

SYSTEMATIC AND BIOLOGICAL NOTES ON BUMBLEBEES
(BREMIDAE; HYMENOPTERA)

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The present paper is the result of a study of a series of bumblebees in the collection of the author from Arizona, several specimens in the collections of the United States National Museum and the Biological Survey, and the entire collection of North American bumblebees of the Academy of Natural Sciences of Philadelphia and the American Entomological Society. To Mr. E. T. Cresson, Jr., Dr. Henry Skinner and Mr. J. A. G. Rehn, I owe my sincere thanks for their many courtesies and the privilege of studying in detail the types and collection of some twenty-eight hundred bumblebees belonging to the American Entomological Society. I am also under obligations to Mr. S. A. Rohwer for the loan of and notes on several specimens belonging to the United States National Museum, and to Mr. Henry L. Viereck for the loan of specimens from the collection of the Biological Survey.

For the sake of convenience and because of the nature of the subject matter itself, I have deemed it advisable to divide this article into five parts.

A. DESCRIPTIONS AND NOTES ON BUMBLEBEES FROM ARIZONA

Prior to 1913 only seven species of *Bremus* and no species of *Psithyrus* were known from Arizona. Recently in Entomological News,¹ I recorded five species and one subspecies of *Bremus* and one species of *Psithyrus* which were additions to the list of this state. This increased the number of Bremidae known to occur in Arizona from seven to thirteen species. When this article was sent to press, I had some other bumblebees from the same state, which I hesitated to report upon at that time because of doubt as to their specific status. Further study has shown these specimens to represent two new varieties of *Bremus kirbyellus*

¹ XXXII, pp. 144-148, (1921).

(Curtis), and one new variety of *Bremus sylvicola* (Kirby), both species being new records for Arizona.

***Bremus kirbyellus* var. *alexanderi* new variety**

Queen and worker.—Taxonomically almost identical with the typical *kirbyellus* (Curtis), which occurs in regions farther north. Differs slightly in structure from the typical queens of *kirbyellus* that I have studied, by having a comparatively shorter malar space, a condition particularly noticeable in the worker caste. Yellow pile of mesopleura not extending to the base of the legs, and with pile on posterior margin of this area entirely black. Metapleura and medium segment with black pile. Posterior margin of the fourth together with the entire fifth dorsal abdominal segment ferruginous, and also the sixth dorsal abdominal segment in the workers. Legs and ventral portions of the body black, except that the tips of some of the setae bordering the corbicula have a slight ferruginous tinge, particularly pronounced in the case of some workers. Coloration otherwise as in typical specimens of *kirbyellus*.

Holotype.—queen, July 11, 1917, Patagonia Mountains, Arizona. *Paratopotype* queen, July 13, 1917. *Morphotype* worker, July 14, 1917, Patagonia Mountains, Arizona. *Paratopotype* workers, one collected July 11, 1917, three on July 13, 1917, and one on July 14, 1917. One *paratype* worker, June 5, 1917, Oracle, Arizona. All the specimens collected by Mr. E. J. Oslar.

One paratopotype worker deposited in the collections of each of the following institutions: American Entomological Society, American Museum of Natural History and the United States National Museum. Holotype and remaining paratype specimens in the collection of the author.

Named in honor of my friend Dr. C. P. Alexander, to whom I am indebted for many favors.

The male of this variety will undoubtedly be obtained in future collections from this region, a caste which may necessitate the elevation of this form from varietal to specific rank. In many respects *B. kirbyellus alexanderi* resembles also *B. polaris* (Curtis), another species of the same group, and if the specimens were from Arctic America might readily pass as that species. I have deemed it advisable to describe my specimens as a variety of *kirbyellus* because this species is found in the high mountain ranges of the western United States, whereas *polaris* is only known from Greenland, Labrador, Alaska and other far northern

localities. The capture of the at present unknown male of variety *alexanderi* will settle this question as to its relationship with *polaris* and *kirbyellus*, as the males of these latter two species are readily separated by genitalic characters.

Bremus kirbyellus var. **arizonensis** new variety

Queen.—Similar in all respects to *kirbyellus* var. *alexanderi* except that the pubescence on the apical dorsal abdominal segments is entirely black, the scutellum is not so strongly yellow, the yellow pile on the mesopleura extends only half way down the bases of the wings to the bases of the legs, and the malar space is slightly shorter.

Holotype.—queen, July 11, 1917, Patagonia Mountains, Arizona. Collector, E. J. Oslar.

The holotype queen of this melanic variety is in the collection of the author.

