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A NEW GENUS AND SPECIES OF PSENINE WASP FROM AFRICA AND A KEY TO GENERA (HYMENOPTERA: PEMPHREDONIDAE: PSENINAE)

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Abstract

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A new genus and species of psenine wasp are described: *Lithium cicatrix*. Relationships with other genera are discussed, new tribal limits are proposed, and a key to genera of psenine wasps is presented.

Résumé

On décrit une nouvelle espèce et un nouveau genre de guêpe psénine: *Lithium cicatrix*. Ses relations avec les autres genres sont commentées, des nouvelles limites tribales sont proposées, et une clé au genre applicable aux guêpes psénines est présentée.

Introduction

A new genus and species of psenine wasp are described below based on a pair of specimens from Mali, Africa. Although only two specimens are known, they possess several character combinations unique in the psenine wasps and of value in generic classification. It is hoped that this publication will bring to light more specimens of this genus.

Lithium new genus

(Figs. 1A–G, 2D)

Female damaged, head and fore legs missing, description of head applicable to male only.

Description. Length, 5 mm. Antennae inserted well above clypeus near middle of face. Apical flagellomeres produced at apex beneath. Inner orbits converging medially. Mandible bidentate apically. Clypeal apex truncate, thin, not beveled or transversely grooved, without teeth and concealing labrum. Papal formula 6-4. Frontal carina complete from mid ocellus to interantennal area but depressed below level of frons just before mid ocellus. Frons beneath mid ocellus with pair of deep comma-shaped grooves reaching almost to inner orbits, separated medially by frontal carina. Gena smooth, without tooth or process. Occipital carina ending ventrally, not reaching hypostomal carina and not toothed or raised. Pronotum rounded, transverse carina only slightly evident laterally. Omaulus present with remnant curving forward as it becomes ventral. Acetabular carina absent. Scrobal sulcus not deeply impressed. Hypoepimeral area punctate, not otherwise sculptured, slightly bulging. Anterior mesopleural sculpture obscured by dense appressed setae. Mid tibia with a single apical spur. Fore wing with three submarginal cells, recurrent veins ending interstitially with submarginal cell II. Hind wing media diverging before cu-a. Propodeal enclosure defined by carina. Petiole short, square, carinate laterally and ventrally, not punctate, pubescence fine. Metasomal tergum I with antero-lateral carina. Male metasomal sterna II, III, IV with transverse rows of specialized setae at apices. Sternum VIII of male slightly protruding from apex of metasoma as a spine. Female pygidial plate well developed with sides parallel.

This genus is named for Jan Pieter van Lith in recognition of his many contributions to the knowledge of psenine wasps.

Type. *Lithium cicatrix* new species.

Lithium cicatrix new species

(Figs. 1A–G, 2D)

The combination of the very short petiole, unsculptured hypoepimeral area, and the presence of an omaulus will serve to distinguish both the genus and the species from all others in the Psenini. In addition, the grooved frons of the male is unique in the family.

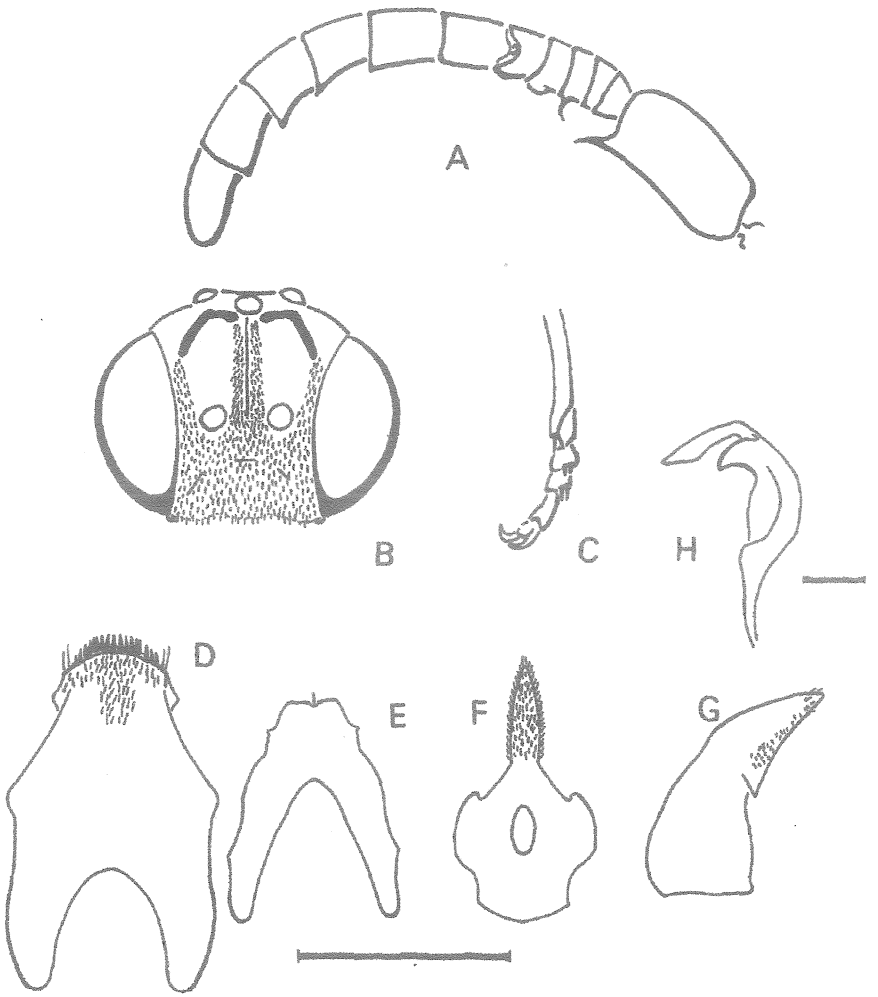

FIG. 1. *Lithium*, male. (A) Antenna, ventral; (B) head, anterior; (C) mid tarsus, ventrolateral; (D) sternum VI, ventral; (E) sternum VII, ventral; (F) sternum VIII, ventral; (G) gonostyle, lateral; (H) penis valve, lateral. Scale on D,E,F,G is 0.5 mm and on H is 0.1 mm.

