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Revision of the Genus *Dimarella* Banks (Neuroptera: Myrmeleontidae)

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Abstract

A taxonomic study of the new world genus *Dimarella* has led to the recognition of 17 species, 9 of which are newly described. Three subgenera are recognized, one of which is described as new. Larvae are described for 11 species and biological data are given. Keys to adults and larvae are provided as well as photographs of larvae and taxonomic drawings. Distribution is summarized in maps.

KEY WORDS: Ant-lion; Biology; *Dimarella*; Larva; Revision; Taxonomy.

Introduction

Many of the new taxonomic revelations presented here are a result of rearing larvae collected in the field in Mexico and Venezuela. We are reducing the genus *Pachyleon* Stange to a subgenus of *Dimarella* in part because the larva of a new species from Venezuela is virtually indistinguishable from the larva of *Dimarella praedator* (Walker) even as regards to detail of color pattern. We are also describing a new subgenus from Brazil. The three subgenera are distinguished by the shape and venation of the wings. We view the differences in wing characters as part of a variation gradient. The subgenera represent extremes of the narrowing and broadening of the wings which, however, show some similar variation within the subgenus *Dimarella*.

The subgenus *Pachyleon* differs from the other two genera in the structure of the pretarsal claws

which can not close upon the distal tarsomere in contrast to the other subgenera. This characteristic has been viewed (Stange, 1963) as of major evolutionary importance. However, it now appears to be less significant because *Pachyleon* is otherwise structurally close to the subgenus *Dimarella* in almost all other details, both in adult and larval structure. The actual movement of the pretarsal claws needs to be studied in more detail. We have observed that in *Dimarella* the claws can close upon the distal tarsomere without spreading apart. However, in *Pachyleon* if the claws are moved toward the distal tarsomere, they will spread apart before reaching the tarsomere. In the *D. angusta* group a third condition appears to occur. In this group the claws are always spaced farther apart so that when they move toward the tarsomere they do not contact it but move to either side of the tarsomere.

The new subgenus *Brasileon*, described below, is still shrouded in some uncertainty as to taxonomic position since the larval stage is unknown and the adults possess two important structural differences from the other two subgenera. These are the lack of tibial spurs at least on the midlegs and hindlegs and lack of a postventral lobe on the male ectoproct. However, the length of the tibial spurs shows some variation in the subgenus *Dimarella*, and one species of *Brasileon* has tibial spurs on the forelegs. *Brasileon* shares many apomorphies with the subgenus *Dimarella* as to details of male genitalia, leg modifications, enlarged mesoscutellum, modifi-

cation of the head and structure of the female terminalia.

These three subgenera share many apomorphic characters. The antennal fossa are separated from the ocular rim by more than greatest width of the pedicel (Figs. 23, 24). This character is unknown in other Myrmeleontidae. Another apomorphic character which characterizes *Dimarella* is the proximity of the radial and subcostal veins (Fig. 17) which is found in all species with one exception, *Dimarella riparia* (Navas). Other apomorphies are the enlarged mesoscutellum (Fig. 25) and the structure of the male genitalia (Figs. 34, 36). All other described new world genera of Nemoleontini lack these apomorphies. However, one undescribed genus containing several species now placed in *Psammoleon* does possess the same type of male genitalia and also has a few structures similar to *Dimarella*.

We have reared the larvae of eleven species of *Dimarella* representing the subgenera *Dimarella* and *Pachyleon*. All of these larvae have similar ecological characteristics. The *D. menkei* and *D. angusta* groups live in open sand tracts or dunes. Larvae of the subgenus *Pachyleon* and *D. praedator* groups can live in shallower sand and prefer protected, shaded areas, such as at the base of trees and under bridges. Descriptions of the habitats, larval structure and behavior and a key to known species are presented here.

Most of the species are quite distinctive, although the male genitalia are of limited value in this genus. Differences in leg structure, wing venation, presence or absence of white bristles on the mesoscutum, and differences in length of the postventral lobe of the male ectoproct provide diagnostic characters in most instances. There are a few closely related species which pose problems in interpretation. These are between the Mexican species *D. nayarita* and *D. psammophila* and the South American species *D. angusta* and *D. bolivarensis*.

Nine new species are described here. Authorship of four species (*D. pennyi*, *D. mixteca*, *D. totoneca*, *D. zulia*) should be credited to R. B. Miller, whereas the other five species (*D. amazonica*, *D. bolivarensis*, *D. nayarita*, *D. guarica*, *D. blohmi*) should be credited to L. A. Stange.

We wish to thank Jack Hall, Riverside, California for the identification of bombyliid fly parasites. Terminalia were drawn from structures cleared in KOH and stained with Wilkey's double stain. Photographs were taken by Robert Miller. Those of the larvae (Figs. 1-16) are all relatively the same size. Research was carried out under the auspices of the Florida Dept. Agric. & Consumer Serv., Division

of Plant Industry, Bureau of Entomology (Contribution No. 669).

Material studied during this investigation is housed in the following collections. Types studied by the authors are indicated by an exclamation mark after the collection symbol.

Barcelona - Museo de Zoologia, Apartado de Correos 593, Barcelona, Spain

BM - British Museum (Natural History), Cromwell Road, London, SW75BD

CAS - California Academy of Sciences, Golden Gate Park, San Francisco, California 94118

FSCA - Florida State Collection of Arthropods, Florida Dept. of Agriculture, 1911 S.W. 34th Street, Gainesville, Florida 32602

INPA - Colecao Sistemática da Entomologia, Instituto Nacional de Pesquisas da Amazonia, Estrada do Aleixo, 1756, C. P. 478, 69.000 Manaus, Brasil

IZAV - Instituto de Zoologia Agrícola, Facultad de Agronomía, Universidad Central de Venezuela, Apartado 4579, Maracay, Venezuela

LACM - Los Angeles County Museum of Natural History, 900 Exposition Blvd., Los Angeles, California 90007

La Plata - Museo de Ciencias Naturales, Universidad de la Plata, Paseo del Bosque, 1900 La Plata, R. Argentina.

Leyden - Rijksmuseum van Natuurlijke Historie, Postbus 9517, 2300 RA Leiden, the Netherlands

MC - Private collection, Robert B. Miller, P. O. Box 1092, Project City, California 96079

MCZ - Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 01238

SC - Private collection, Lionel A. Stange, 610 NW 54 Terrace, Gainesville, Florida 32607

Turin - Istituto e Museo di Zoologia Sistemática, Università di Torino, Via Giovanni Giditti 34, I-10123, Torino, Italy.

USNM - Smithsonian Institution, Washington, D. C. 20560

Dimarella Banks 1913

Dimarella Banks, 1913. Trans. Amer. Entomol. Soc. 39: 229; Banks, 1943, Bol. Ent. Venezolana 2(3): 166; Stange, 1963, Ann. ent. Soc. Amer. 56: 810-816. Stange, 1967. Acta Zool. Lilloana 22: 59; Stange 1970, Contrib. Sci. 186: 7, 18. Type species: *Eremoleon angustus* Banks, 1908, by original designation.

=*Nobra* Navas 1915. Broteria 13: 6. Type species: *Nobra martinsi* Navas, by monotypy (Synonymy by Stange 1963: 812).

=*Furgus* Navas 1921:51. Estudios 21: 51. Type species: *Nobra riparius* Navas, by original designation (Synonymy by Stange 1967: 58).

=*Mystroleon* Banks, 1924. Bull. Mus. Comp. Zool. Harv. 65: 436. Type species: *Myrmeleon praedator* Walker, by monotypy (Synonymy by Stange 1963: 812).

Description: **Adults:** Labrum strongly emarginate at middle; antennal fossae widely separated from ocular rim (by more than greatest diameter of pedicel); antenna variable in length; distal palpomere of labium not swollen; pronotum wider than long; mesoscutellum as long or somewhat longer than metanotum; legs different in lengths, midleg the shortest; hindleg the longest; forefemur often swollen; midtibia sometimes swollen wider than hindtibia; tibial spurs present or absent (*Brasileon*); tarsomeres of foreleg and midleg subequal, those of hindleg much longer; pretarsal claws capable of closing upon distal tarsomere without separating (except *Pachyleon*); wings without Banksian lines; subcostal and radial veins run close together, nearly touching well before their fusion at stigma (except *D. riparia*); male abdomen with numerous tufted pore plates, especially on basal tergites; male abdomen with hairless eversible sacs between segments VI and VII; male ectoproct with or without postventral lobe; male paramere with hook, gonarcus with ventral process; female ectoproct with strong digging setae ventrally, shorter than those on lateral gonapophysis.

Larvae: Mandible shorter than head capsule length, with 3 evenly spaced teeth; basal tooth originates well before mid point of mandible; distance between teeth only little longer than distance between basal tooth and mandibular base; labial palpus 3-seg-

mented; dorsal surface of head capsule with scattered dolichasters; mesothoracic spiracle borne on tubercle; abdominal spiracles borne on small, inconspicuous tubercle or large and bulbous (*D. angusta* Group); abdomen without lateral scoli; abdominal sternite VIII without submedian teeth.

Key to Species of *Dimarella* Banks

ADULTS

1. Tibial spurs absent on midlegs and hindlegs; basal tarsomere of hindleg longer than distal tarsomere; CuP + 1A of forewing runs obliquely to hindmargin well before origin of radial sector (Fig. 21); Subgenus *Brasileon* 2

Tibial spurs present on all legs; basal tarsomere of hindleg shorter than distal tarsomere; CuP + 1A of forewing runs parallel with vein CuA and hindmargin for a long distance (Figs. 17, 18) 3

2. Tibial spurs present on forelegs; mesoscutellum weakly humped at anterior one-third; hindfemur with many black spots on basal 3/4's bearing setae that are as long or longer than femur diameter *pennyi* n. sp.

Tibial spurs absent on forelegs; mesoscutellum strongly humped at anterior one-third; hindfemur nearly all pale yellow on basal 3/4's, longest setae less than 1/2 length of femur diameter *amazonica* n. sp.

3. Hindwing broadest near prestigmal level, then abruptly narrowed toward apex (Figs. 19, 20); pretarsal claws not capable of closing against ventral surface of distal tarsomere (Fig. 29); Subgenus *Pachyleon* 4

Hindwing lanceolate (Fig. 18); pretarsal claws capable of closing against ventral surface of tarsomere (Fig. 32) Subgenus *Dimarella* 5

4. Hindwing as broad as forewing (Fig. 20); forewing vein 2A nearly touching vein 3A (Fig. 22); Brasil *alvarengai*

Hindwing much narrower than forewing (Fig. 19); forewing vein 2A separated by at

- least vein diameter from vein 3A; Venezuela; Surinam *blohmi*
5. Forewing vein CuP + 1A reaches hind margin near origin of radial sector (Fig. 18); forewing posterior area narrower (at greatest height) than cubital area (area between anterior and posterior forks of CuA) at level of radial sector with one series of cells; Mexico and Central America (*D. menkei* Group) 6
- Forewing vein CuP + 1A reaches hind margin well beyond origin of radial sector (Fig. 17); forewing posterior area higher than cubital area at origin of radial sector, with two series of cells; Neotropical 9
6. Basitarsus of foreleg about 3X longer than wide, somewhat shorter than length of tibial spurs; basal palpomere of labium pale brown 7
- Basitarsus of foreleg about 4X longer than wide, much longer than tibial spurs; basal palpomere of labium dark brown 8
7. Hindfemur with row of white setae on closing face, most of which are about equal to greatest femur diameter (Fig. 27); clypeal-frontal area with submedian dark brown spots *menkei*
- Hindfemur without row of prominent white setae on closing face, setae present are dark brown and mostly shorter than greatest femur diameter (Fig. 26); clypeal-frontal area completely pale brown *mixteca*
8. Foretibial spurs much less than 1/2 length of basitarsus; midtibia with no more than two outstanding bristles that are longer than greatest tibial diameter *nayarita*
- Foretibial spurs at least 1/2 length of basitarsus; midtibia with at least four outstanding bristles in a row that are longer than greatest tibial diameter *psammophila*
9. Subcostal and radial veins in both wings widely separated by at least diameter of subcostal vein well before their fusion at stigmal area; postventral lobe of male ectoproct longer than 8th abdominal segment; S. Brazil, Uruguay, Argentina (*D. riparia* Group) *riparia*
- Subcostal and radial veins closely approximated (by much less than diameter of subcostal vein) well before their fusion at stigmal area; postventral lobe of male ectoproct less than 1/2 length of 8th abdominal segment 10
10. Forefemur cylindrical, at least 9X longer than wide (*D. angusta* Group) 11
- Forefemur greatly swollen, about 5X longer than wide (*D. praedator* Group) 13
11. Forefemur about 10X longer than wide; hindfemur over 16X longer than wide (Fig. 28); Gran Sabana, Venezuela; Northern Brazil *bolivarensis*
- Forefemur about 9X longer than wide; hindfemur no more than 15X longer than wide 12
12. Hindfemur about 10X longer than wide; forecoxa mostly pale brown *zulia*
- Hindfemur 14X to 15X longer than wide; forecoxa mostly dark brown on basal one-half of lateral face *angusta*
13. Mesoscutum without white bristles 15
- Mesoscutum with white bristles 14
14. Postventral lobe of male ectoproct about 2.5X longer than middle diameter and shorter than longest setae on apical swelling Venezuela *guarica* n. sp.
- Postventral lobe of male ectoproct at least 4X longer than middle diameter and much longer than longest setae on apical swelling widespread South America *praedator*
15. Hind basitarsus 5X longer than middle diameter, much longer than tibial spurs; abdominal tergite II (Fig. 38) of male nearly as long as tergite III and much broader; Brazil, Venezuela *effera*
- Hind basitarsus 4X longer than middle diameter, only a little longer than tibial

- spurs; abdominal tergite II (Fig. 39) of male only 1/2 as long as tergite III and not much wider 16
16. Hindfemur with subbasal fuscous band complete; forewing stigmal area nearly completely dark brown suffused; postventral lobe of male ectoproct longer than longest setae on apical swelling; Costa Rica; Panama; Ecuador *garciai*
- Hindfemur with subbasal fuscous dark brown marks not forming complete band, mostly pale brown on closing face; forewing stigmal area not completely dark brown suffused; postventral lobe of male ectoproct shorter than longest setae on apical swelling; Mexico *totoneca* n. sp.

