

Fig. 30. A-B. *Anthidium severini* Vachali. A. Female; B. Male; C. *Aspidosmia arnoldi* (Brauns), Female; D. *Aspidosmia* sp., Male; E. *Eoanthidium rothschildi* (Vachal), male.

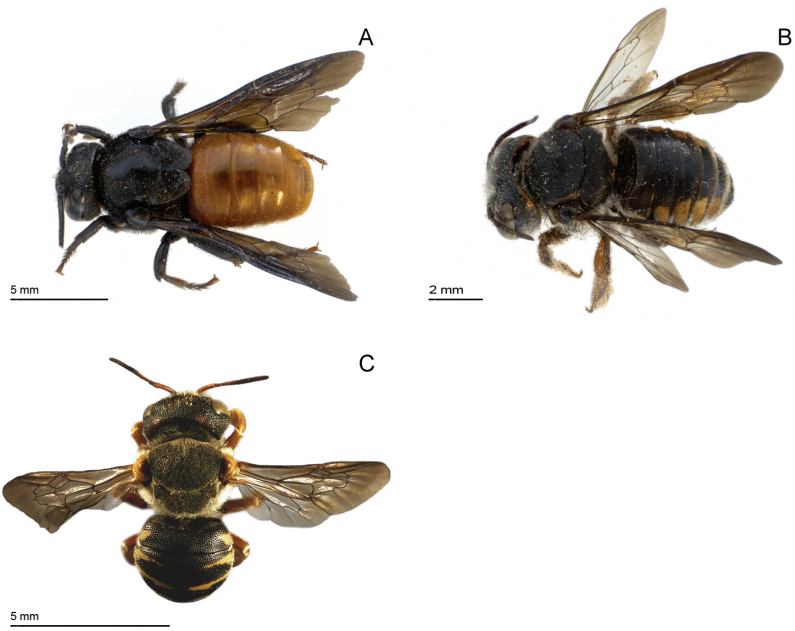


Fig. 31. A. *Euaspis abdominalis* (Fabricius), female; B. *Gnathanthidium prionognathum* (Mavromoustakis), female; C. *Icteranthidium grohmani*, female.

