely to be the correct locality.

Conservation status. *Lamprima aurata* is a relatively common species throughout its extensive range. Although it is a significant part of the insect collecting trade it does not appear to be threatened by this activity.

Lamprima imberbis **Carter, 1926**

(Figs 3, 52, 64)

Lamprima imberbis Carter, 1926: 59 (type locality: Dorrigo).

Material examined. Holotype (Fig. 6): ♂ "/ Dorrigo W Heron / ♂ type / *Lamprima imberbis* Carter / *Lamprima imberbis* Cart. N.S. Wales Type I.15895 / SAMA Database no 25-034446 /" (SAM).

Description. Male. Length 23 mm; pronotum slightly narrower than elytra; upper surface entirely dark bronze-brown, except mandibles, apices femora, tibial teeth and tarsomeres dark purple or bluish black; head, pronotum

and elytra shiny, not distinctly reticulately microsculptured (but note that the only specimen is dull from surface accretion of dirt); upper surfaces of pronotum and elytra apparently glabrous, but each puncture with minute simple seta arising from anterior edge.

Head: sides and apex with scattered erect setae; head length approximately half width; sides convergent from small but angularly projecting temples, along feebly convex eyes, then head parallel sided to obtuse anterior angles; projecting temples notched in lateral view; clypeus with deeply concave anterior margin; dorsum with two smooth ridges from anterior angles to midline of base of head where they meet at about 100º; area subtended by these ridges strongly and closely punctate, except two smooth tubercles at sides of anterior margin; area between ridges and sides of head also strongly punctate. Antennomere 2 slightly elongate, 3–4 elongate, 5 quadrate, 6 transverse, 7 cupuliform or at least broadly expanded on one side; mandible length 16% of overall length; inner faces of mandibles glabrous; mandibles bent inwards one third from base, almost symmetrical, right slightly longer than left; upper surfaces with large, erect, elongate tooth about 2/3 along dorsolateral ridge, tips almost straight, not bent upwards; mandibles laterally smooth with sparse, small punctures; ventral inner edge untoothed, finely crenulate in apical half.

Thorax: shape of pronotum typical for *Lamprima*, strongly arched, almost hexagonal, broadest just behind middle, anterior margin truncate with protruding anterior angles, basal margin strongly sinuate, anterior and posterior angles obtuse, anterior margin much narrower than basal margin, lateral margination crenulate except anterior quarter; distinctly punctate, punctures as large as on head and separated by 1–3 diameters, anterior of disc more closely punctate than posterior; pronotal disc evenly convex, each side with a small dimple. Hypomeron densely punctate, with mostly recumbent setae; scutellum semiovate with sparse, small punctures; base of epipleural upper margin slightly produced; elytra slightly expanded posterior to humeri, then contracted to rounded apices, sides broadly explanate in posterior 2/3; elytra distinctly bevelled at base to accommodate base of pronotum; elytral surfaces sparsely and shallowly longitudinally grooved and more densely but more shallowly, transversely wrinkled, with one distinct longitudinal groove near suture from base of elytron almost to apex; surface between grooves distinctly punctate in basal third, punctures large but smaller than on pronotal disc, and separated by 1–4 diameters, becoming much smaller and sparser on apical half. Elytral humeri prominent so hindwings probably fully developed; meso-metaventral process apex blunt, 100º in lateral view; protibial spur curved, narrowly elongate, and external margin with 4 acute teeth diminishing in size from apex to base; protibia almost parallel-sided from base to apex if teeth are ignored; inner margin gently curved to distally directed truncate lobe with spur articulated from beneath lobe; apex of lobe with few pale setae, not converging into a tuft; spur simple, elongate-conical; upper surface of protibia with two irregular rows of large, setose punctures, separated by a shallow ridge; mesotibiae and metatibiae with 2–4 small external teeth.

Abdomen: sides of ventrites I–V similar to pterothoracic venter, with dense, small punctures and setae; middle third of ventrites more sparsely punctate, surface microsculpture as dorsum; apex ventrite V truncate. Genitalia: not examined.

Female. unknown.

