

THE BUMBLEBEES OF JAVA, SUMATRA AND BORNEO

(Bremidae: Hymenoptera)

By

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The present paper is presented as a revisional study of all the species and varieties of bumblebees known to occur in Java, Sumatra and Borneo. In keeping with the scope of this paper, all references in literature concerning the various species and varieties occurring in the East Indies are listed in accordance with the author's ideas of synonymy, old species are redescribed in the light of modern descriptions in this group of social bees, and new descriptions have been prepared where necessary.

I am indebted for the loan of material to the United States National Museum, Washington, D.C., the American Entomological Society, Philadelphia, Pa., the American Museum of Natural History, New York, N.Y., Zoological Museum, Buitenzorg, Java, 's Rijks Museum voor Natuurlijke Historie, Leiden, Holland, and especially the British Museum, London, England. Mr. O. W. RICHARDS of Oxford, England, has graciously prepared and sent to me detailed notes concerning the structural characters of types in the British Museum and supplied much other information of a varied character. For information regarding the existence and present location of other types mentioned in this paper I am indebted to the following: Dr. FRANZ MAIDL, Vienna, Austria; R. VAN EECKE, Leiden, Holland; Dr. HEINRICH FRIESE, Schwerin, Germany; Dr. LUCIEN BERLAND, Paris, France; ANTOINE BALL, Bruxelles, Belgium; Dr. RECHBERG A. SCHULTHESS, Zürich, Switzerland; Dr. ENRICO FESTA, Torino, Italy; and Dr. WALTHER HORN, Berlin, Germany. To Dr. JAMES WATERSTON I am indebted for arranging the loan of material from the British Museum, and to Dr. H. H. KARNY for similar services in connection with the material belonging to the Zoological Museum, Buitenzorg, Java.

Before passing to a consideration of the species involved, it seems that mention should be made of the fact that among the material sent to me for study by the British Museum is a male with an old label on which is written "Sumatra". This male is identical with the male of *Bremus tunicatus* (SMITH), a species known from India and China. In view of the known distribution of *tunicatus* and the lack of additional specimens from Sumatra, I doubt the correctness of the locality label. Therefore, this species has been left out of consideration in this article and not placed in the keys.

For the sake of convenience and clarity I have arranged my subject matter in this paper under the following headings: Keys to species and varieties, sub-generic groupings, new varieties, synonymy and taxonomic notes on previously described species and varieties, geographical summary, and illustrations.

A. KEYS TO THE SPECIES AND VARIETIES OF *BREMUS* FROM
JAVA, SUMATRA AND BORNEO.

Queens and Workers (Females).

1. Metatarsus of middle leg at apical outer angle with a pronounced, sharp, spine-like projection 2
- Metatarsus of middle leg at apical outer angle without a pronounced, sharp, spine-like projection 5
2. Dorsum of thorax entirely covered with dark pubescence
melanopoda (COCKERELL).
- Dorsum of thorax mostly or entirely covered with white or yellowish-white pubescence 3
3. Dorsum of abdominal segments with at least the first four segments with white pubescence *senex* (VOLLENHOVEN).
- Dorsum of abdominal segments entirely or with some black or dark pubescence on the first two segments 4
4. Dorsum with yellowish-white pubescence on some of the apical abdominal segments *senex* var. *sumatrensis* (COCKERELL).
- Dorsum with dull ferruginous or tawny pubescence on some of the apical abdominal segments *senex* var. *ardentior* (COCKERELL).
5. Dorsal abdominal segments entirely with black pubescence; wings very dark; integument of legs reddish; Java and Sumatra 6
- Dorsal abdominal segments with yellowish, brownish or dull ferruginous pubescence; wings brownish; integument of legs black; Borneo
folsoni FRISON.
6. Dorsum of thorax with black pubescence 7
- Posterior portion of dorsum of thorax (scutellum) with ochraceous pubescence, anterior and middle of thorax with black pubescence
rufipes var. *richardsi* FRISON.
7. Apical dorsal abdominal segments with ferruginous pubescence
rufipes var. *flavipes* (HANDLIRSCH).
- Apical dorsal abdominal segments with dark or black pubescence..... 8
8. Corbicular fringes (hairs fringing pollen basket on hind leg) entirely bright ferruginous *rufipes* (LEPELETIER).
- Corbicular fringes not or but partly bright ferruginous..... 9
9. Basal portion of corbicular fringes black, remainder ferruginous
rufipes var. *intermissus* (FRIESE).
- Corbicular fringes entirely black..... *rufipes* var. *obscuripes* (FRIESE).

Males

(The Males of *Bremus folsomii*, *B. melanopoda*, and certain color varieties of *B. rufipes* and *B. senex* are not known).

1. Fifth antennal segment at least one and one-half times as long as fourth; malar space distinctly punctate on lower or caudal half; metatarsus of middle leg at apical outer angle strongly produced; heads of sagittae of genitalia somewhat dilated and toothed but not with a sickle-like hook... 2
- Fifth antennal segment not one and one-half times as long as fourth; malar space smooth and shiny, but faintly punctate on lower or caudal half; metatarsus of middle leg at apical outer angle not strongly produced; heads of sagittae of genitalia dilated and with a pronounced sickle-like hook... 3
2. Dorsum of thorax mostly with whitish or hoary pubescence; first four dorsal abdominal segments with traces of whitish or hoary pubescence, particularly on the posterior portions of segments; dorsal apical abdominal segments with considerable tawny or dull ferruginous pubescence
senex var. *ardentior* COCKERELL.
- Dorsum of thorax with disk only with whitish or hoary pubescence, remainder dark or black; first four dorsal abdominal segments entirely covered with black pubescence; dorsal apical abdominal segments with considerable ferruginous or golden-brown pubescence
senex var. *pallidithorax* FRISON.
3. Apical dorsal abdominal segments entirely covered with black pubescence 4
- Apical dorsal abdominal segments with considerable ferruginous pubescence *rufipes* var. *flavipes* (HANDLIRSCH).
4. Corbicular fringes entirely bright ferruginous..... *rufipes* (LEPELETIER).
- Corbicular fringes entirely black..... *rufipes* var. *obscuripes* (FRIESE).

B. SUBGENERIC GROUPINGS.

Senexibombus, subgenus new.

(Type *B. senex* VOLLENHOVEN, 1873, original designation).

Male.—Labrum with small areas near each lateral margin smooth, impunctate and shiny, otherwise moderately punctate. Mandibles bidentate at tips. Malar space at least one and one-half times as long as width at articulation at base of mandibles, distinctly punctate on lower or caudal half and smooth and shiny on upper half. Ocelli situated just above narrowest part of the vertex; area between ocelli and compound eyes with a few punctures near compound eyes; remainder of area smooth, polished and impunctate. Compound eyes normal. Flagellum about four times as long as the scape, with middle and distal segments somewhat arcuate; third and fourth flagellar segments about equal in length, the fifth at least one and one-half times as long

as the third. Outer or upper apical angles of metatarsi of hind and middle legs with a strongly produced angular projection; upper edge of hind metatarsus arcuate and with hairs near base scarcely longer than those on middle or distal part of edge, about four times as long as greatest width.

