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THE GENUS PARATROPIDIA HULL

(DIPTERA: SYRPHIDAE)

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ABSTRACT—The genus *Paratropidia* Hull is reviewed and placed in the *Criorhina* Group of the tribe Milesini, subfamily Milesinae. Keys to the genera of the *Criorhina* Group and species of *Paratropidia* are presented. *Paratropidia bilineata* Walker is redescribed and *P.* **alex** n. sp. and *P.* **margarita** n. sp. are described from New Guinea.

The genus *Paratropidia* was proposed by Hull (1949) for a single species of Syrphidae from New Zealand. Among the unidentified syrphid specimens at the Bishop Museum, Honolulu, two new species of *Paratropidia* were found from New Guinea. Discovery of these new species has prompted a review of the whole genus, the result of which is presented below.

The type species of *Paratropidia* Hull is *Milesia bilineata* Walker (1849). Miller (1921) tentatively placed the species in *Tropidia*, but stated that there was "many excellent grounds for the establishment of a new genus upon this species . . ." (1921:313). Hull placed his new genus *Paratropidia* in the Xylotinae, a group equivalent to the tribe Milesini of the two subfamily system currently used (Wirth *et al.*, 1965 and Thompson, 1970). Within the Xylotinae, Hull recognized six tribes: Xylotini, Temnostomini, Milesini, Criorhinini, Pocotini, and Tropidini. *Paratropidia* was placed in the Xylotini by Hull and he suggested that it was "perhaps" related to *Brachypalpus*. I (1970) have followed Hull's basic arrangement of genera within the Milesini (his Xylotinae), but I have included his Pocotini within the *Xylota* group and I have broken down his Criorhinini into two groups, the *Criorhina* group and the *Blera* group.

The position of *Paratropidia* in the phylogeny and classification of the Milesini is problematic. The following characteristics of *Paratropidia* are considered to exclude it from the various groups of the Milesini: 1) metasterna developed (*Temnostoma* and *Blera* groups) and pilose (*Blera* group); 2) face straight or with a trace of tubercle

in *Paratropidia alex* (*Xylota* group), without carinae (*Tropidia* group); 3) hind femora swollen and tuberculate (*Temnostoma* and *Blera* groups), without plates or carinae (*Tropidia* group) or spurs (*Milesia* group); 4) anterior crossvein at apical third of discal cell (*Temnostoma* and *Blera* groups); 5) frontal prominence low (*Blera* group); 6) anal cell with short petiole, not long or bent (*Milesia* group); and 7) distinctive male genitalia (all groups). Thus *Paratropidia* clearly does not belong to any group of the Milesini as they are presently characterized, but rather than setting it off as a new group I prefer to tentatively place *Paratropidia* within the *Criorhina* group. This placement of *Paratropidia*, besides being based on exclusion from the other groups, is also based on two characters: 1) metasterna pilose; and 2) face straight or tuberculate (*P. alex* n. sp.). *Paratropidia* differs from the other members of the *Criorhina* group (except *Aneriophora*) in that it lacks a segmented aedeagus.

The presence of a distinct but reduced tubercle on the face of *P. alex* strongly indicates that *Paratropidia* was derived from a group with tuberculate faces. The tubercle in *P. alex* is considered a primitive trait rather than a secondary development, because: 1) tuberculate faces are found in related groups as well as in less derived ones, and 2) tuberculate faces seem to be an intermediate condition in the facial morphocline as discussed by Hull (1945 and 1949) and Thompson (1970).

This qualification of being derived from a group with tuberculate faces would probably eliminate the *Xylota*, *Tropidia* and *Milesia* groups as the source of *Paratropidia's* ancestral group. These three groups predominantly have concave or carinate, not tuberculate faces. *Paratropidia*, with its pilose metasterna, couldn't have been derived from a member of the *Blera* group, which all have bare metasterna, a derived character. Thus, the ancestral group of *Paratropidia* is restricted to either the *Temnostoma* or *Criorhina* group, with the *Criorhina* group the more plausible choice as indicated above. The following key will distinguish *Paratropidia* from the other criorhine genera.