The status of variety *arizonensis* is the same as that of variety *alexanderi*, and for the same reasons as in the case of the latter variety has been treated as most closely related to *kirbyellus*. Variety *arizonensis* will run to *hyperboreus* Schönherr (= *arcticus* Kirby) in Franklin's key to the bumblebees published in 1913, a species restricted to the northern parts of Eurasia, Greenland and the extreme northern portions of North America. Thus a striking example of color homomorphism in different species from widely separated regions is presented. These two bumblebees are distinctly separated by the great difference in the length of the malar space.

Bremus sylvicola var. **lutzi** new variety

Queen.—Taxonomically almost identical with the typical *sylvicola* (Kirby) found in Alaska and the far northern regions. Face in two specimens black, in four specimens with a slight amount of yellow pile on the very middle portion. Occiput with varying amounts of dark and yellow pile, the dark pile dominating in most specimens. Yellow pile on the pleura of the thorax not extending to the bases of the legs and in most specimens but half way down from the bases of the wings to the bases of the legs. First dorsal abdominal segment yellow, except basal middle portion which often has some black pile; second and third segments ferruginous, with some black pile on their middle portions; fourth segment yellow with black pile on the middle portion; fifth and sixth segments almost entirely black.

Holotype.—queen, July 11, 1917, Patagonia Mountains, Arizona. Five *paratopotype* queens, July 11, 13 and 14, 1917, Patagonia Mountains, Arizona. All the specimens collected by Mr. E. J. Oslar.

One paratopotype queen deposited in the collections of each of the following institutions: American Entomological Society, American Museum of Natural History and the United States National Museum. Holotype and remaining paratopotype queens in the collection of the author.

I name this variety for my friend Dr. F. E. Lutz, who has done a great deal to increase our knowledge of the bumblebees.

Variety *lutzi* differs from the typical *sylvicola* from Alaska, northern Canada and Labrador, as described by Franklin, as follows: the face is dominantly black as well as the lower half of the mesopleura, the metapleura, and the median segment. The black pubescence on the middle dorsal area of segments two, three and four is often so pronounced as to form a distinct longitudinal band, sharply dividing the dominant yellow and ferruginous pubescence of these segments. The yellow pile is of a duller hue than in most specimens of *sylvicola* that I have studied from Alaska, Canadian Northwest Territories and Labrador. In several specimens of variety *lutzi* the pile on the fourth dorsal abdominal segment is whitish. Another difference between the typical *sylvicola* and variety *lutzi* is that in the former the fifth dorsal abdominal segment usually has some yellow pile, whereas in the latter this segment is entirely black or mainly so. Variety *lutzi* also differs from the melanic variety *johanseni* Sladen of *sylvicola*, described in 1919, in having a greater amount of yellow pile on the upper portion of the pleura of the thorax, and the fourth dorsal abdominal segment being largely yellow. Variety *johanseni* is known only from the type localities of Bernard Harbour, Northwest Territories, Coronation Gulf and Herschel Island, Yukon Territory.

I am considering *lutzi* to be a variety of *sylvicola* on the basis of the color pattern and structural characters presented by the queens. There is a possibility, however, that *lutzi* may prove to be a southern species of the *sylvicola* complex. Males are needed to decide definitely this problem of systematic position.

The presence of a variety of *sylvicola* or a member of the *sylvicola* complex in Arizona extends considerably the southward range of this species, and reopens the discussion as to the presence of *sylvicola* in the United States. The first record of this species from the United States is that of Cresson in 1879, when he listed

this bumblebee from Colorado. Since then both Cockerell and Titus have listed this species from the same state. Franklin omits Cockerell's record of 1893, but Lutz and Cockerell have assigned this record to *melanopygus* Nylander. Franklin disposed of the 1902 record of Titus as questionably referring to *melanopygus*, and says that *sylvicola* "does not appear to be present in the United States and is strictly a Boreal form." The same record was also questioned by Cockerell in 1907, when he stated that he believed the apex of *sylvicola* was not black, the alternative through which it was keyed by Titus. The apex of *sylvicola*, however, is black or mainly so, which is an indication that the record of Titus is correct. Titus states that all his specimens of this species were identified for him by Ashmead, and that "It is certainly a distinct high Alpine species." The case in proof of the correctness of the record by Titus is also strengthened when we consider that Ashmead in the same year published his account of the Hymenoptera of Alaska. Though Ashmead frequently confused certain species of bumblebees, he correctly distinguished some specimens of *melanopygus* and *sylvicola* in this Alaskan collection, as Franklin indicates in his species bibliography and a personal study of some of these specimens shows. Therefore, it seems reasonable to suppose that he did not incorrectly identify the same species from Colorado specimens. In 1911, Friese gave the varietal name *flavicollis* to a species he called *lapponicus* from Pike's Peak, Colorado. Lutz and Cockerell consider *flavicollis* to be a variety of *sylvicola*, the nearest relative of *lapponicus* in North America. Recently, I had the opportunity to study two specimens of *sylvicola* belonging to the American Museum of Natural History. Both of these specimens were obtained by the Museum from Friese and labeled by him *lapponicus* var. *flavicollis*. As these two specimens prove to be nearly typical *sylvicola*, the use of *flavicollis* as a varietal name is questionable. One of the specimens is from Labrador and the other from Pike's Peak, Colorado, the type locality of *lapponicus* var. *flavicollis* Friese. In the bumblebee collection of the Bureau of Biological Survey there are many specimens of *sylvicola*, collected in Colorado at high altitudes by Mr. L. O. Jackson. I possess three workers and two males of

