

A Revision of the World *Amphibulus* Kriechbaumer (Hymenoptera: Ichneumonidae, Phygadeuontinae)

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Abstract

Amphibulus Kriechbaumer (Hymenoptera: Ichneumonidae, Phygadeuontinae = Gelinae, Gelini) is revised world-wide. It is separated from its sister group genus *Endasys* Foerster by means of a key and a diagnosis. Keys are given to 3 species groups and 25 species, including European *gracilis* Kriechbaumer and *fenicus* Sawoniewicz. Mexican *satageus* (Cresson) is redescribed, and 22 species are newly described: *africanus*, *auranticeps*, *aurarius*, *aureolus*, *bicolor*, *borealis*, *carinarum*, *dentatus*, *duodentatus*, *eurystomatus*, *flavipes*, *laticornis*, *nigripes*, *orientalis*, *pentatylus*, *pilosus*, *pseudopustulae*, *pustulae*, *pyrrhoborealis*, *rugosus*, *salicis*, and *tetratylus*. Thirty figures illustrate diagnostic characters.

Introduction

This is the first revision of the known species of *Amphibulus* Kriechbaumer world-wide. It is an uncommon sister group genus of *Endasys* Foerster, and is found in the Palearctic, Ethiopian, Nearctic, and Neotropical regions. *Amphibulus* is one of eight genera included by Townes (1970; 1983) in the subtribe Endaseina of Gelini (=Phygadeuontini). It appears to replace *Endasys* in the montane tropics. This revision treats 25 species, including three old and 22 new. It is based on 330 specimens determined from over 50,000 specimens in over 30 museum collections world-wide. In the Acknowledgments are listed those institutions that loaned specimens of *Amphibulus*.

The purpose of this revision is to more clearly define the genus, diagnose and describe new species, and provide a key to the known species and species groups along with illustrations of important taxonomic characters. This study expands the range of *Amphibulus* beyond the Palearctic and Neotropical regions into the Nearctic, and Ethiopian regions. In the Holarctic it is collected in habitats similar to those of *Endasys*, but apparently in more open areas.

Historically *Amphibulus* has been treated as a monotypic genus or as a synonym of *Endasys*. The discovery of additional species has helped further define the limits of both *Amphibulus* and *Endasys*.

Acknowledgments

This study was based on specimens borrowed from the following collections and individuals. Additional material was examined at the Institute of Zoology, Polish Academy of Sciences, Warsaw, with the kind assistance of Dr. Janusz Sawoniewicz. A copy of the habitus of *Amphibulus* was provided by Dr. David Wahl at the American Entomological Institute, Gainesville, Florida.

- ANSP Academy of Natural Sciences, Philadelphia, Penn. (D. Azuma).
- AEI American Entomological Institute, Gainesville, Fla. (D. Wahl).
- CNC Canadian National Collection, Ottawa, Ont. (J. Barron).
- MCZ Museum of Comparative Zoology, Harvard Univ., Mass. (S. Shaw).
- NMNH National Museum of Natural History, Washington, D.C. (R. Carlson).
- UCR University of California, Riverside (J. Hall).
- UM University of Minnesota, St. Paul (P. Clausen).

Methods

Specimens were examined using a binocular microscope under the light of an incandescent bulb. A micrometer was inserted into the objective eye-piece for measuring. Incandescent lighting reveals

both color and surface features best. Fluorescent lighting is best for examining surface features such as punctation, carinae, or sutures. High intensity lighting is least desirable because of the glare. Specimens were examined under 15X or 30X, with 15X mostly for evaluating color patterns and overall form. Illustrations were drawn free-hand under 45X.

Descriptions of species were based on holotypes, with variations reflecting paratypes, if any. The format for describing color patterns is that used in my *Endasys* revision (*op. cit.*), with each color followed by all pertinent parts so colored, a method used by Dr. Z. Boucek. Other morphological characters of diagnostic value are described for each species under the categories Antenna, Head, Thorax, Propodeum, Wing, Femur 3, and Abdomen. Only those characters useful in identifying species are included in diagnoses and descriptions. Redundant or invariable characters are generally omitted.

Measurements were made of body length and clypeal ratios of height versus width. Indications of body size such as "large," "medium," or "small" were made after looking at all available specimens of a species, and are useful in diagnoses. The ovipositor sheath or 3rd valvula was not included in female body lengths.

Terminology

Terms used in keys and descriptions follow Townes (1969: 36-48), with the following exceptions: trochantellus(i) not 2nd trochanter(s); area dentipara not 2nd lateral area; tergum(a) not tergite(s); sternum(a) not sternite(s); 3rd valvula not ovipositor sheath; flagellomeres not flagellar or antennal segments, and tarsomeres not tarsal segments. Some of these changes were necessitated to please certain specialists, while other terms are too long for constant use in diagnoses and descriptions. In addition, the following descriptive terms are defined here for use in the keys, diagnoses, and descriptions.

Body length is "small"—5 mm or shorter, "medium"—5-8 mm, "large"—more than 8 mm long. Longer body length corresponds with longer wing length.

Clypeal margin ranges from "upturned" (Figs. 5-6), "weakly lobed" (Fig. 8A), "distinctly lobed" (Fig. 10), to "upturned and toothed" (Fig. 6).

Basal 3 flagellomeres of the female antenna are "short"—a little longer than wide (Fig. 14), with a stouter flagellum; or "elongate—nearly twice as

long as wide (Fig. 1A,13), with a slender and elongate flagellum.

Punctation is "dense" if pits are 1 diameter or less apart in all directions, "sparse" if more than 1 diameter in all directions, "moderately sparse" means some pits are densely spaced, and "moderately dense" means some pits are sparsely spaced.

Setiferous punctures (pits) are described according to relative width and depth: small pits are "punctulate"; large pits are "punctate." Pitting may be "distinct"—deep, or "indistinct or weak"—shallow.

Surfaces are described as "smooth and shiny", "rugulose"—weakly wrinkled, or "rugose"—strongly wrinkled. Although smooth and shiny surfaces are often without setiferous punctures, wrinkled surfaces are often an artifact of dense punctation. Wrinkled surfaces not artifacts of punctation on the face, cheek, clypeus (Figs. 6A,9) are described as "strigose"

Areola of the propodeum is described as "widely hexagonal," (Fig. 15), "hexagonal" (Fig. 1C), "elongate hexagonal" (Fig. 16), or "narrow and elongate hexagonal" (Fig. 21).

3rd lateral area of the propodeum is "present" (Figs. 17,18,21), "weakly present" (Fig. 1C), or "absent" (Fig. 2).

Relationships

Amphibulus, *Endasys*, *Glyphicnemis* Foerster, and *Coptomystax* Townes comprise a closely related group within the subtribe Endaseina (*sensu* Townes). They share the apomorphy of the transverse break on the posterior margin of the mesoscutum, with or without a transverse ridge across the prescutellar groove (Gauld and Holloway, 1983; Townes, 1970). *Glyphicnemis* is distinctive by autapomorphies of the elongate, lower mandibular tooth and the subapical insertion of the tibiae, as well as the strongly developed tibial bristles. In *Coptomystax*, a high, compressed median tubercle on the upper face, and the prepectal carina ending below the middle of the hind edge of the pronotum are autapomorphic. *Amphibulus* and *Endasys* remain as apparent sister groups. Several apomorphic characters separate the two.

Characters can be polarized using *Cubocephalus* (Gelinae, Echthrini *sensu* Townes) as the outgroup. *Amphibulus* exhibits the following apomorphic character states absent in *Endasys*: appendages maxillary palps more elongate and slender, clypeal margin often toothed or lobed, genal and oral cari-

nae interception before mandible, color pattern more specialized (i.e. white on the thorax, or coxae entirely white), front wing with nervulus and basal vein converging, antenna of males sometimes with annulus, and hind tibial spur shorter than basal 0.4 of basitarsus. Apomorphies of *Endasys* differing from *Amphibulus* are genal and oral carinae interception at mandible, often 2 tyloids (males), sternaulus absent apical half, and usually pronounced sexual dichromatism and dimorphism.

The following characters are seen as plesiomorphic in *Amphibulus*: flagellum usually with annulus (most species), tyloid number three or more (males), weak or absent sexual dimorphism or dichromatism, presence of the ramulus on m-cu1 of front wing (a few species), male subgenital plate not or weakly emarginate, and the sternaulus distinct across mesopleurum.

As host information becomes available for all of the endaseine genera, the relationships and possible phylogeny of the Endaseina will become clearer. At present it appears that *Amphibulus* replaces *Endasys* in meadows near forests, and in the Neotropic and Ethiopian regions. The ecological analogue of *Amphibulus* in the Oriental Region appears to be *Coptomystax*; in the Australian Region, *Meringops* Townes. The widespread distribution of the amphibuline *Satageus* and *Latoris* species groups would support a hypothesis that *Amphibulus* evolved before the Beringia land bridge joined North America (Alaska) with Asia (Siberia) during the Tertiary until the Pleistocene (Matthews, 1980).

Biology

Little is known of the biology of the species. Dr. J. Sawoniewicz in Warsaw, Poland (pers. comm., 1987), has observed European *Amphibulus gracilis* to occur in open meadows near forests, but not within them as with *Endasys*. He has noted (Sawoniewicz, 1985) that adults occur from August to as late as November. Although it is assumed that hosts of *Amphibulus* are cocoons (or prepupae in cocoons) as is true for the subfamily Gelinae, the only host association so far is for *A. salicis* with the label "ex larva feeding on leaves of *Salix*". Thus cocoons of Lepidoptera or sawflies are its probable hosts. *Amphibulus* has weaker tibial spines and more slender appendages and body compared to *Endasys*. Perhaps *Amphibulus* parasitizes cocoons hidden in less confined situations in meadows such as among dried grass or leaf litter, or possibly rolled leaves, rather than beneath the soil as with *Endasys* and *Glyphicnemis*.

Diagnosis

Genus *Amphibulus* Kriechbaumer

Amphibulus Kriechbaumer, 1893. Ent. Nachr. 19: 122; Townes, 1951: 245, 1970: 84; Sawoniewicz, 1985: 133. Type: *Amphibulus gracilis* Kriechbaumer. Monobasic.

Kriechbaumer described *Amphibulus* in 1893 as a monotypic, European genus. Cresson described the first New World species as belonging to the genus *Phygadeuon*, as were most of the North American species of *Endasys* and *Glyphicnemis*. Townes (Townes and Townes, 1951) synonymized *Amphibulus* with *Endasys* in catalogues from 1951 until redescribing it as a separate genus in 1970. Sawoniewicz (1985) redescribed, illustrated, and listed synonyms for the type species of the genus, *Amphibulus gracilis*.

Townes' generic key (1970: 78) to Endaseina is modified as follows to distinguish *Endasys* and *Amphibulus*, based on revisions of *Endasys* (Luhman, 1990; Luhman and Sawoniewicz, 1991) and *Amphibulus* (Sawoniewicz, *op. cit.*).

- 1a. Prescutellar, median longitudinal ridge present (Fig. 2)(absent in *E. gracilis*, and sometimes in *santacruzensis*), sternaulus indistinct across posterior half of mesopleurum, clypeus always without teeth or lobes, 3rd lateral area undefined, subgenital plate of male emarginate medially, and genal carina joining mandible. Holarctic *Endasys*
- 1b. Prescutellar ridge usually absent, sternaulus distinct across entire mesopleurum, strong and often sculptured anterior half, clypeus often with lateral teeth (Figs. 6) or weak medial lobes (Figs. 8,10), 3rd lateral area often defined (Figs. 1C,17,18,21), subgenital plate of male truncate or rounded, and genal carina meeting oral carina distinctly before mandible (Fig. 3). Holarctic, Neotropical, and Ethiopian Regions *Amphibulus*.

The following, modified from Townes (1970: 84), characterizes *Amphibulus*. Although most species are easily separated from *Endasys*, some Holarctic *Amphibulus* are superficially similar to some species in the *Auriculiferus* and *Santacruzensis* groups of *Endasys*. They can be diagnosed mainly by the features of the clypeus, sternaulus, propodeum, genal carina, and subgenital plate (males). Overall,

Amphibulus is more slender than *Endasys* in the appendages, petiole, and abdomen.

Body length: 4-10 mm long.

Wing: 5.5-9.5 mm long.

