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## SOME BEES, PRINCIPALLY FROM FORMOSA AND CHINA

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The bees reported on below are in the collection of the American Museum and were mostly collected by Sauter in Formosa (without more definite locality labels) and by H. R. Caldwell at Yen-ping, China. In addition, there are several new species from Siam, one from Tibet, and one from a locality only indicated as "Mujong."

### **Megachilidæ**

The species of *Megachile* in the warmer parts of Asia are exceedingly numerous and diversified. A small collection recently sent to me by Mr. H. M. Pendlebury of the Federated Malay States Museums, Kuala Lumpur, included no less than eight new species. I have tabulated the species of various regions in Asia, with the following results: Sachalin, 1; Japan, including Tsushima Is., 13; Korea, 1; Lu Chu Is., 1; China, 18; Formosa, 20; Burma and Tenasserim, 7; Siam, 7; Cochin China, 1; Malay Peninsula and Penang, 11, or 19 counting Mr. Pendlebury's species, as yet unpublished; Borneo, 32; Sumatra, 5; Philippine Is., 28; Java, 11. The best explored of these regions, so far as *Megachile* is concerned, are Borneo, Philippine Is. (Baker collections) and Formosa (Sauter collections). In all the others there is very much to be done, and even in these regions novelties will still be found. Borneo probably has the richest fauna, but Sumatra should not be far behind.

Comparatively few species are very wide-ranging but the existing literature is not always reliable on this point, as, for instance, I have found some of the synonymy proposed by Bingham and Meade-Waldo to be erroneous, and Hedicke, working on the Formosa species, was obliged to correct the work of his predecessors in a number of cases. Nevertheless, there are some species which certainly have a very wide range, such, for instance, as the highly characteristic *M. faceta* Bingham. It may perhaps turn out that these are species nesting in timber or joints of bamboo, and hence readily carried from place to place by man. The species of Borneo, with only three exceptions, are different from those of the Philippines. How far the Formosa fauna is really endemic we do not know, as the species of the nearest parts of China are not well known.

The list of recorded Indian species is very long, but it has to be reduced by the removal of several species of *Lithurgus*, *Heriades* and *Osmia*, described by Cameron as *Megachile*. It must also be noted that India contains several different faunæ, including one which is strictly Oriental, a Palæarctic one in the northwest, and a high mountain fauna in the Himalayas.

## KEY TO THE SPECIES DISCUSSED

- Females.....1.  
 Males.....17.
- 1.—Abdomen covered with red hair; larger species, over 15 mm. long.....2.  
     Abdomen not covered with red hair, or, if so covered, much smaller.....4.
  - 2.—Hair of thorax black. (Siam).....*hemimalas*, new species.  
     Hair of thorax pale.....3.
  - 3.—Supraclypeal area exposed, polished and shining in middle; ventral scopa nearly all white.....*bicolor kagiana* (Ckll.).  
     Supraclypeal area not thus polished; ventral scopa pale fulvous.....*takaoënsis* Ckll.
  - 4.—Thorax with red or fulvous hair; large species, 15 mm. or over.....5.  
     Thorax without red or fulvous hair, or, if with it, much smaller.....9.
  - 5.—Clypeus with a printed median projection; very large species.....*monticola* Smith.  
     Clypeus with a strong transverse arched ridge.....*doederleini* Friese.  
     Clypeus otherwise.....6.
  - 6.—Femora bright ferruginous; basal half of ventral scopa fulvous, apical half black.....*ferruginea* Friese.  
     Femora black.....7.
  - 7.—Ventral scopa without fulvous; second abdominal segment entirely black; clypeus with a strong longitudinal keel.....*velutina* Smith.  
     Ventral scopa partly fulvous.....8.
  - 8.—Very broad species, with shining median ridge on clypeus; second abdominal segment with an arched fulvous hair-band.....*ghavanæ* Bingham.  
     Narrower and smaller species; clypeus convex, strongly punctured; no light arched band on second segment; abdomen with metallic tints:  
         .....*humilis* Smith.
  - 9.—Nearly 20 mm. long; head and most of thorax with black hair; ventral scopa bright red.....*ruficorbis*, new species.  
     Length 15 mm. or less.....10.
  - 10.—Abdomen metallic, with purple tints.....11.  
     Abdomen not metallic, or (*M. disjunctiformis*) slightly greenish.....12.
  - 11.—Abdomen obscurely purple; abdominal bands pale ochreous, entire; ventral scopa pale yellowish, but white at base, black on last two segments.  
         .....*remota* Smith.  
     Abdomen brilliantly colored; abdominal bands widely interrupted; ventral scopa red.....*igniscopata* Ckll.
  - 12.—Metathorax and base of abdomen densely covered with pure white hair; abdomen greenish.....*disjunctiformis* Ckll.  
     Metathorax and base of abdomen not so covered; abdomen black.....13.
  - 13.—Larger forms, fully 12 mm. long.....14.