KEY TO THE GENERA OF THE **Criorhina** GROUP OF MILESINI

1. Subcostal cell with numerous crossveins (fig. 7) ..... *Lycastris* Walker (Oriental)
   Subcostal cell without crossveins (figs. 8–11) 2
2. Metasterna pilose 3
   Metasterna bare ..... *Caliprobola* Rondani (Palearctic)
3. Posterior and apical crossveins disjunctive, not continuous; with an external spur at base of apical crossvein (figs. 10–11) 4
   Posterior and apical crossveins continuous; without an external spur at base of apical crossvein (Figs. 8–9) 5
4. Apical cell petiolate, with petiole longer than humeral crossvein (fig. 11) ..... *Aneriophora* Stuardo and Cortes (Chile)

Apical cell not petiolate, closed at wing margin (fig. 10) ..... *Flukea* Etcheverry (Chile)

5. Scutellum with a distinct emarginate rim 6
   Scutellum without an emarginate rim, evenly rounded 7
6. Barrette bare ..... *Paratropidia* Hull (Australian)
   Barrette pilose ..... *Deineches* Walker (Australian)
7. Arista inserted at tip of a conically produced third antennal segment (fig. 3) ..... *Merapioidus* Bigot (Nearctic)
   Arista not inserted at tip of conically produced third antennal segment 8
8. Face tuberculate, oral margin not produced forward (figs. 5–6) 9
   Face straight with oral margin produced forward (fig. 2) ..... *Paratropidia* Hull
9. Short, sparsely pilose flies, wasplike, with distinct yellow pollinose marking on thorax and abdomen (fig. 5) ..... *Sphecomyia* Latreille (Holarctic)
   Long, densely pilose flies, bumblebeelike, without yellow pollinose markings (figs. 6, 8) ..... *Criorhina* Meigen[1] (Holarctic, Oriental)

Paratropidia Hull

Paratropidia Hull, 1949, Trans. Zool. Soc. London 26(4):363. Type-species, *Milesia bilineata* Walker, 1849 (as *Tropidia bilineata* White) (original designation).

Head.—About ⅓ higher than long; face bare except narrowly pilose on sides, extensively pollinose except with shiny medial stripe in female of *bilineata*, straight or slightly slanted forward above, with epistoma strongly produced below, with slight trace of tubercle in *alex*; oral opening 3 to 4 times as long as broad; cheeks linear, more than twice as long as broad; facial grooves distinct, elongate, extending along lower third eyes; facial stripes distinct, narrow, pollinose and pilose; frontal prominence low, slightly above middle of head; front of male short, about 3 times as long as eye contiguity, as long as or longer than vertical triangle; vertical triangle of male long, about as long as face, about twice as long as broad at occiput; front of female narrow, from 2 (*bilineata*) to 5 (*alex*) times as long as broad at vertex, slightly shorter than face, with convergent sides above, from 2 (*bilineata*) to 4 (*alex*) times as broad at antennae as at vertex; ocellar triangle distinctly before posterior margin of eyes. Eyes bare, holoptic in males. Antennae short, slightly shorter than face except longer in *alex*; third segment quadrate with apical end slightly rounded except with elongate point in *alex*; arista bare, long, more than twice as long as antennae.

Thorax.—Slightly longer than broad, with short sparse pile and a pair of submedial longitudinal light pollinose stripes; mesokatepisterna with broadly separated dorsal and ventral pile patches; meso-anepisterna with anterior portion bare and posterior portion pilose; meso-anepimera with anterior portion pilose and posterior portion bare; meropleura bare; metathoracic pleura bare; metasterna pilose, greatly developed, with indistinct membraneous line dividing base from developed ventral portion in *bilineata* and *margarita* but absent in *alex*; postmeta-

[1] *Criorhina* of authors is apparently a polyphyletic and paraphyletic group and needs to be studied in detail. Shiraki's *Narumyia* belongs within the limits of *Criorhina* of authors and may represent a valid group. Some of the Nearctic species I have studied, such as *tricolor* Coquillett, appear to fit the description of *Narumyia*.

coxal bridge absent; metathoracic spiracle small, smaller than third antennal segment; plumulae short; scutellum with ventral pile fringe and distinct apically emarginate rim except indistinct to absent in *bilineata*, especially females. Legs: hind femora strongly swollen with a small low ventral tubercle near apex. Wings: marginal cell open, without petiole; apical cell closed distinctly before reaching costa, with petiole ranging from very short (*bilineata*) to long (*alex* and *margarita*); anterior crossvein at outer third of discal cell, strongly oblique; apical and posterior crossveins continuous, without external spurs at their bases; anal vein straight, without right angle bend before reaching wing margin (as in *Milesia*).

Abdomen.—Elongate with slightly convergent sides.