this species collected by Mr. E. J. Oslar at San Miguel and Clear Creek, Colorado. In the collection of the American Entomological Society are queens of this species which are from Colorado, and it is likely that these are the specimens on which Cresson's record of 1879 is based. In view of the records just given, the occurrence of a variety of *sylvicola* in Arizona is not remarkable, and the species probably occurs in most of the high mountain ranges of the western United States.

Bremus pleuralis Nylander

This species is represented from Arizona by one queen, collected by Mr. E. J. Oslar, in the Patagonia Mountains, Arizona, on July 11, 1919.

I have carefully compared this specimen with queens and workers of *pleuralis* in the United States National Museum and the American Entomological Society, collected by T. Kincaid on the Harriman Alaskan Expedition of 1899. In coloration, except for the triangular patch of black hairs extending downwards on the basal dorsal portion of abdominal segments one and two, and the more yellow scutellum and mesopleura, it reminds one of *kirbyellus* var. *arizonensis*. Structural differences, such as the carinate hypopygium, length of the malar space, and strictly tridentate type of mandibles, readily serve to distinguish *pleuralis* from *kirbyellus* var. *arizonensis*. Cockerell's record of *pleuralis* from the northern peninsula of Michigan in 1916 is certainly wrong. His statement that the specimen he questionably determined as *pleuralis* cannot be a melanic variety of *B. consimilis* [= *vagans*], because of "the malar space being too short," likewise prohibits it from being *pleuralis*. In *pleuralis* the malar space is comparatively almost as long as that of *vagans*. Cockerell says also that the general coloration of the specimen is like that of *vagans*, whereas *pleuralis* usually has a triangular patch of black pile on the dorsal middle portion of abdominal segments one and two, a condition not encountered in *vagans*. I have studied a large series of bumblebees from various parts of Michigan, and am inclined to believe that the *pleuralis* listed by Cockerell from that state is a worker of the variable and oftentimes puzzling bumblebee so well named *perplexus* by Cresson. The melanic condition referred to, the "general coloration" of *vagans* and the "abdomen entirely

black-haired beyond the second segment," as well as statements relative to the length of the malar space, all strengthen my supposition that Cockerell's Michigan record is to be referred to *B. perplexus*. *B. perplexus* is very common in the northern parts of Michigan and, strange to say, is not recorded by Cockerell along with the other bumblebees common to that general region. Varieties of *rufocinctus* Cresson occasionally approach *vagans* and *perplexus* in coloration, but the extremely short malar space, the tendency of the hypopygium to be carinate and the position of the ocelli are all characters which serve to distinguish *rufocinctus* under such conditions. Cockerell mentions that the malar space of his specimen is longer than that of *affinis* Cresson, which indicates that it is not *rufocinctus*. The hypopygium of *pleuralis* likewise has a pronounced carina, a character not mentioned by Cockerell as possessed by his Michigan specimen.

According to Mr. Osler, the bumblebees labelled "Patagonia Mountains, Arizona," were found feeding on the blossoms of wild blackberry and mesquite at altitudes from 5,500 to 6,000 feet. The presence of members of the *Kirbyellus* Group in Arizona, as recorded above, gives that state representatives of all the known American Groups of *Bremus* and one of the three American Groups of *Psithyrus*. This state has therefore a varied bumblebee fauna, which is correlated with the diverse ecological conditions existing in various parts of the state. Because of the occurrence of so many species of true bumblebees, other species of the genus *Psithyrus* besides *crawfordi* Franklin will undoubtedly be found there.

B. THE DESCRIPTION OF THE WORKER AND MALE OF *BREMUS*
FRANKLINI FRISON, AND THE CORRECT SYNONYMY OF
PSITHYRUS KODIAKENSIS ASHMEAD

***Bremus franklini* Frison**

This species was originally described in the Entomological News for 1921, from two specimens of the queens, both collected at Nogales, Arizona. Since then, I have had the opportunity of studying specimens belonging to the United States National Museum which I consider to be the other castes of this species.