Flagellum: moderately slender a little elongate—flagellomeres distinctly longer than wide; flagellum of female usually narrowed apical third (except *carinarum*, *laticornis*, and *pustulae*), annulus (white) present in all but *borealis* and *salicis*; flagellum of male with 2-8 tyloids or none (*pustulae*), most species with 3 or more, usually beginning on flagellomere 10 or 11. Most *Endasys* with 2 or 3 tyloids beginning on flagellomere 9 or 10. some males of tropical species with white annulus.

Face: upper margin concave usually with a small median, rounded tubercle; face more or less swollen medially, or sometimes nearly flat.

Eye: surface bare or with short, sparse hairs.

Clypeus: roundly elliptical to very wide, its apical margin thick or thin and distinctly, often strongly upturned medial third, often with small teeth laterally, or pair of lobes medially.

Mandible: moderately slender and elongate to short and stout. lower tooth shorter than upper tooth, or the same length.

Maxillary palp: 4th segment similar to 5th: slender and elongate, or weakly swollen and at least 0.5 times the length of segment 5 or longer (Fig. 4A). Most species of *Endasys* with 4th segment short and swollen (Fig. 4B); others with 4th less than 0.5 times length of segment 5.

Genal carina: usually joining oral carina distinctly before reaching mandible. In *Endasys*, oral carina usually joining mandible, sometimes meeting oral carina adjacent to mandible, or fading out before reaching mandible.

Prepectal carina: approaching front margin of mesopleurum a little below middle of hind margin of pronotum, then turning dorsad toward subtegular ridge.

Mesoscutum: weakly to moderately convex in males, females sometimes flatter; notaulus strong, weak, or absent. Posterior edge of mesoscutum with break, unusually conspicuous in some species and traversing the width of the mesoscutum; prescutellar groove with longitudinal ridge usually absent, but may be distinct—usually distinct in *Endasys*, except in *E. gracilis* Luhman and variably in *santacruzensis* Luhman.

Sternaulus: distinct across mesopleurum, most species with anterior half strongly impressed and sculptured, posterior half usually distinct, at least

as wrinkles. Absent posteriorly in *Endasys* except sometimes as irregular wrinkles).

Propodeum: carinae strong to weak, usually distinct, apophysis in most species either toothlike or absent, a few species with crestlike apophysis; areola in most species elongate hexagonal to hexagonal (Figs. 16,21)—most *Endasys* broadly hexagonal (Fig. 15); 3rd lateral area defined or not (i.e. dorsomedian carina present apically); petiolar area nearly as high as wide—distinctly wider than high in *Endasys*, in most species petiolar area nearly vertical and flat or faintly concave, or some species with areola and petiolar areas in same plane; petiolar area distinctly concave and slanted in females of *Endasys*.

Wing: ramulus present in a few species; sometimes indicated by swelling or angulation on 1st recurrent vein. Areolet evenly pentagonal or a little higher than wide. Radial sector mostly straight; curved or bowed in many *Endasys*. Nervulus intercepting or a little distad basal vein.

Tibia: bristles moderately strong; apical truncation of hind tibia approximately transverse. Spurs of hind tibia inserted about at apex, longer spur usually less than 0.4 times length of basitarsus. *Endasys* with longer spur, usually more than 0.4 times length of basitarsus.

Abdomen: abdomen of males generally slender and elongate, tergum 1 slender, petiole often elongate in both males and females, postpetiole in males usually distinctly longer than wide. Males of *Endasys* mostly with postpetiole squarish. Postpetiole in females a little wider than long to distinctly elongate; dorsomedian carina of most species weak or absent before spiracle, distinct beyond spiracle only in *carinarum*, *borealis*; and *pyrrhoborealis*; sternum 1 of most species at or beyond spiracle. Terga 2-3 polished, with or without moderate number of hairs in males, females almost hairless, tergum 2 in males of many species narrowed basally. Thyridium usually distinct. Sternum 5 in most species membranous medially, some also with sterna 6-7 membranous. Epipleura of terga 2-3 narrow. Subgenital plate of male truncate, rounded, or emarginate medially.

Ovipositor: sheath (3rd valvula=length of visible part of ovipositor beyond apex of abdomen) as long as basal 2-5 hind tarsomeres, most with sheath as long as basal 4 or 5 tarsomeres; ovipositor moderately stout, compressed, tip elongate lanceolate, with faint ridges.

Sexual dimorphism: nearly absent to weak,

Sexual dimorphism: nearly absent to weak, association of sexes more apparent than in *Endasys*.

Species Groups

The genus may be divided into three species groups on the basis of clypeal characters, primarily shape and the presence or absence of teeth or lobes. Other generic characters useful in dividing *Endasys* are not useful in *Amphibulus* because of much overlapping among its species groups. This is particularly so regarding presence or absence of the prescutellar ridge, color pattern, tyloid number, presence or absence of an annulus, and presence or absence of the 3rd lateral area. Species groups of *Amphibulus* may be diagnosed by the key below. A list of the species included in them follows it. In the text, species are presented in alphabetical order without regard to species groups, which are, however, referred to in diagnoses and remarks.

- 1a. Clypeus widened, about 3 times wider than high ..
..... Latoris Group
- 1b. Clypeus higher, about 2.5 times wider than high or
less 2
- 2a. Clypeus with small, lateral tooth on emarginate
corner of clypeal margin (Fig. 6)
..... Dentatus Group
- 2b. Clypeus without such lateral tooth, but with or
without median pair of apical lobes (Figs. 8, 10)
..... Satageus Group.

The following lists the species included in each group.

Satageus Group: *auranticeps*, *aurarius*, *au-reolus*, *borealis*, *carinarum*, *flavipes*, *gracilis* Kriechbaumer, *nigripes*, *pilosus*, *pyrrhoborealis*, *salicis*, *satageus* (Cresson). Species are Palearctic, Nearctic, and Neotropical.

Latoris Group: *africanus*, *bicolor*, *duodentatus*, *eurystomatus*, *fennicus* Sawoniewicz, Ethiopian, Holarctic, and Neotropical.

Dentatus Group: *dentatus*, *pseudopustulae*, *pustulae*. All species are Neotropical.

Key

The key uses structural and color features known to occur in both sexes. Writing a key to the species of *Amphibulus* poses special problems. Because of the paucity of material, the extent of variation that may occur is largely unknown for most species. On the basis of morphological characters and color patterns of the species studied, I have determined

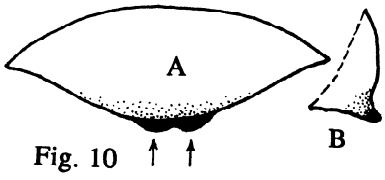
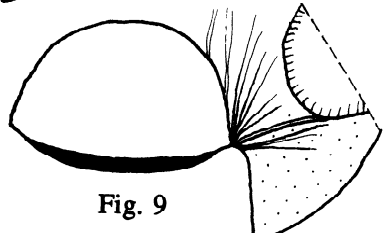
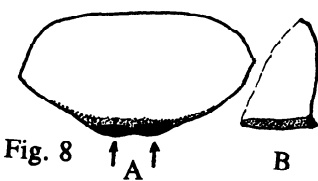
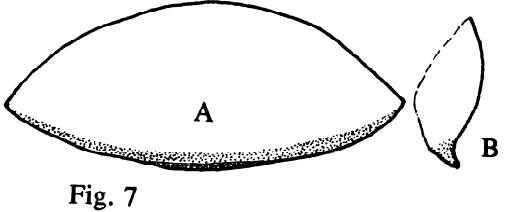
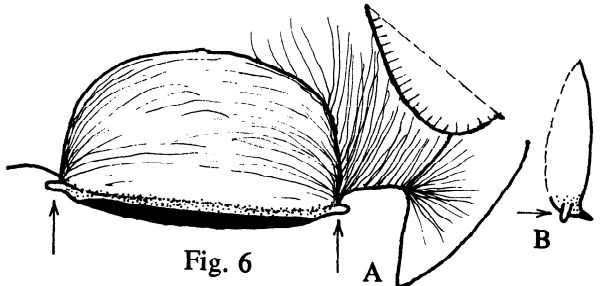
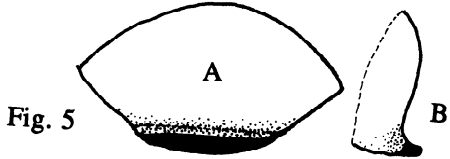
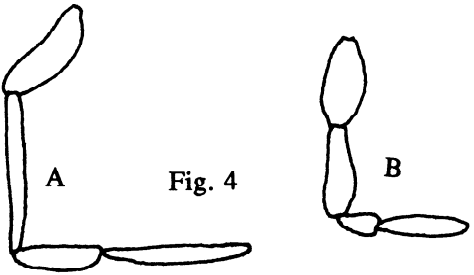
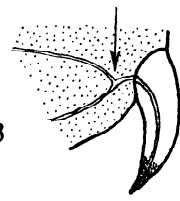
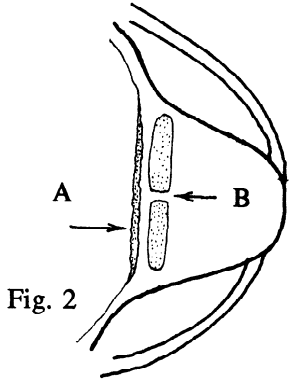
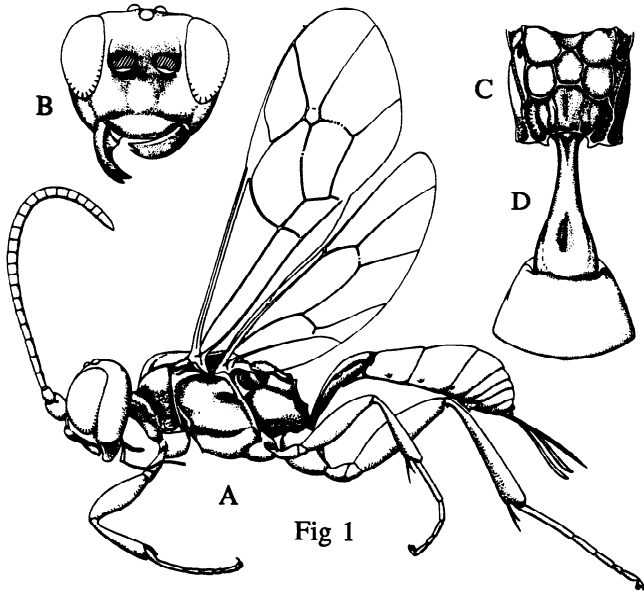
which are least variable within a species and between sexes. Thus it should identify species for which the alternative sex is as yet unknown, or for species described from only a few specimens. Included in the key and in the species-group list are European *A. fennicus* (couplet 26a.) and *A. gracilis* (couplet 20b.), but see Sawoniewicz (1985, 1990) for their descriptions. They can be diagnosed using the key.