THIRD INSTAR LARVAE

1. Lateral abdominal spiracles large and bulbous (Fig. 1) ... *angusta* and *bolivarensis*
- Lateral abdominal spiracles not readily visible (Figs. 3-16) 2
2. Ventral head capsule with submedian dark brown spots near middle (Figs. 14, 16) 3
- Ventral head capsule without submedian dark brown spots near middle (Figs. 4, 6, 8, 10, 12) 5
3. Setae near middle of dorsal head capsule unexpanded from base, more than 5X longer than greatest diameter, and with chisel-shaped ends *totoneca*
- Setae obviously expanded from base and less than 4X longer than greatest width ... 4
4. Distal palpomere of labium pale brown with sensory pit opening not greatly swollen in lateral view (Fig. 43) . *praedator* and *blohmi*
- Distal palpomere of labium dark brown with black sensory pit greatly swollen in lateral view (Fig. 42) *effera*
5. Mesothoracic spiracle borne on tubercle about as long as wide *guarica*
- Mesothoracic spiracle borne on tubercle longer than greatest diameter 6
6. Distal palpomere of labium about 2.5X longer than wide; base of pale brown forecoxa with dark spot reduced to less than 1/2 of lateral face *psammophila*
- Distal palpomere of labium over 3X longer than wide; base of pale forecoxa with dark brown covering complete lateral face 7
7. Basal dark spot of forecoxa reaching to about middle of coxa; pronotum with about 10 peg-like setae from anterior margin of posterior dark brown spot to anterior margin *nayarita*
- Basal dark brown spot of forecoxa reaching to less than 1/3 length of coxa; pronotum with more than 15 peg-like setae from anterior margin of posterior dark spot to anterior margin 8
8. Sublateral dark brown spots on dorsal surface of head capsule separated by much more than spot width (Fig. 11); pronotum with sublateral dark spot near anterior margin *mixteca*
- Sublateral dark brown spots on dorsal surface of head capsule nearly contiguous, separated by much less than spot width (Fig. 9); pronotum without sublateral dark spot near anterior margin *menkei*

Brasileon Miller & Stange new subgenus

Type species: *Dimarella (Brasileon) amazonica* Stange.

Diagnosis: This subgenus can be separated from other subgenera of *Dimarella* by the lack of tibial spurs on at least the midlegs and hindlegs, the oblique course of forewing vein CuP + 1A which reaches the hind margin before the origin of the radial sector and the lack of a postventral lobe of the male ectoproct.

Description: Pretarsal claws capable of closing upon the distal tarsomere without spreading; midleg and hindleg without tibial spurs; pretarsal claws and

tibial spurs (when present) fuscous; mesoscutum without outstanding white bristles; basal tarsomere of hindtarsus longer than distal tarsomere; forewing and hindwing long and narrow, hindwing shorter than forewing; forewing vein CuP + 1A run at an oblique angle to hind margin, reaching hind margin well before origin of radial sector; male ectoproct without postventral lobe.

Discussion: Until recently only *D. amazonica* was available for study. This species lacks tibial spurs on all legs, suggesting that this species belonged to a different genus than *Dimarella*. However, a second species was discovered which has tibial spurs on the forelegs and which thus casts some doubt as to the importance of this character as a generic character. Other characters that separate *Brasileon* from *Pachyleon* and *Dimarella* are the lack of a postventral lobe of the male abdomen and short course of the forewing vein CuP + 1A. We are placing this taxon as a subgenus of *Dimarella* because other characters, such as the distance between the antennal fossa and ocular rim, enlarged mesoscutellum, male genitalia and general leg structure, agree with *Dimarella*. However, it is clear that *Brasileon* is more distantly related to *Pachyleon* and *Dimarella* than these two subgenera are to each other, and when the larval stage is known, it might be elevated to generic level.

Dimarella (Brasileon) amazonica

Stange

new species

Figure 21, Map 3

Holotype male, Jacareacanga, Para, Brasil, XII-1968, M. Alvarenga. Deposited in the collections of the Florida State Collection of Arthropods.

Diagnosis: The lack of tibial spurs on the forelegs is diagnostic.

Description: Length of body about 16 mm, forewing 18 mm, hindwing 14 mm, greatest forewing width about 3 mm, hindwing 2 mm.

Coloration: General body color dark brown to gray, wings mostly pale yellow with dark forewing stigmal spot, apical white spot on hindwing and with limited vein streaking; face with large broad shiny fuscous band below antennae extending narrowly along ocular rim toward vertex where it continues as a narrow transverse fuscous band limiting the anterior margin of vertex, also extending around antennal fossae; clypeus and labrum pale yellow.

Vertex dark grey enclosing reddish scars; postgena shiny brown; antenna with scape pale yellow with narrow fuscous basal ring fading at anterior middle, pedicel pale yellow in front, mostly fuscous behind, flagellomeres I-IV with narrow apical fuscous ring nearly restricted to posterior side, V-XX with broad, complete apical fuscous ring, club with anterior side mostly pale yellow; maxilla and labium pale yellow except for much of cardo, stipes, prementon; pronotum mostly dull dark grey, small ash grey spot at sublateral middle, part of midline and near posterior margin; alinoto mostly dark grey to brown, small ash grey spots anterior to scutellum, sublaterally in front of wing base and on anterior and much of lateral margin of mesoscutellum which also has a shiny fuscous spot submedially at anterior end; pleura mostly dark brown above, dull orange below fading to ash grey at venter; forecoxa mostly pale yellow but with anterior face mostly fuscous and with scattered pale grey areas, especially posteriorly; other coxae mostly grey; forefemur with pale yellow background but considerably darkened by fuscous spots at setal bases, spotting confluent in many places, especially mostly fuscous mesal face; foretibia pale yellow with large fuscous spots and streaks, closing face nearly completely fuscous; midfemur pale yellow with numerous fuscous spots and streaks, subapical fuscous ring; midtibia mostly pale yellow with irregular, well spaced fuscous spots at setal bases except lateral face which is densely streaked with fuscous spots and dashes; hindfemur all pale yellow except broad apical fuscous ring; hindtibia pale yellow with fuscous apical ring and numerous fuscous spots becoming confluent basally on closing face, elsewhere sparsely spotted; tarsi of all legs with same basic pattern, basitarsus pale yellow with lateral fuscous stripe and fuscous apical ring, next tarsomere mostly pale yellow with fuscous apical ring, fuscous rings increasing in size in proportion to pale yellow toward distal tarsomere which is predominately fuscous; pretarsal claws black; wing veins nearly all pale yellow with fuscous streaks at some crossvein junctures, extreme base of most veins fuscous, crossveins of stigma of forewing fuscous; wing membrane nearly without suffusion, fuscous stigma followed by pale yellowish area in forewing, hindwing with a small white spot at extreme apex; abdomen nearly completely dark brown, tergites II-VII and posterior sternites with small pale yellow apical spot at posterior margin; ectoproct with most of middle pale yellow.

Chaetotaxy: Vertex and face with few evident setae except for some long ones on clypeus and labrum; pronotum with very short setae, alinotum

with short setae on prescutum and in front of scutellum, elsewhere not evident; forecoxa with white, mostly appressed setae, especially on lateral face; forefemur densely matted with mostly white setae except medial face which has a number of long, mostly dark setae; foretibia and midlegs with a moderate number of bristles, hindfemur without bristles although with considerable fine white hair-like setae; hindtibia with bristles reduced in length to less than diameter of tibia; ventral setal pad of distal tarsomere with bristles somewhat thickened, straight; femoral sense hair not distinguishable; wings with all setae so reduced to be barely distinguishable except for base of costal and posterior veins; abdomen with setae extremely reduced in size except for tergite and sternite IX and ectoproct which has several outstanding black bristles ventrally.

Structure: Head with vertex raised above eyes with higher, rounded submedial prominence; greatest ocular width about one-half interocular distance (measure just below antennal fossae); antenna rather long with 28 flagellomeres, flagellomere I longer than wide, rest wider than long with increasing width toward apex; distal palpomere of labium slender, sensory pit nearly round, slightly closer to base than to apex; pronotum about 1.25X wider than long; mesoscutellum strongly humped at anterior one-third; forefemur thickened beyond base, about 6X longer than greatest breadth, longer than foretibia and slightly longer than midfemur which is somewhat thickened subapically; foretibia nearly cylindrical, longer than midtibia which is swollen; hindfemur cylindrical, about 10X longer than greatest breadth, somewhat longer than hindtibia; tibial spurs absent; basitarsus of foreleg about 5X longer than wide, tarsomere and claw proportions of foreleg about 35:25:18:10:40:32; basitarsus of midleg about 5X longer than wide, tarsomere and claw proportions 35:20:15:10:40:32; basitarsus of hindleg about 7X longer than wide, tarsomere and claw proportions about 48:25:18:10:40:32; wings extremely narrowed, forewing longer than hindwing, costal area with cells longer than high, other details as in Figure 21. Abdomen much shorter than wings, pleural regions of segments III and IV broadened, tergites II-VIII and sternites III-VIII with numerous small pits; male ectoproct without postventral lobe.

Female: Agreeing with the male except: Abdominal tergites and sternites without tufted pore plates.

Types: In addition to the holotype, one paratype female bearing the data "Obydos, Brazil, 18 Aug. '19,

Parish coll." identified as *Mystroleon praedator* (by Banks), was studied from the collections of the Museum of Comparative Zoology, Harvard University. Two paratype females, Brazil, Para, Tukurui, Rio Tocantins, 12-16.VI.1980, J. A. Rafael (INPA). One paratype female, T. Guapore, C. Samuel, Rio Jamary, Park, Brasil (SC).

Discussion: Markl (1954: 247, Fig. 85) published a figure of the wings of this species misidentified as *Mystroleon praedator* (Walker).

Dimarella (Brasileon) pennyi Miller new species Map 3

Holotype female, "Brasil, Para, Conceicao do Araquai, 13-24-I. 1983, N. Penny." Deposited in the Instituto de Pesquisas da Amazonia (INPA).

Diagnosis: Distinguished from all other *Dimarella* by the presence of tibial spurs on the forelegs only.

Description: Length of body about 14 mm, forewing 17 mm, hindwing 15 mm, greatest forewing width about 3 mm, hindwing width about 2.5 mm.

Coloration: General and specific color markings about the same as *amazonica* except as follows: face with broad shiny fuscous band extending below onto clypeo-frontal area; distal palpomere of labium with some dark brown marking; antenna with fuscous dark basal and dorsal mark much reduced; flagellomeres I-IV with apical fuscous ring complete as in following flagellomeres; pronotum with sublateral gray area more extensive and paler; alinoto nearly completely dark brown to gray, faint pale brown sublateral area anterior to all dark scutellum; hindfemur with numerous fuscous spots, especially at setal bases, basad to apical fuscous band; all tibiae more dark brown; subapical tip of hindwing with reduced thickened white suffusion.

Chaetotaxy: No significant differences in chaetotaxy were observed between *amazonica* and *pennyi*.

Structure: Foretibia with fuscous spurs which extend about one-fourth length of basitarsus; mesoscutellum weakly humped at anterior one-third; forewing hypostigmatic cell with a fuscous crossvein near distal end.

Subgenus *Dimarella* Banks 1913

Type species: *Eremoleon angustus* Banks, by original designation.

Description: Pretarsal claws capable of closing upon or beyond the distal tarsomere; all legs with tibial spurs; pretarsal claws and tibial spurs pale yellow basally, pale red distally; mesoscutum with or without outstanding white bristles; basal tarsomere of hindtarsus shorter than distal tarsomere; forewing and hindwing about equal in length, hindwing much narrower than forewing; forewing vein CuP + 1A, and posterior branch of CuA run parallel with each other and hind margin for a long distance, CuP + 1A reaches hind margin near or well beyond origin of radial sector; forewing vein 2A closely associated with vein 1A before angling sharply toward vein 3A; male ectoproct with well developed postventral lobe.

Discussion: Four distinct species groups are represented in this subgenus, three of which can be identified by the wing venation. *D. riparia* Group has the subcostal and radial veins well separated in both wings for their complete courses to the stigma. This is unique in the genus. The *D. menkei* Group, restricted to Mexico and Central America, has the forewing vein CuP + 1A running to the hind margin near the origin of the radial sector with a narrow posterior area with only one series of cells. The other two groups, *D. angusta* and *D. praedator*, have vein CuP + 1A running to hind margin well beyond origin of the radial sector and have two series of cells. They differ by leg structure, especially the length of the forefemur. The forefemur is strongly swollen and about 5X longer than wide in the *D. praedator* Group, whereas the forefemur is at least 9X longer than femur diameter in the *D. angusta* Group. Furthermore, the *D. angusta* Group has the second tarsomere in most legs longer than the basitarsus and the basal antennal flagellomeres are longer than wide. Larvae are known for three of the groups and also show good group differences. *D. angusta* larvae have bulbous abdominal spiracles. The mesothoracic spiracle is borne on a tubercle that is longer than wide in the *D. menkei* Group in contrast to the *D. praedator* Group where the tubercle is usually about as long as wide. The larvae of the subgenus *Pachyleon* are virtually identical to those of the *D. praedator* Group.

D. angusta Group

Description: Mesoscutum with very long white bristles; forefemur cylindrical, at least 9X longer than greatest femur diameter; basitarsus shorter than tarsomere II; forewing vein CuP + 1A runs parallel with posterior branch of CuA and hind

margin for a long distance, reaches hind margin well beyond origin of radial sector; forewing posterior area about as high as cubital area at origin of radial sector, with 2 series of cells; subcostal and radial veins of both wings closely approximated (by much less than diameter of subcostal vein) well before their fusion at stigmal area; postventral lobe of male ectoproct 2X to 3X longer than middle diameter.

Larva: Lateral abdominal spiracles enlarged and bulbous; ventral head capsule without sublateral dark brown spots; head and mandibles dark brown dorsally and ventrally; thorax and abdomen with ivory-colored background with dark brown spots dorsally and ventrally.

Biology: Larvae live in sandy areas beneath small bushes and grasses which protect them from overheating. They live under conditions in which they become trapped in damp, well-drained sand frequently during the rainy season. The enlarged spiracles may be an adaptation to these conditions. In capturing prey in the laboratory, they show no tendency to run forward or dig after prey, but simply lie in wait with only the mandibles exposed. They walk from place to place if the need arises to regulate temperature. *D. angusta* is found in sandy areas bordering rivers, and coastal sands.

