

for example some *Tetraloniella* males have short antennal flagella. These characters are conspicuous, commonly encountered and easy to remember, and help as a guide before venturing into keys. Regulars at identifying bees should attempt to develop a bigger suit of character for the bees they commonly encounter.

Key to the Afrotropical bee families

- 1. Short-tongued (Labial palp with four similar segments) (Fig. 7D) **2**
- 1'. Long-tongued (Labial palp with basal two segments long, apical two segments short (Fig. 7C) **5**
- 2. Glossa bifid apically **Colletidae**
- 2'. Glossa pointed apically **3**
- 3. Two subantennal sutures **Andrenidae**
- 3'. One subantennal suture **4**
- 4. Basal vein distinctly curved **Halictidae**
- 4'. Basal vein straight or nearly straight **Melittidae**
- 5. Female scopa on ventral surface of metasoma, except cleptoparasitic species; male metasoma curled under distally; labrum longer than wide; mostly two submarginal cells (*Fidelia* with three submarginal cells) **Megachilidae**
- 5'. Female scopa on hind leg, except cleptoparasitic species; male metasoma more or less straight; one, two or three submarginal cells; labrum mostly wider than long **Apidae**

8.1. Family Colletidae

The Colletidae are short-tongued bees with one subantennal suture, a forked glossa and a straight basal vein in the forewing. The structure of the glossa is unique. The hairs on the metasoma terga T3-T5 are all directed posteriorly.

In the Afrotropical Region the Colletidae has two subfamilies; the Colletinae and the Hylaeinae. The Colletinae has two tribes: Colletini, with one genus *Colletes*; and Scraptrini with *Scapter*. The other subfamily is the Hylaeinae, with genera *Calloprosopis* and *Hylaeus*.

These bees are collectively known as cellophane bees. This is because of their habit of applying a transparent secretion onto the walls of their brood cells. They nest in tunnels in the ground or in hollow twigs. The African species are all pollen collecting bees. *Hylaeus* and *Calloprosopis* do not have a scopa and carry their pollen in the crop. Most *Colletes* and all *Scapter* have a scopa on the hind leg.

The family is cosmopolitan, but has its greatest diversity in Australia.

Key to the Colletidae

1. Three submarginal cells in forewing ***Colletes***
- 1'. Two submarginal cells in forewing **2**
2. Integument metallic ***Calloprosopis***
- 2'. Integument not metallic (mostly black or black and reddish, sometimes with pallid maculation) **3**
3. Mostly hairy, female with scopa on hind leg; inter-antennal socket area flat or gently convex ***Scapter***
- 3'. Largely naked; female without scopa; inter-antennal socket area strongly and steeply raised ***Hylaeus***

8.1.1. Subfamily Colletinae

8.1.1.1. Tribe Colletini

Genus *Colletes* Latreille (Fig. 10A-B)

A quick indication as to whether a bee belongs to this genus is, a medium sized, hairy bee with eyes distinctly convergent below. In Africa *Colletes* bees mostly occur in southern and eastern Africa.

8.1.1.2. Tribe Scaptini

Genus *Scapter* Lapeletier and Serville (Fig. 10C-D)

Scaptini is endemic and monotypic, occurring mostly in southern Africa, but are also recorded from Kenya. They vary from very hairy to largely naked, and very small to quite large (5-12 mm), but always with the scopa on the hind leg and two submarginal cells in the forewing.

8.1.2. Subfamily Hylaeinae

Genus *Calloprosopis* Snelling (Fig. 10E-F)

Calloprosopis is monotypic and endemic to high altitudes in Kenya. It is metallic blue-green, and its status as a distinct genus is questionable, as its only representative is possibly a metallic *Hylaeus*. They do not have a scopa and carry their pollen in the crop.