Key to the world *Amphibulus* Kriechbaumer

- 1a. Clypeus with teeth or lobes 2
- 1b. Clypeus without teeth or lobes 9
- 2a. Face and cheek strigose (Fig. 6A) 3
- 2b. Face and cheek not strigose 4
- 3a. Clypeus smooth, apophysis reduced or absent;
Mexico and Arizona *pseudopustulae* sp. n.
- 3b. Clypeus rugulose, apophysis more or less distinct;
Mexico *pustulae* sp. n.
- 4a. Apophysis absent; Mexico and Arizona
..... *duodentatus* sp. n.
- 4b. Apophysis distinct 5
- 5a. Abdomen mostly orange 6
- 5b. Abdomen mostly black, brown, or yellow 7
- 6a. Orange: thorax, propodeum, most of legs; South
America *aurarius* sp. n.
- 6b. Black: thorax, propodeum, most of legs; Mexico
..... *nigripes* sp. n.
- 7a. Thorax and propodeum mostly white; Mexico....
..... *satageus* (Cresson).
- 7b. Thorax and propodeum almost entirely black.. 8
- 8a. Scape and legs black, male flagellum without
annulus, clypeal margin with small teeth later-
ally; Mexico *dentatus* sp. n.
- 8b. Scape and legs mostly yellow, male flagellum with
annulus, clypeal margin with very faint lobes
medially; Venezuela *flavipes* sp. n.
- 9a. Face and cheek strigose (Fig. 9A); Mexico and
Arizona *pseudopustulae* sp. n.
- 9b. Face and cheek not strigose 10
- 10a. Propodeum completely covered with very dense,
long gray hairs, obscuring surfaces; Mexico and
Central America *pilosus* sp. n.
- 10b. Propodeum covered with shorter, less dense hairs,
not obscuring surfaces 11

- 11a. Third lateral area weakly to strongly defined (Figs. 1C, 17, 21) 12
 11b. Third lateral not defined (Figs. 16) 21
- 12a. Thorax and propodeum orange 13
 12b. Thorax and propodeum black 15
- 13a. Head capsule entirely orange, areola about twice as long as wide; Mexico *auranticeps* sp. n.
 13b. Head capsule mostly black, areola about 3 times as long as wide 14
- 14a. Apophysis absent, wings vitreous, scape yellow; Peru *rugosus* sp. n.
 14b. Apophysis present, wings yellowish or blackish, scape blackish; Brazil and Ecuador *aurarius* sp. n.
- 15a. Clypeus widened, about 3 times wider than high (Fig. 7A) 16
 15b. Clypeus not so widened, usually about 2.5 times wider than high 18
- 16a. Frontwing without trace of ramulus, notaulus faint, female with 2 white flagellomeres; United States and Canada *latioris* sp. n.
 16b. Frontwing with ramulus present as stub or swelling, notaulus distinct, female with 6 or more white flagellomeres; Korea or Mexico 17
- 17a. Abdomen blackish apical half; Korea *bicolor* sp. n.
 17b. Abdomen mostly orange apical half; Mexico *eurystomatus* sp. n.
- 18a. Apophysis more or less distinct (Fig. 21), legs mostly yellow, abdomen black; Europe or Venezuela 20
 18b. Apophysis absent (Figs. 20,23,24), legs and abdomen variable; Central America or Oriental Region 19
- 19a. Abdomen and leg 3 mostly orange; Central America *aureolus* sp. n.
 19b. Abdomen and leg 3 mostly black; China and Japan *orientalis* sp. n.
- 20a. Clypeus black, male with annulus; Venezuela *flavipes* sp. n.
 20b. Clypeus yellowish brown, male without annulus; Europe *gracilis* Kriechbaumer.
- 21a. Abdomen entirely black 22
 21b. Abdomen with orangish on terga 2-6 25
- 22a. Propodeum distinctly flattened, dorsal and petiolar areas in same plane, carinae of areola faint or absent (Fig. 19); Mexico *pentatylus* sp. n.
 22b. Propodeum with distinct dorsal and petiolar areas in different planes, carinae of areola distinct 23
- 23a. Thorax and propodeum orange; South Africa *africanus* sp. n.
 23b. Thorax and propodeum black; New World 24
- 24a. Postpetiole with distinct dorsomedian carina, apophysis present; United States and Canada (some) *carinarum* sp. n.
 24b. Postpetiole without dorsomedian carina, apophysis absent; Mexico *tetratylus* sp. n.
- 25a. Dorsomedian carina of petiole distinct to postpetiole, apophysis distinct; United States and Canada 26
 25b. Dorsomedian carina of petiole absent or faint, apophysis absent or crest-like (Fig. 23); Pakistan *salicis* sp. n.
- 26a. Clypeus widened, about 3 times wider than high *fennicus* Sawoniewicz.
 26b. Clypeus not so widened, usually about 2.5 times wider than high 27
- 27a. Propodeal carinae strong, female with annulus, postpetiole of male about as long as wide (most) *carinarum* sp. n.
 27b. Propodeal carinae fine, female without annulus, postpetiole of male about twice as long as wide 28
- 28a. Face yellow or orange above clypeus, propleurum partly orange *pyrrhoborealis* sp. n.
 28b. Face black above clypeus, propleurum entirely black except apex next to tegula *borealis* sp. n.

Figures 1-10. 1) *A. orientalis*. (A) Habitus lateral view, (B) head anterior view, (C) propodeum dorsal view, (D) abdominal tergum 1 dorsal view. 2) *Endaseina* spp. Prescutellar (A) break and (B) ridge (diagrammatic). 3) *A. borealis*. Junction of genal and oral carinae before mandible. 4) Maxillary palpal segments 2-5. (A) *Amphibulus carinarum*, (B) *Endasys callidius*. 5) *A. carinarum*. Clypeus (A) anterior view, (B) lateral view. 6) *A. pustulae*. Clypeus (A) anterior view showing pustulae and strigose clypeus, face, and cheek; (B) lateral view showing pustula. 7) *A. latioris*. Clypeus (A) anterior view, (B) lateral view. 8) *A. satageus*. Clypeus (A) anterior view showing weak lobes, (B) lateral view. 9) *A. pseudopustulae*. Clypeus anterior view showing strigose face and cheek; (B) lateral view. 10) *A. duodentatus*. Clypeus (A) anterior view showing lobes, (B) lateral view.



Amphibulus africanus Luhman, sp. n.

Female Diagnosis. Orange thorax and propodeum, black head, legs, and abdomen; medium size, about 7 mm long; South Africa. The only known African species.

Female Description. (based on 1 specimen). Antenna: flagellomeres 6-10 white, remainder black; flagellum short but moderately slender, distinctly narrowed apically, basal 3 flagellomeres less than twice as long as wide. Head: clypeus about 3 times wider than long, margin upturned; face swollen medially; face and frons densely punctate and a little rugulose, temple, sparsely punctate. Thorax: notaulus faintly indicated at anterior margin, prescutellar ridge absent, transverse break distinct; mesopleurum sparsely punctate and rugulose. Propodeum: distinctly swollen dorsally, areola nearly hexagonal, 3rd lateral area not defined. Wing: ramulus present as small stub. Femur 3: moderately swollen, about 3.5 times as long as wide. Abdomen: petiole moderately slender, not distinctly elongate, postpetiole about as long as wide, dorsomedian carina absent; 3rd valvula about as long as basal 2 hind tarsomeres. Color: white on apex of terga 4-8; blackish yellow: mandible basally, variably on femora 1-2 and tibiae 1-2; orange: thorax except mesosulcus, metasternum, coxa 3 with dorsal mark; black: scape, clypeus, mandible basally, tegula, mesosulcus, metasternum, most of legs 1-2, leg 3 except orange mark on coxa, abdomen except as noted.

Male. Unknown. Based on female characters, diagnostic features would include the orange thorax and propodeum, black abdomen, clypeus widened, margin upturned, without lobes, propodeum without apophysis, 3rd lateral area not defined, and ramulus present.

Holotype: female, SOUTH AFRICA, CAPE OF GOOD HOPE: Grahamstown, 21-31-x-1970, F. Gess (AEI).

Etymology: from African, referring to the continent.

Amphibulus auranticeps Luhman, sp. n. (Figure 29)

Male Diagnosis. Most of head, thorax, propodeum, and abdomen yellowish orange; scape, clypeus and face whitish, legs mostly yellow; flagellomeres 6-13 white, tyloids on flagellomeres 10-16; medium size, 6 mm long; southern Mexico. Differs from *aurarius* and *rugosus* by the orange head and whitish face.

Male Description. (based on 1 specimen). Antenna: elongate and slender, coloration and tyloids as in diagnosis. Head: clypeus broadly elliptical, margin slightly upturned medial third, margin without tubercles; face densely punctulate and rugulose, frons densely punctate and rugose, temple moderately sparsely and finely punctulate. Thorax: central area of mesopleurum impunctate; notaulus absent; prescutellar ridge absent, transverse break distinct. Propodeum: carinae very fine but distinct, areola elongate hexagonal, apophysis weak, 3rd lateral area defined. Wing: faintly yellowish, radial cell a little widened. Abdomen: petiole elongate and slender, sternum 1 beyond spiracle, postpetiole about twice as long as wide; tergum 2 a little narrowed basally; sterna 5-6 not membranous medially. Color: whitish scape, pedicel, clypeus, mandible; yellowish: collar, mesosternum, legs 1-2 except at least tarsomere 5 blackish; yellowish orange: most of head

Figures 11-30. 11) *A. duodentatus*. Flagellum apex of female. 12) *A. latioris*. Flagellum apex of female. 13) *A. areolus*. Antenna base of female. 14) *A. salicis*. Antennae base of female. 15) *Endasys santacruzensis*. Propodeum of female, dorsal and posterior view. 16) *Amphibulus carinarum*. Propodeum of female, dorsal and posterior view. 17) *A. pseudopustulae*. Propodeum of female, posterior view of 3rd lateral area. 18) *A. aurarius*. Propodeum of male, posterior view showing 3rd lateral area. 19) *A. pentatylus*. Propodeum of male, (A) dorsal view, (B) lateral view. 20) *A. aureolus*. Propodeum of female, dorsal view of area dentipara. 21) *A. flavipes*. Propodeum of male, dorsal view. 22) *A. nigripes*. Propodeum of male, lateral view of apophysis. 23) *A. salicis*. Propodeum of female, lateral view of area dentipara. 24) *A. rugosus*. Propodeum of female, lateral view of area dentipara. 25) *A. tetratylus*. Propodeum of male, lateral view of area dentipara. 26) *A. aureolus*. Abdomen of female, dorsal view. 27) *A. borealis*. Abdominal tergum 1 of female, dorsal view. 28) *A. borealis*. Abdomen of male, dorsal view. 29) *A. auranticeps*. Radial cell of front wing. 30) *A. bicolor*. Ramulus of front wing.

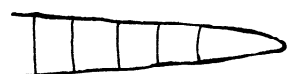


Fig. 11

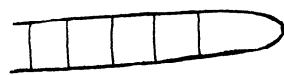


Fig. 12



Fig. 13



Fig. 14

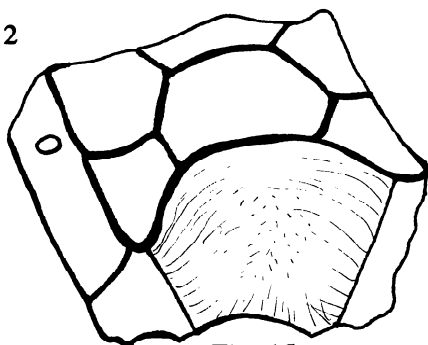


Fig. 15

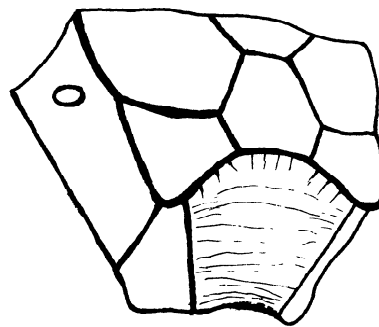


Fig. 16

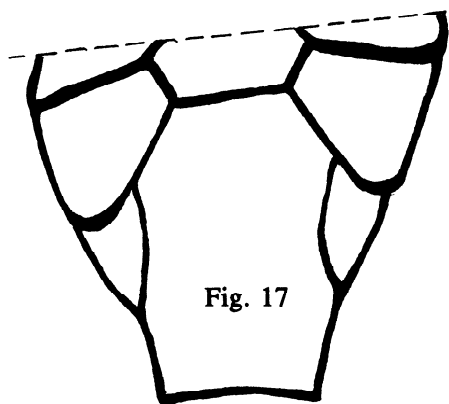


Fig. 17

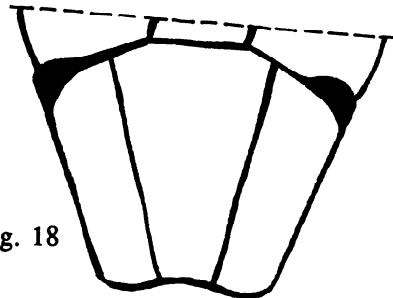


Fig. 18

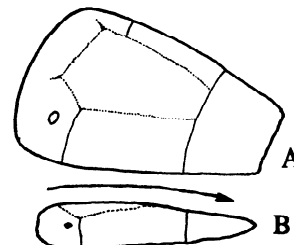


Fig. 19

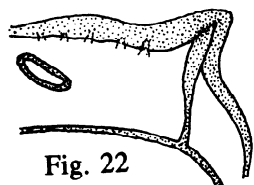


Fig. 22

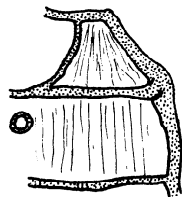


Fig. 23

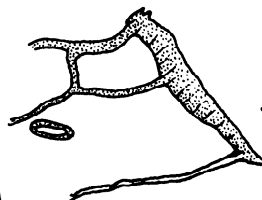


Fig. 24

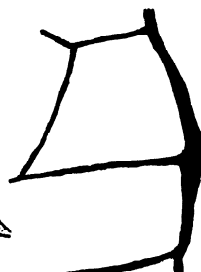


Fig. 20

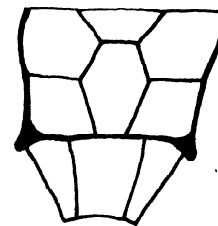


Fig. 21

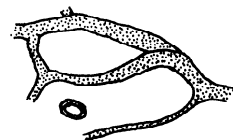


Fig. 25

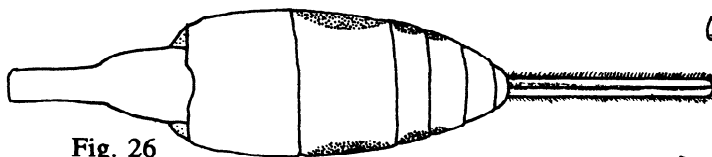


Fig. 26

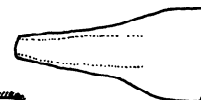


Fig. 27



Fig. 28

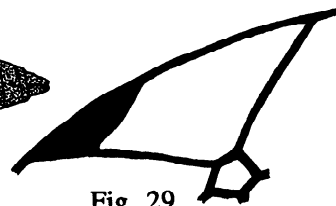


Fig. 29

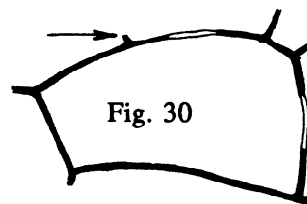


Fig. 30

except face, thorax except collar, propodeum, leg 3 except trochantellus and tarsomere 5, abdomen more orangish.