Taxonomy. This distinctive species is known only from its male holotype. Nagel (1930: 87) suggested *L. imberbis* was most similar to *L. aurata* (as *L. varians*), but he cannot have seen Carter's specimen. *Lamprima imberbis* differs from all other *Lamprima* by the structure of the mandibles and protibial spurs, and due to its similarity to *Phalacrognathus*, discussed above, we hypothesise that it is the sister species to all other *Lamprima*.

Distribution and conservation status. *Lamprima imberbis* was described from a single specimen labelled "Dorrigo", a town on the Dorrigo Plateau, an area extensively logged in the early 20th century (Carter 1933). The collector, William Heron, was an amateur who supplied museums, and for many years was resident of the town of Bellingen (Daniels 2004), just below the Dorrigo escarpment. Heron seems to have used the appellation "Dorrigo" to refer to anywhere on or near the Dorrigo plateau, not just the vicinity of the town of that name. There is still considerable mature native forest around the edges of the extensive plateau, but almost all the once extensive rainforest on basalt has been cleared (Adam 1987). Numerous collectors have searched for this species and failed to find it. Although it could be argued that the status of *L. imberbis* is still "data deficient", we think that this category is an excuse to do nothing for the conservation of most invertebrates. *Lamprima imberbis* should be regarded as at least endangered (International Union for Conservation of Nature 2012), if not already extinct.

***Lamprima insularis* W.J. Macleay, 1885**
(Figs 4, 20, 24, 35, 53, 65, 83, 96)

Lamprima insularis W.J. Macleay, 1885a: 137 (type locality: Lord Howe Island).

Material examined. Types (lectotype, here designated, three paralectotypes): *Lamprima insularis* (4): 1 ♂ "/ Lord Howe I / syntype / on permanent loan from Macleay Museum, University of Sydney / lectotype *Lamprima insularis* Macleay, designated Reid, Smith & Beatson 2018 " (ANIC); 1 ♂, 2 ♀ "/ Lord Howe I / syntype / on permanent loan from Macleay Museum, University of Sydney / paralectotype *Lamprima insularis* Macleay, designated Reid, Smith & Beatson 2018" (ANIC).

Other material (346: * = specimen dissected): **Lord Howe Island**: 1 ♀, Macleay Museum collection (AMS); 1 ♂, 2 ♀, K27898 (AMS); 2 ♂, xii.1921, R. Baxter (AMS); 1 ♀, 3.i.1922, A. Musgrave (AMS); 1 ♂*, 3 ♀, 1 ♀*, T. Kingston (AMS); 1 ♂, 23.ix.1971, G.A. Holloway (CMNC); 2 ♂, 17–31.v.1980, S. & J. Peck (CMNC); 172 ♂, 1 ♂*, 139 ♀, xii.2002, Ushijima & Chikakura (AMS); 1 ♀, Boatharbour Trail, near Blinkeys Beach, 14.ii.2001, G. Milledge (AMS); 1 ♀*, Intermed[iate]. H[ill]., rotting scalybark, 16.i.1979, T Kingston (AMS); 1 ♂, Kims Lookout, 18.ii.2001, G. Milledge (AMS); 1 ♂, Lagoon Road, 3.v.1979, T. Kingston (AMS); 1 ♂, Lagoon Road, 200 m north Middle Road junction, 21.ii.2001, M. Shea (AMS); 1 ♀, Little Island, on rocks, 1.ii.1979, T. Kingston (AMS); 1 ♀, Middle Beach, 26.iii.1979, T. Kingston (AMS); 1 ♀[elytron], junction Mulley Drive and Lagoon Road, rotting *Howea belmoreana*, 11–14.v.2003, C. Reid (AMS); 2 ♀, behind Salmon Beach, 10.ii.2017, Jenkins, Shaw & Jensen (AMS); 1 ♂, Salmon Beach creek, 15.i.1979, T. Kingston (AMS); 1 ♂, Salmon Beach southwest end, on *Lagunaria*, 4.xii.2000, C. Reid (AMS); 1 ♀, Soldiers Creek, malaise trap, 7–15.ii.2017, C. Reid (AMS); 1 ♂, 1 ♀, Soldiers Creek, rotting *H. belmoreana* stem, 7.ii.2017 (AMS); 1 ♂[head only], Stevens Reserve, sifting leaf litter, 5.ii.2017, Jenkins, Shaw & Jensen (AMS); 1 ♂[elytron], Stevens Reserve, rest of specimen to D. Hawks, 23.ii.2001, G. Milledge (AMS); 1 ♂, 1 ♀, Stevens Reserve, *Cryptocarya trinervia* [sic], 11–14.v.2003, C. Reid (AMS); 1 ♀, Stevens Reserve, under *Araucaria* bark, cut log, 18.ii.2017, C. Reid (AMS); 1 ♀, Valley of Shadows, rotting *Cryptocarya trinervia* [sic], 11–14.v.2003, C. Reid (AMS).