Genitalia (figure 1) with head of each sagitta (figure 4) with jagged teeth on lower margin extending back from tip for about one-fourth of the length of the sagitta, no sickle-like hook present, middle of each sagitta on lower margin with an angular downward projecting tooth. Volsellae projecting much beyond squamae and curved inward, a small recurved hook on upper distal end. Squama large, with a prominent hooked projection at base on mesal margin, beneath which extending downward as a continuation is another inward extending arm which ends in a large sharp prong. Uncus narrow, slightly widened at base. Outer spatha (figure 2) and inner spatha (figure 3) as in figures.

Female.—Labrum with tubercle-like areas deeply and widely separated, strongly punctate; lamella prominent and extending most of width of labrum. Mandibles (nomenclature of KRÜGER, 1920) without a conspicuous incisura lateralis; with teeth I and II, the gerader rand, a distinct sulcus obliquus, a basalfurche, a hauptleiste, a nebenleiste, a nebenfurche and a begleitfurche. Clypeus swollen, with large mesal anterior portion smooth, polished and but faintly punctured; latero-anterior corners somewhat depressed and strongly punctate. Malar space somewhat longer than its width at articulation of mandibles, with lower or caudal half with small punctures. Ocelli situated slightly above narrowest part of the vertex. Compound eyes normal. Antennae with the flagellum about twice as long as the scape; the third flagellar segment noticeably longer than the fifth, the fifth is longer than the fourth. Apical or outer upper angles of metatarsi of hind and middle legs with a strongly produced angular projection; upper edge of hind metatarsus somewhat arcuate, outer surface slightly concave, about three times as long as greatest width.

Sting sheath between two basal arms (genital guides of FRANKLIN) with a narrow, heavily chitinized strip along side margins, without conspicuous inner projections and no heavily chitinized detached areas in membrane (*incrustationes vestibuli aculei* of CHOLODKOVSKY) between these strips.

Besides the type of this new subgenus (*B. senex* VOLLENHOVEN), the species *B. irisanensis* (COCKERELL) from the Philippine Islands belongs here. *B. irisanensis* was formerly considered by the writer (1928) to belong to the subgenus *Hortobombus* VOGT, but a recent study of both *senex* and *irisanensis* in comparison with typical species of *Hortobombus* reveals that they should be placed in a new subgenus.

Rufipedibombus SKORIKOV, 1922.

(Type *B. rufipes*, LEPELETIER, 1836, monobasic and by absolute tautonymy).

Male.—Labrum with small areas near each lateral margin smooth, impunctate and shiny, otherwise sparsely punctate and particularly so on anterior

depressed portion. Mandibles bidentate at tips. Malar space about one and one-third times as long as greatest width at articulation of mandibles, smooth and shiny, and lower or caudal portion with minute indistinct punctures. Ocelli situated just above the narrowest part of the vertex; area between ocelli and compound eyes with a few fine punctures near compound eyes; remainder of area smooth, polished and impunctate. Compound eyes normal. Flagellum about four times as long as the scape, middle and distal flagellar segments not arcuate; third and fourth segments about equal in length, fifth about one and one-fourth times as long as third. Outer or upper apical angles of metatarsi of hind and middle legs without a strongly produced angular projection; upper edge of hind metatarsus arcuate and with hairs near base two or three times longer than those on middle or distal part of edge, outer surface concave, about four times as long as greatest width.

Genitalia (figure 5) with head of each sagitta enlarged at middle on lower margin but without a distinct angular downward projecting tooth; head (figure 8) with a very broad inward directed sickle-like hook. Volsellae finger-like and projecting forward and inward far beyond squamae. Squama much reduced and visible from above mainly as an inward projecting arm. Uncus linear, as narrow at base where it unites with sagittae as at apex. Outer spatha (figure 6) and inner spatha (figure 7) as in figures.

Female.—Labrum with a deep, wide depression between tubercle-like areas; lamella prominent, but extending in middle of sclerite only about one-third the width of the labrum. Mandibles with a conspicuous incisura lateralis; with teeth I and II, the gerader rand, an indistinct sulcus obliquus, a basal-furche, a hauptleiste, a nebenleiste, a nebenfurche, and a begleitfurche. Clypeus but slightly swollen, with large mesal anterior portion smooth, polished and mostly impunctate; latero-anterior corners somewhat depressed and with large punctures. Malar space but slightly longer than its width at articulation of mandibles, smooth and shining. Ocelli situated in the narrowest part of the vertex. Compound eyes normal. Antennae with the flagellum about twice as long as the scape; the third flagellar segment about one and one-half times as long as the fourth, the fifth slightly longer than the fourth. Apical or outer upper angles of metatarsi of hind and middle legs without a pronounced angular projection; upper edge of hind metatarsus but slightly arcuate, outer surface slightly concave, about three times as long as greatest width.

Sting sheath between two basal arms with a narrow, heavily chitinized strip along side margins and membrane between them somewhat chitinized near where they join.

Besides the type of this subgenus (*B. rufipes* LEPELETIER), several species on the Asiatic mainland such as *B. eximius* SMITH belong here.

Other Subgenera.

B. folsomi FRISON and *B. melanopoda* (COCKERELL) cannot be definitely placed to subgenera at the present time owing to the fact that both are known

only from the unique female types. The fact that the metatarsus of the middle leg of *B. folsomi* is without a spine-like projection at apical outer angle indicates that this species belongs to the Section *Anodontobombus* KRÜGER. It cannot at present be definitely placed to subgenus until the male is discovered.

B. melanopoda, according to O. W. RICHARDS, has a pronounced spine-like or angular projection at apical outer angle of metatarsus of middle leg. This places this species in the Section *Odontobombus* KRÜGER. It cannot at present be definitely placed to subgenus until the male is discovered.

C. NEW VARIETIES.

Bremus (Rufipedibombus) rufipes var. **richardsi** FRISON, new variety.

Queen.—Structurally identical with the queen of *rufipes* (LEPELETIER) as described in this paper. Differs from the typical form of *rufipes* in having the scutellum entirely covered with light chocolate brown pubescence sharply contrasting with the black pubescence on remainder of the thorax.

Holotype.—Queen, 10,000 ft., May, 1914, Korinchi Peak, Sumatra.

Bears, also, a label as follows: "1915 - 182". Deposited in the collection of the British Museum of Natural History, London, England.

It is with great pleasure that I name this handsome bumblebee in honor of Mr. O. W. RICHARDS, of England, in recognition of his many kindnesses to the writer. This form had been previously recognized as new by the late G. MEADE-WALDO, but no description of it was ever published.

Bremus (Senexibombus) senex var. **pallidithorax** FRISON, new variety.

Male.—Clypeus, front of head both below and above articulation of antennae, occiput and occipital orbits with long black pubescence; a small impunctate polished concave circular area on mesal anterior portion near clypeal-labral suture. Labrum with small areas near each lateral margin smooth, impunctate and shiny, otherwise moderately punctate; with short golden brown hairs. Mandibles with golden brown hairs, those fringing lower edge rather long; bidentate at tips. Malar space at least one and one-half times as long as its width at articulation of mandibles; distinctly punctate on lower or caudal half, mostly smooth and shining on upper half; about two-thirds as long as the greatest width of, and about one-third as long as, the compound eye. Ocelli situated just above narrowest part of the vertex; each lateral ocellus closer to the median ocellus than its diameter; area between ocelli and median margin of compound eyes with a few punctures near compound eyes, the remainder of this area smooth, polished and impunctate. Flagellum about four times as long as scape; third flagellar segment slightly longer than the fourth, fifth at least one and one-half times as long as the third; middle and distal flagellar segments somewhat arcuate.