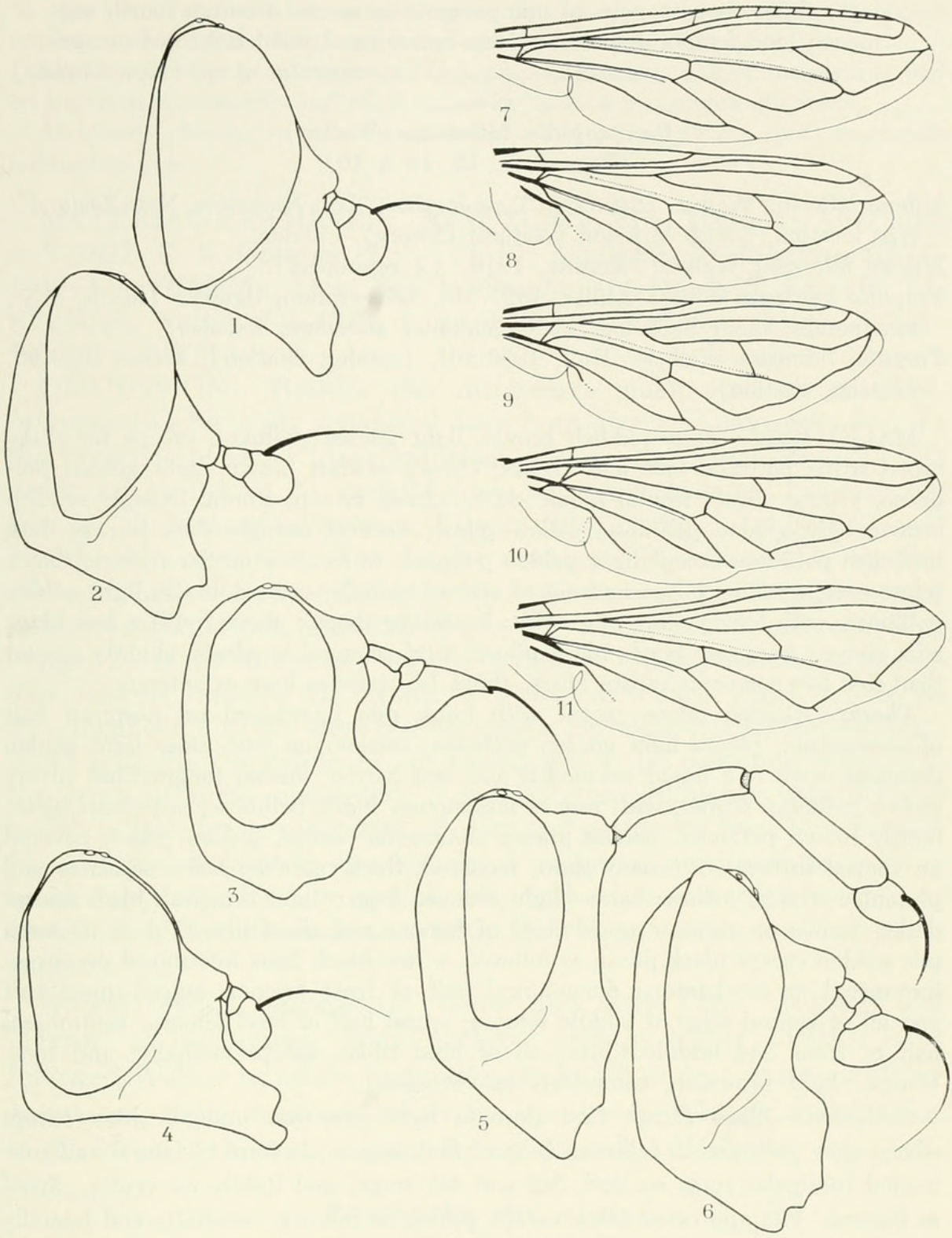
DISCUSSION: *Paratropidia* Hull with its pollinose longitudinal mesonotal stripes and facial shape, is not easily confused with any other milesine genus. *Senogaster* Macquart is the only other genus of the Milesini with longitudinal mesonotal stripes, but *Senogaster* can be easily separated from *Paratropidia* by its bifid spur on the hind femora, etc. *Paratropidia* is also one of the few genera of the Milesina with snoutlike faces. The only other genera of the Milesinae with snoutlike faces are *Lycastris* Walker, *Lycastrirhynchus* Bigot, *Rhingia* Macquart, and *Rhinotropidia* Stackelberg. *Paratropidia* can be separated from *Lycastris* by its lack of costal crossveins, from *Lycastrirhynchus* by its open marginal cell and straight R4 + 5 vein, from *Rhingia* by its apical anterior crossvein and short costa, which ends before the apex of the wing and from *Rhinotropidia* by its pollinose mesonotal strips.

