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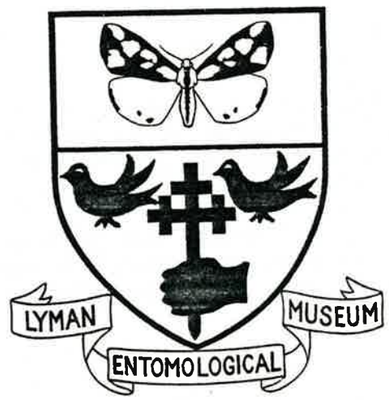

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Preface

The Lyman Entomological Museum and Research Laboratory is pleased to publish the work on Sphecidae of Quebec by Mr. A.T. Finnamore, a young and promising taxonomist of Hymenoptera, who is a third-generation entomologist.

Although the work has been edited for publication, all opinions and decisions contained in the work are those of the author. Comments or queries should be directed to him.

Edited and prepared for publication by V.R. Vickery, Curator, Lyman Entomological Museum and Research Laboratory and Professor of Entomology.

April, 1982

Abstract

The superfamily Sphecoidea comprises a relatively large group of predaceous solitary wasps. This study surveys the sphecoid fauna of southern Quebec and lists 156 species including 68 new records for the province.

Keys to subfamilies, tribes, genera and species are provided, together with diagnostic characters. Synonymy is listed for genera and species and any pertinent literature dealing with Quebec species is indicated. Each species is discussed with respect to biology, world distribution and with reference to maps of Quebec distribution.

Resume

Les Sphecidae du Quebec Méridional (Hymenoptera)

La super-famille des Sphecoidea comprend un groupe relativement important de guêpes prédatrices solitaires. Cette étude couve la faune des Sphecoidea du Québec méridional et etablit la liste de 156 espèces, laquelle inclus 68 nouvelles mentions pour la province.

Les clés des sous-familles, tribus, genres et espèces sont présentées accompagnées des caractères d'identification. La synonymie est établie pour le genre et l'espèce, et toute littérature pertinente aux espèces québécoises est mentionnée. La discussion sur chaque espèce porte sur sa biologie et sa distribution mondiale. Les différentes localités des spécimens examinés sont reportés sur une carte de distribution québécoise et ce, pour chaque espèce.

Acknowledgements

I would like to thank Dr. V.R. Vickery, curator of the Lyman Entomological Museum and Research Laboratory, for taking time from a very busy schedule to read and edit the manuscript and to prepare it for publication. Grateful appreciation is extended to Dr. L. Masner and Mr. G.A.P. Gibson of the Biosystematics Research Institute in Ottawa for their cooperation in a collecting venture at Mt. St. Hilaire and for loan of specimens from the Canadian National Collection. Thanks are also extended to Mr. M.E. Neary of the Nova Scotia Agricultural College for loan of specimens, and to Miss A.E. Johannsen, Warden of the Galt Estate, for granting permission to sample the Mt. St. Hilaire fauna.

I would like to thank the following workers who have generously assisted this study in providing identification checks: Dr. R.M. Bohart, University of California, Davis (*Podalonia*, *Tachytes*); Dr. D. Vincent, Smithsonian Institution, Washington, D.C. (*Passaloecus*); Dr. A.S. Menke, Smithsonian Institution (*Ammophila*); and the late Mr. J.P. van Lith, Rotterdam, The Netherlands (Psenini).

I would also like to thank Mr. N. Duffy, Mr. A. Garland, Dr. D.K. McE. Kevan, Miss D. Johnstone and Mr. M. Sharkey, Department of Entomology, Macdonald College, for their helpful suggestions and contributions to the collected material used in this study. Thanks are also due to Mr. C. Vincent for translating the abstract.

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INTRODUCTION

The Sphecoidea, including mud daubers, thread-waisted wasps, digger wasps, sand wasps and others, is a relatively large superfamily, with over 1200 Nearctic species of highly diverse wasps. These wasps function as predators on a wide variety of insects and spiders, but a few are cleptoparasitic on other sphecoids.

They are generally solitary with the female constructing a nest, laying her eggs in fully provisioned cells, then sealing the nest and constructing another. Although this is the general case, there are many species which show the development of what may be called primitive sociality with females and progeny occupying the same nest for a period of time, or progressive provisioning where the female supplies the larva with food as the need arises. Prey are captured by the adult female wasp, paralyzed by a sting and provisioned in a nest for larvae. The adults feed on nectar, honeydew and occasionally body fluids of the prey.

Nests are located either below ground, usually in sandy soil, or above ground in decaying wood, hollow twigs, stems, abandoned beetle borings or as mud nests, often on buildings. There is great diversity in nest structure and nesting habits ranging from temporary single cell solitary nests to multicellular mud nests or to a number of multicellular nests in a more or less permanent nesting aggregation.