Discussion: This group of *Dimarella* has more elongate legs and antennae. The elongate tarsomere II of the midleg and hindleg which is longer than the basitarsus (Fig. 32) is diagnostic of the adults. The larva is distinguished by the enlarged abdominal spiracles. We are recognizing three species which are structurally very similar, differing by the degree of lengthening of the hind leg. The three species occur very close to one another, and *angusta* has a very large range, but structural characters are constant without intermediate forms or geographic variation.

Dimarella (Dimarella) angusta (Banks) Figure 17, Map 4

Eremoleon angustus Banks 1908. Proc. ent. Soc. Wash. 9: 31. Holotype female, Santa Elena, Ecuador (MCZ!).

=*Furgus campestris* Navas 1930:107. New Synonym. Holotype male: Guayaquil, 1930, Campos (Barcelona!)

=*Nobra nevermanni* Navas 1936. Broteria 32: 167.

Syntypes, Farm Hamburg am Reventazon, Costa Rica, May 2, 1934 (Barcelona!). Synonymy after Stange 1963: 812.

Description: *Adult.* Length of body about 20 to 25 mm, length of forewing 20 to 24 mm. Hindfemur pale brown, without fuscous subbasal band, subapical band about 1/10 length of femur; mesoscutum with many outstanding, white bristles; midfemur usually with 3 white bristles; antennal flagellomeres IV-XII longer than wide; forefemur about 9X longer than wide; hindfemur about 14-15X longer than postventral lobe; postventral lobe of male ectoproct about 2X longer than middle diameter, shorter than longest setae on apical swelling.

Larva: As described for *D. bolivarensis*.

Material studied: **COSTA RICA:** **Puntarenas:** Boca de Barranca, June 12-14, 1972, Hogue & Dockeweller (1 male, SC); Rio Reventazon, Farm Hamburg, Nevermann (Vienna, SC); **Canton Aguire:** El Tarso, Distrito Savegre, Sept. 25, 1951, Duret (1 female, SC); **BOLIVIA:** **Cochabamba:** Todos Santos, Dept. Cochabamba, 300 m, (1 female, SC). Chapare, Alto Palmar, Steinbach coll (1 female, SC). **Santa Cruz** = Santa Cruz, Dept. Santa Rita, 500 m. July 10, 1951, (1 female, SC); Santa Cruz, El Citadel, January 28, 1962, R. Golbach (1 female, SC). **BRITISH GUIANA:** Bartica, December (1 female, MCZ); Kartabo, April 19, 1919 (1 female, MCZ). **BRAZIL:** **Amapa:** Diapoque, May 1959, M. Alvarenga (1 female, SC); **Amazonas:** Reserva Ducke, 25 km. N.E. Manaus, 17.III.1979 & 18.XI.1978, J. Arias & N. Penny (2, INPA); State Highway 010, km. 244, 19.I.1977, N. Penny (1, INPA); Manaus, INPA, 4.VI.1977, M. Serrano (1, INPA); **Mato Grosso:** Reserva Humboldt, 10° 11' S, 59° 48' W, 17.III.1977, N. Penny (1, INPA); Jacare, P.N. Xingu, November 1961, M. Alvarenga (2 females, SC); **COLOMBIA:** 20 miles W. Manizales, Caldes, 1020 m, March 15, 1933, Schlenger & Ross (1 female, CAS); **Cauca:** Jumbo, 1900 m, January (1 female, MCZ); **Magdalena:** Rio Frio, May 20, 1929, G. Salt (1 female, MCZ). **ECUADOR:** Santa Elena, F. Campos (1 female, MCZ). **PANAMA:** San Blas, Rio Carti Grande near Coast, 2.III.1985, Flint & Louton (1 female, USNM). **PERU:** **Huanuco:** Tingo Maria, 670 m, November, 1947, W. Weyrauch (1 female, SC) 67 m. E. Tingo Maria, October 4, 1954, Schlenger & Ross (1 female, CAS). **Huallago:** Aguaytia, 400 m, Sept. 5, 1961 (1 female, SC). **SURINAM:** Paramaribo, Combe, June 13, Geijskes Col. (1 female, MCZ). **VENEZUELA:** Aragua: El

Limon, May, July (4 males, 40 females, IZPA, SC, MC). **Bolivar:** Rio Yurani, 4 km S. San Francisco de Yuruani, March 6, 1987, R. Miller & L. Stange (2 larvae, 1 male, SC). Km. 130, October 24, 1983, C. Bosdon (1 male, IZAV). **Zulia:** between San Juan and San Antonio, 9-11.X.1979, H. Savage (1-CAS).

Discussion: This is the most widespread species of *Dimarella* known to date ranging from Costa Rica to Bolivia. Structurally, the leg length and other characters are constant. We have reared this species from Costa Rica. We are unable to separate the larva of *angusta* from *bolivarensis* based on available material.

Dimarella (Dimarella) bolivarensis Stange new species

Figure 1-2, 28, 32, Map 4

Holotype male, 2 km E. Kavanayen, Bolivar, Venezuela, March 10, 1987, R. Miller and L. Stange (FSCA) (with pupal skin, 2nd and 3rd instar larval exuviae, and cocoon).

Description: Length of body 26 mm, length of forewing 23 mm. Face mostly shiny, fuscous, completely bordering ventral margins of antennal fossae; anterior row of vertex scars pale reddish; lateral face of forecoxa mostly dark gray brown; other coxae mostly dark gray brown; forefemur about 10X longer than greatest diameter; hindfemur about 17.5X longer than greatest femur diameter.

Larva (figs. 1-2): Distal palpomere of labium about 3X longer than wide; mesothoracic spiracle borne on tubercle that is longer than greatest diameter; abdomen with lateral spiracles borne on tubercles that are longer than greatest diameter; shortest setae near middle of dorsal head capsule much longer than wide; ventral head capsule without submedian dark spot near middle; pronotum with about 10 peg-like setae from anterior margin of posterior dark spot to anterior margin; pronotum with sublateral dark brown spot near anterior margin; base of pale brown forecoxa with dark brown area covering over 1/2 length of lateral face, area between forecoxae completely pale brown; head and mandibles are dark brown dorsally and ventrally.

Types: 2 female paratypes, Kavanayen, 1000 m, Bolivar, Venezuela, August 8, 1970, R. E. Dietz Col. (SC, USNM); 1 paratype male, Km. 130, Bolivar,

Venezuela, October 24, 1983, C. Bordon (IZAV). 1 female paratype, 2 km. E. Kavanayen, Bolivar, Venezuela, March 10, 1987, R. Miller & L. Stange (reared, MC). 1 paratype, Manaus, Taruma, Amazonas, Brazil, 14.XI.1980, N. Penny (INPA).

Discussion: This species occurs in the Gran Sabana of Venezuela and also in Amazonas State of Brazil. According to the collector, the species in Amazonas State lives in a different ecological area called "Campina." This is a zone characterized by stunted trees growing on coarse, organically poor white sand. This species has longer legs than *angusta* and much longer than in *D. zulia*. In particular, the hindfemur measures more than 16X longer than greatest femur diameter which contrasts to 14-15X in *D. angusta* and about 10X in *D. zulia*. The holotype was damaged in shipment and now lacks the postventral lobes of the ectoproct.

Dimarella (Dimarella) zulia Miller
new species
Map 4

Holotype male, Rio Pauji, between San Juan & San Antonio, Zulia State, Venezuela, October 9-11.1979, H. M. Savage (CAS).

Description: Length of body 21 mm, length of forewing 20 mm. Agreeing with description of *D. angusta* except: Face pale brown with broad, shiny, fuscus median band which does not border all of ventral margin of antennal fossa; lateral face of anterior row of vertex scars mostly pale reddish; forecoxa nearly all pale brown with many brown spots, mostly at setal bases; other coxae pale brown; forefemur about 9X longer than greatest diameter; hindfemur about 10X longer than greatest diameter.

Types: Two paratype females, Rio Santo Domingo, Barinas, Venezuela, February 17, 1976, C. & O. Flint (SC, USNM).

Discussion: This species is very close structurally to *D. angusta* and *D. bolivarensis*. The major difference is the shorter hindfemur which is about 10X longer than wide in *zulia*, 14-18X longer than wide in *D. angusta* and *D. bolivarensis*.

D. menkei Group

Description: Mesoscutum with several outstanding white bristles; forewing veins CuP + 1A reaches hind margin near origin of radial sector; forewing

posterior area narrower (at greatest height) than cubital area (area between anterior and posterior forks of CuA) at level of radial sector with one series of cells; subcostal and radial veins of both wings closely approximated (by much less than diameter of subcostal vein) well before their fusion at stigmal area; postventral lobe of male ectoproct at least 5X longer than middle diameter.

Larva: Mesothoracic spiracle borne on tubercle that is longer than wide; lateral abdominal spiracle not enlarged, inconspicuous; ventral head capsule with sublateral dark brown spots; head and prothorax pale orange with black setae dorsally; mandibles pale burnt orange; background coloration of head, thorax and abdomen pale brown ventrally, pale yellow dorsally on abdomen with overlying markings dark brown.

Biology: Larvae of this group capture prey by lying in wait or crawling for short distances out of the sand in the direction of small moving prey. They do not run directly at the prey, but in its general direction. While doing so they move the head from side to side to increase the likelihood of contacting the prey. If they miss the prey, they cannot make a directional correction unless the prey is moving. All of the species in the *D. menkei* group are found on sandy borders of rivers, washes, and coastal dunes. *D. psammophila* and *D. nayarita* dominate the coastal habitats, whereas *D. menkei* and *D. mixteca* dominate the habitats along rivers and washes. This group of *Dimarella* is known only from Mexico and Central America. They are all structurally very similar.

Dimarella (Dimarella) menkei Stange
Figure 9, 10, 27, 31, 35, 36, Map 1

Dimarella menkei Stange 1963. Ann. ent. Soc. Amer. 56: 814.

Holotype male, Rio Cuchujachi, 10 miles southeast Alamos, Sonora, Mexico, May 22, 1962, L. Stange collector (CAS).

Description: *Adult.* Body length 13-17 mm, forewing length 14 to 17 mm. Basal palpomere of labium pale brown; clypeal-frontal area with submedian dark brown spots; hindfemur about 10X longer than greatest femoral diameter; basitarsus of foreleg about 3X longer than wide, somewhat shorter than tibial spurs (Fig. 31); midtibia with 4 outstanding black bristles in a row; scutelli without outstanding

setae near posterior margin; hindfemur with row of white setae on closing face, most of which are about equal to greatest femur diameter.

Larva: Distal palpomere of labium over 3X longer than wide mesothoracic spiracle borne on tubercle that is longer than greatest diameter, somewhat pointed apically; abdomen with lateral abdominal spiracles not enlarged, inconspicuous; shortest setae near middle of dorsal head capsule as wide as long; ventral head capsule without submedian dark spots near middle (Fig. 10); pronotum with more than 15 peg-like setae from anterior margin of posterior dark spot to anterior margin; sublateral dark spots on dorsal surface of head capsule nearly contiguous, separated by much less than spot width; pronotum without sublateral dark spot near anterior margin; base of pale brown forecoxa with dark brown area covering complete lateral face, reaching less than 1/3 length of coxa; area between forecoxae completely pale brown.

Material studied: ADULTS. **MEXICO: Sonora:** Rio Cuchujachi, 10 miles southeast Alamos, May 22, 1962 (2 males, 4 females, SC); **SINALOA:** 8 miles south of Elota, August 26, 1963, F. Parker & L. Stange (2 females, SC). **LARVAE. Colima:** Rio Salado, 7 km S. Colima, March 14, 1985, R. Miller and L. Stange (1 male, 2 females (reared), 2 larvae, MC, SC).

Discussion: This is the smallest species of *Dimarella*. The distribution seems to be restricted to the west coast of mainland Mexico from Sonora south to Colima. The row of outstanding white setae on the closing face of the hindfemur (Fig. 27) is diagnostic in the subgroup.

Dimarella (Dimarella) mixteca Miller
new species
Figure 11, 12, Map 1

Holotype male, 5 miles W. Zanatepec, Rio Ostuto, Oaxaca, Mexico, February 27, 1985, R. Miller & L. Stange collectors (FSCA) (With associated cocoon, pupal skin, and larval exuviae. Cocoon constructed April 20, 1985. Adult emerged May 1985).

Diagnosis: Agrees with *D. menkei* in the short foreleg basitarsus (about 3X longer than wide) which is slightly shorter than the tibial spurs. From *D. menkei*, the absence of outstanding white setae on the closing face of the hindfemur is distinctive as

are the lack of submedian markings on the clypeus which are found in *menkei*.

Description: Body length about 21 mm, forewing length 20 mm; basal palpomere of labium pale brown; clypeal-frontal area pale brown; hindfemur about 10X longer than greatest diameter; basitarsus of foreleg about 3X longer than wide, somewhat shorter than tibial spurs; scutelli without outstanding setae near posterior margin; midtibia with 4 outstanding black bristles in a row; hindfemur without row of white setae on closing face; postventral lobe of male ectoproct about 5X longer than middle diameter.

Larva: Distal palpomere of labium over 3X longer than wide; mesothoracic spiracle borne on tubercle that is longer than greatest diameter, blunt ended; abdomen with lateral abdominal spiracles not enlarged, inconspicuous; shortest setae near middle of dorsal head capsule as wide as long; pronotum with more than 15 peg-like setae from anterior margin of posterior dark spot to anterior margin; all prothoracic dorsal setae about 2X longer than wide; ventral head capsule without submedian dark spots near middle (Fig. 12); sublateral dark spots on dorsal surface of head capsule separated by much more than spot width (Fig. 11); pronotum with sublateral dark spot near anterior margin; base of pale brown forecoxa with dark brown area covering complete lateral face, reaching less than 1/3 length of coxa; area between forecoxae with pair of submedian dark brown markings.

Types: 9 male, 14 female paratypes and five preserved larvae from Rio Ostuto, 5 miles W. Zanatepec, Oaxaca, Mexico, February 27, 1985, R. Miller & L. Stange collectors (FSCA, USNM, MC, SC). 1 female, Zamorino, Dept. of Francisco Morazan, Honduras, Sept. 21, 1981, S. Passoa (FSCA). 1 female, 2 miles S. Santa Ana, Vera Cruz, Mexico, February 20, 1985, R. Miller & L. Stange (MC); 1 female, Caracol, Chiapas, Mexico, March 2, 1985, R. Miller & L. Stange (MC). 1 female, Tehuantepec, Oaxaca, Mexico, July 15-16, 1964, P. Spangler (USNM).