Description. Male. Length 5 mm.

Head. Scape short, broad, with apical outer spine, broadly and deeply excavated at apex; pedicel sunk into apex of scape; flagellomeres I–V short, much broader than long, III with sharp outer spine opposing spine on scape, IV and V with rounded tyli in line with spine on III, V with v-shaped emargination on inner margin at apex enclosing small rounded area between apex of V and base of VI; flagellomeres VI–X produced beneath at apices, all slightly longer than broad, X and XI concave on inner margin at base. Frons, vertex, and gena shining, punctate, without microsculpture. Face below antennal sockets, inner orbits and frontal carina obscured by dense appressed setae. Antennal sockets closer to inner orbits than each other, separated by prominent tubercle. Frons flat above antennal sockets on each side of frontal carina, becoming tumid toward vertex, each tumidity forming ventral margin of deep comma-shaped groove between which frontal carina is evident.

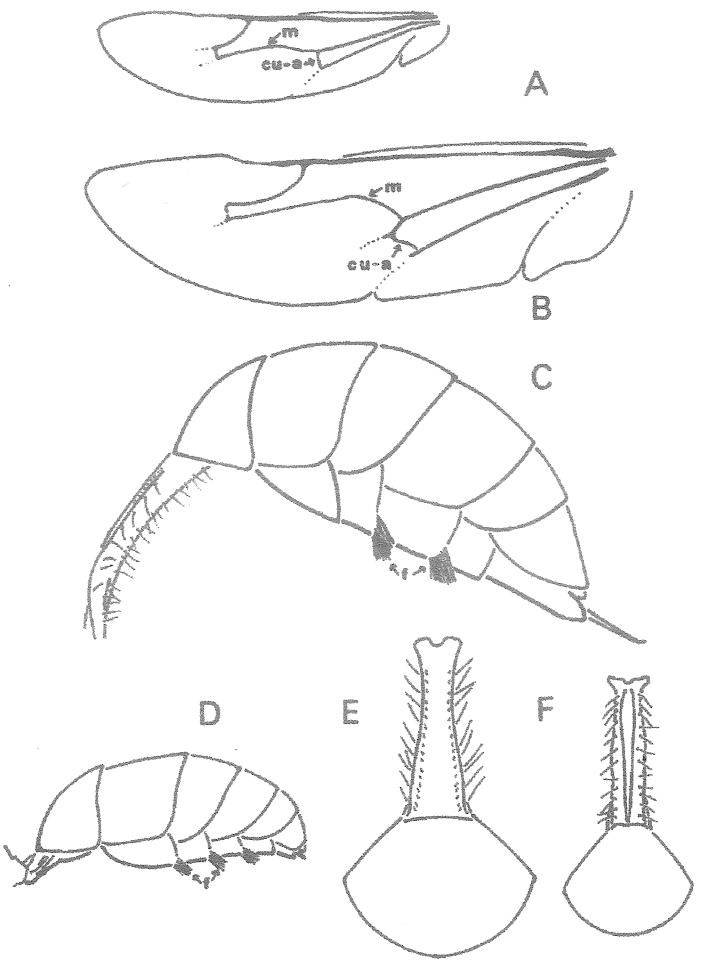

FIG. 2. (A) *Pluto*, hind wing; (B) *Mimesa*, hind wing; (C) *Psen*, male metasoma, lateral; (D) *Lithium*, male metasoma, lateral; (E) *Psen*, petiole and first tergum, dorsal; (F) *Mimumesa*, petiole and first tergum, dorsal. *f* = specialized setae, sternal frimbriae of authors.

Mesosoma. Pronotal angles rounded, transverse carina only faintly evident laterally. Scutum, scutellum, mesopleuron including hypoepimeral area shining, at most faintly microsculptured, closely punctate with sparse pubescence. Pubescence becoming dense toward omaulus, obscuring sculpture beneath. Mid basitarsus projecting ventrally under second tarsomere, mid tarsomeres III and IV asymmetrical, each with pair of peg-like spines on small lobe. Propodeum with enclosure well defined, striate, adjacent areas granular becoming microstriate to rugosoreticulate on lateral spheres. Propodeum oblique in lateral profile, evenly curved, separate dorsal and posterior surfaces not evident.

Metasoma. Petiole, measured dorsally, short, as long as broad with well developed dorsolateral carinae and faint median ridge, setae fine, short, restricted to lateral and ventral areas. Sterna II, III, and IV with apical transverse rows of specialized setae. Sternum VI with apical row of peg-like spines. Sternum VII truncate apically with small median emargination. Sternum VIII with setose upcurved apical spine, only tip of which protrudes from metasomal apex. Volsella divided into digitus and cuspis.

Coloration. Black. Creamy white: antenna ventrally, mandibles medially, pronotal lobe, tibiae except apically, and tarsi except hind tarsomeres. Yellow-brown to brown: antenna dorsally, apex of mandible, fore femur and trochanter ventrally, fore basitarsus dorsally, and apical hind tarsomere.

Description. Female. Damaged, head and fore legs missing.

Identical to male except mid tarsi unmodified, sculpture of propodeum finer on lateral spheres, pygidial plate present on metasomal tergum VI and specialized setae on metasomal sterna absent. The grooved frons of the male may not appear in the female.

The species epithet *cicatrix*, meaning scar, refers to the deeply grooved frons of the male.

Holotype. Male. Mali, Gao 250m, 29-IX-1976. K. Guichard.