Description. Male. Length 18−33 mm; cylindrical, pronotum slightly broader than elytra in large specimens, narrower in small specimens; usually entirely metallic green except antennae and tarsomeres darker, almost black, and inner faces of mandibles and extreme tips dark purple; less often elytra and head green but with slight bronze reflection, or entirely green with bronze reflection; rarely head and pronotum bluish green (1 old specimen seen, colour possibly an artefact of preservation) or head and pronotum greenish black and elytra dark green (Hangay & de Keyzer 2016: 55); “almost violet” and “pale-bluish green” recorded by Olliff (1889: 84) but it is not clear whether he is referring to males, or females, or both; tarsi and antennae occasionally red; whole upper surface minutely reticulately microsculptured and relatively dull (with a metallic sheen but not shiny); upper surfaces of pronotum and elytra apparently glabrous, but each puncture with minute, simple seta arising from anterior edge.

Head: sides and apex with scattered, erect setae; head length approximately half width; sides convergent and almost straight, from small but angularly projecting temples, along feebly convex eyes, to obtuse anterior angles; projecting temples grooved in lateral view; anterior margin concave; dorsum with two smooth ridges from anterior angles to midline of base of head where they meet at about 100º; area subtended by these ridges strongly and closely punctate, except two smooth tubercles at sides of anterior margin; area between ridges and sides of head also strongly punctate, but less closely and often more finely than middle of head. Antennomere 2 transverse, 3–5 elongate, 6 transverse and ridge on anterior edge, 7 cupuliform; mandible length 13–19% of overall length; inner faces of mandibles almost entirely densely setose; mandibles relatively straight sided (except one dwarf male with rounded mandibles), almost symmetrical, right usually slightly longer than left; upper surfaces without teeth, with dorsolateral ridge throughout, tips concave but not bilobed, bent inwards; mandibles bent upwards in apical third, laterally smooth and finely punctate; ventral surface of mandibles with single prominent 80º tooth ¼ from apex; mentum flat, closely punctate and setose.

Thorax: shape of pronotum typical for *Lamprima*, hexagonal, broadest just behind middle, anterior margin truncate with slightly protruding anterior angles, basal margin strongly sinuate, anterior and posterior angles obtuse, anterior margin narrower than basal margin, lateral margination complete, without crenulation, but almost effaced at middle; mostly distinctly punctate, punctures separated by about 2–4 diameters, anterior of disc impunctate or minutely so; pronotal disc even convex. Hypomeron finely and densely punctate, with mostly

recumbent setae; prosternum strongly and densely punctate with erect setae; scutellum semiovate with sparse, small punctures; elytra with small tubercle at base of epipleural upper margin, slightly expanded posterior to humeri, then contracted to rounded apices, sides narrowly explanate in posterior 2/3; elytra usually distinctly bevelled at base to accommodate base of pronotum; elytral surfaces finely and sparsely punctate, punctures distinctly smaller than pronotal disc and separated by 3–6 diameters, and shallowly longitudinally and transversely strigose; meso-metaventral process glabrous or with scattered recumbent setae, and shiny, apex blunt, approximately 80º in lateral view. Protibia with pair of curved elongate apical teeth, outer wider than inner, and external margin with 4 well-spaced triangular approximately right-angled teeth; inner lobe of protibia large and rounded, with basal dense tuft of convergent red setae and anterior greatly expanded spur (width 65–80% of length); upper surface of protibia with scattered punctures on inner half and an irregular line of punctures on outer half, short recumbent setae arising from punctures, plus tuft of elongate setae at tarsal insertion; mesotibiae and metatibiae with 1–3 small external teeth.