Biology: Larvae found in loose sand along river at base of large *Acacia* shrubs in semi-shade.

Discussion: This species is obviously closely related to *D. menkei* and appears to replace *menkei* in southern Mexico and Central America. Larvae of the two species are quite distinctive. The major differ-

ence in the adults is the somewhat larger size (body typically more than 21 mm long in *mixteca*, 17 mm or less in *menkei*), the absence of white setae on the closing face of the hindfemur of *mixteca* and all pale-brown clypeo-frontal area.

***Dimarella (Dimarella) nayarita* Stange**
new species
Figure 7, 8, Map 1

Holotype male, Los Corchos (Playa), Nayarit, Mexico, March 17, 1985, L. Stange & R. Miller collectors (FSCA).

Diagnosis: The short tibial spur which extends less than 1/2 length of the basitarsus is diagnostic for this species.

Description: Holotype male (with associated pupal skin and larval exuviae, cocoon and meconium). Cocoon constructed July 1985. Adult emerged August 27, 1985). Length of body 21 mm, forewing length 20 mm; basal palpomere of labium dark brown; clypeo-frontal area pale brown; basitarsus of foreleg about 4X longer than wide, much longer than basitarsus; tibial spurs of all legs less than 1/2 length of basitarsus; hindfemur about 11X longer than greatest femur diameter; scutelli with outstanding white bristles near posterior margin; midtibia with 4 outstanding black bristles in a row; hindfemur without row of white setae on closing face.

Larva: Distal palpomere of labium over 3X longer than wide; mesothoracic spiracle longer than greatest width; abdomen with lateral abdominal spiracles not enlarged, inconspicuous; shortest setae near middle of dorsal head capsule longer than wide; ventral head capsule without submedian dark spots near middle; pronotum with about 10 peg-like setae from anterior margin of posterior dark spot to anterior margin; some prothoracic dorsal setae are 4X longer than wide; sublateral dark spots on dorsal surface of head capsule separated by about spot width; pronotum with sublateral dark spot near anterior margin; base of pale brown forecoxa with dark brown area covering complete lateral face, reaching to about middle of coxa; area between forecoxae pale brown.

Types: 4 female paratypes and 3 preserved larvae, Los Corchos, Nayarit, Mexico, March 17, 1985 (MC,

SC). 1 paratype male, Barra de Navidad, Jalisco, Mexico (MC). All reared from larvae.

Biology: Larvae were found on small sand dunes on a beach under plants in full shade.

Discussion: This species appears to be a strictly coastal species restricted in distribution to the west coast states of Nayarit and Jalisco in Mexico. It is very closely related to *D. psammophila*.

***Dimarella (Dimarella) psammophila* Stange**
Figure 5, 6, 24, 26, 30, Map 1

Holotype female, Veracruz, Mexico, April 29, 1962, L. Stange col. (CAS).

Description: Length of body 18-19 mm, forewing length about 20 to 22 mm. Basal palpomere of labium dark brown; clypeo-frontal area with submedian dark brown spots; basitarsus of foreleg about 4X longer than wide, longer than basitarsus; tibial spurs of all legs 1/2 length of basitarsus or more; hindfemur about 12X longer than greatest femur diameter; scutelli without outstanding white bristles near posterior margin; mid-tibia with 4 outstanding black bristles that are longer than greatest tibial diameter; hindfemur without row of white setae on closing face although many white setae may be present on posterior face, especially along basal one-half.

Larva: Distal palpomere of labium about 2.5X longer than wide; mesothoracic spiracle longer than greatest width; abdomen with lateral abdominal spiracles not enlarged, inconspicuous; shortest setae in central area of dorsal head capsule longer than wide; ventral head capsule without submedian dark spots near middle pronotum with about 15 peg-like setae from anterior margin of posterior dark spot to anterior margin; sublateral dark spots on dorsal surface of head capsule separated by much more than width of spot; pronotum without sublateral dark spot near anterior margin; base of pale brown forecoxa reduced to less than 1/2 of lateral face; area between forecoxae pale brown.

Biology: Larvae were found in sand dunes. At Santa Ana larvae were all found concentrated in a large wind-protected depression and were found mainly at the base of scattered plants.

Material examined: **MEXICO: Guerrero**, Acapulco, Oct. 6, 1986, R. Miller & L. Stange collectors (1 male, SC). **Nuevo Leon**: Rio Camacho, Linares, June 21-22, 1965, O. Flint (USNM). **Oaxaca**: Rio Ostuto, 5 miles W. Zanatepec, February 27, 1985, R. Miller & L. Stange (1 reared, MC) **San Luis Potosi**: Palitla, July 21, 1970, Schaffner, Murray, Phelps, Hart, (1 female, SC) July 11, 1983, J. Doyen (3 females, SC, USNM). **Vera Cruz**: 2 miles N. Santa Ana, February 20, 1985, R. Miller and L. Stange collectors (4 males, all reared, 9 females, 4 larvae, MC, SC, FSCA, USNM). Boca de Chalacas, July 2, 1975, J. Gillaspay (1 female, SC), **Tabasco**: 17 mi. E. Frontera (3 females, SC).

Discussion: The single male taken at Acapulco lacks the clypeo-labral dark marks. However, the Oaxaca specimen has them better developed than those from Vera Cruz. The Tabasco specimens have the tibial spurs shorter than the other specimens studied, attaining no more than 1/2 length of basitarsus. The tibial spurs of one foreleg are aberrant in reaching less than 1/2 length of basitarsus. *D. psammophila* appears closely related to *D. nayarita* but larval differences bolster the few structural differences found in the adults, mainly the chaetotaxy of the midtibia and the somewhat longer tibial spurs of *psammophila*.

D. riparia Group

Description: Mesoscutum with or without outstanding white bristles; forefemur cylindrical, about 9X longer than greatest diameter; basitarsus of hindleg longer than tarsomere II; forewing vein CuP + 1A runs parallel with posterior branch of CuA and hind margin for a long distance, reaches hind margin well beyond origin of radial sector; forewing posterior area about as high as cubital area at origin of radial sector, with 2 series of cells; subcostal and radial veins of both wings well separated (by more than diameter of subcostal vein) to stigma; postventral lobe of male ectoproct more than 10X longer than middle diameter.

Larval stage unknown.

This monobasic species group is found in northern Argentina, Bolivia, Brazil and Uruguay. The wide separation of the subcostal and radial veins of both wings is diagnostic and plesiomorphic.

Dimarella (Dimarella) riparia (Navas) Map 2

Nobra riparius Navas 1918 Mem. Accad. Pont.

Nuovi Lincei. (2)4: 16. Lectotype male, Santa Fe, Argentina, January. 19, 1917 (Barcelona!), designated by Stange 1967: 59.

=*Dimarella pallida* Navas 1933. Rev. Acad. Cienc. Zaragoza 16: 89. Holotype female, San Miguel, Argentina, Nov. 25, 1932 (Barcelona!). Synonymy after Stange 1967: 59.

Description: Body length 21 to 24 mm (females) or 24 to 26 mm (males), forewing length 24 to 27 mm. Coloration: Head mostly pale brown, with extensive reddish brown vertex scars, submedial dark spots near posterior margin, dark brown spot laterally at posterior margin of vertex, shiny fuscous band above antennal fossae, broken by pale medially, above which separated by pale area a dull dark brown band; narrow shiny fuscous band below antennal fossae; dark brown spots on cardo and stipes; antennal scape and pedicel pale brown with dark brown medially, flagellomeres with dark brown on basal one-half, incomplete and pale brown on apical one-half; pronotum gray-brown, paler especially medially and sublaterally; scutelli paler posteriorly; thorax mostly gray brown dorsally with scattered paler areas, especially at lateral margin, spiracle, and submedially; pleura gray brown above, paler brown below; venter mostly pale brown; coxae all pale brown except some diffused dark brown areas on forecoxa; femora and tibiae pale brown with extensive dark brown spots, mostly at setal bases, except mesal face; femora with small subapical fuscous band, tibiae with subapical fuscous band; tarsomeres pale brown except fuscous apically; abdomen with tergites most predominately gray brown with pale brown on most tergites subbasally and sublaterally, along some of mesal area and much of posterior margin; male ectoproct mostly pale brown; sternites mostly pale brown becoming darker posteriorly, with dark brown stripes mostly at sublateral margins; wings with venation mostly pale brown, no dark stigmal mark, forewing radial, subcostal and cubital veins with small dark brown spots as well as on hindwing radial vein.

Chaetotaxy: Head with mostly inconspicuous setae, long setae on clypeal-frontal area and postmenton; pronotum with many erect, mostly dark brown setae; cervical sclerite with many long white setae; alinota usually with inconspicuous setae, few short white ones on scutelli; pleura with many long, white setae; mostly absent on venter; all coxae with long white setae especially posteriorly; forefemur with femoral sense hair the longest seta (about twice diameter of femur), row of about 5 black setae on

lateral margin of closing face and a corresponding row of 5 white setae on other side; anterior face of forefemur with many decumbent hair-like setae; a foretibia with setae on anterior face semi-erect, anterior face with pair of black setae subbasally, followed by row of 3 black setae, plus a few other setae; midfemur with most setae on closing face with numerous short white setae flanked on either side by mostly white bristles some of which are twice femur diameter and longer than midfemoral sensory hair; midtibia with most setae on closing face, these shorter than femur diameter, exterior face with several outstanding black setae, some of which are longer than femur diameter; hindfemur with double row of elongate, mostly black, bristles on closing face, elsewhere with shorter setae; hindtibia with few black setae on exterior face elsewhere much shorter; abdomen with short setae on tergites, longer, more abundant, white setae on sternites; postventral lobe of ectoproct with setae on apical swelling shorter than diameter of swelling.

Structure: Antennal flagellomeres I to about X longer than wide, then becoming shorter toward distal end; forefemur about 7X longer than greatest femoral diameter; midtibia not swollen thicker than midfemur; basitarsus of foreleg about 3X longer than greatest diameter, about equal to tibial spur length; basitarsus of midleg and hindleg about 4X longer than greatest diameter, longer than tibial spur length; forewing and hindwing of equal length, hindwing much narrower than forewing; abdomen of both sexes much shorter than wing length.

Material examined: **ARGENTINA: Jujuy:** Aguas Calientes, Sept. 18, 1968, R. Golbach (2 females, SC); **Sante Fe:** Santa Fe, Dec. 6, 1917 (2 females, SC); Tucuman: Rio Calera, Aserradero near Villa Padre Monti, Feb 4, 1969, W. & J. Peters (1 female, SC). **BOLIVIA:** Rio Negro, Feb. 27, 1960, R. Golbach coll. (2 males, SC). **BRAZIL: Goias:** Chapada dos Veadeiros, 18 km. N. Alto Paraiso, 1400 m., 2-5.X.1985, S. E. Miller (1 female-USNM). **URUGUAY: Artigas:** Sepulturas, Jan. 11, 1962 (1 female, SC); **Durazno:** Arroyo Cordobes, Jan. 9, 1953, Zollesi coll. (1 male, SC); **Colonia:** Nueva Palmira, Jan. 2, 1962, Carbonell coll. (1 male, SC).

Discussion: Outstanding white bristles on the mesoscutum are lacking in most of the specimens studied. However, one specimen from Goias, Brazil, has at least five white bristles submedially, whereas two specimens from Jujuy, Argentina, have one relatively short white bristle sublaterally. It may be that the Brazilian specimen represents another

species, but additional material is needed to understand the significance of this variation. There are also a few subtle differences in leg structure.

D. praedator Group

Description: Mesoscutum with or without outstanding white bristles; forefemur swollen, about 5X longer than greatest diameter; basitarsus of hindleg as long or longer than tarsomere II; forewing vein CuP + 1A runs parallel with posterior branch of CuA and hind margin for a long distance, reaches hind margin well beyond origin of radial sector; forewing posterior area about as high as cubital area at origin of radial sector, with 2 series of cells; subcostal and radial veins of both wings closely approximated (by much less than diameter of subcostal vein) well before their fusion at stigmal area; postventral lobe of male ectoproct 2X to 4X longer than middle diameter.

Larva: Mesothoracic spiracle borne on tubercle about as long as wide; abdomen with lateral spiracles not enlarged, inconspicuous; ventral head capsule usually with submedian dark brown spots near middle (except *D. guarica*); entire body pale yellow with brown markings of varying intensity.

Biology: Larvae of this group either lie in wait for prey or only partially pull themselves from the soil when trying to grasp prey. *D. praedator*, *D. guarica*, and possibly *D. effera* can live in patches of loose earth ranging from large areas all the way down to an area not much larger than their bodies. *D. praedator* was found both in raised areas near the base of trees and in areas with better rain protection, such as under rock overhangs and bridges. *D. guarica* was most commonly found in the latter situation, but a certain amount of species overlap in the habitats did occur. One specimen of *D. effera* was reared but we are uncertain of its precise habitat.

Discussion: We are recognizing 6 species in this group. However, there is considerable geographic variation in minor color pattern, and there may be many more species, since most species are quite similar in structure and basic color pattern. *D. effera*, *D. totoneca*, and *D. garciai* lack mesoscutal bristles. *D. praedator* appears to be the most widely distributed species in tropical South America whereas *D. totoneca* is the only known member of the group from Mexico. *D. guarica* is known only from Venezuela.

Dimarella (Dimarella) effera (Walker)
Figure 25, 38, 41, Map 2

Myrmeleon efferus Walker 1853. List. Neurop. specimens Brit. Mus., p. 387. Holotype female, Para, Brazil (BM!).

Taxonomy: Hagen 1860:364 (in *Creagris*), Banks 1913a:229 (in *Dimarella*), 1943: 168 (*effusa* Walker!=*tarsalis*), Stange 1963:812 (notes). Distribution: Brazil (Banks 1913b:86)

Description: ADULT: Length of body about 21 mm, forewing length about 20mm, hindfemur pale brown with large subbasal fuscous band in addition to large subapical fuscous band, bands occupy about 2/3 length of femur; mesoscutum without white bristles; midfemur with 4 or 5 outstanding white bristles; antennal flagellomeres IV-XII wider than long; forefemur greatly swollen, about 5X longer than wide; hindfemur about 10X longer than greatest diameter; hind basitarsus 5X longer than middle diameter, much longer than tibial spurs; abdominal tergite II nearly as long as III and much broader; postventral lobe of male ectoproct about 3X longer than middle diameter, longer than longest setae on apical swelling.