- Smaller, not over 10 mm. .... 15.
- 14.—Thorax in front of wings with dense bright ferruginous hair. . . . .*faceta* Bingham.  
Thorax without such hair; ventral scopa bright red, black at extreme apex.  
*dolichotricha*, new species.
- 15.—Scutellum with some black hair; ventral scopa cream color, black at apex;  
hair of sides of thorax white. .... *tranquilla* Ckll.  
Scutellum with fulvous hair; ventral scopa red, white at base. .... 16.
- 16.—Ventral scopa black at apex; flagellum dark. .... *angustistrigata* Alfken.  
Ventral scopa not black at apex, or with few black hairs; flagellum red beneath.  
*rixator* Ckll.
- 17.—Upper part of clypeus bare and rugose, lower part with a dense beard of downwardly directed white or fulvous hair; end of abdomen very obtuse, black, with a deep pit; wings dark fuliginous except at base. .... 18.  
Clypeus otherwise, or if upper part bare, end of abdomen quite different. .... 19.
- 18.—Larger; hair of thorax posteriorly fulvous. . . . .*doederleini* Friese (small variety).  
Smaller; hair of thorax posteriorly white. .... *disjunctiformis* Ckll.  
(About 10 mm. long; hair of thorax posteriorly black, pale at sides (Koh Tao I.)  
*kohtaoensis* Ckll. ined.)
- 19.—Hair of thorax all black, of face white, of abdomen red (Australia).  
*mystacea* (Fabricius).  
Hair of thorax mainly black above, at sides white; no red on abdomen (Siam).  
*siamensis*, new species.  
Hair of thorax not black. .... 20.
- 20.—Sixth abdominal segment with a longitudinal keel; abdomen with red hair.  
*takaoensis* Ckll.  
Sixth abdominal segment without a longitudinal keel. .... 21.
- 21.—Transverse keel of sixth abdominal segment denticulate. .... 22.  
Transverse keel of sixth segment not denticulate. .... 23.
- 22.—Tegulae dark reddish; flagellum dark; anterior legs partly red; larger species.  
*bicolor kagiana* (Ckll.).  
Tegulae clear ferruginous; flagellum ferruginous beneath; anterior basitarsi modified. .... *aspermata* Ckll.
- 23.—Larger species, fully 13 mm. long; hair of face golden; sixth abdominal segment dull and rugose above, without any patch of pale hair. .... *humilis* Smith.  
Smaller; if not much smaller, much more slender. .... 24.
- 24.—Sixth segment dorsally with a very dense patch of light hair; very small species.  
*abluta* Ckll.  
Sixth segment with no such patch. .... *subusta* Ckll.

### **Megachile humilis** Smith

MALE.—Length about 13 mm. Robust; black, including mandibles, antennae (flagellum long and slender) and legs, but tegulae clear yellowish-ferruginous; eyes red; face densely covered with golden hair; thorax with long fulvous hair, thin dorsally, dense at sides; wing veins paler and more slender than in female; anterior tarsi simple, but rather stout and very hairy; anterior coxae with spines, hidden by the long hair; hind basitarsi stout but not broadened; keel of sixth abdominal segment with a rounded median notch; claws apically bidentate. I had taken this for a new

species, but careful comparisons indicate that it must be the male of *M. humilis*, the characters of which were too briefly indicated by Smith. The abdomen has no metallic tints.

A female from the same locality differs from Smith's description by having less than the apical half of ventral scopa black, and the abdomen with distinct metallic tints, but it is doubtless *M. humilis*.

China: Yen-ping, Aug. 3, one female; Sept. 3, one male.

***Megachile ghavanæ* Bingham**

China: Yen-ping, Oct. 1, 1917, one female. The clypeus has a smooth median band; tegulae clear red; second abdominal segment with an arched band of bright red hair. In the British Museum I found what I take to be the type of this species under a manuscript name of Bingham's, differing only in one letter from the name *M. sikkimi* Rad.; Bingham evidently changed the name at the last moment to avoid confusion. I noted: Large and robust, like *M. luculenta*, but red hair on thoracic dorsum.

***Megachile dolichotricha*, new species**

FEMALE.—Length 12.5–14 mm. Black, with very bright red ventral scopa, a little black hair at extreme tip; fifth abdominal segment with a clear white hair-band, fourth with same at sides, but failing in middle, third with traces at extreme sides; antennae, legs and tegulae black. Very close to *M. lagopoda* (L.) (which occurs in Siberia), but apparently more than a variety, as the hind basitarsus is distinctly shorter. Compared with *M. lagopoda* from Buda, it differs thus: front (extending more or less on face), vertex and thoracic dorsum with long dark fuscous, almost black, hair, paler and redder on scutellum, but throughout longer than in *M. lagopoda*; wings dilute brownish (much clearer in *lagopoda*); long hair at sides of metathorax pale fulvous; abdominal segments 2 to 4 with much long erect black hair; apical segment not concave in lateral profile; scopa brighter red. The middle tarsi are like those of *M. lagopoda*. On account of the dark dorsal hair, there is some resemblance to *M. lagopoda seitziana* Ckll., but that has shorter hair on thorax above, and last two segments of scopa black-haired.

