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A REVISION OF THE SUBGENUS *CTENOXYLOCOPA* (Hymenoptera : Anthophoridae)

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Abstract : Seven species and subspecies, in 2 groups, are recognized for the subgenus. Among them, *Xylocopa ustulata* F. Sm. is resurrected from synonymy, while *sulcatipes* (Arabia, Palestine, Transcaspia) and *tessellata* (Eritrea, Sudan) are described as new, and *fenestrata* is split into 2 subspecies including *mauritii* n. ssp. (Mauritius, Madagascar). Of the earlier nominal species, *taschenbergi* Vach. and *sudanica* Ckll. are suppressed as synonyms of *ustulata* ; *hottentotta* F. Sm., *stadelmanni* Vach. and *aliceae* Ckll. are removed from the subgenus. To avoid further confusion, lectotypes are designated for *basalis* F. Sm., *hottentotta* F. Sm., *oblonga* F. Sm., *taschenbergi* Vach. and *ustulata* F. Sm.

Ctenoxylocopa is one of the small, well characterized subgenera of *Xylocopa* commonly referred to as the carpenter bees. It is fairly abundant in many parts of the Old World and there is an odd record from S. America (Hurd & Moure 1961 : 184). Most members of the subgenus are closely similar in superficial appearance to one another and even to several remotely related bees. The nomenclature and systematics are so chaotic and confusing that 2 of the species have long been known under wrong names while 3 others have been erroneously included. It is hoped that this article might serve as the basis for a further, more detailed study.

Material

This paper is based almost entirely on the collections in the British Museum (Nat. Hist.) (BMNH), Museo civico di Storia Naturale in Genova (MSNG), Naturhistorisches Museum in Wien (NHMW) and Rijksmuseum van Natuurlijke Historie in Leiden (MNHL).

Terminology

The terminology employed in this paper is essentially the same as that of Hurd & Moure (1963). For brevity, the word *medial*, as opposed to *lateral*, is understood to be the same as *mediolongitudinal* of authors ; and tergum 1 refers to the 1st metasomatic or gastral tergum ; the other terga and sterna are numbered accordingly. The tergum 8 of the ♂ (fig. 17-21), herein used for descriptive purposes only, refers to a submembranous structure lying between the genital capsule and tergum 7, with its apophyses in close proximity to those of sternum 8 and with its posterior portion in connection

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with the anus. The hind femora, for convenience, are described as in resting position. The posteroventral slope refers to the longitudinally depressed area between the faint medial ridge (as seen in ventral view) and sharply edged posterior margin (=inner or interior margin of authors) while the ventral surface refers only to the longitudinally convex area between that faint ridge and the anterior margin. The tibiae and tarsi are described as if they are stretched out horizontally and lying perpendicular to the longitudinal axis of the body, hence each has an anterior, posterior, dorsal and ventral surface. The setae are arbitrarily grouped into 5 kinds, viz., *simple* setae referring to simple (without branches, without spiral sculpture), moderately stiff ones; *spiral*, with spiral sculpture, but without branches, very stout; *subplumose*, moderately fine, with few short branches; *soft*, very fine and soft, with numerous long branches; *microsetae*, simple, very fine, less than 2 × as long as their respective punctures at bases. All relative measurements in the descriptions are at the magnification of 31 micrometric units=1 mm. The 2nd abscissa of cubitus in forewing is understood to be from its junction with 1st, to that with 2nd intercubitus, disregarding its junction with 1st recurrent. The length of 3rd cubital cell is measured along (or in close parallel to) its hypothetical medial line to the summit of curvature or angulation of 3rd intercubitus. The length of femur 3 is measured, in the ventral view, along a hypothetical medial line; that of tibia 3, in lateral view, along a straight line drawn from the very beginning of setose area (for practical reasons, the bare, often partially concealed, portion at tibial base is not included in the measurement) to the apex of dorso-apical process.

Bibliography, Synonymy, Lectotypes

The bibliography at the end of this article and under each species includes only a few more important papers, and is, therefore, far from complete. Misidentifications and misinterpretations are so numerous that the published records of the various species, in many cases, are of doubtful value and before re-examining the original specimens involved, it is hardly possible to properly place them into synonymy. For instance, Maidl's (1912) original series of "*hottentotta*" was found to be a mixture of 3 distinct species. The following summary of misidentifications is based on material examined and is intended to exemplify the confusion existing in collections.

"*amethystina* Fabr." of Paiva, = *fenestrata* ♀.

"*carinata* F. Sm." of Kohl, = *tessellata* ♂ plus *ustulata* ♀; of Magretti, = *sulcatipes* ♀ plus *tessellata* ♀.

"*dissimilis* Lep." of Sichel, = *fenestrata* ♀.

"*fenestrata* Fabr." of Benson, = *sulcatipes* ♂♀.

"*hottentotta* F. Sm." of Alfken, = *ustulata* ♀; of Friese, = *fenestrata* ♀ plus *sulcatipes* ♂ plus *ustulata* ♀; of Guiglia, = *ustulata* ♀; of Kohl, = *sulcatipes* ♂♀; of Magretti, = *sulcatipes* ♂♀ plus *ustulata* ♀; of Maidl, = *sulcatipes* ♂ plus *tessellata* ♂ plus *ustulata* ♂; of Meade-Waldo, = *ustulata* ♂♀; of Ritsema, = *sulcatipes* ♂ plus *ustulata* ♀; of F. Smith, = *sulcatipes* ♂♀; of Vachal, = *ustulata* ♀; of Uvarov, = *sicheli* ♀.

"*oblonga* F. Sm." of Magretti, = *tessellata* ♀; of Ritsema, = *fenestrata* ♀.

"*taschenbergi* Vach." of Enderlein, = *ustulata* ♀; of Kohl, = *tessellata* ♀; of Vachal, = *tessellata* ♂ plus *ustulata* ♀.

"*valga* Gerst." of Friese, = *fenestrata* ♀.

To avoid further confusion, lectotypes of the following species are designated in this paper : *basalis* F. Sm. (♀, Northern India), *hottentotta* F. Sm. (♀, Natal), *oblonga* F. Sm. (♂, "Cape of Good Hope"), *taschenbergi* Vach. (♂, "Africa"), *ustulata* F. Sm. (♂, Gambia).

Drawings, Synoptic Key

The accompanying figures of tergum 8 and sterna 7–8 are drawn from microscopic preparations with the aid of a camera lucida ; those of legs, tergum 7 and ♂ genital capsule are based on cleared specimens with the aid of a low-power drawing tube. In both cases, the same organ of all species is at the same magnification. In the synoptic key, each couplet contains more than one character for each sex, with the most conspicuous or convenient characters placed at the beginning while the least significant and convenient ones, at the end. Characters of ♂ genitalia, for practical reasons, are omitted from the key.

Genus **Xylocopa** Latreille 1802

Subgenus **Ctenoxylocopa** Michener 1942

Ctenopoda Maa 1938 : 270, 285 (orthotype : *Apis fenestrata* Fabr.). Nom. praeocc., nec *Ctenopoda* McAtee & Malloch 1933 (Diptera).
Ctenoxylocopa Michener 1942 : 282, nom. nov. pro *Ctenopoda* Maa.
Baana Sandhouse 1943 : 530, nom. nov. pro *Ctenopoda* Maa.

Species Included

This subgenus was originally (Maa 1938) intended for 2 Indian species, *basalis* and *fenestrata*. Prior to that, *fenestrata* and "*hottentotta*" were assigned by Taschenberg (1879) to the section I, subsection A.c (scutellum rounded, thoracic dorsum and abdomen with setae not paler than on other parts of body, inner orbits in ♂ always closer to each other than in ♀ and more or less convergent posteriorly), and by Friese (1901) to the Group Violacea (abdomen dark, with dark setae). Later, Friese (1909) assigned *gribodoi* to the Group Villosa, and *fenestrata* as well as "*hottentotta*" to the Group Capensis (*taschenbergi* was unclassified and included in an Appendix), apparently on basis of color pattern ; and Hurd & Moure (1963) enumerated under *Ctenoxylocopa* 15 nominal species plus 1 nom. nudum (*bombayensis*) and 1 misidentification (*amethystina* Stadelm. nec Fabr.). In the latter elaborate paper, largely on authority of earlier works, *basalis*, *fenestrata*, *hottentotta*, *stadelmanni* and *sudanica* were listed as valid species ; *gardineri*, *hedickei*, *indica*, *lunata*, *serripes* Burm., *serripes* Hed., *taschenbergi* and *ustulata*, as junior synonyms ; while *aliceae* and *gribodoi* were provisionally assigned to *Ctenoxylocopa*. In the present article, only *basalis*, *fenestrata*, *gribodoi* and *ustulata*, among the earlier nominal species, are considered valid, and 2 new species and 1 new subspecies are added to the subgenus. *Aliceae* and *stadelmanni* are removed to subgenera other than *Ctenoxylocopa*.

Definition

This subgenus is unique for the genus in several respects. In ♂, the posterolateral lobe of pronotum is prolonged posteriorly well beyond level of anterior margin of tegula ; the tergum 3 bears a pair of elevated, setose, posteriorly directed, scale-like processes near mesal margins of spiracles ; the mesal margins of both gonocoxite and penis-valve are lamellately expanded near apices ; and the lateral margin of gonocoxite is strongly concavely curved in L-shape near apex. In ♀, the face is flattened and heavily punctate-setose and is in strong contrast to the convex and lightly punctate-setose vertex, from which it is demarcated by a weak transverse carina across posterior ocelli. Other more important or conspicuous characters of the subgenus are : Face lacking pale markings, frontal carina (♀) short, mandible (♀) tridentate, dorsum of thorax posteriorly rounded into propodeum, tibia 3 (♂) almost always as long as corresponding basitarsus, basitibial plate strongly developed and apically bifid, dorsum of tergum 1 anteriorly rounded into its anterior slope, tergum 2 and sternum 2 (in ♀, also tergum 3) each with a gradulus, all succeeding terga and sterna without graduli, tergum 7 (♂) generally subtruncate or bilobed posteriorly, sternum 8 (♂) posteriorly with short broad medial lobe.

Hurd & Moure (1963) enumerated 94 and 87 characters for the ♂ and ♀, respectively, of the subgenus. For the accommodation of all 6 species hereby included, the following characters, in the same order as set forth by those 2 authors, seem in need of modification. ♂. *1.* (a) Eyes small or enlarged. *2.* (b) face of type EF2 or EF3, i.e., face widest below or at level of antennal sockets. [Since the inner orbits in this subgenus are hardly curved and quite nearly parallel, the difference of intermediate and lower interorbital distances is very slight.] *3.* (c) Orbitoccipital distance long or short, i.e., longer than, as long as or shorter than flagellomere 1. *7.* (a) Epistomal suture with transverse section either clearly evident (though weak and fine) or, obscured or obliterated by punctation. *8.* Subantennal sutures short or long, i.e., a little shorter or distinctly longer than interalveolar distance. *10.* (d) Frontal carina with a medial sulcus on either basal or intermediate portion [variable intraspecifically in this subgenus]. *16.* (b) Maxillary palpi with segment 6 either much or very slightly shorter than 5 ; (c) length of segment 4 either subequal to or distinctly smaller than that of 5 plus 6. *23.* (b) Forewing with 3rd intercubitus either strongly or gently bowed outward [variable intraspecifically in this subgenus]. *24.* (c) Apex of basitibial plate situated very slightly before or clearly before tibial midlength. [If the bare, often partly concealed, extreme base of tibia is included in measurement, the apex of the plate in *gribodoi* may well be described as situated just at tibial midlength.] *30.* Tarsi and claws 1 and 2 normal ; basitarsi 3 either normal, or ventrally sulcated, or dorsally greatly flattened-dilated and bilaterally compressed ; claws 3 either normal or slightly asymmetrical. *31.* (c) Propodeum with either large or small triangular area ; (d) anterior section of medial groove either present or replaced by apical portion of triangular area. *37.* Metasomal tergum 3 with pair of elevated, posteriorly directed, scale-like processes near mesal borders of spiracles ; tergum 4 either normal, or with similar processes but their surface is bare, shining (not each with a small setal tuft) and less elevated than those on tergum 3, and their lateral margins are shorter than mesal margins. [Incidentally, in the paper by Hurd & Moure (1963), p. 80, line 17, the word

"*Stenoxylocopa*" is obviously a typographic error for "*Ctenoxylocopa*".] *39*. Metasomal tergum 7 almost always bearing pair of well separated posterolateral dentiform projections. *40*. Apex of gonocoxite with, on ventral side, usually weak, occasionally very strong, inwardly directed process. ♀. *55*. (d) Clypeus as long as or shorter than clypeocellar distance. *58*. (c) Frontal carina sulciform, or cariniform to nearly tuberculiform ; (d) usually with a medial sulcus at base, occasionally with a punctiform pit at midlength [variable intraspecifically]. *69*. (b) As in *23* (b), above. *79*. (c) Apical margins of metasomal sterna 2–5 either pointed, or not, at middle ; (d) medial carina of metasomal sternum 6 elevated along posterior 1/2 or 1/3. *80*. (a) Pygidial plate either narrow and very nearly parallel-sided, or moderately narrow and distinctly narrowed apicad.