Allotype. Female. Same data as holotype.

Both specimens are deposited in the Invertebrate Collection of the Provincial Museum of Alberta, Edmonton, Canada.

Postulated Apotypic Character States
(Fig. 5B)

The following is not intended to be an exhaustive phylogenetic analysis of the Pseninae. I seek to present an alternative tribal classification based on synapomorphic character states which in turn are used as evidence to elucidate the relationships of *Lithium* within the Pseninae. In the following section character state polarization has been determined by outgroup analyses which unless otherwise stated are the genera *Pemphredon* and *Diodontus* in the Pemphredoninae.

Head. 1. Apical flagellomeres in males produced at apices beneath (Fig. 1A). This character state is found in males of *Lithium* and *Ammopsen*; all other genera exhibit the plesiotypic condition with at most a tylus that is not produced at the apex of the flagellomere (Fig. 3B).

2. Raised or lamellate interantennal carina. The interantennal carina in all psenine genera except *Psenulus* is a low, unmodified carina on at most a small prominence between the antennal sockets and represents the plesiotypic condition. In *Psenulus* the carina is strongly raised and often lamellate between the antennal sockets representing an apotypic character state.

3. Frons grooved (Fig. 1B). All genera in the Pseninae except *Lithium* exhibit the plesiotypic unmodified frons. *Lithium* males have a pair of deep comma-shaped grooves on the upper frons on each side of the frontal carina. Some members of the pemphredonines (*Stigmus*) possess a similar but independently derived development in the form of grooves or microsculpture patches on the lateral area of the vertex.

4. Gena with ammochaetae. The long specialized setae arranged in a row on the posterior part of the gena are an apotypic condition found in females of *Ammopsen*. All other genera except *Polemistus* (Pemphredoninae) have non-specialized genal setae. *Polemistus* possess scattered elongate setae on the gena representing a separate derivation from the plesiotypic non-specialized setae.

Mesosoma. 5. Omaulus terminating in a setose patch on each side of midventral line. The omaulus cannot be considered as a character separately from the acetabular carina. Six acetabular-omaular interactions have been identified in the Pemphredonidae, most of which show considerable homoplasy in the group (these interactions are treated in the discussion following this section). In spite of homoplasy and the plesiotypic nature of a forward curving omaulus, the forward curving omaulus terminating in a setose patch is considered apotypic and is found only in *Psenulus*.

6. Hypoepimeral area bulging (Figs. 3B, 4A,B). The hypoepimeral area in the Pseninae is plesiotypically a low convex swelling, the scrobal sulcus impressed or not. In the

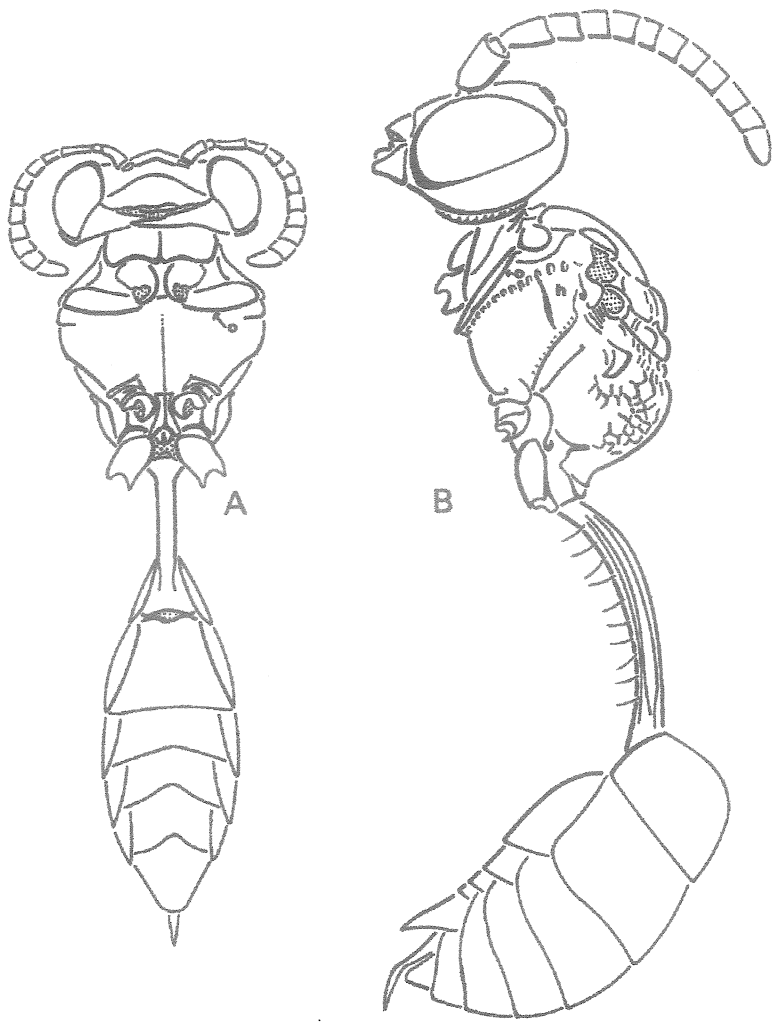

FIG. 3. (A) *Mimesa*, female, ventral; (B) *Pseneo*, male, lateral. *h* = hypoepimeral area; *o* = omaulus.

psenine genera *Mimumesa, Deinomimesa, Nesomimesa, Pseneo*, and *Psen* the hypoepimeral area strongly bulges and the scrobal sulcus is deeply impressed.