The economic importance of these wasps has not been appreciated. Sphecoid wasps because of their predatory nature are of indirect economic importance exerting some measure of population pressure on many insects and spiders.

The oldest specimens of sphecoid wasps are known from Cretaceous amber in Canada and Siberia; Bohart and Menke (1976) believe the group was probably quite diversified by the end of the Mesozoic Era. These wasps are believed to have evolved from scolioid or vespoid ancestors and early in their history formed the stock from which the Apoidea developed (Malyshev, 1968). Bohart and Menke (1976) share the view of Michener (1944) and Bradley (1958) who suggest that bees should be included in the superfamily Sphecoidea.

The Quebec fauna of sphecoid wasps comprises a total of 158 species in 8 families: Sphecidae (18 species), Pemphredonidae (33 species), Astatidae (4 species), Larridae (16 species), Crabronidae (50 species), Mellinidae (1 species), Nyssonidae (21 species), and Philanthidae (15 species). The last survey of these wasps in Quebec was conducted almost 100 years ago by l'Abbe L. Provancher (1883b, 1887, 1888) who provided keys for distinguishing 68 species occurring in the province. This work is now much out of date. Although many authors have since made contributions on one group or another in the superfamily, these wasps on the whole remain difficult to work with and in several cases keys to species do not exist for the Nearctic Region. It is my hope that the present study will fill this gap for the Quebec region and possibly stimulate further research in the province on this fascinating group of wasps.

The format adopted in the main body of this study consists of 8 main sections each corresponding to a family; these main sections are subdivided into sections at subfamily, tribal, generic and specific levels. Following each taxonomic category is a short paragraph of diagnostic characters for the category; this paragraph is not intended to be a complete diagnosis for the taxon involved but rather is a set of key characters which can be used to facilitate determination of Quebec material. Complete diagnoses may be found in Bohart and Menke (1976). Agreement with all characters in the diagnosis of a taxon is a good indication that the specimen in question belongs to the taxon involved.

After each heading of genus and species is a list of world synonymy; except where indicated in the text all synonymy is after Bohart and Menke (1976). The entries in the synonymy are followed by author, year and page reference of the original description; complete citation can be found in the references. Parenthesis placed around a name in the generic synonymy indicates a subgenus. Parenthesis around the name of an author following a species name indicates a change in generic status has occurred at some point in the taxonomic history of the species. The insertion of the word "of" between the species name and the author indicates that the author is not the true author of the species. Finally, the use of the word *nec* followed by an entry indicates homonymy.

Under the generic headings after synonymy and diagnosis is a short paragraph giving statistics of the genus from a world perspective; any revisions with respect to North America and references to descriptions of the larvae of Quebec species are also included. Following this, if more than one species is involved, keys to the Quebec species are provided.

Information under each species includes synonymy, diagnosis and a section on biology which includes North American and often European references to the species. The world distribution of the species is included under a section on distribution and finally material examined is indicated with reference to a map of eastern Canadian distribution.

A section on morphology of sphecoid wasps was not included in this study because Bohart and Menke (1976) have provided an adequate treatment. In the interests of standardization of morphological terms used in sphecoid taxonomy great effort was made to follow the terms used by these authors and a glossary of morphological terms used in this treatment has been provided in the appendix following the text.

Unless otherwise indicated the use of the name Bohart in the text refers to R.M. Bohart.

Review of Literature

The literature pertaining to sphecoid wasps in Quebec may be divided into four broad categories: species surveys, biological studies, taxonomic studies and reference works.

Geographical Species Surveys: The earliest and most important survey of sphecoid wasps in Quebec is contained in the work of Provancher (1883b, 1887, 1888) on the entomological fauna of Canada. Provancher recorded a total of 90 species supposedly from Quebec; but when modern synonymy is considered the number of species drops to 78 and this is further reduced by eliminating those of his species with distributions far removed from Quebec, so that the actual number of sphecoid wasps found in Quebec by Provancher was 68 species. Of particular interest are 5 species recorded by Provancher which were not found in the present study; these are *Prionyx canadensis* (Provancher), *Lyroda triloba* (Say), *Tachysphex laevifrons* (F. Smith), *Trypargilum clavatum* (Say) and *Trypargilum lactitarse* (Saussure). These probably represent adventitous records in southwestern Quebec.

Although Provancher's work is the earliest survey of sphecoid wasps for Quebec, two genera, *Ammophila* and *Sphex*, were mentioned forty years earlier by Gosse (1840) in a much more general natural history of the Eastern Townships area.

