



Digging down under: Australian Bolboceratini, their habits and a list of species (Coleoptera: Scarabaeoidea: Geotrupidae)

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Abstract

The adult habits of the ten genera of Australian Bolboceratini (Scarabaeoidea, Geotrupidae: Bolboceratinae) are briefly discussed, mentioning at least one species in each genus. Morphological variation, food, and/or predation are described for some species. The eggs and larvae of *Bolborhachium annea* Howden are discussed and pictured. A picture of one of the fungi used for adult food is included and one of push-ups marking burrows. The Australian species of Bolboceratini described through 2006 are listed.

Key words: Australia, Bolboceratini, natural history, checklist

Introduction

Studying the habits and life cycle of an insect can be challenging. This is particularly true for burrowing insects that spend much of their time underground, *e.g.*, the Bolboceratinae (Scarabaeoidea, Geotrupidae).

In general, species of Bolboceratinae occur on all continents except Antarctica, but almost none are found on oceanic islands. From a conservative point of view, there are two tribes in the Bolboceratinae: Athyreini and Bolboceratini. The Athyreini occur in South America, Africa, and in a narrow band to northern India. The Bolboceratini are essentially worldwide and are found mostly in areas with sandy or light clay soils; they are the only tribe in the family occurring naturally (not introduced) in Australia.

For many years the geotrupids have been called dung beetles, although the epithet does not apply to all geotrupids. This usage started when some species of European *Geotrupes* Latreille were discovered using dung for their larval cells, and they and others were attracted to dung as adults. This carried over to the Australian species, particularly when Carne (1965), in his revision of the genus *Elephastomus* Macleay, stated that he found specimens using cow dung. Years later Dr. Carne told us that he found burrows beside and through piles of dung, but had not excavated the burrows to verify that the dung was used as food. Subsequently we dug many burrows of *Elephastomus* near Atherton, Queensland (Qld). In some pastures, burrows were indeed beside or through piles of dung, but no dung was found in the burrows. We could only conclude that in cases where the burrow went through the dung, it was deposited after the burrow was started!

To our knowledge, the Australian species of Bolboceratini are not even occasional dung feeders. If a common name is needed, we suggest a term sometimes used in Western Australia (WA): “musician beetles,” named for their ability to stridulate when disturbed. Some large species can be heard for some distance when collected; occasionally one can be heard “complaining” when disturbed by a straw shoved into its burrow.

Each species of bolboceratine seems to have a particular niche, but some generalities about adult habits can be made. In eight of the ten genera occurring in Australia, the adults are nocturnal, the flight period begin-

ning shortly after dusk and often lasting for only a brief time. In two genera, *Stenaspidius* Westwood and *Gilletinus* Boucomont, adults fly close to the ground during the day. These day flying forms are small (5–10 mm long), partly to entirely black with deeply striate elytra. Nocturnal species are small to large (5–30 mm long), brown to dark brown and frequently have shallow elytral striae. All species, whether nocturnal or diurnal, are strong burrowers and if one can learn to recognize the burrows, some may be collected in series. Some nocturnal species fly to lights; often they fly toward the light, stop short of bright lights, then drop and dig a burrow. Fresh burrows can often be found the next morning, particularly if the light has been set in an open area.

Certain characteristics of bolboceratine burrows are typical for most of the group worldwide, provided that the soil is not hard clay and is relatively free of stones or roots. The burrows are always circular in cross section and, if they extend to any depth, leave a noticeable pile of soil at the entrance. This is true for other burrowing insects as well, but bolboceratine burrows are usually vertical and the pile of soil has the burrow entrance in the middle, not to one side. In making the burrow, the beetle digs with its head and fore legs pushing the dirt backwards and upwards with its middle and hind legs. It may dig for several centimeters in this manner, before turning and pushing the plug of moist soil out of the burrow. The effect is similar to toothpaste being squeezed from a vertically held tube. The plug of soil frequently maintains its shape, giving the pile of dirt a “ropy” appearance. Some other insects, notably some bees, make similar looking burrows, but these usually have an open entrance and can be confused mainly with the smaller bolboceratines (*Australobolbus* Howden and Cooper, for example). Usually if the beetle burrow is open, it indicates that the beetle has left, but occasionally the beetle has an open burrow and is near the top and slightly to one side of the burrow. The depth of the burrow depends both on the soil type and the size of the beetle. Some large species in the genus *Blackburnium* Boucomont have burrows in sand dunes that may exceed two meters in depth; in sandy soil most species in all genera may have burrows that reach a depth of about one meter. Near the bottom the burrow may bend sideways, or seemingly end; in either case when collecting these beetles it is best to continue digging as the beetle may have gone deeper without clearing the burrow.