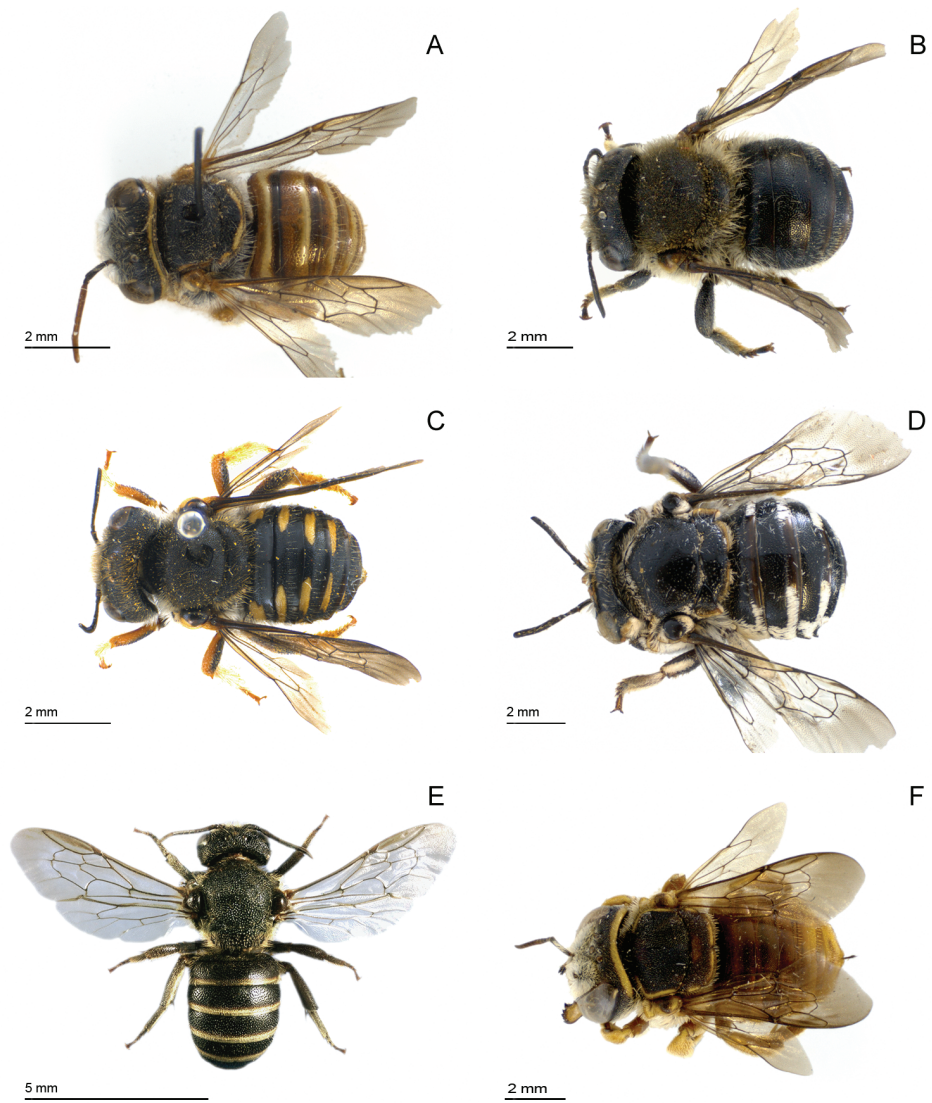


Fig. 32. A. *Pachyanthidium* sp., female; B. *Plesianthidium volkmanni* (Friese), female; C. *Pseudoanthidium tuberculiferum* Friese, female; D. *Serapista rufipes* (Friese), female; E. *Stelis* sp., female; F. *Trachusa* sp., female.