Tibet Prov., China (A. Genstier). Two specimens, one in very poor condition.

***Megachile albolineata* Cameron**

I examined the type in the Rothney Collection, and made the following notes.

Length about 9.5 mm. Female with white scopa, aspect of subgenus *Oligotropus*, abdomen narrow like *M. exilis*; no pulvilli. Middle and hind femora red; lower margin of clypeus elevated and slightly emarginate in middle; facial quadrangle longer than wide, eyes distinctly converging below; mandibles very short and broad; area

of metathorax dull at base, but polished in middle; scutellum with short black hair; mesothorax strongly and closely punctured; base of first abdominal segment with well-defined edge; abdominal segments with linear marginal bands of white pubescence, and a similar linear band between mesothorax and scutellum; scopa scanty, of visibly separate fringes on segments.

This came from Ceylon, and cannot well be *M. vigilans* Smith, described from Ladak, as Bingham queried.

***Megachile amputatiformis*, new name**

*Megachile amputata* Bingham, 1897, 'Faun. Brit. India, Hym.,' I, p. 484 (description). Not of Smith. Type locality, Sikkim.

*M. fulvofasciata* Rad., which Bingham thought might be the same, is 10 mm. long, with whitish scopa, so, of course, quite another thing. I examined the so-called *M. amputata* in the British Museum.

***Megachile atrolateralis*, new name**

*Megachile nigrolateralis* Cockerell, 1919, Proc. U. S. Nat. Mus., LV, p. 217. Mexico. Not *M. lachasis nigrolateralis* Cockerell, 1914 (Philippine Is.).

***Megachile siamensis*, new species**

MALE.—Length about 8.4 mm. Black, with large head and short curved abdomen; eyes dark reddish; face covered with long pale yellow hair; upper part of clypeus partly visible, shining and strongly punctured; mandibles, antennæ (long, reaching end of thorax), tegulæ (very faintly brownish) and legs black; vertex and thorax above with long black hair; cheeks, sides of thorax, and metathorax with white hair, but no fulvous; vertex with large shallow punctures; mesothorax and scutellum dullish, with shallow punctures; pleura densely punctured; wings strongly suffused with brown; nervures dark; legs with thin pale hair, fulvous on inner side of tarsi, anterior and middle tarsi with long white hair behind; anterior tarsi slender, simple; anterior coxæ without spines; abdomen shining, nearly bare, with very slender pure white hair-bands; sixth segment retracted, with a deep pit, the transverse keel presenting a pair of broadly rounded lobes; venter with two conspicuous white hair-bands.

Siam: Chiengmai, Oct. 27, 1920 (H. E. Crampton).

Superficially resembles *M. kualana* Ckll., ined., based on a female from Kuala Lampur, but the latter has the thorax much more densely and roughly punctured, the second recurrent nervure nearer end of second cubital cell, etc. There is closer affinity with *M. merrilli* Ckll., from the Philippine Islands, but that has much deeper yellow hair on face, and keel of sixth segment different. *M. kohtaoënsis* Ckll., also related to *M. merrilli*, is larger, with bright fulvous hair on front and tubercles, and darker wings. *M. butteli* Friese differs by the red-brown venter, with yellowish bands.

**Megachile mystacea** (Fabricius)

Australia: Halifax, June, one male (F. X. Williams).

**Megachile remota** Smith

China: Yen-ping, Sept. 3, one female. Described from Shanghai. The ventral scopa on last two segments is black.

**Megachile ferruginea** Friese

China, Yen-ping, Aug. 17, one female. Described from Siam. It is clearly *M. ferruginea* as differentiated from *M. amputata* Smith by Friese; but there is some confusion as to the identity of *M. amputata*, which was described from Sarawak. The species described as *M. amputata* by Bingham ('Faun. Brit. India, Hymenop.,' I, p. 484), which he had from Sikhim, is certainly not Smith's insect; it has only the two apical segments of scopa black, while Smith's has three.

**Megachile ruficorbis**, new species

FEMALE.—Length about 18.5 mm.; robust, but of parallel-sided type; black, including tegulae and legs; flagellum very obscurely brown beneath; head and thorax with short black hair, a small pallid tuft at each side of prothorax above, long dull white hair on sides of metathorax, and a regular white fringe overlapping the basal area, which has a silvery-sericeous surface; legs with black hair, deep red on inner side of tarsi; first abdominal segment with erect black hair, second and third with a black fringe, but at extreme sides of second an elongate-quadrate patch of bright red hair, and a little of same hair at posterior corners of third; fourth segment with an apical fringe of red hair, and red hair at extreme sides; fifth covered with red hair, but not so densely as to hide surface; sixth with pale yellow hair; ventral scopa entirely very bright ferruginous red. Clypeus short and broad, irregularly rugosopunctate, with no keel or smooth line; face broad, orbits parallel; vertex strongly punctured, dullish between the punctures; mesothorax and scutellum strongly punctured, dullish; wings strongly flavescent, with pale brown apical patch, nervures dusky reddish; legs shining; hind basitarsi very bristly, not as broad as tibiae; hind spurs dark red, curved at end; abdomen with a slight greenish tinge.