Paratropidia is easily delimited by its male genitalia: 1) elongate, tubular aedeagus; 2) sclerotized elongate, tubular ejaculatory duct, which is almost completely enclosed within the aedeagus; and 3) simple hook-shaped styles. The elongate tubular construction of the aedeagus appears to be an unique development within the Milesini[2].

KEY TO THE SPECIES OF **Paratropidia** HULL

1. Scutellum black; petiole of apical cell very short, much shorter than humeral crossvein; legs brownish black ..... *bilineata* Walker (New Zealand)
   Scutellum orange; petiole of apical cell long, much longer than humeral crossvein; legs orange and black 2
2. Tarsi orange; abdomen black, without orange markings; hind femora with apical third orange and basal ⅔ black ..... *alex*, n. sp. (New Guinea)
   Tarsi black on apical four segments of anterior legs and all segments of hind

[2] Since writing this revision I have examined the male genitalia of *Orthoprosopa grisea* (Walker), a genus of the tribe Eristalini, subtribe Helophilina. The male genitalia of this species is almost identical to that of *Paratropidia* and indicates that *Orthoprosopa* should be placed in the tribe Milesini with *Paratropidia* despite its looped third vein, a typical eristaline characteristic. *Orthoprosopa* will run out to *Paratropidia* in the key given above and it can be separated from *Paratropidia* by its looped third vein and lack of pollinose mesonotal vittae.



Figs. 1–6, lateral view of heads; 7–10, wings: 1, *Paratropidia alex*, n. sp., male (PT); 2, *P. billineata* (Walker), male; 3, *Merapioidus villosus* Bigot, male; 4, *P. margarita*, n. sp., female (PT); 5, *Sphecomyia vittata* (Wiedemann), male; 6, *Criorhina ascilia* (Fallén), male; 7, *Lycastris cornutus* Enderlein, (after Hull 1949); 8, *Criorhina caudata* Curran; 9, *P. bilineata* (after Miller 1921); 10, *Flukea vockerothi* Etcheverry, (after Etcheverry 1966); 11, *Aneriophora aureorufa* (Philippi).

legs; abdomen with pairs of orange spots on second through fourth segments; hind femora with black dorso-apical band and basal third orange. ..... *margarita*, n. sp. (New Guinea)

Paratropidia bilineata (Walker)
(Figs. 2, 3, 12, 14 & 16)

Milesia bilineata Walker, 1849:566. Type-locality, "Port Nicholson, New Zealand"; type location, British Museum (Natural History), London.
Milesia bilineata Walker: Kertesz, 1910. (2 references).
Tropidia bilineata White: Miller, 1921:314, (description, figures) (heads, ♂ ♀; mesonotum; tarsi; hind leg; male genitalia; abdomen, female).
Tropidia bilineata Walker: Hull, 1936:201, (catalog citation); Miller 1950:98, (catalog citation).

MALE. *Head.*—Face reddish brown, light golden pollinose except for shiny broad stripe between face and cheeks; cheeks reddish brown, light golden pollinose, yellow pilose; frontal lunule dark reddish brown; frontal triangle reddish brown, light golden pollinose, yellow pilose; vertical triangle dark brown, dark brownish pollinose except light golden pollinose in front of ocellar triangle, black pilose except yellow pilose in front of ocellar triangle; occiput black, light golden pollinose, with long yellow pile below becoming shorter above, with a few black cilia above. Antennae black, black pilose; third segment quadrate, slightly shorter than first two segments; arista black, about 1.5 times as long as antenna.

Thorax.—Golden pilose except with black pile intermixed on posterior half of mesonotum; pleura light golden pollinose; mesonotum with sides light golden pollinose, with two broad submedial and one narrow medial longitudinal silvery brown pollinose stripes, with rest of mesonotum black pollinose; scutellum black, lightly brown pollinose, golden pilose; metasterna orange, golden pilose, covered on ventral surface with many short, recurved, thick spinelike hairs; squamae and plumulae whitish yellow; halters light orange. Legs: light brownish black except darker brown on anterior apical third of femora and all of tibiae, black on tarsi; pile golden except black pilose as follows: a few black hairs intermixed on coxae; intermixed on trochanters; dorso-apical half of front femora; antero-apical half and all of ventral edge of middle femora; apical half of hind femora; ventrobasal half of front and middle tibiae; all of hind tibiae except medially; and tarsi. Wings: light brownish, completely microtrichose.