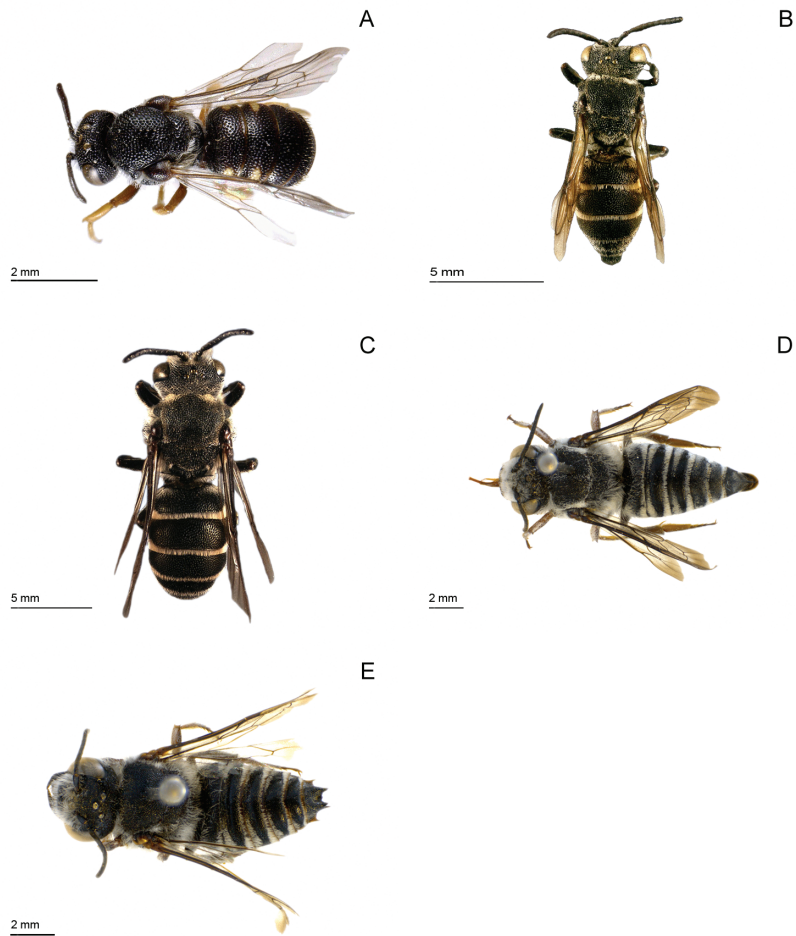


Fig. 33. A. *Xenostelis polychroma* Baker, female; B-C. *Aglaopis trifasciata* (Nylander); B. Female; C. Male; D-E. *Coelioxys circumscriptus* Schulz: D. Female; E. Male.

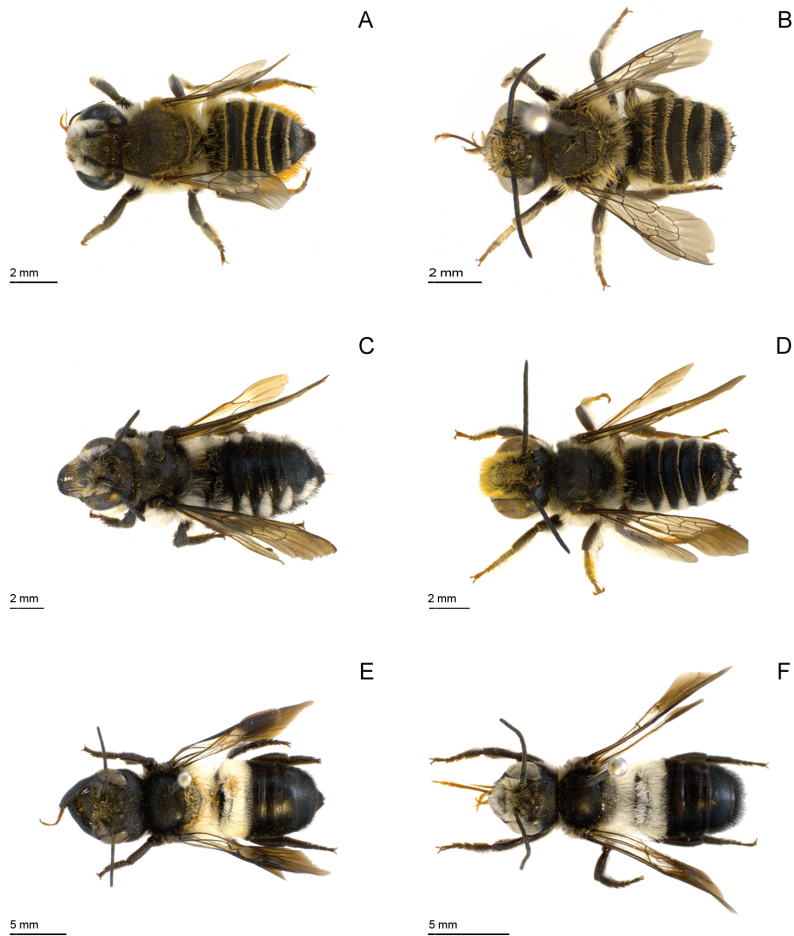


Fig. 34. A-B. *Megachile frontalis* Smith. A. Female. B. Male. C-D. *Megachile ianthoptera* Smith. C. Female. D. Male. E-F. *Megachile maxillosa* Guérin-Méneville. E. Female. F. Male.

8.6. Family Apidae

The Apidae is one of two long-tongued bee families that occur in Africa, the other is the Megachilidae. It is very diverse. Within the long-tongued bees, the scopa on the hind leg and the male tergum 7 not largely concealed ventrally are diagnostic; parasitic genera, however, pose a challenge. Characters unique to Apidae, but not occurring in all Apidae are: a long antennal flagellum; pale yellow stripes adjacent to the eye; a corbicula; a sickle-shaped hind tibial spur; a pseudopygidium on tergum 5; a posteromedial concavity on sternum 5. The best way to identify this family is by excluding the short-tongued bees and the Megachilidae. As the parasitic genera do not have a scopa, the females are more difficult identify. A key to the long-tongued parasitic bees is therefore given.