Larva: Distal palpomere of labium dark brown with black sensory opening greatly swollen (Fig. 41); shortest setae near middle of dorsal head capsule less than 4X longer than wide, evenly expanded from base; pronotum with about 10 peg-like setae in a row from anterior margin of posterior dark spot to anterior margin; ventral head capsule with submedian dark brown spot near middle; sublateral dark brown spots on dorsal surface of head capsule separated by more than width of spot; base of pale brown forecoxa with small dark brown area; area between forecoxae pale brown.

Material examined: **BRAZIL:** Roraima, Ilha do Maraca, 9.IX.1980, E. Fernandez (1, INPA). **FRENCH GUIANA:** Maroni River, W. Schaus (1 female, USNM). **VENEZUELA:** Guarico: 44 km south Calabozo, Hato Masguaral, Feb. 9-11, 1986, R. B. Miller & L. A. Stange (1 female, SC); same May 3-10, 1985, Menke & Carpenter (15 males, 20 females, MC, SC, USNM).

Discussion: *D. effera* occurs together with the closely related species *D. praedator* and *D. guarica* in the Calabozo area of Venezuela. The coloration of the hindfemur is distinctive from these two species

with large subbasal fuscous band in addition to the subapical fuscous band. Only *D. garciai* from Ecuador and Central America has similar hindtibial coloration. The lack of mesoscutal white bristles is diagnostic in the group except for *D. totoneca* and *D. garciai*. The enlarged tergite II (Fig. 38) of the male abdomen appears to be diagnostic.

Dimarella (Dimarella) garciai (Navas)
Figure 39, Map 2

Nobra garciai Navas 1932. Boll. Mus. Zool. Univ. Turin (3) 42:12. Holotype female, Vinces, Ecuador (Turin!).

Description: Length of body 20 to 24 mm, forewing length 19 to 23 mm; hindfemur pale brown with large subbasal fuscous band in addition to large subapical fuscous band, bands occupy about 2/3 length of femur; mesoscutum without white bristles; midfemur with 4 or 5 white bristles, as long or longer than femoral diameter; antennal flagellomeres IV-XII wider than long; forefemur greatly swollen, about 5X longer than wide; hindfemur about 9X longer than greatest diameter; hind basitarsus 4X longer than middle diameter, only little longer than tibial spurs; abdominal tergite II of male abdomen about 0.5X as long as tergite III, about same width; postventral lobe of male ectoproct about 3X longer than middle diameter, longer than longest setae on apical swelling.

Material studied: **ECUADOR: Los Rios:** Quevedo, 11.v.1975, Spangler & Gurney at black-light (1 male, USNM). Rio Palenque, xii.1980, R. Ulloa (1 female, SC); **PANAMA: Darien:** Rio Tuira at Rio Pucuro 16-17.ii.1984, J. Louton (1 male, USNM). **COSTA RICA: Guanacaste:** Santa Rosa National Park, 12.xii.1978, D. Janzen (1 male, SC).

Discussion: *D. garciai* is one of 3 species of the *D. praedator* Group which lacks the mesoscutal bristles. Superficially it agrees with *D. effera* in having the hindfemur marked by a prominent subbasal fuscous band. However, structurally this species appears more closely related to the Mexican species *D. totoneca*.

Dimarella guarica Stange
new species
Figure 3, 4, Map 2

Holotype male, 15 km S. Calabozo, Ruta 2, Rio

Orituco, Guarico, Venezuela, February 27, 1986, R. B. Miller and L. A. Stange collectors (FSCA) (with associated cocoon, pupal skin, and larval exuviae). Cocoon constructed April 14, 1986. Adult emerged May 14, 1986).

Diagnosis: *D. guarica* is one of three known species of the *D. praedator* Group with white bristles on the mesoscutum. From *D. praedator*, the shorter male ectoproct (about 2.5X longer than middle diameter versus about 4X longer in *D. praedator*) is diagnostic. Although adult structure is similar in these species, the larva (Fig. 3) of *D. guarica* is very distinctive in color and structure.

Description: Length of body 21 mm, length of forewing 18 mm, greatest width 5mm; length of hindwing 16 mm., greatest width 3 mm; hindfemur with solid dark brown subapical ring mark distinctly separated by pale brown area from subbasal dark brown area which is most prominent on posterior face; abdomen mostly pale brown, tergites with irregular dark brown stripes sublaterally and medially; ectoproct mostly dark brown with pale brown stripe near posterior margin; mesoscutum with white bristles; midfemur with 5 white bristles which are much longer than femur diameter; antennal flagellomeres IV-XII wider than long; forefemur greatly swollen, about 5X longer than wide; hindfemur about 10X longer than greatest diameter; hind basitarsus about 5X longer than middle diameter, longer than tibial spurs which are strongly curved apically; abdominal tergite II about 0.5X as long as tergite III, about same width; postventral lobe of ectoproct about 2.5X longer than middle diameter, about same length as longest setae on apical swelling; hook of paramere wider apically than subapically.

Larva: Distal palpomere of labium 5X longer than wide; mesothoracic spiracle borne on tubercle about as long as wide; lateral abdominal spiracles not large and bulbous; shortest setae near middle of dorsal head capsule about 5X longer than wide, expanded from base, and flat ended; ventral head capsule without submedian markings near middle; forecoxae and area between entirely pale brown, same shade as ventral head capsule.

Types: 1 male, 7 females paratypes, 15 km S. Calabozo, Ruta 2, Rio Orituco, Guarico, Venezuela, February 27, 1986, R. B. Miller and L. A. Stange (MC, SC, USNM). All of the types were reared from larvae.

Discussion: The discovery of the larvae of *D. guarica* and *D. praedator* together near Calabozo, Venezuela, provides us with some understanding of the difficulty of defining species in this group. The larvae of these two species are so different in structure and coloration that they appear to be in different species subgroups. The mandibles and head capsule are longer in *guarica*. The coloration of *guarica* is more pale brown and the head capsule lacks the prominent dark brown spots found in all other species of the group. However, the adults of *D. guarica* are very similar to those of *D. praedator* in structure and coloration. Comparing adults from the same locality, there is an obvious difference in the markings of the abdomen which are much paler brown in *guarica*. The male ectoproct has a shorter postventral lobe which is only about one-half as long as in *praedator*. There even seems to be a small difference in male genitalia with the paramere hooks broader apically in *guarica* than in *praedator*. However, specimens studied of *praedator* from other parts of South America, especially Brazil and Argentina, show variation in color pattern, male genitalia and even the length of the postventral lobe. This means that a complex exists which will only be understood properly when larvae from many localities are found and associated with the adults.

Dimarella (*Dimarella*) *praedator* (Walker)

Figure 40, 42, Map 2

=*Myrmeleon praedator* Walker 1853. List Neurop. specimens British Mus., Part II:391. New Synonym. Holotype female, Santarem, Brazil (BM!)

=*Myrmeleon arcuatus* Hagen 1861. Smiths. Misc. coll. 4:325 (nomen nudum)

=*Nobra martinsi* Navas 1915. Broteria 13:6. New Synonym. Holotype female, Rio Purus, Brazil 1904 (Paris!) New Synonym.

=*Nobra silvaticus* Navas 1918. Mem. Accad. Pont. Nuovi Lincei (2)4:6. New Synonym. Holotype female, Mato Grosso, Brazil (La Plata!) New Synonym.

Taxonomy: Hagen 1860:364 (in *Creagris*); 1866:405 (*tarsalis* in *Myrmeleon*, 435 (*arcuatus* = *praedator*); Banks 1924:436 (*praedator* type *Mystroleon*), 1943:168 (in *Dimarella*).

Description: Abdomen usually mostly dark brown with pale markings; mesoscutum with white bristles; midfemur with 5 white bristles which are much longer than femur diameter; postventral lobe of male ectoproct over 4X longer than greatest diameter.

Larva: Distal palpomere of labium pale brown with sensory opening weakly swollen; pronotum with about 10 peg-like setae in a row from anterior margin of posterior dark brown spot to anterior margin; setae near middle of dorsal head capsule not obviously expanded from base and less than 4X longer than greatest width; ventral head capsule with submedian dark brown spot near middle; base of pale brown forecoxa with small dark brown area; area between forecoxae pale brown.

Biology: Larvae live in open sand tracts coinhabiting with *D. blohmi* and much less commonly with *D. guarica* in protected areas.

Material studied: **ARGENTINA: Corrientes:** Paso de la Patria, November 5-7, 1969, C. Porter (1 female-SC); **Salta:** La Lasa, Rio Bermejo, December 16, 1970, L. Stange (1 male-SC). **BRAZIL: Amazonas,** Manaus (1 male, 3 females, INPA; SC); **Mato Grosso:** Jacare, P. M. Xingu, November, 1961, M. Alvarenga (2 males, SC), Rosario Oeste, November 1963, M. Alvarenga (1 female-SC); **Para:** Jacarecanga, October 1959, M. Alvarenga (8 females, CAS, SC); Rio Xingu Camp (52° 22' W., 30° 39' S.), 60 km. S. Altamira, October 13-21, 1986, P. Spangler & O. Flint (35 females, MC, SC, USNM). **BRITISH GUIANA:** Kuyuwini River, November 23, 1937 (1 female-SC). **PARAGUAY:** Carumbe, Dept. San Pedro, January 28, 1965, R. Golbach (1 female-SC). **PERU; Loreto:** Iquitos, July 24, 1984 (1 female-SC). **VENEZUELA: Aragua:** El Limon, May 30, 1959, F. Fernandez Yopez (2 females-IZAV;SC); **Guarico:** 15 km. S. Calabozo, March 15, 1987, Miller & Stange (6 males, 5 females, MC, SC).

Discussion: Earlier authors have identified this species as *Dimarella tarsalis* (Guilding) 1833. We prefer to treat this name as a nomen dubium since the type appears to be lost and no worker on the group has seen the Guilding material since the original description. Hagen (1866:405) placed the species in *Myrmeleon*. Banks did not deal with this name until 1943 when he incorrectly stated it was described from Jamaica. Guilding did not know the locality of his specimen but gave Demerara (British

Guiana) as a questionable locality. Without even a geographic clue as to the identity of this species, it would be virtually impossible even to hazard a guess as to its true identity. Furthermore, this species is probably a complex, so that it is preferable to use a name based on an existing holotype.

Dimarella (*Dimarella*) *totoneca* Miller
new species
Figure 13, 14, 43, Map 1

Holotype male, 10 miles W. Puente Nacional, Vera Cruz, Mexico, February 22, 1985, R. B. Miller and L. A. Stange collectors (FSCA) (with associated cocoon, pupal skin, and larval exuviae. Cocoon constructed April 28, 1985; emerged May 30, 1985).

Diagnosis: Separated from all other species of the *D. praedator* Group by the lack of mesoscutal white bristles except for *D. garciai* and *D. effera*. These latter two species both have a prominent subbasal fuscous band on the hind femur which is incomplete in *totoneca*. Also, the postventral lobe of the male ectoproct of *D. totoneca* differs from those two species in being shorter than the longest setae on its apical swelling.

Description: ADULT: Length of body 22 mm, forewing length 19 mm, greatest width 5 mm, hindwing length 17 mm, greatest width 3 mm; hindfemur pale brown with some dark brown subbasally but not forming complete ring, subapical fuscous ring prominent; dark brown area occupies about 1/3 length of femur; mesoscutum without white bristles; midfemur with 5 white bristles which are much longer than femur diameter; antennal flagellomeres IV-XII wider than long; forefemur greatly swollen, about 5X longer than wide; hindfemur about 9X longer than greatest diameter; hind basitarsus 4X longer than middle diameter, only little longer than tibial spurs; abdominal tergite II about 0.5X as long as tergite III, about same width; postventral lobe of male ectoproct about 2X longer than middle diameter, shorter than longest setae on apical swelling.

Larva: Distal palpomere of labium over 3X longer than wide; mesothoracic spiracle borne on tubercle that is longer than wide; setae near middle of dorsal head capsule unexpanded from base, more than 5X longer than greatest diameter, and with chisel-shaped ends; pronotum without peg-like setae; ventral head capsule with submedian dark brown spot near middle; double pair of dark brown spots

near anterior margin of dorsal head capsule, posterior pair contiguous, anterior pair separated by approximate width of spot; forecoxa pale brown; area between forecoxa pale brown.

Types: 4 male, 4 female paratypes, all reared with same data as type (MC, SC, USNM). 1 female paratype, Santa Rosa, Vera Cruz, Mexico, April 1906, Wm. Schaus (1 USNM).

Subgenus *Pachyleon* Stange new status

Pachyleon Stange 1970. Contr. Sci. L.A. Co. Mus. 186: 12

Type species: *Pachyleon alvarengai* Stange, by Monotypy and original designation.

Description: Pretarsal claws not capable of closing upon distal tarsomere; all legs with tibial spurs; pretarsal claws and tibial spurs pale yellow basally, pale red distally; basal tarsomere of hindtarsus shorter than distal tarsomere; mesoscutum with several outstanding white bristles; forewing and hindwing broadened, hindwing broadest near prestigmal level, then abruptly narrowed toward apex; forewing vein CuP + 1A and posterior fork of CuA run parallel with each other and hind margin for a long distance, CuP + 1A reaches hind margin well beyond origin of radial sector; forewing vein 2A somewhat separated from vein 1A or closely associated with vein 3A; male ectoproct with well developed postventral lobe.

Discussion: The type species of *Pachyleon* has the condition of forewing vein 2A highly modified being closely associated with vein 3A (Fig. 22). However, a second species of *Pachyleon* from Venezuela has the modification of vein 2A less pronounced. The shape of the hindwing is diagnostic in the subgenus. Also, the pretarsal claws can not close upon the distal tarsomere as in the other subgenera. This can be easily appreciated in live specimens but in occasional museum specimens of the subgenus *Dimarella* all the claws have dried away from the distal tarsomere which makes it necessary to relax specimens to verify this character. The larva of *Pachyleon blohmi* is virtually indistinguishable from larvae of *D. praedator* which has prompted us to consider *Pachyleon* only as a subgenus.

Dimarella (Pachyleon) alvarengai Stange

Figure 20, 23, 29, 33, 34, 37, Map 3

Pachyleon alvarengai Stange 1970. Contr. Sci., L. A. Co. Mus. 186: 13. Holotype male, Jacare (N. Xingu), Mato Grosso, Brazil, XI-1961, M. Alvarenga (LACM).