Dorsum of the thorax with center or disk, except smooth, polished impunctate area, with whitish or hoary pubescence; remainder of dorsum and pleurae with long black pubescence.

Abdomen with the first four dorsal segments entirely covered with long black pubescence; fifth dorsal segment mainly black, but with some golden-brown or ferruginous pubescence on posterior margin; sixth dorsal segment similar to the fifth, except ferruginous pubescence dominates; seventh dorsal segment almost entirely with ferruginous pubescence. Venter with mostly dark pubescence, except that on posterior margin of seventh it is ferruginous. Hypopygium with posterior margin strongly ridged, the part anterior to ridge smooth, polished and with few punctures.

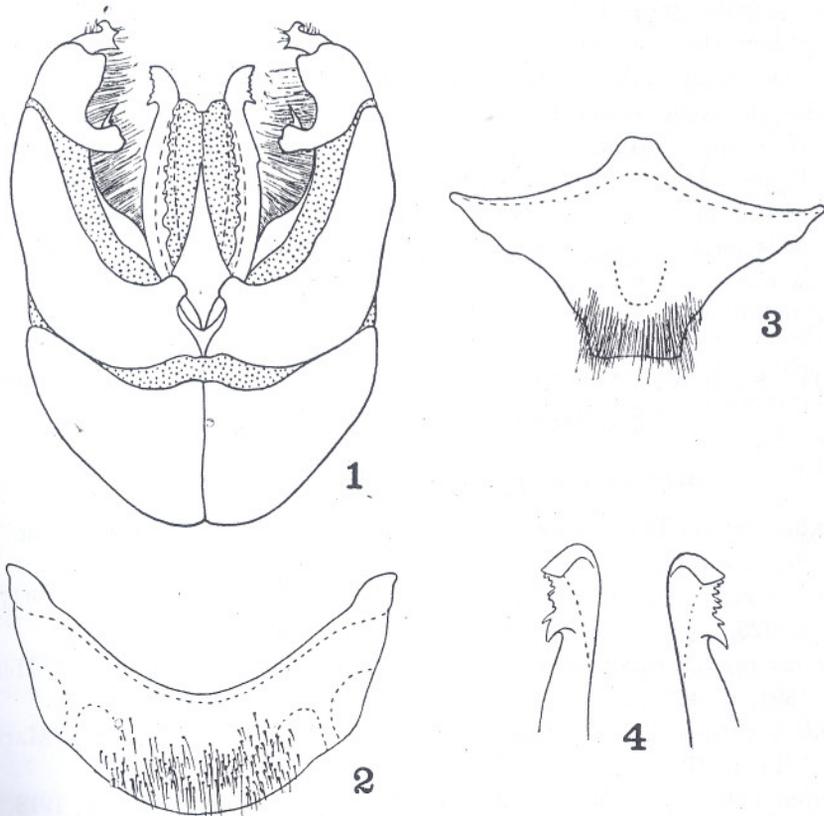


Fig. 1-4.—*Bremus senex* var. *pallidithorax* FRISON.
1. Dorsal view of male genitalia; 2. Outer spatha of male; 3. Inner spatha of male; 4. Heads of sagittae of male.—All enlarged.

Genitalia (figure 1). Head of each sagitta (figure 4) with jagged teeth on lower margin extending back from the tip for about one-fourth of the length of the sagitta, no sickle-like hook present; middle of each sagitta on lower margin with an angular downward projecting tooth. Volsella projecting much beyond squama and curved inward; a small recurved hook on upper distal end.

Squama large, with a prominent hooked projection at base on mesal margin, beneath which extending downward as a continuation is a projection on lower mesal margin which at tip ends in a large sharp prong. Uncus narrow, slightly widened at base. Outer spatha (figure 2) and inner spatha (figure 3) as in figures.

Legs with integument of tarsi and tibiae reddish, that of femora black. Hairs on tarsi and tibiae golden-brown, those on femora black. Metatarsus of hind leg arcuate on upper edge and with hairs near base scarcely longer than those on middle or distal part of edge, outer surface concave, upper posterior angle acute or strongly produced; about four times as long as greatest width. Outer or upper apical angle of metatarsus of middle leg with a strongly produced angular projection.

Wings stained with orange-brown, nervures dark brown.

Length, 21 millimeters; spread of forewings, 42 millimeters; width of abdomen at second segment, 9 millimeters.

Holotype.—Male, May, 1914, Korinchi Peak, Sumatra.

Bears, also a label as follows: „1915-182”. Deposited in the collection of the British Museum of Natural History, London, England.

This form was previously recognized as new by the late G. MEADE-WALDO, but it was wrongly considered as a variety of *rufipes* and no description was ever published.

D. SYNONYMY AND TAXONOMIC NOTES ON PREVIOUSLY DESCRIBED SPECIES AND VARIETIES.

***Bremus (Rufipedibombus) rufipes* (LEPELETIER).**

Bombus rufipes LEPELETIER, Hist. natur. des Insectes — Hymén., Tome 1, 1836, No. 25, p. 473, ♀.

Bombus rufipes HANDLIRSCH, Ann. k. k. Naturh. Hofmus., Band III, 1888, p. 226, ♀ [not ♀ as stated by HANDLIRSCH].

Bombus rufipes HANDLIRSCH, Ann. k. k. Naturh. Hofmus., Band VI, Heft 3-4, 1891, p. 452, ♀.

Bombus rufipes FRIESE, Tijdschr. v. Entomol., deel 57, No. 67, Marsch 21, 1914, p. 10, ♀ ♀ ♂.

Bombus rufipes FRIESE, Zool. Jahrb., Abt. Syst., Band 41, Heft 5, 1918, p. 517, ♀ ♀ ♂.

Bombus (Rufipedibombus) rufipes SKORIKOV, Bull. Stat. Regionale Protect. Plantes, Petrograd, Vol. IV, Part 1, November, 1922, p. 123 and p. 156. Type of *Rufipedibombus* SKORIKOV (autobasic).

Queen.—Face, occipital orbits and occiput with black hairs. Labrum with a deep, wide, punctate depression between tubercle-like areas; each tubercle-like area with mesal and upper margin strongly punctate and ridged, remainder of area, gradually rounded off towards sides and base; shelf-like projection

(lamella) prominent, but extending only about one-third the width of labrum. Mandibles with two small teeth on upper mesal margin and a third on lower mesal margin, between these teeth is a smooth and wide even-edged surface; base of mandibles with numerous large and small punctures; setae on distal portion between polished carinae short, dense and of a golden-brown color, a few long hairs on lower proximal portion. Disk of clypeus smooth and shining, with a few large widely separated punctures; anterior-lateral corners somewhat depressed and with large punctures otherwise smooth and shining. Malar space but slightly longer than its width at articulation of mandibles, smooth and shining; about three-fourths as long as greatest width of and about one-fourth length of compound eye. Ocelli situated in the narrowest part of the vertex, lateral ocelli slightly closer to the inner margin of the compound eyes than to one another, each ocellus with a diameter about the same as fourth antennal segment; area directly laterad of each lateral ocellus with two-thirds of the distance to compound eye smooth and impunctate, remaining third near compound eye with some small punctures. Flagellum about twice as long as the scape; third antennal segment about one and one-half times as long as the fourth, the fifth slightly longer than the fourth.