The Apidae have diverse biologies. They bore nests in the wood (carpenter bees), tunnel in the ground (Anthophorini) and use existing cavities (Meliponini and Apini). Most are solitary, but a number of different types of sociality occur: ranging from semi-social to eusocial (sociality also occurs in Halictini, but eusociality is unique to the Apidae in bees). There are no daubers. Parasitism includes social parasites, where the parasite replaces the queen of the host species, cleptoparasites and robbers, in the latter the parasite raids the host's nest to provision its own cells. They occur in all habitat types in Africa.

Key to the Apidae

1. Marginal cell of forewing long, about four times as long as distance between marginal cell and distal end of forewing **Apis**
- 1'. Marginal cell of forewing much shorter **2**
2. Forewing with submarginal cross veins weakly developed or absent . . . **3**
- 2'. Submarginal cross veins well developed **8**
3. Scopa not corbiculate, outer surface convex **Cleptotrigona**
- 3'. Scopa modified to form a corbicula, outer surface concave or flat, surrounded by hairs **4**
4. Forewing with vein Rs visible **5**
- 4'. Vein Rs not discernable **7**
5. Outer surface of hind tibia strongly concave **Meliponula**
- 5'. Outer surface of hind tibia weakly concave **6**
6. First metasomal segment broader than long; posterodistal part of hind tibia angulate **Plebeina**
- 6'. First metasomal segment longer than broad; posterodistal part of hind tibia rounded **Dactylurina**
7. Propodeum long, dorsal (horizontal) surface longer than vertical surface **Hypotrigona**
- 7'. Propodeum short, dorsal surface shorter than vertical surface **Liotrigona**
8. Labial palp weakly flattened, not long and sheath-like; resembling short-tongued bees more closely **9**
- 8'. Labial palp flattened and sheath-like; typical for long-tongued bees . . . **11**
9. Without oil collecting hairs on metasomal venter; three submarginal cells in forewing **Ancyla**
- 9'. With oil collecting hairs on metasomal venter; two submarginal cells . . **10**
10. Hind tibial spur greatly expanded **Ctenoplectra**
- 10'. Hind tibial spur not expanded **Ctenoplectrina**
11. Two submarginal cells in forewing **12**
- 11'. Three submarginal cells in forewing **24**
12. Clypeus slightly restricted near tentorial pits, parallel above tentorial pits; scopa on female hind leg (reduced in *Eucondylops* – parasitic); softly

	sclerotized; distal end of metasoma without pygidial plate or other modification (pointed)	13
12'	Clypeus converges dorsally; without scopa, parasitic; robustly sclerotized; distal end of metasoma with pygidial plate or other modification	19
13.	Tongue relatively long; transverse fasciae of short appressed hair on T2-T5; jugal lobe of hind wing almost as large as vannal lobe	<i>Macrogalea</i>
13'	Tongue of normal length; metasomal dorsum sparsely pubescent; jugal lobe extending little, if any, beyond vein cu-a of vannal lobe.	14
14.	Vein 2m-cu absent; scopa weakly developed, parasitic bee	<i>Eucondylops</i>
14'	Vein 2m-cu present; scopa mostly well developed, pollen collecting and parasitic bees	15
15.	Lateral margins of tergum 6 curved sharply under	16
15'	Curvature on lateral margins of tergum 6 rounded	17
16.	Extensive yellow maculation on entire body or black with strongly concave upper clypeal margin	<i>Compsomelissa</i>
16'	Head and mesosoma black with yellow maculation, metasoma red	<i>Allodapula</i>
17.	Integument yellow along inner eye margin	<i>Allodape</i>
17'	Integument black along inner eye margin	18
18.	Clypeus with tubercle	<i>Nasutapis</i>
18'	Clypeus flat	<i>Braunsapis</i>
19.	Marginal cell of forewing truncate apically	<i>Chiasmognathus</i>
19'	Marginal cell rounded apically	20
20.	Mandibles cross in repose, head and mesosoma black, metasoma red	<i>Sphecodopsis</i>
20'	Mandibles overlap in repose, colour variable	21
21.	Female sternum 6 broad posteriorly and concave posteromedially; male unknown	<i>Ammobatoides</i>
21'	Female sternum 6 spinose	22
22.	Female tergum 5 with pseudopygidium and circular hole through which sternum 6 protrudes; male omaulus carinate	<i>Schwarzia</i>
22'	Female tergum 5 without pseudopygidium or circular hole; male omaulus rounded	23
23.	Female sternum 5 concave with gutter posteromedially; male with 13-segments antenna	<i>Ammobates</i>
23'	Female sternum 5 concave, without gutter; male with 12-segmented antennal	<i>Pasites</i>
24.	Jugal lobe less than one forth as long as vannal lobe.	25
24'	Jugal lobe more than one forth as long as vannal lobe.	27