To supplement those enumerated by Hurd & Moure (1963), the following characters may be added : Forewing with bulla (which marks the basal limits of pterostigma) on costa lying apicad to level of base of 3rd discoidal cell, 1st and 2nd cubital cells hardly narrower than 3rd ; upper and lower ends of 2nd intercubitus lying almost at same level, 1st abscissa of radius rather strongly curved, apical part of jugal vein fully pigmented and reaching anal margin of wing ; hindwing with cubitus not pigmented beyond apex of medial cell. ♂ : Tergum 8 with anterolateral margins parallel to one another and each forming a very obtuse interior angle with corresponding posterolateral margin ; posterior margin of sternum 7 angulately produced at middle ; sternum 8 bare, anterior lobe hardly developed, posterior lobe ca 2.5 × as wide as long, posterior arm of its T or Y-shaped rib much shorter and hardly stronger than anterior arms ; gonobase very short (i.e., transversely very narrow) ; gonocoxites widely separated at base in dorsal view, lateral margin concavely curved in L-shape near apex, apical part of mesal margin lamellately expanded, apex thinly setose and ventrally with rather weak or strong mesal projection ; penis-valve also lamellately expanded on mesal margin. ♀ : Basitibial plate lined with 2 columns of dentiform spines.

Distribution, Nesting Material

This subgenus is widespread in the Old World tropics and subtropics. The limits of its known range are Transcaspia : Imam-bara (ca 38° N) in the north, Madagascar (ca 20° S) in the south, Gambia (ca 15° W) in the west and Burma : Tenasserim (ca 99° E) in the east. The only forms found south to the Equator are *X. fenestrata mauritii* (Madagascar, Mauritius I.) and *X. gribodoi* (Tanzania, 3 records). The present-day distributional center is apparently in NE Africa and SW Arabia where 4 of the 6 species coexist and their ranges partially overlap. In the remaining countries, with exception of Afghanistan-W. Pakistan-NW India borderland, there is only 1 species each. From faunistic features, the subgenus may conveniently be divided into 2 sections, one found in continental Africa and W. Asia and if the record is reliable, penetrating into Transcaspia ; another found in western Oriental Region and extending to Madagascar-Mauritius. The latter section appears to be more specialized and its present-day range might have resulted from the land connection of Peninsular India with Malagasy Subregion during Lower Cretaceous era or even as early as Upper Triassic. Within each section, the generalized form (*ustulata*, *fenestrata*) has a much wider distributional range and is probably more adaptable to varied environments than in the specialized forms. The

occurrence of one of the Oriental species in S. America is probably accidental (Hurd & Moure 1961 : 184) and requires verification.

The nesting habits of this subgenus are hardly known, the only record being that *X. basalis* has been found nesting in *Calotropis*. Pollinia probably of this plant were often found attached to mouthparts and legs of *basalis*, *ustulata* etc., but it is not clear whether or not the presence of such pollinia is connected with nesting habits of these bees.

Relationships

In Maa's (1938, 1954) papers, *Ctenoxylocopa* was placed between the subgenera *Xylocopa* s. str. and *Nodula* while in Hurd & Moure's (1963), it was placed at the very beginning of the Old World *Xylocopa*, i.e., before the subgenera *Copoxyla*, *Rhysoxylocopa*, *Gnathoxylocopa*, *Xylocopa* s.str., etc. As pointed out by the latter 2 authors, *Ctenoxylocopa* is characterized by several unique features and is not closely related to any other known subgenera of *Xylocopa*. Its similarities to *Copoxyla* etc. are largely in the color pattern, sexual dimorphism, head and hind tibia, and may well be merely superficial coincidence or evolutionary convergence. Before the morphological (details of ♀ genitalia, etc.), cytological and other details of the entire tribe Xylocopini can be thoroughly investigated, the question of the systematic and phylogenetic affinities of *Ctenoxylocopa* is, at best, to be left open. It is almost certain, however, that this subgenus is not the most generalized among the Old World *Xylocopa* since the tergal and sternal graduli in both sexes are strongly reduced, and the tergum 8, sternum 8, gonobase, gonocoxite and penis-ring in ♂ are apparently highly specialized.

Within the subgenus, the various species may be allotted to 2 or 3 groups in several ways. In the color pattern of wings and pilosity, relative width of face, relative length of 3rd cubital cell, relative steepness of posteroventral slope of ♂ femur 3 and asymmetry of ♂ claws 3, *gribodoi* and *basalis* stand well apart from the remaining species. In the shape of basitarsus 3 and tergum 7 in ♂ as well as the relative length of ocellorbital distance and profile shape of labrum in ♀, *fenestrata*, *ustulata* and *gribodoi* are similar to one another, *sulcatipes* and *tessellata* together form a group, while *basalis* represents a 3rd group. But on the bases of the details of ♂ genitalia and the shape of ♂ femur 3, ♂ tibia 3, ♂ sternum 7 and ♀ frontal carina etc., apparently the subgenus may be subdivided into 2 groups. The 1st group is represented solely by *fenestrata* and spreads from Iraq to Burma and Madagascar, whereas the 2nd is represented by the remaining 5 species and occurs from W. Africa to Transcaspia. The 1st group is perhaps geologically older than the 2nd and the separation of the 2 groups might have occurred not later than the Upper Cretaceous era when the land mass of India-Madagascar was isolated. Within the 2nd group, *ustulata* is apparently the most generalized and *basalis* the most specialized. The former species spreads over most parts of the known range of the group whereas the latter is confined to the NE corner of the range. From *ustulata* onward to *basalis*, the diversification has apparently been in several directions, viz., color pattern, sexual dimorphism, facial width, frontal carina, flagellum, mandible, labrum, venation, leg 3, terga 3 and 7, but the modification of ♂ genitalia appears to have been along a single continuous series.

Key to Species

1. Wings in both sexes clear hyaline at basal 1/3. ♂ : Posterior margin of tergum 7 (fig. 16) evenly rounded, no trace of posterolateral lobes; basitarsus 3 as robust as corresponding tibia, triangular in cross section at basal 1/2, largely bare and shining on anterior and dorsal surfaces, and with compact dorsal tuft of silvery setae at apex. ♀ : Face with purely silvery soft setae, sterna 3-5 entirely pale setose; lateral spines of pygidial plate strongly compressed bilaterally and lying on oblique planes; mandible with basimedial area strongly depressed and bearing 9± coarse punctures plus about equal number of minute ones; penultimate flagellomere hardly longer (8.5×8) than wide ..... **basalis**

   Wings either clear hyaline at extreme bases or at basal 2/3 (♂), or uniformly dark. ♂ : Posterior margin of tergum 7 (fig. 11-15) not evenly rounded, with pair of more or less definable posterolateral lobes; basitarsus 3 distinctly more slender than corresponding tibia, more or less roundish in cross section at both basal and apical portions, at least dorsal surface entirely covered with setae, never with such pale setal tuft at apex. ♀ : Face usually entirely black setose, rarely with dominant silvery soft setae plus few black simple ones, sterna 3-5 black setose, at most with pale setae on lateral portions; lateral spines of pygidial plate conical, not lying on oblique planes; mandible not as described above; penultimate flagellomere distinctly longer than wide 2

2. Posterior terga in both sexes laterally pale setose. ♂ : Clypeus with purely silvery setae; width of posterior ocellus 2 × ocellorbital distance; medial arm of T-shaped carina of labrum much shorter, narrower than basal arms and not quite reaching discal summit. ♀ : Clypeus almost purely silvery setose; medial carina of labrum not reaching midway to anterior margin of plateau-like area but with apex slightly overhanging that plateau; mandible with basimedial punctate area not larger than outer (lower) condyle ..... **gribodoi**

   All terga in both sexes black setose. ♂ : Clypeus with either purely black or mixture of black and white setae; width of posterior ocellus subequal to ocellorbital distance; medial arm of T-shaped carina of labrum not or hardly shorter and narrower than basal arm, hence reaching discal summit. ♀ : Clypeus purely black setose; medial carina of labrum reaching or surpassing midway to anterior margin of plateau-like area, apex never overhanging that plateau; mandible with basimedial punctate area usually much larger than outer condyle 3

3. ♂ : Basitarsus 3 modified, anterior surface largely bare, in strong contrast to densely setose posterior surface, whereas ventral surface medially sulcated for its full length; tergum 7 (fig. 13, 15) posteriorly subtruncate, with poorly developed posterolateral lobes. ♀ : Interocellar distance subequal to ocellorbital distance; frontal carina in profile with upper slope ca 115° or 135° to apical slope which is ca 45° or less to general curvature of face; labrum in profile with apical slope of medial carina in line with anterior slope of plateau-like area 4

   ♂ : Basitarsus 3 normal, anterior surface nearly as densely and uniformly setose as posterior surface, whereas ventral surface not sulcated at all; tergum 7 (fig. 11, 12, 14) with well developed posterolateral lobes. ♀ : Interocellar distance distinctly greater than ocellorbital distance; frontal carina in profile with upper slope ca 75° or 90° to apical slope which is perpendicular or nearly perpendicular to general curvature of face; labrum in profile with apical slope of medial carina distinctly angulate to anterior slope of plateau-like area 5

4. ♂ : Terga 4-7 laterally each with pair of compact pen-like setal tufts; tibia 3 modified, anterior surface almost entirely bare; basitarsus 3 dorsally with uniform short setae,

ventral sulcus narrow, rather shallow. ♀ : Frontal carina strong, distinctly more elevated than neighboring areas; mandible with outer sulcus only ca as long as sulcus separating apical from subapical tooth, basimedial punctate area reaching mandibular midlength and bearing 40 ± coarse punctures ..... **tessellata**

♂ : Terga 4-7 laterally with similar setae as in terga 1-3, no pen-like tufts; tibia 3 normal, anterior surface uniformly setose; basitarsus 3 dorsally with exceedingly long

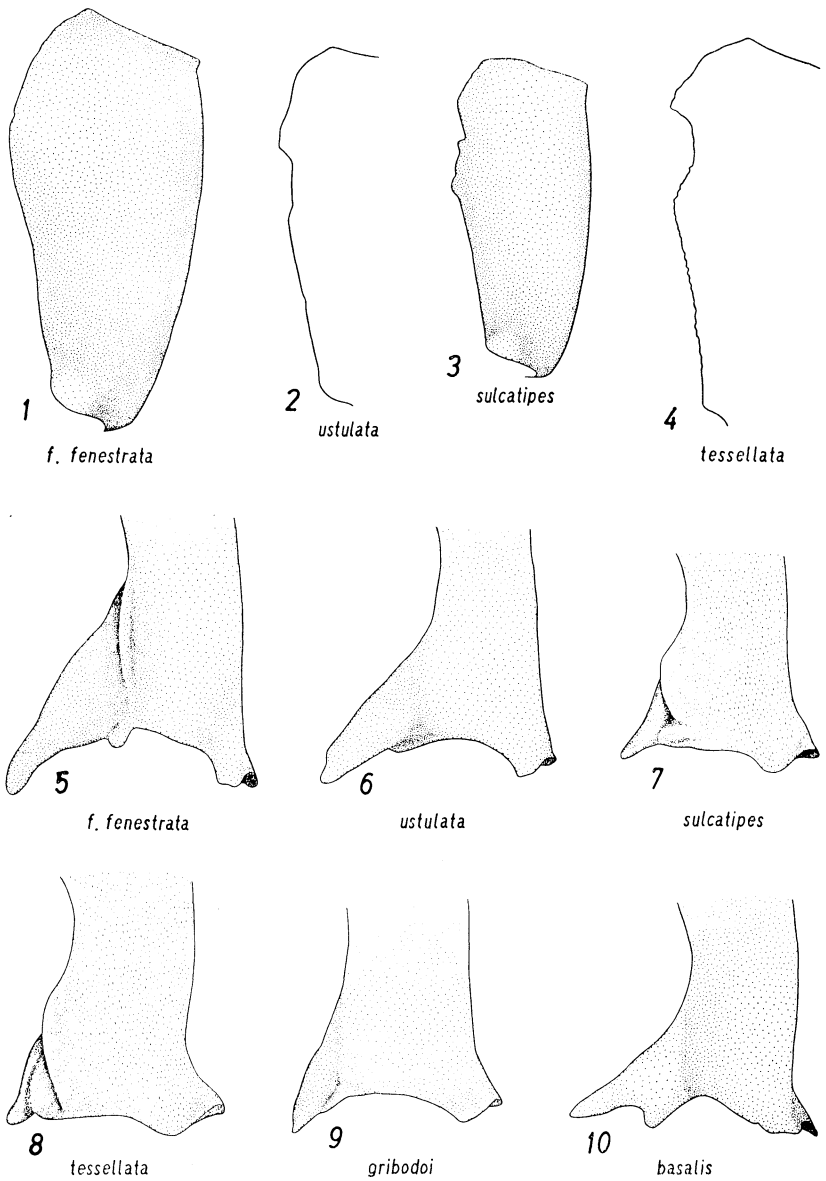

Fig. 1-10. *Ctenoxylocopa*, ♂♂. Femora 3, dorsal view (1-4); tibial apices, posterior (inner) surface (5-10). Setae all omitted.