Worker.—Face with black and whitish-yellow pile intermixed, the black pile dominant. Occipital orbits dark, somewhat coarsely and densely punctate. Occiput with a triangular patch of nearly pure whitish-yellow pile. Labrum with tubercle-like areas large and well separated, coarsely punctate; shelf-like projection about one-third as broad as labrum; pile on anterior margin ferruginous. Mandible four-toothed, with numerous minute coarse scattered punctures; setae on distal portion short, on lower proximal margin long, ferruginous. Clypeus well punctate, particularly so in anterior and posterior corners. Malar space somewhat shorter than its width at articulation of mandible, about one-half as long as greatest width of and one-fifth length of eye, nearly impunctate, polished. Ocelli situated just above the narrowest part of the vertex; lateral ocelli as far distant from each other as distant from inner margin of the eye; area just laterad of lateral ocelli impunctate, polished, but becoming well punctate again near inner margin of the eye. Flagellum about one and three-fourths times as long as the scape; third antennal segment longer than the fifth, the fifth a trifle longer than the fourth.

Thorax with dorsal cephalic portion covered with pure yellow pile, the yellow pile extending (except for a little black pile on the middle of its posterior border) caudad to the cephalic margin of the scutellum. Scutellum with pure black pile. Disk of mesonotum bare, impunctate and polished. Mesopleura, except for the yellow pile of dorsum slightly extending down below the level of the bases of the wings, black. Pile on the metapleura and propodeum black.

Abdomen with the pile on the first four dorsal segments entirely black, the fifth and sixth dorsal segments with a slight touch of light pile on their lateral margins. Venter brownish-black. Hypopygium without a median carina.

Legs black, but with some light ferruginous short setae on tarsal segments. Corbicular fringes black. Hind metatarsi distinctly arcuate.

Wings very dark, with a slight violaceous reflection.

Length, 14 mm.; spread of wings, 31 mm.; width of abdomen at second segment, 7 mm.

Morphotype worker, Oregon. (Collector, C. F. Baker.) Deposited in the collection of the United States National Museum.

Male. Face with pure yellow pile below and with intermixed black and whitish-yellow pile above the articulation of the antennae. Occipital orbits mostly with dark pile, but that on posterior portion somewhat yellowish, coarsely and densely punctate. Occiput with a triangular patch of pure light yellow pile. Malar space slightly longer than its width at articulation of mandible, about one-half as long as greatest width of and one-fourth length of the eye. Ocelli situated just above the narrowest part of the vertex; lateral ocelli as far distant from each other as from the inner margin of the eye. Flagellum about two and two-thirds times as long as the scape; third and fifth antennal segments subequal in length, the fourth much shorter than either.

Thorax with dorsal cephalic portion covered with pure yellow pile, the yellow pile extending (except for a little black pile on the middle of its posterior border) caudad to the cephalic margin of the scutellum. Scutellum with pure black pile. Disk of the mesonotum bare, impunctate and polished. Mesopleura, except for the yellow pile of dorsum slightly extending down below the level of the bases of the wings, black. Metapleura and propodeum with black pile.

Abdomen with pile on the first four dorsal segments entirely black; fifth, sixth and seventh segments with anterior portion black and posterior portion (particularly the sixth and seventh segments) a pale brownish-yellow. Venter brownish-black, with light pile particularly noticeable on the posterior margins of the second, third and fourth segments. Genitalia of the same general type as in the other members of the *Terrestris* group (Radoszkowski) in the United States.

Legs mostly black, but with a large number of short ferruginous setae on the tarsal segments and a slight amount of long light pile on the trochanters and hind femora. Outer aspect of hind tibia slightly convex, smooth, polished; corbicular fringes black, slightly tinged with ferruginous at distal ends.

Wings very dark, with a slight violaceous reflection.

Length, 15 mm.; spread of wings, 35 mm.; width of abdomen at second segment, 7.5 mm.

Allotype.—male, Oregon. (Collector, C. F. Baker.) Deposited in the collection of the United States National Museum.

The discovery of the male and the worker castes of *Bremus franklini* Frison confirms my previous supposition, based on the characters presented by the queen, that this species is a member of the *Terrestris* Group (Radoszkowski) and most closely related to *Bremus occidentalis* Greene. It may readily be separated from the latter species, as pointed out in Entomological News of 1921,² by the marked differences in the color pattern of the thorax, apical abdominal segments, whitish-yellow pile of the occiput, violaceous wings and darker corbicular fringes. Though *Bremus franklini* was described from Arizona, I am regarding the male and worker described here as being this species on the basis of the close agreement in structural and colorational characters. The absence of specimens of this species in the very large series of bumblebees I have examined in various collections, indicates that *Bremus franklini* is one of our rarer species of this widely distributed genus.

