

PHARPA. A NEW GENUS OF NEOTROPICAL AGATHIDINAE (HYMENOPTERA: BRACONIDAE) WITH A DISCUSSION OF PHYLOGENETIC RELATIONSHIPS

M. SHARKEY

Biosystematics Research Centre, Agriculture Canada, Ottawa, Ontario, Canada K1A 0C6

Abstract

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The genus *Pharpa* is erected to include three species of Braconidae in the subfamily Agathidinae, viz. *P. dubiosum* (Szépligeti), *P. basimacula* (Cameron), and *P. simulatrix* (Cameron) all new combinations. *Microdus albitarsis* Cameron is newly synonymized with *P. basimacula* (Cameron). The genus *Pharpa* is distributed widely throughout the neotropics from southern Mexico to northern Argentina. Phylogenetic relationships with other agathidine genera are discussed, as is the possibility that the various species represent a polytypic, conspecific, mimetic complex.

Résumé

Le genre *Pharpa* de la sous-famille des Agathidinae est érigé afin d'inclure trois espèces de Braconidae, soit *P. dubiosum* (Szépligeti), *P. basimacula* (Cameron) et *P. simulatrix* (Cameron) toutes de nouvelles combinaisons. *Microdus albitarsis* Cameron devient un nouveau synonyme de *P. basimacula* (Cameron). L'aire de distribution du genre *Pharpa* comprend toute la région néotropicale du sud du Mexique jusqu'au nord de l'Argentine. On discute des rapports phylogénétiques avec d'autres genres d'Agathidinae et de la présence possible d'un complexe polytypique, conspécifique et mimétique représenté par diverses espèces.

INTRODUCTION

While revising a large monophyletic group of neotropical Agathidinae, composed of the genera *Alabagrus* Enderlein, *Astiria* Enderlein, *Craspedobothrus* Enderlein, and *Liyptia* Enderlein, it became apparent to me that *Pharpa* formed its sister-group. I describe it here as a new genus and will be using it as the foundation of my out-group analysis for this group of genera.

MATERIALS AND METHODS

I have borrowed specimens of neotropical agathidines from about 20 of the world's major collections, but most of these collections do not contain specimens of *Pharpa*. Eventually only 37 specimens of the genus were accumulated. Much more collecting will have to be done to obtain a more complete understanding of the variation, species limits, and total diversity of the genus.

The nomenclature used for wing venation in this paper follows that of Riegel (1948). Mesosoma is a term meaning thorax plus propodeum; metasoma means abdomen minus the first segment (propodeum).

ABBREVIATIONS USED IN THE TEXT

AEI: American Entomological Institute, Gainesville, Florida. BMNH: British Museum (Natural History), London, England. CNC: Canadian National Collection, Agriculture Canada, Ottawa, Ontario. CU: Cornell University, Ithaca, New York. FSCA: Florida State Collection of Arthropods, Florida State Department of Agriculture and Consumer Services, Gainesville, Florida. MCZ: Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts. MNHP: Muséum National d'Histoire Naturelle, Paris, France. MZSP: Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil. RNHL: Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands. UCV: Instituto de Zoología Agrícola, Universidad Central de Venezuela, Maracay, Venezuela. ZMHB: Zoologisches Museum, Humboldt Universität, East Berlin, German Democratic Republic. ZSBS: Zoologische Sammlungen des Bayerischen Staates, Munich, German Federal Republic.

PHARPA NEW GENUS

Type species. *Pharpa dubiosum* (Szépligeti).

Etymology. *Pharpa* is a Kechwan word meaning "wing" and is a reference to the importance I have placed on wing patterns to delineate species. The gender is neuter.

Diagnosis. Members of the subfamily Agathidinae may be distinguished from all other braconids by the unique venation of the fore wing. Agathidines have a small areolet (1RS cell), a narrow 2R cell, and a RS vein that is tubular to the anterior margin of the wing. Members of the genus *Pharpa* may be distinguished from all other Agathidinae by the following combination of characters: frons margined by carinae (Fig. 1), tarsal claws with rounded basal lobe, and first metasomal tergum with two carinae that delimit a median depression (Fig. 5).