7. Hypoepimeral area exhibiting regular sculpture, striate to microsculptured. Sculpture of the hypoepimeral area varies from absent to striate and coarsely irregular. The absence of sculpture, macro and micro, results in a shining hypoepimeral area representing an apotypic condition through a character loss. The plesiotypic state is that exhibited in *Pemphredon* with coarsely irregular sculpture on the hypoepimeral area. In some species of *Pseneo* and *Psen* which normally exhibit unsculptured hypoepimeral areas, character reversals may exist in the form of coarsely irregular sculpture. The genera *Mimesa, Odontopsen, Ammopsen*, and *Lithium* have striate to microsculptured hypoepimeral areas representing an apotypic condition independently derived from the plesiotypic state. Partial or complete loss of the striate condition occurs in all the above genera but is always associated with an increase in mesopleural setal density to the point where underlying sculpture is obscured. Such is not the case in *Psen* and related genera where the mesopleuron exhibits at most scattered erect setae that do not in any way obscure the surface.

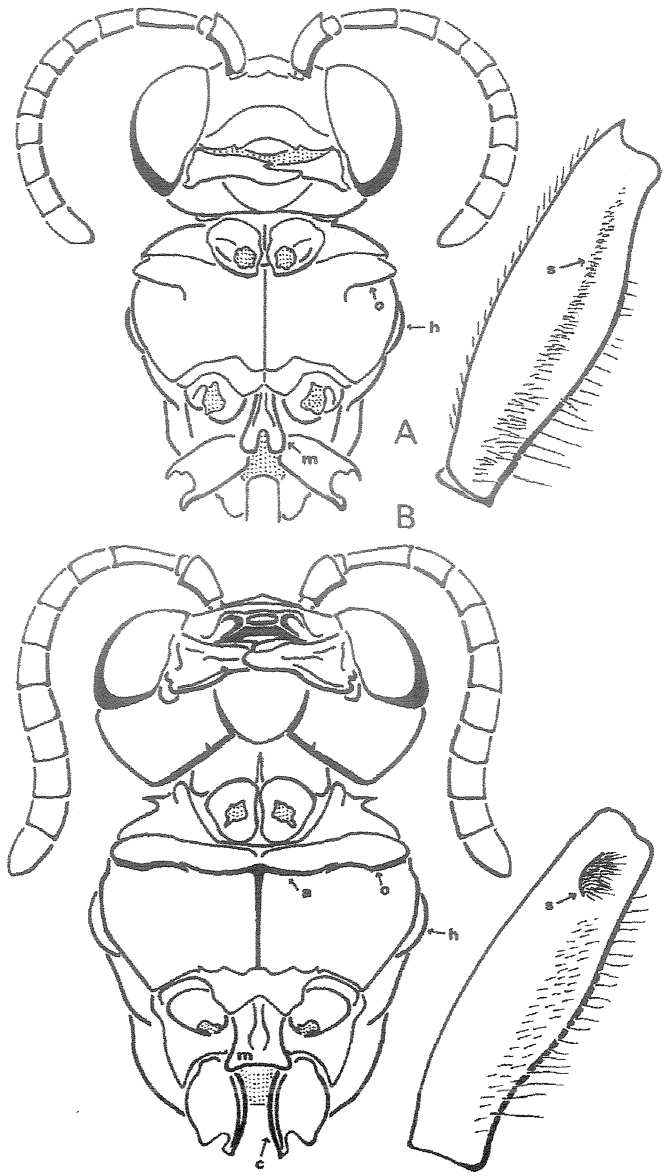

FIG. 4. (A) *Psen*, female head, mesosoma, ventral, and inner hind femur; (B) *Pseneo*, female head, mesosoma, ventral, and inner hind femur. *a* = acetabular carina; *c* = hind coxal carina; *h* = hypoepimeral area; *m* = mesosomal metasternum; *o* = omaulus; *s* = setal patch or line.

8. Mesosomal metasternum broadly emarginate (Fig. 4B). The mesosomal metasternum in genera of Pseninae is plesiotypically deeply emarginate (Fig. 4A). *Pseneo* exhibits a broadly emarginate metasternum representing an apotypic condition.

9. Inner hind coxal carina strong from base to apex (Fig. 4B). The inner hind coxal carina is plesiotypically absent to partially developed on the basal half, in *Pseneo* the carina is strong from base to apex.

10. Ventrally directed bristle on hind coxa. The setae of the hind coxa are plesiotypically unspecialized in all genera except *Pluto* where a ventrally directed elongate bristle is present.

11. Hind femur with an oval patch of dense setae on apical inner side (Fig. 4B). The hind femur in psenine genera is either without or with a line of setae on the apical half or more of the inner side as exhibited by *Pluto* and *Psen*. In members of *Pseneo* this setal line is apotypically reduced to a dense oval patch on the inner apex.

12. Apical hind tarsomere with lateral bristles. The genera *Deinomimesa* and *Nesomimesa* possess lateral bristles on the apical hind tarsomere (Bohart and Menke 1976), a character plesiotypically absent in all other psenine genera.

13. Hind wing media diverging beyond cu-a (Fig. 2A). The hind wing media diverges before cu-a (Fig. 2B) in most sphecoid wasps. The apotypic condition of the media diverging after cu-a has apparently evolved a number of times and can be found in members of *Pluto*, *Psenulus*, *Carinostigmus*, and some *Stigmus*.

Metasoma. 14. Dorsolateral setae of petiole reduced in size (Fig. 2E). The presence of a single row of setae dorsolaterally on the petiole is an apotypic condition found in all psenine genera, the plesiotypic condition being represented by *Pemphredon* where the setae are scattered over the dorsal surface of the petiole (outgroup in this case is the Sphecidae). In most psenine genera the dorsolateral setae are long, more than half the width of the petiole (Fig. 2F) but in the genera *Deinomimesa*, *Nesomimesa*, *Pseneo* and *Psen* these setae have become greatly reduced in size representing a further apotypy associating these four genera.