The only other biological survey concerning Quebec fauna was for Anticosti Island in the Gulf of St. Lawrence (Schmitt, 1904) and in this study no sphecoid wasps were recorded. The study by Schmitt (1904) on the whole is very poor in the insect fauna. Harrington (1902) however, recorded 81 sphecoids from the Ottawa area.

Other biological surveys of importance with respect to Quebec fauna are those of Rohwer *in* Viereck (1916) "Guide to the insects of Connecticut" and the biological survey of the Mount Desert Region in Maine by Procter (1946). Viereck (1916) recorded 134 species of sphecoid wasps from Connecticut and Procter (1946) found 52 species of sphecoid wasps in the Mount Desert Region.

Biological Studies: Although the literature dealing with various aspects of biology of sphecoid wasps is extensive there are several works with particular relevance to this study. The first of these is a review of the behavioural patterns of nonparasitic solitary wasps by Evans (1966b). The article considers many aspects of wasp behaviour and provides not only a good introduction to the subject, but also serves as a good base for field observations.

Two earlier works, Peckham and Peckham (1898) and Rau and Rau (1918) have provided observations on many species found in Quebec. More modern treatments include the work of Evans (1966a) and Krombein (1967b). The former

deals with sand nesting wasps of the family Nyssonidae and includes chapters on comparative ethology of the group and the evolution of behaviour in the sand wasps. The twig nesting groups of sphecoid wasps are dealt with to some extent by Krombein (1967b); a few members of the families Larridae, Pemphredonidae, Sphecidae and Crabronidae, are considered, but perhaps more important is the development of suitable observation techniques for studying these groups of wasps (Krombein 1967b, 1970).

Although Bohart and Menke (1976) have considered biological information at the generic level, it is at present most practical to present biological observations at the species level since most authors deal with one or a few often unrelated species. Exceptions other than those noted above, are Evans (1957a, c) on the genera *Bembix* and *Astata* respectively, Evans (1958c) on *Prionyx*, Evans (1962a) on *Aphilantops*, Evans (1971) on Cercerinae, Evans and Lin (1959) on *Philanthus*, Scullen (1965) on *Cerceris*, and Peckham *et al.*, (1973) on *Oxybelus*.

Taxonomic Studies: The development of larval taxonomy in North America is due primarily to the work of Evans and Lin (1956a, b) and Evans (1957b, 1958a, 1959a, 1964a, d). These studies include larval keys to genera and attempt to establish phylogenetic association of the various groups in the Sphecoidea based on larval characters.

The development of adult taxonomy of sphecoid wasps in North America began with the work of Ashmead (1899) who recognized 12 families and 177 genera. American workers have generally ignored the work of Kohl (1897) who provided the first modern classification, probably because, as Bohart and Menke (1976) suggest, it was in German and Ashmead's work was more readily available in English. Kohl's groupings were given subfamily status by Dalla Torre (1897) who recognized 17 subfamilies and 69 genera in the family Crabronidae. Handlirsch (1925) made further modifications and recognized 14 subfamilies including 24 tribes.

American authors on the other hand following Ashmead continued to split at the family level with Brues and Melander (1932) recognizing 17 families and finally Essig (1942) who recognized 21 families. A generic catalogue presented by Pate (1937b) cleared up many nomenclatorial problems and brought attention to many others. The work of Evans and Lin (1956a, b) and Evans (1957b, 1958a, 1959a, 1964a, d) culminated in a classification of sphecoid wasps as suggested by larval characters which went beyond the accepted European classification at the time based on the work of Leclercq (1954) who recognized 15 subfamilies. Evans (1964d) proposed a single family system with 8 subfamilies which is in general concordance with the single family system of Bohart and Menke (1976) and the 9 family system of Krombein *et al.* (1979).

In a work of landmark proportions Bohart and Menke (1976) have presented a world generic revision of the superfamily (see also Menke and Bohart, 1979). By comparison with former studies they have recognized a single family with 11 subfamilies, 33 tribes and 226 genera. The major

differences with the work of Evans (1964d) are the recognition of the Crabroninae as a separate subfamily; the placement of Mellinini as a tribe of Nyssoninae and the association of Astatinae and Philanthinae with the larrine stem. Evans (1964d) on the other hand would include the Crabroninae as a tribe of Larrinae, recognize the Mellini as a separate subfamily and associate the Astatinae and Philanthinae with the nyssonine stem. Bohart and Menke (1976) have provided sections on morphology, including a glossary, systematics, a generic catalogue, keys to genera, lists of species and their synonymy under each genus, and taxonomic as well as biological references for each genus.

The taxonomy of sphecoid wasps in Quebec has been considered by Provancher (1883b, 1887, 1888); this work however is much out of date and more accurate treatments of Quebec species are now available usually in Nearctic revisions of genera by a number of authors. These revisions are indicated under each genus in the text.