Thorax, except for smooth and polished impunctate area on disk, entirely covered with long black pubescence.

Abdomen with long black pubescence upon the dorsum and posterior ventral margins of the first five segments; dorsum of sixth segment with very short black pubescence along lateral and posterior margins, the center being shining and punctate with a slight indication of a longitudinal carina; tip of hypopygium (sixth ventral segment) with short ferruginous hairs and without median carina.

◦ Legs with bright ferruginous hairs, except upon fore tibiae, femora and basal segments of all legs where hairs are black; integument of tarsi and tibiae reddish black, fore-tibiae and femora with integument much darker. Metatarsus of hind leg but slightly arcuate on upper or posterior margin, but slightly concave on outer surface, and apical outer angle without a pronounced angular projection. Metatarsus of middle leg without a pronounced, sharp, spine-like projection at outer apical angle.

Wings very dark, almost violaceous.

Length, 29 millimeters; spread of wings, 54 millimeters; width of abdomen at second segment, 16 millimeters.

Worker.—Structurally and in color similar to the queen as redescribed above. Differs in being smaller in size.

Male.—Clypeus densely covered with long black pubescence, except for a small, narrow, smooth and polished mesal area on the anterior portion near clypeal-labral suture. Pubescence on occipital orbits, surrounding bases of antennae and occiput entirely black. Malar space about one and one-third times as long as greatest width at articulation of mandibles, about two-thirds as long as greatest width of and a little less than one-fourth as long as length of com-

pound eye; smooth and shiny. Ocelli of moderate size, situated just above the narrowest part of the vertex, each lateral ocellus removed less than its diameter from median ocellus and about twice its diameter from inner margin of compound eye. Space between each lateral ocellus and compound eyes smooth and shiny, a few fine punctures near compound eyes. Labrum with two large, smooth, polished, impunctate slightly raised areas on each side of meson. Mandibles densely hairy, bidentate at tips. Flagellum about four times as long as scape; third and fourth segments about equal in length, fifth about one and one-fourth times as long as the fourth, middle flagellar segments not distinctly arcuate.

Entire thorax covered with uneven black pubescence. A smooth, polished impunctate area on disk of mesonotum and a similar narrow linear area on disk on scutellum.

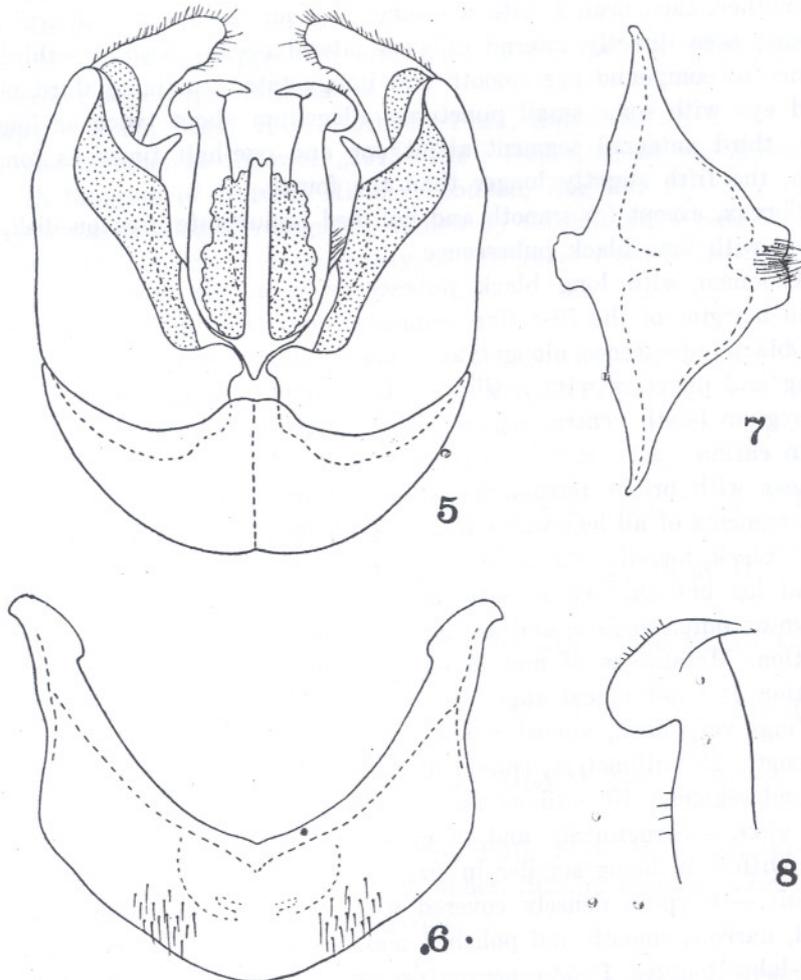


Fig. 5-8. — *Bremus rufipes* LEPELETIER.
5. Dorsal view of male genitalia; 6. Outer spatha of male; 7. Inner spatha of male; 8. Heads of sagittae of male. — All enlarged.

Abdomen entirely covered with black pubescence, except for apical fringe of hairs on hypopygium which are golden-brown. Hypopygium with edges sharply ridged on the sides as well as at end, the enclosed area being smooth, polished and but slightly punctate.

Genitalia (figure 5). Each sagitta enlarged at middle on lower margin but without a distinct angular downward projecting tooth; head (figure 8) with a very broad sickle-like inward directed hook. Volsella finger-like and projecting forward and inwardly far beyond squamae. Squama much reduced and visible from above mainly as an inwardly projecting arm. Uncus linear, as narrow at base where it unites with sagittae as at apex. Outer spatha (figure 6) and inner spatha (figure 7) as in figures.

Legs with integument of tibiae and tarsi an obscure reddish black, that of femora entirely black. Hairs black. Metatarsus of hind leg arcuate on upper edge and with hairs near base two or three times longer than those on middle or distal part of edge; outer surface concave; upper apical angle not sharply produced; about four times as long as greatest width. Metatarsus of middle leg at apical outer angle without a pronounced projection.

Wings very dark, almost with violaceous reflections.

Length, 20 millimeters; spread of wings, 40 millimeters; width of abdomen at second segment, 9 millimeters.

According to Dr. L. BERLAND the type of this species is not in the collection of the Musée Nationale at Paris, France, and I cannot discover its whereabouts if it is still in existence. Therefore, I am selecting a male of this species from Korinchi Peak, Sumatra, May, 1914, as the *Neotype* and depositing it in my private collection of these social bees.

The original description by LEPELETIER (1836) of this large and handsome bumblebee is as follows:

„*Hirsutus, niger, tarsi omnibus tibiisque duobus posticis rufis, rufoque hirtis; alis violaceis.*“

„Noir. Tous les tarses foncièrement roux, ainsi que les deux jambes postérieures; les poils de ces parties roux en dessus et en dessous. Ailes rembrunies, avec un reflet violet.