15. Petiole with longitudinal, non-carinate, median swelling. A number of character states have developed independently from the plesiotypic conditions of sessile abdomen or short petiole (wider than long) as exhibited by *Lithium*, *Diodontus*, and *Passaloecus*. In these genera the petiole is square in cross section and heavily carinate both dorso- and ventro-laterally but otherwise unmodified. Three states have arisen from the generalized condition; these are the presence of a median swelling, presence of a median ridge, and finally a petiole with a round cross section. The latter condition exhibits considerable homoplasy and is difficult to interpret. The median, non-carinate, longitudinal swelling occurs only in *Mimesa*, with some species showing a transition to a round petiole and others showing a transition to a flat petiole.

16. Petiole with a longitudinal, carinate, median ridge (Fig. 2F). An independent development from the previous character state where the petiole in *Mimumesa* has a longitudinal, median, gradually tapering, bicarinate ridge. Superficially similar ridges are developed in *Stigmus* but in that genus are derived from the dorsolateral carinae shifting to a more dorsomedian position on the petiole and in any case are not gradually tapered distally.

17. Transverse rows of specialized setae on metasomal sterna III, IV, or V (Fig. 2C). Males of the genera *Lithium* and *Psen* have apical, transverse, rows of elongate setae (frimbriae of authors) on metasomal sterna II, III, IV, or V. All other genera possess the plesiotypic condition of only a few widely spaced, subapical, elongate setae. *Lithium* has these specialized setae developed on metasomal sterna II, III, and IV while *Psen* almost always has specialized setae developed on sternum IV, less frequently on III or V. These setae are absent in only one species of *Psen*, *P. exaratus* (Eversmann), for which van Lith (1968) described the subgenus *Punctipsen*. The coarsely punctate petiole found in *Punctipsen* is a character unique in the Pseninae and as such *Punctipsen* probably should receive generic status but I have yet to examine a specimen of this subgenus and will reserve further comment until I do so. Although *Lithium* and *Psen* both have specialized setae on the metasomal sterna, they share no other apotypic character states and the specialized setae are here considered to be independently derived and do not indicate relationship.

18. Transverse rows of specialized setae on metasomal sterna II, III, and IV (Fig. 2D). An apotypic state possessed only by male *Lithium*; see number 17.

19. Metasomal sternum VI with apical row of peg-like spines (Fig. 1D). This character is present only in the Psenulini. These minute pegs are developed in *Psenulus*, *Pluto*, *Mimesa*, *Lithium*, *Ammopsen*, and probably *Odontopsen*. They are plesiotypically absent in all other genera in the family.

Discussion

Bohart and Menke (1976) divided the tribe Psenini (here treated as a subfamily) into two subtribes, the Psenulina comprising *Psenulus* and *Pluto* and the Psenina comprising all other genera. The Psenulina were associated on the basis of the hind wing media diverging beyond cu-a (Fig. 2A) but the Psenina were associated on the basis of a plesiotypic character state (hind wing media diverging before cu-a) resulting in an unsubstantiated group. I am unable to find a single synapomorphy to support the Psenina subtribal division first proposed by Gittins (1969) as a suprageneric group and later adopted by Bohart and Menke (1976) as a subtribe (Fig. 5A).

The genera of Pseninae can be divided into two tribes based on synapomorphic character states; these relationships are presented in Figure 5B where numbers are used to indicate apotypic character states treated in the previous section. As proposed here the Pseninae constitute two tribes, Psenulini and Psenini. The Psenulini (*Psenulus*, *Pluto*, *Mimesa*, *Lithium*, *Ammopsen* and probably *Odontopsen*) are associated on the basis of small peg-like spines on the apex of sternum VI (character state 19). This character is lacking in all members of the Psenini (*Psen*, *Pseneo*, *Mimumesa*, and probably *Nesomimesa* and *Deinomimesa*) and also lacking in the outgroup. Peg-like spines on sternum VI are well developed in *Mimesa*, *Pluto*, *Lithium*, and *Ammopsen* but in *Psenulus* are very small and possibly absent in some species.

The Psenini are associated on the basis of the bulging hypoepimeral area (character state 6). In addition the scrobal sulcus is deeply impressed and sculpture of the hypoepimeral area is either absent (smooth and shining) or more rarely, coarsely and irregularly rugose and shining. In the Psenulini the hypoepimeral area is not bulging but flattened and more or less continuous with the mesopleuron. The scrobal sulcus is absent in *Psenulus*, poorly defined in *Pluto* but defined in the other genera to the same extent as in most Pemphredoninae.

The psenuline genera *Pluto* and *Psenulus* are associated on the basis of the hind wing media diverging beyond cu-a (character state 13, Fig. 2A). In all other Pseninae the media diverges before cu-a. *Pluto* is distinguished from *Psenulus* on the basis of the posteriorly curving omaulus and an elongate, ventrally directed bristle on the hind coxa (character state 10). Species of *Psenulus* are associated on the basis of the omaulus terminating in a setose patch on each side of the midventral line (character state 5) and also by the raised or lamellate interantennal carina (character state 2).