In some cases adults have been found in their burrows with bits of fungi. We have not been able to get a proper determination of the fungi, which belong to either the family Hymenogasteraceae or Clathraceae, but the fruiting body is circular, 2–4 cm in diameter and barely breaks the surface of the ground (Fig. 2). The beetles cut pieces from the fungus and carry it to the bottom of their burrows. Occasionally a few other beetles, mainly staphylinoids, may be found in the burrows, sharing the fungi with the bolboceratine. Dr. J. Ridsdell-Smith, (C.S.I.R.O., Perth) suggested (*in litt.*) that some mycorrhizal fungi used by trees in sandy soils in WA may be spread by beetles carrying the bits of fruiting fungi to some depth in their burrows. Houston (2006) discussed this phenomenon at length. As mentioned previously, we have never found any species of bolboceratine using dung for either adult or larval food.

The burrowing habits of bolboceratines and their brief above ground flight periods seem to allow them to avoid many predators. However, we have found some of the larger flightless Carabidae in WA in their burrows with fragments of the original occupant. Some mites may also feed on bolboceratine eggs, but so far we have found this true of only some North American dung-feeding Geotrupinae.

Almost all of the above observations have been made after recent rains. During extended dry periods there is usually no sign of above ground activity. The adult beetles can survive long periods of drought underground. They have large fat bodies in their abdomens and can survive without food for long periods. We have kept some large North American bolboceratines alive in salve tins without food for over six months. While it is not possible to guess the age of a beetle, many newly emerged bolboceratine adults are light tan, darkening with age. In a few cases in WA we collected at the same time light tan and dark brown specimens of the same species at one locality. We can only conclude that generations may occasionally overlap.

Several methods can be used to excavate a burrow. First, the entrance must be found under the push-up; then use a straw, grass tree leaf, or similar marker and push it as far as possible into the burrow. The size of the

pile of dirt will give an indication of the depth. Carefully dig off to one side of the marker, gradually opening up the burrow until the beetle is found, usually at the bottom. This method is slow, but if there is any food or a pair of beetles in the burrow, it is perhaps the best method. Another way is to use a narrow bladed, long handled shovel and a sifter with about a six or seven millimeter mesh. Using the marker as the center of the excavation, dig and sift every shovel-full of sand. This is the quickest way to get specimens, but information may be lost or the beetle damaged. In clay or rocky soil the first method is by far the best.

Notes on some species in the Australian genera of Bolboceratini

***Stenaspidius* Westwood.** We have taken probably the most wide-ranging species, *S. albosetosus* Howden, in the afternoon flying 10–30 cm above the ground in open eucalyptus-grassland habitats from January to March. Most of these were collected near Leyburn, about 65 km SW of Toowoomba; many others were taken 12 km NW of Mareeba at the Southedge Tobacco Research Station, a few others at 26 km E Mt. Garnet, Bucasia (near Mackay), and Keppel Sands. Many were in burrows or taken in flight interception traps; all localities mentioned are in Queensland. Other specimens of *S. albosetosus* were collected by Drs. S. and J. Peck (Carleton University, Ottawa) in December at Kakadu National Park, Northern Territory (NT), in the Alligator River section using flight interception traps. They also took a single specimen at the Darwin C.S.I.R.O. station in December.

Most of the other personally collected species in the genus were found in burrows. For example, a small series of *S. matthewsi* Howden from WA was collected in August in an open sandy area 50 km east of Kalbarri. The eight specimens taken were in a small area about 2 m², excavated to a depth no greater than 50 cm. There was little surface evidence of burrows and no indication of food except possibly some deposits of rich, black humus. Five specimens of *Eucanthus felschei* Boucomont were collected in the same excavation. Other WA species have been taken in burrows, but no food has been found in the burrows.