Genus *Hylaeus* Fabricius (Fig. 10G-H)

Hylaeus are also largely naked, without a scopa, and mostly black with red and/or yellow maculations, never metallic. There are six subgenera in the Afrotropical Region (*Alfkenylaeus*, *Cornylaeus*, *Deranchylaeus*, *Metylaeus*, *Nothylaeus* and *Prosopisteron*) (Michener, 2007). *Prosopisteron* was introduced into South Africa from Australia.

Key to the subgenera of *Hylaeus*

1. Interantennal socket area gently convex; propodeum smooth and without definite basal area; male S7 with four similar, hairy lobes ***Hylaeus (Prosopisteron)***
- 1'. Interantennal socket area abruptly raised, with juxta antennal carina; propodeum with definite, usually coarsely sculptured, basal area; male S7 either 2 lobed or with 4 dissimilar lobes, one pair naked **2**
2. Mandible long and slender, apex acute ***Hylaeus (Nothylaeus)***
- 2'. Mandible short, broad, apex oblique, two or three teeth, outer surface usually ridged **3**
3. Integument coarsely punctured, scutum and scutellum usually each with a pair of spines; occiput and omaulus carinate ***Hylaeus (Metylaeus)***
- 3'. Punctuation variable; scutum and scutellum without lateral spines; occiput and omaulus often without carinae (males needed for further identification) **4**
4. Male S7 with two, small lobes; gonoforceps narrowed and attenuate distally, ending beyond apex of penis ***Hylaeus (Alfkenylaeus)***
- 4'. Male S7 with four lobes; gonoforceps truncate distally, apex about at end of penis valve **5**
5. Discs of T1-T3 with abundant erect hairs; S7 with proximal, apical lobes either naked or with median row of small setae, ***Hylaeus (Cornylaeus)***
- 5'. Discs of T1-T3 with few or no erect hairs; S7 with proximal, apical lobes either naked or with maginal row of large setae ***Hylaeus (Deranchylaeus)***

Subgenus *Hylaeus (Alfkenylaeus)* Snelling

Hylaeus (Alfkenylaeus) is endemic to and occurs through much of sub-Saharan Africa. There are five species including the unique *Hylaeus arnoldi* (Friese) that was included by Michener (2007). Females cannot be separated from *Deranchylaeus*. The single pair of lateroapical lobes directed laterobasally on the male S7 is the only diagnostic feature.

Subgenus *Hylaeus (Cornylaeus)* Snelling

This subgenus appears to be wide spread in Central Africa and extends its distribution southwards along the eastern half of the continent. There are two species. Apart from being larger than its close relative *Deranchylaeus*, this subgenus can only be identified by the hairyness of the lobes of the male S7. Its status is questionable.

Subgenus *Hylaeus* (*Deranchylaeus*) Bridwell

Hylaeus (*Deranchylaeus*) is a large subgenus, with 49 species, and occurs throughout sub-Saharan Africa.

Subgenus *Hylaeus* (*Metylaeus*) Bridwell

This subgenus is widespread in the Afrotropical Region, with four African and two Madagascan species. The well-developed occipital carina and carinate omaulus are diagnostic.

Subgenus *Hylaeus* (*Nothylaeus*) Bridwell

Hylaeus (*Nothylaeus*) is widespread through Africa and Madagascar. Snelling (1985) recorded 34 species. They are unlike the other hyaline bees in that the mandibles are slender, smooth and pointed. Snelling (1985) considered *Nothylaeus* to be a genus, but Michener (2007) considers this single apomorphy to be insufficient to justify generic status.

Subgenus *Hylaeus* (*Prosopisteron*) Cockerell

This genus is indigenous to Australia, New Zealand and several Pacific islands. During 1930 and 1948 a number of specimens of *Hylaeus* (*Prosopisteron*) *perhumilis* (Cockerell) were found in South Africa (Michener, 2007). As no specimens have been recently collected, it has presumably disappeared from Africa.

