

except a yellow median spot, spots on the pleuræ above the coxæ, the margins of the scutellum and postscutellum, the mesosternum, a triangular spot at the apex of the median segment, and the base and apex of each of the abdominal segments rather broadly above, more narrowly beneath, dull ferruginous. Wings hyaline; nervures fuscous, testaceous at the extreme base.

♂. As in the female; but the margins of segments 4-7 are black instead of ferruginous. The first recurrent nervure is received at the middle of the second cubital cell, the second at one-quarter from the base of the third cubital cell. The submedian cell is no longer than the median. In both sexes the mandibles are black at the apex.

Length, ♀ 12 mm., ♂ 16 mm.

Hab. S.W. Persia (*Escalera*).

Very near *S. glasunovii*, Mor., but in the present species the second joint of the flagellum is distinctly longer than the third, the tegulæ are less strongly punctured, the metapleuræ are not striated, the colour also differs considerably. I have not seen specimens of *glasunovii*, and it is possible that the differences may prove to be of subspecific rather than of full specific importance. The slight differences in neuration between the sexes are remarkable.

The ♀ is the type.

XXXIV.—*Descriptions and Records of Bees.*—XXXV.

By T. D. A. COCKERELL, University of Colorado.

Xylocopa amethystina sigiriana, subsp. n.

♂.—Face very narrow, facial quadrangle at least twice as long as broad; all of face below antennæ, and a small bilobed spot on labrum, ivory-colour; flagellum, except first joint, dark red beneath; vertex with a tuft of white hair; hair of cheeks white; hair of thorax in front broadly, and of pleura except the uppermost part, white, that of thorax dullish and rather yellowish; hair of metathorax all black; light hair of anterior legs white, and a little white hair on outer side of middle tarsi. Abdomen with shining white hair beneath. Wings translucent, strongly stained with brown, especially in the region of the marginal and submarginal cells, and the apex, the veins and parts immediately adjacent shining brilliant purple. Hind legs quite ordinary;

hind femora not incrassate and without any lobe or tooth, hind tibiae not arched.

♀.—Black, with the wings very dark fuliginous, very brilliantly purple throughout; face black, clypeus strongly punctured, with a median carina; a strong keel extending from middle ocellus to level of antennæ; hind tibiae very short and thick; second s.m. in both sexes short.

Hab. Sigiri, N.W. India, March 1910 (*E. Comber*). One male (type) and two females in British Museum.


This agrees with *X. amethystina* as defined by Bingham, except in the colour of the hair of the male, the paler wings of that sex; and in the female the more carinate clypeus and front. Bingham's *amethystina* is presumably the species of Fabricius, but it is not the *amethystina* of Lepeletier, which has quite different hind legs in the male. Bingham wrongly places *minuta*, Lepeletier, as a synonym of *amethystina*, it really belongs to *X. cyanescens*. *X. ignita*, Smith, based on a female, is doubtless *amethystina*. In the female this species exactly imitates *Anthophora violacea*, Lepeletier, which was taken by Mr. Comber at Karachi, N.W. India.

Crocisa takaonis, sp. n.

Black, with white markings; in size and appearance exactly like *C. ramosa*, Lep., but differing as follows: scutellum with a white apical hair-patch, as well as white hair projecting from beneath; apical plate of abdomen strongly keeled; mesothorax and scutellum more finely punctured; white L on each side of first abdominal segment thicker, its inner angle rounded. By having the third antennal joint in the female equal to the fourth, and a patch of hair at apex of scutellum, *C. takaonis* resembles *C. affinis*, Mor., but the male antennæ are not unusually short or thick, the flagellar joints being, as usual, longer than broad. The hind femora of the male have rounded compressed lobes beneath, but are not dentate. The wings are very dark; the lower part of the pleura is black, with a white spot.

Hab. Takao, Formosa, two of each sex (*Sauter*). Berlin Museum. The dates of capture are Oct. 11 and 30, Nov. 2 and Dec. 1, 1907.

A *Crocisa* from Foochow, China (*H. R. Caldwell*), is between this species and *C. ramosa*. Like *ramosa*, it lacks the white hair-patch on the scutellum; the apical plate of the abdomen has a weak keel; the mesothorax and scutellum are punctured as in *takaonis*, but the second abdominal segment is less closely punctured; white markings on first

abdominal segment practically as in *takaonis*; the margins of the scutellar incision are curved, producing a , not practically straight as in *takaonis*.