The *Mimesa* group of genera share the sculpture of the hypoepimeral area which is striate to microsculptured, the latter condition correlating with increased setal density on the mesopleuron to the point where sculpture is obscured (character state 7). The plesiotypic condition for sculpture of the hypoepimeral area is that exhibited by *Pemphredon* showing irregularly rugose sculpture. *Mimesa* is separated from *Lithium* and *Ammopsen* on the basis of petiole structure (character state 15). The shape of the petiole in the Pemphredonidae (round, flat, carinate, ridged, etc.) has probably evolved independently a number of times so that species sharing the same petiole structure are not necessarily related. The plesiotypic condition is that found in the short petioled genera *Passaloecus*, *Diodontus*, and *Lithium* where the petiole is square in cross section and heavily carinate dorso- and ventro-laterally. The median longitudinal, non-carinate, swelling occurs only

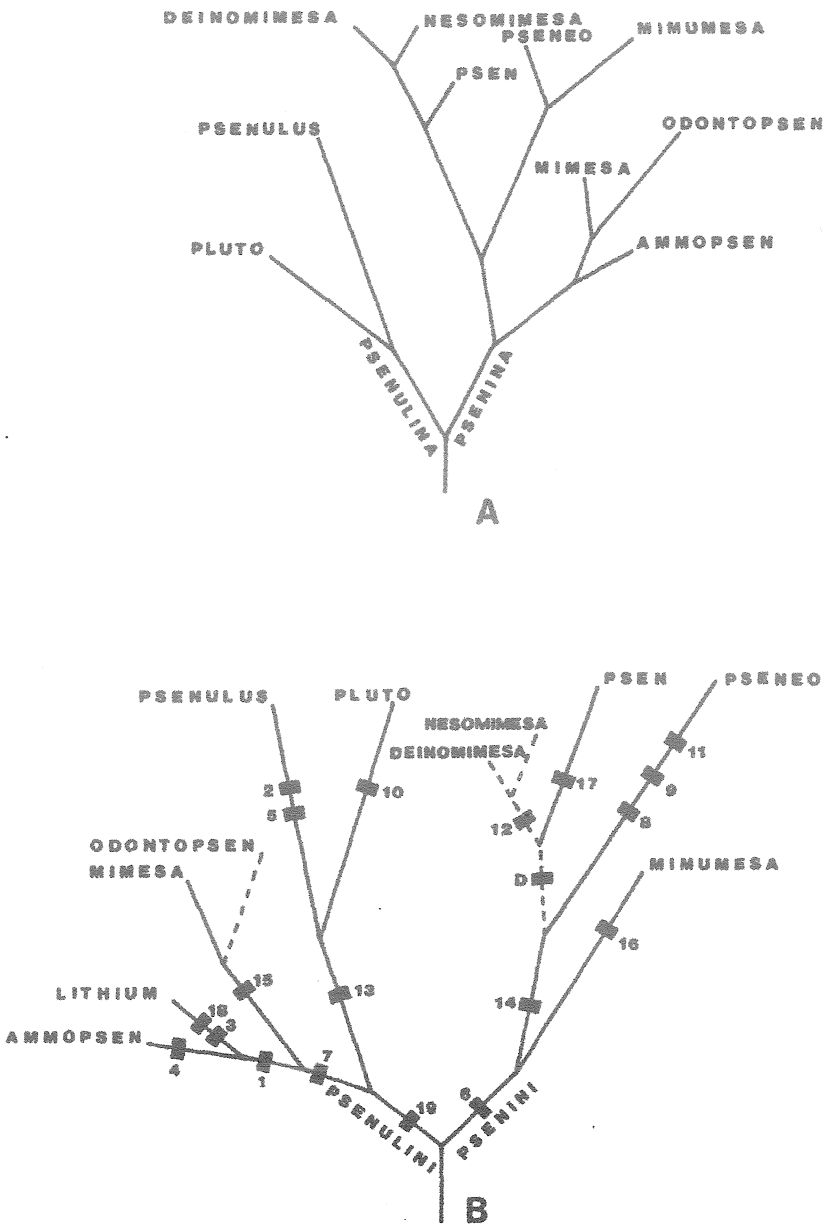

FIG. 5. (A) Relationships in the Pseninae according to Bohart and Menke (1976). (B) Cladogram presenting relationships in the Pseninae according to the present paper. Numbers refer to apotypic character states in text, dotted lines indicate examples of taxa not seen and placement uncertain, D = see Discussion.

in *Mimesa* with a few species showing transitions to a round petiole or a flat petiole, both states of which show considerable homoplasy in the Pseninae.

Lithium and *Ammopsen* can be associated on the basis of the apical flagellomeres of the males being produced at the apices beneath (character state 1, Fig. 1A). *Lithium* is separated from *Ammopsen* on the basis of the grooved frons and specialized setae on the metasomal sterna of the male (character states 3 and 18, Figs. 1B, 2D). *Ammopsen* is

distinguished using the ammochaetae on the female gena (character state 4) (Krombein 1959).

Other authors have separated Psenini (as considered here) using the presence of an acetabular carina or an omaulus that ventrally turns posteriorly, which although a good key character in some geographic regions, does not bear scrutiny on a global scale and has led to misinterpretations of relationship in some genera and species. The acetabular carina cannot be considered as a character separately from the omaulus. In the Pemphredonidae there are six progressively apotypic but not necessarily sequentially derived character states involving omaular-acetabular interactions.

(A) Acetabular carina undeveloped, omaulus curving forward toward prothorax (Fig. 3A).

(B) Aacetabular carina partially developed or absent, omaulus curving forward and terminating in setal patches on each side of midventral line (character state 5).

(C) Acetabular carina developed, omaulus continuous with acetabular carina and continued forward toward prothorax as a subomaulus.

(D) Acetabular carina developed, omaulus continuous with acetabular carina but subomaulus absent (Fig. 4B).

(E) Acetabular carina reduced or lost, omaulus ending ventrally or curving posteriorly (Fig. 4A).

(F) Acetabular carina reduced or lost, omaulus reduced or lost.

Character state C occurs only in the Pemphredoninae and states B and E only in the Pseninae but combinations of states C and D in the pemphredonines and states D and E in the Pseninae can exist in the same genus. In addition, transitions from state B to C exist in *Psenulus* and A to C in *Carinostigmus* where a weakly developed acetabular carina can be found in some species. The acetabular carina is likely to have been gained and lost a number of times independently in both Pseninae and Pemphredoninae, thus rendering the character very difficult to interpret when discussing relationships. The genera of the Psenini all possess states D and/or E but state E also exists in *Pluto* and state D exists in a number of pemphredonine genera. As mentioned previously the Psenini can be associated using the bulging hypoepimeral area.