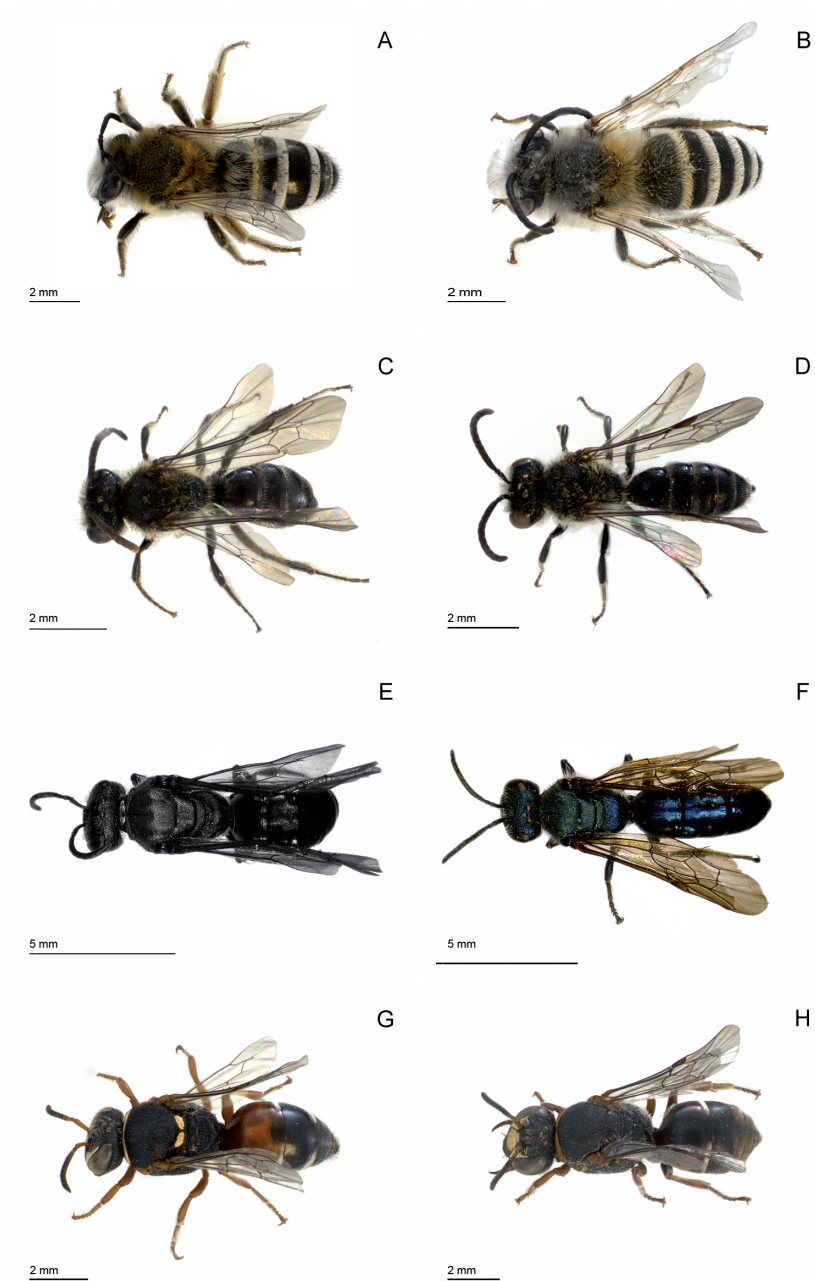


Fig. 10. A-B. *Colletes capensis* Cameron; A. Female; B. Male; C-D. *Scapter nitidus* (Friese); C. Female; D. Male; E-F. *Calloprosopis magnifica* (Cockerell); E. Female; F. Male; G-H. *Nothylaeus junodi* (Friese); G. Female; H. Male.

8.2. Family Andrenidae

The Andrenidae are short-tongued bees with two subantennal sutures, a pointed glossa and straight basal vein in the forewing. The subantennal sutures, which are the diagnostic feature, are easy to see in most panurgine bees, but difficult to see in the Andreninae. This is because the former are sparsely hirsute (some have the lower face yellow with black subantennal sutures) and the latter are very hairy with black facial integument. The hairs on the metasoma terga T3-T5 are all directed posteriorly.