Crocisa amata, sp. n.

Length 9 to 13 mm.

Black with very brilliant but not shining turquoise-blue markings: runs in my table in 'Entomologist,' Aug. 1910, to *C. decora*, Smith, to which it is very closely allied. Compared with a Singapore example of *decora*, it differs as follows: markings a little lighter, with a faint greenish shade, occasionally almost white; basal band of first abdominal segment very thick in middle, projecting from beneath scutellum, but sublaterally interrupted or much narrowed (in *decora* thick and even, with a linear median interruption); sublateral discal spots of thorax smaller.


Hab. Formosa (*Sauter*). Berlin Museum.

I have before me 37 males and 27 females; the type is a male from Takao. The localities and dates are Takao, Oct. 11, 19, 30, Nov. 2, Dec. 5, 15, 1907; Kanshi, June 8, 1908; Fuhosho, July 1909; Kanshirei, June 8, 1908.

This is a blue-marked species, with the hind femora of the male bearing a large, sharp, thorn-like tooth, in all respects very close to the mainland *C. decora*. I should have thought it a variety of *decora*, had I received only a single specimen, but the very long series holds its characters well, slight as they are. In the 'Entomologist,' 1910, p. 219, I expressed some fear that I might not have correctly identified *decora*; but since then Mr. Meade-Waldo has examined Smith's type (a female from N. China) for me, and returns to me one of the specimens from Singapore I had considered *decora*, assuring me that it is a true exponent of the species. Mr. Meade-Waldo adds: "*decora* is certainly marked with strong, dark blue (not the pallid wash of Transcaspian specimens of the genus *Crocisa*); the bands on the abdomen, viewed from above, almost meet (rather more so than in Singapore specimen); the mesothoracic spots are far from the prothoracic band, a line drawn through the extreme anterior edge of the tegulæ would just pass through the hinder edge of the mesothoracic spots."

Crocisa kanshireana, sp. n.

Length about 12 to 14 mm.

Black with cobalt-blue markings, which are not at all shining; scutellum -like, with a blue apical patch.

Abdomen in male with purple and green tints ; basal band of first abdominal segment narrow, slender, often interrupted in middle ; apical band of first segment also rather slender, interrupted in middle line by a space about equal to distance from notch in scutellum to one of its lateral points ; bands of first segment not united at sides ; the other bands, four in number, are transverse, interrupted about as widely as that on apex of first segment ; median stripe of mesothorax going back about to middle ; discal spots small, isolated ; mesothorax with much black hair ; pleura crossed by a blue band, narrowed in middle. Wings very dark ; apex of male abdomen with three low lobes (in *C. amata* truncate, with a tooth-like pencil of hair on each side) ; hind femora of male unarmed ; hind tibiae with a patch of blue hair at base ; hair of basitarsi black, in female with a fair amount of blue, in male with the blue reduced to a few hairs, often only on anterior tarsi.

Hab. Kanshirei, Formosa, June 8, 1908 (*Sauter*). 6 ♂ ; 2 ♀, in Berlin Museum.

A very closely related *Crocisa* from Foochow, China (*Caldwell*), differs by the much duller, greyish-blue of the abdominal markings ; the W-like scutellum, without an apical blue patch ; the broader median mesothoracic band ; the apical band of first abdominal segment very narrowly or not interrupted, and joined at sides by a longitudinal band to the basal ; and the abundant light hair on the tarsi.

In Friese's table of Oriental and Australian *Crocisa* (*Ann. Mus. Nat. Hung.* 1909) this runs in both sexes straight to *C. emarginata*, but it is certainly not the *emarginata* of Lepeletier, which has shining blue markings. In my table in 'Entomologist,' Aug. 1910, it runs nearest to *C. decora*, to which it is not closely allied.

It is seen from the above that Formosa contains three species of *Crocisa*, all of different groups. All are close to Chinese species, but nevertheless distinct.

ANDROGYNELLA, gen. nov.

Like *Megachile*, but female with 13-jointed antennæ, and ventral surface of abdomen smooth and bare, without any trace of a scopa. Junction of third and fourth antennal joints in female very oblique. Male with short flattened anterior coxal spines or lamellæ ; anterior tarsi somewhat modified. Type *Androgynella detersa* (*Megachile detersa*, Ckll.).