Mimumesa, *Pseneo*, and *Mimesa* have been and in some cases are still considered subgenera of *Psen*. Although it is clear that *Mimesa* is not closely related to *Psen* there has been some difference of opinion as to the status of the other genera even though good synapotypic character states exist in each of these groups. Species of *Mimumesa* are associated on the basis of the bicarinate, gradually tapering, median, longitudinal ridge on the dorsal surface of the petiole (character state 16, Fig. 2F), a character state superficially similar to that found in *Mimesa* (state 15). Other genera in the Psenini (*Psen*, *Pseneo*, *Deinomimesa*, and *Nesomimesa*) possess smooth or otherwise modified petioles but are associated on the basis of a dorsolateral row of very small setae on each side of the petiole (character state 14, Fig. 2E), except an undescribed species of *Psen* from Bolivia which has both long and short setae in the dorsolateral row. In *Mimumesa* and also in *Mimesa* the dorsolateral setae are long and prominent, representing a more plesiotypic condition.

I have not seen examples of either *Deinomimesa* or *Nesomimesa* and am uncertain of their affiliations with respect to *Psen* and *Pseneo*. The presence and shape of setal patches on the hind femur could prove of importance in determination of their affinities. It is likely that the reduced acetabular carina discussed below will serve to associate *Psen* with *Deinomimesa* and *Nesomimesa* but I will reserve further comment until specimens of the latter two genera have been studied in greater detail. *Deinomimesa* and *Nesomimesa* are associated by the lateral bristles on the apical hind tarsomeres of the females (Bohart and Menke 1976).

The presence or absence of an acetabular carina has been used to distinguish *Psen* from *Pseneo* (Bohart and Menke 1976). The acetabular carina in *Pseneo* is always present and continuous with the omaulus. In *Psen* the acetabular carina is reduced and the omaulus curves posteriorly, representing an apotypy through character loss found in *Deinomimesa* and *Nesomimesa* but independently developed in *Pluto*; in any case difficult to interpret because of homoplasy. Additionally, van Lith (1975*a*) found that 8 of the 12 New World species of *Psen* possess an acetabular carina present and continuous with the omaulus causing difficulty in the identification of *Psen* and *Pseneo* at the generic level. To confuse the issue further some *Psen* females (e.g. *Psen erythopus* Rohwer) have a beveled clypeal edge that is almost indistinguishable from that used by authors to characterize *Pseneo*. It is clear that both characters, a developed acetabular carina and a beveled clypeal edge, occur in *Psen* and in *Pseneo* and that they cannot be used to associate the species of either genus.

Species of *Pseneo* have been described from the New World and from Southeast Asia. The New World species are easily distinguished from *Psen*. Those described from Southeast Asia were originally placed in *Mimumesa* (except *Psen (Pseneo) townesi* van Lith and *Pseneo leytensis* Bohart and Grissell) and subsequently transferred to *Pseneo* (Bohart in Bohart and Menke 1976) on the belief that only *Pseneo* possessed a complete acetabular carina. These species are probably not *Pseneo* but rather *Psen* and are discussed in greater detail below.

Nearctic and Neotropical species of *Pseneo* are associated on the basis of an oval patch of dense setae on the inner side of the hind femur at its apex (character state 11, Fig. 4B) and by the strong carina on the inner side of the hind coxa from base to apex (character state 9, Fig. 4B). In addition, the mesosomal metasternum is broadly emarginate (character state 8, Fig. 4B). Species of *Psen* do not possess a dense setal patch on the inner side of the hind femur but rather a line of setae on the apical half or more (Fig. 4A), a character state also found in *Pluto*. The inner hind coxal carina, like that in most of the subfamily, if present, is weak and basal. The mesosomal metasternum is usually deeply emarginate, a plesiotypic state found in most other genera (Fig. 4A). Species of *Psen* are associated by an apical transverse row of specialized setae (apical frimbriae of authors) on male metasomal sterna IV and occasionally III or V. The one exception to this is noted in the character state discussion (character state 17, Fig. 2C).

The Pemphredonidae show a propensity to develop setal patches anywhere on the ventral surface. The presence of specialized setae and the usually associated microsculpture patches on the ventral regions of these wasps provides a wealth of characters that have not been utilized in determining relationships in either subfamily. These setal patches and brushes may be gland associated. They are found ventrally on the antenna, mandible, lower gena, hypostomal region, propleuron, fore coxa, fore trochanter, fore femur, prepectus, mesosternopleural region, hind coxa, hind femur, petiole, and metasomal sterna II–VI including the pegs on the apex of sternum VI here used to associate the Psenulini.

It is very likely that *Pseneo* will turn out to be restricted to the New World and that the "deviants", referred to by Bohart and Menke (1976) in the section on systematics under *Pseneo*, will be assignable to *Psen*. van Lith (1975*a*) has already reassigned one of these "deviant" species, *Pseneo irwini* Bohart and Grissell, to *Psen*. The other species of *Pseneo* described by Bohart and Grissell (1969), *Pseneo leytensis* from the Philippines, is also assignable to *Psen* based on the illustrations and description provided by the authors and on the generic characters presented above.

All species of *Pseneo* described from Southeast Asia were unfortunately described from females (van Lith 1959; Bohart and Grissell 1969) but based on these descriptions almost all species seem to possess a setal line on the inner apical half or more of the hind femur, indicating that they are not likely to be *Pseneo*. Of the two additional subspecies described by van Lith (1965) one male *Psen (Mimumesa) tridentatus chrysomalla* was

indicated as having fringes of specialized setae on the metasomal sterna, a character state here considered synapotypic for *Psen*. van Lith (1965) did not indicate presence or absence of this character in the other male he described, *Psen (Mimumesa) auratus miltoni*, but later (1976) did indicate the uncertainty of the generic assignment of this and his other species mentioned here. Based on these descriptions, the following species and subspecies of *Pseneo* are assignable to *Psen* or are likely to form a species group of *Psen*. They are possibly closely related to those New World *Psen* possessing a complete acetabular carina.