(ca 1/2 tibial length) setae at basal 1/2, in strong contrast to much shorter setae at apical 1/2, ventral sulcus very broad and deep. ♀ : Frontal carina exceedingly weak, hardly more elevated than neighboring areas; mandible with outer sulcus 2–3 × as long as sulcus separating apical from subapical tooth, basimedial punctate area far from reaching mandibular midlength, and bearing only 15 ± coarse punctures ..... **sulcatipes**

5. ♂ : Clypeus with mixture of pale and black setae, wings with hardly definable clear hyaline areas at extreme bases; posterolateral lobes of tergum 7 (fig. 12) obtuse at apex and slightly shorter than wide at base; femur 3 (fig. 2) ventrally with large compact tuft of soft setae at base, posterior margin sinuate at a point of basal 1/3; tibia 3 in dorsal view not dilated at apex. ♀ : Frontal carina in profile gradually elevated from base to apex, upper slope ca 90° to apical slope; clypeus with quite evenly dense punctures, interspaces of both punctures and punctural series mostly 1/2 punctural diameter ..... **ustulata**

♂ : Clypeus with purely black setae, wings with very conspicuous clear hyaline areas at extreme bases; posterolateral lobes of tergum 7 (fig. 11) acute at apex and as long as wide at base; femur 3 (fig. 1) lacking such setal tuft, posterior margin entire; tibia 3 in dorsal view distinctly dilated along apical 1/4 of posterior margin. ♀ : Frontal carina very weak at basal 1/2, very strong at apical 1/2, in profile with upper slope ca 75° to apical slope; clypeus (particularly at its anterior 1/2) not quite evenly punctate, with interspaces of punctural series mostly subequal to punctural diameter (although punctural interspaces of same series mostly ca 1/2 punctural diameter) 6

6. ♂ : Sternum 7 (fig. 22, 23) posteriorly broadly or strongly produced at middle, sternum 8 (fig. 30, 31) with T-shaped carina. ♀ : Basitibial plate with anterior and posterior columns of dentiform spines clearly convergent apicad. Madagascar; Mauritius I. ..... **fenestrata mauritii**

♂ : Sternum 7 (fig. 25) posteriorly narrowly, moderately produced at middle, sternum 8 (fig. 29) with Y-shaped carina. ♀ : Basitibial plate with anterior and posterior columns of dentiform spines practically parallel. Asia ..... **fenestrata fenestrata**

Xylocopa (Ctenoxylocopa) fenestrata fenestrata (Fabricius)
Fig. 1, 5, 11, 19, 25, 29, 37, 39.

Apis fenestrata Fabricius 1798 : 273. Type ♂ (Kϕbenhavn Mus.), India orientali.

Xylocopa lunata Klug 1807 : 264. Type ♂ (Berlin Mus.), Tranquebaria. Synonymy teste Maa 1938 : 285.

Xylocopa indica Klug 1807 : 264. Type♀ (Berlin Mus.), Tranquebaria. Synonymy teste Bingham 1897 : 539.

Xylocopa serripes Burmeister 1876 : 156, ♂♀. Types (Buenos Aires Mus.), Brazil : Rio de Janeiro. Synonymy teste Hurd & Moure 1961 : 184.

Xylocopa gardineri Cameron 1902 : 62, ♂. Lectotype (BMNH Type Hym. 14. B. 131), Maldive Archip.: Mahlos Atoll, Mamaduwari. Synonymy teste Maa 1938 : 286.

Xylocopa serripes Hedicke 1938 : 189, ♀. Type (Berlin Mus.), Iran : Bushire. Name preoccupied, renamed *X. hedickei* q. v.

Xylocopa hedickei Maa 1940 : 131, nom. nov. pro *X. serripes* Hed. nec Burm. Synonymy teste Maa 1954 : 221.

MATERIAL. In addition to those listed previously (Maa 1938 : 285), I have since then checked the specimens recorded by Maidl (1912) from Iraq : Assur, Ceylon and Andaman

Is. (plus some from unknown localities). The other materials examined are as follows. NE ARABIA : 1 ♂, 1 ♀ (BMNH 99. 73), Muscat. W. PAKISTAN : 2 ♂♂, 2 ♀♀ (NHMW), Karachi. MALDIVE IS. : 2 ♀♀ (MNHL), Fadiffolu Atoll, Madewaru. INDIA : many ♂♂, ♀♀ (MNHL), Karikal, Coimbatore, Kerala State (Walayer Forest), Orissa State (Teypone), Thar Desert, Calcutta, etc. BURMA : 27 ♂♂, 2 ♀♀ (MSNG), Mandalay. Unknown Localities : 1 ♂ (MNHL ex colln. C. & O. Vogt), det. Friese as *hottentotta* ; 1 ♀ (MSNG), labeled by Gribodo "Coll. Guerin", "*X. dissimilis* Lep. Det. Sichel/*oblonga* Smit. Det. Ritsema". As mentioned (Maa, l.c.), I have seen 1 ♀ of *fenestrata* each, det. Friese, Paiva and Gribodo, respectively, as *valga*, *amethystina* and *hottentotta*.

DISTRIBUTION. Widespread in western Oriental Region and penetrating into part of Palaearctic Region, very common in lowlands in India ; at present known from NE Arabia (Muscat), Iraq (Assur), Iran, W. Pakistan, Kashmir, India, Maldive Is., Ceylon, Andaman Is., E. Pakistan and Burma. The western- and northernmost limits of the known range are Iraq : Assur and Kashmir : Srinagar, respectively. F. Smith's (1874 : 268) record of this species from Celebes is obviously unreliable ; Burmeister's (1876 : 156) record, under the name *serripes* from Brazil : Rio de Janeiro is perhaps in need of verification to see if the species has become established permanently in that country ; Friese's (1909 : 231) record, from French Somaliland : Obock probably referable to *tessellata* (coincidentally, Vachal 1899 : 94, 107 recorded *tessellata*, also from Obock, under the name *taschenbergi*) ; Alfken's (1935 : 174) record from Palestine probably referable to *sulcatipes*. Meanwhile, Alfken's (1926 : 318) record of *taschenbergi* from Iraq : Basra is probably referable to *fenestrata* instead.

SYNONYMY. Although the list of synonyms of this species is long, the synonymy established by earlier authors seems to deserve no further comments, particularly because I have not seen types of *lunata*, *indica*, *serripes* Burm. and *serripes* Hed.

AFFINITIES. This species is fairly isolated within the subgenus and bears several outstanding characters. In the ♂, the femur 3 has entire posterior margin but no basal setal tuft on ventral surface which is gently descending into posteroventral slope ; the tibia 3 is distinctly widened at apex in dorsal view, its posteroventral ridge is strong and straight, ventro-apical process exceedingly large and long, and apical margin of posterior surface with narrow strong lobe ; the posterolateral lobes of tergum 7 are long and acute at apex ; the gonocoxite and penis-valve are long, slender and hardly lamellate along mesal margins. In the ♀, the frontal carina is unique in having basal 1/2 weak, level and in strong contrast to the very strong apical 1/2. In the color pattern of ♂, the clear hyaline areas at extreme wing-bases are larger and more conspicuous than in *ustulata*, *sulcatipes* and *tessellata* but the pale setae on head and thorax are less extensive than in the latter 3 species. In Friese's (1901) scheme for European species, *fenestrata* was assigned to the Group Violacea which was characterized as having abdomen dark and dark-haired. In the same author's (1909) scheme for African species, it was assigned to the Group Capensis apparently also on the basis of color pattern. These artificial classificatory schemes were followed by Maidl (1912). On the other hand, Dover (1925 : 222) went so far that even *auripennis* Lep. and *iridipennis* Lep. (both belonging to subgenus *Biluna*) were considered to be merely subspecies of *fenestrata*. Structural details of this species have been described, to a certain extent, by Taschenberg (1879 : 577), Perez (1901 : 208), Maa (1938 : 285, 1954 : 221, fig. 11) ; the

♂ genitalia, figured by Maidl (1912 : 256, 270, 307, fig. 6) ; and a gynandromorph from the W. Himalayas, described by Maa (1940 : 83).

Description. ♂. Body fairly robust, length 20–26 mm, width across abdomen 9.5–11 mm, length of forewing 18–23 mm. Integument black, wings clear hyaline at extreme bases, elsewhere blackish and with strong purplish lustre which more or less changes to steel-blue on approaching wing-bases. Hairs black, mesoscutum marginally with short gray hairs.

Head narrower (197 : 281) than thorax including tegulae. Face moderately narrow, eye narrower (58 : 71) than upper interorbital distance, width of posterior ocellus subequal to ocellorbital distance, width of anterior ocellus vs its distance to inner orbit 17 : 34. Interspace of posterior ocelli moderately depressed. Relative lengths of first 3 flagellomeres 18 : 11 : 13. Labrum with medial arm of T-shaped carina evenly broad, longer and broader than basal arms, reaching discal summit. Mandible basally with 10 ± roundish punctures, apical 2/3 of outer sulcus nearly as wide and deep as inner sulcus. Relative lengths of segments of maxillary palpus 12 : 26 : 22 : 14 : 11 : 6.5. Triangular area of propodeum small, linear at apical 1/4, strongly curved along lateral margins. Forewing with relative lengths of 1st to 4th abscissae of cubitus as 45 : 60 : 45 : 30, medial length of 3rd cubital cell 2.1 (87 : 41) its maximum width. Femur 3 (fig. 1) in ventral view ca 2 × as long as wide, posterior margin entire, rather strongly curved, widest at a point of basal 1/3, ventral surface with long black subplumose setae, posteroventral slope gently descending, uniformly covered with long soft setae ; no basal tuft of soft setae on ventral surface and posteroventral slope. Tibia 3 (fig. 5) as long as basitarsus 3, distinctly widened at apex in dorsal view ; anterior surface uniformly setose, apex of basitibial plate lying at a point of basal 2/5 of tibia ; ventral surface with long dense setae ; apical margin of posterior surface strongly curved, with narrow strong lobe at level of posteroventral ridge which is strong, straight, raised along ventral margin of posterior tibial surface (but not also along posterior margin of ventral surface) ; posterior dorso-apical process strongly projecting apicad ; ventro-apical process very large, in profile distinctly longer than wide, projecting apicad much beyond level of dorso-apical process, its surface convex, and in ventral view, longitudinally convex, with weakly compressed apex ; tibial spur long, slender, gently curved. Basitarsus 3 normal, subcylindrical, anterior surface uniformly setose, elsewhere with denser setae, basal 1/2 of ventral surface very slightly flattened and longitudinally depressed. Claws of tarsus 3 normal, subapical teeth of both anterior (outer) and posterior claws distinctly shorter than corresponding apical teeth. Lateral tergal setae normal. Tergum 4 lacking well defined spiracular scales. Tergum 7 much longer than sternum 6, posterolateral lobe as long as wide at base, apically acute. Tergum 8 as in fig. 19. Posterior margins of sterna 2–5 hardly produced at middle. Sternum 6 laterally moderately setose ; sterna 7–8 as in fig. 25, 29. Genitalia (fig. 37, 39) long, in dorsal view with basal and apical parts of gonocoxite subequal in length ; apical part of gonocoxite in dorsal view weakly lamellate mesad, and in ventral view with weak mesal projection ; penis-valve in dorsal view distinctly narrowed apicad, its lamellate process very narrow, directed mesad-ventrad and forming at base a very small tooth-like process in dorsal view.

♀. Size and color similar to ♂, but wings not clear hyaline at extreme bases, no pale hairs on thorax.

Interocellar distance much greater (39 : 26) than ocellorbital distance, interspace of posterior ocelli weakly depressed, interocellar ridges lying above level of anterior margins of posterior ocelli. Frontal carina moderately broad, basal 1/2 very weak, apical 1/2 very strong, surface flattened ; apex often narrowed, much closer (24 : 35) to anterior ocellus than to clypeus, in profile upper slope ca 75° to apical slope, latter vertical ; medial sulcus usually weak. Relative lengths of first 3 flagellomeres 21 : 10 : 13, penultimate flagellomere 12 × 10. Clypeus, particularly its anterior 1/2, not quite evenly punctate, interspace of punctures of same series distinctly

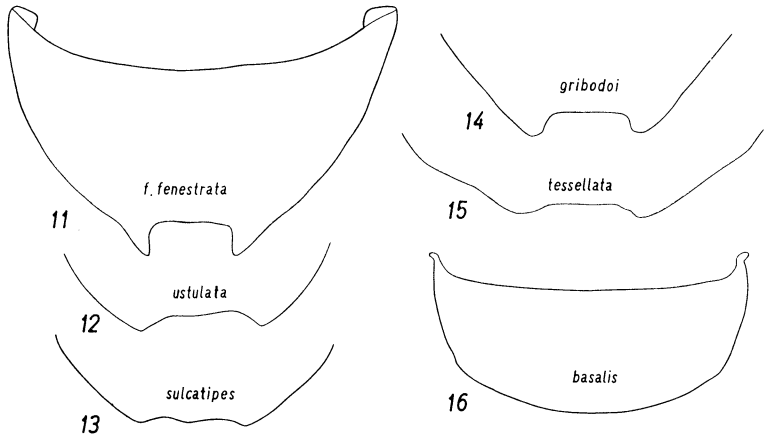

Fig. 11-16. *Ctenoxylocopa*, ♂♂. Terga 7, dorsal view; setae omitted.

smaller than interspace of punctural series, former ca 1/2 punctural diameter, latter subequal to same diameter. Medial carina of labrum moderately broad, with anterior slope in profile almost vertical to surface of plateau-like area. Mandible with small basimedial punctate area which is ca as long as wide, hardly depressed, with 15± coarse punctures; discal area longitudinally convex; outer sulcus normal, i.e., ca 1/2 as long as mandible itself and basally running into a deep concavity next to outer (lower) condyle. Relative length of segments of maxillary palpus 12 : 28 : 24 : 15 : 10 : 7.5. Venation similar to that in ♂. Femur 3 sharply edged along full length of posterior margin. Triangular area of propodeum large, extending slightly beyond midpoint to posterior end of latter. Pygidial plate with medial groove widest at intermediate section, often with extra minor spines at base; lateral spines conical, parallel, with interspace of their tips subequal to length of 1 spine but much less (12 : 27) than distance from tip of spine to apex of plate.