The locality is given as "Mujong," the label being in the same handwriting as that of *M. velutina*. Probably the locality is in the Malay Peninsula, Siam or Burma.

Very close to *M. frederici* Cam. from the Malay Peninsula (Kuala Aring), but nervures paler, and fifth segment covered with red hair. It may be only a variety. I examined Cameron's type of *M. frederici* and noted pale ochreous hair only on last segment, but traces on the one before, which appears to have been denuded.

**Megachile hemimelas**, new species

FEMALE.—Length about 16.5 mm.; robust, of parallel-sided type; black, including tegulae (faintly brownish externally), antennae (flagellum faintly brown beneath) and legs; head and thorax with black hair, a large beard of black over apex of clypeus, concealing margin, large tufts around antennae, but hair on head and thorax above very short; legs with black hair, but that on hind tarsi entirely bright ferruginous; abdomen above covered with short deep red hair, on which are four bands of clearer and brighter red; ventral scopa ferruginous. Mandibles quadridentate, basal half not grooved; clypeus short and broad, densely rugosopunctate, not keeled, upper edge shining, sending a very fine shining line a little way downward in middle; vertex dull, very densely punctured; mesothorax and the somewhat bigibbous scutellum dull and densely punctured; wings brownish hyaline, the apical half darkest; nervures dusky ferruginous.

Siam: Chiengmai, Oct. 20, 1920 (H. E. Crampton). Resembles *M. luculenta* Bingham, but smaller, with hair of head and thorax all black.

**Megachile angustistrigata** Alfken

Alfken (1924) described this from six females taken at Takao, which is also the type locality of *M. rixator* Ckll. and *M. abluta* Ckll. He remarked that it was intermediate between *M. rixator* and *M. abluta*. Compared with *M. abluta*, it is easily distinguished by the more coarsely punctured clypeus, with a variably distinct smooth middle line, and the brighter red of the ventral scopa. From *M. rixator* it is separated by the scopa being black on last segment (this fails in one specimen before me, though there is black at sides of apex) and the flagellum dark, not ferruginous beneath.

Certainly this is nearest to *M. rixator*, and it is noteworthy that Alfken's type was taken by Sauter at the same place on the same day as the type of *M. rixator*. My strong impression is that it is only a variety of *M. rixator*, or possibly a hybrid with *M. abluta*. However, complications are introduced when we consider the males. According to Hedicke (1925), the male of *M. rixator* is *M. aspernata* Ckll. (type locality also Takao), which is structurally very different from the male of *M. abluta*. Furthermore, Hedicke describes the male of *M. angustistrigata* from two specimens collected at Taihorin (whence no females of that species were received), and finds it very close to *M. abluta*, differing only by subtle characters hard to appreciate. In the Formosa series from the American Museum, collected by Sauter, are nine females of *M. angustistrigata* and one *M. rixator*. These are accompanied by a series of twelve males, which show variability in the exact shape of the end of abdomen, and after repeated comparisons I am quite unable to separate them from

my cotype males of *M. abluta*. I therefore label them *abluta*, but strongly suspect that there is some confusion to be cleared up by field observation.

***Megachile rixator* Cockerell**

Formosa: one female.

***Megachile aspernata* Cockerell**

Formosa: seven males; very variable in size, 8–10.5 mm. I cite this separately, as the facts noted above suggest a suspicion that it may not belong to *M. rixator*. The fact that no other female can be suggested as available is in favor of the synonymy proposed by Hedicke.

***Megachile takaoënsis* Cockerell**

Formosa: seven females, three males. As to the validity of the name, see Pan-Pacific Entomologist, III, p. 86 (1926).

***Megachile doederleini* Friese**

Five females from China: Yen-ping, April 21, June 23, July 9 and 30, Aug. 19. Two males, length 14.5–15.5 mm., are unusually small for the species, but otherwise seem to agree. They are labelled "Tibet Prov., China." The usual length of male *M. doederleini* is 18–20 mm.

***Megachile monticola* Smith**

Formosa: two females. China: Yen-ping, August, one female. First recorded from Formosa by Strand (1913).

***Megachile igniscopata* Cockerell**

Formosa: five females. Alfken wrongly referred this to *M. remota* Sm., as Hedicke shows.

***Megachile disjunctiformis* Cockerell**

Formosa: one female, five males. Also a male, rather larger and with more coarsely punctured clypeus, from Yen-ping, China, Sept. 13.

***Megachile tranquilla* Cockerell**

Formosa: two females.

***Megachile faceta* Bingham**

China: Yen-ping, April 16, one female.

***Megachile bicolor kagiana* (Cockerell)**

Formosa: two females, one male.



**Megachile subusta** Cockerell

Formosa: seven males.