The species was described from a single female. Mr. R. *Ann. & Mag. N. Hist.* Ser. 8. Vol. vii.

E. Turner examined 14 female specimens in his collection, and all had 13-jointed antennæ and wholly lacked a ventral scopa. It is therefore certain that this is a normal condition, and must represent an early stage in the evolution of a parasitic series, like those of *Cælioxys* and *Stelis*. From the standpoint of genetics, it is an extraordinary case, since the female seems to have dropped her secondary sexual characters and thereby assumed those of the male, which were present in her gametic constitution. It is noteworthy that the sting, a modified primary character, is retained. It appears that in *Megachile* the female is heterozygous for the secondary sexual characters, with the female characters dominant.

Thus a new generic type has been produced by the simple dropping out of one set of characters. It may be objected that the insect is still essentially a *Megachile*, and this is indeed true as regards its major characters, but according to any logical system of classification it must go in a distinct generic group, as otherwise our current definition of *Megachile*, applicable to hundreds of species all over the world, breaks down.

Mr. Turner sends me the male of *A. detera*, taken at the same tree as the female, and having the same general characters.

Male.—Length about 8 mm. Eyes green; face with abundant pale yellow hair; third antennal joint (as Mr. Turner noted) oblique at end as in the female; lower part of cheeks with very abundant snow-white hair; anterior coxæ with short flat spines; anterior tarsi reddish, the first three joints oval, flattened, especially the first, so that the posterior margin of the tarsus is strongly crenate, the tarsus also with a strong fringe of white hair behind; middle and hind tarsi also somewhat thickened, middle tarsi with a very long fringe of white hair behind; hind tibia swollen; vertex and thorax above with a good deal of black hair; abdomen short, with narrow hair-bands, the apex strongly retracted; dorsal surface of sixth segment densely covered with cream-coloured hair, margin of segment little projecting, with a broad shallow median depression; no ventral teeth or spines; claws bifid at end. The claws are also bifid at end in the female, with no basal tooth.

Heriades sauteri, sp. n.

♀.—Length about $6\frac{1}{3}$ mm.

Black, superficially looking exactly like the European *H. truncorum* (L.), to which it is closely allied, differing as

follows: mandibles much shorter, the apex reaching only a little beyond middle line of clypeus; head round instead of quadrate, the occiput and cheeks less developed; cheeks in lateral view about as wide as eye. Wings hyaline, faintly greyish; b. n. falling a little short of t.-m.; abdomen beyond the second segment with a fine thin pruinose pubescence. The punctures of the abdomen are very much finer than in the American *H. carinatus*, Cresson. The ventral scopa is white.

♂.—Length about 5 mm.

Formed as in *H. truncorum*, but readily separated by the hyaline wings.

Hab. Formosa (*Sauter*). Berlin Museum. Six specimens were obtained at Takao, Sept. 29 and Oct. 11, 1907.

The genus is new to Formosa. The species is apparently related also to *H. tenuis*, Nurse, from Mt. Abu, but the tibiae are not especially enlarged. There is no tooth at each side of the scutellum in *H. sauteri* ♀; hence in Friese's table of Palæarctic species it runs to the Egyptian *H. moricei*, Friese, from which it is at once separated by the non-dentate clypeal margin.

Megachile faceta, Bingham.

Two females in the Berlin Museum were collected by Sauter in Formosa, one at Cikutoge, May 1909. Bingham reported the species from Burma and Tenasserim; I have one from the Khasia Hills, received from Mr. Sladen.

Megachile studiosella, n. n.

Megachile studiosa, Bingham, Jn. Bombay Nat. Hist. Soc. 1898, p. 126
Simla. (Not *M. studiosa*, Cresson.)

♀.—9 mm. long.

Ventral scopa white.

Megachile (Eumegachile) dinura, sp. n.

♀.—Length about 19 mm.