Description. Head. Malar space not elongate, about half as long as eye height (Fig. 2); frons margined by carinae posteriorly (Fig. 1); maxillary palpus five-segmented; labial palpus four-segmented (basal segment not visible in Fig. 2), third segment of labial palpus reduced, about 0.1 length of segment 4 (Fig. 2); occiput not modified, only slightly excavated for reception of pronotum (Fig. 1); gena expanded posteroventrally but not forming acute angle (Fig. 2); antenna about as long as body, flagellum 45- to 60-segmented.

Mesosoma. Notaulus impressed but without pits; propodeum irregularly areolate to almost smooth (Figs. 3, 4); propodeal spiracles oval, about 1.5 times longer than wide; hind coxal cavities closed; propodeal pseudosternite wide between hind coxa and propodeal foramen; mid tibia with several preapical spines on anterior surface; tarsal claws with sharp, curved, apical tooth and large rounded basal tooth; fore coxa quadrate, inner distal angle pronounced (Fig. 6); 1st RS + M vein (disco-cubital) absent, therefore 1st R₁ cell (1st cubital) and 1st M cell (1st discoidal) confluent (Figs. 8-12); 2nd RS₂ vein present as small stub or absent (Figs. 8-12); weak anterior portion of 2 r-m vein (inter-cubitella) of hind wing present, extending 0.4 times distance from 1st RS vein (radiella) to 2nd M vein (cubitella).

Metasoma. Tergum 1 lacking microsculpture; tergum 1 with two strong, smooth carinae, converging posteriorly and forming large depression anteriorly (Fig. 5); tergum 2, and usually 3, with deep, smooth transverse groove (Fig. 6); ovipositor as long as or slightly longer than body.

KEY TO SPECIES OF *Pharpa*

- | | |
|---|----------------------|
| 1. Fore wing evenly infuscate (Fig. 9)..... | <i>P. basimacula</i> |
| — Fore wing patterned with bands or pale areas (Figs. 8, 10, 11, 12)..... | 2 |
| 2. Fore wing pale apically (Fig. 8)..... | <i>P. simulatrix</i> |
| — Fore wing not pale apically..... | <i>P. dubiosum</i> |

Pharpa basimacula (Cameron) N. COMB.
(Figs. 9, 13)

Microdus basimacula Cameron, 1887, 1: 405.

Agathis basimacula: Shenefelt, 1970, 6: 319.

Microdus albitarsis Cameron, 1887, 1: 406, NEW SYNONYM.

Agathis duplalbitarsis Shenefelt, 1970, 6: 331. New name for *M. albitarsis* Cameron.

Note: when *Microdus albitarsis* Cam. (1887) was transferred to *Agathis* by Shenefelt (1970), it became a junior secondary homonym of *Agathis albitarsis* Spinola (1840). Shenefelt therefore created the replacement name *Agathis duplalbitarsis* for *Microdus albitarsis* Cameron. Now that I transfer *Microdus albitarsis* Cam. to the genus *Pharpa* the replacement name is unnecessary and it becomes a junior objective synonym of *Microdus albitarsis* Cam.

Diagnosis. Fore wing evenly infuscate (Fig. 9).

Holotype ♀ Description. Coloration. Black except propodeum posteriorly and metasoma anteriorly orange and fore tarsus orange; fore wing as in diagnosis.

Head. Number of flagellomeres ? (antennae broken).

Mesosoma. Sternaulus weak, represented by several foveae posteroventrally and shallow groove 0.5 length of mesopleuron; metapleuron sparsely punctate; propodeum roughly areolate; mid tibia with one preapical spine; (hind legs missing from holotype).

Metasoma. Tergum 1 as wide as long; fused terga of segments 2 and 3 as wide as long; ovipositor about as long as body, 6.5 length of hind femur.

Length. 11.3 mm.