**Coelioxys** Latreille

- 1.—Female about 23 mm. long, face and front with red hair.....*ducalis* Smith.  
Length 17 mm. or less.....2.
- 2.—Males, less than 10 mm. long.....3.  
Females.....4.
- 3.—Mesothorax with a triangular fulvous hair-patch in front.....*sauteri* (Cockerell).  
Mesothorax with a widely separated pair of creamy white patches in front.  
*taiwanensis* Cockerell.
- 4.—Hair of face and front entirely fulvous; last ventral segment broad but pointed.  
*fenestrata* Smith.  
Hair of face and front not entirely fulvous; when partly so, last ventral segment  
long and narrow.....5.
- 5.—Last ventral segment broad and short.....*sauteri* (Cockerell).  
Last ventral segment long and narrow.....6.
- 6.—Eyes bare; length 11.5–15.5 mm.....*kosemponis* Strand.  
Eyes hairy.....7.
- 7.—Clypeus without a keel.....*siamensis* Cockerell.  
Clypeus with a high sharp keel; length 12.5–17 mm.....*rhinosa* Cockerell.

**Coelioxys ducalis** Smith

Formosa: Dec. 1, 1907. This magnificent species has been figured in colors by Bingham (1905). It is known from the Malay Peninsula, and Baker obtained it in the Philippines.

**Coelioxys rhinosa** Cockerell

Formosa. Described from Formosa (Entomologist, Nov., 1911, p. 342).

**Coelioxys fenestrata** Smith

Formosa. Described from "Hakodadi, N. China." *C. fulviceps* Friese, from Formosa and China (Canton), would appear to be a synonym were it not that the wings are described as almost hyaline, with broad blue-violet margin. Strand thought his *C. kosemponis* very close to *C. fulviceps*, but Strand's bee has bare eyes, while those of *C. fenestrata*, at any rate, are hairy.

**Coelioxys sauteri** (Cockerell)

Formosa. Described from Formosa on the same page as *C. rhinosa*. I called it *C. afra sauteri*, but I think it may stand as a distinct species. The male was not described by me. Male: length about 8.5 mm.; compared with *C. afra* Lep., it differs by the black mandibles; meso-

thorax anteriorly with a triangular fulvous patch; pubescent spots on scutellum yellowish, not white; axillar spines much shorter, and straighter; tarsi black instead of fulvous; hair of abdomen cream-color instead of white; end of abdomen entirely black; lower apical spines longer and more parallel. From *C. bakeri atripes* Ckll. of the Philippine Islands it is readily known by the dull very densely punctured mesothorax.

***Coelioxys siamensis* Cockerell**

China: Yen-ping, Sept. 4, 1920. Previously known from Siam and the Malay Peninsula.

***Coelioxys taiwanensis*, new species**

MALE.—Length about 8 mm. Black, including mandibles (except red outer apical tooth), antennæ, tegulæ and legs (except brown tarsi); first ventral abdominal segment rufous apically; fourth ventral with the black densely punctured surface deeply emarginate, the emargination filled in with white hairs, while a straight membranous margin goes right across, filling the gap; fifth ventral pale ferruginous, with glittering microscopic hairs converging toward the middle; sixth with fine white hair at the base, forming a pointed pencil on each side of the middle, which is overlapped by a large square red membranous plate; fifth abdominal segment at sides merely angulate, not dentate; apex with eight teeth, a fairly long straight one at each side, four short ones above, and a widely separated somewhat diverging pair of long spines below. Pubescence white, with at most a slight creamy tint, except the spots at base of scutellum, which are definitely pale ochreous; mesothorax anteriorly with a pair of widely separated subtriangular white patches, and between them scattered light scales; scutellum with a pair of large spots at base, and scattered yellowish scales at apex; abdomen with entire light bands; eyes pale ochreous, with very short hair; a keel behind lower end of eye; vertex with large punctures; mesothorax and scutellum above dull, coarsely punctate; hind margin of scutellum nearly straight, finely nodulose, in one view appearing to have two little teeth; axillar spines short; wings hyaline, stained with reddish, especially along the veins; stigma ferruginous, nervures fuscous; first recurrent joining second cubital cell a short distance from base; spurs very pale reddish; abdomen strongly punctured.

Formosa (Sauter). Very close to the Indian *C. capitata* Smith, but larger, with black antennæ and legs. According to Bingham, the male *C. capitata* has a variation with black legs, but I think the characters mentioned, with the abdominal peculiarities described above, indicate that *C. taiwanensis* is distinct. Compared with *C. afra* Lep., the lower apical spines are much longer and closer together. *C. luzonica* Ckll. has the abdomen more finely punctured, and the hair-bands widely interrupted.

Subgenus **LIOTHYRAPIS** Cockerell**Coslioxys kosemponis** Strand

Four from Formosa, one from Yen-ping, China, June 17, 1920.  
Described from Formosa. There are no hair-spots at base of scutellum.

**CROCISA** Jurine

I include in the table a couple of species from Koh Tao, a remote, uninhabited island in the Gulf of Siam, collected by Dr. H. M. Smith, Jan. 1, 1927.