***Gilletinus* Boucomont.** In the Cape York region of Queensland, *G. bipagus* Howden seems to be moderately common. Many specimens were collected in the Tolga-Mareeba area in January and February in flight interception traps and in fixed light traps. At Cape Tribulation, Qld., we took a specimen flying over a grassy area at 4 PM, December 18, 1986. Other species in the genus have been collected less frequently, usually in flight interception or light traps. Dr. J. F. Lawrence found a few *G. flavocastaneus* (Lea) in February in a swimming pool 12 km SE of Gympie, Qld.

***Eucanthus* Westwood.** This is the only genus of Bolboceratini not endemic to Australia-New Guinea; it also occurs in North and South America. Only one Australian species is recognized, *E. felschei* Boucomont, found in South and Western Australia. A few specimens have been collected in areas of coastal heath in WA in burrows 15–25 cm deep. As mentioned under *Stenaspidius matthewsi*, *E. felschei* was also collected in the same small area with a very rich layer of black humus, but most specimens lack data on how they were collected.

***Elephastomus* Macleay.** As mentioned in the introductory section, these and the other Australian bolboceratines are not dung feeders. Some adults of several species have been found in burrows feeding on bits of fungi, but otherwise little is known of their habits. Collecting data, when available, indicates that specimens were either dug up or taken at light.

***Australobolbus* Howden and Cooper.** This large genus of small (most under 13 mm) Bolboceratini has 46 species or subspecies currently recognized. Most, if not all of the species, are nocturnal. The great majority of specimens have been taken at light. One species, *A. gayndahensis* (Macleay), in a study on nocturnal activity patterns by Steinbauer and Weir (2007) came in some numbers to an 8 watt black light between 23:15 and 1:00 in New South Wales, a later flight period than many species in other genera. North of Mareeba, Qld., a kerosene lantern set in a shallow one meter square pan of water near a rice field collected a number of speci-

mens of several different species. Some specimens, we were told, were collected south of Darwin, NT, at the parking lights of a car the day after a heavy rain. Specimens will often come near a bright light, then make a burrow. Others, particularly in rainforest areas, are frequently collected in flight interception traps. The burrows we have found average about 10–24 cm deep. Occasionally a pair has been taken in the same burrow, but no food has been recorded. Considering how common some species are, it is surprising how little is known of the habits of this genus. Larvae have yet to be described.

***Bolbobaineus* Howden and Cooper.** A single species is currently placed in this genus, *B. planiceps* (Macleay). The species, as currently recognized, is widespread and locally common; records are lacking only for Victoria and Tasmania. It is highly variable morphologically and may represent several sibling species, but this needs further investigation. Specimens have been collected using the same methods as were used for *Australobolbus*; occasionally both genera are taken at the same light or trap.

***Blackbolbus* Howden and Cooper.** Of the 31 species described in this genus, 24 are limited to WA. Many of these have very restricted ranges and possibly represent relict forms surviving in moist areas which usually receive less than 25 mm of rainfall per year. Possibly because of the relict nature of the species, there is a considerable morphological diversity within the genus, the result being that the genus has been divided into six quite different groups (see Howden [1985] for morphological differences). The distinctive “taurus group” contains three species and occurs across the southern part of the continent from New South Wales (NSW) and Victoria (VIC) to WA in either sandy or clay soils and often in wooded areas. In sandy soils, burrows can reach a depth of 30 cm, while in clay they may reach a depth of only 10 cm. While many specimens in this group have been collected by digging, nothing is known of their food or larvae. The “hoplocephalus group” of three species is limited to the western half of WA and occurs mostly in scrub or treed areas with sandy soils; a few were also taken digging in clay soil. Many have been collected “at light,” others in burrows up to a meter in depth; some females of *B. hoplocephalus* (Lea) were found in burrows with bits of fungi being used for food. No larvae were found. Specimens of the other two species in the group were frequently taken “at light.” The “inconsuetus group” of five species is a complex of uncommon species; only two, *B. falcatus* Howden and *B. orarius* Howden, have been collected from burrows, the others almost entirely “at light.” The “contextus group” with five species is eurytopic, and is found in both sand and clay soils, most common in the wetter areas of southern WA. The most interesting species in the group is *B. carnabyorum* Howden, which exhibits a strong pronotal dimorphism in major males. One type of male has a conical pronotal horn on each side with its single acute tip directed laterally, the other form has the apex of the horn bifurcate, with tips directed anteriorly and posteriorly. Males of both types were found in a burrow with a single female, the dimorphism being found mainly in male majors; no differences were found in females. The last two groups, “matthewsi” and “frontalis,” contain some of the more common and widespread species in the genus. Adults of a number of the species have been taken with bits of fungi in their burrows (Fig. 2). Some, such as *B. frontalis* (Guérin-Méneville), stridulate loudly when disturbed. Species, particularly in WA, are winter active and most have been collected from July to October.