Male. Coloration. Orange-red except fore and mid tarsi yellow and the following areas black: head, prothorax, fore leg except tarsus, mid leg except tarsus, tegula, and hind leg except coxa posteriorly. (One specimen with ventral and apical portions of metasoma yellow to yellow-orange.)

Mesosoma. Mid tibia with two or three preapical spines, hind tibia with six apical spines.

Length. 12.0 mm.

Variation. I have seen only two other specimens of this species; both are males. One specimen was described previously as *Microdus albitarsis* Cameron. The specimens agree with the type of *P. basimacula*, except in body coloration (a character quite variable in other species of *Pharpa* and in many species of Agathidinae), and the more developed sculpture of the propodeum and the first metasomal tergum. The difference in the degree of sculpture is not usually a reliable specific level character in the Agathidinae; males often have stronger sculpture. This is evident in long, reared, series of species such as *Agathis stigmatera* (Cresson).

Remarks. The type of *Microdus albitarsis* is in fair condition. The following parts are damaged or missing: both antennae, right hind leg except coxa, and left hind tarsus.

Material Examined. Holotype, ♀, MEXICO (coll. Sallé). No further locality data on specimen label. (BMNH Type No. 3c 648.)

1♂ (holotype of *M. albitarsis*), MEXICO (coll. Sallé). No further locality data on specimen label. (BMNH Type No. 3c 647.)

The only other specimen that I have seen is from Orizaba, Vera Cruz, and is deposited in BMNH.

Distribution. See map (Fig. 13).

Pharpa dubiosum (Szépligeti) N. COMB.

(Figs. 1-6, 10-13)

Aerophilus dubiosus Szépligeti, 1914, 7: 217.

Diagnosis. Fore wing with some yellow coloration (Figs. 10-12), but never pale apically.

Holotype ♀ Description. Coloration. Body orange except antenna: antenna black except scape, pedicel, and several basal flagellomeres (most terminal flagellomeres broken). Fore wing yellow basally and near stigma (Fig. 11).

Head. Antennae broken, flagellum with about 50 articles.

Mesosoma. Sternaulus weakly impressed, represented by several foveae posteroventrally; metapleuron sparsely punctate, punctures weaker than in other species; propodeum with weak, longitudinal carinae posteriorly and medially (Fig. 4); mid tibia with two or three preapical spines; hind tibia with about six spines.

Metasoma. Tergum 1 as long as wide; fused terga of segments 2 and 3, 1.1 times longer than wide; ovipositor about as long as body, 4.2 times longer than hind femur.

Length. 11.3 mm.

Males. Similar to females except propodeal sculpture stronger and with areolae (Fig. 3).

Variation. Coloration. Specimens from the northern limits of this species (see map) are considerably darker in color. In the darkest, the body is black except as follows: fore tarsus yellow, all legs and metasomal sterna reddish-brown; fore wing varies as in diagnosis. Most specimens have pale body coloration as in the type and fore wings as in Figure 12.

Mesosoma. Hind tibia with 6–10 apical spines.

Length. 10.5–13.0 mm.

From the available data, there appears to be a cline in body coloration. The lightest specimens are from the south (Argentina, Paraguay, and southern Brazil); intermediate specimens are found in Goiás and Mato Grosso do Sul; and the darkest specimens are from Colombia, Ecuador, Peru, and Venezuela.

Remarks. The specimens with fore wing patterns as in Figure 10 may represent a new species. Besides the wing color pattern the body color is consistently darker than other specimens. More collecting may resolve this question.

Material Examined. Holotype ♀, BRAZIL, São Paulo (the label of this specimen gives the locality as Senegal but this is certainly incorrect as three conspecific and almost identical specimens from the same collection are recorded from São Paulo, Brazil). (ZMHB.)

Specimens that I have determined are in the following collections: AEI, BMNH, CNC, CU, FSCA, MCZ, MNHP, MZSP, RNHL, UCV, ZSBS.

Distribution. See map (Fig. 13).

Pharpa simulatrix (Cameron) N. COMB.

(Fig. 8)

Microdus simulatrix Cameron, 1887, 1: 405.