„*Ouvrière* probablement. Long. 6 lig.

„Ile de Java, d'après M. LATREILLE. Musée de M. le comte DEJEAN.”

Additional notes regarding the structural characters of the worker are given by HANDLIRSCH (1888). FRIESE (1914 and 1918) has recorded additional specimens and SKORIKOV (1922) has erected a new subgenus — *Rufipedibombus* — for the reception of this species.

This beautiful bumblebee has been recorded from the mountainous regions of both Sumatra (Mt. Singalang) and Java. I have studied specimens of all castes loaned by the British Museum from Sumatra (Korinchi Peak) and a queen without locality label determined as this form by FRIESE. SKORIKOV (1922, p. 156) lists the range of this species as India, Java, Sumatra, and the Philippines but I know of no authentic records of this species from the Philippine Islands

(FRISON, 1928) or India. The subgenus *Rufipedibombus* is, however, not confined to the East Indies and is represented in India, China and Formosa (for example, *eximius* SMITH and varieties). Since SKORIKOV (1922, p. 159) lists *eximius* and *latissimus* as „Bombi incertae sedis” it is evident that he was not aware of the generic relationship of these forms and considering them as varieties of *rufipes*. In view of the distribution of *Rufipedibombus* in India, China, Formosa, Sumatra and Java it will be surprising if a member of this subgenus is not eventually found both in Borneo and the Philippine Islands.

B. rufipes LEP. from Sumatra and Java may be separated from *eximius* SMITH by the difference in color of the wings. In *rufipes* the wings are very dark, almost with violaceous reflections, whereas in *eximius* and varieties the wings are mostly a yellowish-brown with at most the apical portions darker. According to information in a letter from Mr. RICHARDS, *B. festivus* SMITH from northern India is a *Rufipedibombus*.

***Bremus (Rufipedibombus) rufipes* var. *flavipes* (HANDLIRSCH).**

Bombus flavipes HANDLIRSCH, Ann. k. k. Naturh. Hofmus., Band III, 1888, p. 225, ♀.

Bombus rufipes var. *flavipes* HANDLIRSCH, Ann. k. k. Naturh. Hofmus., Band VI, Heft 3-4, 1891, p. 452, ♀ ♀ ♂.

Bombus rufipes var. *flavipes* FRIESE, Tijdschr. v. Entomol., deel 57, No. 67, March 21, 1914, p. 10. [record of HANDLIRSCH, 1891].

Bombus rufipes var. *flavipes* FRIESE, Zool. Jahrb., Abt. Syst., Band 41, Heft 5, 1918, p. 517-518, ♀ ♀.

Queen.—Structurally similar to the queen of *rufipes* LEPELETIER as redescribed in this paper. Differs in having the last two or three apical dorsal abdominal segments with ferruginous pubescence.

Worker.—Similar to the queen but smaller.

Male.—Structurally similar to the male of *rufipes* LEPELETIER as redescribed in this paper. Differs in having the last two or three apical dorsal abdominal segments with ferruginous pubescence.

The type of *B. flavipes* (HANDLIRSCH) is now in the private collection of Dr. A. v. SCHULTHESS, Zürich, Switzerland. He writes that later it will be deposited in the collection of the Entomological Institute of the Swiss Polytechnic School at Zürich, Switzerland.

The original description of this "red-tailed" color variety of *rufipes* LEP. is as follows:

„25 mm. Kopf, Thorax und Hinterleib mit Ausnahme der beiden roth behaarten Endsegmente mit langer schwarzer Behaarung bedeckt. Flügel dunkel schwarzbraun, stark violett schimmernd. Vorder-, Mittel- und Basis der Hinterbeine rothbraun, Schienen und Tarsen der Hinterbeine röthlichgelb. Die Hinterseite der Hinterschienen und die Hintertarsen sind mit anliegender, feiner, gelber Behaarung bedeckt, im Uebrigen ist die Behaarung der Beine schwarz.

„Der Kopf ist gross und breit; Wangen so lang als am Ende breit; Clipeus

stark gewölbt, glänzend, in der Mitte sehr spärlich, an den Rändern dichter punktiert; Oberlippe in der Mitte mit einer tiefen Grube versehen; Mandibeln stark gefurcht, am Endrande nur sehr schwach gezähnt. Das 3. Fühlerglied ist kaum um die Hälfte länger als das 4., dieses sehr wenig kürzer als das 5. — Metatarsus der Hinterbeine am Ende nicht in eine Spitze ausgezogen.

„Sechste Bauchplatte ohne Kiel, die entsprechende Rückenplatte mit sehr grober Sculptur.“

In 1891, HANDLIRSCH recorded all castes of this color variety from East Java, gave a fairly detailed description of the structural characters of the female, and figured a rough sketch of the male genitalia which is identical with that of the typic form. At the same time he called attention to the specific agreement of *rufipes* and *flavipes* and relegated the latter to its proper status as a color variety of the former. The references in literature since then by FRIESE (1914 and 1918) have repeated records of HANDLIRSCH (1891) and added new ones.

This color variety of *rufipes* has been recorded previously only from the East Indies and East Java by HANDLIRSCH (1888 and 1891). I have studied a queen from Buitenzorg, Java (SCHMIEDK.) determined as this variety by FRIESE and loaned to me by the American Museum of Natural History, and one queen (Tengger Geb., Ost-Java) and one worker (Java, 1891, FRUHSTORFER) loaned to me by Dr. MAIDL of the Hofmuseum, Wien, Austria, determined by HANDLIRSCH as this variety and undoubtedly part of the material recorded by him in 1891.

***Bremus (Rufipedibombus) rufipes* var. *obscuripes* (FRIESE).**

Bombus rufipes var. *obscuripes* FRIESE, Tijdschr. v. Entomol., deel 57, No. 67, March 21, 1914, p. 10, ♀ ♀ ♂.

Bombus rufipes var. *obscuripes* FRIESE, Zool. Jahrb., Abt. Syst., Band 41, Heft 5, 1918, p. 517 - 518, ♀ ♀ ♂.

Queen. — Structurally similar to the queen of *rufipes* LEPELETIER as redescribed in this paper. Differs in having the hairs on the legs entirely black.

Worker. — Similar to the queen but smaller.

Male. — Structurally similar to the male *rufipes* LEPELETIER as redescribed in this paper. Differs in having the hairs on the legs entirely black.

The typic specimens of this variety are now in the possession of Dr. H. FRIESE, Schwerin, Germany. He informs me that later they will be deposited in the Berlin Museum, Germany.

The original description of this color variety of *rufipes* LEP. was given by FRIESE as „wie *B. rufipes* aber alle Beine wohl rotgefärbt, doch mit schwarzer Behaarung“.

FRIESE (1914 and 1918) records this variety from Java (Gunung Papan-dajan, Bandung, Salatiga, Gunung Gedeh, Soekaboemi and Tjibodas). I have studied females of this variety determined by FRIESE from Tjibodas and Ban-

dung (probably of paratypic status) which were loaned to me by the American Museum of Natural History.