Abdomen: sides of ventrites I–V similar to pterothoracic venter, with dense, large punctures (partly coalescent, interspaces less than diameters) and setae; middle third of ventrites more sparsely punctate (insterspaces = several diameters), surface microsculpture as dorsum; apex ventrite V truncate. Genitalia: apical half of phallobase dorsally with irregular, short, oblique ridges or tubercles either side of shallow median groove, apical margin with V-shaped notch deepened at base; venter of phallobase smooth, apex more deeply notched; parameres setose dorsally, tips triangular but often incurved; penis with oblique basal ridges, thinly sclerotised apex level or almost level with apices of parameres.

Female. As male, except: length 16−22 mm; head, pronotum and elytra more strongly and densely punctate, interspaces 1–3 puncture diameters on pronotal disc, shiny, not distinctly microsculptured, and colour dark olive-green; pronotum not broader than elytra; head with approximately 90º anterior angles; antennomeres 3–5 transverse; dorsally visible part of mandibles shorter than head; mandibles in dorsal view with slightly elongate-rectangular (rarely triangular) dorsal tubercle from base to almost half mandible length, remainder of dorsal surface excavate with sharp outer edge. Pronotum lateral margins not distinctly crenulate or at most crenulate on apical half and with < 5 notches on basal half; outer edge protibia with 6–8 triangular teeth, generally increasing in size from base to apex, inner edge without internal lobe; outer edges mesotibiae and metatibiae with 4–6 prominent spines; venter shiny, otherwise similar to male; apex ventrite V rounded; apex of tergite IX transparent and evenly rounded. Gonostylus almost quadrate, inner edge straight, slightly longer than basal width, outer edge only slightly expanded; spermatheca tapered from blunt apex to base, slightly bent, spermathecal duct long and densely coiled.

Taxonomy. In 2004, the validity of this species was challenged in a magistrate's court as part of the defence of two Japanese collectors, but the challenge was rejected based on the distinct male morphology and head colour. However, to provide greater stability for this species we designate a lectotype.

Natural history and distribution. The observed or recorded larval hosts of *Lamprima insularis* include a wide range of timber types: *Araucaria heterophylla* (Araucariaceae), *Cryptocarya triplinervis* (Lauraceae), *Elaeodendron curtipendulum* (Celastraceae), *Howea belmoreana*, *H. forsteriana* (Arecaceae), *Olea paniculata* (Oleaceae), and *Syzygium fullagarii* (Myrtaceae), the first of which is exotic on Lord Howe (Wilson 1994). Communal male sap-feeding sites have not been observed in this species, but an early reference "males are sometimes found in great numbers clinging to the limbs of low growing shrubs" (Olliff 1889: 84) suggests such activity. The species does not seem to have been observed in such numbers since then. One male was recently collected on shoots of *Lagunaria patersonia* (Malvaceae) and this coastal shrub is a possible adult host.

Lamprima insularis was noted as present “throughout the rainforests on Lord Howe Island” (Hangay & de Keyzer 2017: 54), but it is a lowland species, absent from above 500 m (C.A.M.R., personal observations 2001–2017; Fig 96). It has not been collected from the small offshore islands in the region, including Blackburn Island, Roach Island and Balls Pyramid. This distribution reflects the dependence of *L. insularis* on large logs, particularly of *Cryptocarya triplinervis*, which is a lowland subtropical rainforest species. In the lowlands, *L. insularis* is absent from unwooded habitats, such as sand dunes, open fields, golf fairways and low heathland on ridgetops. It is possibly also absent from the high rainfall cliff shelves at the southern end of the island, but there has been little collecting in these inaccessible areas (Cassis *et al*. 2003). In wet conditions, such as the summer of 2001–2002 (Anonymous 2017b: 523 mm rain from October to December, 2001), adults and larvae of *L. insularis* can be found breeding in narrow stems, such as fallen palms 10–20 cm in diameter (C.A.M.R., personal observations). In contrast, in dry conditions such as the summer of 2016–2017 (Anonymous 2017b: 165.4 mm rain from October to

December, 2016), the fallen palm stems had dried out and no adults or larvae were found in them (C.A.M.R., personal observations). Narrow stemmed hosts, such as palms, should therefore be considered secondary, only utilised under suitable conditions.

Conservation status. *Lamprima insularis* should be regarded as Vulnerable (International Union for Conservation of Nature 2012) based on endemicity to a small island (about 14 km^2), limited suitable habitat and harvesting pressure from collectors.

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