***Blackburnium* Boucomont.** Thirty species are currently recognized in this genus of relatively large (15–25 mm in length) bolboceratines. Many species have been taken at light, usually within a few weeks of a good rain. In WA on the North West Cape, a small series of *B. insigne* (Lea) was collected flying to a 12-watt black light in August at approximately 8PM in a light drizzle with a temperature between 4–6°C. It was not uncommon in WA to have a few specimens of different species attracted to black lights in July–August on cool, wet nights when the temperature was near freezing. Others, including *B. insigne* at the North West Cape (Fig. 1), were dug from their vertical burrows, which occasionally reached a depth of 2 meters in deep sand; this was true of species like *B. reichei* (Guérin-Méneville) which is common in the coastal sands of WA. In one two-month period in July to September, with the aid of Keith and Edith Carnaby, we dug more than 50 specimens, many more than came to light. Some of the wide-ranging species, such as *B. sloanei* (Blackburn), were collected throughout the year when and where wet conditions prevailed. One or two *Blackburnium* burrows

occupied by adult beetles contained bits of fungi, but no larvae were found.

In WA we occasionally found specimens of one of the large flightless Carabidae feeding on adult *Blackburnium* at the bottom of their burrows. This is the only type of predation we have seen on these beetles in Australia.



FIGURE 1. From left: Edith Carnaby, Anne Howden, Geoff Holloway, and Keith Carnaby digging *Blackburnium insigne* (Lea) burrows on the North West Cape, WA. Burrows in foreground indicated by piles (“push ups”) of sand.

***Bolboleaus* Howden and Cooper.** Fourteen species are currently placed in this genus, which range in size from 10–26 mm. Many *Bolboleaus* are known from very few specimens. Some of the rarely collected species occur inland, in dryer areas with irregular rains; among these are *B. houstoni* Howden, *B. mimus* Howden, *B. storeyi* Howden, *B. trifoveicollis* (Lea), and *B. variolicollis* (Lea). Even the more widely ranging species have spotty distributions and are rarely taken in series.

One exception was after a heavy rain in an area northwest of Bourke, NSW, in August, 1983, when we dug 34 *B. truncatus* (Blackburn) from a 20 m² area of red sand. Burrows averaged about 24 cm deep, and there was no evidence of any type of food. Most specimens of this species in collections have been taken at light. Another species, *B. quadriarmigerus* Howden, was found in some numbers near Leyburn, Qld., in March. The beetles were digging in red loam soil. One pair was taken in a burrow 25 cm deep, other burrows varied from 18–30 cm deep; no food was found. In general, species in the genus seem to be more active during the warmer months if there is rain. Occasionally they are found in heavy loam soils. Nothing is known of their food preferences or larvae.

***Bolborhachium* Boucomont.** The 25 species in this genus range in size from 9–22 mm in length and have been placed in six groups. These are not as morphologically diverse as those in the genus *Blackbolbus* and are not discussed separately here. Species in the genus are, in general, concentrated in the southern half of Australia, and their surface activity influenced by rain. A number of adults of different species have been collected in burrows with bits of fungi. Beetles of the family Leiodidae were frequently found in burrows containing both

the adult *Bolborhachium* and fungi. Many species in this genus are found in areas of coarse sand, often in open areas; those digging in sand often have deep burrows, sometimes exceeding a meter in depth.



FIGURE 2. Exposed fungus, normally only tip visible, with “push-up” of bolboceratine beside fungus.



FIGURE 3. *Bolborhachium anneae* Howden, egg, adult female, and first stage larva.