Xylocopa (Ctenoxylocopa) fenestrata mauritii Maa, new subspecies Fig. 17, 18, 22, 23, 30, 31, 38.

MATERIAL. 8 ♂♂, 1 ♀. Holotype ♂ in MSNG.

MAURITIUS I.: 3 ♂♂ incl. holotype (MSNG ex colln. Gribodo), "I. Maurizio. *Xylocopa indica* ♂ Klug, = *fenestrata* F. ?/Det. Ritsema"; 2 ♂♂ (BMNH 84.71), "Mauritius"; 1 ♂, 1 ♀ (BMNH 57.140), "Mauritius"; 1 ♂ (NHMW), "Boier. Ile de France".

MADAGASCAR: 1 ♂ (NHMW), "Boyer. Madag. 1861".

DISTRIBUTION. Probably confined to Madagascar and Mauritius I.

AFFINITIES. Inseparable from the nominate subspecies except in the shape and relative abundance of setae on ♂ sternite 7, presence of T-shaped carina on ♂ sternum 8, relative width of "neck" region of gonocoxite and gonobase, and arrangement of teeth of ♀ basitibial plate. There is so little material at hand that these differences may perhaps prove to be variable and inconstant. This subspecies is most probably very young in geological age and is hereby recognized largely for geographical reasons. It is named in honor of my good friend Dr Maurits A. Lieftinck of the Leiden Museum.

Description. Differing from nominate subspecies in having posteromedial lobe of ♂ sternum 7 (fig. 22, 23) more produced posteriorly, more profusely setose, carina of sternum 8 T-shaped, "neck" region of gonocoxite (fig. 38) in dorsal view more conspicuous, that of gonobase (fig. 38) broarder, ♀ basitibial plate with anterior and posterior columns of dentiform spines distinctly divergent apicad, with interspace of 1st, 2nd and last pairs of such spines in ratio 3.5: 5: 10. In the unique ♂ from Madagascar, the posteromedial lobe of sternum 7 is slightly less produced and not profusely setose.

Xylocopa (Ctenoxylocopa) ustulata F. Smith Fig. 2, 6, 12, 26, 35, 40.

Xylocopa ustulata F. Smith 1854: 351, ♀♂. Lectotype ♂ (BMNH Type Hym. 17. B. 127), Gambia.

Xylocopa hottentotta: Taschenberg 1879: 575, ♀♂. Misidentification, nec F. Smith, renamed *X. (X.) taschenbergi*, q. v.

Xylocopa (Xylocopa) taschenbergi Vachal 1898: 93, nom. nov. pro *X. hottentotta* Tasch. (misidentification). Lectotype ♂ (Halle Mus.), "Africa", no other detail. **New synonymy.**

Xylocopa sudanica Cockerell 1933: 684, ♂. Type (BMNH Type Hym. 17. B. 140), Sudan: Shendi. **New synonymy.**

MATERIAL. Besides the type series of *ustulata* and *sudanica*, I have examined the following.

UPPER VOLTA: 1 ♂ (Calif. Ins. Surv.) Fada-Ngourma, 32 km SW, XII.1965, R. S. Lawler.

GAMBIA: 1 ♂, 4 ♀♀ (BMNH 1911.250), III.1911, J. J. Simpson, compared with type of *hottentotta* by Meade-Waldo!

MALI: 2 ♀♀ (Calif. Ins. Surv.), Hamburi, 85 km W., XII.1965, R. S. Lawler.

NIGERIA: 1 ♂ (BMNH 1911.417), Zungeru, XI.1910, J. W. Scott-Macfie.

LIBYA: 2 ♀♀ (MSNG), Fezzan, Ubari. 1 ♀ (MSNG), Tripolitania, Tin Alcun, det. Guiglia as *hottentotta*.

EGYPT: 2 ♂♂ (NHMW), det. Maidl as *hottentotta*. 4 ♀♀ (NHMW), det. Kohl as *carinata*, and then by Friese as *hottentotta*.

SUDAN: 1 ♀ (NHMW), Atbara, det. Alfken as *hottentotta*.

ETHIOPIA: 1 ♀ (MSNG), Nubia, Metemma, det. Magretti as *carinata*. 1 ♂, 1 ♀ (MSNG), Scioa, Farrè, det. Vachal as *hottentotta* and *taschenbergi* respectively!

ERITREA: 1 ♀ (MSNG), Asmara. 2 ♂♂, 6 ♀♀ (MSNG ex colln. Magretti), Ghinda, Saati & Sahali. 1 ♀ (MSNG), Cheren, det. Vachal as *hottentotta*; 1 ♀ (MSNG), Keren, det. Magretti as *hottentotta*.

ARABIA: "Arabia": 1 ♀ (MNHL), det. Enderlein as *taschenbergi*; 1 ♀ (BMNH 1900. 36). Aden: 1 ♀ (BMNH 93.145); 1 ♀ (MNHL ex colln. F. Smith), det. Ritsema as *hottentotta*!

I have also seen 1 ♀ of *X. sicheli* Vach. (BMNH 1925.272) from Natal: Weenan, det. Uvarov as *hottentotta*.

DISTRIBUTION. Widespread from W. Africa to SW Arabia; definitely known from Upper Volta, Gambia, Mali, Nigeria, Libya, Egypt, Sudan, Ethiopia (Abyssinia), Eritrea and Aden. In SW Arabia, its distribution overlaps that of *sulcatipes*; and in Sudan and Eritrea, that of *tessellata*. The earlier records of this species under the name "*hotten-*

totta" from Senegal (Vachal 1899: 93, 107; Maidl 1912: 256, 270), are probably correct although I am unable to verify this; the record from Cape of Good Hope (Vachal, l. c.) is certainly unreliable; and the records by Maidl (l. c.) from S. Arabia, Dead Sea and Transcaspia, as evidenced by re-examination of his original material and by his description of ♀ frontal carina ("ganz gerade"), were clearly referable to *sulcatipes*. Friese's (1909: 231) and Alfken's (1935: 174) records from Jericho were probably referable to *sulcatipes*, too.

SYNONYMY. Since the appearance of Taschenberg's (1879: 574) description of "*hottentotta*", *ustulata* has long been known incorrectly under that name. A re-examination of the lectotype ♀ of F. Smith's species (BMNH Hym. 17. B. 127) from Natal revealed that true *hottentotta* (q. v.) obviously does not belong to *Ctenoxylocopa*. Accordingly, I hereby resurrect the earliest available and long-forgotten name *ustulata*, which was first suppressed as a synonym of "*hottentotta*" by Vachal (1899: 107) and Friese (1909: 232). Apparently, Meade-Waldo's comparison of the above-listed Gambia specimens with the type of *hottentotta* was very superficial. Particularly surprising is that the ♂ specimen bears the same comparison label although the type series of *hottentotta* is entirely of ♀♀.

Taschenberg's original material of "*hottentotta*", 1 ♂, 1 ♀ from "Africa", is unavailable to me. To avoid further confusion, I hereby designate the ♂ as the lectotype of *taschenbergi* Vach., which is evidently a nom. nov. pro *hottentotta* Tasch. nec F. Sm. (Probably by oversight, Hurd & Moure 1963: 317 did not indicate *taschenbergi* as a nom. nov. and listed "1 ♀ d'Afrique, don de Reiche, existe au Muséum de Paris" of Vachal as the type). Taschenberg's description of "*hottentotta*" regarding its resemblance to *fenestrata*, relative lengths of first 3 flagellomeres (♀♂) and of interocellar vs ocellorbital distance (♂), presence of frontal carina (♀), interocellar ridges (♀), spiracular scales on tergum 3 (♂) as well as extent of basitibial plates (♀), was so clear and exact that the species in question is obviously a *Ctenoxylocopa*. The specific criteria mentioned therein were "Zwischen den Fühlern eine glänzende, nasenartige, aber nur schwache Erhebung" for ♀ and "die Hinterecken des fünften und der ganze Hinterrand des sechsten schwarz zottig-behaart, das Endsegment an seinem Hinterrande gradlinig ausgeschnitten, so dass jederseits eine zahnartige Hervorragung entsteht wie bei *X. fenestrata*" for ♂. The former criterion is applicable to either *ustulata* or *tessellata* but not to *sulcatipes* [the frontal carina in ♂ *fenestrata*, which is slightly stronger than in ♀ *sulcatipes*, was described as "sehr unbedeutendes, schneidiges Höckerchen"]. The latter criterion fits only *ustulata* but not *sulcatipes* and *tessellata* since in those 2 species, the tergum 7 (fig. 13, 15) is posteriorly subtruncate and its posterolateral lobes are hardly developed. Taschenberg's "*hottentotta*" can scarcely be mistaken for *gribodoi* where the pale pubescence is so extensive and conspicuous and the ♂ ocellorbital distance is only 1/2 as long as interocellar distance. It may be noted that while describing in detail the spiracular scales on tergum 3 in both sexes of "*hottentotta*" and the various modifications of legs 3 in several other species, Taschenberg did not mention the spiracular scales on tergum 4 (which is characteristic for ♂ *tessellata*) and any modification of tibiae-basitarsi 3 (characteristic for ♂ *sulcatipes* and *tessellata*) for his "*hottentotta*". These may possibly be interpreted as negative characters rather than an oversight or casual omission. The body lengths given by Taschenberg (♀ 25 mm, ♂ 23 mm) were slightly greater than in average specimens of *ustulata* but the difference is evidently negligible.

Vachal (1898 : 93) considered the *hottentotta* he had then in mind to be different from what Taschenberg has described. His remarks may be quoted in full : "*Xylocopa* (Xyl.) *Taschenbergi* nom. nov. Taschenberg a décrit, sous le nom de *Xyl. hottentota* [sic] Smith, les deux sexes d'une espèce qui n'est pas la vraie *Xyl. hottentota* et pour laquelle je propose le nom de *Taschenbergi*. 1 ♀ d'Afrique, don de Reiche au Muséum de Paris. La description de Taschenberg est très bonne, comme toutes ses descriptions, mais incomplète en ce point que la ♀ que j'ai sous les yeux a un espace cordiforme grand, très distinct et lisse, comme du reste *Xyl. hottentota* vraie. Cette dernière diffère à première vue par sa taille beaucoup plus petite." A little later, in the synoptic key to European and African species of *Xylocopa*, Vachal (1899 : 93, 107) separated "*hottentota*" from *taschenbergi* (and *fenestrata* as well) only by lengths of body and wing (♀♂) and by color of antennal scape and hind femora (♀), and of facial setae (♂). The aforementioned character "espace cordiforme" was not repeated, nor the "1 ♀ d'Afrique, don de Reiche au Muséum de Paris". Instead, under *fenestrata*, "1 ♀ de Para? Afrique provenant de Reiche ; ··· Mus. de Paris" was listed. This suggests the possibility that Vachal in 1899 had no more trust in the reliability of "espace cordiforme" as a criterion for *taschenbergi*, and/or the 1 ♀ in the Paris Museum ex colln. Reiche listed in 1898 under *taschenbergi* and the 1 ♀ listed in 1899 under *fenestrata* were actually one and the same specimen. If the latter were true, the unique ♀ referred to by him in 1898 as *taschenbergi* was in fact *fenestrata* : Perhaps in a desperate way to rescue the name *taschenbergi* from being suppressed, Vachal (1899, l. c.) redefined, on the basis of 9 ♀♀, 4 ♂♂ from French Somaliland : Obock and Djibouti, the ♀ *taschenbergi* as : "Base de la mandibule sans fossette, ayant le triangle basal entièrement ponctué. Segment 3 en dedans de l'aire stigmatique plus densement et plus fortement ponctué. Carinule frontale s'élevant moins au bout, ayant sa crête presque convexe. Espaces transparents de la base de l'aile toujours enfumés." The ♂ was redefined as "Intervalle entre les deux mucrone terminaux de la rotule et la bout du tibia 3 déprimé, imponctué, souvent limité en avant et en arrière par un pli ou un ligne élevée plus ou moins marqués ; segments dorsaux 4, 5 et 6 ayant chacun leur frange latérale disposée en un fort bouquet un peu divergent en arrière, simulant de loin de grosses dents noires. Base extrême de l'aile à peine plus claire. Bordure antérieure du mesonotum et côtés du segment 1 à poils gris blanchâtres." The above definition was in comparison with *fenestrata* but not directly with "*hottentotta*." It fits *tessellata* very well. Apparently Vachal overlooked the fact that his description of the ♂ pen-like tergal setal tufts was in contradiction to Taschenberg's. He also overlooked the fact that since *taschenbergi* is fundamentally a nom. nov., its identity is on the basis of Taschenberg's original specimens and can by no means be affected by how and to what extent any subsequent authors might recharacterize it from other specimens (1961. Internat. Code, Art. 72, d). Consequently, the *taschenbergi* of Vachal (1899), and possibly the one in Vachal's (1898) mind, too, cannot be accepted as the same species as "*hottentotta*" of Taschenberg (1879). The synonymy, as I can see, of this nomenclatorial confusion may be summarized as follows :

"*hottentotta*" ♂ of Taschenberg 1879, = *ustulata* F. Sm., = *taschenbergi* Vach.
"*hottentotta*" ♀ of Taschenberg 1879, = either *ustulata* or *tessellata*.
"*taschenbergi*" ♀ of Vachal 1898 (i.e., the ♀ specimen ex colln. Reiche), possibly = *fenestrata* Fabr.