In the Afrotropical Region they are all pollen collectors. They nest in burrows in the soil.

Key to the Andrenidae

1. Head, mesosoma and metasoma clothed with long hairs **Andrena**
- 1'. Body sparsely clothed with mostly short hairs, except scopa [Panurginae] **2**
2. Two submarginal cells **Mermiglossa**
- 2'. Three submarginal cells **3**
3. Large bees, more than 10 mm long, forewing with first and third submarginal cells subequal in length; male eyes much wider than interocular area near antennal sockets **Melitturga**
- 3'. Small bees, less than 10 mm long; forewing with first submarginal cell about twice as long as second submarginal cell; male eyes narrower or subequal in width to interocular area near antennal sockets **4**
4. Scutum mostly with sparse, semi-erect, hairs; male T7 simple apically; male S6 and S7 transverse or convex distally; male gonostylus robust, half as long as gonocoxa **Meliturgula**
- 4'. Scutum densely clothed with appressed hair, intermixed with semi-erect hairs; male T7 bifid apically; male S6 and S7 emarginate distally; male gonostylus slender, as long as gonocoxa **Borgatomelissa**

8.2.1. Subfamily Andreninae

Genus *Andrena* Fabricius (Fig. 11A-B)

All the Afrotropical species of the Andreninae occur in the genus *Andrena*. They are densely hirsute. It does not have a tribal classification.

Andrena is very diverse in the Holarctic Region (more than 1400 species), and is represented in the Afrotropical Region by only 14 species, several of which most likely also occur in the Palaearctic Region, *i.e.*, they occur in north-eastern Africa. There are many subgenera in the Northern Hemisphere and only five are recorded in the Afrotropical Region (*Andrena*, *Euandrena*, *Melandrena*, *Micrandrena* and *Zonandrena*), all of whose occurrence in sub-Saharan Africa can be regarded with circumspection. The subgeneric classification of the Afrotropical *Andrena* needs revision and a subgeneric classification is therefore

not applied here. The single southern African species and its differences to a closely related East African species, were documented by Eardley (2007a).

8.2.2. Subfamily Panurginae

8.2.2.1. Tribe Melitturgini

These bees are sparsely hirsute. They are dorso-ventrally flattish and sometimes have a reddish metasoma. They are mostly southern African. *Borgatomelissa*, *Melitturga* and *Meliturgula* also occur in the Palaearctic. *Mermiglossa*, however, is endemic and monotypic.

The Melitturgini are the only panurgine bees that occur in the Afrotropical Region. The tribe is represented by four genera (*Borgatomelissa*, *Melitturga*, *Meliturgula* and *Mermiglossa*) and 18 species. None of the genera have a subgeneric classification.

Genus *Borgatomelissa* Patiny (Fig. 11C)

Borgatomelissa is widely distributed across the southern border of the Sahara Desert, from Mauritania to Ethiopia and Arabia. There are two described species.

Genus *Melitturga* Latreille (Fig. 11E-F)

This genus occurs in southern Africa, around the Mediterranean and through southern Asia to China. In the Afrotropical Region there are four southern African species.

Genus *Meliturgula* Friese (Fig. 11G-H)

Meliturgula occurs in North Africa (1 endemic species), southern Africa (7 species), and there is one widespread species (*Meliturgula scriptifrons* (Walker)). They occur mostly in arid areas, except *M. scriptifrons*, which occurs in savannah.

Genus *Mermiglossa* Friese (Fig. 11D)

The concave lower edge of the *Mermiglossa* clypeus is distinct. It is monotypic and endemic to Namibia.