Abdomen.—Black except first sternum light brownish orange, shiny except silvery-gray pollinose as follows: base of first tergum; in form of lateral and submedial triangular spots on 2nd, 3rd and 4th terga; and lightly on venter. Spots as figured. Pile appressed black except golden as follows: ventrally and laterally on all segment except genitalia; basal ¾ of second tergum; and basal submedial half of third tergum. Hairs on apical margin of fourth tergum strongly developed and bristlelike.

FEMALE. *Head.*—Similar to male except as follows: face more extensively shiny, with a median shiny stripe and broader shiny lateral stripes; front with two large shiny spots above and lateral to antennal bases, dark brown pollinose with a few black hairs above antennal bases, light golden pollinose medially with golden pile, shiny on upper half with black pile, with sides convergent above,

½ as wide at vertex as at antennal bases, ⅙ as wide as head width at anterior ocellus, with a faint medial impressed groove on upper ⅔.

Thorax.—Similar to male except black pile on posterior half of mesonotum and on legs is more extensive and black spinelike hairs of metasterna are fewer.

Abdomen.—Similar to male except broader and with pollinose spots frequently reduced in size.

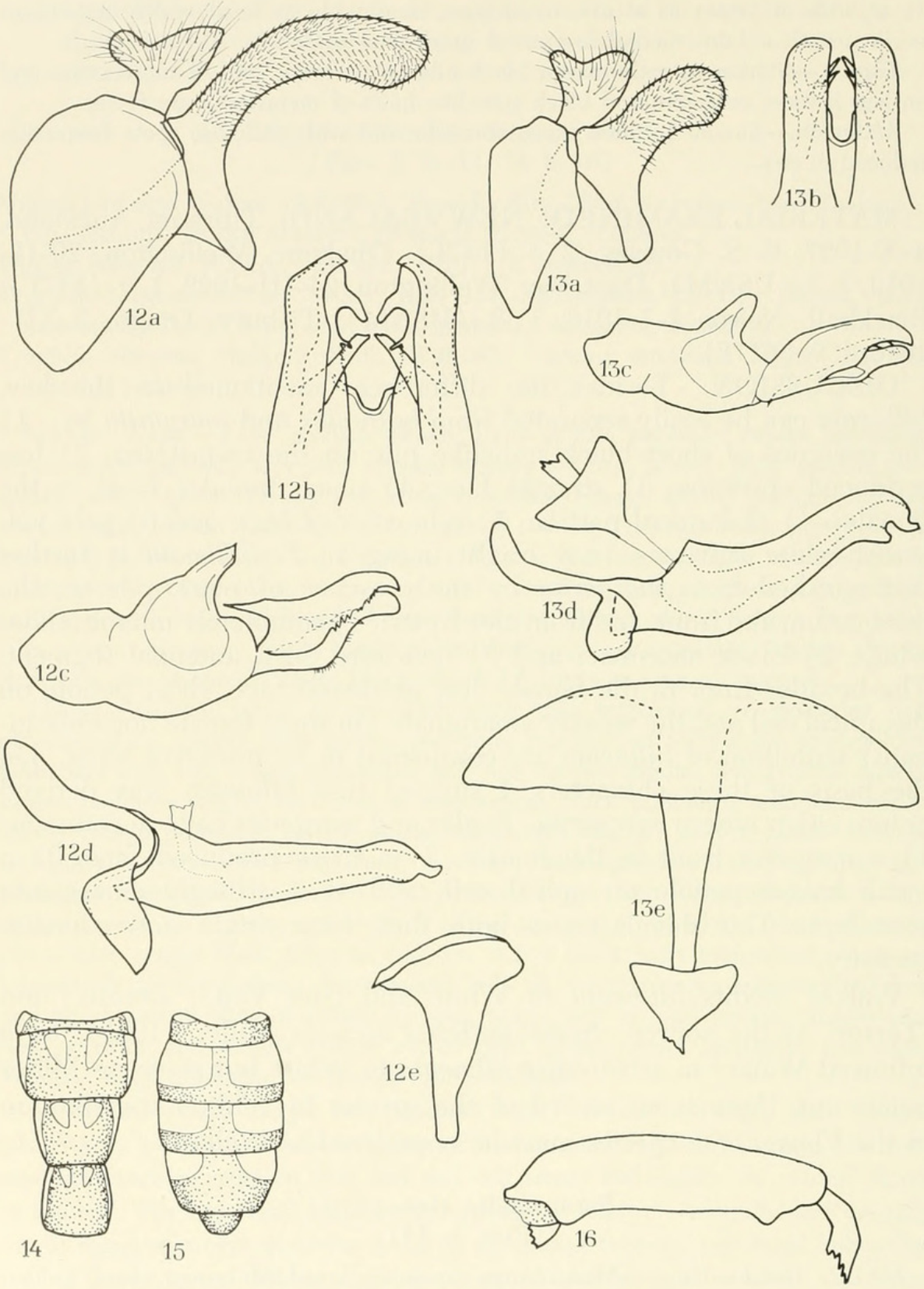
MATERIAL EXAMINED: NEW ZEALAND: Titirangi, Auckland, 4–X–1927, E. S. Gourlay, 2 ♂ (FCT); Ohakune, Wellington, 20–II–1919, 1 ♂ (USNM); Days Bay, Wellington, 24–III–1922, 1 ♀ (FCT); Blackball, Nelson I–I–1918, 1 ♀ (USNM); Tisbury, Otago, 5–XII–1916, 1 ♀ (FCT).