Description: Length of body about 19 mm, forewing 15 mm, hindwing 11 mm, greatest wing width (about equal in forewing and hindwing) 4.76 mm.

Coloration: Face (Fig. 24) pale yellow with ^ - shaped dark brown mark at middle below antennae and crescent-shaped dark brown mark above each antenna, sublateral spot on each side of clypeus, larger dark brown area laterad of antenna toward eye, extending ventrally and dorsally nearly to first row of vertex scars; vertex with gray bloom; antenna with scape and pedicel pale yellow with dark brown posteriorly, flagellomeres dark brown basally and much paler distally; maxilla and labium nearly all pale yellow except distal palpomere and cardo with dark brown; postgena mostly dark brown; pronotum mostly dark brown with grayish bloom interrupted by irregular paler areas; notum II and III dark brown with grayish bloom, darker velvety areas as follows: submedial triangular area on each side of prescutum II; dark brown oval spot each side of middle and touching, surrounded by golden colored microtrichia on prescutum III; large curved dark brown mark sublaterally near anterior margin of scutum; postscutellum II and III nearly all black; cervical sclerites pale yellow; pleuron and sternum mostly dark brown with gray bloom, paler brown areas mostly in front of midcoxa and hindcoxa, mesopleural wing process yellowish; forecoxa mostly pale brown, other coxae darker brown; forefemur pale brown with numerous dark brown spots, spots becoming confluent on most of exterior face and on distal one-third of closing face; foretibia pale brown with dark brown spots and small dark brown stripes at basal one-third of exterior face, larger dark brown areas at middle, mostly complete but smaller apical rings, dark brown areas interconnected along closing face; midtibia and midfemur with large, mostly separated dark brown spots on exterior face, somewhat denser and forming short transverse dark brown bands on closing face of tibia, subapical interrupted dark brown ring on femur, solid dark brown one on tibia; hindfemur pale brown with dark brown spots at setal bases, infuscated between spots especially on exterior face, large subapical dark brown band; hindtibia pale brown with large, mostly sepa-

rated dark brown spots at setal bases on closing face, small dark brown stripe near base, spots becoming more stripelike distally, exterior face nearly all pale brown except dark brown apical ring and smaller dark brown area toward base; tarsi of all legs similarly patterned, pale brown with apical dark brown ring on tarsomeres; wings nearly without suffusion, pale white stigmal area preceded by small darkish brown area in forewing; wing veins mostly pale brown, especially hindwing, with dark brown streaks along longitudinal veins principally at cross-vein junctions, many crossveins dark brown especially apically in forewing; abdomen with tergites mostly pale brown with complicated pattern formed by dark brown areas; sternites mostly dark brown with a prominent although narrow median longitudinal pale brown line.

Chaetotaxy: Head with few prominent setae except on most of clypeus, white ones on dark brown areas of frons, longer ones on labrum and many long white setae on mentum and stipes; vertex with few inconspicuous appressed dark setae; pale with very sparse, short dark brown setae; pronotum with some short setae on disc, longer dark brown ones at lateral and posterior margin; row of 5 long white setae on each side of middle along anterior margin of scutum II, several smaller dark brown setae on prescutum II, elsewhere nearly absent or very short; pleuron and coxa with rather conspicuous long white hairlike setae; forefemur with dense, mostly appressed white setae on exterior surface, some black and some white erect setae distally, closing surface with fewer setae and with more black ones; foretibia with subbasal row of 3 black bristles, followed by another similar row, then one of two bristles and finally a subapical black bristle on exterior face, interspersed with shorter, mostly dark setae, closing surface with many stout setae, predominate-ly white; midfemur with row of white bristles on exterior surface, many other setae elsewhere but more hairlike and white; midtibia with mostly black setae of various sizes, larger black ones toward apex of lateral face, larger white ones near base of median face; hindfemur with many short, mostly appressed white setae; hindtibia with many setae along closing surface, white ones mostly concentrated in middle, exterior surface nearly without setae, only a few scattered minute ones; femoral sensory hair of foreleg and midleg shorter than width of femur at that point; tarsi with rather dense, dark brown setae on closing surface flanked (typically) on the 4 basal tarsomeres by one white seta near apex, exterior surface with fewer setae, especially hindtarsus; abdomen with only microsetae on tergites I-V; start-

ing with tergite VI, dark brown setae mostly laterally increasing in abundance toward terminalia; sternites with numerous, mostly white hairlike setae; postventral lobe with rather prominent black bristles toward apex (Fig. 33).

Structure: Head with vertex not much raised above eyes; greatest ocular width about 1/3rd interocular distance (measured just below antennal fossae); antenna short and rather flattened with 19 flagellomeres, flagellomere I longer than wide, II about 1.5X wider than long (in flat view), III 3X wider than long), with increasing width toward apex; distal palpomere of labium rather slender, not much swollen, sensory pit oval and close to base; pronotum about 2.5X as wide as long; femur of all legs broadened beyond base, tibia much more slender except midtibia, which is subequal to midfemur; midleg much shorter than either foreleg or hindleg; basitarsus of hindleg about 3X longer than wide; hind wing venation and shape as in Fig. 20; hindwing broader than forewing and much shorter; forewing vein 2A nearly touching vein 3A (Fig. 22); abdomen shorter than forewing in repose, segments larger basally, decreasing in diameter beginning with segment IV; tergites I-V and sternite II with numerous scalelike spicules; postventral lobe of male ectoproct about 5X longer than greatest diameter; terminalia as in Figs. 37, 44, genitalia as in Fig. 38.

Material examined: **BRAZIL: Mato Grosso:** Banado Lapinape, Jan. 9, 1966 (1 male, SC); Jacore, N. Xingu, Nov. 1961 (1 female, SC).

Dimarella (Pachyleon) blohmi Stange
new species
Figure 15, 16, Map 3

Holotype male, Venezuela, Guarico, Hato Masguaral, 44 km south Calabozo, February 2-11, 1986, R. Miller and L. Stange collectors (FSCA) (with associated cocoon, pupal skin, and larval exuviae. Cocoon constructed June 20, 1986. Adult emerged July 18, 1986).

Diagnosis: From *D. alvarengai*, the only other species known in the subgenus *Pachyleon*, the narrower hindwing, shorter male postventral lobe, and less crowded condition of forewing vein 2A provide critical differences.

Description: Length of body 20 mm, forewing 17 mm, hindwing 15 mm, greatest forewing width 5 mm, greatest hindwing width 4 mm.

Coloration: Agreeing with *D. alvarengai* except as follows: face pale brown with dark brown, subshiny band (interrupted with pale brown medially) below antennae extending onto clypeus as inverted V-shaped markings, extending dorsally around mesal margin of antennal fossae to other side; thoracic nota with pale brown areas more extensive and regular pattern.

Chaetotaxy: Agreeing with *D. alvarengai* except as follows: mentum and stipes without long setae; cervical sclerite without long white setae; prescutum II with several white bristles, scutum II with white bristles extending nearly to scutellum; hindfemur and hindtibia with few setae, all much shorter than segment width; hind tarsus with setae very short, tarsomeres without white setae.

Structure: Antenna moderately long not flattened, with 23 flagellomeres, flagellomere III about 2X wider than long; pronotum 2X as wide as long (measured medially), hindwing much narrower than forewing and about as long; forewing vein 2A separated by at least vein diameter from vein 3A; basitarsus of hindleg about 4X longer than diameter; postventral lobe of ectoproct about 1.5X longer than apical diameter which bear setae longer than lobe.

Larva: Distal palpomere of labium pale brown with sensory pit not much swollen (lateral view); shortest setae near middle of dorsal head capsule less than 4X longer than wide, evenly expanded from base; ventral head capsule with submedian dark brown spot near middle; pronotum with about 11 peg-like setae in a row from anterior margin of posterior dark brown spot to anterior margin; base of pale brown forecoxa with small dark brown area; area between forecoxae completely pale brown.

Biology: In Guarico state of Venezuela this was the commonest *Dimarella* larva. The preferred habitat was in sandy areas beneath plants or in small patches of loosened soil at the base of trees where it coexisted with *D. praedator* and probably *D. effera*. We reared a bombyliid fly, *Neodiplocampta paradoxa* (Jaennicke), from larvae collected at Rio Yuruani. This appears to be a general ant-lion parasite since we also reared it from species of *Myrmeleon* and *Eremoleon* in Venezuela. It is probably an internal parasite since we noticed no external larvae on the host larvae.

Types: 18 male, 17 female paratypes, from Venezuela, Guarico, 44 km S. Calabozo, February 9-11, 1986, R. Miller & L. Stange (all reared) (SC, MC, USNM, CAS) 1 male, 2 female paratypes, Hato Masgual,

44 km. W. Calabozo, Guarico, Venezuela, May 11-19, 1985, A. Menke & J. Carpenter (USNM); 1 paratype; Rio Pariji, between San Juan and San Antonio, Zulia, October 9-11, 1979, H. Savage (CAS). 1 male paratype (reared), Venezuela, Bolivar, Rio Yurani, 4 km South San Francisco de Yuruani, March 6, 1987, R. Miller & L. Stange (SC).

Other material studied: 1 female, Pepeiae, Surinam, May 25, 1952, D. C. Geijskes (Leyden); 1 female, Drietabletje, Surinam, May 31, 1952, Geijskes (Leyden); 1 female, Nickerie River, Stondansi, Surinam, January 28, 1971, D. C. Col, Geijskes (SC); 1 female, Brokopondo, Surinam, March 21, 1965, F. F. Mees (Leyden). 1 female Rockstone, Esseq., British Guiana, March 27-29, 1979, Duckworth & Dietz (USNM).

We are naming this species for Tomas Blohm, an outstanding Venezuelan naturalist and conservationist, whose protected ranch "Hato Masgual" is the type locality of this species.

Discussion: The series from Surinam has a prominent dark brown stigmal spot, but no other differences are present. This species is structurally intermediate in wing structure between the subgenus *Dimarella* and the type species of *Pachyleon*, *D. alvarengai*. The larva is virtually identical with that of *D. praedator*.

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Table 1. Summary of laboratory life cycle data

Species	Reared Specimens	Cocoon to Emergence (extreme dates)	Period (Days)	Adult Alive (w/o feeding) (Days)
<i>(Pachyleon)</i>				
1. <i>D. blohmi</i>	13M, 8F	May 10 - Aug 29	31	—
<i>(D. angusta Group)</i>				
<i>D. bolivarensis</i>	1M, 1F	—	17	—
2. <i>D. angusta</i>	1F	Mar 31 - Apr 18	18	—
<i>(D. praedator Group)</i>				
3. <i>D. effera</i>	1F	May 3 - June 2	29	—
4. <i>D. praedator</i>	2M, 5F	April 28-July 4	30	—
5. <i>D. guarica</i>	2M, 5F	April-June	30	—
6. <i>D. totoneca</i>	4M, 4F	Apr 22-June 4	30	—
<i>(D. menkei Group)</i>				
7. <i>D. menkei</i>	1M, 2F	—	30	—
8. <i>D. mixteca</i>	6M, 5F	Apr 3 - June 10	30	4-6
9. <i>D. nayarita</i>	2M, 4F	June 17-Aug 28	29	7
10. <i>D. psammophila</i>	4M, 7F	April 6-June 17	35	—

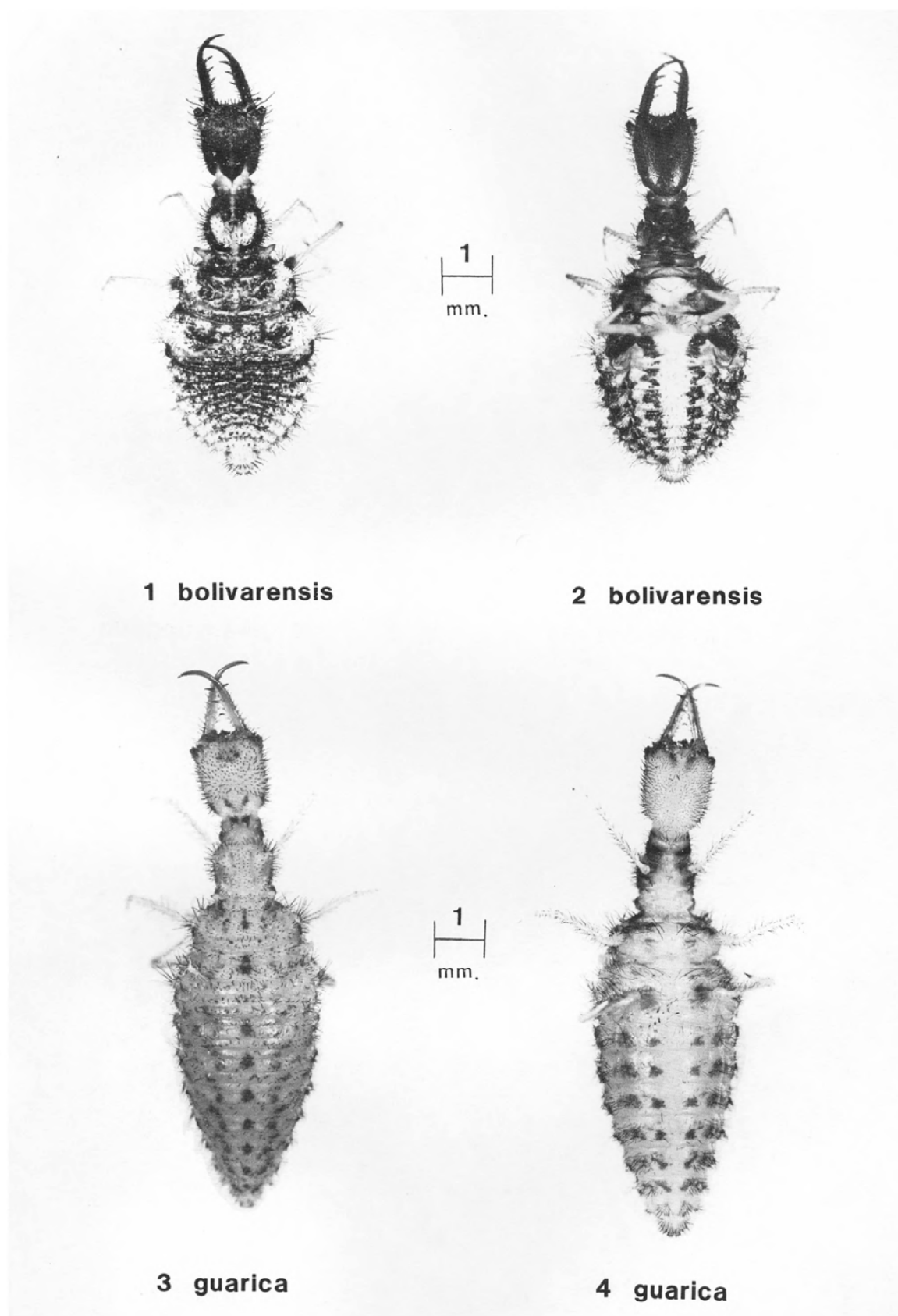


Figure 1-4. Third instar larva of *Dimarella*. 1,3) Dorsal view; 2,4) Ventral view.