***Bremus kirbyellus* (Curtis).**

In 1902, Ashmead in the Proceedings of the Washington Academy of Sciences described two male bumblebees under the name

²Page 48.

of *Psithyrus kodiakensis*. Since that time the true status of this species has remained in doubt and has caused considerable confusion. Franklin in 1912 considered *P. kodiakensis* as the male of *Bremus kincaidii*, described by Cockerell from the Pribilof Islands, in 1898. In a recent paper on the "Hymenopterous Insects of the Family Bremidae from the Pribilof Islands, Alaska," 1921, I questioned the correctness of the synonymy as given by Franklin, based on the geographical distribution of the two forms in question, and the lack of additional records for *kincaidii* in Alaska. In a still later paper in the Entomological News for 1922, I reported on a study of the male of *kincaidii* from a specimen collected on St. Paul Island of the Pribilof Group. As there is every evidence to believe that only one species of bumblebee occurs on the Pribilof Islands, this specimen was extremely valuable to me from a comparative standpoint. More recently still I have made a detailed study of the paratype male of *kodiakensis* and drawings of the claspers of the type male, and compared these with a male of *kincaidii* from the Pribilof Islands. Both the type and paratype males prove to be *kirbyellus* (Curtis), a species of common occurrence in Alaskan collections, and therefore *kincaidii* is still to be considered as endemic to the Pribilof Islands. Dr. G. Dallas Hanna even presents evidence to show that the latter species is "confined solely to St. Paul Island of the Pribilof Group." I know of no other species of bumblebee with such a restricted distribution. Confusion concerning the true status of what Ashmead named *kodiakensis* has been due, no doubt, to the fact these specimens are somewhat aberrant in color from the usual type of *kirbyellus*. Structural differences are available, however, in this instance for a correct conception of the species. Lutz and Cockerell in their recent check-list also deem it probable that *kodiakensis* is synonymous with *kirbyellus* and not *kincaidii*.

C. CHANGES IN NOMENCLATURE AND SYNONYMY BASED PRINCIPALLY ON A STUDY OF SPECIMENS AND TYPES IN THE COLLECTIONS OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA AND THE AMERICAN ENTOMOLOGICAL SOCIETY

Bremus polaris (Curtis) and ***hyperboreus*** (Schönherr)

In the Proceedings of the Academy of Natural Sciences for 1892, Mr. William J. Fox published a report on some Hymenop-

tera collected in West Greenland. In this paper *B. nivalis* (Dahlbom), *B. hyperboreus* (Schönherr), *B. derhamellus* (Illiger) and *Bremus* species are recorded. A careful study of these specimens establishes the fact that all of them belong to two species, *hyperboreus* and *polaris* (Curtis). Lutz and Cockerell (1921) wrongly placed under *B. frigidus* (F. Smith) Fox's record for *derhamellus* from Greenland. Franklin undoubtedly overlooked this record as he makes no mention of the same. Accordingly, the specific name *derhamellus*, which applies to a European species not a member of our fauna, can be stricken from our American list. The record of *nivalis* by Fox was doubtfully considered by Franklin, in 1912, as pertaining to *kirbyellus*, but all of the specimens studied by Fox belong to *polaris* with the exception of the specimens of *hyperboreus*. The results of my study of these Greenland species is quite in keeping with my opinion that only two species of bumblebees occur in Greenland, namely, *hyperboreus* and *polaris*. The European references to *kirbyellus* as present in Greenland probably all refer to *polaris*. Whether the form we call *kirbyellus* from the northern regions and high altitudes, and which has a more westerly distribution than *polaris*, is identical with the species listed by the same name in Siberia and northern Europe remains for future solution.

Bremus edwardsii (Cresson) and ***bifarius*** (Cresson)

In his monograph of the bumblebees, in 1912, Franklin placed *B. bifarius* (Cresson) in the synonymy of *B. edwardsii* (Cresson). A thorough study of the lectotype worker of *edwardsii* from California, as well as several workers and allotypes from the same locality, prove this to be the form Franklin described as new under the name of *B. fernaldi*. The name *edwardsii* should therefore be the name used for the species redescribed by Franklin, as it has priority. Likewise, because of this change, the name *bifarius* must be adopted for the species Franklin lists as *edwardsii*.

Several characters are present in the lectotype worker of *edwardsii* which prohibit it from being considered the same as Cresson's type of *bifarius*. The posterior border of the black band between the wings is straight, the corbicular fringes are black, the malar space is proportionally longer than in *bifarius*,

and there is a slight difference in the shape of the hind metatarsus. The points of difference just stated are the points of difference existing between Franklin's *fernaldi* and what he calls *edwardsii*. It is also desirable to add that the allotype males of *edwardsii* have longer antennae than do males of *bifarius* and that they exhibit also a slight difference in the form of the genitalia. This difference in the length of the antennae is also apparent in Franklin's description of *fernaldi* and *edwardsii*. There is a variety of *bifarius* which closely resembles what must now be called *edwardsii* (= *fernaldi* Franklin), which was described as *nearcticus* by Handlirsch in 1888. Undoubtedly this has been the cause of the present confusion. It is very probable that Cresson mixed the variety *nearcticus* of *bifarius* with his own species *edwardsii*, as he gives the distribution of *edwardsii* as California and Colorado. I have never seen a specimen of true *edwardsii* from Colorado. In this connection it may be noted that Fowler listed *edwardsii* from California, and that Franklin later considered this record as pertaining to his species *fernaldi*. In the light of the present evidence, Fowler determined this species correctly.