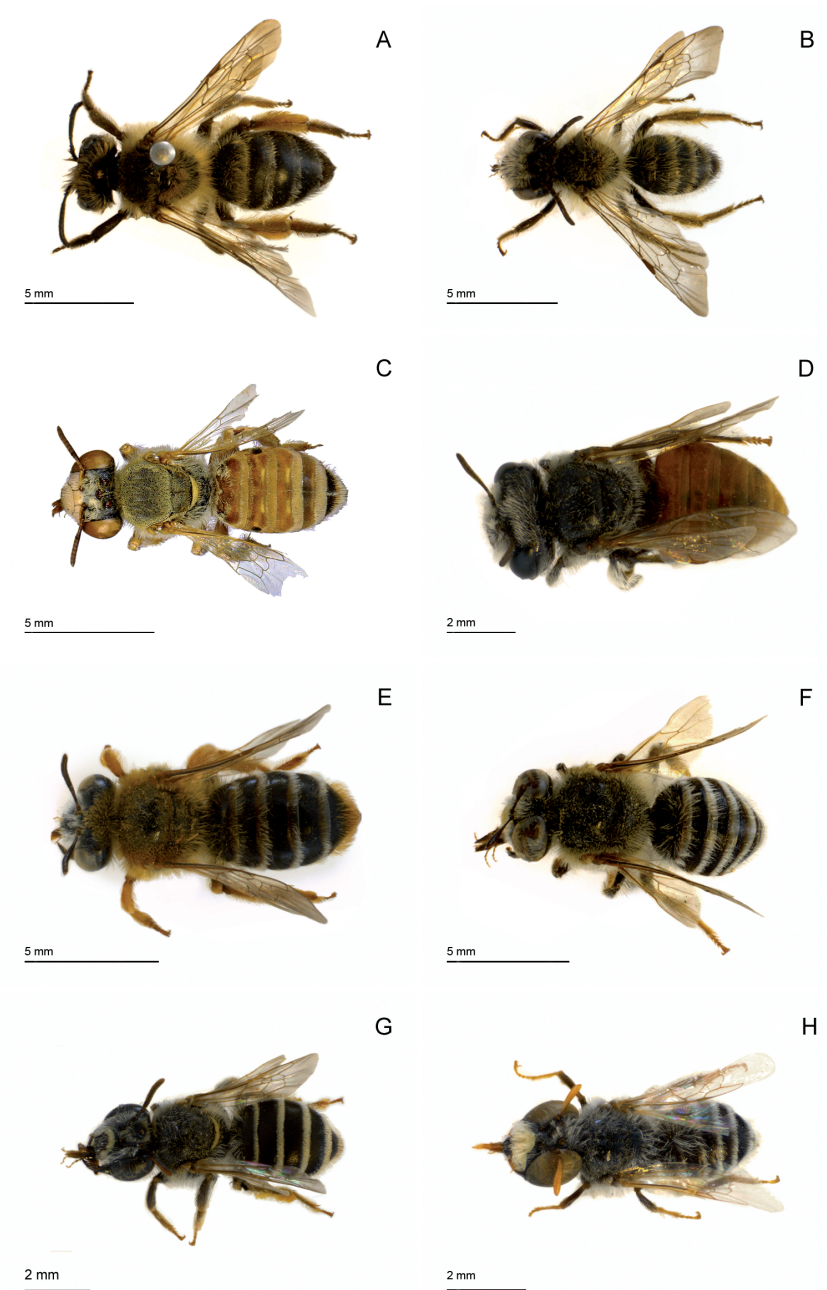


Fig. 11. A-B. *Andrena notophila* Cockerell; A. Female; B. Male; C. *Borgatomelissa brevipennis* (Walker), female; D. *Mermiglossa rufa* Friese, female; E-F. *Melitturga penrithorum* Eardley; E. Female; F. Male; G-H. *Meliturgula scriptifrons* (Walker); G. Female. H. Male.

8.3. Family Halictidae

The Halictidae are short-tongued bees with one subantennal suture, a pointed glossa and a strongly curved basal vein in the forewing. Within the short-tongued bees the shape of the basal vein is unique; some long-tongued bees have a weakly curved basal vein.