Black; hair of head short and black, a little fulvous on lower part of cheeks; mandibles with a broad cutting-edge, but only two teeth; clypeus transverse, short, densely rugose, not at all keeled, lower margin straight, with a pair of small obscure tubercles in the middle; cheeks with very large punctures; vertex, mesothorax, and scutellum very densely punctured, scutellum more coarsely than mesothorax; mesothorax and scutellum almost nude, with some very short inconspicuous black hair; other parts of thorax with fulvous

hair, very dense and bright on tubercles and behind the wings; disc of anterior coxæ with black hair; tegulæ black. Wings dark fuliginous, the basal half paler and yellower. Legs black, with short fulvous and black hair, that on inner side of tarsi rufo-fulvous; hind basitarsus not especially broadened. Abdomen of the long and parallel-sided type, with fulvous hair at sides of first segment, and forming inconspicuous narrow bands, broadly interrupted in middle on the following four; surface shining, punctures on second and third segments very large; ventral scopa bright rufo-fulvous, becoming blackened on fourth segment, and entirely black on fifth and sixth; abdomen not at all metallic.

Hab. Fuhosho, Formosa, July 1909 (*Sauter*). Berlin Museum.

This looks exactly like a small example of *M. doederleinii*, Friese, but is readily distinguished by the darker wings, the eyes almost parallel (widely diverging below in *doederleinii*), and the normal (not elevated) lower margin of clypeus.

The antennæ of *M. dinura* are shorter in proportion than those of *M. doederleinii*. The structure and sculpture of the abdomen are nearly the same in both.

Comparison may also be made with *M. sculpturalis*, Smith, which has much more fulvous hair, and the abdomen with metallic tints.

Megachile conjuncta, Smith.

I have a co-type female from F. Smith's collection. The abdomen has strong purple tints, and the ventral scopa, while largely red, is white at the base and black laterally and apically; by no means "entirely bright fulvous," as Bingham has it. The mandibles are strongly arched near the apex, and the upper part of the clypeus has a longitudinal smooth band. Thus the species, while superficially just like *M. disjuncta*, is really very distinct.

Megachile disjunctiformis, sp. n.

Like *M. disjuncta*, but ventral scopa of female creamy white as far as base of fourth segment, black beyond. This is evidently nearer to *M. disjuncta* than to the Chinese *M. relata*, Smith, agreeing with *disjuncta* in sculpture, form, and the colour of the wings (compare Bingham's account of *M. relata*); in *relata* the ventral scopa is bright fulvous and black, in *disjuncta* it is all black. The hair at the base of abdomen and adjacent parts of thorax is white, as in a *disjuncta* from Deli, Sumatra (*L. Martin*); in *disjuncta* from

Madagascar and Mauritius it is ochreous. The female clypeus is formed exactly as in *disjuncta*, with the same pair of apical tubercles, but the delicate median carina is usually (not always) absent.

The male has simple anterior tarsi and tibiæ; anterior coxæ with very small spines, reddish at end; clypeus with a dense white beard, but otherwise bare and shining, with strong punctures; mesothorax with well-separated punctures; apex of abdomen obscurely bilobed. The smaller males are not over 10 mm. long, while the larger females are 18.

Hab. Formosa (*Sauter*); very many specimens. Berlin Museum.

The type is a female from Chikutoge, May 1909. Other specimens are from Takao, July to October.

Megachile takaoensis, sp. n.

♂.—Length 14 (small examples 12) mm.

Black, with abundant pale yellow hair on head, thorax, and legs, and brighter red (orange-fulvous) on abdomen; vertex and disc of mesothorax with fuscous hair; dense hair of face fulvous varying to cream-colour; head and thorax above dullish, densely punctured; tegulæ very dark brown, finely punctured. Wings subhyaline, apical margin broadly fuscous. Legs black, including tarsi; anterior tarsi more or less reddish, rather thickened, but essentially simple, with a fringe of hair behind, and the middle tarsi also fringed; anterior coxæ with short but stout black spines. Abdomen covered with red hair; sixth segment very hairy, projecting, sharp-edged, emarginate in the middle and variously subdentate, and with a strong median keel; sub-apically beneath is a pyramidal projection ending in a short spine, and another spine projecting from its hinder part, close to the apical emargination; stigma ferruginous, nervures mostly fuscous.

♀.—Length about 18 mm.

The abdomen covered with light red hair, the scopa entirely orange-fulvous; appearance of the African *M. fulva*, Smith, but the wings much darker, the apical half fuscous; mandibles massive, quadridentate; clypeus short and broad, very densely punctured, with a small median apical tubercle; hair of clypeus largely dark fuscous and dark reddish; flagellum short and thick; hind basitarsus little broadened, with much red hair on inner side.

Hab. Takao, Formosa (*Sauter*). Many specimens in Berlin Museum.