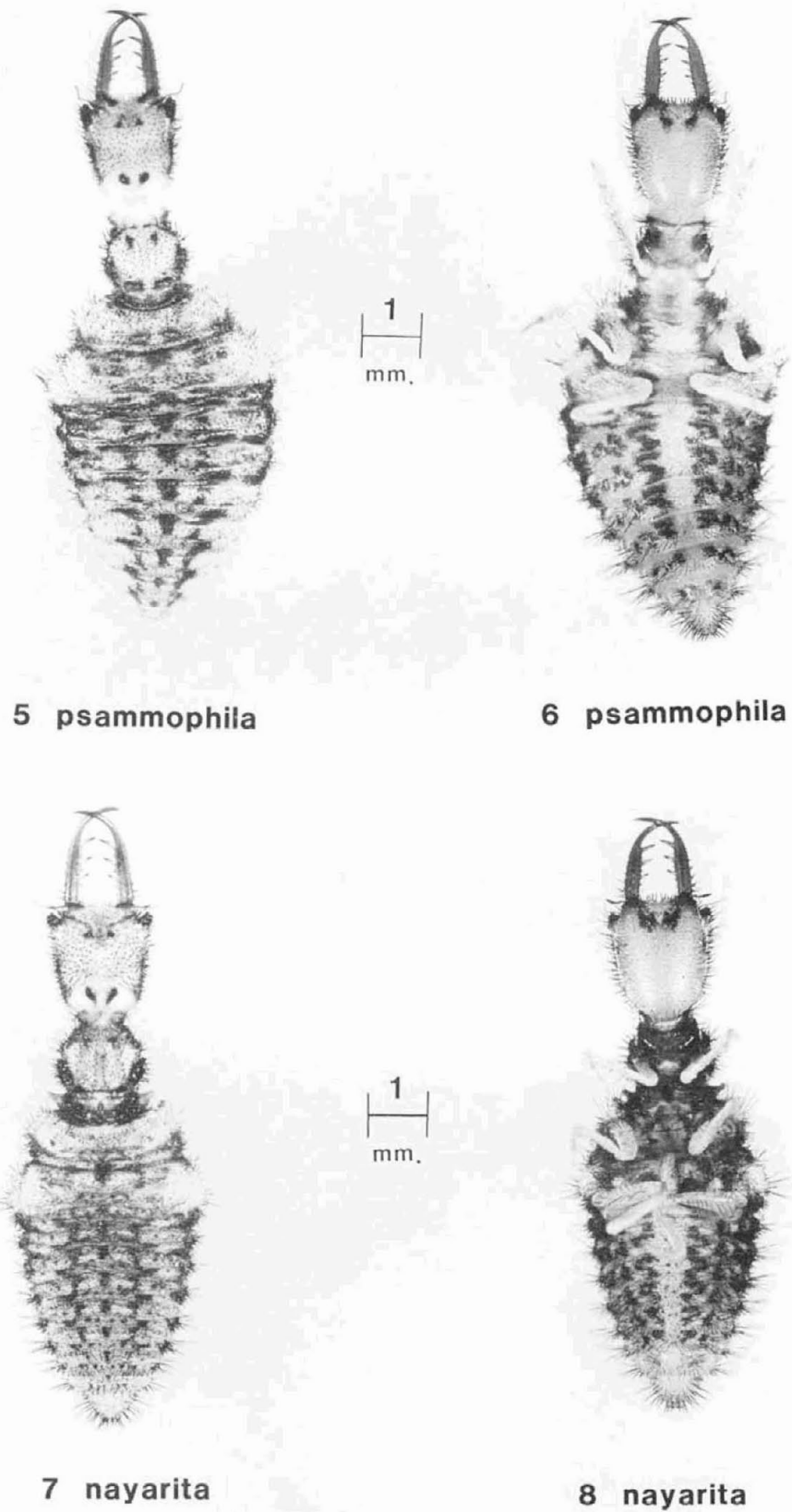


Figure 5-8. Third instar larva of *Dimarella*. 5,7) Dorsal view; 6,8) Ventral view.

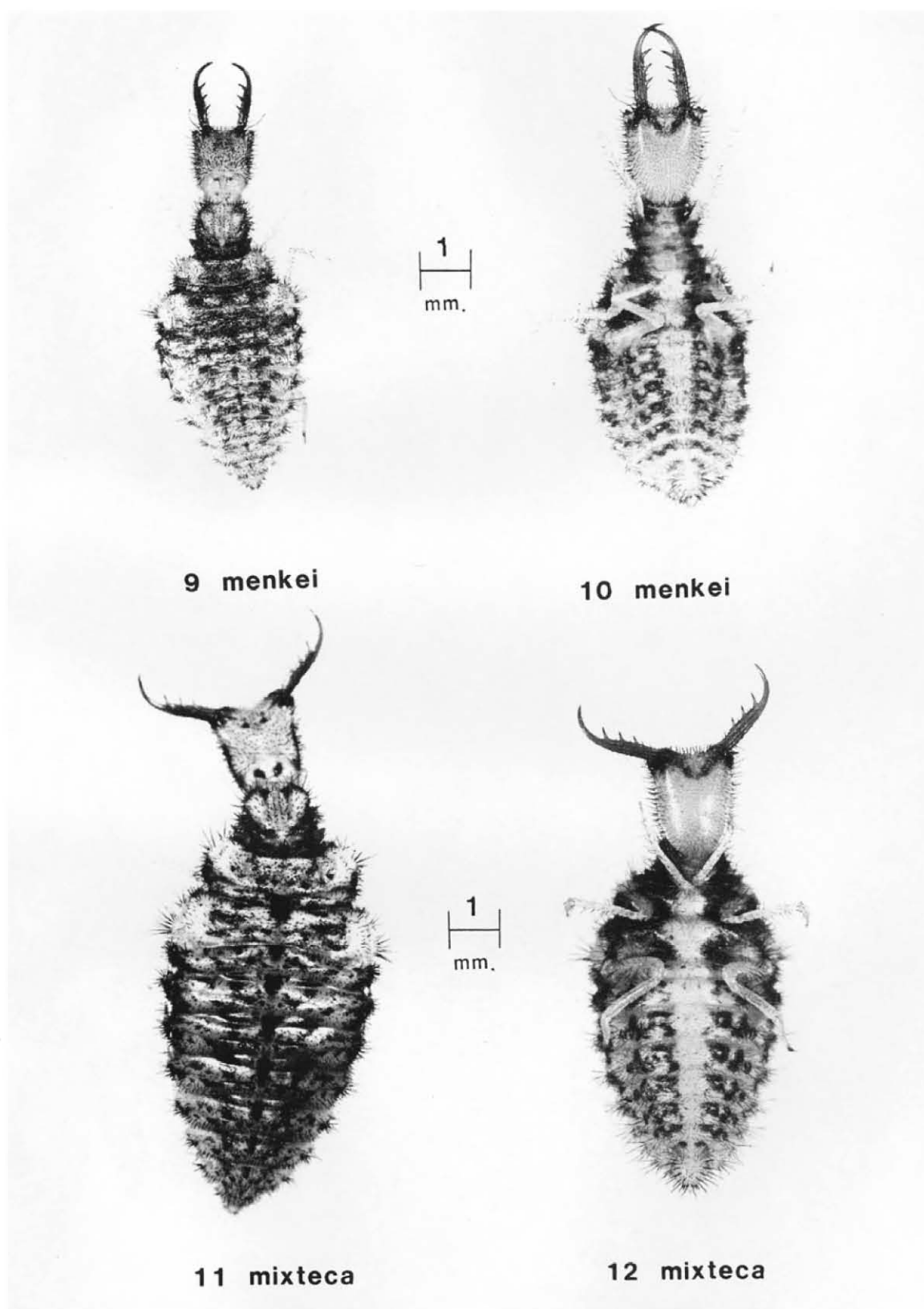


Figure 9-12. Third instar larva of *Dimarella*. 9,11) Dorsal view; 10,12) Ventral view.

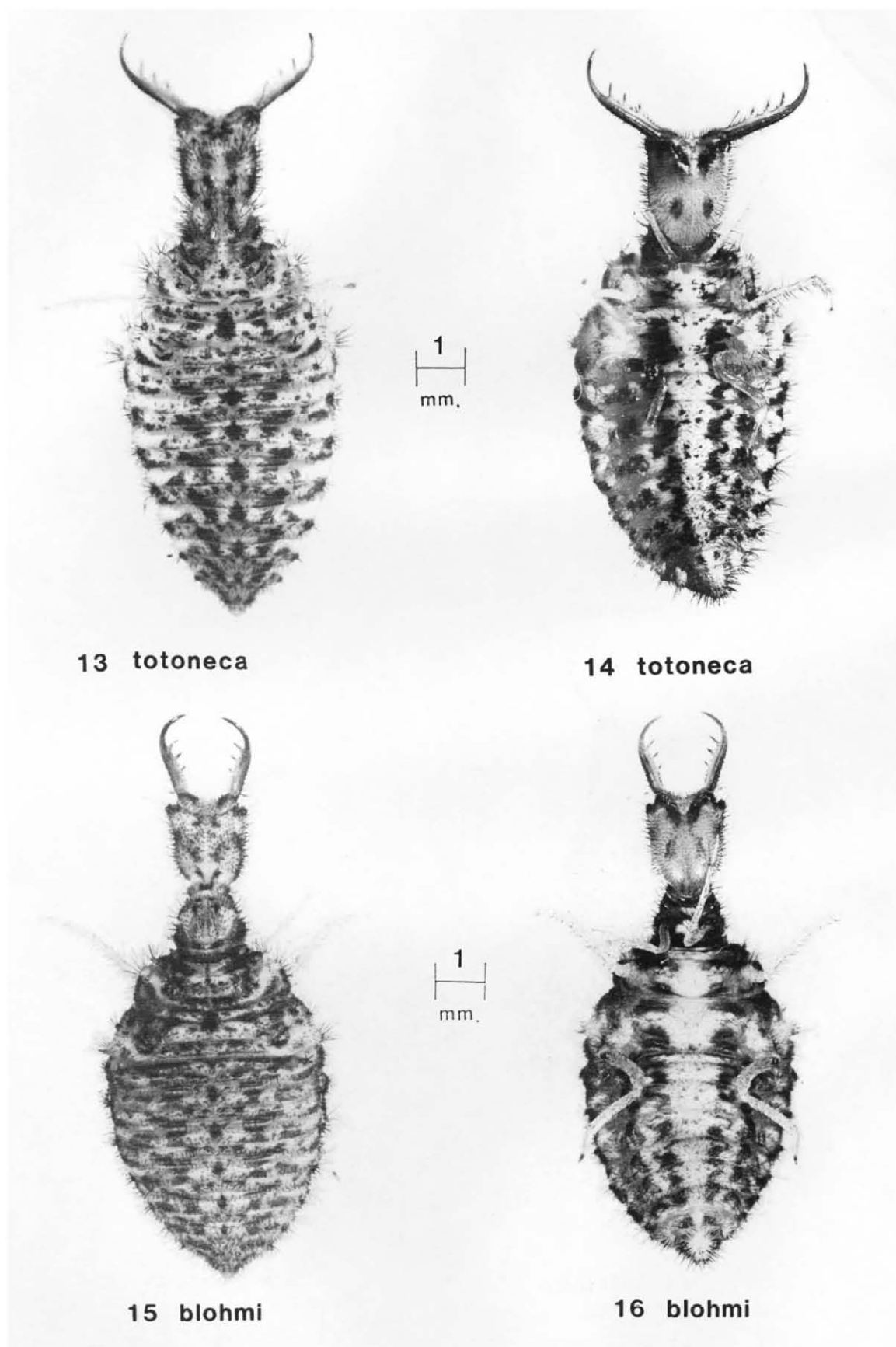


Figure 13-16. Third instar larva of *Dimarella*. 13,15) Dorsal view; 14,16) Ventral view.