Bremus flavifrons (Cresson)

A study of the lectotype male and paratype male of *B. flavifrons* (Cresson), both of which bear the label "R. A." (Russian America), shows that neither specimen is the same as the species now going by the name of *flavifrons* and answering the description of that species as redescribed by Franklin in 1912. Instead, these specimens are males of *B. pleuralis* (Nylander). Both these last-named species and *B. centralis* (Cresson) are very closely related, but sufficiently distinct to be considered as species. The presence of a definite black band between the wings is a decided characteristic of *pleuralis*, as well as the pure yellow character of the pubescence anterior to the black thoracic band. On specimens which I consider to be males of *flavifrons*, the anterior dorsal part of the thorax bears a mixture of black and yellow pubescence; thus agreeing in this respect with the queens and workers of the same species. The paratype male also has a considerable amount of ferruginous pubescence on the fifth dorsal segment, a condition which occurs in a male

variety of *pleuralis* from Alaska. The specimens described as *alaskensis* and *dimidiatus* by Ashmead in his report on the Hymenoptera taken by the Harriman Alaskan Expedition in 1902 are, as stated by Franklin, the species called *flavifrons*. I wish, however, to recognize Ashmead's name *dimidiatus* as a varietal name for the specimens of this species lacking ferruginous pubescence on the third and fourth dorsal abdominal segments.

The fact that the male selected as the lectotype of *flavifrons* belongs to another species is unfortunate, but does not offer sufficient grounds for considering *flavifrons* as synonymous with *pleuralis*. Cresson's original description of the queen of *flavifrons* in 1863, certainly applies to the species we have been calling *flavifrons*. His description of the male, which follows the descriptions of the queen and worker, indicate, however, that it was based upon specimens of *pleuralis*. As there is no means of proving that the lectotype and paratype males bearing the label "R. A." are from the type locality, "Ft. Youcon, Arctic America," it is advisable to retain the name *flavifrons*.

The determinations of males belonging to the above species has been a constant source of perplexity to persons engaged in the determination of bumblebees. In this connection it seems well to note that the presence of a sharply defined black band on the dorsum of the thorax between the wings in a male of this complex denotes *pleuralis*; a mixture of black and yellow pubescence on the anterior dorsal portion of the thorax, *flavifrons*; dorsum of thorax mostly pure yellow, except for a very poorly defined black band between wings, *centralis*; and *sitkensis* as described by Franklin. The length of the malar space in all castes is longer in *flavifrons* than in *centralis*.

A study of two cotype workers of *B. ambiguus* (Franklin) convinces me that *ambiguus* is merely a slight color variety of *flavifrons*. The malar space in both cotypes is considerably longer than the length of the malar space in specimens of *sitkensis* (Nylander), thus agreeing in this respect with *flavifrons*. Franklin considered *ambiguus* as most closely allied to *sitkensis*. It is to be noted also that the pubescence of *ambiguus* is short, another attribute of *flavifrons*. In *sitkensis* the pubescence is

very long and shaggy. The arrangement of the setal punctures about the ocelli also bears out the view of the closer affinity of *ambiguus* with *flavifrons* as compared with *sitkensis*, in fact so closely do the two agree that I consider *ambiguus* to be but a color variety of *flavifrons*.

Studies of representatives of all North American species of the Pratorum Group show that *centralis*, *flavifrons*, *pleuralis* and *sitkensis* form a small complex of their own within this large, quite generally distributed group.

***Bremus americanorum* (Fabricius)**

There has been repeated discussion concerning what species of bumblebee DeGeer described, in 1773, by the name *pennsylvanicus*. Franklin came to the conclusion that *americanorum* of Fabricius (1775) was synonymous with *pennsylvanicus*, the latter having priority. The correctness of this interpretation has recently been questioned by Robertson (1920) and *americanorum* is the name now used by Lutz and Cockerell (1920). A careful study of DeGeer's description and figure, and the arguments pro and con, convinces me that DeGeer described the species we are now calling *fervidus*. The fact that the scutellum is stated by DeGeer to be yellow, and is so illustrated, is an argument in favor of *pennsylvanicus* being synonymous with *fervidus*. Franklin has called attention to this, but adds that such a condition is sometimes found in specimens of *auricomus* (Robertson) and *americanorum*. This, however, is the exception and not the rule. The same type of argument on the basis of color characters might be used to refute some of the views advanced by Franklin that the species is not *fervidus*. In DeGeer's description he stated in one place that the abdomen is entirely yellow above, except at its extremity where the last segments are black. If the yellow pubescence of the abdomen was restricted to but a portion of the first and the entire second and third dorsal abdominal segments, why such a statement as this? Franklin says the figure "represents a female with the black pile running up on the mesopleura nearly to the level of the bases of the wings," and accordingly the species can not be *fervidus*. It seems to me that the figure shows the basal segments of the legs drawn up rather closely to the body, and as