- 1.—Spots and bands white. .... 2.  
Spots and bands more or less distinctly blue, but in no case shining. .... 3.
- 2.—Incision of scutellum with white hair above; marks on apical part of first abdominal segment rounded mesad. .... *takaonis* Cockerell.  
Incision of scutellum without white hairs above; marks on apical part of first abdominal segment pointed mesad. .... *subramosa* Cockerell.
- 3.—Apical band on first abdominal segment straight, entire or rather narrowly interrupted. .... 4.  
Apical band on first abdominal segment reduced to lateral patches or triangles; scutellum without discal spots. .... 8.
- 4.—Apical band on first abdominal segment broad and not interrupted; markings pale blue; anterior margin of mesothorax hairy right across; scutellum polished and shining, without spots, its posterior margin W-like. .... 5.  
Apical band on first segment definitely interrupted; anterior margin of mesothorax more or less pale-haired; bands pale blue; scutellum shining, without spots. .... *surda* Cockerell (♀).  
Apical band on first segment entire if not abraded; anterior margin of mesothorax not hairy at sides, though the contiguous parts of prothorax are hairy. .... 6.
- 5.—Dark band on disc of first abdominal segment long, little shorter than that on second. .... *surda* Cockerell (♂).  
Dark band on disc of first abdominal segment short, not nearly reaching sides; blue at sides much wider than the apical band; hair of thorax shaggy, discal spots on mesothorax rather small; eyes brownish; hind femora shining, not toothed beneath; hind tibia conical in outline, extremely broad at apex; basitarsi light-haired on outer side; apical band on first abdominal segment slightly, on second strongly, constricted in middle, the other three widely interrupted; apical plate of abdomen with a straight edge, and no median tooth (Koh Tao). .... *insulicola*, n. sp. (♂).
- 6.—Scutellum without discal spots. .... *indica* Friese.  
Scutellum with a pair of discal spots. .... 7.
- 7.—Abdominal bands whitish, that on second segment narrowly interrupted. .... *pallescens*, n. sp.  
Abdominal bands blue, that on second segment rather widely interrupted. .... *japonica* Friese.
- 8.—Flagellum red beneath. .... *reducta fulvicornis*, n. subsp.  
Flagellum black. .... 9.

9.—Dark area on first abdominal segment bilobed in outline, the anterior margin deeply excavated. . . . . *amata* Cockerell, and *niasensis*, n. sp.

Dark area on first abdominal segment straight right across basally, the blue with a narrow band-like median interruption; the blue is turquoise blue, with a greenish tint, quite different from that of *C. decora* Smith; differs from *C. ridleyi* Ckll., by anterior margin of pleura black in middle and quite different color of markings; differs from *C. angulifera* Ckll. (which is closely allied) by sides of black on first segment pointed instead of broadly rounded, interruption of basal band much narrower, axillæ blue-spotted; blue marks on mesothorax posteriorly much larger, connected with band over tegulæ; blue spots on disc of mesothorax much larger (Koh Tao).

*pernitida basifracta*, n. subsp.

***Crocisa takaonis* Cockerell**

Formosa: four males. Described from Formosa.

***Crocisa takaonis* x *subramosa***

A female from Formosa has the marks on apical part of first abdominal segment pointed mesad, as in *C. subramosa* Ckll. and *C. rectangula* Meyer, and a weak keel on apical plate. It has the appearance of a hybrid, or a mongrel, if *C. subramosa* is not really a distinct species.

***Crocisa subramosa* Cockerell**

Formosa: one female. Described from the mainland of China. Its occurrence on Formosa suggests that it may not be a distinct species.

***Crocisa surda* Cockerell**

China: Yen-ping, male, June 9, 1917; females, June 9 and 22. Described from Foochow, China.

***Crocisa indica* Friese**

China: Yen-ping, six females, May 14, June 24, Sept. 11 and 15; two males, Sept. 3 and 6. The markings are bluer in the females, which closely resemble *C. kanshireana* Ckll. (from Formosa), but are more robust (like *C. japonica* Fr.), without any apical blue spot on scutellum. The species was described from a single male collected by Grubauer in Upper Perak.

***Crocisa pallescens*, new species**

MALE.—Length about 11.5 mm.; robust, with the markings white stained with clear blue, the abdominal bands appearing pale gray with a blue suffusion; antennæ black, third joint equal to fourth; mandibles long, falciform, curved apically, with a stout inner tooth; pleura crossed by a white hair-band, stained with blue in front; upper margin of prothorax with dense pale blue hair; median band of mesothorax

slender, going from anterior edge to level of posterior side of spots, the latter small; bands over tegulae slender, not joining posterior spots; wings very dark; anterior tibiae bluish-white haired on outer side, middle at base, hind pair on basal half; basitarsi with pale hair; hind femora faintly reddish, not toothed beneath; hind tibiae very broad at apex; scutellum with a pair of small discal spots, and a little median spot at the incision; margin  $\sim$ -like, not W-like; first abdominal segment with basal and apical bands, very narrowly interrupted in middle, not joined at sides; bands on four following segments moderately interrupted; apical plate with the margin nodulose in middle.