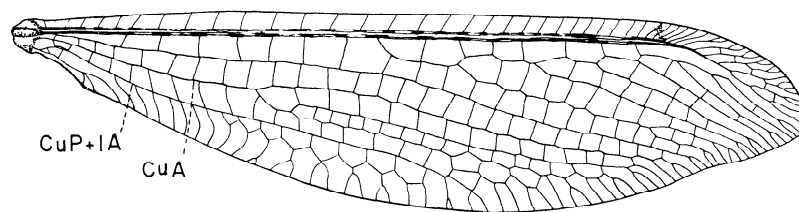
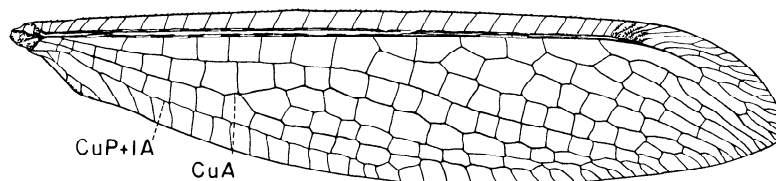
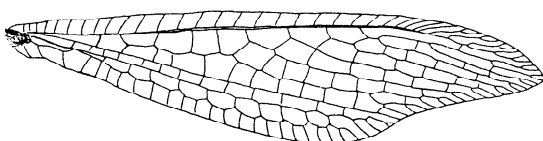
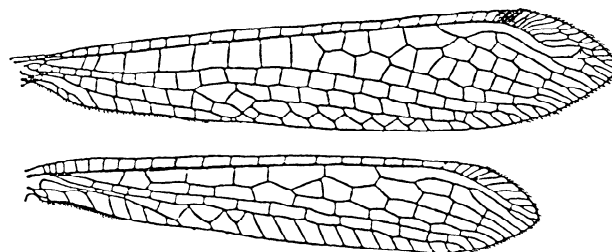
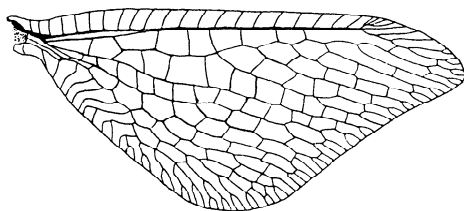
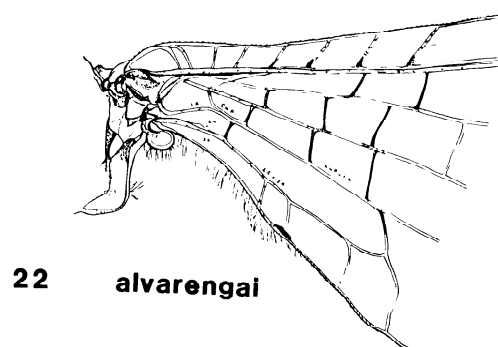
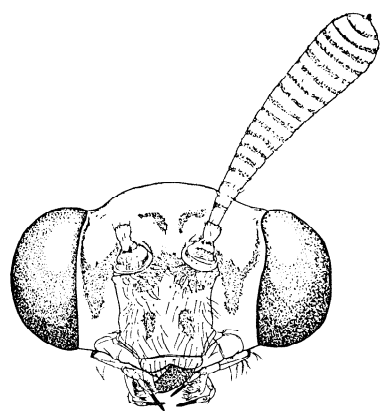
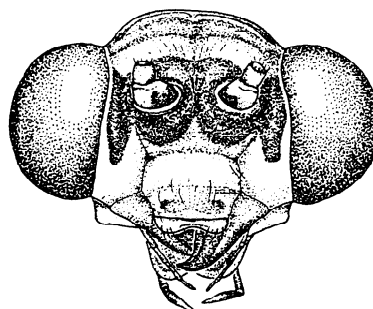
**17 angusta****18 menkei****19 blohmi****21 amazonica****20 alvarengai****22 alvarengai**

Figure 17-22. Taxonomic characters of *Dimarella*. 17) forewing; 18) wings; 19,20) hindwings; 21) wings; 22) base, forewing.



23 alvarengai



24 psammophila



25 efferata



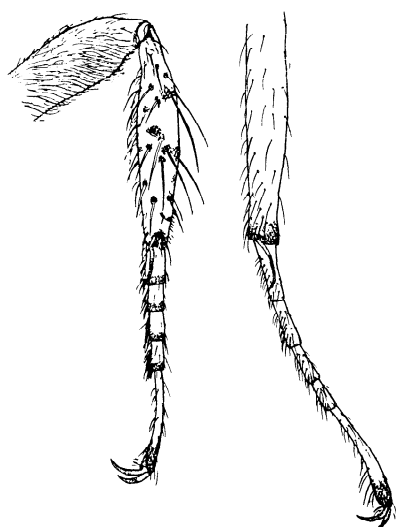
26 psammophila



27 menkei



28 bolivarensis



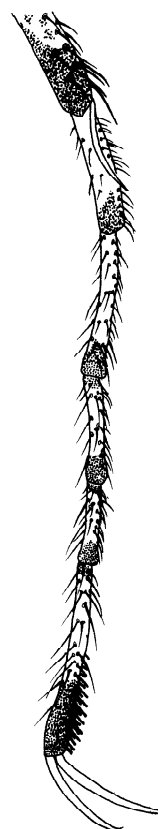
29 alvarengai



30 psammophila

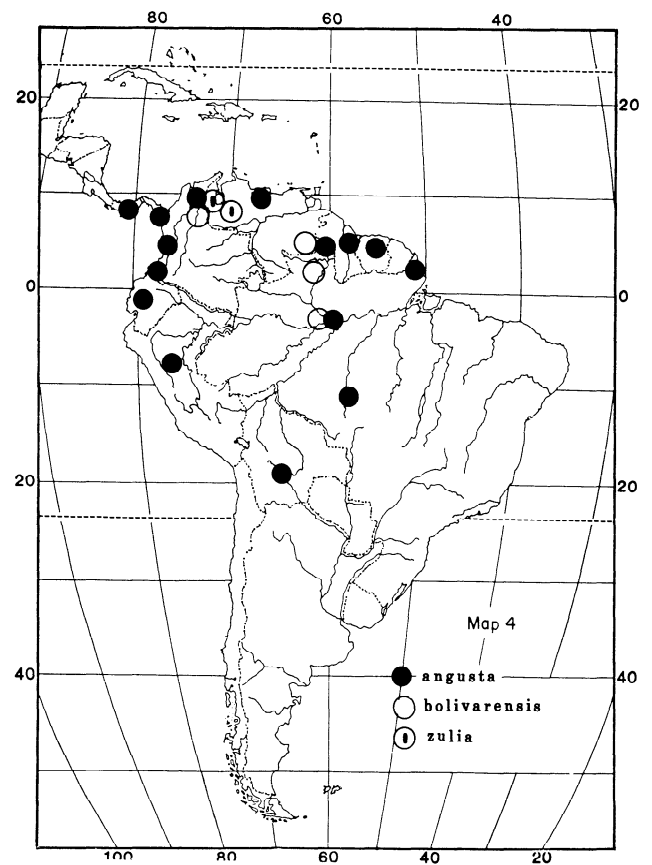
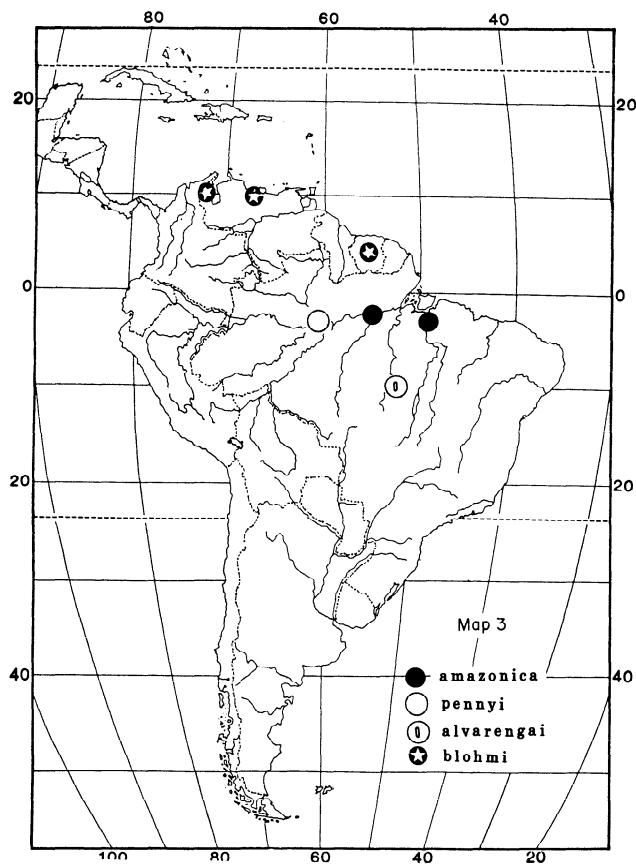
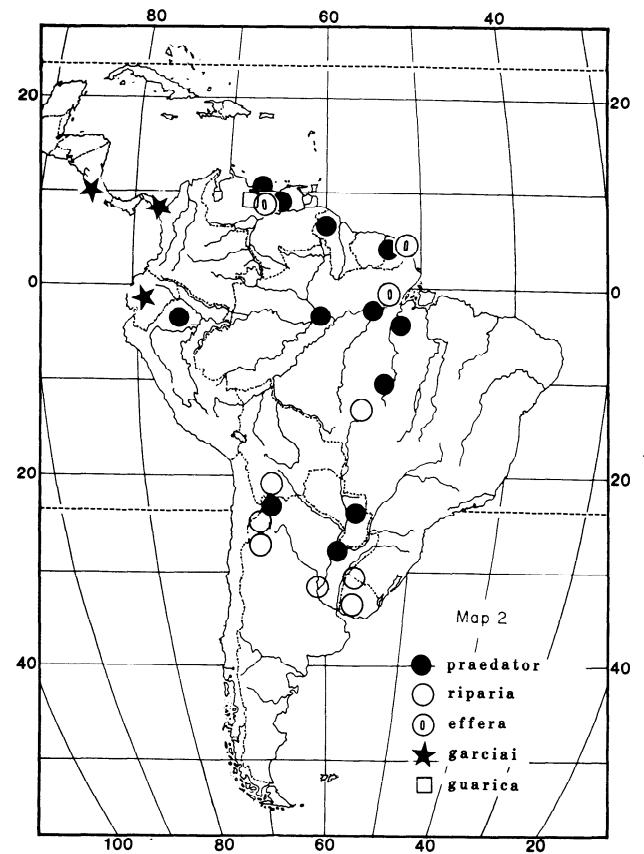
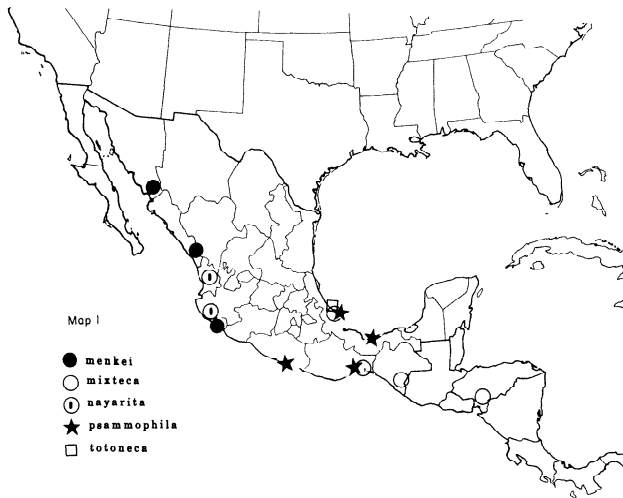


31 menkei



32 bolivarensis

Figure 23-30. Taxonomic characters of *Dimarella*. 23,24) frontal view of head; 25) head and thorax (dorsal view); 26,27) hind tibia; 28) foreleg and hindleg; 29,30) hindleg.

Map 1-4. Distribution of *Dimarella* species.

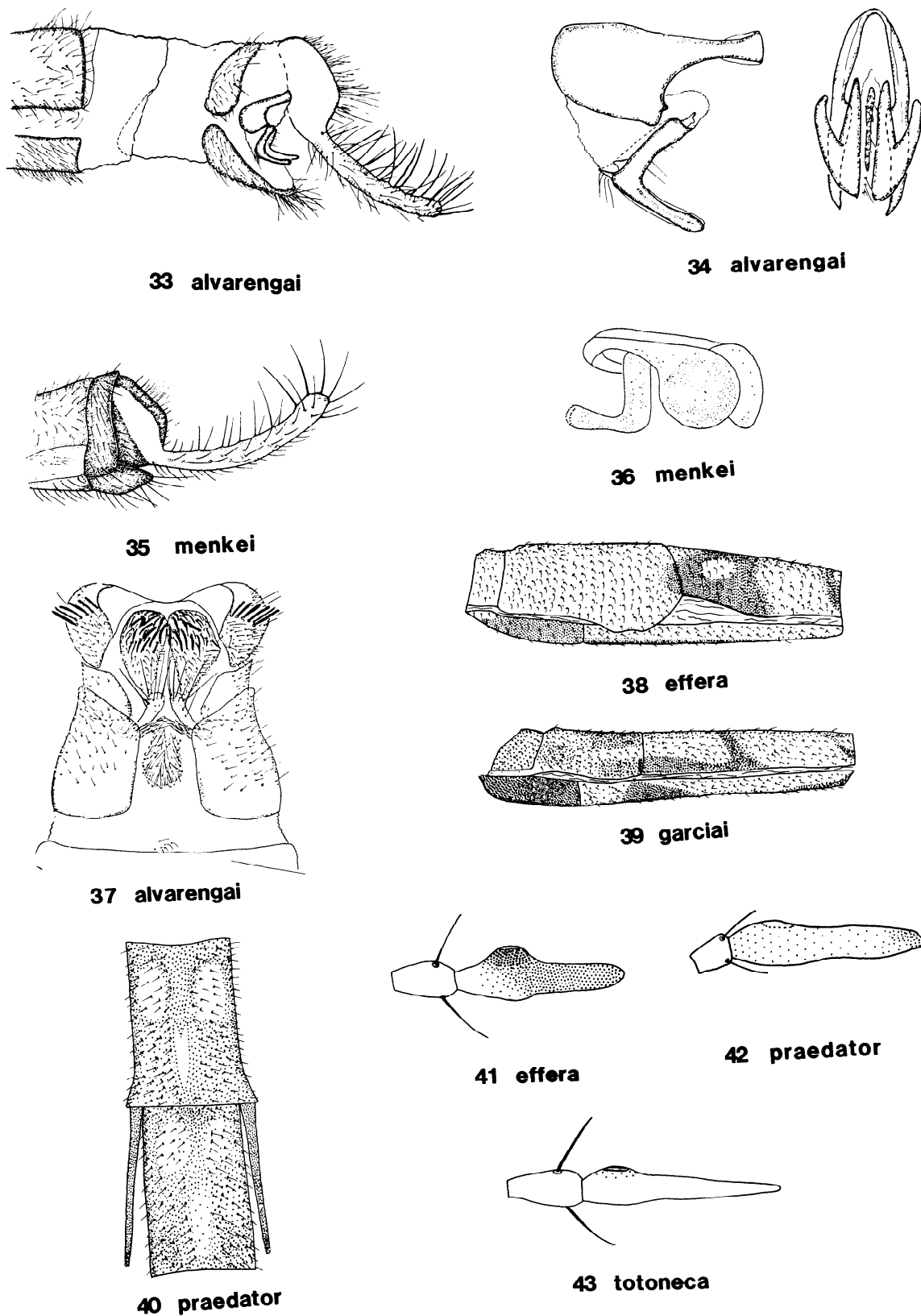


Figure 33-43. 33, 35) male terminalia (lateral view); 34, 36) male genitalia; 37) female terminalia (ventral view); 38-39) male abdomen, lateral view of basal three segments; 40) male abdomen; dorsal view of segments VI-VII; 41-43) distal segments of larval labial palpus.