Additional material from Java has been loaned to me by the Zoological Museum, Buitenzorg, Java, as follows: 1 ♀ Mount Salak, December, 1900; 9 ♀ and 1 ♂, Tjibodas, slope of Mount Gedeh, 1400 m. above sea level, 4 ♀ and 1 ♂ on August, 1921, and 1 ♀ and 1 ♂ on January, 1900; 2 ♀, 2 ♂ and 1 ♂, Pengalengan, April 1920; 2 ♀, 15 ♀ and 3 ♂, Mount Slamet, February, 1917; 1 ♀, 2 ♀ and 7 ♂, Bandjar; 2 ♀ Tjitjoeroek-Salak (between Tjitjoeroek and Mount Salak), about 700 m. above sea level, March 6, 1921, collected by H. H. KARNY, and 1 ♀ on January 1, 1921; 1 ♀ and 1 ♂, Buitenzorg, February, 1920; and 1 ♀ from Preanger. In addition I have studied two workers of this variety without locality labels and determined as *rufipes* by HANDLIRSCH. These were sent to me by Dr. MAIDL of the Hofmuseum, Wien, Austria, and are undoubtedly part of the material recorded by HANDLIRSCH in 1888. These latter specimens indicate that the HANDLIRSCH records of 1888 refer both to the typical *rufipes* and its variety *obscuripes*.

Bremus (Rufipedibombus) rufipes var. **intermissus** (FRIESE).

Bombus rufipes var. *intermissus* FRIESE, Zool. Jahrb., Abt. Syst., Band 41, Heft 5, 1918, p. 516, ♀ ♀.

Queen. — Structurally similar to the queen of *rufipes* LEPELETIER as redescribed in this paper. Differs in having the corbicular fringes on the basal half of the hind tibiae black and those on the apical half reddish.

Worker. — Similar to the queen but smaller.

The typical specimens of this variety are now in the possession of Dr. HEINRICH FRIESE, Schwerin, Germany. He informs me that later they will be deposited in the Berlin Museum, Germany.

The original description of this color variety of *rufipes* LEPELETIER is as follows:

„Wie *B. rufipes* LEPELETIER, aber die Körbchenhaare an der Basalhälfte der Tibia III schwarz. Länge ♀ 28 mm, Breite 15 mm; Länge ♂ 14 - 18 mm, Breite 7 - 8 mm.

„Die Form *intermissus* steht also zwischen *rufipes* und *obscuripes* FR., sie vermittelt den Uebergang zwischen beiden, und da die Körbchenbehaarung oft mehr oft weniger schwarz ist, so zeigen die einzelnen Exemplare das Werden des *obscuripes* sehr deutlich.

„Zentral-Sumatra, bei Beras Tagi (♀), im Mai gefangen und auf Java, bei Tjibodas (♀♀) im März.“

No additional records have been published for this color variety since its original description. I have studied a worker of this variety (probably a paratype) from Beras Tagi (Brastagi), North Sumatra, determined as this variety by FRIESE and loaned to me by the American Museum of Natural History.

Bremus (Senexibombus) senex (VOLLENHOVEN).

Bombus senex VOLLENHOVEN, Tijdschr. v. Entomol., jaargang 16, 1873, p. 229, pl. 10, col. fig. A and B, ♀.

Bombus rufipes var. *senex* RITSEMA, Notes Leyden Museum, VI, 1884, p. 200, ♀.

Bombus senex HANDLIRSCH, Ann. k. k. Naturh. Hofmus., Band III, 1888, p. 227, ♀.

Bombus eximius var. *senex* FRIESE, Tijdschr. v. Entomol., deel 57, No. 67, March 21, 1914, p. 11, ♀.

Bombus senex FRIESE, Zool. Jahrb., Abt. Syst., Band 41, Heft 5, 1918, pp. 516-517, ♀.

Female (♀) type in good condition in the collection of the Rijks Museum voor Natuurlijke Historie, Leiden, Holland.

Queen. — Face, occipital orbits and occiput with black hairs. Labrum with tubercle-like areas deeply and widely separated, with numerous coarse punctures, slightly shagreened; lamella prominent and extending most of width of labrum. Mandibles without conspicuous incisura lateralis; with teeth I and II, the gerader rand, a distinct sulcus obliquus, a basalfurche, a hauptleiste, a nebenleiste, a nebenfurche, and a begleitfurche. Disk of clypeus smooth and shiny with a few small scattered punctures, anterior-lateral corners depressed and strongly punctate, middle anterior portion of clypeus with a circular concavity. Malar space about one and one-half times as long as width at articulation of mandibles, smooth and shining, with lower or caudal half with small punctures. Ocelli situated just above narrowest part of the vertex, lateral ocelli as close to inner margin of compound eyes as to one another, each ocellus with a diameter about equal to width of fourth antennal segment; area directly laterad of each lateral ocellus smooth and shiny, with but few punctures near compound eye, immediately caudad of smooth area is a densely punctate area. Flagellum about twice as long as the scape; third antennal segment noticeably longer than the fifth, the fifth longer than the fourth, segments not arcuate.

Thorax, except for smooth and polished area on disk, entirely covered with long whitish pubescence.

Abdomen with long whitish pubescence on the first four dorsal segments; dorsum of fifth segment with whitish pubescence tinged with orange; dorsum of sixth segment with very short black and orange pubescence along lateral and posterior margins, the center being shining and with scattered punctures; tip of hypopygium (sixth ventral segment) without a median keel or carina. Venter of abdomen with black pubescence.

Sting sheath between basal arms with a narrow heavily chitinized strip along side margins, without conspicuous inner projections and no heavily chitinized detached areas in membrane between strips.

Legs with all tarsi and usually corbicular fringes with bright ferruginous or golden hairs, remainder of legs with hairs mostly black; integument of hind tarsi and tibiae reddish, darker on other segments. Apical or outer upper angles

of metatarsi of hind and middle legs with a strongly produced angular projection; upper edge of hind metatarsus somewhat arcuate, outer surface slightly concave, about three times as long as greatest width.

Wings distinctly stained with orange-brown, the nervures darker.

Length, 24 millimeters; spread of wings, 48 millimeters; width of abdomen at second segment, 12 millimeters.

Worker. — Specimens with pubescence colored like the queen are not as yet known. See notes under varieties *ardentior* (CKLL.) and *sumatrensis* (CKLL.).

Male. — No males belonging to the species *senex* with the pubescence colored like the queens have thus far been found. It may be that the males exhibit dimorphism and normally assume the colors of varieties *ardentior* (CKLL.) or *pallidithorax* FRISON. If males of *senex* are later found with colors comparable to the typical queens, their structural characters will be the same as described under *pallidithorax* FRISON.

The original description of this species is as follows:

„Cette nouvelle espèce se distingue de toutes les autres qui me sont connues par la blancheur de son poil et la limpidité de ses ailes.

„La couleur générale du corps est noire. La tête est assez grosse par rapport à la taille de l'insecte, faiblement ponctuée, à chaperon très-lisse et bombé. Le front et l'occiput sont couverts de poils bruns et blancs entremêlés, ceux de la face et des joues sont tous bruns. Les yeux sont grands, en ovale allongé de couleur gris-brune; les ocelles sont petits et jaunâtres. Les antennes, médiocrement longues, sont noires, d'un ton mat. Les mandibules sont noires, luisantes; les autres parties de la bouche d'un brun de poix.