"taschenbergi" ♀♂ of Vachal 1899, = *tessellata.*

In Friese's (1909) work on African bees, *taschenbergi* Vach. 1899 [not 1898] was at first (p. 231) listed, with a question mark, as a possible synonym of *fenestrata*, and then (p. 255), by quoting in full Vachal's (1898) text, listed as an independent species in the Appendix. Maidl (1912 : 270), also without mentioning Vachal's 1898 paper as did Friese (1909 : 231), sank *taschenbergi* Vach. 1899 as a synonym of *"hottentotta"* on the basis of 2 ♂♂, 1 ♀ from Eritrea : Massaua determined by Vachal as *taschenbergi.* On re-examination, these 2 ♂♂ proved to be *tessellata.* I have not seen the Massaua ♀. It might be *sulcatipes* since Maidl described the frontal carina in ♀ *"hottentotta"* to be "ganz gerade". Cockerell (1917 : 460) recognized *taschenbergi* as a distinct species. From his descriptive notes, the species involved was apparently *tessellata.* Alfken (1926 : 318) suggested that *taschenbergi* might be a variety of *"hottentotta"*. Incidentally, there is 1 ♀ (MSNG) of *ustulata* from Ethiopia : Scioa (see list under the subheading Material) determined by Vachal as *taschenbergi* while 1 ♂ of the same series, as *hottentotta.*

The new synonymy of *sudanica* with *ustulata* is based upon a direct comparison of their types.

AFFINITIES. *Ustulata* stands intermediate between *fenestrata* and *sulcatipes-tessellata.* The ♂ genitalia (fig. 40) strongly simulates that of the last 2 species whereas the ♂ legs 3, particularly the tibiae and basitarsi, are more closely similar to those of *fenestrata.* In the ♀, *ustulata* is hardly separable from *fenestrata* except by the characters given in the key. Being fairly generalized within the subgenus, the species apparently can only be recognized by a combination of characters. The only outstanding character I can find is the apical margin of posterior surface of ♂ tibia 3 (fig. 6) bears a broad weak lobe at level of posteroventral ridge. As *fenestrata, ustulata* (under the name *"hottentotta"*) was assigned to the Group Violacea among the European species and to the Group Capensis among the African species by Friese (1901, 1909) and Maidl (1912). The ♂ genitalia (dorsal view) of *"hottentotta"* illustrated by Maidl (l. c.) might not apply here.

Description. ♂. Body fairly robust, length 17–22 mm, width across abdomen 8–9 mm, forewing 16–18 mm long. Integument and hairs similar in color to those in ♂ *fenestrata* but wings with hardly definable clear hyaline areas at extreme bases, and with little steel-blue lustre at basal 1/2, face with mixture of black and pale hairs, lateral surface of thorax and dorsal surface of tergum 1, in addition to mesoscutum, with some pale hairs.

Head narrower (168 : 202) than thorax including tegulae. Face moderately narrow, eye narrower (50 : 61) than upper interorbital distance, width of posterior ocellus subequal to ocellorbital distance, width of anterior ocellus vs its distance to inner orbit 15 : 28. Interspace of posterior ocelli moderately depressed. Relative lengths of first 3 flagellomeres 16 : 8 : 11. Labrum with medial arm of T-shaped carina as long and broad as basal arms, strongly narrowed apicad, reaching discal summit. Mandible basally with 20 ± elongate punctures, basal 2/3 of outer sulcus poorly developed, whereas apical 1/3 ca as wide as but shallower than inner sulcus. Relative lengths of segments of maxillary palpus 10 : 19 : 14 : 9 : 8 : 5.5. Triangular area of propodeum small, complete, ca as wide as tegula, strongly curved along lateral margins. Forewing with relative lengths of 1st to 4th abscissae of cubitus as 36 : 52 : 32 : 23, medial length of 3rd cubital cell 2 × (63 : 31) its maximum width. Femur 3 (fig. 2) in ventral view ca 2 × as long as wide, posterior margin weakly sinuate; ventral surface with long subplumose setae, basally with large compact tuft of long black soft setae ; posteroventral slope moderately steep,

also with subplumose setae. Tibia 3 (fig. 6) as long as basitarsus 3, not widened at apex in dorsal view; anterior surface uniformly setose, basitibial plate reaching a point of basal 4/9 of tibia; ventral surface with short sparse setae; apical margin of posterior surface moderately curved, with broad weak lobe at level of posteroventral ridge which is weak, curved and not expanded; posterior dorso-apical process moderately projecting apicad; ventro-apical process in profile fairly large, slightly longer than wide at base, projecting apicad much beyond level of dorso-apical process, its surface weakly convex, and in ventral view, longitudinally convex, with moderately compressed apex; tibial spur long, slender, gently curved. Basitarsus 3 normal, subcylindrical, anterior surface uniformly setose, elsewhere very densely so. Claws of tarsus 3 symmetrical. Lateral tergal setae normal. Tergum 4 lacking well defined spiracular scales. Tergum 7 (fig. 12) much longer than sternum 6, posterolateral lobe slightly wider at base than long, apically obtuse. Posterior margins of sterna 2-5 hardly produced at middle. Sternum 6 laterally moderately setose; sterna 7-8 as in fig. 26, 35. Genitalia (fig. 40) moderately long; apical part of gonocoxite in dorsal view strongly lamellate mesad, and in ventral view with rather weak mesal projection; penis-valve in dorsal view not narrowed apicad, its lamellate process rather wide, elongate, extending to apex.

♀. Body length 19-24 mm. Color similar to that in ♀ *fenestrata*.

Interocellar distance much greater (37 : 27) than ocellorbital distance, interspace of posterior ocelli weakly depressed, interocellar ridges lying above level of anterior margins of posterior ocelli. Frontal carina broad, strong, gradually elevated on approaching apex, surface gently flattened; apex much closer (20 : 35) to anterior ocellus than to clypeus, in profile upper slope ca 90° to apical slope, latter almost vertical; medial sulcus usually only definable at apical 2/3. Relative length of first 3 flagellomeres 19 : 9 : 12. Clypeus evenly, very densely punctate. Labrum similar to that in ♀ *fenestrata*. Mandible with discal area slightly flattened, otherwise as in ♀ *fenestrata*. Relative lengths of segments of maxillary palpus 11 : 22 : 17 : 11 : 7.5 : 6. Venation as in ♂. Femur 3 sharply edged along full length of posterior margin. Triangular area of propodeum large, reaching midpoint to posterior end of latter. Pygidial plate with lateral spines conical, parallel, apically blunt, interspace of their tips much shorter (10 : 20) than distance to apex of plate.

Xylocopa (Ctenoxylocopa) sulcatipes Maa, new species Fig. 3, 7, 13, 32, 42, 45.

MATERIAL. 12 ♂♂, 13 ♀♀. Holotype ♂ in MSNG.

ARABIA : 2 ♂♂, 2 ♀♀ incl. holotype ♂ (MSNG ex colln. Gribodo), Aden, det. F. Smith as *hottentotta*; 3 ♀♀ (MSNG), Aden, r. Pogliani, det. Magretti as *carinata*; 1 ♂ (NHMW), Aden, det. Maidl as *hottentotta*; 1 ♀ (BMNH 79.22 ex colln. F. Smith), Aden; 1 ♂ (MNHL ex colln. F. Smith), Aden, det. Ritsema as *hottentotta*. 1 ♂ (NHMW), Al-Sel-Kari, det. Friese as *hottentotta*. 1 ♂, 2 ♀♀ (BMNH 1931.220), Qara Mts, det. Benson as *X. (Mesotrichia) fenestrata*. 1 ♂ (NHMW), Ras Farták, det. Kohl as *hottentotta*. 1 ♀ (MNHL), Riyath. 1 ♂, 1 ♀ (BMNH 1900. 36), "Arabia". 1 ♀ (USNM ex colln. Magretti), Aden; 1 ♀ (Helsinki Mus.), Aden, IV.1895, Levander. 1 ♂, 1 ♀ (colln. E. J. Schlinger), Aden, Sheikh 'Othman, II.1962, R. v. d. Bosch.

PALESTINE : 1 ♂, 1 ♀ (MSNG), Jericho, det. Magretti as *hottentotta*; 1 ♂ (BMNH 1919.52), Jericho. 2 ♂♂, 2 ♀♀ (NHMW), Dead Sea, det. Kohl as *hottentotta*. 1 ♂ (Field Mus.), Jerusalem, F. R. Vester.

TRANSCASPIA : 1 ♀ (NHMW), Imam-bara, det. Kohl as *hottentotta*.

DISTRIBUTION. Widespread in W. Asia, at present known from Arabia, Palestine and Transcaspia. In SW Arabia : Aden, this species coexists and has long been in

confusion with *ustulata*, and F. Smith's (1874) and Friese's (1901, 1909) records of "*hottentotta*" from Aden might well be a mixture of both species. The records under the same name by Friese (1901, 1909) from Jericho, and by Maidl (1912) from Arabia (in part), Dead Sea and Transcaspia are certainly referable to *sulcatipes*.

SYNONYMY. As indicated above, this species has long been known as and confused with "*hottentotta*".

AFFINITIES. In superficial appearance, *sulcatipes* and *ustulata* are closely similar; while in shape and other details of tibia 3 and tergum 7 of ♂, as well as face and labrum of ♀ (see key, couplet 3), the former is clearly a near relative of *tessellata*. From all other members of the subgenus, *sulcatipes* can readily be distinguished by the exceedingly deep and wide ventral sulcus on basitarsus 3 in ♂ (for which the name *sulcatipes* is suggested), and by the exceedingly weak frontal carina in ♀. Other outstanding characters in ♂ are that the femur 3 (fig. 3) is unusually narrow in proportion, the basitarsus 3 is largely bare on its anterior surface, and bears exceedingly long setae on basal 1/2 of dorsal surface.

Description. ♂. Body fairly robust, length 17–22 mm, width across abdomen 7–9 mm, forewing 16–18 mm long. Integument and hairs similar in color to those in ♂ *fenestrata*, but face with dominant pale hairs and few black ones, dorsum of tergum 1 laterally with pale hairs, wings with practically no clear hyaline areas at extreme bases and with little steel-blue lustre at basal 1/2.

Head narrower (151 : 204) than thorax including tegulae. Face moderately narrow, eye narrower (45 : 58) than upper interorbital distance, width of posterior ocellus subequal to ocellorbital distance, width of anterior ocellus vs its distance to inner orbit 14 : 25. Interspace of posterior ocelli moderately depressed. Relative lengths of first 3 flagellomeres 15 : 8 : 11. Labrum with medial arm of T-shaped carina ca as long and wide as basal arms, gently narrowed apicad, reaching discal summit. Mandible basally with 15 ± roundish punctures, apical 2/3 of outer sulcus as wide as but shallower than inner sulcus. Relative lengths of segments of maxillary palpus 9 : 20 : 17 : 9 : 7 : 5.5. Triangular area of propodeum small, linear at apical 1/4, strongly curved along lateral margins. Forewing with relative lengths of 1st to 4th abscissae of cubitus as 41 : 52 : 28 : 28, medial length of 3rd cubital cells 2.2 × (66 : 30) its maximum width. Femur 3 (fig. 3) in ventral view 2.5 × as long as wide, posterior margin weakly sinuate, ventral surface with long black subplumose setae, basally with large compact tuft of long black soft setae; posteroventral slope moderately steep, microsetose. Tibia 3 (fig. 7) as long as basitarsus 3, not widened at apex in dorsal view; anterior surface uniformly setose, apex of basitibial plate slightly closer (52 : 57) to base than to apex of tibia; ventral surface with short sparse setae; apical margin of posterior surface moderately curved, with hardly definable lobe below level of posteroventral ridge which is strong, curved and expanded on posterior (but not also on ventral) tibial surface; posterior dorso-apical process moderately projecting dorso-apicad; ventro-apical process in profile small, slightly shorter than wide at base, not projecting apicad beyond level of dorso-apical process, its surface concave, in ventral view longitudinally convex, with subconical apex; tibial spur long, slender, gently curved. Basitarsus 3 modified, dorsal surface with exceedingly long (ca 1/2 as long as tibia itself) erect setae at basal 1/2, in strong contrast to short recumbent setae at apical 1/2; anterior surface extensively microalutaceous and seemingly bare, only with few scattered microsetae, and with compact patch of long setae at extreme base and similar patch of shorter setae at extreme apex; anteroventral surface setose, strongly depressed for its entire length, thus forming a very wide and deep sulcus; posteroventral and posterior surfaces normal, uniformly setose. Claws of tarsus 3 symmetrical. Lateral tergal setae normal. Tergum 4 lacking well defined spiracular scales. Tergum 7 (fig. 13) much longer than sternum

6, posterior margin subtruncate, posterolateral lobe hardly developed, very broadly rounded. Posterior margins of sterna 2–5 slightly produced at middle. Sternum 6 laterally moderately setose; sternum 8 as in fig. 32. Genitalia (fig. 42, 45) moderately long; apical part of gonocoxite in dorsal view strongly lamellate mesad, and in ventral view with rather weak mesal projection; penis-valve in dorsal view not narrowed apicad, its lamellate process rather wide, elongate, extending to apex.