DISCUSSION: Besides the differences mentioned in the key, *bilineata* can be easily separated from both *alex* and *margarita* by: 1) the presence of short black spinelike pile on the metasterna; 2) less produced epistoma; 3) straight face; 4) much broader front in the female: 4) abdominal pattern; 5) pile color of legs; and 6) pale yellowish-white squamae (not bright orange). *P. bilineata* is further distinguished from *margarita* by the presence of black pile on the mesonotum and front, and from *alex* by its: 1) completely microtrichose wings; 2) black antennae; and 3) quadrate third antennal segment. The broader front in the female, less produced face, short petiole on the apical cell and the weakly emarginate (in some female non-emarginate) scutellum of *bilineata* are considered to be primitive traits. On the basis of these characters, I suggest that *bilineata* was derived before either *alex* or *margarita*. *P. alex* and *margarita* have in common: 1) a narrower front in the female, 2) a more produced face, 3) a much longer petiole on apical cell, and 4) a strongly emarginate scutellum. This demonstrates both their later origin and common ancestry.

Walker credits *bilineata* to White and cites *Voy. "Erebus" and "Terror"* as the source. Some authors, such as Miller (1921), have followed Walker in attributing *bilineata* to White but since, as Miller points out, there is no record of the species in White's contribution to the *Voyage*, the species must be considered as Walker's.

Paratropidia alex, n. sp.
(Figs. 1, 13)

MALE. *Head.*—Face reddish orange except dark reddish-brown snout, golden pollinose with pollinosity darker on snout, with a shiny stripe between face and cheeks; cheeks reddish brown, golden pollinose, yellow pilose; frontal lunule reddish orange; frontal triangle reddish orange, golden pollinose, yellow pilose; vertical triangle black, brownish-yellow pollinose in front of ocellar triangle, yellow pilose; occiput black, golden pollinose, long yellow pilose below becoming shorter above. Antennae orange except black dorsal third and apex of third seg-



Figs. 12–13, male genitalia; a, lateral view of tergite 9 and associated structures; b, dorsal view of apex of sternite 9; c, lateral view of sternite 9; d, lateral view of aedeagus and apodeme; e, lateral view of ejaculatory apodeme; 14–15, dorsal view of abdomen; 16, lateral view of hind femora: 12, *Paratropidia bilineata* (Walker); 13, *P. alex*, n. sp., (PT); 14, *P. bilineata*, male; 15, *P. margarita*, n. sp., (PT); 16, *P. bilineata*.

ment, black pilose above and orange pilose below; third segment slightly longer than basal two segments, elongate ventrally; arista black, twice as long as antenna.

Thorax.—With upper part of sternopleura laterally produced to form a blunt cone, golden-yellow pilose except black pilose across mesonotum between wings; pleura golden pollinose; mesonotum with sides broadly dark golden-brown pollinose, with two submedial longitudinal dark golden-brown pollinose stripes that are connected to lateral stripes across transverse sutures, with rest of mesonotum black pollinose; scutellum orange, translucent, shiny, orange pilose; squamae white with brownish-orange fringe; plumulae dark brown; halters orange. Legs: anterior four legs completely orange, sparsely golden pollinose, orange pilose; hind coxae brown, golden pollinose, orange pilose; hind trochanters brownish orange, orange pilose except for short black pile in small apical patch; hind femora with basal ⅔ dark reddish brown, with apical third orange, orange pilose except black pilose ventrally; hind tibiae and tarsi orange, orange pilose except with a few black hairs on apical tarsal segments. Wings: slightly smoky, dark in area of stigma, with stigma brown, microtrichose except bare medially and basally (1st and 2nd basal cells, basal third of discal cell, anterior half of anal cell, posterior half of costal cell, area around anal vein, basal half of alula—all bare).