Agathis simulatricoides Shenefelt, 1970: 355. New name for *M. simulatrix* Cameron.

Note: *Agathis simulatricoides* Shenefelt (1970) is an unnecessary replacement name for *Microdus simulatrix* Cam. (1887) because *M. simulatrix* became the senior secondary homonym of *Agathis simulatrix* Kok. (1895) when the former was transferred to *Agathis* by Shenefelt. As *Agathis simulatrix* Kok. became the junior homonym it is the species that required a new name. *Agathis simulatricoides* therefore becomes a junior objective synonym of *Microdus simulatrix* Cam.

Diagnosis. Fore wing infusate except for apical hyaline band (Fig. 8).

Holotype ♀ Description. Coloration. Black except anterior sterna of metasoma reddish-black, fore wing as in diagnosis.

Head. Antenna with 46 flagellomeres.

Mesosoma. Sternaulus weak, represented by several foveae posteroventrally and shallow groove 0.5 length of mesopleuron; metapleuron sparsely punctate; propodeum roughly areolate (c.f. Fig. 3); mid tibia with three preapical spines; hind tibia with about six apical spines.

Metasoma. Tergum 1 about as wide as long; fused terga of segments 2 and 3 as wide as long; ovipositor slightly longer than body, 1.0–1.1 body length, 4.5 length of hind femur.

Length. 11.7 mm.

Male. Unknown.

Material Examined. Holotype ♀, GUATEMALA, San Geronimo, nr. Guatemala City, Champion. (BMNH Type No. 3c 649.)

Other specimens that I have viewed are in BMNH and FSCA.

Distribution. See map (Fig. 13).

PHYLOGENETIC RELATIONSHIPS

Pharpa belongs to a group of Agathidine genera that has been informally called the *Agathis* group (Bhat and Gupta 1977). The character states that it shares with most members of this group are as follows:

1. Tarsal claws with rounded basal tooth.
2. Outer surface of mid tibia with preapical spines.
3. Ovipositor longer than metasoma.

Character state 2 is a synapomorphy for the group as it is rare within the Braconidae and only found convergently in rather distantly related taxa, e.g. Rogadinae. Character states 1 and 3 are likely plesiomorphic as they are widespread in the Braconidae. The sister-group of the Agathidinae is not known. Bhat and Gupta (1977) list other characters but some of their *Agathis* group characters exclude *Agathis s.s.* itself. Therefore, I have widened the concept of the *Agathis* genus group to include forms not found in the Oriental region.

The following group of genera, and perhaps some others, belong to the *Agathis* genus group: *Aerophilodes* Strand, *Aerophilus* Szépligeti, *Agathirsia* Westwood, *Agathis* Latreille, *Alabagrus* Enderlein, *Astiria* Enderlein, *Bassus* Fabricius, *Braunsia* Kriechbaumer, *Camptothlipsis* Enderlein, *Craspedobothrus* Enderlein, *Crassomicrodus* Ashmead, *Earinus* Wesmael, *Laccagathis* Watanabe, *Liyptia* Enderlein, *Mesocoelus* Schulz, *Pharpa* Sharkey, *Rhamphagathis* Tobias, *Trachagathis* Viereck, and *Zamicrodus* Viereck.

Of all the genera, *Alabagrus*, *Astiria*, *Craspedobothrus*, and *Liyptia* form a monophyletic assemblage which I hypothesize to be the sister-group of *Pharpa*. All of these genera, including *Pharpa*, share two apomorphies. First, the frons is bordered by carinae that have a shape unique among the Agathidinae and among the entire Braconidae (Fig. 1). Secondly, the fore coxa is subquadrate (Fig. 6), a condition unique within the Agathidinae and rare in the Braconidae as a whole. Most agathidines have the fore coxa smoothly rounded as in *Agathis malvacearum* Latreille (Fig. 7).