Reference Works: A small number of publications have proved particularly valuable when researching sphecoid wasps at the specific level. The first of these is volume 8 of the "Catalogus Hymenopterorum, Sphegidae", by Dalla Torre (1897) which gives a list of the world species and synonymy with abbreviated citations. Coupled with this is the "Bibliotheca Entomologica" by Hagen (1862) which provides complete citations of many of the older publications. Other catalogues of value are the synoptic catalogues and supplements to the "Hymenoptera of North America" (Krombein *et al.*, 1951, 1958d, 1967a, 1979). These contain a list of North American species and synonymy with abbreviated citations as well as information on distribution and biological references.

Superfamily Sphecoidea

Diagnosis: Pronotum with lateral lobes usually well separated from the tegula so that the scutum and mesopleurae are in contact (Fig. 1); hind margin of pronotum nearly straight, not concavely arcuate to V-shaped (Fig. 2); mesopleuron usually with an episternal sulcus (Fig. 1); setae of thorax simple, unbranched; hindleg without a pecten on inner side of basitarsus which is not expanded or broadened but simple, similar to succeeding tarsal segments; wings without a longitudinal fold when at rest.

Key to Quebec Families of Sphecoidea
(Adapted from Bohart and Menke, 1976)

1 Gaster with petiole (often small*) composed of sternum only (Fig. 1) 2

1' Gaster sessile, or with petiole composed of both tergum and sternum 3

2 Midtibia with two apical spurs (Fig. 71) and/or jugal lobe of hindwing comprising nearly all of anal area (Fig. 34) . . . . . Sphecidae

2' Midtibia with one apical spur (Fig. 70); jugal lobe of hindwing comprising less than half length of anal area (Fig. 37) . . . . . Pemphredonidae

3 Midtibia with two apical spurs (Fig. 71) 4

3' Midtibia with one apical spur (Fig. 70) 6

4 Hindwing with jugal lobe more than half length of anal area (Fig. 41) . . . . . Astatidae

4' Hindwing jugal lobe more than length of anal area (Fig. 57) . . 5

5 Gaster pedunculate; omaulus absent; second submarginal cell receiving at most the first recurrent vein (Fig. 51) . . . . . Mellinidae

5' Gaster sessile; omaulus present; second submarginal cell usually receiving at least the second recurrent vein (Fig. 57) . . . . . Nyssonidae

*petiole is wider than long in both *Diodontus* and *Passaloecus*.

6 Forewing with two submarginal cells and a much enlarged stigma (Fig. 40) . . . . . Pemphredonidae

6' Forewing with normal stigma; submarginal cells variable . . 7

7 Hindocelli deformed or greatly reduced (Fig. 12) 8

7' Hindocelli normal 9

8 Hindwing jugal lobe subequal to length of anal area (Fig. 42) . . . . . Larridae

8' Hindwing jugal lobe at most a little more than half as long as anal area (Fig. 58) . . . . . Nyssonidae

9 Propodeum with a small sharp dorsal tooth posterolaterally; with a pair of spots on abdominal tergum II only . . . . . Nyssonidae

9' Propodeum not distinctly toothed; abdominal maculations variable 10

10 Antennal sockets placed above clypeus by at least one-third of a socket diameter; forewing with three submarginal cells . . . . . Philanthidae

10' Antennal sockets touching clypeus, or if not then forewing with fewer than three submarginal cells 11

11 Inner orbits angulate (Fig. 105) or forewing with three submarginal cells or scape much less than half length of flagellum . . . . . Larridae

11' Inner orbits not angulate; forewing with one submarginal cell (Fig. 50); scape about half length of flagellum . . . . . Crabronidae

Family Sphecidae

Diagnosis: Ocelli normal; mandible unnotched; jugal lobe large and containing an anal vein; forewing with two recurrent veins; omaulus absent; propodeal sternite present; gaster with a sternal petiole; tergum I without a lateral carina.

The Sphecidae contains three subfamilies, all of which are found in Quebec. Two of the subfamilies, Sceliphrinae and Sphecinae, have been revised by Bohart and Menke (1963) for the Nearctic species. The Quebec species of Ammophilinae have been dealt with in Nearctic treatments by Murray (1940) for *Podalonia* and Menke (1964b) for *Eremnophila*. The genus *Ammophila* is in need of revision, but the works of Fernald (1934), Murray (1938), and Menke (1964a, 1966, 1967, 1970) are helpful.