♀. Size as in ♂, color similar to that in ♀ *fenestrata*.

Interocellar and ocellorbital distances subequal (28 : 26), interspace of posterior ocelli weakly depressed, interocellar ridges lying almost on level of anterior margins of posterior ocelli. Frontal carina evenly narrow, widened at extreme base, exceedingly weak, surface gently flattened; apex slightly closer (24 : 29) to anterior ocellus than to clypeus, in profile very little higher than general curvature of face; apical slope gently descending; medial sulcus usually weak. Relative lengths of first 3 flagellomeres 17 : 8.5 : 12. Clypeus evenly, very densely

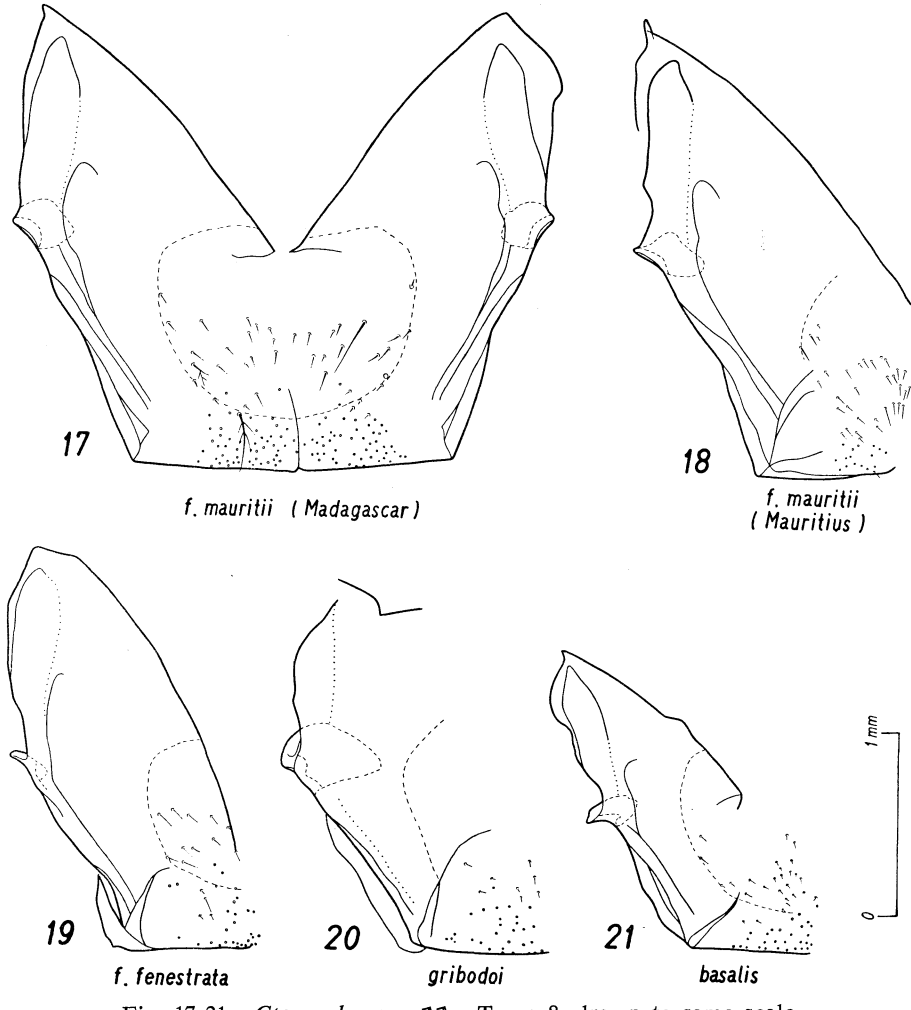

Fig. 17–21. *Ctenoxylocopa*, ♂♂. Terga 8, drawn to same scale.

punctate. Labrum with medial carina slightly narrower in proportion, otherwise similar to that in ♀ *tessellata*. Mandible similar to that in ♀ *fenestrata* but discal area slightly flattened. Relative lengths of segments of maxillary palpus 9 : 22 : 17 : 9.5 : 7 : 6.5. Venation as in ♂. Femur 3 sharply edged along full length of posterior margin. Triangular area of propodeum large, posterior 1/4 linear. Pygidial plate with medial groove very weakly narrowed apicad; lateral spines conical, parallel, with length subequal to distance from tip to tip and much less (8 : 19) than distance to apex of plate.

Xylocopa (Ctenoxylocopa) tessellata Maa, new species Fig. 4, 8, 15, 27, 33, 43.

MATERIAL. 9 ♂♂, 5 ♀♀. Holotype ♂ in MSNG.

ERITREA : 4 ♂♂, incl. holotype (MSNG), Gaharre, III.1929, Franchetti, originally labeled as *violacea*. 1 ♂ (MSNG), Abbullo, III.1929, Franchetti. 1 ♂ (MSNG ex colln. Magretti), Ghinda, III.1900, det. Vachal as *taschenbergi*. 3 ♀♀ (MSNG), Keren, XII.1900 & 1905, D. Parvis. 2 ♂♂ (NHMW), "Tiokali. 1872. Massaua", det. Kohl first as *carinata* and then as *taschenbergi*. 1 ♂ (NHMW), "Afrika. Bara. 8.III.1914", det Maidl as *hottentotta*.

SUDAN : 1 ♀ (MSNG), Kassala, II.1883, det. Magretti as *oblonga*. 1 ♀ (MNHL), Khartoum, V.1967, W. Wismeijer.

DISTRIBUTION. Probably confined to NE Africa, at present known from Sudan, Eritrea and French Somaliland. I have not seen any material from the last country but Friese's (1909 : 231) record of "*fenestrata*" from Obock and Vachal's (1899 : 94, 107) records of 2 ♂♂, 2 ♀♀ of "*taschenbergi*" from Obock and 2 ♂♂, 7 ♀♀ from Djibouti are very likely to be referable to *tessellata*. The single ♀ "Afrique, don de Reiche, existe au Muséum de Paris" recorded by Vachal (1898 : 93) as *taschenbergi* is possibly referable to *fenestrata* (see discussions under *ustulata*) and is perhaps a part of the original series of *frontalis* Reiche & Fairmaire from Abyssinia (Ethiopia).

SYNONYMY. This species is most probably the same as *taschenbergi* of Vachal (1899), Cockerell (1917) and other authors. As shown in the discussion under *ustulata*, the name *taschenbergi* is not available here.

AFFINITIES. As suggested by the name, *tessellata* can immediately be recognized by the pen-like setal tufts on sides of ♂ terga 4-7. The ♂ is also outstanding in having very weak outer sulcus on mandible, extensively bare anterior surface of tibia 3, narrow ventral sulcus on basitarsus 3, and very small triangular area on propodeum ; whereas the ♀ is unique in having exceedingly large basimedial punctate area and exceedingly short outer sulcus on mandible. In the shape of ♀ frontal carina, *tessellata* is similar to *ustulata* but in the modification of legs 3, shape of tergum 7 in ♂, and relative length of interocellar vs ocellorbital distance, shape of labrum in ♀, it is evidently a very close relative of *sulcatipes*.

Description. ♂. Body robust, length 21-22 mm, width across abdomen 10-11 mm, forewing 19-20 mm long. Color of integument and hairs similar to that in ♂ *fenestrata*, but wings with hardly definable clear hyaline areas at extreme bases.

Head narrower (192 : 288) than thorax including tegulae. Face moderately narrow, eye narrower (56 : 71) than upper interorbital distance, width of posterior ocellus subequal to ocellorbital distance, width of anterior ocellus vs its distance to inner orbit 16 : 33. Interspace of

posterior ocelli moderately depressed. Relative lengths of first 3 flagellomeres 18 : 10 : 14. Labrum with medial arm of T-shaped carina evenly broad, ca as long and wide as basal arms, reaching discal summit. Mandible basally with 30 ± roundish punctures, apical 2/3 of outer sulcus represented by double series of elongate punctures, much weaker than inner sulcus. Relative lengths of segments of maxillary palpus 11 : 22 : 20 : 13 : 8.5 : 6.5. Triangular area of propodeum exceedingly small, linear at apical 1/2 to 3/4, strongly curved along lateral margins. Forewing with relative lengths of 1st to 4th abscissae of cubitus as 45 : 67 : 37 : 30, medial length of 3rd cubital cell 2 × (76 : 38) its maximum width. Femur 3 (fig. 4) in ventral view ca 2.1 × as long as wide, posterior margin deeply sinuate, forming angulate tooth near base ; ventral surface microsetose ; posteroventral slope moderately steep, also microsetose, basally with large compact tuft of long black soft setae. Tibia 3 (fig. 8) modified, as long as basitarsus 3, not widened at apex in dorsal view ; anterior surface microalutaceous, with scattered microsetae at basal 1/3 whereas apical 2/3 entirely bare and weakly longitudinally depressed ; anterodorsal setae simple, unusually robust and dense, each apically curved anteroventrad, forming together something like a thick fence for that practically bare anterior surface ; apex of basitibial plate lying at a point of basal 2/5 of tibia ; ventral surface with short dense setae ; apical margin of posterior surface weakly curved, with hardly definable lobe below level of posteroventral ridge which is strong, curved, expanded on both posterior and ventral tibial surfaces ; posterior dorso-apical process moderately projecting dorso-apicad ; ventro-apical process in profile small, much shorter than wide at base, not projecting apicad beyond level of dorso-apical process, its surface flattened, and in ventral view, longitudinally convex, with subconical apex ; tibial spur long, slender, gently curved. Basitarsus 3 also modified, anterior surface microalutaceous, with sparse recumbent microsetae ; setae on dorsal surface dense, erect, robust, uniform, moderately short ; ventral surface setose, with narrow, moderately deep sulcus along its full length ; posterior surface as usual. Claws of tarsus 3 symmetrical. Lateral margins of terga 4–7 each with a conspicuous pen-like setal tuft. Tergum 4 with pair of spiracular scales which are bare on surface and have much shorter lateral margins than in those on tergum 3. Tergum 7 (fig. 15) much longer than sternum 6, posterolateral lobe weakly developed, very broadly rounded, and laterally flanked by pair of small tufts of curved, exceedingly long setae in addition to above-mentioned pen-like setal tufts. Posterior margins of sterna 2–5 hardly produced at middle. Sternum 6 laterally with long, very dense setae ; sterna 7–8 as in fig. 27, 33. Genitalia (fig. 43) moderately long ; apical part of gonocoxite in dorsal view strongly lamellate mesad, and in ventral view with rather weak mesal projection ; penis-valve in dorsal view not narrowed apicad, its lamellate process narrow, elongate, extending to apex.

♀. Size as in ♂, color similar to that in ♀ *fenestrata*.

Interocellar and ocellorbital distances subequal (36 : 38), interspace of posterior ocelli weakly depressed, interocellar ridges lying above level of anterior margins of posterior ocelli. Frontal carina evenly broad, strong, surface longitudinally convex ; apex much closer (24 : 42) to anterior ocellus than to clypeus, and in profile upper slope ca 115° to apical slope, latter ca 45° to general curvature of face ; medial sulcus usually definable at basal 2/3. Relative lengths of first 3 flagellomeres 20 : 10.5 : 14 ; penultimate flagellomere longer (12.5 × 10.5) than wide. Clypeus evenly, very densely punctate. Labrum with broad medial carina, which is narrowed apicad and of which the apical slope in profile is in line with anterior slope of plateau-like area. Mandible with basimedial punctate area unusually large, ca 1.5× as long as wide, extending to mandibular midlength (i.e., discal area merged into punctate area) and gently depressed, with 40 ± coarse punctures ; outer sulcus unusually short, only ca as long as sulcus between apical and subapical teeth ; concavity next to outer (lower) condyle relatively shallow. Relative lengths of segments of maxillary palpus 10 : 23 : 19 : 13 : 9 : 7.5. Venation as in ♂. Femur 3 sharply edged along full length of posterior margin. Triangular area of propodeum large, posterior 1/4 linear. Pygidial plate with lateral spines conical, slightly convergent apicad,

distance from tip to tip much smaller (12 : 21) than distance to apex of plate.