Female. Unknown. Based on male, diagnostic characters would be the orange head, thorax, propodeum, and abdomen, and mostly yellow legs; flagellum with medial white annulus; 3rd lateral area defined; and mesoscutum as in male.

Holotype: male, MEXICO (OAXACA): 97 km S.W. Tuxtepec, Vista Hermosa (1450 m), 20-x-1962, H. and M. Townes (AEI).

Etymology: *auranti-* (orange) + *ceps* (head), referring to the orange head.

Amphibulus aurarius Luhman, sp. n.
(Figure 18)

Male Diagnosis. The following mostly orange: thorax, propodeum, legs, and abdomen; 8 tyloids on flagellomeres 11-19, flagellomeres 9-14 white; large size, 8-10 mm long; Brazil and Ecuador. Differs from *auranticeps* especially by the black head and clypeus, and from *rugosus* by the weak medial lobes of the white clypeus.

Male Description. Antenna: flagellum elongate and slender, flagellomeres 9-14 white, 8 tyloids on flagellomeres 11-19, tyloids long and thin. Head: clypeus about 2.5 times as wide as high, apicomedial margin with pair of faint lobes; face densely punctulate and finely rugulose; frons densely punctate and rugose; temple moderately densely punctate and a little rugulose. Thorax: central area of mesopleurum impunctate; notaulus absent; prescutellar ridge absent, transverse break distinct. Propodeum: carinae strong, apophysis weak, areola narrowed, elongate hexagonal, area dentipara nearly square, 3rd lateral area defined. Abdomen: petiole long and slender, sternum 1 at or beyond spiracle, postpetiole longer than wide, widened apically; tergum 2 narrowed basally. Color: yellowish: hind tarsomeres 1-4; orange: most of thorax, propodeum, most of legs 1-2 except tarsi often blackish, leg 3 except tarsus and sometimes blackish on femur and tibia dorsally, most of abdomen except often blackish apico-laterally on terga 2-7; black: head capsule, mandible blackish, scape except sometimes orangish basally, clypeus except more orangish apically, sometimes

thorax suffused with blackish, tarsi 1-2, hind tarsomere 5 and sometimes 4, femur 3 and tibia 3 orangish black dorsally, abdomen often blackish apico-laterally on terga 2-7.

Female Diagnosis. The following mostly orange: thorax, propodeum, legs, and abdomen; flagellomeres 7-13 white; apophysis toothlike; large, 9-10 mm long.

Female Description. Antenna: flagellum slender and elongate, narrowed apical third, 6 or more flagellomeres white. Head: clypeus broadly elliptical, apical margin with pair of faint lobes medially; face densely punctulate and a little rugulose; frons densely punctate and rugulose; temple moderately densely punctate and slightly rugulose. Thorax: notaulus absent; prescutellar ridge absent, transverse break distinct. Propodeum: carinae strong, areola narrow and elongate, apophysis toothlike, 3rd lateral area defined. Abdomen: petiole long and slender, postpetiole longer than wide, a little widened apically; 3rd valvula short, about as long as basal 2 hind tarsomeres. Color: as in male except leg 3 and thorax without blackish, and all 5th tarsomeres blackish.

Material Examined. **Holotype:** male, BRAZIL (RIO DE JANEIRO): Teresopolis, 12-iii-1966, H. and M. Townes (AEI). **Paratypes:** 4 males, 2 females: BRAZIL (RIO DE JANEIRO): Teresopolis, 9-12-iii-1975; ECUADOR (PICHINCHA): Santo Domingo, 15-30-v-1975, S. and J. Peck (AEI).

Etymology: *aurarius* (golden), referring to the extensively golden orange color of the body.

Amphibulus aureolus Luhman, sp. n.
(Figures 13, 20, 26)

Female Diagnosis. Legs mostly yellowish, abdomen mostly orange with blackish laterally, 3rd valvula about as long as basal 4 hind tarsomeres, flagellum narrowed apically, flagellomeres 6-11 white, scape and basal 3 flagellomeres distinctly elongate; punctuation of head dense and rugulose; 3rd lateral area weakly defined, apophysis crest-like, areola elongate hexagonal and narrow; medium size, 5-6 mm long; Caribbean area. Differs from *borealis* and

salicis by the annulus and the distinctly elongate basal flagellomere, and from *latioris* and *eurystomatus* by the clypeus not widened.

Female Description (based on 1 specimen). Antenna: flagellum as in diagnosis. Head: clypeus about 2.5 times wider than high, apical margin upturned; face very densely punctulate and a little rugulose; frons very densely punctate and rugulose; temple densely punctate and rugulose. Thorax: mesonotum very densely punctate and a little rugulose; central area of mesopleurum sparsely punctulate and a little rugulose; prescutellar ridge absent, transverse break distinct. Propodeum: as in diagnosis. Femur 3: moderately swollen, about 4 times longer than wide. Abdomen: postpetiole as little longer than wide, sternum 1 a little before spiracle; 3rd valvula as in diagnosis. Color: yellow legs 1-2 except coxae and trochanters lighter yellow, trochanter 3 light yellow; orange: scape and pedicel, clypeus blackish orange apically, tegula, most of leg 3 except trochanters, most of abdomen except brownish laterally on terga 3-5; black: clypeus basally.

Male. Unknown. Based on characters of female, diagnosis would be mostly yellowish legs 1-2, mostly orange leg 3 and abdomen except for blackish apico-laterally on apical terga, apophysis absent, 3 lateral area defined, prescutellar ridge absent.

Holotype: female, label reads "ex plane from El Salvador and Cuba. vii-21-1956 at Miami, Fla. /56-15369" (NMNH).

Etymology: *aureo-* (gold) + *-lus* (diminutive suffix), referring to its color and size.

Amphibulus bicolor Luhman, sp. n.
(Figure 30)

Male Diagnosis. Clypeus distinctly widened, margin without lobes; abdomen bicolored, terga 2-3 mostly orangish, terga 4-apex black, coxae and trochanters white; apophysis absent, 3rd lateral area weakly defined; ramulus present; medium size, about 8 mm long; Korea. Differs from other Eurasian species by the widened clypeus, white coxae and bicolored abdomen.

Male Description (based on 1 specimen). Antenna: moderately slender, basal 3 flagellomeres about twice as long as wide (flagellum of type broken, tyloid number indeterminable). Head: clypeus widened, 3 times wider than high, apical margin upturned; face swollen medially, very densely punctulate, appearing granular; frons densely punctulate, temple sparsely punctulate, smooth and shiny. Thorax: notaulus distinct, prescutellar ridge faint or absent, transverse break weak medially, evanescent laterally, mesopleurum sparsely punctate, smooth and shiny. Propodeum: areola elongate hexagonal but short, apophysis absent, 3rd lateral area weakly defined, appearing as continuous wrinkle from more distinct basal carina stub. Wing: ramulus present, nervulus distad basal vein; hyaline. Abdomen: petiole moderately slender, sternum at or beyond spiracle, dorsomedian carina distinct to a little beyond spiracle; postpetiole less than twice as long as wide; tergum 2 narrowed basally; sterna 2-5 membranous. Color: white or pale yellow clypeus, scape, mandible, tegula, coxae 1-2, coxa 3 apico-ventrally, trochanters; yellow: femora except femur 3 apically, tibiae 1-2, tibia 3 variably basally and ventrally, apex of terga 2-3; orangish: tergum 1 apically, terga 2-3 except apico-laterally, tergum 4 basally; black: most of tergum 1, tergum 3 apically except line of yellowish, terga 4-apex, tibia 3 variable, at least at base and apex, hind tarsus.

Remarks. This species is exceptional in having the genal carina meeting the mandible and the distinct dorsomedian carina. It is placed in *Amphibulus* because of the faint or absent prescutellar ridge, weakly defined 3rd lateral area, ramulus present, subgenital place not projecting medially, and the apophysis absent or faint.

Female. Unknown. Based on male, diagnosis would include the distinctly widened clypeus without teeth or lobes, ramulus present, 3rd lateral area defined, apophysis absent or weak, areola nearly hexagonal, abdomen bicolored, legs most yellow, coxae and trochanters paler.

Holotype: male, KOREA: Seoul (Youny-San), 7-vi-1962, E. Smith (AEI).

Etymology: *bicolor*, referring to the distinctly orange and black abdomen.

Amphibulus borealis Luhman, sp. n.
(Figures 3, 27, 28)

Male Diagnosis. Postpetiole about twice as long as wide with distinct dorsomedian carina, 3 tyloids on flagellomeres 10-12, face with broad, weak groove parallel to inner eye margin, abdomen mostly dusky, yellowish orange, black basally and apically, and sometimes most of tergum 2, most of legs 1-2 yellowish, leg 3 mostly black, apophysis crestlike; medium size, 6-7 mm long; northern North America. Differs from *carinarum* by distinctly slender tergum 1, distinctly elongate areola, and apophysis not toothlike.

Male Description. Antenna: tyloids on flagellomeres 10-12 moderately long, short on 13th. Head: clypeus about 2.5 times as wide as high; face sparsely, finely punctulate, frons mat, temple sparsely and finely punctulate. Thorax: central area of mesopleurum impunctate. Propodeum: carinae finely distinct, areola elongate hexagonal, apophysis weak or absent. Abdomen: postpetiole about twice as long as wide, dorsomedian carina distinct on about basal half or more; tergum 2 a little elongate. Color: orangish yellow: most of legs 1-2; orange: scape, clypeus, tegula, coxae 1-2, coxa 3 apically, hind trochanters, femur 3 ventrally, tibia 3 basally, hind tarsus, most of terga 2-6 except laterally and apically; black: most of coxa 3 except apically, femur 3 except ventrally, tibia 3 except basally, tergum 1 7-apex, and 2-6 laterally and apically.

Female Diagnosis. Postpetiole with distinct carina, flagellum moderately stout, slightly swollen apical half, without annulus and mostly linear to apex, basal 3 flagellomeres twice as long as wide, apophysis more or less distinct, abdomen mostly orangish except blackish basally, apically, and on terga 2-6 laterally and apically, hind coxa and femur mostly blackish. It is distinguished from *carinarum* by the lack of a flagellar annulus; from *pyrrhoborealis* by the entirely black face and thorax.

Female Description. Antenna: as in diagnosis. Head: clypeus about 2.5 times wider than high; face and frons densely punctulate and a little rugulose, temple sparsely punctulate. Thorax: prescutellar ridge absent. Propodeum: carinae finely distinct; areola hexagonal, small and a little elongate and narrowed anteriorly, area dentipara about as wide as high, but strongly narrowed mesad, apophysis

more or less distinct, 3rd lateral area not defined. Abdomen: dorsomedian carina distinct beyond spiracle, postpetiole a little wider than long. Color: yellowish: legs 1-2 except femur more blackish yellow, tegula; orangish: scape, clypeus, abdomen as in diagnosis, coxa 3 apically, hind trochanters ventrally, sometimes femur 3 apically or ventrally; black: abdomen as in diagnosis, leg 3 except orangish as noted.