Key to Subfamilies of Sphecidae

(Adapted from Bohart and Menke, 1976)

1 Tarsi with plantulae (Fig. 65); some claws with one mesal tooth on inner margin (Fig. 62); colour metallic blue or black and yellow . . . . . Sceliphrinae

1' Tarsi without plantulae; claws simple or with one or more basal teeth on inner margin; colour black or black and red 2

2 Claws with two or more basal teeth on inner margin (Fig. 64) and/or apicoventral setae of hindtarsomere V very broad, separated at base by no more than 1½ setal widths (Fig. 66) . . . . . Sphecinae

2' Claws simple (Fig. 63); apicoventral setae of hindtarsomere V narrow, separated at base by 3 or more setal widths (Fig. 67) . . . . . Ammophilinae

Subfamily Sceliphrinae

Diagnosis: Tarsal claws with single mesal tooth; apicoventral setae of hindtarsomere V narrow, separated by more than twice the setal width; tarsi ventrally with plantulae.

Key to Quebec Genera of Sceliphrinae

1 Colour metallic blue . . . . . *Chalybion* Dahlbom

1' Colour black and yellow . . . . . *Sceliphron* Klug

Genus *Chalybion* Dahlbom

Chalybion Dahlbom, 1843: 21.

Chalybium Agassiz, 1847: 77; Schulz, 1906: 192.

Diagnosis: Flagellomeres I and II of antenna about equal in length; pronotal collar with a median notch or sulcus; episternal sulcus long; spiracular groove absent; propodeum without dorsal enclosure; submarginal cell I receiving both recurrent veins.

Two of the 31 recognized species occur in North America. The Nearctic species have been reviewed by Hutson (1919) under the name of *Sceliphron* and more recently by Bohart and Menke (1963). One species *Chalybion californicum* (Saussure) is found in Quebec. Evans and Lin (1956a) and Evans (1959a) provide a description of the larva of this species.

Chalybion californicum (Saussure)

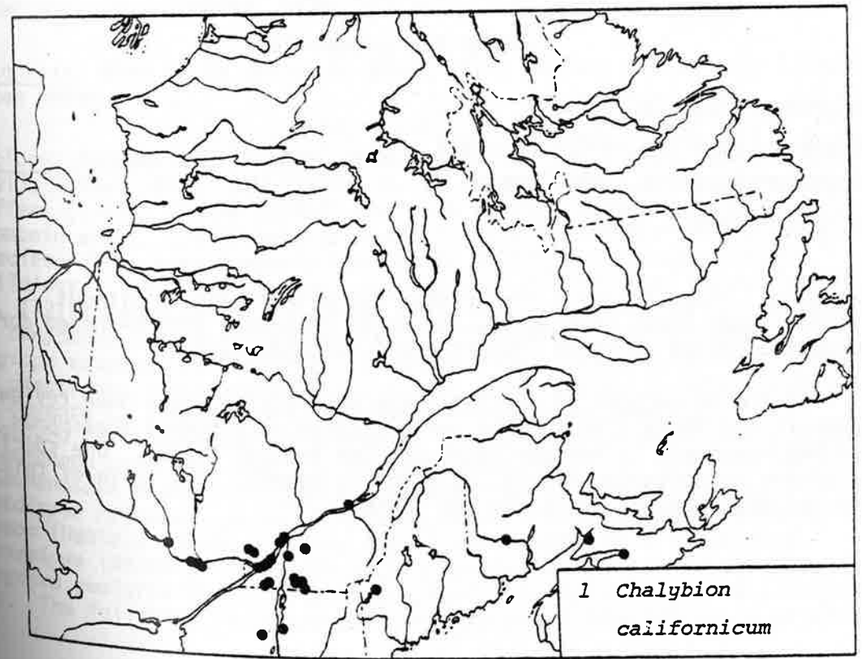
Fig. 34

Sphex caerulea Linnaeus, 1763b: 412; 1767: 914.

Sphex cyanea Fabricius, 1775: 364. New name for *Sphex caerulea* Linnaeus, 1763b, *nec* Linnaeus, 1758.

Pelopeus californicus Saussure, 1867: 26. Lectotype designated by Bohart and Menke (1963).

Pate (1942) provides a more detailed list and explanation of synonymy.



1 *Chalybion californicum*

Diagnosis: Erect hair of body black; metapleuron depressed, channel-like; metanotal flange dialated posteriorly; tarsi ventrally with plantulae.