This is the largest family of short-tongued bees in the Afrotropical Region. It accounts for about one-third of all the Afrotropical bee species, and this family is possibly the most abundant because many species occur in large numbers. There are 16 genera and four subfamilies.

Key to the Halictidae

1. Antennal sockets below middle of face; scopa on side of metasoma, not on legs [Rophitinae] **Systropha**
- 1'. Antennal sockets near middle of face; scopa on hind legs, rarely on sterna (this excludes parasitic genera that do not have a scopa) **2**
2. First and third submarginal cells subequal in length, longer than second submarginal cell (rarely only 2 submarginal cells) [Nomiinae] **3**
- 2'. First submarginal cell longest, second and third submarginal cell shorter than first and more or less subequal in length (always three submarginal cells) **7**
3. Two submarginal cells in forewing **Steganomus**
- 3'. Three submarginal cells in forewing **4**
4. Metasoma with pale integument bands on T2-T5 **Nomia**
- 4'. Metasoma without pale integument bands on T2-T5 **5**
5. Tegula greatly enlarged; lower margin of eye carinate **Pseudapis**
- 5'. Tegula not modified (some exceptions, then body elongated, without carina below eye) **6**
6. Male last antennal segments narrowly pedunculate; female mandible simple; large species (13-15 mm); red metasoma, without bands of tomentum **Spatunomia**
- 6'. Male last antennal segment not narrowly pedunculate, mostly cylindrical; female with mandible bidentate or tridentate; metasoma mostly with bands of tomentum **Lipotriches**
7. Minute species (3-6.5 mm) often with yellow integument maculations on head, mesosoma and metasoma; prepygidial fimbria of female not divided medially [Nomioidinae] **8**
- 7'. Minute to large species; body without pale maculations; prepygidial fimbria of female divided by longitudinal median furrow (absent in cleptoparasitic genera) [Halictinae] **10**
8. Second submarginal cell petiolate; black; female inner metatibial spur unidentate **Cellariella**
- 8'. Second submarginal cell not petiolate; mostly metallic, rarely black; female inner metatibial spur bi or multidentate **9**

9. Metasoma with pale integument bands on base of terga (posterior depressed marginal zone of tergum 2 and frequently other terga translucent yellowish, so that yellow base of tergum 3 shows through) **Nomioides**
- 9'. Metasoma with pale integument bands on apical part of terga **Ceylalictus**
10. Hairs on distal ends of metasomal terga 3-5 directed laterally; malar area usually long, one-third to four times as long as wide **Thrinchostoma**
- 10'. Hairs on distal ends of metasomal terga 3-5 directed backwards; malar area short **11**
11. Cleptoparasitic (no scopa in female); without clear hair bands on distal ends of metasomal terga; metasoma often red (sometimes black or metallic blue), rarely with tomentum **12**
- 11'. Pollen collector, scopa on female hind leg; metasoma rarely red, often with distinct hair bands on base of metasomal terga **13**
12. Body coarsely pitted; mandible of female often with preapical tooth; fourth antennal segment a little longer than third in females, twice as long as third in males **Sphecodes**
- 12'. Body usually more finely punctate; mandible simple; third and fourth antennal segment distinctly broader than long in both sexes **Eupetersia**
13. Forewing with vein 2rs-m weakly developed than vein Rs (more prominent in females) **Lasioglossum**
- 13'. All veins of submarginal cells equally well developed **14**
14. Body mostly black **Patellapis**
- 14'. Body with metallic green, gold or blue reflections **15**
15. Glossa very long, about twice as long as head **Glossodialictus**
- 15'. Glossa short **Seladonia**

8.3.1. Subfamily Nomiinae

The Nomiinae, in large, have the first and third submarginal cells in the forewing subequal in length and distinctly longer than the second submarginal cell. The exception is *Steganomus*, which has only two submarginal cells, and is the only halictid genus in Africa with two submarginal cells. They are all pollen collecting bees. They nest in tunnels in the ground.