25.	Pterostigma absent; hirsute; scopa in female.	<i>Xylocopa</i>
25'.	Pterostigma present; sparse hair or appressed pubescence; female without scopa.	26
26.	Female with pseudopygidium; metasoma with appressed pubescence	<i>Epeolus</i>
26'.	Female without pseudopygidium; metasoma sparsely pubescent, hairs not appresses.	<i>Nomada</i>
27.	Female without scopa (parasitic); scutellum modified into spines or a lamella	28
27'.	Female with scopa; scutellum gently rounded	29
28.	Scutellum with medio-lateral points	<i>Afromelecta</i>
28'.	Scutellum distinctly lamellate	<i>Thyreus</i>
29.	Pygidial plate absent; forewing with basal vein gently curved (entire body sparsely hirsute)	<i>Ceratina</i>
29'.	Pygidial plate present in all female and most males; basal vein straight (mostly densely hirsute)	30
30.	Marginal cell of forewing longer than distance from marginal cell to wing tip; wing not hairy	31
30'.	Marginal cell of forewing shorter than distance from marginal cell to wing tip; wing hairy	33
31.	Hind wing with jugal lobe much less than half length of vannal lobe	<i>Pachymelus</i>
31'.	Hind wing with jugal lobe about half length of vannal lobe	32
32.	Females with scopa sparse; clypeus distinctly protuberant in both sexes (about 0.8x eye width); maxillary palp 3-4 segmented; male never with long antennal flagellum (less than twice as long as eye)	<i>Tetralonia</i>
32'.	Females with scopa dense; clypeus weakly protuberant (about 0.5x eye width); maxillary palp 5-6 segmented; male often with antennal flagellum more than twice as long as eye	<i>Tetraloniella</i>
33.	Arolia absent	<i>Amegilla</i>
33'.	Arolia present	<i>Anthophora</i>

8.6.1. Subfamily Xylocopinae

The Xylocopinae are commonly known as carpenter bees, although other bees also bore into wood, such as *Lithurgus*. They nest in holes they bore into dead plant material; mostly wood and pithy stems. They have diverse biologies in that they are solitary, solitary with social tendencies, social or social parasites.

8.6.1.1. Tribe Xylocopini

Genus *Xylocopa* Latreille (Fig. 35A-D)

This tribe comprises one Afrotropical genus, *Xylocopa*, commonly known as the large carpenter bees. They are all pollen collectors. They all separate their cells

with partitions made of wood shavings. They are mostly large, among the biggest bees in Africa.