Biology: Peckham and Peckham (1898), Peckham and Peckham (1905), Rau (1915a, 1928a, b, 1935a), Rau and Rau (1916b), Irving and Hinman (1935), Muma and Jeffers (1945), Andrewes (1969), Ward (1972), Coville (1976) and Krombein *et al.* (1979) have published biological information on this species. This wasp nests usually in an abandoned *Sceliphron* mud nest which is slightly modified using water to soften the mud. The cells are mass provisioned with spiders; Krombein *et al.* (1979) recorded the following: *Lactrodectus mactans* (F.), *Asagena americana* Em., *Enoplognatha puritana* Chamb. and Ivie, *Theridion tepidariorum* (Koch), *T. frondeum* Hentz, *T. australe* Bks., *Steatoda borealis* (Hentz), *Neoscona* sp., *Epeira foliata* (Fourcr.), *Araneus* sp., *Gea heptagon* (Hentz), Misumeninae sp., Thomisidae spp., *Oxyopes scalaris* Hentz, Oxyopidae sp., *Paraphidippus marginatus* (Walck.) and Salticidae sp. Two parasites have also been recorded, the bombyliid *Anthrax limatulus artemisia* Marst. and the mutillid wasp *Sphaeropthalma* (*S.*) *a. auripilis* (Bl.).

Distribution: North America, Mexico, Hawaii and Bermuda (Bohart and Menke, 1976). The presence in Hawaii and Bermuda of this species is the result of introduction (Bohart and Menke, 1963).

Material Examined: 140 males; 111 females.

Genus *Sceliphron* Klug

Sceliphron Klug, 1801: 561.
Pelopoeus Latreille, 1802-1803: 334.
Pelopaeus Latreille, 1804: 180.
Sceliphrum Schulz, 1906: 192.

Diagnosis: Flagellomere I longer than II; male flagellum without placoids; body black with yellow markings; propodeum with U-shaped dorsal enclosure defined at least posteriorly by a broad furrow.

Of the 30 recognized species 3 are Nearctic and have been reviewed by Bohart and Menke (1963). The world species of subgenus *Sceliphron* have been reviewed by van der Vecht and van Breugel (1968). One species *Sceliphron caementarium* (Drury) is found in Quebec. The larva of this wasp was described by Evans and Lin (1956a).

Sceliphron caementarium (Drury)

Figs. 62, 65.

Sphex caementaria Drury, 1773: 105.
Sphex flavomaculata DeGeer, 1773: 558.
Sphex lunata Fabricius, 1775: 347. Lectotype designated by van der Vecht (1961).
Sphex flavipes Fabricius, 1782:444. Lectotype designated by van der Vecht (1961).
Sphex flavipunctata Christ, 1791: 301.
Sphex affinis Fabricius, 1793: 203. Syntype designated by van der Vecht (1961).
Pelopaeus architectus Lepeletier, 1845: 313.
Pelopaeus servillei Lepeletier, 1845: 313.
Pelopaeus solieri Lepeletier, 1845: 313.
Pelopaeus canadensis F. Smith, 1856: 233.
Pelopoeus nigriventris Costa, 1864: 60.
Pelopeus tahitensis Saussure, 1867: 27. Lectotype designated by Menke *in* Bohart and Menke (1976), see also Krombein (1949).
Sphex economica Curtiss, 1938: 154.

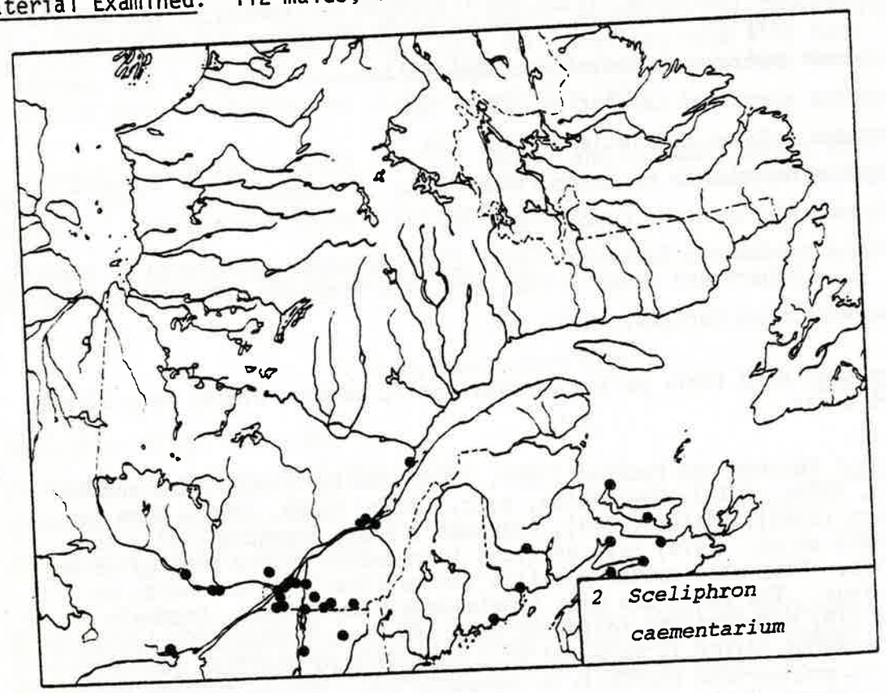
Diagnosis: Hind tibia yellow on basal half; abdomen black; male clypeal lobes broad.