The eggs and larvae of two species, *Bolborhachium anneae* Howden and *B. recticorne* (Guérin-Ménéville), have been described (Howden 1985), the former from Lake Bryde, WA, and the latter from Wilga, WA. Most of our data refers to *B. anneae* (Fig. 3), as only a damaged larva of *B. recticorne* was available for study. The eggs of both species were yellowish white and reniform. Two eggs of *B. anneae* measured 6.5 x 6.2 mm and 7.3 x 6.4 mm while two eggs of the slightly larger adult *B. recticorne* measured 7.2 x 5.9 mm and 8.1 x 6.5 mm. The largest female of *B. anneae* measured 15.1 mm in length, while the largest female of *B. recticorne* measured 18.8 mm in length. The eggs of both species are unusually large when compared to the size of the adult. One egg was found in an incomplete cell with the adult female, therefore a great increase in size due to water intake or other reasons seems unlikely. One egg of *B. anneae* was broken and was found to contain a large amount of yolk; eleven other eggs were found along with two first-stage larvae. One egg was preserved and ten were reared to first or second instars. Unfortunately, at that time, it was necessary to preserve all specimens before our departure from Australia.

The eggs of *B. anneae* were collected on October 13, 1981, and preserved on October 28; during that time five of the larvae became second instar. This type of rapid development seems typical of geotrupids and of some other beetles subject to irregular environmental conditions, such as sporadic rainfall. The brood cells of *B. anneae* were between 80–110 mm in length and between 16–22 mm in greatest width with an internal cavity of a width only slightly greater than that of the beetle, about 8 mm. The cell appeared to be composed of fine black humus, perhaps mixed with fungi; unfortunately the composition of the cells was not analyzed. The brood cells of *B. recticorne* were slightly larger, measuring from 110–150 mm in length, with a similar composition. Males and females of both species were found in nearby burrows and one female was finishing its brood cell. These brood cells differ from those formed by dung feeding scarabaeines which usually have a coating of mud or non-food material covering the brood ball. The wall of the *Bolborhachium* cell is composed of food packed into the burrow with an elongate cavity within. The cavity is equal to the diameter of the female making the cell. A picture of part of a brood cell and included egg of an unknown species of *Bolborhachium* was published in Howden and Cooper (1977, Fig. 71). The depth of the burrows in disturbed areas in sandy, open woodland reached a depth of approximately 1 m. Below that appeared a dense layer of clay and it was just above this layer and parallel to it that the brood cells were found. We speculated that the interface between sand and clay was ideal for maintaining moisture, so that both adults and larvae could survive, even during long periods of surface aridity.

Finding the proper moisture level and timing of the brief larval stage remains unknown for all of the other Australian bolboceratines. We hope that someone will continue to investigate this fascinating group of beetles.

Checklist of Australian Bolboceratini

This checklist is complete through 2006, and updates the previous catalogue published by Cassis & Weir (1992). Howden (1992, 1993) described numerous species that were not listed in Cassis & Weir (1992).

***Australobolbus* Howden and Cooper, 1977**

Australobolbus adamsi Howden, 1992 — QLD, (WA?)