Key to the subgenera of *Xylocopa*

1. Tergum 1 with divide between anterior (subvertical) and posterior (subhorizontal) surfaces rounded; female T1 never with pouch **2**
- 1'. Tergum 1 angulately divided between anterior (subvertical) and posterior (subhorizontal) surfaces; female T1 often with pouch for *Dinogamasus* mites in subvertical surface **4**
2. Female mandible with large tooth on ventral surface; male eyes not enlarged and face black ***Xylocopa (Gnathoxylocopa)***
- 2'. Female mandible without ventral tooth; male either with eyes not enlarged and clypeus yellow, or eyes enlarged and face black **3**
3. Female without propodeal triangle; male with pronotal lobe short, not prolonged into mesepisternum ***Xylocopa (Xylomelissa)***
- 3'. Female with propodeal triangular; male with pronotal lobe long, extending into mesepisternum ***Xylocopa (Ctenoxylocopa)***
4. Female head distinctly enlarged, gena as wide as eye; posterior region of male mesosoma arched, propodeum integument yellow ***Xylocopa (Xenoxyllocopa)***
- 4'. Female head unmodified; male scutellum angulately divided; propodeal integument black **5**
5. Female with posterior margin of scutellum projecting beyond posterior margin of metanotum; male middle tarsus unmodified ***Xylocopa (Koptortosoma)***
- 5'. Female with posterior margin of scutellum not projecting beyond posterior margin of metanotum; male middle tarsus enlarged ***Xylocopa (Mesotrichia)***

Subgenus *Xylocopa (Ctenoxylocopa)* Michener

Ctenoxylocopa is mostly Asian and occurs in North-East Africa (3 species). There are six species in this subgenus.

Xylocopa (Gnathoxylocopa) Hurd and Moure (Subgenus)

This subgenus comprises one species, *Xylocopa sicheli* Vachal. It has a unique tooth on the lower surface of the female mandible. It nests only in dead inflorescences of *Aloe*. They are endemic to southern Africa, occurring through most of the arid areas south of Bulawayo.

Subgenus *Xylocopa (Koptortosoma)* Gribodo (Fig. 35C-D)

Koptortosma is a large subgenus and it comprises some of the most common, widespread large carpenter bees. It has a few species that do not have a pouch for *Dinogamasus* mites, e.g., *Xylocopa scioensis* Gribodo. There are 58 species in sub-Saharan Africa and about 196 species world wide.

Subgenus *Xylocopa* (*Mesotrichia*) Westwood

Mesotrichia are among the largest large carpenter bees. Mostly they are black with the mesosomal dorsum orange or brownish, or entirely black. There are seven Afrotropical species, and 16 additional species east of the Sahara through South-East Asia.

Subgenus *Xylocopa* (*Xenoxylocopa*) Hurd and Moure

This subgenus superficially looks like *Xylocopa* (*Koptortosoma*), but the females have an enlarged head and the males have a gently curved propodeum. It is endemic to tropical Africa and has two species. The females are banded like some *Koptortosoma*, but the colour of the anterior band (yellow or white) extends onto the mesepisternum, which does not happen in *Koptortosoma*, making the subgenera easy to separate.

Subgenus *Xylocopa* (*Xylomelissa*) Hurd and Moure (Fig. 35A-B)

These are the typical group of large carpenter bees without mite pouches. They are mostly completely black, except males mostly have a yellow clypeus. They are found throughout sub-Saharan Africa, and there are about 65 species.

8.6.1.2. Tribe Ceratinini

Genus *Ceratina* Latreille (Fig. 35E-F)

Ceratina are small carpenter bees. They share this common name with the Allodapini. As with *Xylocopa*, they all separate their cells with partitions made of wood shavings. They have three submarginal veins in the forewing and the marginal vein is weakly curved. They are all pollen collecting bees.