Biology: Peckham and Peckham (1898, 1905), Morley (1900), Rau and Rau (1913, 1916a, 1918), Rau (1915a, b. c, 1928b, 1935b, 1946), Muma and Jeffers (1945), Shafer (1949), Andrewes (1969), Eberhard (1971) and Krombein *et al.* (1979) have provided information on the biology of this species. This wasp commonly builds its multicellular mud nests on buildings. The cells are mass provisioned with spiders. Krombein *et al.* (1979) recorded the following prey: *Neoscona arabesca* (Walck.), *N. benjamina* (Walck.), *Neoscona* sp., *Acanthepeira stellata* (Walck.), *Argiope trifasciata* (Forsk.), *A. aurantia* Luc., *Epeira foliata* (Fourcr.), *E. displicata* Hentz, *Epeira* sp., *Aranea nivea* Hentz, *A. miniata* (Walck.), *A. cornuta* Cl., *Aranea* sp., *Metepeira labyrinthea* (Hentz), *Eustala anastera* (Walck.), *Mangora gibberosa* (Hentz), *Philodromus pernix* Blackw., *Misumenops asperatus* (Hentz), *Misumena calycina* (L.), *Misumena* sp., *Misumenoides aleatorius* (Hentz), Misumeninae sp., Thomisidae sp., *Phidippus mystaceus* Hentz, *P. clarus* Keys., *Phidippus* sp., *Xysticus ferox* (Hentz), *Marpissa undata* (DeG.), Salticidae sp., *Schizocosa crassipes* (Walck.), Lycosidae sp., *Dolomedes* sp., Anyphaenidae sp., *Oxyopes scalaris* Hentz, *O. salticus* Hentz, Oxyopidae sp., and Clubionidae sp. The following parasites have been recorded from the nests of this

wasp: Bombyliidae: *Anthrax limatulus fur* (O.S.), *A. l. artemisia* Marst.; Sarcophagidae: *Amobia floridensis* (Tns.); Ichneumonidae: *Acroricnus s. stylator* (Thunb.), *A. s. edwardsii* (Cr.), *A. s. junceus* (Cr.); Chrysididae: *Chrysis fuscipennis* Br.; Mutillidae: *Sphaeropthalma* (*Photopsioides*) sp., *S.* (*S.*) *a. auripilis* (Bl.), *S.* (*S.*) *p. pensylvanica* (Lep.), and *S.* (*S.*) *p. scaeva* (Bl.).

Distribution: United States and southern Canada, Mexico, Central America, West Indies, Bermuda, Peru, Japan, Mariana Is., Marshall Is., Hawaii, Australia, New Caledonia, Fiji, Samoa, Society Is., Marquesas Is., Gambier Is., France, Germany, and Madeira Is. The Pacific records are the results of introduction (Krombein, 1949; Williams, 1947).

Material Examined: 112 males; 114 females.



Subfamily Sphecinae

Diagnosis: Tarsal claw with two or more basal teeth; apicoventral setae of hindtarsomere V broad, separated by no more $1\frac{1}{2}$ setal widths; tarsi without plantulae.

Key to Genera of Sphecinae

1 Length of basal veinlet of second submarginal cell greater than anterior veinlet (Fig. 35); pectens of inner hindtibial spur coarse (Fig. 69); spiracular groove absent . . . . . Tribe Prionyxini, *Prionyx* van der Linden

1' Length of basal veinlet of second submarginal cell equal to or shorter than anterior veinlet (Fig. 36); pectens of inner hindtibial spur usually fine (Fig. 68); spiracular groove present or absent . . . . . Tribe Sphecini . . 2

2 Spiracular groove complete (Fig. 1) . . . . . *Sphex* Linnaeus

2' Spiracular groove absent or incomplete . . . . *Isodontia* Patton

Genus *Sphex* Linnaeus

Sphex Linnaeus, 1758: 569.
Sphaex Scopoli, 1772: 122.
Ammobia Billberg, 1820: 105.
Proterosphex Fernald, 1905: 165.

Diagnosis: Propodeum with a complete spiracular groove; length of basal veinlet of second submarginal cell equal to or shorter than anterior veinlet; pectens of hindtibial spur usually fine.

This cosmopolitan genus contains 111 currently recognized species; 10 of the 12 Nearctic species have been keyed by Bohart and Menke (1963). Evans and Lin (1956a) provide descriptions of the larvae of the two Quebec species, *Sphex ichneumoneus* (Linnaeus) and *S. pensylvanicus* Linnaeus.