„Le thorax est couvert sur la partie dorsale et le long des flancs du mésothorax de longs poils d'un blanc argenté qui lui forment une belle fourrure de grande densité; les autres parties sont couvertes de quelques poils soyeux d'un noir brunâtre, entre lesquels on distingue aisément que la poitrine est peu ponctuée. Les pattes sont d'un rouge jaunâtre et couvertes d'assez longs poils noirs, excepté sur les tarses et sur les deux faces plates des jambes postérieures, ainsi que sur la corbeille tant en dessus qu'en dessous. Les ailes sont transparentes d'un blanc jaunâtre à nervures d'un rouge brunâtre, la costale plus foncée; leurs épaulettes sont de même d'un blanc plus ou moins jaune.

„Le dos de l'abdomen est couvert de poils argentés semblables à ceux du thorax; le ventre, dont la couleur est un noir brun et qui est densément ponctué, n'est fourni que de peu de poils d'un noir grisâtre, plus soyeux que ceux du dos. L'aiguillon d'un brun de poix est recourbé en haut.

„Cette belle espèce habite l'île de Sumatra; M. le Docteur LUDEKING fit cadeau au Museum royal d'histoire naturelle de la femelle qui a servi à cette description.”

This species is known only from Sumatra. FRIESE (1918) summarizes the records of this species since the original description as follows: „bei Tau am Vulkan Dempo an Geiszblatt (*Lonicera*) im Jahre 1884 und auch an *Melastoma*-Arten in 2300 m. Höhe” and „von Sumatra (Bergregion)”. I have studied in detail

two queens loaned to me by the British Museum with data as follows: 1 queen, May, 1914, 10,000 ft., Korinchi Peak, Sumatra, and 1 queen, April 1914, 5,000 ft., Sungei Kring, Sumatra. A third queen, graciously donated to me by the Rijks Museum voor Natuurlijke Historie, Leiden, Holland, bears the data „Gun. Teleman, Sumatra, June, 1917, coll. EDW. JACOBSON”. I am informed that other specimens are in the collection of the Rijks Museum.

***Bremus (Senexibombus) senex* var. *sumatrensis* (COCKERELL).**

Bombus sumatrensis COCKERELL, Ann. Mag. Nat. Hist., 7th Series, Vol. 16, 1905, p. 392, ♀ (not ♀ as stated in original description).

I have seen no specimens of this variety and none have been recorded in literature since the original description based upon the unique type. This type certainly belongs to the worker caste instead of being a queen. In the re-description of *senex* (VOLLENHOVEN), I have noted the circular depression on the median anterior portion of the clypeus. Mr. O. W. RICHARDS has very kindly examined the type of *sumatrensis* (COCKERELL) in the British Museum and reports that the clypeus has the same "curious circular depression" on the clypeus as *senex*. In view of the limited bumblebee fauna of the East Indies and the absence of a difference in structural characters between *senex* and *sumatrensis*, it seems advisable to the writer to consider the latter as a color variety of the former.

Worker. — Structurally similar, except for smaller size, to the queen of *senex* as redescribed in this paper. Differs from *senex* as follows: first two dorsal abdominal segments mostly with black pubescence; that on lateral margins, especially on second segment, yellowish white; third dorsal segment with black pubescence; fourth and fifth segments yellowish-white.

Worker (♀) type in the collection of the British Museum.

The original description of this variety is as follows:

”*Queen*. — Length about 18 mm.

”Head elongata, narrow, the greater part of the clypeus, which is smooth and shining, below the level of the eyes; malar space long, smooth and shining; a round red tubercle at extreme base of mandibles; labrum bituberculate, with a median depression, its lower part with reddish and black hair; hair of face and cheeks long and black, that of upper part of head mixed black and white, the white hairs being long and mainly on the occiput; antennae entirely black, scape long, strongly curved; first joint of flagellum as long as third or slightly longer, the second much shorter than either; hair of thorax long, dense, yellowish white, with no sign of any median band or patch. Legs very dark reddish, the hind tibiae and tarsi quite bright ferruginous; hair of legs black and orange, the latter mainly on the distal parts; hind metatarsi very broad. Wings strongly suffused with orange-brown, nervures ferruginous. Hair of abdomen long, black on first two segments, with yellowish white towards the sides, especially on the second; black on third segment, yellowish white on fourth and fifth, the

colours largely mixed owing to the overlapping of the long hairs and the presence of more or less pale hair even amongst the black; hair of venter black, except at apex (principally fringe of penultimate segment), where it is yellowish.

"*Hab.* Sumatra; marked "at flower, 2381. X², 2.5.81". In the collection of British Museum, received in 1892."

This color variety, like the species to which it belongs, is known to date only from Sumatra. It, or *senex* var. *ardentior* (COCKERELL), may prove to be the normal form of the worker of *senex*. Such color dimorphism is of rather common occurrence among bumblebees.

***Bremus (Senexibombus) senex* var. *ardentior* (COCKERELL).**

Bombus sumatrensis var. *ardentior* COCKERELL, Ann. Mag. Nat. Hist., 8th Series, Vol. 5, 1910, p. 416, ♀ (not ♀ as stated in original description).

One worker and one male of this color variety of *senex* (VOLLENHOVEN), belonging to the British Museum, have been studied. The worker bears the label "Sumatra, X/2/5/81, 92.182" suggestive of the same general lot of material as the type. As in the case of *senex* and its other color variety *sumatrensis* (COCKERELL), this variety has the circular depression on the median anterior portion of the clypeus; a structural character proving its affinity with them. This relationship is further substantiated by the study of a worker which was kindly donated to me by the Rijks Museum voor Natuurlijke Historie. This latter worker bears the following data on the pin label: Gun. Teleman, Sumatra, June, 1917, Coll. EDW. JACOBSON.

Worker. — Structurally similar, except for smaller size, to the queen of *senex* as redescribed in this paper. Differs from *senex* as follows: first four dorsal abdominal segments mostly with black pubescence; at least some specimens with sides of thorax mostly with black pubescence; both fourth and fifth dorsal abdominal segments, or only the fifth, with dull ferruginous pubescence; wings slightly darker.

Worker (♀) type in the collection of the British Museum.

Male. — Structurally similar to the male *senex* var. *pallidithorax* as described in this paper. Differs in color as follows: Dorsum of thorax entirely covered with hoary or whitish pubescence, that on sides of thorax mixed with dark pubescence; dorsum of first two dorsal abdominal segments mostly covered with black pubescence, except posterior margins which are whitish; third and fourth dorsal abdominal segments mostly whitish but with some black pubescence intermixed, particularly on anterior margins; fifth, sixth and seventh dorsal abdominal segments with dull ferruginous pubescence.

Allotypic Male. — Barong Baru, Korinchi, Main Range, Sumatra, 4,000 feet elevation, June, 1914. Deposited in the collection of the British Museum.

The original description of this variety is as follows:

„Queen. — Length about 17 mm.

„Structure as in *B. sumatrensis*; hair of face, front, vertex, and cheeks entirely black; of labrum reddish black; of thorax above yellowish white; of

abdomen black, on fourth and fifth segments rather dull ferruginous. A colour-variety only, with the abdominal band red instead of yellowish white.

"*Hab.* Sumatra, "X.1, 5.81". British Museum, 92.182."