China: Yen-ping, spring, 1915. Certainly distinct from *C. japonica* by the color of hair and form of scutellum. In Meyer's table it runs closest to *C. surda*.

***Crocisa japonica* Friese**

China: Yen-ping, female, Sept. 8, 1917.

***Crocisa reducta fulvicornis*, new subspecies**

MALE.—Resembles *C. reducta* Ckll., from Singapore and Penang, but antennae with flagellum ferruginous beneath. The hind femora have a strong sharp tooth on the under side. The wings are redder than in *C. reducta*.

China: Hongkong, Sept. 20, 1920.

***Crocisa amata* Cockerell**

Many from Formosa, whence it was described. Also one, larger and more robust, from Yen-ping, China, June 15, 1917. Possibly the mainland form represents a distinct race. The hind femora of the male in this species are toothed beneath.

***Crocisa niasensis*, new species or race**

FEMALE.—Similar to *C. amata*, except as follows: discal spots on mesothorax less elongated; axillae covered with blue hair (in *amata* without blue hair, or with at most a minute dot); lateral lobes of black on first abdominal segment much narrower, so that the narrowest part of the blue basal band is nearly as wide as the black behind it (reduced to a very narrow strip or broken in *amata*); lateral blue markings of abdomen distinctly larger, and a rather deeper shade of blue. Antennae black; scutellum without spots, its hind edge  $\sim$ -like, not W-like; anal cell of front wings pallid but not clear hyaline; anterior edge of pleura broadly black in middle; basitarsi with light hair.

Goenoeng Sitoli, Island of Nias, west of Sumatra. Sent by Dr. Friese as *Crocisa nitidula*. Nias is more widely separated from Sumatra than the latter from the Malay Peninsula, and doubtless the form found there represents a local race or species. Dr. R. Meyer, in his excellent revision of *Crocisa* (1921) interprets *C. nitidula* Fabricius as a species

with dull blue markings, so closely allied to *C. amata* Ckll., *C. decora* Sm., and *C. ceylonica* Friese that he makes these three subspecies of it. In the Berlin Museum he found a specimen with dull (i.e., not shining) blue markings, marked by Klug as having been compared with the type of Fabricius. In those days, however, judgments of species in a genus like *Crocisa* were not very critical, and I would rather trust my own identification of *C. nitidula* from a specimen with shining blue markings, agreeing with the Fabrician description, and collected on Amboina, whence came the Fabrician type (Bull. Amer. Mus. Nat. Hist., 1907, p. 233; Ent. News, 1907, p. 46). Meyer gives the distribution of what he calls *nitidula* as Sumatra, Java, India, Ceylon, Manila. As to the question whether the local forms of *Crocisa* are species or races, perhaps we cannot reach a final decision, but my impression is that there are actually many distinct species, remaining apart in nature, though closely allied.

On the page of Bull. Amer. Mus. N. H. just cited (p. 233) there are two unfortunate errors. *C. nitidula* has the scutellum without light (not dark) marks, and of course it is the scutellum of *C. novæ-hollandiæ* which forms a wide W.

#### ***Ceratina siamensis*, new species**

FEMALE.—Length 8.5 mm.; rather dark but shining blue-green, strongly and closely punctured; clypeus with a very broad pale yellow band, broadest at base (on lower margin of clypeus), where its breadth equals distance from it to eye; labrum rugose, entirely black, as also mandibles; antennæ black, the flagellum obscure reddish beneath; tubercles with a large pale yellow spot; tegulæ piceous, outer margin paler; wings strongly suffused with brown; stigma dark reddish; legs black, anterior and hind knees very obscurely spotted with yellow; first four abdominal segments with large dense punctures, apical segments rugulose; venter with no special markings, but broad black bands at ends of first three segments, and with silvery hairs.

Siam: Chiangmai, Oct. 27 (1920), collected by Prof. H. E. Crampton. Nearest to *C. penangensis* Ckll., but easily distinguished by the dark blue-green color, and the spots on the tubercles. It is a species of Palæarctic affinities, and in Friese's table (1901) runs nearest to *C. callosa* Fabricius, which is, however, blue with disc of mesothorax black and polished, instead of green and densely punctured all over as in *C. siamensis*. The short, well-sculptured, posteriorly sharply defined area of metathorax of *C. siamensis* is very different from the same part in *C. callosa*. The basal nervure is much more strongly arched or bent in *C. siamensis* than in *C. callosa*.

**Habropoda mimetica**, new species

FEMALE.—Length about 15 mm.; robust, black, the legs dark red, and the abdomen reddened at base below; clypeus entirely black, but a broadly triangular cream-colored supraclypeal mark; antennæ black, slightly stained with reddish, the flagellum dusky ferruginous beneath; labrum with pale golden hair; face, front and vertex with thin black hair; cheeks with white hair; thorax with bright yellowish-tawny hair, except a very broad dark brown or nearly black band between the wings; tegulæ very dark; wings very brown; second cubital cell broad and quadrate, receiving recurrent nervure some distance before its end; marginal cell long, not much less than half its length beyond the third cubital cell; legs with black or brown-black hair, dark reddish on inner side of tarsi, long and yellowish-white on under side of anterior femora, also pale on middle legs beneath basally, anterior and middle tibiæ with a little red tuft on outer side at apex; spurs dark; abdomen densely hairy, first segment with long fulvous hair, except at apex, where it is black; second with black, but a fulvous fringe at apex; third and fourth very bright orange-fulvous; apex with pale chocolate hair; hair of venter long and mainly pale chocolate.