Australobolbus allsoppi Howden, 1992 — QLD, WA

Australobolbus aridulus Howden, 1992 — WA

Australobolbus austrinus Howden, 1992 — NSW, QLD

Australobolbus basedowi (Blackburn, 1904) — NSW, NT, QLD, SA, WA

Australobolbus bihamus Howden, 1992 — NSW, NT, QLD, SA, WA

Australobolbus binasutus Howden, 1992 — QLD

Australobolbus canalis Howden, 1992 — NT
Australobolbus carinatus (Blackburn, 1904) — NT, QLD, WA
Australobolbus carnabyorum Howden, 1992 — WA
Australobolbus centrus Howden, 1992 — NT, WA
Australobolbus clypealis (Blackburn, 1904) — NT, QLD
Australobolbus convergifrons Howden, 1992 — WA
Australobolbus cruciatus Howden, 1990 — QLD (+ New Guinea)
Australobolbus distropis Howden, 1992 — NT, QLD
Australobolbus fenestratus (Blackburn, 1888) — NT, QLD, WA
 Synonym: *Bolboceras fraternum* Blackburn, 1904
Australobolbus gayndahensis (Macleay, 1871) — ACT, NSW, QLD
 Synonym: *Bolboceras mandibulare* Blackburn, 1904
Australobolbus impressicollis (Blackburn, 1904) — NT, QLD, WA
Australobolbus intermedius Howden, 1992 — QLD
Australobolbus labratus Howden, 1992 — QLD
Australobolbus laevipes (Blackburn, 1904) — NT, QLD, WA
Australobolbus lineocollis Howden, 1992 — NSW, QLD
Australobolbus lobatus Howden, 1992 — NSW, QLD
Australobolbus lobocapsus Howden, 1992 — QLD
Australobolbus loweri laratinus (Arrow, 1916) — QLD (+ New Guinea)
Australobolbus loweri loweri (Blackburn, 1904) — NT, QLD
Australobolbus masneri Howden, 1992 — QLD
Australobolbus monteithi Howden, 1992 — QLD
Australobolbus mouldsi Howden, 1992 — QLD
Australobolbus nitens (Blackburn, 1904) — QLD
Australobolbus nitidiceps (Blackburn, 1904) — QLD
Australobolbus obscurius (Blackburn, 1904) — NT, WA
Australobolbus obtusus Howden, 1992 — NT, QLD, WA
Australobolbus occidentalis Howden, 1992 — WA
Australobolbus pseudobscurius Howden, 1992 — NT, QLD, WA
Australobolbus pseudolaevipes Howden, 1992 — WA
Australobolbus pygmaeus Howden, 1992 — WA
Australobolbus rossi Howden, 1992 — QLD
Australobolbus rotundatus globuliformis (Macleay, 1864) — QLD
Australobolbus rotundatus rotundatus (Hope, 1842) — NT, QLD, WA
 Synonym: *Bolboceras sweerii* Macleay, 1873
Australobolbus rubescens (Hope, 1842) — NT, QLD, WA
Australobolbus sedlaceki Howden, 1992 — QLD
Australobolbus subretusus (Blackburn, 1904) — NT, QLD, WA
Australobolbus tibialis Howden, 1992 — WA
Australobolbus walfordi Howden, 1992 — QLD
Australobolbus weiri Howden, 1992 — NT, WA

***Blackbolbus* Howden and Cooper, 1977**

Blackbolbus augustus Howden, 1985 — SA
Blackbolbus bispinicollis (Lea, 1919) — WA

Blackbolbus brittoni Howden, 1985 — WA
Blackbolbus carnabyorum Howden, 1985 — WA
Blackbolbus contextus (Lea, 1916) — NT
Blackbolbus denticollis (Macleay, 1873) — QLD
Blackbolbus echinocollis Howden, 1985 — WA
Blackbolbus falcatus Howden, 1985 — WA
Blackbolbus frontalis (Guérin-Méneville, 1838) — WA
 Synonym: *Bolboceras latum* Bainbridge, 1842
 Synonym: *Bolboceras serricolle* Bainbridge, 1842
Blackbolbus fucinus Howden, 1985 — WA
Blackbolbus furcaticollis Howden, 1985 — QLD, NSW
Blackbolbus goldingorum Howden, 1993 — WA
Blackbolbus hollowayorum Howden, 1985 — NSW
Blackbolbus hoplocephalus (Lea, 1916) — WA
Blackbolbus incertus Howden, 1985 — WA
Blackbolbus inconsuetus (Lea, 1915) — WA
Blackbolbus incus Howden, 1993 — WA
Blackbolbus inopinus Howden, 1985 — WA
Blackbolbus insolitus Howden, 1985 — WA
Blackbolbus kalbarriensis Howden, 1985 — WA
Blackbolbus lunatus Howden, 1985 — WA
Blackbolbus matthewsi Howden, 1985 — NSW, SA, WA, NT
Blackbolbus multifidus Howden, 1985 — WA
Blackbolbus orarius Howden, 1993 — WA
Blackbolbus puncticollis (Macleay, 1873) — NSW, SA, VIC, WA
Blackbolbus quadricornis (Klug, 1843) — WA
Blackbolbus quinquecavus Howden, 1985 — WA
Blackbolbus rostratus Howden, 1985 — WA
Blackbolbus rugosicollis Howden, 1985 — WA
Blackbolbus taurus (Westwood, 1848) — WA
 Synonym: *Bolboceras bubalus* Gillet, 1925
Blackbolbus yunaensis Howden, 1985 — WA