As suggested under *senex* var. *sumatrensis*, either this worker variety or *sumatrensis* may be the normal form of the worker of *senex*. Known to date only from the type and present recorded specimens. It is quite evident that the type is a worker instead of a queen as stated in the original description.

Bremus (subgenus?) **folsomi** FRISON.

Bremus folsomi FRISON, Trans. Amer. Ent. Soc., Vol. XLVIII, No. 835, March 2, 1923, p. 322, ♀.

No specimens of this sole known representative of the genus *Bremus* in Borneo have been recorded since the original description. The original description is as follows:

Queen.—Face, occiput and cheeks with brownish-black pile. Labrum moderately punctate; tubercle-like areas large, slightly shagreened, with the space between them equal to the length of the second flagellar segment; shelf-like projection broad; pile on anterior margin bright golden in color. Mandible distinctly four-toothed, the fourth tooth, however, much less developed than the others; setae on the distal portion between the longitudinal ridges very short, dense and bright golden in color, that on the lower proximal portion very long and of the same color as the short setae. Clypeus with numerous small punctures on the disk, and large scattered punctures mixed with smaller ones on the lateral, dorsal and anterior portions. Malar space slightly shorter than its width at articulation of mandibles, about two-thirds the greatest width of and one-fourth the length of the eye. Ocelli situated slightly above the narrowest part of the vertex; lateral ocelli almost as far distant from each other as from inner margin of eye; area between lateral ocelli and eyes polished, impunctate except for a very few small punctures near inner margin of eye. Flagellum about twice as long as the scape; third antennal segment somewhat longer than the fifth, the fifth slightly longer than the fourth.

"Entire dorsum and pleura of thorax, except for the small polished and impunctate disk, covered with moderately long tawny-yellow pile.

"Abdomen with the first dorsal segment yellow, the pile being short and sparse on the middle portion; second dorsal segment with dull ferruginous pile on the sides and yellow in the middle; third, fourth and fifth dorsal segments with dull ferruginous pile; sixth dorsal segment with short brownish-black pile. Venter with golden and brown pile fringing posterior margins of the segments. Hypopygium without a median carina.

"Legs black, but with the pile on the ventral surfaces of the femora and a portion of the tibiae dull golden or ferruginous. Corbicular fringes both on the dorsal and ventral margins bright ferruginous. Hind metatarsi distinctly arcuate.

"Wings pale brown, the nervures distinctly outlined in darker brown.

"Length, 20 mm; spread of wings, 39 mm; width of abdomen at second segment, 10 mm.

"*Holotype*.— Queen, Kina Balu, British North Borneo.

"The *holotype*, No. 10542, is in the collection of the Academy of Natural Sciences of Philadelphia."

The holotype, as stated in original description, is in the collection of the Academy of Natural Sciences, Philadelphia, Pennsylvania.

When the species was described no mention was made of the shape of the metatarsus of the middle leg. A recent study of the middle leg reveals that this species is without a spine-like projection at the apical outer angle of the metatarsus of the middle leg.

Bremus (subgenus!) **melanopoda** (COCKERELL).

Bombus rufipes var. *melanopoda* COCKERELL, Ann. Mag. Nat. Hist., 8th Series, Vol. 5, 1910, p. 416, ♀.

I have seen no specimens of this species and none have been recorded since the original description based upon an unique female was published in 1910. Since the original description does not give sufficient information regarding the structural characters for the definite recognition of this species, Mr. O. W. RICHARDS has very kindly supplied the following notes concerning the characters of the typic female.

Queen.— Malar space about twice as long as broad at articulation with mandible, as long as the transverse diameter of the compound eye. Labrum with labral furrow shallow, narrow, about one-half as broad as tubercle; lamella nearly as broad as a tubercle. Clypeus a little swollen, apical depression scarcely marked, with close, medium sized punctures which are finer and fewer on the disk. Ocelli lying on the supraorbital line, each lateral ocellus being separated from the compound eye by about two and one-half times its width; a small space around the ocelli unpunctured. Third antennal segment as long as fourth and fifth together; fourth only a little longer than quadrate; fifth one and one-half times as long as broad.

Metatarsus of middle leg at apical outer angle with a pronounced spine-like projection. Upper apical angle of hind tibiae not produced.

Hypopygium apparently without a conspicuous median carina or keel.

Body covered with black pubescence; hind tibiae somewhat pitchy; wings subhyaline.

The female type labelled "Sumatra" is in the British Museum.

The original description of this species is as follows:

"*Queen*.— Length about 25 mm; anterior wing 18.

"Robust, black, with black pubescence, that on apex of labrum ferruginous; legs black, the hind tibiae very dark reddish. Wings dark.

"Similar to *B. rufipes*, but distinguished by the dark black-haired legs. The difference is not absolute, as the hind legs have many of the long tibial hairs orange-tipped and the hair on the inner side of the basitarsus is wholly dull ferruginous. *B. rufipes* var. *obscuripes* FRIESE, from Java, has dark hair on the legs, but the legs themselves are clear red.

"F. SMITH compares *B. rufipes* with *B. eximius* SM., noting the important color differences. The Sumatra specimen now before me also differs structurally, having the third antennal joint longer and the clypeus and malar space very much longer. In the long malar space, the long clypeus, shining on the disk, the bituberculate labrum, etc. it agrees with the other Sumatran forms, from which it differs totally in coloration.

"*Hab.* Sumatra. British Museum, 92 - 182."*

Without doubt this species belongs to the section *Odontobombus* KRÜGER, but its subgeneric status is in doubt. The discovery of the male is needed to definitely establish its subgeneric status.

E. GEOGRAPHICAL SUMMARY.

It is evident from this study of the bumblebees of Java, Sumatra and Borneo, and a comparison of them with the fauna of the Asiatic Mainland, Formosa and Japan, that the East Indian species are endemic to their islands. Their affinity with the fauna of the Asiatic Mainland is still clearly shown, however, by the existence of the species *rufipes* (VOLLENHOVEN) and its color varieties. This species belongs to the subgenus *Rufipedibombus*; a subgenus which is represented in Asia and Formosa. The subgenus *Senexibombus*, proposed in this paper, is interesting in that it links up the fauna of the East Indies (*senex*) with that of the Philippines (*irisanensis*), and to date is not known from Eurasia.

It seems to the writer that not enough collecting has been done as yet to definitely establish the limits of distribution of the various species and varieties on the different islands comprising the East Indies. The present known range of the East Indian species and varieties has been tabulated for convenience as follows:

Species and Varieties	Java	Sumatra	Borneo
<i>senex</i> (VOLLENHOVEN)		×	
„ var. <i>sumatrensis</i> (COCKERELL)		×	
„ „ <i>ardentior</i> (COCKERELL)		×	
„ „ <i>pallidithorax</i> FRISON		×	° °
<i>melanopoda</i> (COCKERELL)		×	
<i>rufipes</i> (LEPELETIER)	×	×	
„ var. <i>flavipes</i> (HANDLIERSCH)	×		
„ „ <i>obscuripes</i> (FRIESE)	×		
„ „ <i>intermissus</i> (FRIESE)		×	
„ „ <i>richardsi</i> FRISON		×	
<i>folsomi</i> FRISON			×