Remarks. This species resembles *Endasys* of the Santacruzensis Group, but it is placed in *Amphibulus* because of the following: absence of the prescutellar ridge, genal carina joining oral carina distinctly before mandible, male subgenital plate truncate, a distinct prescutellar transverse break across the mesoscutum, maxillary palp 4 as long as 5, areola about as long as wide, and the petiolar area of the propodeum nearly vertical and flat.

Material Examined. Holotype: female, MINNESOTA: Cook Co., Minn. Forest Sta. (Hovland), 10-viii-1973 (UM). **Paratypes**, 4 male, 2 females: MICHIGAN: Isle Royale, 3-7-viii-1936, C. Sabrosky (AEI); MINNESOTA: Itasca Co., 10-12-vii-1973, D. Rau (UM); PENNSYLVANIA: Gaines, 29-30-vi-1980, C. Dasch (Dasch).

Etymology: *borealis* (Greek northern), referring to the distribution.

Amphibulus carinarum Luhman, sp. n.
(Figures 4, 5, 16)

Male Diagnosis. Areola hexagonal or nearly so, propodeal carinae strong, apophysis distinct; tergum 1 with dorsomedian carina distinct beyond spiracle, tergum 2 wider than long; 3 tyloids on flagellomeres 10-12, scape orangish, clypeus blackish orange; small, 5 mm or more; eastern United States and Canada. Differs from most *Amphibulus* by the strong propodeal and petiolar carinae, and the square postpetiole.

Male Description. Antenna: as in diagnosis. Head: clypeus about twice as wide as high, apical margin distinctly upturned; face, frons, and temple smooth and shiny, moderately densely, weakly punctulate. Thorax: central area of mesopleurum mostly smooth and impunctate, prescutellar groove with ridge weak or absent. Propodeum: carinae strong; areola

hexagonal or a little elongate; apophysis short but distinct; 3rd lateral area not defined. Abdomen: tergum 1 more abruptly widened at spiracle, postpetiole a little longer than wide, dorsomedian carinae distinct beyond spiracle, sternum 1 at or before spiracle; tergum 2 wider than long, hairs moderately sparse, evenly distributed; sterna 2-5 membranous medially. Femur 3: moderately swollen, about 4 times longer than wide. Color: yellowish legs 1-2, coxa 3 and trochanters 3, femur 3 basally and ventrally; terga 1-3 apical margin; orangish yellow: scape and pedicel, most of mandible, tegula, femur 3 variably blackish orange except apically black, tibia 3 at base and sometimes subbasal patch, larger specimens with terga 1-3 orangish apically and medially, and sometimes tergum 2 basally; blackish: clypeus more blackish orange, femur 3 at least apically, most of tibia 3 except orangish patches basally, hind tarsus, most of abdomen except apically and medially on terga 1-3 and basally on tergum 2 in larger specimens.

Female Diagnosis. Legs mostly yellow except femur 3 and tibia 3 with blackish, abdomen mostly orangish except tergum 1; flagellum moderately stout, 2-4 flagellomeres white, flagellomere 1 less than twice as long as wide, flagellum mostly linear; apophysis short but distinct.

Female Description. Antenna: as in diagnosis, usually flagellomeres 7-10 white. Head: clypeus about twice as long as wide, apical margin strongly upturned; face rugulose, densely, indistinctly punctulate; frons moderately sparsely, indistinctly punctulate; temple sparsely punctulate. Thorax: mesopleurum rugulose and sparsely punctate centrally, prescutellar groove with transverse ridge weak or absent. Propodeum: propodeal carinae distinct, 3rd lateral area not defined, apophysis short but distinct, areola hexagonal, a little elongate anteriorly. Abdomen: postpetiole wider than long, 3rd valvula about as long as hind tarsus. Femur 3: moderately swollen, about 4 times longer than wide. Color: yellowish legs 1-3 except femur 3 and tibia 3, and hind tarsus mostly orangish to blackish; orangish yellow: scape, pedicel, most of mandible, femur 3 and tibia 3 more basally and ventrally, abdomen except most of tergum 1 and sometimes blackish spot on tergum 2 basally; blackish: clypeus blackish orange, mandible apically, femur 3 and tibia 3 at least apically, hind tarsomeres orangish yellow apically.

Material Examined. Holotype: male, ONTARIO: St. Lawrence Is. Nat. Pk., McDonald Is., 28-viii-1976, W. Reid (CNC). **Paratypes**, 10 males, 6 females: ONTARIO: St. Lawrence Is. Nat. Pk., at McDonald and Thwartway Is., 20, 24, 28, 30-viii and 1, 7, 12, 14-ix-1976, W. Reid and A. Carter (CNC). Other material studied: 33 males, 6 females: MICHIGAN: Midland Co., 28-viii-1937, R. Dreisbach (AEI); ONTARIO: St. Lawrence Is. Nat. Pk., viii-ix-1976, W. Reid, A. Carter, and G. Calderwood (CNC).

Etymology: *carinarum* (of carinae), referring to the strong carinae of the propodeum and tergum 1.

Amphibulus dentatus Luhman, sp. n.

Male Diagnosis. Mostly black, 4 moderately long tyloids on flagellomeres 10-13, faint 5th tyloid on flagellomere 9, clypeus with small toothlike tubercle on each side of clypeal margin, apophysis toothlike; medium size, about 7 mm long; southern Mexico. Differs from similar colored species by the black legs, teeth on lateral margin of clypeus, and the toothlike apophysis.

Male Description. (Based on 1 specimen) Antenna: as in diagnosis. Head: clypeus a little rugulose and flat, coarsely punctate, small tubercle on lateral third of margin, apical margin upturned; entire head densely punctate and a little rugulose. Thorax: mesopleurum smooth and shiny, mostly impunctate centrally; prescutellar ridge present. Propodeum: carinae strong, enclosing rugose areas, apophysis toothlike, areola nearly hexagonal, 3rd lateral area undefined. Abdomen: tergum 1 with dorsomedian carina distinct beyond spiracle, sternum 1 a little before spiracle; sterna 4-5 membranous medially. Color: brownish black mandible, scape, clypeus, legs except more yellowish anteriorly, abdomen and propodeum.

Female. Unknown. Based on male, diagnostic characters would be mostly brownish black color, toothlike apophysis, clypeus toothed lateral third, prescutellar ridge present, and entire head densely punctate and rugulose, and 3rd lateral area undefined.

Holotype: male: MEXICO, OAXACA: 97 km S.W.. Tuxtepec (1450 m), 20-x-1962, H. and M. Townes (AEI).

Etymology: *dentatus* (toothed), referring to the tubercles on the clypeus.

Amphibulus duodentatus Luhman, sp. n.
(Figures 10, 11)

Male Diagnosis. Clypeus wide, nearly 3 times wider than high, apical margin with pair of distinct, toothlike, medial lobes; 2 tyloids on flagellomeres 10-11; entire mesopleurum punctate and a little rugulose; legs and abdomen mostly yellowish orange; medium sized, 5-7 mm long; southern Arizona and northern Mexico. Distinguished from similar species with a widened clypeus by the pair of medial teeth on the clypeus, and the lack of apophysis on the propodeum.

Male Description. Antenna: as in diagnosis. Head: clypeus as in diagnosis; face and frons rather smooth, moderately densely punctulate, temple sparsely punctulate and smooth. Thorax: entire mesopleurum moderately densely punctate, a little rugulose; prescutellar ridge strong. Propodeum: carinae distinct, 3rd lateral area undefined, areola nearly hexagonal but a little elongate, apophysis absent. Abdomen: tergum 1 with dorsomedian carina faint or absent, postpetiole distinctly longer than wide, sternum 1 at or before spiracle; tergum 2 a little wider than long; sterna 2-6 membranous medially. Femur 3: swollen, about 4 times as long as wide. Color: yellowish orange tegula, legs except hind tarsus, abdomen except usually terga 7-apex, usually mandible, and sometimes scape and clypeus; black: sometimes scape and clypeus, sometimes mandible, sometimes tarsi 2-3, terga 7-apex, sometimes terga 3-6 blackish apically and laterally.

Female Diagnosis. Clypeus wide, nearly 3 times wider than long, with pair of medial lobes on apical margin, face and cheek bulging, most of basal half of flagellum white, apical half narrowed toward apex, frons coarsely punctate and rugulose; medium size, 6 mm long. Distinguished from species with widened clypeus by the medial pair of lobes, and the swollen face and cheek.

Female Description. Antenna: flagellum short and stout, color and form as in diagnosis, flagellomeres 1-2 a little blackish. Head: clypeus as in diagnosis; cheek swollen, sparsely punctate and a little rugulose; face distinctly swollen medially,

very densely punctulate and a little rugulose; frons coarsely punctate and rugulose; temple moderately punctate and a little rugulose. Thorax: mesopleurum coarsely punctate and a little rugulose; entire mesopleurum rugulose and punctate; prescutellar ridge strong. Propodeum: rather rugulose with distinct carinae, 3rd lateral area not defined, areola widely hexagonal, apophysis absent, area dentipara higher than wide. Femur 3: swollen, a little more than 3 times as long as wide. Abdomen: petiole with faint dorsomedian carina, obsolete on postpetiole, latter wider than high; 3rd valvula a little longer than basal 3 hind tarsomeres. Color: yellowish orange tegula, most of legs, abdomen; orangish: scape, clypeus, mandible.

Material Examined. Holotype male, ARIZONA: Portal, 25-viii-1974, H. and M. Townes (AEI). **Paratypes**, 10 males, 3 females: ARIZONA: Portal, 11-31-viii to 1-7-ix-1974, H. and M. Townes (AEI). MEXICO (DURANGO): Durango, 26-vi-1964, L. Kelton (CNC); MEXICO: Altacomulco (8500 ft.), 8-viii-1954, J. Chillcott; Mexico City, 28-viii-1947, H. Milliron (UM). Other material studied, 25 males: ARIZONA: Portal, vii-ix-1974, H. and M. Townes (AEI); MEXICO (ZACATECAS): 10 mi S. Rio Grande, 4-x-1966, G. and A. Bohart (AEI); GUANAJUATO: Salvatierra (5600 ft.), 7-viii-1962, H. Evans (MCZ); JALISCO: Guadalajara, 17-vii-1965, H. Evans (MCZ).

Etymology: *duo-* (two) + *dentatus* (toothed), referring to the pair of teeth on the clypeus.

Amphibulus eurytomatus Luhman, sp. n.

Male Diagnosis. Ramulus of front wing present as small swelling on 1st recurrent vein, 3 tyloids on flagellomeres 11-13, 3rd lateral area not defined, apophysis absent; medium size, more than 6 mm long; central Mexico. Differs from similar *latioris* by having a trace of the ramulus, and distinct notaulus.

Male Description (based on 1 specimen). Antenna: as in diagnosis. Head: clypeus as in diagnosis, apical margin distinctly upturned; face and frons densely punctulate, temple sparsely punctulate. Thorax: mesopleurum sparsely punctulate and slightly rugulose centrally; prescutellar ridge absent or faint. Wing: ramulus as in diagnosis. Propodeum: areola nearly hexagonal, apophysis absent, 3rd lateral area defined. Abdomen: dorsomedian

carina of tergum 1 faint before spiracle, absent beyond, postpetiole a little longer than wide; sterna 2-6 membranous. Color: whitish: tegula, terga 3-6 apical margin; yellow: mandible, coxae 1-2 except 2 basally, trochanters 1-2; orange: scape, clypeus dark orange apically, legs 1-2 yellowish orange except yellow as noted, leg 3 except tibia dorsally and apically and tarsus, tergum 1 apically, terga 2-6 except whitish as noted; black: clypeus except apically, tibia 3 dorsally and apically, hind tarsus, tergum 1 brownish except apically, terga 7-apex.

Female Diagnosis. Ramulus present as with male, flagellomeres 5-11 white, 3rd lateral area defined, apophysis absent; more than 6 mm long. Differs from similar species by the same characters as the male.

Female Description (Based on 1 specimen). Antenna: annulus as in diagnosis, flagellum narrowed apical third. Head: clypeus wide, about 3 times wider than high, apical margin distinctly upturned; face swollen centrally, face and frons very densely punctulate and a little rugulose. Thorax: prescutellar ridge faint, transverse break distinct. Wing: with ramulus as in male. Propodeum: areola hexagonal, apophysis absent, 3rd lateral area defined. Abdomen: petiole with faint dorsomedian carina before spiracle, absent beyond, postpetiole nearly as long as wide; 3rd valvula about as long as hind tarsus. Color: yellowish: mandible, tegula, legs except leg 3 darker yellow, hind tibia and tarsus more brownish; orange: abdomen.