Key to the subgenera of *Ceratina*

1. Prestigma long, about as long as distance from base of pterostigma to vein r; distal regions of middle and hind femora with blade-like edges ventrally ***Ceratina* (*Megaceratina*)**
- 1'. Prestigma short, much shorter than distance from base of pterostigma to vein r; ventral edges of femora rounded **2**
2. Metallic, usually green or blue, sometimes gold or red; deeply punctured; terga 2-3 without graduli. **3**
- 2'. Usually black, some with weak lusters of metallic green; small, shallow punctures; terga 2-3 with graduli **4**
3. Axilla not spinose; mandible curved inwards . . . ***Ceratina* (*Protopithitis*)**
- 3'. Axilla spinose; mandible straight ***Ceratina* (*Pithitis*)**
4. Metallic green ***Ceratina* (*Copoceratina*)**
- 4'. Head and mesosoma black **5**
5. Posterior margins of terga 2-5 each with a row of coarse, pallid, conspicuous, thickened, posteriorly directed setae **6**
- 5'. Posterior margins of terga 2-5 without modified setae **7**

- 6. Scutellum strongly curved, propodeum straight and distinctly declivous in profile ***Ceratina (Simioceratina)***
- 6'. Scutellum and propodeum together gently curved, sloped posteriorly in profile ***Ceratina (Ctenoceratina)***
- 7. Tergum 5 without a gradulus ***Ceratina (Hirashima)***
- 7'. Tergum 5 with a distinct gradulus ***Ceratina (Ceratina)***

Subgenus *Ceratina (Ceratina)* Latreille

These are the common, mostly shiny black, small carpenter bees without scale-like setae along the posterior edges of the metasomal terga. *Ceratina rhodura* Cockerell and *Ceratina whiteheadi* Eardley & Daly have a red metasoma. Bees of this subgenus occur through much of the Old World. In sub-Saharan Africa there are about 20 species.

Subgenus *Ceratina (Copoceratina)* Terzo and Pauly

Copoceratina has two species. One is African, *Ceratina minuta* Friese, the other occurs in Madagascar and the Seychelles. They are weakly metallic.

Subgenus *Ceratina (Ctenoceratina)* Daly and Moure

Ctenoceratina and *Simioceratina* have scales modified to look like teeth along the terga margins. They are common. The slope of the propodeum, in relation to the scutum, separates these two subgenera and in learning how to separate them the comparison of these two subgenera is needed for accuracy. The subgenus is widespread in sub-Saharan Africa and includes 10 species.

Subgenus *Ceratina (Hirashima)* Terzo and Pauly

These closely resemble *Ceratina* s. str. However, they are dull black and more deeply punctured, *Ceratina* s. str. being shiny black. There are nine species in southern Africa and more surely occur through the rest of sub-Saharan Africa.

Subgenus *Ceratina (Megaceratina)* Hirashima

Ceratina (Megaceratina) is the subgenus of the largest tropical, small carpenter bee, *Ceratina sculpturata* (Smith). The metasoma has orangish-red maculations.

Subgenus *Ceratina (Pithitis)* Klug

This subgenus represents the fairly common, strongly sculptured, metallic (mostly blue or green) bees. They resemble *Ceratina (Protopithitis)*, which is much less common. It appears to occur throughout the Old World. Two widespread species occur in southern Africa, several more possibly occur in tropical Africa.

Subgenus *Ceratina (Protopithitis)* Hirashima

Ceratina (Protopithitis) are fairly rare and occur in tropical Africa. There are two described species, one intrudes into southern Africa.

Subgenus *Ceratina* (*Simioceratina*) Daly and Moure

This subgenus superficially resembles *Ceratina* (*Ctenoceratina*), and after comparing these two subgenera it is fairly easy to identify the declivous propodeum. There are three species that occur, fairly frequently, through most of sub-Saharan Africa.

8.6.1.3. Tribe Allodapini

The Allodapini are also small carpenter bees, but are often called allodapine bees. They have two submarginal cells, they are not strongly sclerotized and are black, reddish or yellowish. Unlike *Xylocopa* and *Ceratina*, they mostly do not have separate cells in their nests and feed their larvae progressively. *Compsomelissa* (*Halterapis*) is the exception that mass provisions and has separate cells for its larvae. The nesting biology was documented by Michener (1971). This tribe comprises nine African genera; *Allodape*, *Allodapula*, *Braunsapis*, *Hasinamelissa*, *Macrogalea* and *Compsomelissa*, possibly all have both pollen collecting bees and social parasites. *Effractapis*, *Eucondylops* and *Nasutapis* are parasitic. The greatest diversity of allodapine bees is in Africa and Madagascar, but they also occur in Asia and Australia. The two submarginal cells in the forewing give a good first indication of an allodapine bee.