these are black the true color of the mesopleura is obliterated, and instead the black of the legs is depicted. I see no more justification for assuming DeGeer's species to be *auricomus* than for calling it *pennsylvanicus*.

However, because of the fact that there is no absolute certainty as to which species *pennsylvanicus* refers, without recourse to the type, I have adopted the term *americanorum* for what Franklin calls *pennsylvanicus*. This is the position taken by Lutz and Cockerell, "as the identity of the latter [*pennsylvanicus*] is too uncertain."

***Psithyrus fernaldae* Franklin**

When Franklin first described this species of *Psithyrus*, in 1911, he described also in the same article a male of *Psithyrus* by the name *tricolor*. At this time Franklin thought it very probable that *tricolor* was the male of *fernaldae*, as he says "I am strongly of the opinion that *fernaldae* is the female of *tricolor*." There were several reasons for this assumption. In the first place, both *tricolor* and *fernaldae* were in many ways structurally unique among the other *Psithyrus*. In both cases the opposite sex was unknown, a condition which might readily be interpreted to indicate that they were the same species, but opposite sexes. Again, the distribution of *tricolor* and *fernaldae* corresponded in many places. In some localities, however, one form was known and not the other, and Franklin particularly stresses the fact that "*tricolor* has been taken in Colorado while *fernaldae* has not." Recently I found a specimen of *P. fernaldae* from Colorado in a collection of bumblebees sent me for study by Mr. H. L. Viereck. This specimen was collected at Duck Lake, Grant, Colorado, on July 17, 1916, at an altitude of 11,000 feet, by Mr. L. O. Jackson. In view of this record and the additional ones given in another part of this paper, it seems advisable to drop the name *tricolor* and consider this male as the opposite sex of *fernaldae*.

***Psithyrus insularis* (F. Smith)**

In 1920, Bequaert listed both *P. insularis* and *P. consultus* Franklin, from Alaska. In this connection the statement of Franklin that "*consultus*" is most probably the male of *P. insularis*" was mentioned. In 1915, Sladen published a short

article recording the capture of *P. insularis* in a nest of *Bremus flavifrons* (Cresson). As males of *P. consultus* were found in this nest, ample evidence was provided that *consultus* was the male of *insularis*. Lutz and Cockerell (1921) have wisely dropped the name *consultus* and list under *insularis* all records referring to the former species.

Psithyrus variabilis (Cresson)

A specimen contained in the collection of the Academy of Natural Sciences of Philadelphia presents evidence that *P. bicolor* Cockerell is but a color variety of *P. variabilis* (Cresson). The specimen in question is a female and was collected on June 16, 1902, at Cloudcroft, New Mexico, by H. L. Viereck. This specimen will run to *bicolor* in Franklin's key to the females of *Psithyrus*, because of the presence of some yellow pubescence on the fourth dorsal abdominal segment. According to the descriptions of *bicolor* and *variabilis* the only difference between them is that the former has some yellow pubescence on the dorsum of the abdomen. Cockerell's description was based on one female. It is interesting to note that this female was collected at Rociada, New Mexico, and has never been found elsewhere. Males of *variabilis* very frequently possess a considerable amount of yellow pubescence on the dorsum of the abdomen. I have also seen females of *variabilis* from Illinois which had a slight amount of yellow pubescence on the dorsum of the abdomen. The fact that I can find no structural difference between this specimen from New Mexico and *variabilis*, convinces me that *bicolor* is merely a color variety of *variabilis*.

D. A NEW SPECIES FROM BORNEO

Bremus folsomi new species

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.

Bremus folsomi is the first species of bumblebee to be found in Borneo. The discovery of a species of this genus at Kina Balu, however, is not surprising as bumblebees are known from Java, Sumatra and the Philippine Islands (Luzon, Mindanao and Negros).

I name this species for my friend Dr. J. W. Folsom, who first interested me in the study of the bumblebees and has assisted me in many ways.

E. NEW DISTRIBUTIONAL RECORDS

The following new distributional records, unless otherwise noted, are based upon specimens contained in the collections of the Academy of Natural Sciences of Philadelphia and the American Entomological Society.