The monophyly of *Pharpa* rests on the strength of one synapomorphy, the unique shape of the first metasomal tergum. The presence of two longitudinal carinae on the first metasomal tergum is a character state that I believe to be plesiomorphic for the Agathidinae. It is widespread throughout the Braconidae and the Ichneumonidae. Members of the genus *Pharpa* have these carinae but they are modified such that they are very high and smooth, enclosing a large anteromedial depression (Fig. 5). The sister-group of *Pharpa* (viz. *Alabagrus* + *Astiria* + *Craspedobothrus* + *Liyptia*) is united on the basis of one synapomorphy that I have discovered: the lateral carinae of the first metasomal tergum are fused to form a medial keel, anteromedial bump, or a distinctly convex surface. It is unlikely that this condition arose from the character state found in *Pharpa* because males of certain species within the sister-group of *Pharpa* have two carinae on the first metasomal segment and I believe that this is the ancestral state for the assemblage. In males of these species the carinae do not converge medially and the tergum is on the same plane medially as laterally, i.e. there is no strong medial depression as there is in *Pharpa*. This is the character state most widely distributed among the *Agathis* group of genera, whereas the state found in *Pharpa* is unique to that genus. It is probable that these males have retained the plesiomorphic condition.

I have not attempted a phylogenetic analysis of the species of *Pharpa*. They differ mainly in wing color pattern and each state that is present in *Pharpa* is also present in its sister taxon.

DISCUSSION

Structurally all species of *Pharpa* are similar. There are minor differences in ovipositor length and degree of sculpture on the propodeum, but there are no great differences between species other than the color patterns of the wings. This may indicate that it is

composed of one large species represented by various morphotypes. Perhaps each of the color patterns found in *Pharpa* is the result of local selection on one species to conform to a predominant mimetic pattern. See Papageorgis (1975) for an interesting discussion of neotropical mimetic patterns in butterflies including a description of polymorphic species of this type.

In the sister-group of *Pharpa* wing color patterns are usually (98%) consistent intra-specifically. This is corroborated by other morphological characters. Several species, e.g. *Agathis stigmatera* (Cresson), show some variability, but they are the exceptions.

Because wing color pattern is a reliable species level character in its sister-group I suspect that it is in *Pharpa* as well, despite the lack of other morphological differences. For this reason I choose not to suppress all of the species (morphs?) under one name.

Pharpa dubiosum may consist of more than one species (compare Figs. 10 and 12) but due to some variability within the species (e.g. Fig. 11) and general uncertainty, I choose not to propose new names until more material is collected.