Material Examined. Holotype male, MEXICO (JALISCO): Guadalajara, 4-viii-1965, H. Evans (MCZ). **Paratype** male, JALISCO: Chapala, 21-viii-1965, H. Evans (MCZ).

Etymology: *eury-* (Greek wide) + *stom-* (Greek mouth) + *-atus* (Latin -ed), referring to the widened clypeus.

Amphibulus flavipes Luhman, sp. n.
(Figure 21)

Male Diagnosis. Abdomen shiny black, legs mostly, at least 7 flagellomeres white, 9 tyloids on flagellomeres 11-19; medium to large size, 6-8 mm long; Venezuela. Distinct from other species with a black abdomen by the yellow legs and extensive annulus.

Male Description. Antenna: at least 7 flagellomeres white, beginning on flagellomeres 7 or 8; tyloids as in diagnosis. Head: clypeus broadly elliptical, apical margin rather strongly produced into 2 faint medial lobes; face very densely punctulate, slightly rugulose; frons very densely punctate and rugulose; temple moderately densely punctate and slightly rugulose. Thorax: notaulus absent, prescutellar ridge absent, transverse break distinct; mesopleurum entirely (sparsely) punctate and a little rugulose. Propodeum: areola elongate hexagonal, apophysis distinct, 3rd lateral area defined. Abdomen: petiole slender and elongate, sternum 1 beyond spiracle, postpetiole about twice as long as wide, widened apically; tergum 2 a little narrowed basally, thyridium distinct. Color: pale yellow thyridium, hind tarsus except tarsomere 5; yellow: scape, most of legs except coxae and trochanters, tibia 3 apically, and hind tarsus; black: clypeus, most of mandible except orangish apically, tegula, coxae, trochanters (more yellowish black dorsally), abdomen except thyridium, apex of terga 1-5 lighter black.

Female Diagnosis. Abdomen shiny black, legs mostly yellow, flagellomeres 4-14 white; medium size, 6-7 mm long.

Female Description. Antenna: 11 flagellomeres white as in diagnosis, flagellum slender and elongate, distinctly narrowed apically. Head: clypeus broadly elliptical, produced apically into 2 faint medial lobes; face and frons very densely punctulate and a little rugulose; temple densely punctulate and a little rugulose. Thorax: notaulus absent, prescutellar ridge absent, transverse break distinct. Propodeum: areola narrowed and elongate hexagonal, apophysis distinct, 3rd lateral area defined. Femur 3: distinctly slender. Abdomen: petiole slender and elongate, sternum 1 at spiracle, postpetiole about 1.5 times longer than wide, widened apically; tergum 2 narrowed basally; 3rd valvula moderately long, about as long as basal 3 hind tarsomeres. Color: pale yellow hind tarsomeres 1-4; yellow: legs except hind tarsus and coxae; black: scape, clypeus, tegula, coxae blackish, hind tarsomere 5, abdomen.

Material Examined. Holotype: male, VENEZUELA: Yacambu (1200 m), 13-v-1981, H. Townes (AEI). **Paratypes,** 2 males, 1 female: same data as type, 7 and 13-v-1981 (AEI).

Etymology: *flavi-* (yellow) + *pes* (foot), referring to the mostly yellow legs.

Amphibulus latioris Luhman, sp. n.
(Figures 7, 12)

Male Diagnosis. Clypeus widened, about 3 times wider than high, without apical teeth or lobes; 4 tyloids on flagellomeres 10-13; legs mostly yellowish orange; abdominal terga mostly orange, apical terga often black apico-laterally; apophysis absent; medium size, 5-8 mm long; northeastern Mexico. Differs from *borealis* and *eurytomatus* by lacking the 3rd lateral area and having weak notaulus

Male Description. Antenna: flagellum slender, flagellomeres 10-13 with tyloids. Head: clypeus as in diagnosis, apical margin upturned medial third, without lobes; face and frons densely, finely punctulate, temple moderately sparsely and finely punctulate. Thorax: mesoscutum distinctly convex and shiny, notaulus faintly present at pronotal margin; mesopleurum entirely punctulate. Propodeum: areola narrow and elongate hexagonal, apophysis absent, 3rd lateral area very weakly defined. Abdomen: tergum 1 moderately elongate and moderately slender, sternum 1 in front of spiracle, postpetiole longer than wide, sides diverging apically, dorsomedian carina present. Color: white tegula in larger specimens; yellowish: scape, mandible, hind trochanter, legs 1-2 except coxae and trochanters lighter yellow apically; orange: clypeus blackish orange apically, most of leg 3 except trochanters, tarsus, and femur and tibia at least apically, abdomen generally, except apex and apically on terga 1-6 (variably blackish); black: clypeus basally, femur 3 and tibia 3 at least apically, hind tarsus, abdomen apex and variably blackish apically on terga 1-6, smaller specimens blacker on legs and terga 1-6, larger ones faintly blackish on terga 4-6 and femur 3 and tibia 3.

Female Diagnosis. Clypeus widened, about 3 times wider than high; face, frons, and mesoscutum densely punctulate and a little rugulose; 2 white flagellomeres beyond 8th; areola narrow, elongate hexagonal; 3rd valvula about as long as hind tarsus; medium small, greater than 5 mm long; central Mexico. Distinguished from *borealis* by the flagellum with an annulus; from *duodentatus* by the clypeus without lobes or teeth; and from *eury-*

stomatus by lacking a ramulus and without distinct notaulus.

Female Description. Antenna: linear apical third, basal 3 flagellomeres a little less than twice as long as wide, flagellomeres 9-10 whitish to pale yellow. Head: clypeus, face, and frons as in diagnosis; temple sparsely punctulate and slightly rugulose; vertex slightly lengthened and flattened. Thorax: entire mesoscutum densely punctulate, distinctly convex, notaulus weakly present at pronotal margin; prescutellar ridge absent; mesopleurum rugulose and punctulate across central area. Femur 3: moderately swollen, about 4 times longer than wide. Propodeum: carinae fine but distinct, 3rd lateral area not defined, areola narrow and elongate hexagonal, apophysis absent. Abdomen: tergum 1 with weak dorsomedian carina basally, absent on postpetiole, latter a little longer than wide, spiracle near mid-point, sternum 1 a little before spiracle; 3rd valvula about as long as hind tarsus. Color: yellowish: mandible, tegula, most of legs 1-2 except sometimes more brownish dorsally on basal segments, hind coxa and trochanters except sometimes mostly brownish, hind tibia and tarsus except latter sometimes more brownish apically on tarsomeres; orangish: most of abdomen except brownish basally and on terga 2-7 apico-laterally; brownish: clypeus apically, femur 3.

Material Studied. Holotype: female, MEXICO (MEXICO): nr. Cortes Pass (1100 ft.), 13-viii-1954, J. Chillcott (CNC). **Paratypes,** 4 males, 1 female: MEXICO: near Cortes Pass (1100 ft.), 13-viii-1954, J. Chillcott (CNC); NEUVO LEON 32 km W. Linares, San Pedro Iturbide, 5-6-x-1962, H. and M. Townes (AEI).

Etymology: *lati-* (wide) + *oris* (of the mouth), referring to the wide clypeus.

Amphibulus nigripes Luhman, sp. n.
(Figure 22)

Male Diagnosis. Flagellomeres 5 to at least 16 white, flagellum elongate and slender, tyloids on flagellomeres at least 11-19, abdomen orangish or brownish, legs 1-3 blackish with hind tarsus pale yellowish, clypeus black with pair of weak lobes medially; large size, 8-10 mm long; Ecuador. Differs from similar colored species by the number of ty-

loids, the annulus, strong toothlike apophysis, and the whitish hind tarsus.

Male Description. Antenna: flagellum elongate and slender, annulus and tyloids as in diagnosis, each tyloid nearly as long as flagellomere length. Head: clypeus about twice as wide as high, apical margin as in diagnosis; punctation mostly very dense and coarse, surface rugulose. Thorax: notaulus absent; prescutellar ridge absent, transverse break distinct; punctation of pro- and mesothorax similar to head, densely punctate and rugulose. Propodeum: areola narrow and elongate hexagonal, apophysis strong and toothlike, 3rd lateral area defined, sometimes weakly. Abdomen: petiole slender and elongate, postpetiole about twice as long as wide, sternum 1 a little beyond spiracle. Color: pale yellowish hind tarsus except basitarsus brown basally; orange: often abdomen; brownish: sometimes abdomen; black: clypeus, scape, legs 1-3 except hind tarsus, and legs 1-2 more brownish.

Female. Unknown. On basis of male would be diagnosed by clypeal margin with weak medial lobes, legs mostly brownish or blackish, hind tarsus pale yellowish, abdomen orangish, apophysis toothlike, 3rd lateral area defined, prescutellar features as in male, punctation and surface of head and thorax densely punctate and rugulose.

Material Examined. Holotype: male, ECUADOR: Abitagua (1200 m), 27-v-1939, Clarke and McIntyre (AEI). **Paratypes,** 2 males: ECUADOR: Banos (1900 m), 19-viii-1938 and Santana, vi-1949, Clarke and McIntyre (AEI).

Etymology: *nigri-* (black) + *pes* (foot), referring to the blackish legs.

Amphibulus orientalis Luhman, sp. n.
(Figure 1)

Male Diagnosis. Body and legs mostly black with whitish hind tarsus; flagellomeres at least 7-12 white dorsally, 2 distinct tyloids; moderately large, 6-9 mm long; China and Japan. Differs from other *Amphibulus* having a black abdomen by lacking apophysis, lacking teeth or lobes on the clypeus, and by the whitish hind tarsus.

Male Description. Antenna: flagellomeres 7-13 or

at least 9-11 white dorsally (small specimens with the latter), 2 tyloids on flagellomeres 10-11, sometimes faint 3rd on flagellomere 12. Head: clypeus widened, about 3 times wider than high, apical margin upturned, without lobes; face and frons densely punctate and a little rugulose, face swollen medially; temple moderately punctulate and a little rugulose, surface smooth (small specimens) or rugulose (large specimens). Thorax: notaulus distinct; prescutellar ridge absent, several fine longitudinal ridges in groove, transverse break distinct; mesopleurum impunctate centrally, remainder sparsely punctulate. Wing: ramulus sometimes present as swelling or vein; wings blackish. Propodeum: carina finely distinct, apophysis weak to absent, areola elongate hexagonal, about as long as wide, 3rd lateral area more or less defined. Abdomen: petiole slender and elongate, sternum 1 at or beyond spiracle; sternum 6 complete medially. Color: whitish hind tarsus except basally and apically; yellowish: mandible at least apically, sometimes coxae 1-2 apically, trochanters ventrally, variably on remainder of legs 1-2, apex of terga 2-6, thyridium; black: scape, clypeus, tegula, leg 1-2 except yellowish as noted, femora and 5th tarsomeres more brownish, leg 3 except trochanters and tarsus as noted, abdomen except apices as noted.

Female Diagnosis. Body and legs mostly brownish or dark orangish, hind tarsus mostly pale yellowish hind tarsus; flagellomeres (at least) 9-11 white, a little swollen apical half and strongly narrowed apically; moderately large, 6-8 mm long.

Female Description. Antenna: flagellum and annulus as in diagnosis. Head: clypeus wide, about 3 times wider than high; face and frons densely punctate and a little rugulose, temple moderately densely punctate and rugulose. Thorax: notaulus distinct; prescutellar ridge absent, several small longitudinal ridges in groove, transverse break distinct; meso- and metapleura sparsely punctate and a little rugulose. Propodeum: carina finely distinct, areola nearly hexagonal, apophysis absent but with weak crests, 3rd lateral area weakly defined. Femur 3: moderately swollen, about 4 times as long as wide. Abdomen: petiole slender and elongate, sternum 1 at spiracle, postpetiole a little longer than wide; 3rd valvula about as long as basal 3 hind tarsomeres. Color: yellowish mandible, most of legs 1-2 except often brownish on coxae and femora, hind coxa and trochanters ventrally, hind

tarsus except basally and apically; dark orangish or brownish: coxa 3, abdomen except most of tergum 1; black: clypeus, scape, tegula, femur 3 and tibia 3, tarsus 3 basally and apically, most of tergum 1.

Material Examined. Holotype: male, JAPAN: Kamikochi, 25-vii-1954, Townes family (AEI). **Paratypes**, 5 males, 2 females: CHINA (FUKIEN): Shaowu Hsien, 1200-1500 m, 30-iv, 21-v, 10-vi- 1942 (AEI); JAPAN: Kamikochi, 25-vii-1954, Townes family (AEI); Yokohama, 10-17-v-1942. K. Sato (AEI).