Genus *Lipotriches* Gerstaecker

This is the largest genus of Nomiinae in the sense of Michener (2007), and it includes the species that Pauly (1990; 2009) separated into several genera. It is difficult to identify and determination usually results from the elimination of the genera with more conspicuous diagnostic features. This may turn out to be a paraphyletic taxon (Michener, 2007).

Key to the subgenera of *Lipotriches*

1. Female mandible tridentate, bidentate in male; basal region of propodeum forming a thin line or groove ***Lipotriches (Nubenomia)***
- 1'. Female mandible bidentate, usually simple in male, sometimes bidentate in *Lipotriches s.str.*, if so base of propodeum broader than described above **2**
2. Pronotum carinate, sometimes notched, scutum not bent down anteromedially (inner hind tibial spur of female not toothed but lamellate) ***Lipotriches (Lipotriches)***
- 2'. Pronotal carina absent or broadly notched medially, anterior part of scutum bent down medially to depressed pronotal margin **3**
3. Ocellular distance less than twice ocellus diameter; glossa as long as face; small species with red metasoma ***Lipotriches (Maynenomia)***
- 3'. Ocellular distance at least twice ocellus diameter; glossa shorter than face; colour of metasoma variable (females needed for identification) . . **4**
4. Margin of basitibial plate in female carinate posteriorly only ***Lipotriches (Macronomia)***
- 4'. Anterior and posterior margins of female basitibial plate carinate **5**
5. Propodeum base entirely sub-horizontal . . . ***Lipotriches (Austronomia)***
- 5'. Propodeum base sub-vertical medially **6**
6. T1 minutely tessellate and finely punctured; male hind tibia with three large teeth ventrally ***Lipotriches (Trinomina)***
- 6'. T1 shiny, often shagreened, coarsely punctured; male hind tibia with zero, one or two teeth ventrally ***Lipotriches (Afronomia)***

Subgenus *Lipotriches (Afronomia)* (Fig. 13A-B)

Species of *Afronomia* are very similar to African *Austronomia* but much larger (10-18 mm). The males of *Afronomia* cannot be separated from males of *Macronomia*. This endemic subgenus is widely distributed in southern and eastern Africa (7 species), and is absent from West Africa.

Subgenus *Lipotriches (Austronomia)* (Fig. 13G-H)

This subgenus is widespread in Australasia and Africa. Males of *Austronomia* cannot be separated from males of *Macronomia*. About 20 minute species occur in Africa, most of them have not been described.

Subgenus *Lipotriches (Lipotriches)* (Fig. 12E-F)

Lipotriches s. str. is widely distributed through Africa (about 70 species), Madagascar (4 species), southern Asia (27 species), New Guinea (3 species), the Solomon Islands (1 species) and northern Australia (3 species). Most groups of species forage pollen of Poaceae (grasses) exclusively.

Subgenus *Lipotriches* (*Macronomia*) (Fig. 12A-B)

This subgenus is widely distributed and diversified in the Afrotropical (about 45 species) and Oriental regions (11 species).

Subgenus *Lipotriches* (*Maynenomia*) (Fig. 12C-D)

Three species occur in sub-Saharan Africa and about ten in the Oriental Region. The absence of a pronotal carina, enlarged ocellae, long glossa, red metasoma and short scape are diagnostic for the African species.

Subgenus *Lipotriches* (*Nubenomia*) (Fig. 13D)

These are relatively large species (9-12 mm). Except for the subgenus *Melittidia* from New-Guinea, *Nubenomia* is the only nomiine with a tridentate female mandible. Other diagnostic characters are the clypeus that extends as a lip below a fringe of apical hairs, the head is about as long as broad, unlike the great majority of *Lipotriches*, and the distal part of the forewing is strongly darkened. The ocellae are large and *Nubenomia* are often crepuscular. It is endemic to Africa, with seven species in forested area.