Abdomen.—Terga shiny black except orange pollinose on first tergum and two median spots of grayish pollinosity on basal margin of second tergum, with pollinose areas orange pilose except black pilose on apical half of first tergum, with shiny areas long orange pilose laterally and appressed black pilose medially; venter shiny black except orange pollinose on first sternum, orange pilose on first and second sterna, black pilose on fourth sternum and genitalia, orange and black pilose on third sternum.

FEMALE. *Head.*—Similar to male except: snout more extensively dark; with a large bare spot above antennal bases; frons with sides convergent above, ¼ as wide at vertex as at antennal bases, 1/10 as wide as head width at anterior ocellus, and with a faint medial impressed groove on upper ⅔.

Thorax.—Similar to male except black pile on mesonotum greatly reduced and medial stripes grayish pollinose, not golden-brown pollinose as in holotype male (paratype male also with grayish pollinose stripe).

Abdomen.—As in male.

MATERIAL EXAMINED: Holotype—male: Wau, Morobe Distr., NEW GUINEA; 20 December 1961, 1400m; J. and J. H. Sedlacek, collectors. Allotype—female: same data as holotype. Paratype—male: Wau, NEW GUINEA; 7 August 1965, 1250m; J. and M. Sedlacek, Malaise Trap. Holotype and allotype in Bishop Museum, Honolulu and paratype in author's collection.

DISCUSSION: *Paratropidia alex* is easily separated from the other two species of *Paratropidia* by its produced sternopleuron. Besides the differences mentioned in the key, *alex* can be contrasted with *margarita* as follows: 1) face straight above, with a distinct trace of a tubercle, not concave above; 2) epistoma not as strongly produced; 3) front of female very narrow and shiny, not broad and pollinose above antennae; 4) third antennal segment slightly pointed, longer than broad, not round and as long as broad; 5) pleuron uniformly dark, not with

the pectus black and strongly contrasting with rest of pleuron; 6) mesonotum with black pile across the middle, not uniformly yellow pilose; 7) coxae and trochanters with orange, not black, pile; 8) front and middle coxae and trochanters orange, not black; 9) metasterna with orange, not black, pile; 10) wings with medial areas bare, without microtrichia, not uniformly microtrichose; and 11) abdominal margins continuous orange pilose, not alternating black and orange pilose.

This species is affectionately dedicated to Dr. Charles Paul Alexander. Dr. Alexander has lived one of the longest and most distinguished lives in the history of Systematic Biology. During the last 60 years Dr. Alexander has written over 900 papers on the taxonomy of Diptera, particularly the Tipulidae. He has described approximately one per cent of the total diversity of life on earth and is the first man to have named more than 10,000 species in a single family of organisms. It is hoped that Dr. Alexander may have more productive and successful years.

Paratropidia margarita, n. sp.

FEMALE. *Head.*—Mainly brownish orange except brown snout; face light brown-yellow pollinose except more brownish on snout; cheeks golden pollinose yellow pilose; frons light brownish-yellow pollinose except large brownish pollinose spot above antennal bases, light brownish-yellow pilose, with a faint medial ridge on upper ⅔, with sides convergent above, about twice as wide at antennal bases than at anterior ocellus, one eighth the width of head at anterior ocellus; frontal lunule dark reddish brown, vertex and ocellar triangle brown pollinose, black pilose, with both brown pollinosity and black pilosity extending laterally down on to frons; occiput completely golden pollinose, yellow pilose below becoming browner above. Antennae dark reddish brown except dark brown on dorsal third of third segment; third segment approximately quadrate, 1.3 times longer on ventral edge than on dorsal, twice as long as first two segments; arista brownish black, twice as long as antennae.

Thorax.—Orange brown except black pectus and diagonal stripe on mesopleura; pleura light pollinose and yellow pilose except with a few black hairs intermixed on metasterna; mesonotum dark brown pollinose except for four light yellow longitudinal stripes, with two stripes lateral and other two submedial, yellow pilose; scutellum orange, shiny, orange pilose; Squamae, plumulae and halters orange. Legs: coxae black, silvery pollinose, black pilose except with a few white hairs intermixed on outer portions; trochanters black, shiny, black pilose except with a few white hairs intermixed; anterior four femora orange except black anterobasal third, golden pilose except black pilose on black areas and posterior dorsoapical edge (more extensive on front femora than middle femora); hind femora orange except black dorsobasal spot and large dorso-apical spot which extends dorsally from basal third (connected to basal black spot) to apical tip and laterally to ventral margin on apical half, golden pilose on orange areas and black pilose on black areas; tibiae orange, orange pilose; tarsi black except orange on first segment of anterior four tarsi, dark pilose on dark areas and orange pilose on orange areas. Wings: brownish, with stigma brown, uniformly microtrichose.