1. *Bremus terricola* (Kirby). Montana, one queen. Not previously recorded from the United States west of North

Dakota. The presence of this species in Montana is not surprising when the records of its distribution in North Dakota, Saskatchewan, and Alberta are considered.

2. *Bremus affinis* (Cresson). Virginia, one queen and seven workers; West Virginia, two workers and two males; Illinois, one male. Franklin lists this species from Virginia and West Virginia in his geographical table, but it is not clear from his remarks whether it had actually been found there. In 1919, the writer expressed the view this species would be found in Illinois. The existence of this male confirms this supposition and makes a total of sixteen *Bremidae* now recorded from Illinois.

3. *Bremus affinis* var. *novae-angliae* (Bequaert). West Virginia, one male; Grandfather Mt., North Carolina, one male, September 11, 1908, 2500–3000 feet altitude (Z. P. Metcalf). The occurrence of this variety in these two states is interesting, as the variety was formerly only known from Massachusetts and New York.

4. *Bremus borealis* (Kirby). Volga, South Dakota, two workers.

5. *Bremus vosnesenskii* (Radoszkowski). Montana, one queen. This is a very small specimen.

6. *Bremus perplexus* (Cresson). Illinois, one worker. Listed by myself, in 1919, from Illinois on the basis of the record furnished me by the late Mr. O. S. Westcott. This is the first specimen of this species I have seen from Illinois.

7. *Bremus ternarius* (Say). Montana, one queen. This species has been repeatedly confused with *B. huntii* (Greene) in the western states, but the present specimen is without doubt *ternarius*. The fact that *ternarius* is also known from the Dakotas, Saskatchewan and Alberta helps explain the distribution in the present instance.

8. *Bremus frigidus* (F. Smith). Thunderhead Mountain, 6,000 ft. altitude, Blount County, Tennessee, one female, August 4, (H. A. Pilsbry). This species presents a very scattered distribution and is evidently one of the rarer forms throughout its range.

9. *Bremus vagans* var. *sandersoni* (Franklin). Baraga County, Michigan, one queen, July 20, 1903, (Morgan Hebard); Pequaming, Michigan, one queen, July 3, 1903, (Morgan Hebard).

10. *Bremus americanorum* (Fabricius). Nova Scotia, four queens.

11. *Bremus auricomus* (Robertson). Volga, South Dakota, two queens and one worker; Georgia, one queen; Miami, Florida, one worker, (P. Laurent).

12. *Bremus nevadensis* (Cresson). Condor, Oregon, one queen, July 5, 1899.

13. *Bremus fraternus* (F. Smith). Volga, South Dakota, one worker.

14. *Bremus morrisoni* (Cresson). Trego County, Kansas, three workers, July 12, 1912 (Williams). Specimens in the collection of the University of Kansas.

15. *Bremus impatiens* (Cresson). Douglas County, Kansas, two workers, October, (F. H. Snow); Douglas County, Kansas, one queen, May; Lawrence County, Kansas, one queen, May 5, 1911, (F. X. Williams). All specimens in the collection of the University of Kansas. Mr. E. S. Tucker recorded *B. impatiens* by the name *B. virginicus* from Lawrence, Kansas, in 1909, as listed by Lutz and Cockerell (1921). Franklin apparently overlooked this record. The present records are given merely to substantiate the occurrence in Kansas of this species.

16. *Bremus bimaculatus* (Cresson). Chatauqua County, Kansas, one queen and three workers, 1916, (Beamer); Douglas County, Kansas, four workers, July 5–August 12, 1919, (Hoffman); Douglas County, Kansas, fifteen males, July 29–30, 1919, (Hoffman). Specimens in the collection of the University of Kansas.

17. *Psithyrus insularis* (F. Smith). Duluth, St. Louis County, Minnesota, two males, August 6–8, 1912, (Witmer Stone); Shore of Keweenaw Bay, Pequaming, Michigan, one queen, July 9, 1903, (Morgan Hebard); Regua, California, one male, September 10, 1920, (C. D. Duncan).

18. *Psithyrus fernaldae* Franklin. Pequaming, Michigan, one male, August 8, 1903, (Morgan Hebard); Point Abbaye, Michigan, one male, August 4, 1903, (Morgan Hebard); Point Abbaye, Michigan, one male, July 31, 1903, (Morgan Hebard); Clingman

Dome, Blount County, Tennessee, August 4, altitude 6,000 feet, (H. A. Pilsbry); Corvallis, Oregon, one male; New Mexico, one male; Virginia, seven males; Massachusetts, one male.

19. *Psithyrus variabilis* var. *bicolor* Cockerell. Cloudcroft, New Mexico, one queen, June 16, 1902, (H. L. Viereck).



1922. "Systematic and biological notes on Bumblebees (Bremidae; Hymenoptera)." *Transactions of the American Entomological Society* 48, 307–326.

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