Subgenus *Lipotriches* (*Trinomia*) (Fig. 13E-F)

This subgenus is near *Austronomia*, differing in that the propodeal triangle is vertical. The posterior leg of the male is swollen, and there are three teeth on the underside of the femur. It is endemic to Africa, with six species.

Genus *Nomia* Latreille

Nomia can be easily recognised, in the Nomiinae, by the pallid, distal integument bands on the metasomal terga (this also occurs in *Patellapis*, which is in the Halictini). This possibly paraphyletic genus was split into several genera by Pauly (1990; 2009).

Key to the subgenera of *Nomia*

1. Metanotum lamellate ***Nomia* (*Crocisaspidia*)**
- 1'. Metanotum not lamellate **2**
2. Female with basitibial plate completely carinate; tegula auriform; outer hind tibia spur bent near apex, with projection near bend; middle tibial spur long, with a few conspicuous preapical teeth . . . ***Nomia* (*Acunomia*)**
- 2'. Female with basitibial plate carinate posteriorly only; tegula oval; outer hind tibia spur unmodified; middle tibial spur short and with only minute teeth **3**
3. T1 without coloured band; T2-T4 with coloured bands yellow or whitish; male hind tibia mostly unmodified, femur rarely with tooth ventrally near base ***Nomia* (*Leuconomia*)**
- 3'. T1-T4 with whitish or yellow bands; male hind tibia enlarged, femur ventrally with one preapical tooth ***Nomia* (*Nomia*)**

Subgenus *Nomia* (*Acunomia*) Cockerell (Fig. 14C-D)

This subgenus is widespread through Africa, Asia, North and Central America. Michener (2007) suggested that it is a paraphyletic group, which means that it may be divided in years to come. The structure of the outer hind and mid tibial spurs are diagnostic. All Asian species are now placed in *Nomia* (*Curvinomia*), *N.* (*Maculonomia*) and *N.* (*Gnathonomia*) (Pauly 2009).

Subgenus *Nomia* (*Crocisaspidia*) Ashmead (Fig. 14A-B)

Nomia (*Crocisaspidia*) is widespread in the Afrotropical Region (9 species) and occurs in India (1 species). The laminate scutellum is diagnostic, and they often have pale blue metasomal bands, resembling *Thyreus*, but in *Thyreus* the pale blue is coloured pubescence and in *Crocisaspidia* it is integument. *Crocisaspidia* are oligolectic on Fabaceae (beans).

Subgenus *Nomia* (*Leuconomia*) Pauly (Fig. 14G-H)

These bees are small, have pale, inconspicuous tergal bands, and therefore superficially resemble *Lipotriches*. They can be identified by the lack of tergal band on T1 and the incomplete basitibial plate in the female. *Nomia* (*Leuconomia*) is widespread in Africa (25 species), one species occurs in Madagascar and two in India.

Subgenus *Nomia* (*Nomia*) Latreille (Fig. 14E-F)

Nomia s. str. has only six described species, and they occur throughout the Afrotropical Region (3 species), Madagascar (1 species) and tropical Asia (2 species).

Genus *Pseudapis* Kirby

Pseudapis has a very large tegula and three submarginal cells in the forewing. Not to be confused with *Steganomus*, which has a large tegula, but always has two submarginal cells. Some *Lipotriches* also have an enlarged tegula but they can be distinguished by the lack of a carina along the lower margin of the eye, a character shared only by the subgenera of *Pseudapis*.

Key to the subgenera of *Pseudapis*

1. Female basitibial plate with anterior and posterior margins carinate; male hind leg often swollen and with one or no apical spines ***Pseudapis* (*Pseudapis*)**
- 1'. Female basitibial plate with only posterior margin carinate; male hind tibia not enlarged and with two apical spurs ***Pseudapis* (*Pachynomia*)**

Subgenus *Pseudapis* (*Pachynomia*) Pauly (Fig. 15E-F)

This subgenus is widespread in Africa (four species) and two species occur in India.