***Blackburnium* Boucomont, 1911**

Blackburnium acutipenne Howden, 1979 — QLD
Blackburnium ambiguum Howden, 1979 — QLD
Blackburnium angulicorne angulicorne (Macleay, 1873) — NSW, QLD
Blackburnium angulicorne convexicolle Howden, 1979 — QLD
Blackburnium aratum (Blackburn, 1904) — NT, QLD
Blackburnium barretti Howden, 1979 — NT, QLD
Blackburnium brooksi Howden, 1979 — QLD
Blackburnium canningense Howden, 1979 — WA
Blackburnium carpentariae (Macleay, 1873) — NT, QLD, WA
 Synonym: *Bolboceras albertisi* Harold, 1877
Blackburnium cavicolle (Macleay, 1873) — QLD, SA, VIC

Blackburnium centrale Howden, 1979 — NT, SA, WA
Blackburnium cooperi Howden, 1979 — NT, WA
Blackburnium cornutum (Macleay, 1888) — NT, WA
Blackburnium darwinense Howden, 1979 — NT, QLD
Blackburnium harslettae Howden, 1979 — NT, QLD, WA
Blackburnium hippopum (Macleay, 1888) — NT, WA
Blackburnium insigne (Lea, 1916) — WA
Blackburnium kirbyi (Bainbridge, 1842) — NT, QLD, WA
 Synonym: *Bolboceras reichei* Westwood, 1848
Blackburnium macleayi (Blackburn, 1904) — QLD, WA
Blackburnium monteithi Howden, 1979 — QLD
Blackburnium neocavicolle Howden, 1979 — NSW, NT, QLD, SA, WA
Blackburnium pauperculum Howden, 1979 — NT
Blackburnium pontiferum (Blackburn, 1904) — WA
Blackburnium quinquecorne (Lea, 1916) — NT
Blackburnium reichei (Guérin-Méneville, 1838) — WA
 Synonym: *Bolboceras cornigerum* Macleay, 1873
 Synonym: *Blackburnium bifoveatum* Howden, 1954
Blackburnium rhinoceros (Macleay, 1864) — NT, QLD (+ New Guinea)
Blackburnium seticolle Howden, 1979 — QLD
Blackburnium sloanei (Blackburn, 1889) — NSW, NT, QLD, SA, WA, VIC
Blackburnium tatei (Blackburn, 1888) — NT, WA
 Synonym: *Bolboceras bovilli* Blackburn, 1904
Blackburnium triceratops Howden, 1979 — WA

Note: *Blackburnium neglectum* (Hope, 1842) was described based on a female that is unidentifiable to the species level. It should therefore be considered an *incertae sedis* within this genus.

***Bolbobaineus* Howden and Cooper, 1977**

Bolbobaineus planiceps (Macleay, 1873) — NT, QLD, NSW, SA, WA
 Synonym: *Bolboceras simpliciceps* Blackburn, 1888

***Bolboleaus* Howden and Cooper, 1977**

Bolboleaus froggatti (Blackburn, 1904) — QLD
Bolboleaus hiaticollis Howden, 1985 — WA
Bolboleaus houstoni Howden, 1985 — WA
Bolboleaus ingens (Macleay, 1888) — NT, QLD, WA
Bolboleaus mimus Howden, 1985 — NT
Bolboleaus parvicollis Howden, 1985 — WA
Bolboleaus propinquus Howden, 1985 — SA
Bolboleaus quadriarmigerus (Howden, 1954) — NSW, NT, QLD
 Synonym: *Bolboceras armigerum* Macleay, 1873
Bolboleaus quadrifoveatus (Lea, 1919) — QLD

Bolboleaus storeyi Howden, 1985 — NT, QLD
Bolboleaus tenax (Blackburn, 1904) — NSW, SA, VIC, WA
Bolboleaus trifoveicollis (Lea, 1916) — WA
Bolboleaus truncatus (Blackburn, 1904) — NSW, NT, QLD, SA, WA
Bolboleaus variolicollis (Lea, 1915) — NSW, QLD, SA