Xylocopa (Ctenoxylocopa) gribodoi Magretti Fig. 9, 14, 20, 24, 34, 44.

Xylocopa gribodoi Magretti 1892 : 959, ♀. Lectotype (MSNG), Somalia : sponde dell'Uebi.

MATERIAL. SOMALIA : 3 ♀♀ (MSNG), type series ; 1 ♂ (MSNG), fra Gallacajo e Bohotle, 1903, Citerni, det. Mantero.

DISTRIBUTION. Somalia, Tanzania ; earlier records were from Uebi (Magretti 1892), Sheikh Husein and Meo (Fox 1896), Usambara and Ikutha (Friese 1909). This species is a rarity in collections.

AFFINITIES. In the original description, *gribodoi* was compared with *angolensis* F. Smith, *imitatrix* F. Smith and *violacea* Linnaeus ; while in Friese's (1909 : 134) enumeration of African bees, it was placed, together with *villosa* Friese, in the Group Villosa. Evidently the species has nothing in common with the latter 4 species besides superficial similarities in body size and color pattern. It was provisionally assigned by Hurd & Moure (1963 : 175, 305) to *Ctenoxylocopa*.

Within the subgenus *Ctenoxylocopa*, *gribodoi* stands intermediate between *sulcatipes-tessellata* and *basalis*. In details of the ♂ genitalia, it is apparently closer to the former 2 species, while in the color pattern of head and abdomen, relative width of face (♂), depression of interocellar area, length of 3rd cubital cell, and steepness of posteroventral slope of femora 3 (♂), it is close to *basalis*. The outstanding features are shown by the very strong sexual dimorphism in the wings (clear hyaline at basal 2/3 in ♂, uniformly dark in ♀), exceedingly short medial carina of labrum (and in ♀, apex slightly overhanging), posteriorly pale-fringed basitarsi 1 (♂), and a basal setal tuft on central area of ventral surface of femora 3 (♂) extending to posteroventral slope. These features are unknown in other members of the subgenus. The ♂ of this species has only been briefly described by Fox (1896 : 556). The lectotype was designated by me (1968 : 103) recently.

Description. ♂. Body fairly robust, length ca 23 mm, width across abdomen 9 mm, forewing 16 mm long. Integument black, wings clearly hyaline at basal 2/3, fuscohyaline and with purplish lustre at apical 1/3. Hairs partly black; pale ones found on head, thorax (anterior part of mesoscutum, tegulae, lateral and ventral surfaces), coxae, posterior surface of basitarsi 1, lateral parts of dorsum of tergum 1, posterior margins (lateral sections) of terga 4-6, posterior margins of sterna 1-6 ; trochanters with dominant pale hairs and few black ones ; pale hairs on face silvery, elsewhere more or less tinted yellow.

Head narrower (200 : 279) than thorax including tegulae. Face narrow, eye wider (69 : 60) than upper interorbital distance, width of posterior ocellus 2 × as long as ocellorbital distance, width of anterior ocellus vs its distance to inner orbit 19 : 23. Interspace of posterior ocelli strongly depressed. Relative lengths of first 3 flagellomeres 17 : 9 : 11. Labrum with medial arm of T-shaped carina much shorter, narrower than basal arms, strongly narrowed apicad, not quite reaching discal summit. Mandible basally with 20 ± roundish punctures, apical 2/3 of outer sulcus ca as wide and deep as inner sulcus. Relative lengths of segments of maxillary palpus 11 : 21 : 17 : 11 : 6.5 : 4.5. Triangular area of propodeum large, complete, ca as wide as upper interorbital distance, weakly curved along lateral margins. Forewing with relative lengths of 1st to 4th abscissae of cubitus as 38 : 59 : 33 : 21, medial length of 3rd cubital cell 1.8 × (64 : 36) its maximum width. Femur 3 in ventral view 2.2 × as long as wide, posterior margin

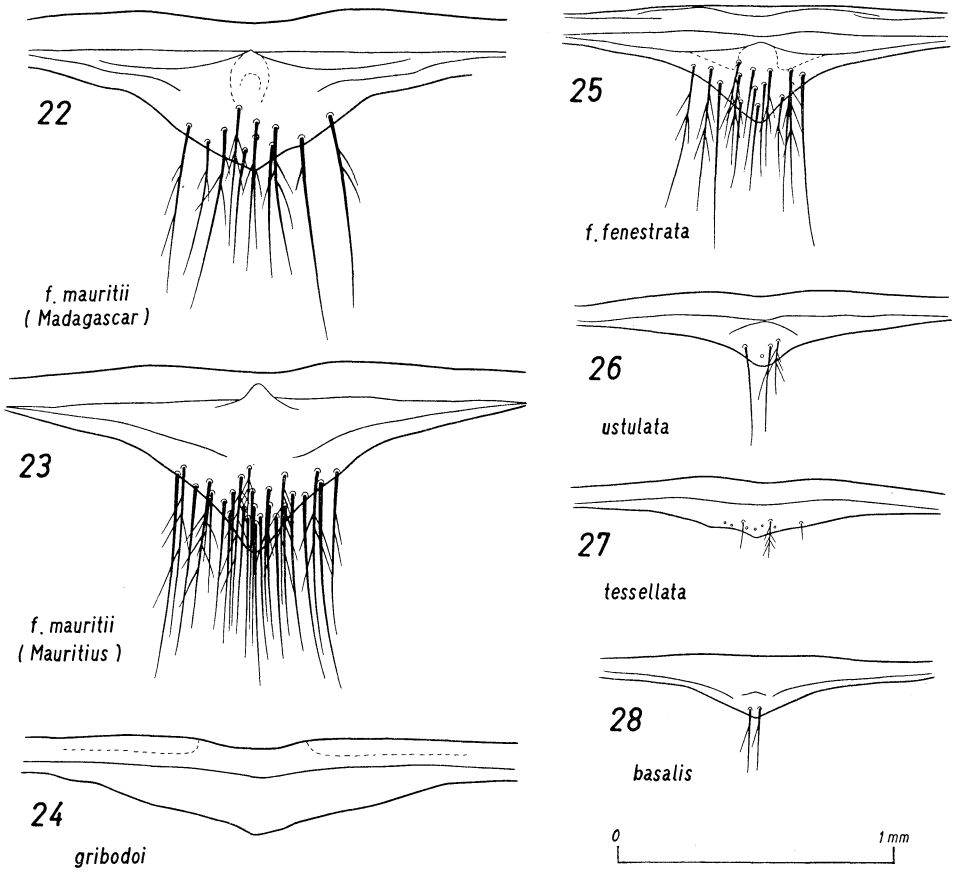

Fig. 22-28. *Ctenoxylocopa*, ♂♂. Sterna 7, drawn to same scale.

weakly sinuate ; ventral surface with long subplumose setae, basally with moderately large tuft of pale soft setae ; posteroventral slope very steep, with brownish long soft setae, those at basal area denser and merged into above-mentioned pale setal tuft on ventral surface. Tibia 3 (fig. 9) as long as basitarsus 3, not widened at apex in dorsal view ; anterior surface uniformly setose, apex of basitibial plate lying at a point of basal 8/17 of tibia ; ventral surface with long dense setae ; apical margin of posterior surface strongly curved, with hardly definable lobe below level of posteroventral ridge which is weak, curved, not expanded ; posterior dorso-apical process strongly projecting dorso-apicad ; ventro-apical process in profile fairly large, ca as long as wide at base, not projecting apicad beyond level of dorso-apical process, its surface concave, and in ventral view, longitudinally carinate, with moderately compressed apex ; tibial spur long, slender, gently curved. Basitarsus 3 normal, subcylindrical, anterior surface uniformly setose, elsewhere very densely so. Claws of tarsus 3 not quite symmetrical, subapical tooth of anterior (outer) claw virtually as long as corresponding apical tooth. Lateral tergal setae normal. Tergum 4 lacking well defined spiracular scales. Tergum 7 (fig. 14) much longer than sternum 6, posterolateral lobe slightly shorter than wide at base, apically blunt. Posterior margins of sterna 2-5 hardly produced at middle. Sternum 6 laterally moderately setose ; sterna 7-8 as in fig. 24, 34. Genitalia (fig. 44) moderately long ; apical part of gonocoxite in

dorsal view strongly lamellate mesad, and in ventral view with rather weak mesal projection; penis-valve in dorsal view not narrowed apicad, its lamellate process narrow, elongate and extending to apex.

♀. Size as in ♂. Wings uniformly dark, not clear hyaline at basal 2/3; face with silvery soft setae plus a few black simple setae on marginal areas, terga 2-6 and sterna 3-5 laterally with whitish setae.

Interocellar distance much greater (33: 26) than ocellorbital distance, interspace of posterior ocelli distinctly depressed, interocellar ridges lying above level of anterior margins of posterior ocelli. Frontal carina strong, widened basad, surface flattened; apex much closer (23: 35) to anterior ocellus than to clypeus, and in profile upper slope ca 90° to apical slope, latter nearly vertical; medial sulcus represented by a deep pit at midlength. Relative lengths of first 3 flagellomeres 18: 9: 11, penultimate flagellomere longer (11 × 9) than wide. Clypeus evenly, very densely punctate. Labrum with medial carina moderately broad, unusually short, apex not reaching midway to anterior margin of plateau-like area and in profile, slightly overhanging that plateau. Mandible with very small basimedial punctate area, which is not larger than outer (lower) condyle, and bears only 10 ± coarse punctures, other details as in ♀ *fenestrata*, Venation as in ♂. Femur 3 sharply edged along full length of posterior margin. Triangular area of propodeum very large, practically reaching posterior end of latter. Pygidial plate similar to that in ♀ *fenestrata*.

Xylocopa (Ctenoxylocopa) basalis F. Smith Fig. 10, 16, 21, 28, 36, 41.

Xylocopa basalis F. Smith 1854: 355, ♀♂. Lectotype ♀ (BMNH Type Hym. 17. B. 141), "Northern India."

MATERIAL. In addition to the few specimens recorded by me (1938: 288, 1954: 222) from Afghanistan (Zija nr Pirzada) and Pakistan (Karachi, Wazirabad), 1 ♂, 1 ♀ (BMNH 1920.72 ex colln. C. G. Nurse) from NW India: Ferozepore are at hand.

DISTRIBUTION. Afghanistan; W. Pakistan; NW India (Punjab State). The only nesting record (Maa 1938: 289) was from *Calotropis* stems. This species is also a rarity in collections.

AFFINITIES. Although the pale color pattern, relatively narrow face and distinct interocellar depression in this and the preceding species are similar, *basalis* is isolated within the subgenus. It can readily be recognized by any of the following unique characters: Wings clear hyaline at basal 1/3 in both sexes; 3rd cubital cell only ca 1.6× as long as wide; ♂: basal setal tuft of femur 3 lying on posteroventral slope (not on ventral surface), apical spur of tibia 3 short, stout and straight, basitarsus 3 exceedingly robust, extensively bare and shining, and strongly compressed, posterior margin of tergum 7 entire, mesal lamellae of gonocoxite and penis-valve exceedingly large; ♀: penultimate flagellomere hardly longer than wide, lateral spine of pygidial plate strongly compressed bilaterally. The robustness and bareness of the basitarsi 3 are so conspicuous that both F. Smith (1854, etc.) and Bingham (1897: 542) mistook them as tibiae 3. The ♂ genitalia of this species (dorsal view) has been illustrated by Maa (1938) and the hind leg by Maa (1954).