Yen-ping, China, Sept. 11, 1920. Collected by the Rev. H. R. Caldwell. Allied to *H. turneri* Ckll. (Assam) by the long marginal cell and general appearance, but *H. turneri* has the black band on third abdominal segment, and the thorax anteriorly all black. *H. rowlandi* Meade-Waldo (Assam) has the black band on second segment, but no black band between the wings. *Anthophora pseudobomboides* Meade-Waldo (Assam) looks superficially like *H. turneri*, but has the second cubital cell narrowed above, short appressed felt-like tomentum on second abdominal segment, which is black at sides, etc. These insects present an extraordinary resemblance to the species of *Bombus*; the present species (*H. mimetica*) recalling such species as *B. bizonatus* Smith and *B. mendax* subsp. *defector* Skorikov.

**Colletes speculiferus**, new species

MALE (TYPE).—Length a little over 8 mm., anterior wing 6 mm.; black, including antennæ and tarsi, but apical part of mandibles red, tegulæ reddish testaceous, and abdomen with sides of second sternite pale ferruginous; spurs extremely pale; hair of head and thorax above abundant, erect, rather bright pale yellow with no admixture of dark hairs; on sides and lower part of head and thorax it is grayish white, on face very pale, with a yellowish tint; malar space distinct, but much shorter than width of mandible; labrum highly polished, with a small central pit; eyes light brown, strongly converging below; third antennal joint much shorter than fourth, middle joints much longer than wide; mesothorax shining, sparsely and weakly punctured; pleura closely punctured; base of metathorax with rather weak and widely spaced ridges; legs with pale hair; wings hyaline, rather short; stigma rather small, pale dull testaceous; nervures brown; second cubital cell very broad, as broad as third, receiving recurrent nervure a little beyond middle; abdomen with five dense entire pale yellowish hair-bands, hair on middle segments between the bands very short;

first segment smooth and highly polished, very finely punctured at sides; the other segments shining, with rather close but very small punctures; apex rather narrow; venter with entire bands, the surfaces of the sternites with no special features.

FEMALE.—Similar, except for the usual sexual characters; hair of thorax above very bright yellow; malar space short, fully three times as broad as long; clypeus densely striatepunctate, but glistening; flagellum in some lights appearing faintly brownish beneath; eyes dark brown; third antennal joint longer than fourth; middle joints broader than long; tegulae piceous, rufous externally; abdominal bands broad and dense, the first on apex of first segment and base of second; second segment dullish, closely and excessively minutely punctured.

North Japan, 1910, one female and two males. No other particulars known. In Morice's table (1904) it runs nearest to *C. caspicus* Morawitz, which it does not at all resemble. It is superficially not unlike *C. hylæiformis* Eversm., but easily separated by the first abdominal segment, which recalls that of *C. impunctatus* Nyl. Among the Japanese species it is easily known by the shining first abdominal segment, its margin not red, and the yellow hair of thorax above.

#### *Colletes kudonis*, new species

MALE.—Length about 8 mm., anterior wing 7; black, robust, shining; mandibles dark red apically; flagellum dusky red beneath; eyes brown, converging below, but the face wide; tegulae rufous; wings hyaline, stigma and nervures brown; tarsi reddish at tip; spurs very pale; hair of head and thorax long, clear white on face, cheeks, under side of abdomen and sides of metathorax, but pale tawny on vertex, and yellowish gray on thorax above, with darker gray hair on scutellum anteriorly; abdomen with five rather narrow dull white hair-bands, the first thin and evanescent in middle; labrum vertically plicate; malar space short, over twice as broad as long; third antennal joint considerably shorter than fourth, middle joints longer than wide; mesothorax rather coarsely rugosopunctate; basal band of metathorax short, with rather close plicae; apical triangular space smooth, with some irregular channels on basal part; lateral apical faces coarsely sculptured, more or less transversely grooved; second cubital cell very broad, receiving recurrent nervure a little beyond middle; basal nervure falling a considerable distance short of nervulus; legs with pale hair; first abdominal segment highly polished, finely and not very densely punctured, the other segments shining and finely punctured; hair of middle segments between bands very short and scanty; apex obtuse, with fine pale hair; venter with no striking features, the last sternite red at end, and with a little pit in middle.

North Japan, 1910, one male. Somewhat allied to *C. perforatus* Smith, described from the female, but too different to be its male. It is named after the botanist Kudo, who has done such important work on the flora of northern Japan. I thought perhaps these species of northern Japan would prove allied to those I collected on the coast of Siberia, but such is not the case.