***Bolborhachium* Boucomont, 1911**

Bolborhachium anneae Howden, 1985 — WA
Bolborhachium bainbridgei (Westwood, 1848) — WA
Bolborhachium chelyum (Blackburn, 1889) — NSW, SA, VIC
Bolborhachium concavum Howden, 1985 — WA
Bolborhachium coronatum (Klug, 1843) — WA
 Synonym: *Bolboceras capreolum* Westwood, 1848
 Synonym: *Bolboceras pentagonicum* Lea, 1916
Bolborhachium dacoderum (Lea, 1916) — WA
Bolborhachium deceptum Howden, 1985 — WA
Bolborhachium edithae Howden, 1985 — WA
Bolborhachium hollowayi Howden, 1985 — WA
Bolborhachium inclinatum Howden, 1985 — NSW, NT, QLD, SA, WA
Bolborhachium keithi Howden, 1985 — WA
Bolborhachium kevinci Howden, 1985 — NT, SA, WA
Bolborhachium lacunosum (Macleay, 1873) — NSW, QLD
Bolborhachium laticorne (Macleay, 1873) — SA
Bolborhachium leai (Boucomont, 1924) — QLD
 Synonym: *Bolboceras interruptum* Lea, 1915
Bolborhachium nanum Howden, 1985 — WA
Bolborhachium pastinum Howden, 1985 — NSW, SA, WA
Bolborhachium prochelyum Howden, 1985 — SA
Bolborhachium recticorne (Guérin-Méneville, 1838) — WA
 Synonym: *Bolboceras fissicornis* Bainbridge, 1842
 Synonym: *Bolboceras hastifer* Bainbridge, 1842
 Synonym: *Bolboceras septemtuberculatum* Bainbridge, 1842
 Synonym: *Bolboceras excavatum* Klug, 1843
Bolborhachium richardsae (Blackburn, 1890) — SA
Bolborhachium scopulum Howden, 1985 — WA
Bolborhachium tricavicolle (Lea, 1924) — WA
Bolborhachium trituberculatum (Bainbridge, 1842) — WA
Bolborhachium triunum (Lea, 1919) — WA
Bolborhachium trymoderum (Lea, 1916) — WA

***Elephastomus* Macleay, 1819**

Elephastomus carnei Krikken, 1976 — QLD
Elephastomus gellarus Carne, 1965 — QLD, NSW

Elephastomus howdeni Nikolajev, 1990 — QLD
Elephastomus meraldus Carne, 1965 — NSW, VIC
Elephastomus proboscideus kirbyanus Carne, 1965 — NSW, VIC
 Synonym: *Bolboceras kirbyi* Westwood, 1848
Elephastomus proboscideus proboscideus (Schreibers, 1802) — QLD, NSW, TAS, VIC
 Synonym: *Bolboceras australasiae* Kirby, 1819
Elephastomus terraereginae (Blackburn, 1899) — QLD

***Eucanthus* Westwood, 1848**

Eucanthus felschei Boucomont, 1911 — SA, WA
 Synonym: *Eucanthus tricarinaticeps* Lea, 1924

***Gilletinus* Boucomont 1932**

Gilletinus bipagus Howden, 1990 — QLD (+New Guinea)
Gilletinus corrugatus (Lea, 1924) — QLD
Gilletinus flavocastaneus (Lea, 1924) — QLD, NSW
Gilletinus porosus Howden, 1992 — QLD
Gilletinus williamsi Howden 1992 — QLD, NSW

Note: *Gilletinus multicostatus* (Lansberge, 1885) is endemic New Guinea species and does not occur in Australia as previously reported (see Howden 1990).

***Stenaspidius* Westwood, 1848**

Stenaspidius albosetosus Howden, 1974 — NT, QLD
Stenaspidius allsoppi Howden, 1976 — QLD
Stenaspidius brittoni Howden, 1974 — WA
Stenaspidius enigmaticus Howden, 1992 — WA
Stenaspidius houstoni Howden, 1993 — WA
Stenaspidius lividus Howden, 1992 — WA
Stenaspidius matthewsi Howden, 1974 — WA
Stenaspidius nigricornis Westwood, 1848 — WA
Stenaspidius ruficornis Boucomont, 1906 — NSW, VIC, SA
Stenaspidius spatuliferus Howden, 1992 — WA

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