Description. ♂. Body rather slender, length 15-17 mm, width across abdomen 7.0 - 7.5 mm, forewing 13-16 mm long. Integument black, flagellum and legs more or less tinted reddish; wings clear hyaline at basal 1/3, whereas apical 2/3 fuscohyaline and with purplish lustre. Hairs largely black; pale ones found on face, lateral and ventral surfaces of thorax, apex of

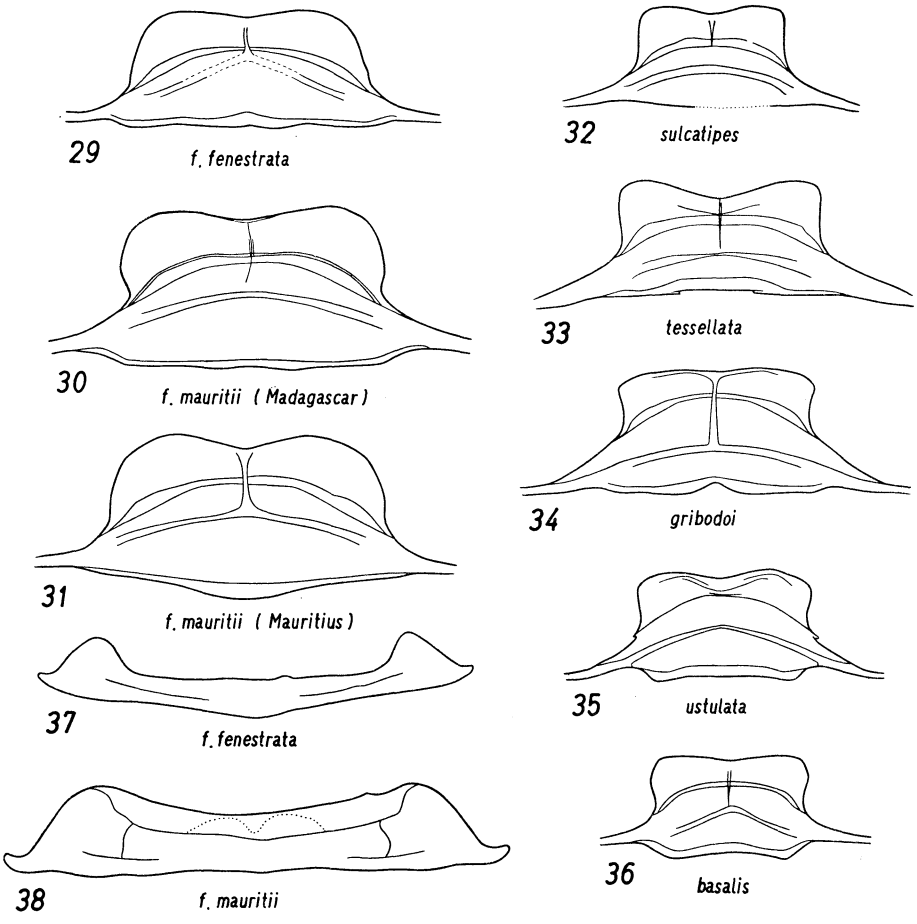

Fig. 29-38. *Ctenoxylocopa*, ♂♂. Sterna 8, drawn to same scale (29-36) ; gonobase, drawn to same scale (37-38).

basitarsus 3, dorsal surface of tergum 1, lateral margins of terga 2-6 and posterior margins of sterna 1-5.

Head narrower (166 : 206) than thorax including tegulae. Face narrow, eye wider (56 : 44) than upper interorbital distance, width of posterior ocellus 2 × ocellorbital distance, width of anterior ocellus vs its distance to inner orbit 14 : 19. Interspace of posterior ocelli strongly depressed. Relative lengths of first 3 flagellomeres 15 : 7 : 9.5. Labrum with medial arm of T-shaped carina shorter than but as wide as basal arms, strongly narrowed apicad, reaching discal summit. Mandible basally with 20 ± roundish punctures, apical 2/3 of outer sulcus much shallower than inner sulcus. Relative lengths of segments of maxillary palpus 10 : 17 : 13 : 9 : 5 : 4.5. Triangular area of propodeum large, linear at apical 1/4, weakly curved along lateral margins. Forewing with relative lengths of 1st to 4th abscissae of cubitus as 37 : 40 : 29 : 15, medial length of 3rd cubital cell only 1.6× (76 : 38) its maximum width. Femur 3 in ventral view 2.1× as long as wide, posterior margin weakly sinuate, ventral surface with moderately long black subplumose setae, posteroventral slope very steep, microsetose, basally with

large compact tuft of short pale soft setae. Tibia 3 (fig. 10) distinctly longer (106: 89) than basitarsus 3, not widened at apex in dorsal view; anterior surface uniformly setose, apex of basitibial plate slightly closer (50: 60) to base than to apex of tibia; ventral surface with long sparse setae; apical margin of posterior surface strongly curved, with strong lobe below level of posteroventral ridge which is very weak, curved and not expanded; posterior dorso-apical process strongly projecting dorso-apicad; ventro-apical process in profile fairly large, distinctly longer than wide, not projecting apicad beyond level of dorso-apical process, its surface obliquely carinate toward apex, and in ventral view, longitudinally carinate, with apex strongly compressed; tibial spur short, robust, straight. Basitarsus 3 strongly modified, as robust as corresponding tibia, isogonally triangular in cross section at basal 1/2; dorsal surface with parallel and sharply edged anterior and posterior margins, shining, flattened (slightly depressed at discal area), extensively bare, only with triangular patch of black soft setae at basal 1/3, its extreme apex forming an abrupt slope covered with very long and dense silvery soft setae; anterior surface also extensively bare, basally with large patch of long dense black setae and immediately apicad to that setal tuft, there is a large, very deep, elongate concavity which is deepest at base and has rather definable basal and dorsal limits; posterior surface similar but extensively covered with black subplumose setae, only with bare strip (which is widened at base) along dorsal margin, its elongate depression deepest slightly away from base and with no definable basal limits; ventral surface heavily setose, basal 1/2 linear, thence gradually widened apicad. Claws of tarsus 3 not quite symmetrical, subapical tooth of anterior (outer) claw virtually as long as corresponding apical tooth, posterior claw with normal apical and subapical teeth. Lateral tergal setae normal. Tergum 4 with pair of spiracular scales which are bare, mesally clearly demarcated by sulcus. Tergum 7 (fig. 16) hardly longer than sternum 6, posterior margin evenly rounded, no trace of posterolateral lobes. Posterior margins of sterna 2-5 straight. Sternum 6 laterally moderately setose; sterna 7-8 as in fig. 28, 36. Genitalia (fig. 41) moderately long; apical part of gonocoxite in dorsal view strongly lamellate mesad, and in ventral view with strong mesal projection; penis-valve in dorsal view not narrowed apicad, its lamellate process large, lunular and situated well before apex.

♀. Size of body and color of integument as in ♂, i. e., wings also clear hyaline at basal 1/3; face with purely silvery soft setae, terga 2-6 (laterally) and sterna 3-5 (entire posterior margins) with whitish setae.

Interocellar distance distinctly greater (27: 20) than ocellorbital distance, interspace of posterior ocelli distinctly depressed, interocellar ridges lying practically on level of anterior margins of posterior ocelli. Frontal carina strong, widened basad, surface longitudinally convex; apex much closer (18: 29) to anterior ocellus than to clypeus and in profile, upper slope ca 80° to apical slope, latter vertical; medial sulcus usually wanting. Relative lengths of first 3 flagellomeres 15.5: 7: 9, penultimate flagellomere hardly longer (8.5 × 8) than wide. Clypeus evenly, very densely punctate. Labrum with moderately broad medial carina, in profile anterior slope of that carina perpendicular to plateau-like area. Mandible with basimedial area moderately large, strongly depressed, ca as long as wide, with 9 ± coarse punctures plus similar number of minute ones; discal area small, gently convex; outer sulcus normal, similar to that in ♀ *fenestrata*. Venation as in ♂. Femur 3 sharply edged along basal 1/2 of posterior margin, whereas apical 1/2 rather rounded. Triangular area of propodeum small, not reaching midpoint to posterior end of latter. Pygidial plate with medial groove gradually narrowed apicad, lateral spines strongly compressed bilaterally, convergent apicad, and lying on oblique planes, distance from tip to tip of lateral spines shorter (8: 12) than distance from tip of a spine to apex of plate.

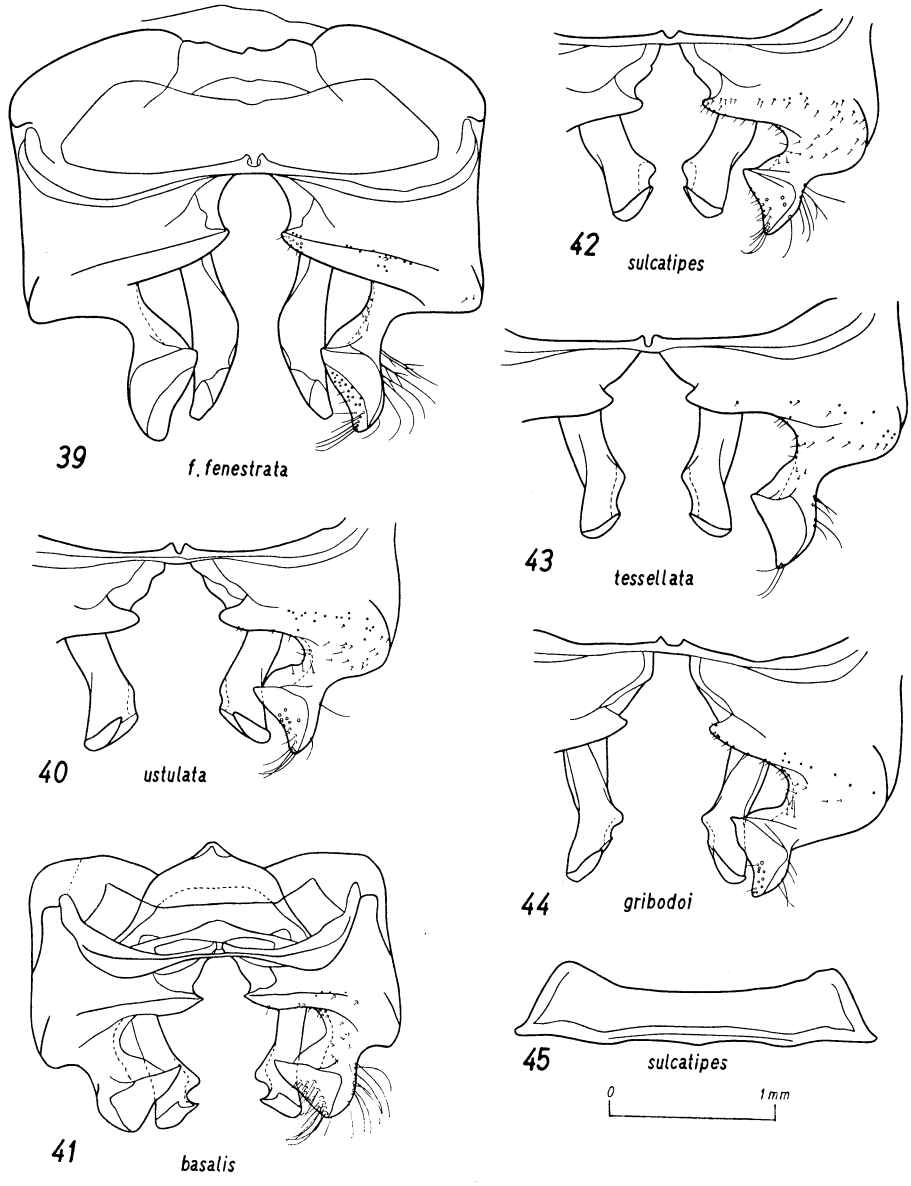

Fig. 39-45. *Ctenoxylocopa*, ♂♂. Genitalia, ventral view, drawn to same scale (39-44); gonobase (45).

Species to be Removed from Ctenoxylocopa

Xylocopa aliceae Cockerell 1931 : 209, ♂. Type (BMNH Type Hym. 17. B. 110), Morocco : Ifrane.

The type is a worn specimen and is referable to either *iris* Christ or *cantabrita* Lep. The genitalia and the structural details of the legs must be examined before the exact identity can be ascertained. The species was tentatively assigned to *Ctenoxylocopa* by Hurd & Moure (1963: 175, 296).

Xylocopa hottentotta F. Smith 1854: 349, ♀. Lectotype ♀ (BMNH 49.29. Type Hym. 17. B. 127), Port Natal. The rest of the type series, which I did not see, was from Sierra Leone.

The lectotype (here designated) doubtless belongs to the subgenus *Nodula* s. l. and is, for geographical reasons, most probably not conspecific with the paratype(s) from Sierra Leone. The spelling of the specific name was given by Vachal and some other workers as *hottentota* (Hottentot, a member of a Negroid race living in S. Africa, or, the language of the Hottentots).

Xylocopa oblonga F. Smith 1874: 256, ♀♂. Lectotype ♂ (BMNH Type Hym. 17. B. 1252), Cape of Good Hope.

The lectotype ♂, here designated, certainly belongs to *Biluna*; whereas the paratype ♀, also from Cape of Good Hope, to *Mesotrichia*. Since *Biluna* appears to be confined to the Oriental Region, the lectotype might have been either mislabeled or introduced accidentally (? permanently established) into S. Africa. The species was suppressed by Friese (1909: 227) as a synonym of *capensis* Lep. which is, according to Friese (1909: l. c.) and Hurd (1959: 141), the same as *capitata* F. Smith (type species of *Acroxylocopa*). It is included here because 2 of the specimens of *tessellata* were previously determined as *oblonga*. The spelling of the specific name was given as *oblongata* by Friese (l. c.).

Xylocopa stadelmanni Vachal 1898: 157, nom. nov. pro *X. amethystina*: Stadelmann (misidentification, nec Fabricius 1793) 1898 : 8, 21, 24, ♀. Type (? Berlin Mus.), Tanzania: Bondei, Usambara.

This dubious species is so far known only from Stadelmann's description which may be quoted in full "Weibchen. Körper einfarbig schwarz mit geringen bläulichen Schimmer, mittelgrosse Tiere." This may be applied to almost any medium-sized black *Xylocopa* of E. Africa and seemingly sounds like a *Nodula* s. l. The species was listed by Hurd & Moure (1963: 175, 316) under *Ctenoxylocopa*. Incidentally, the bodies of all *Ctenoxylocopa* have exceedingly slight, if any, bluish metallic lustre, and practically no *Ctenoxylocopa* has ever been recorded from continental Africa south to the Equator.

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