Etymology: *orientalis* (of the Orient), referring to the faunal region.

Amphibulus pentatylus Luhman, sp. n.
(Figure 19)

Male Diagnosis. 5 tyloids on flagellomeres 10-14; clypeus widened, about 3 times wider than high, apical margin without lobes, strongly upturned medial third; propodeum flattened, petiolar area and areola in approximately same plane, carinae weak or absent, apophysis nearly absent; legs and abdomen mostly black; medium size, 6-7 mm long; central Mexico. Especially distinguished by the flattened propodeum with weak or absent carinae, and the 5 tyloids.

Male Description. Antenna: flagellum elongate and slender, tyloids as in diagnosis. Head: clypeus as in diagnosis; mandible moderately slender; face and frons densely, finely punctulate; temple moderately sparsely punctulate. Thorax: central area of mesopleurum smooth and shiny, sparsely and very finely punctulate, foveal pit conspicuously deep; prescutellar ridge absent, transverse break distinct. Propodeum: as in diagnosis, apophysis weakly indicated, areola elongate hexagonal with faint carinae, or absent; petiolar and dorsal areas separated only by transverse carina. Abdomen: slender and elongate, spiracle nearly at mid-point, sternum 1 beyond spiracle, postpetiole elongate, about twice as long as wide; tergum 2 a little narrowed basally—appearing longer than wide. Color: yellowish orange mandible, legs 1-2 except tarsi and sometimes coxae and trochanters, terga 4 or 5 to 6 basally, terga 1-6 apical margin, and thyridium; black: scape, clypeus, tarsi 1-2, most of leg 3 except trochantellus, most of abdomen except as noted.

Female. Unknown. Based on male, diagnostic features of the female would include flattened propodeum dorsally, with weak or obsolescent carinae; prescutellar break distinct, ridge absent; slender and elongate flagellum; widened clypeus without lobes, strongly upturned medial third.

Material Examined. Holotype: male, MEXICO: Hidalgo Nat. Park (3000 m), 12-x-1962, H. and M. Townes (AEI). **Paratypes**, 3 males, same data as type (AEI).

Etymology: *penta* (Greek 5) + *tylus* (Greek knob), referring to the 5 tyloids of the male antenna.

Amphibulus pilosus Luhman, sp. n.

Male Diagnosis. Gray hairs covering head, legs, thorax and propodeum extremely dense, obscuring surface features; body and legs black except apices of terga 3-7 whitish; 3 tyloids on flagellomeres 10-12; apophysis strong and toothlike, and directed posteriorly; medium large, about 7 mm long; southern Mexico. Differs from all other *Amphibulus* by the very dense, gray hairs of the head, thorax and propodeum.

Male Description. Antenna: as in diagnosis, moderately slender. Head: hairs as in diagnosis; clypeus smooth, margin sharp and upturned; face smooth with dense, fine punctulation; frons and temple densely, finely punctulate. Thorax: hairs as in diagnosis, mesopleurum with central area densely, finely punctulate; notaulus distinct; prescutellar ridge present. Propodeum: covered with unusually thick, gray hairs that obscure well-defined carinae, areola broadly hexagonal, apophysis as in diagnosis. Abdomen: postpetiole square, a little flattened, dorsomedian carina weak to spiracle, obsolete beyond, sternum 1 before spiracle; tergum 2 wider than long. Color: black: except apices of terga 3-7 whitish, and hairs grayish; wings dusky.

Female. Unknown. Based on male, diagnosis would be mostly black color; dense, gray hairs on especially head, thorax and propodeum, apophysis strong and toothlike; prescutellar ridge present.

Remarks. This species has several characters more typical of *Endasys*, but is placed in *Amphibulus*

because of the genal and oral carinae joining distinctly behind the mandible, the lengthened petiole along with a short postpetiole and tergum 2, and the short hind tibial spurs.

Material Examined. Holotype: male, MEXICO (OAXACA): Metate, 86 km S.W.. Tuxtepec (900 m), 19-x-1962, H. and M. Townes (AEI). **Paratype:** male, EL SALVADOR: Hacienda Capolinas, 5 km N.W. Quezaltepeque (450 m), 28-xii-1964, M.E. Irwin (UCR).

Etymology: *pilosus* (hairy), referring to the very dense body hairs.

Amphibulus pseudopustulae Luhman, sp. n. (Figures 9, 17)

Male Diagnosis. Strigosity in front of genal suture beneath eye, clypeal margin flange-like and strongly upturned, 4 short and inconspicuous tyloids beginning on flagellomere 12 or 13, mesopleurum entirely punctulate and a little rugulose; small, 4-6 mm long; northern Mexico. Distinguished from *pustulae* by the 4 tyloids and lacking apophysis.

Male Description. Antenna: as in diagnosis. Head: strigosity beneath eye converging on mandibular condyle; clypeus about twice as wide as high, apical margin flange-like and strongly upturned; face and frons faintly but densely punctulate, temple smooth and shiny, sparsely punctulate. Thorax: mesopleurum as in diagnosis; prescutellar ridge absent. Wing: ramulus sometimes weakly present, at least as distinct angulation in 1st recurrent vein; wings faintly darkened. Propodeum: carinae strong, 3rd lateral area defined but short, areola nearly hexagonal, apophysis reduced. Abdomen: petiole long and slender, dorsomedian carina absent, sternum 1 at or before spiracle, postpetiole nearly twice as long as wide; tergum 2 about as long as wide; sterna 2-6 membranous ventrally. Color: whitish tegula except sometimes light brown, terga 4-7 apical margin; yellow: mandible, legs 1-2 except often coxae and trochanters, leg 3 dark yellow, often brownish at least apically on femur and tibia and most of tarsus, sometimes most of tergum 1, thyridium on tergum 2; brownish or blackish: clypeus, scape, abdomen except sometimes most of tergum 1, apical margins of terga 4-6, and thyridium.

Female Diagnosis (based on 1 specimen). Face and cheek with strigosity, clypeus smooth and shiny, clypeal margin with small tooth on lateral margin, flagellomeres 7-10 white, apophysis absent. Differs from similar *pustulae* by the smooth clypeus and lack of apophysis.

Female Description. Antenna: flagellum moderately slender, basal 4 flagellomeres less than twice as long as wide, flagellum faintly narrowed on apical fourth; flagellomeres (5)6-11(12) white dorsally. Head: clypeus a little impressed apically, margin distinctly upturned, small tooth on lateral third; strigosity beneath eye as in male; face and frons finely densely punctulate, temple sparsely punctulate. Thorax: mesopleurum variably but coarsely punctate and rugulose; prescutellar ridge absent. Propodeum: a little swollen dorsally, carinae distinct, 3rd lateral area reduced but defined, areola small and elongate hexagonal, apophysis crest-like. Abdomen: petiole elongate and slender, sternum 1 before spiracle, postpetiole about as long as wide, dorsomedian carinae absent; 3rd valvula about as long as basal 2 hind tarsomeres. Femur 3: moderately swollen, about 4 times as long as wide. Color: sometimes tegula white; yellow: usually tegula; yellowish orange: sometimes scape, mandible, and clypeus (apically), legs 1-2; orange: often mandible apically, sometimes face medially, sometimes thorax or propodeum variably orangish, especially pleura, most of leg 3 and abdomen; brownish: usually tegula; black: often scape, most of clypeus and mandible, sometimes coxae blackish basally, sometimes femur 3, most of tergum 1, laterally on terga 2-6, and terga 5-6 apically.

Material Examined. Holotype: male, MEXICO (SINALOA): near Concordia (3000 ft.), 8-viii-1964, W. Mason (CNC). **Paratypes**, 8 males, 8 females: ARIZONA: Parker Canyon L., 22-viii-1974, H. and M. Townes (AEI); MEXICO (SINALOA): Concordia (3000 ft.), 12-viii-1964, W. Mason (CNC); DURANGO: near Durango, 29-vii-1964, J. McAlpine (CNC). Other material studied, 5 males, 25 females: ARIZONA: Parker Canyon L., 22-23-viii-1974, H. and M. Townes (AEI).

Etymology: *pseudo-* (Greek false) + *pustulae* (pimple), referring to similarity with *pustulae*.

Amphibulus pustulae Luhman, sp. n.
(Figure 6)

Male Diagnosis. Toothlike pustule on clypeal margin laterally, clypeus, face, and cheek rugose, flagellum without tyloids, scape blackish, clypeus orangish yellow; moderately small, 5 mm or longer; northern Mexico. Differs from most *Amphibulus* by the small, lateral tooth and the lack of tyloids; from *pseudopustulae* by lacking tyloids.

Male Description. Antenna: tyloids absent. Head: clypeus nearly as wide as high and rugulose, apical margin distinctly upturned, small tooth projecting on lateral third of margin; face and cheek rugose, frons moderately sparsely punctulate; temple very finely, sparsely punctulate; vertex a little flattened and lengthened. Thorax: central area of mesopleurum mostly smooth and shiny with very fine, scattered punctures; ridge across prescutellar groove absent. Propodeum: carinae distinct, 3rd lateral area not defined, areola elongate hexagonal, apophysis more or less distinct. Abdomen: tergum 1 slender and elongate, postpetiole about twice as long as wide, slightly widened beyond spiracle; sterna 2-7 membranous medially. Femur 3: slender, nearly 5 times longer than side. Color: pale yellow: coxae 1-2 and trochanters 1-2 at least ventrally, tegula; yellow: mandible, legs 1-2 except as noted, hind tarsomeres apically; orangish yellow: clypeus, leg 3 except often brownish suffusion on femur dorsally, tibia at least apically, and tarsus; blackish: scape, tergum 1 at least basally, often entirely; terga 2-3 at least on margins (except thyridium), sometimes entirely; terga 4-6 at least apically and laterally, sometimes entirely, most of terga 7-apex.

Female Diagnosis. Clypeus, face, and cheek rugose, small tooth on lateral third of clypeal margin, flagellomeres 6-10 white, apophysis strong and toothlike. Differs from *pseudopustulae* by the rugulose clypeus and strong apophysis.

Female Description. Antenna: apical third linear, basal 4 flagellomeres elongate, at least twice as long as wide; at least 6 flagellomeres white, beginning with 5th or 6th, remainder black. Head: Clypeus, face, and cheek rugose; clypeus about twice as long as high, margin distinctly upturned, small tooth on lateral third of margin; frons rugulose and moderately densely punctulate; temple smooth and shiny, sparsely punctulate; vertex a little flattened

and lengthened. Thorax: central area of mesopleurum rugulose, sparsely punctulate. Propodeum: carinae distinct, 3rd lateral area not defined; areola elongate hexagonal, apophysis distinct; ridge across prescutellar groove absent. Abdomen: tergum 1 without dorsomedian carina, petiole elongate and slender, postpetiole longer than wide; 3rd valvula about as long as hind tarsus. Color: pale yellowish: scape sometimes, tegula, coxae 1-2, trochanters 1-2, hind trochanters ventrally; yellowish: legs 1-2 except as noted; orangish yellow: most of leg 3 except trochanters ventrally and often tibia and tarsus a little darkened, most of abdomen except often darker basally, lighter apically, and sometimes terga 2-3 brownish laterally.

Material Examined. Holotype: male: MEXICO (DURANGO): nr. El Palmito (5000 ft.), 25-vii-1964, W. Mason (CNC). **Paratypes**, 3 males, 3 females: DURANGO: nr. El Palmito (5000 ft.), 20, 25-vii, 8.12-viii-1964, W. Mason (CNC).

Etymology: *pustulae* (pimple), referring to the small tooth on the clypeus.

Amphibulus pyrrhoborealis Luhman, sp. n.

Male Diagnosis. Clypeus and face above it yellow, propleurum partly orange, apex at tegula yellow, subgenital plate weakly emarginate; medium size, 5-8 mm long; Pacific Northwest and Idaho. Differs from *borealis* by the partly orange propleurum and the yellow face above the clypeus.