The type is a male taken April 18, 1907. The males were taken in April, May, and July; the females in July, September, and October.

Megachile kagiana, sp. n.

♂.—Length $14\frac{1}{2}$ (small specimens $12\frac{1}{2}$) mm.

Superficially exactly like *M. takaoensis*, with which I had mixed it, but easily separated as follows: hair of head and thorax above all fulvous; anterior coxæ with long black spines; anterior femora subtrigonal, keeled beneath, ferruginous, the posterior inferior face blackened; anterior tibiæ ferruginous, with the outer side black; anterior tarsi distinctly broadened, dull cream-colour stained with reddish, fringed behind with white hair, on inner side a large dark brown oval spot; sixth abdominal segment hairy and keeled, but strongly retracted, not produced, the broad margin with irregular sharp teeth; fourth ventral segment emarginate, but no evident projections.

Hab. Formosa (*Sauter*). Several in Berlin Museum.

Type from Koroton, Sept. 9, 1907.

Megachile rufovittata, sp. n.

♀.—Length about $14\frac{1}{2}$ mm.

Similar to *M. takaoensis*, but shorter and proportionately broader, the abdomen shovel-shaped; abdomen appearing banded, the segments crossed by strong ridges which stand up above the pubescence; basad of these ridges the surface is densely punctured with dark red hair, apicad of them it is very densely covered with brilliant orange-ferruginous hair; ventral scopa creamy white at base, becoming deep ferruginous apically; posterior basitarsus very broad and flat; hair of vertex dark fuscous; disc of mesothorax nearly bare, with scanty short fuscous hair, but with fulvous hair along the margins; hair of front and sides of face very bright orange-ferruginous; clypeus and supraclypeal area shining, with strong punctures; clypeus not so short as in *takaoensis*, with its apical margin broadly though not deeply excavated; flagellum longer and more slender than in *takaoensis*.

Hab. Fuhosho, Formosa, July 1909 (*Sauter*). One female in Berlin Museum.

The Sauter collection from Formosa includes a great number of red-haired specimens of *Megachile*, superficially like *M. fulva*. Upon close examination it proves easy to sort

out two kinds of males and two of females. All the males described as *takaoensis* come from Takao, thirty-two specimens. Eight females from Takao evidently belong with them. The males described as *kagiana* are two from Kagi, Aug. 26, 1907; three from Koroton, Sept. 9, 1907; and one from Takao, July 21, 1907. Two females from Koroton, Sept. 9, 1907, are referred with doubt to *M. kagiana*, but I cannot find any distinct character to separate them from that sex of *takaoensis*, although the abdomen seems to have a slightly more banded appearance. A third female from Koroton, however, is fresher, and is exactly like female *takaoensis* from Takao; so either the females of these species are alike, or we do not know the true female of *kagiana* *.

M. rufovittata, from a locality not represented by males, has the abdomen shaped more as in *M. bicolor*, and can hardly be the female of *M. kagiana*. *M. rufovittata* has the antennæ formed as in *M. bicolor*, and is evidently closely allied, but the scopa is quite differently coloured. *M. fraterna*, Smith, also resembles these insects, but is easily separated from them by the black hair of the front in the female. *M. doleschalli*, Ckll., from Amboina, resembles *M. rufovittata*, but has the hair of the clypeus black, and rufo-fulvous tegulæ (those of *rufovittata* are piceous, with a patch of red hair in front).

Megachile bicolor (Fabr.).

This also occurs in Formosa, a single female having been taken by Sauter at Takao, July 26, 1907.

The ventral scopa is a rather creamy white, black on the last segment. The middle of the clypeus and the supra-clypeal area are shining.

Apis nursei, n. n.

Apis testacea, Bingham, Jn. Bombay Nat. Hist. Soc. xii. p. 129. Deesa.
♀, 9 mm. (Not *A. testacea*, Smith, 1857.)

* The reverse hypothesis could be entertained, and supported to some extent by the observation that the females were taken in July, September, and October, practically coinciding with the flight of male *kagiana*; whereas the males of *takaoensis* occurred from April to July. It seems scarcely possible, however, that the abundant species *takaoensis* should not belong with the prevalent female of the locality.



Cockerell, Theodore D. A. 1911. "Descriptions and records of bees. XXXV." *The Annals and magazine of natural history; zoology, botany, and geology* 7, 310–319.

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