Genus *Allodape* Lepelletier and Serville (Fig. 36A)

Allodape has pale maculation on the paraocular area adjacent to the inner eye margin. Such marks are found in two species of *Allodapula*, which have a distinctly different tergum 5. They may be completely black or mostly black with a reddish metasoma, and are fairly hard to identify to species.

Genus *Allodapula* Cockerell (Fig. 36B)

Allodapula has the sides of the last metasomal tergum curved strongly under, and the dorsal surface gently concave. They are mostly southern African. They are mostly black with a reddish metasoma; a few species are completely black. The subgenera are difficult to identify, as they are based on male genitalia, and it is possibly easier to identify them to species.

Key to the subgenera of *Allodapula*

1. Male gonostylus minute, stylus-shaped, hairs short and slender *Allodapula* (*Dalloapula*)
- 1'. Male gonostylus not stylus-like, hairs long and often robust 2
2. Gonobase reduced to a narrow sclerotized band *Allodapula* (*Allodapula*)
- 2'. Gonobase unmodified *Allodapula* (*Allodapulodes*)

Subgenus *Allodapula* (*Allodapula*) Cockerell

These are southern African and common. Apparently it comprises eight pollen collecting species and one social parasite, *Allodapula guillarmodi* Michener.

Subgenus *Allodapula* (*Allodapulodes*) Michener

Allodapula (*Allodapulodes*) are more robust than *Allodapula* (*Allodapula*) and are endemic to the Cape Province of South Africa. There are five species.

Subgenus *Allodapula* (*Dalloapula*) Michener

Allodapula (*Dalloapula*) comprises two species, both of which are endemic to South Africa.

Genus *Braunsapis* Michener (Fig. 36C)

Braunsapis are mostly black with no distinctive characters within the Allodapini. They are very common.

Genus *Compsomelissa* Alfken (Fig. 36D)

Compsomelissa comprises either yellow and black bees, or black bees with the upper edge of the clypeus distinctly concave. Michener (1975) referred to the two subgenera as genera.

Key to the subgenera of *Compsomelissa*

1. Extensive pallid maculation ***Compsomelissa* (*Compsomelissa*)**
- 1'. Mostly black, clypeus, pronotal lobe and legs may be yellow
..... ***Compsomelissa* (*Halterapis*)**

Subgenus *Compsomelissa* (*Compsomelissa*) Alfken

This subgenus is very conspicuous because of the pallid yellow maculation. They occur in the Sahelian countries, East Africa and southern Africa. There are six species, five of which occur in sub-Saharan Africa.

Subgenus *Compsomelissa* (*Halterapis*) Michener

Compsomelissa (*Halterapis*) spp. look like black *Braunsapis* spp. They are difficult to separate, as some *Braunsapis* have the clypeus gently concave dorsally; the extent of the concavity separates them. The most common species has very dark wings veins, hence it is called *Compsomelissa nigrinervis* Cameron. They occur in southern Africa (four species). The 18 Malagasy species, previously placed in *Halterapis*, are now all placed in a new endemic genus *Hasinamelissa* Chenoweth & Schwarz (Chenoweth *et al.*, 2008).

Genus *Eucondylops* Brauns (Fig. 36F)

Eucondylops does not have a Vein 2m-cu in the forewing.

Genus *Macrogalea* Cockerell (Fig. 36G-H)

Macrogalea has a long proboscis. The males have large eyes, but they do not touch above. There are four African species; at least one is a social parasite on another *Macrogalea* species, and six Madagascan species.