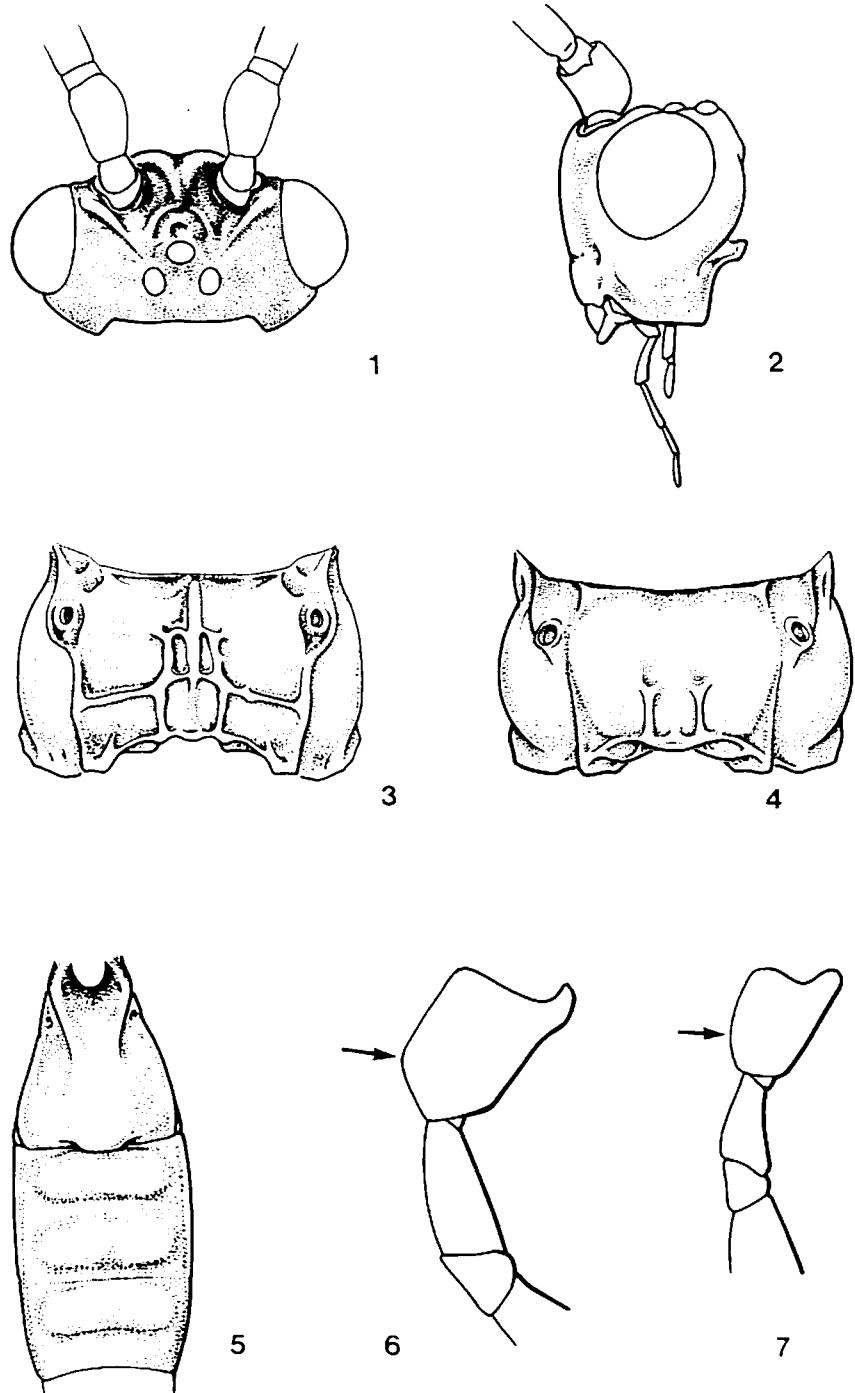
ACKNOWLEDGMENTS

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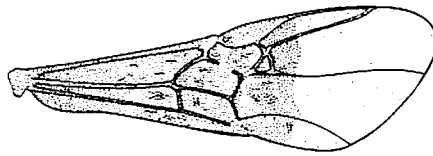
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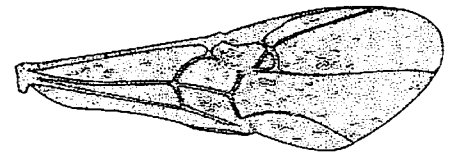
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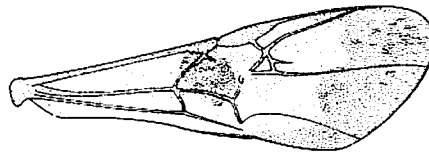
FIGS. 1-7. 1, *P. dubiosum*, dorsal aspect of head showing carinae bordering frons; 2, *P. dubiosum*, lateral aspect of head showing expanded gena; 3, *P. dubiosum*, propodeum (male); 4, *P. dubiosum*, propodeum (female); 5, *P. dubiosum*, dorsal aspect of first three metasomal terga; 6, *P. dubiosum*, ventral view of right anterior coxa showing subquadrate shape; 7, *Agathis malvacearum* Latr., ventral view of right anterior coxa showing plesiomorphic, rounded shape.