Male Description. Antenna: 3 tyloids on flagellomeres 10-12. Head: clypeal margin weakly upturned apically; face finely, densely punctulate, surface slightly rugulose; frons and temple mostly smooth and shiny, setiferous punctures moderately dense. Thorax: notaulus distinct, transverse break across mesoscutum faint or obsolete, prescutellar ridge absent. Propodeum: areola elongate hexagonal, apophysis weak, 3rd lateral area absent. Abdomen: tergum 1 with dorsomedian carina distinct to about middle of postpetiole, sternum 1 at or beyond spiracle, subgenital plate weakly emarginate medially, sterna 5-6 complete. Color: yellow: scape baso-ventrally, mandible, clypeus, face above clypeus, tegula, hind corner of propleurum, most of legs 1-2 except pale yellow on coxae and trochanters, most of leg 3 except tarsus and at least apices of femur and tibia, thyridium; yellowish to brownish: apical

margins of terga 1-4, variably on terga 2-6, large specimens usually yellowish, smaller ones brownish; orange: part or most of propleurum; black: scape except as noted, flagellum, femur 3 and tibia 3 at least apically, tarsus, tergum 1 except apex, terga 2-5 variably brownish to blackish, terga 6-apex.

Female Diagnosis. Clypeus, scape, mandible, and face orange; propleurum, mesonotum, and upper part of mesopleurum orange; medium size, about 6 mm long. Differs from *borealis* by the orange on the thorax.

Female Description. Antenna: flagellum orangish, linear to apex, basal 3 flagellomeres short. Head: clypeal margin upturned apically; face finely, densely punctulate, surface finely rugulose; frons and temple densely punctulate, smoother than face. Thorax: notaulus distinct, transverse break across mesoscutum faint, prescutellar ridge absent. Propodeum: carina fine but distinct, areola about as long as wide, faintly triangular and small, apophysis distinct, 3rd lateral area absent. Abdomen: dorsomedian carina distinct to postpetiole, postpetiole wider than long; 3rd valvula about as long as hind tarsus. Color: yellowish orange legs; orange: antenna, most of face, mandible, clypeus, pronotum, mesonotum, scutellum and postscutellum, upper part of mesopleurum, abdomen; black: lower part of mesopleurum, propodeum translucent, orangish black.

Remarks. This species resembles species of the *Endasys* Santacruzensis Group. It is placed in *Amphibulus* because of the lack of the prescutellar groove, the genal carina joining the oral carina behind the mandible, the sternaulus distinct across the mesopleurum, the orange area on the propleurum, the short hind tibial spurs, and the elongate 3rd valvula.

Material Examined. **Holotype:** female: IDAHO: nr. Stanley, 8-viii-1978, H. and M. Townes (AEI). **Paratypes,** 13 males: OREGON: Mary's Peak, 23-vii-1978, H.K. Townes (AEI); Mt. Hood (5400 ft.), 20-30-vii-1978, H. and M. Townes (AEI); WASHINGTON: Mt. Rainier (5300 ft.), 15-16-viii-1940, H. and M. Townes (AEI). Other material studied, 11 males: WASHINGTON: Mt. Rainier (5300-5500 ft.), 23-vii, 15-16-viii-1940, H. and M. Townes (AEI).

Etymology: *pyrrho-* (Greek orange) + *borealis* (Greek

northern), referring to the color of the thorax and the distribution in North America.

Amphibulus rugosus Luhman, sp. n.
(Figure 24)

Female Diagnosis. Mostly orangish with black head and yellowish orange scape and clypeus, areola narrow and elongate, 3rd lateral area defined; medium size, about 6 mm long; Peru. Differs from similar *aurarius* by the lack of apophysis and the yellowish scape and clypeus.

Female Description (based on 1 specimen). Antenna: flagellomeres 7-12 white, basal 2 yellow, basal 3-6 brownish, basal 3 elongate, flagellum narrowed apical third. Head: punctation very dense, coarse, and rugulose; clypeus without apical lobes. Thorax: notaulus absent; prescutellar ridge absent, transverse break distinct. Wings: vitreous, nervulus a little distad of basal vein, areolet higher than wide. Propodeum: areola elongate hexagonal and narrow, apophysis absent, indicated by sharp angle of dorsal surface with petiolar area, 3rd lateral area defined. Abdomen: tergum 1 slender and elongate, sternum 1 beyond spiracle; 3rd valvula a little shorter than hind basitarsus. Color: yellowish orange: body and legs except as follows: head black except frons orange, hind tarsus pale yellow.

Male. Unknown. Based on female, diagnosis would include similar coloration, weak or absent apophysis, narrowed and elongate areola, 3rd lateral area defined, and prescutellar ridge and break as in female.

Holotype: female: PERU: Cusco, Machu-Picchu, 27-xi-1965, (AEI).

Etymology: *rugosus* (wrinkled), referring to the head.

Amphibulus salicis Luhman, sp. n.
(Figures 14, 23)

Male Diagnosis. Scape and clypeus black; clypeus high, about twice as wide as high; 2 tyloids on flagellomeres 10-11, coxae black, trochanters pale yellow, abdomen and femur 3 mostly brownish, 3rd lateral area and apophysis absent; medium size, 6-

7 mm long; Pakistan. Differs from similar North American species by the higher clypeus and the black coxae and scape.

Male Description (based on 1 specimen). Antenna: flagellum slender and elongate with 2 tyloids on flagellomeres 10-11. Head: mandible moderately stout; clypeus about twice as wide as high, distinctly upturned apically; face and temple densely punctulate, frons densely punctulate and a little rugulose. Thorax: notaulus distinct, prescutellar ridge faint, transverse break evanescent laterally, mesopleurum entirely punctulate. Propodeum: carinae weak, areola narrowly hexagonal and a little elongate, apophysis absent, 3rd lateral area absent. Abdomen: petiole long and slender, postpetiole about twice as long as wide, sternum 1 at or beyond spiracle; tergum 2 a little narrowed basally. Color: yellow: trochanters pale yellow except basally, femora 1-2, tibiae 1-2; yellowish orange: terga 2-3 apico-medially, terga 4-5 at least baso-medially; brown: femur 3, terga 2-apex except as noted and thyridium; black: scape, clypeus, coxae, trochanters basally, tarsi 1-2 except basally, tibia 3 and tarsus 3 more blackish, tergum 1 and most of 2 except as noted.

Female Diagnosis. Prescutellar ridge weakly present, 3rd lateral area absent, tergum 1 without distinct carina, abdomen mostly orange, trochanters basally and coxae black, leg 3 mostly blackish. Differs from *areolus* by the flagellum without an annulus, and from *borealis* and *latioris* by the black coxae and scape, the high clypeus, and the lack of apophysis.

Female Description (based on 1 specimen). Antenna: flagellum black basally and apically, brownish medially; moderately slender, nearly linear to apex, basal 3 flagellomeres less than twice as long as wide, scape elongate, longer than basal 2 flagellomeres. Head: clypeus about 2.5 times wider than high; face and frons very densely punctate and rugulose; temple densely punctate and a little rugulose. Thorax: notaulus distinct, prescutellar ridge and break as in male. Propodeum: carinae weak, apophysis weakly crest-like, 3rd lateral area absent. Abdomen: petiole slender, postpetiole about twice as long as wide; 3rd valvula about as long as basal 4 hind tarsomeres. Color: yellow most of legs 1-2 except coxae and 1st trochanters, hind trochanters except basally; orange: abdomen except most of tergum 1; brownish: femora 1-2 dorsally, leg 3 except coxae and tro-

chanters; black: scape, clypeus, tegula, coxae, 1st-trochanters basally, most of tergum 1.

Remarks. Specimen labels read "ex larva feeding on leaves of *Salix*."

Material Examined. Holotype: male, PAKISTAN: Kuldana, 8-viii-1964, (NMNH). **Paratype** female: same data as type.

Etymology: *salicis* (of *Salix*, willow), referring to the host plant of the host larva from which the type series was apparently reared.

Amphibulus satageus (Cresson)
new combination
(Figure 8)

Phygadeuon satageus Cresson, 1873: 140. Holotype female, here determined.

Male Diagnosis. Mostly white propodeum, mesopleurum, collar, anterior pronotum, scape and pedicel (entirely), coxae 1-2 and trochanters 1-2, and flagellomeres 6-14; large, 9-10 mm long; southern Mexico. Differs from all other *Amphibulus* by the white on the thorax and propodeum.

Female Diagnosis. Mostly pale yellow or yellow legs, tergum 1, and propodeum; white on anterior and posterior margin of pronotum, tegula, scutellum, and medial flagellomeres.

Female Description (based on type). Antenna: flagellomeres 6-14 white. Propodeum: carinae distinct, areola elongate hexagonal, area dentipara squarish, apophysis distinct, 3rd lateral area defined. Abdomen: petiole elongate and slender, postpetiole about twice as long as wide; 3rd valvula about as long as basal 3 hind tarsomeres. Color: white scape and pedicel entirely, dorsal and ventral margins of pronotum, collar, tegula and subtegular ridge, anterior part of mesopleurum above sternaulus and before prepectus, oblique line on mesoscutum before scutellum, scutellum, coxae 1-2, trochanters 1-2, petiole; yellow: femora 1-2 and tibiae 1-2 except 5th tarsomeres blackish, hind tarsus; yellowish orange: clypeus, mandible, leg 3 except tarsus; orangish: propodeum, abdomen except petiole; black: thorax except as noted, mesosternum orangish black, tarsomeres 5 blackish.

Material Examined. Holotype: female, MEXICO: Cordova (type No. 760), (ANSP). Other material studied, 1 male: OAXACA: 86 km S.W. Tuxtepec (Metate, 900 m), 18-x-1962, H. and M. Townes (AEI).

Etymology: possibly from *satag-* (*satagere*, to keep very busy) + *-eus* (agent suffix), maybe referring to the behavior of the adult.

Amphibulus tetratylus Luhman, sp. n.
(Figure 25)

Male Diagnosis. Three or more tyloids, beginning on flagellomere 11, propodeum without apophysis, entire mesopleurum distinctly punctulate, abdomen mostly black; medium small, greater than 5 mm long; northern Mexico. Differs from species without clypeal teeth or lobes by the numerous tyloids and the lack of apophysis.

Male Description. Antenna: usually 3 or 4 tyloids (sometimes more), usually beginning on flagellomere 11. Head: clypeus about 2.5 times as wide as high, apical margin distinctly upturned; face and frons moderately densely punctulate; temple sparsely punctulate and shiny. Thorax: entire mesopleurum moderately sparsely to moderately densely punctulate, central area a little rugulose; ridge across prescutellar groove faint or absent. Propodeum: carinae fine but distinct, 3rd lateral area undefined, apophysis absent, areola elongate hexagonal. Abdomen: tergum 1 elongate and slender, postpetiole at least twice as long as wide, sternum 1 at or beyond spiracle, dorsomedian carina absent; tergum 2 at least as long as wide; sterna 2-6 membranous medially. Color: white tegula; yellowish: scape, usually, mandible, legs 1-2 except sometimes leg 2 suffused with brownish, often terga 4-7 more yellowish basally; brownish: clypeus, leg 3 mostly brownish to mostly yellowish brown, especially dorsally, most of abdomen except variably on terga 4-7.

Female Diagnosis. Clypeus at least 2.5 times as wide as high, distinctly upturned medial third, flagellum a little flattened apical third and narrowed, 5 or 6 flagellomeres white beyond 6th.

Female Description. Antenna: as in diagnosis, basal 3 flagellomeres about twice as long as wide or shorter. Head: clypeus at least 2.5 times as wide as

high; face and frons densely punctulate; temple sparsely punctulate. Thorax: entire mesopleurum moderately sparsely to moderately densely punctulate, a little rugulose centrally. Propodeum: carinae fine but distinct, 3rd lateral area undefined, areola narrow and hexagonally elongate, apophysis absent. Abdomen: petiole elongate and slender, sternum 1 at spiracle, dorsomedian carinae weak on petiole, absent of postpetiole, latter a little wider than long; 3rd valvula about as long as basal 3 hind tarsomeres. Color: white tegula; pale yellow: coxae 1-2 and trochanters 1-2; yellowish: remainder of legs 1-3 except leg 3 more brownish yellow (especially coxa, femur, and tarsus), abdomen except suffused with brownish apically and laterally; brownish: clypeus, terga 1-3 except with mostly yellowish basally on terga 1-3.

Material Examined. Holotype: male, MEXICO (DURANGO): nr. El Palmito (5000 ft.), 8-VIII-1964, W. Mason (CNC). **Paratypes**, 4 males, 2 females: DURANGO: near El Palmito (5000 ft.), 8-viii-1964; near La Ciudad (6500, 7000 ft.), 8, 25-vii and 4-viii-1964, W. Mason (CNC). Other material studied, 1 male: DURANGO: nr. El. Palmito (5000 ft.), 8-viii-1964, W. Mason (CNC).

Etymology: *tetra-* (Greek 4) + *tylus* (Greek swelling), referring to the 4 tyloids of the male antenna.

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