Abdomen.—First tergum black except orange base and lateral margins, appressed black pilose medially and longe yellowish-orange pilose laterally; second through fourth terga black except two large orange lateral quadrate spots, with spots extending from base to apical fourth on second tergum, to apical third on third tergum, and to apical half on fourth tergum, appressed black pilose except for orange triangular pile patches extending from base of tergum medially to end of orange spots laterally; fourth tergum with a small lateral white pollinose spot; fifth tergum dark orange, black pilose; first sternum dark, silvery pollinose, white pilose; second through fourth sterna orange, white pilose except black on apical half of fourth sternum; fifth sternum black, black pilose; cerci bright orange.

MATERIAL EXAMINED: Holotype, female. Daulo Pass, Asaro-Chimbu Dic., NEW GUINEA (NE); 11 June 1955, 2400m; J. L. Gressitt, collector. Paratype, female. Daulo Pass, NEW GUINEA (NE); 2 May 1959, 2500m; C. D. Michener, collector. Holotype in Bishop Museum, Honolulu and paratype in author's collection.

DISCUSSION: This species is named after Dr. Alexander's devoted wife, Mabel Margarita, who has not only made me feel free at home with them but a part of it. For a discussion of the differences between *margarita* and the other species, see the discussions under those species.

ACKNOWLEDGMENTS

I would like to thank Dr. J. L. Gressitt of the Bishop Museum, Honolulu for the loan of the material described in this study; Dr. G. Kuschel of New Zealand Department of Scientific and Industrial Research for the gift of the *Paratropidia bilineata* material used; and Dr. Lloyd V. Knutson of the Systematic Entomology Laboratory, USDA, for his critical reading of this manuscript.

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OBSERVATIONS ON THE MATING PERIODS OF SOME GROUND BEETLES

(COLEOPTERA: CARABIDAE)

The majority of North American Carabidae apparently mate in spring. During June and July, 1971, I observed, in the field and in captivity, mating pairs of sixteen species of ground beetles, in Saguenay County, and in Schefferville, New Quebec, Quebec. The following is a list of the mating pairs, with their dates and numbers.

Agonum decentis Say: Tadoussac, June 14, in captivity, a pair.

A. muelleri Herbst: Port-Menier, July 13, in captivity, a pair.

A. propinquum G. and H.: Natashquan, June 28, in captivity, a pair.

Amara torrida Panzer: Blanc-Sablon, July 4, in the field, two pairs; Brador, July 7, in the field, three pairs; Havre-Saint-Pierre, June 24, in the field, a pair; Magpie, June 23, in the field, a pair; Mingan, June 21, in the field, a pair; Port-Menier, July 13, in captivity, a pair.

Bembidion carinula Chaud.: Rivière-Saint-Jean, June 22, in the field, a pair.

B. petrosum Gebler: Rivière-Saint-Jean, June 22, in the field, three pairs.

B. sejunctum Casey: Magpie, June 23, in the field, a pair.

Blethisa multipunctata L.: Natashquan, June 28, in captivity, a pair.

Carabus chamissonis Fischer: Blanc-Sablon, July 4, in captivity, a pair, and July 8, in captivity, two pairs; Brador, July 6, in captivity, a pair.

Harpalus affinis Schrank: Baie-Trinité, June 17, in captivity, a pair; Havre-Saint-Pierre, June 20, in the field, two pairs, and June 24, in the field, two pairs; Port-Menier, July 13, in captivity, a pair; Rivière à l'Huile, July 14, in captivity, four pairs.

H. rufipes De Geer: Rivière à l'Huile, July 14, in captivity, a pair.

Nebria gyllenhali Schön.: Blanc-Sablon, July 4, in the field, a pair; Schefferville, July 23, in captivity, a pair.

Pterostichus coracinus Newman: Port-Menier, July 12, in captivity, two pairs.

P. melanarius Illiger: Baie-Sainte-Claire, July 18, in captivity, a pair.

P. punctatissimus Randall: Middle Bay, July 5, in captivity, a pair.

Sphaeroderus nitidicollis Chev.: Rivière Jupiter, July 17 and 18, in captivity, four pairs.

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