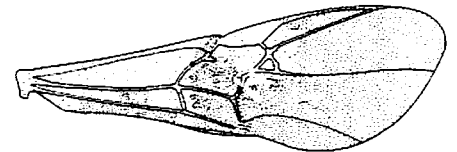
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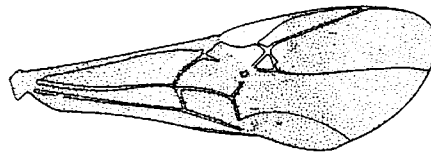
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10



11



12

FIGS. 8-12. Fore wings of the following species: 8, *P. simulatrix*; 9, *P. basimacula*; 10, *P. dubiosum*, Ecuador; 11, *P. dubiosum*, type, southern Brazil; 12, *P. dubiosum*, southern Brazil.

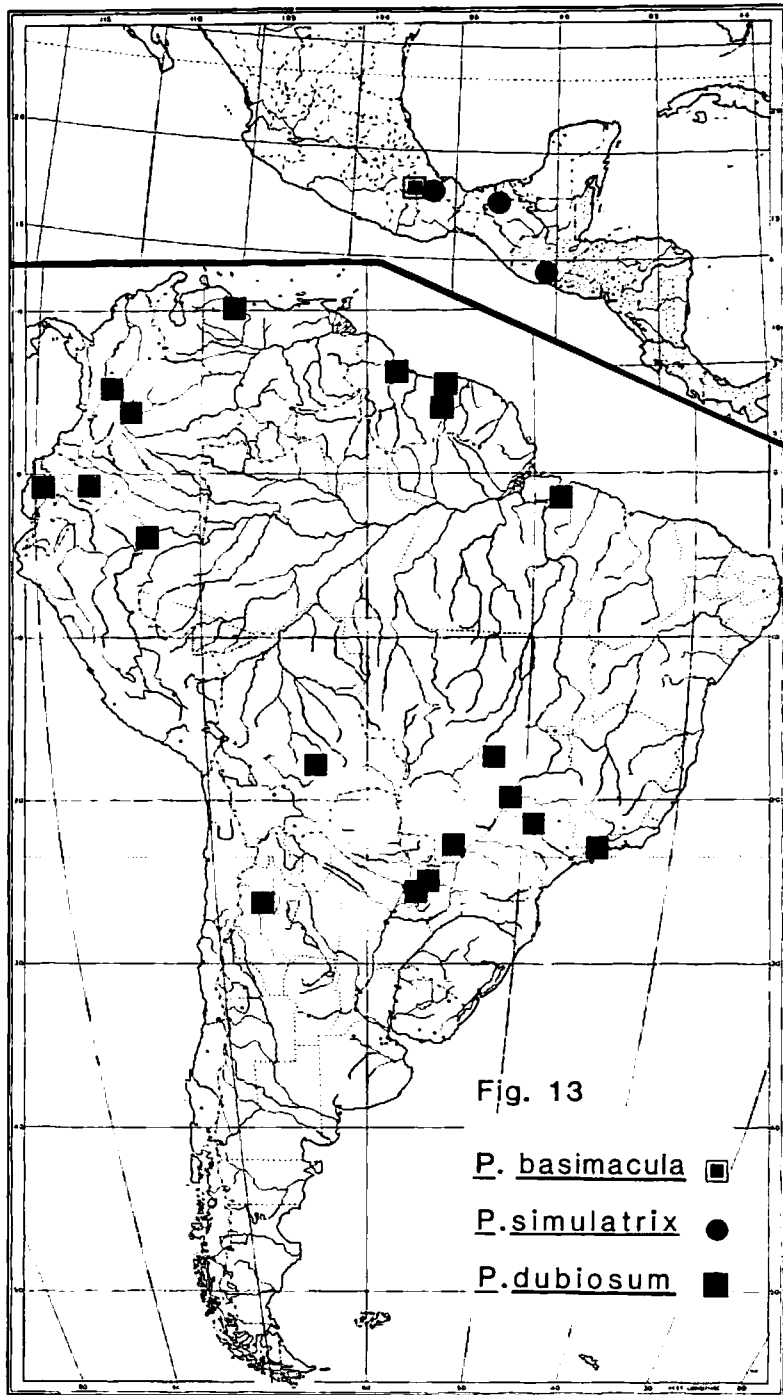


FIG. 13. Distribution map of the species of *Pharpa*.