Pseneo auratus (van Lith) 1959
P. auratus mindoroensis (van Lith) 1959
P. auratus multipunctatus (van Lith) 1959
P. auratus miltoni (van Lith) 1965
P. irwini Bohart and Grissell 1969
P. leytensis Bohart and Grissell 1969
P. townesi (van Lith) 1959
P. tridentatus (van Lith) 1959
P. tridentatus chrysomalla (van Lith) 1965

Since the appearance of the revision of world sphecid genera (Bohart and Menke 1976), 93 species and 17 subspecies of psenine wasps have been described and recent revisions are available for several genera. For the genus *Mimesa*, the American species were revised by Finnamore (1983) and the species of the USSR were keyed by Budrys (1985). In *Mimumesa*, van Lith (1976) has described a species from Pakistan. In *Psen*, descriptions of new species were presented by Budrys (1986), Tsuneki (1977) and van Lith (1975*a*, 1976). Budrys (1986) presented a key to species of the eastern USSR and van Lith (1975*a*) keyed the American species. In *Pseneo*, the American species were keyed by van Lith (1975*a*, 1975*b*). *Pluto* was revised by van Lith (1979) and descriptions of new species of *Psenulus* were published by van Lith (1976, 1978*a*, 1978*b*).

Conclusion

Considerable work remains to be done on the generic limits and relationships of the psenine wasps particularly in the Old World fauna where several species have not satisfactorily been assigned to genera. I have not examined specimens of *Odontopsen, Deinomimesa*, or *Nesomimesa* and have had to rely on published generic descriptions to determine character states.

The Pseninae is treated as two tribes: Psenulini, consisting of *Psenulus, Pluto, Mimesa, Lithium, Ammopsen*, and probably *Odontopsen*; and the Psenini, consisting of *Pseneo, Psen, Mimumesa*, and probably *Deinomimesa* and *Nesomimesa*. Evidence for this arrangment has been presented on the basis of synapomorphic character states and presence of these characters has been used to indicate the relationships of *Lithium*, a new genus. Further evidence points to *Pseneo* being clearly distinct from *Psen* but probably restricted to the New World, the Old World *Pseneo* probably assignable to *Psen*.

Key to Genera of Psenine Wasps

1 Hind wing media diverging beyond cu-a (Fig. 2A) 2
1′ Hind wing media diverging before cu-a (Fig. 2B) 3

2 Frontal carina simple, not raised between antennal sockets; hind coxa with a downwardly directed bristle; New World ..... *Pluto* Pate
2′ Frontal carina raised between antennal sockets and usually intersecting a transverse carina beneath them; hind coxa without a special bristle; widespread ..... *Psenulus* Kohl

3 Petiole short, no longer than broad (measured dorsally); omaulus present; hypoepimeral area shining, punctate only; male with comma-shaped grooves on frons (Fig. 1B); metasoma with transverse rows of specialized setae on sterna II to IV (Fig. 2D); Ethiopian ..... *Lithium* Finnamore

3′ Petiole usually much longer than broad, if short then omaulus absent or hypoepimeral area sculptured; male, without grooves on frons and without a transverse row of specialized setae on metasomal sternum II 4

4 Omaulus absent or present and curving forward toward prothorax (Fig. 3A); acetabular carina absent; hypoepimeral area not bulging, either sculptured or obscured by dense appressed setae 5

4′ Omaulus present but not curving forward, either ending ventrally, turning posteriorly or joining an acetabular carina (Figs. 4A,B); acetabular carina present or absent; hypoepimeral area bulging, usually shining, punctate, rarely sculptured 7

5 Omaulus absent; Nearctic ..... *Ammopsen* Krombein

5′ Omaulus present 6

6 Occipital carina simple, not ending in a ventral tooth; Holarctic, Oriental, Ethiopian ..... *Mimesa* Shuckard

6′ Occipital carina ending ventrally in a tooth; Japan ..... *Odontopsen* Tsuneki

7 Petiole with a longitudinal, median, bicarinate ridge; setae of dorsolateral rows of petiole, long and prominent (Fig. 2F); Holarctic, Neotropical, Oriental ..... *Mimumesa* Malloch

7′ Dorsal surface of petiole smooth, punctate or otherwise modified; dorsolateral setae small, inconspicuous, rarely with a few long setae (Fig. 2E) 8

8 Ventrolateral setae of petiole inconspicuous; Hawaii 9

8′ Ventrolateral setae of petiole long, prominent (Fig. 3B) 10

9 Female with genal process; male petiole without mediodorsal carina ... *Nesomimesa* Perkins

9′ Both sexes: gena normal, without process; petiole with mediodorsal carina ..... *Deinomimesa* Perkins

10 Inner side of hind femur at apex with an oval patch of dense setae; hind coxa with an inner carina from base to apex; clypeal edge beveled, thickened apically; acetabular carina continuous with omaulus (Fig. 4B); petiole impunctate; male metasomal sterna without transverse rows of specialized setae; New World ..... *Pseneo* Malloch

10′ Inner side of hind femur with narrow linear patch of setae on apical half or more; hind coxa with an inner carina on at most basal half; clypeal edge usually thin but occasionally beveled; acetabular carina absent (Fig. 4A) to present and continuous with the omaulus; males either with petiole punctate (*Psen (Punctipsen)*) or sterna IV and occasionally III or V with transverse rows of specialized setae (Fig. 2C); widespread except Australia ..... *Psen* Latreille

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