Key to Quebec Species of *Sphex*

1 Abdomen with red; thoracic pubescence golden . . . . . *ichneumoneus* (Linnaeus)

1' Abdomen black; thoracic pubescence black . . *pensylvanicus* Linnaeus

Sphex ichneumoneus (Linnaeus)

Fig. 1

Apis ichneumoneus Linnaeus, 1758: 578. Lectotype designated by Bohart and Menke, 1963: 123.

Nomada surinamensis Retzius, 1783: 62. New name for *Apis ichneumonea* Linnaeus.

Sphex croesus Lepeletier, 1845: 351.

Sphex dimidiatus Lepeletier, 1845: 352, *nec* DeGeer, 1773.

Sphex ignotus Strand, 1916: 99.

Doubtful Synonymy: (Bohart and Menke, 1976).

Sphex aurifluus Perty, 1833: 142.

Sphex aurocapillus Templeton, 1841: 51.

Sphex sumptuosus Costa, 1862: 66.

Diagnosis: Male; placoids of antennal flagellomeres extending along nine-tenths of flagellomeres IV to VI; clypeus with erect hair; pronotal lobe golden; tibia bright orange; abdomen red towards base with segments III to VII mostly or entirely black.

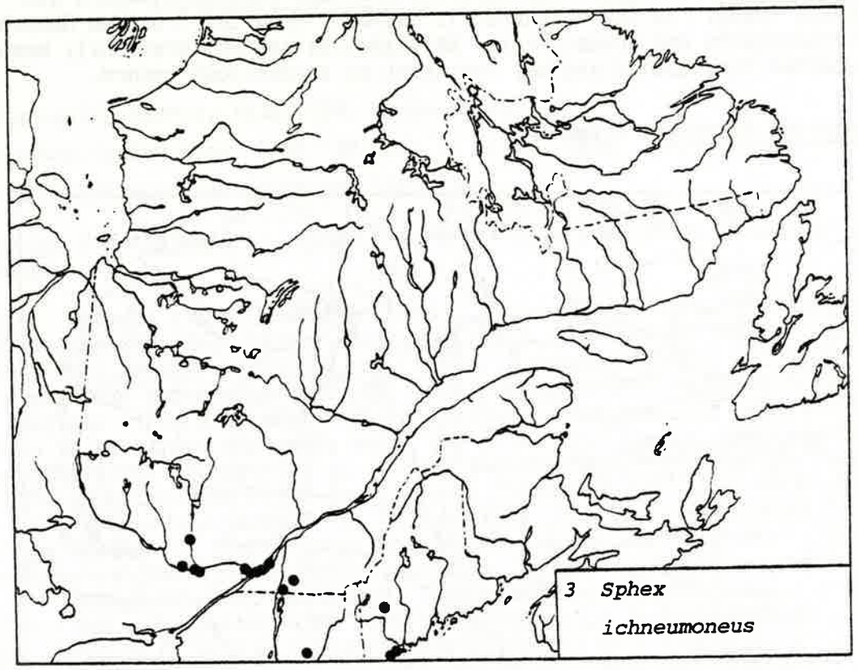
Female with a bright spot of golden pubescence behind pronotal lobe; forefemur with scattered bristly hair on lower ½ of outer surface, concentrated mostly along ventral line; propodeum with appressed golden pubescence; abdomen red at base, last three segments black.

Biology: Packard (1872), Peckham and Peckham (1898), Rau and Rau (1918), Reinhard (1929b), Abbot (1931), Frisch (1937), Fernald (1945), Ristich (1953), Bohart and Menke (1963), Andrewes (1969), Sismondo (1978) and Krombein *et al.* (1979) have published information on the biology of this species. This wasp often nests gregariously in open sandy soil, the colony remaining in the same area for up to 25 years (Fernald, 1945). Prey consists of orthopteroids; the following species have been recorded: Grylloidea: *Oecanthus nigricornis* (Wlkr.); Gryllacrididae: *Brachybaenus* sp., *Gryllacris* sp.; Tettigonioidea: *Conocephalus fasciatus* (DeGeer), *C. attenuatus* (Scudder), *C. triops* (Linnaeus), *C. brevipennis* (Scudder), *Orchelimum vulgare* Harris, *O. calcaratum* Rehn and Hebard, *O. delicatum* Brun., *O. gracile* (Harris), *Neoconocephalus ensiger* (Harris), *Meconema thallassinum* DeGeer, *Atlanticus dorsalis* (Burmeister), *Neduba* sp., *Amblycorypha oblongifolia* (DeGeer), *Scudderia texensis* Sauss. and Pict., *S. pistillata* (Brunn.), *Acanthodis* sp.

Krombein *et al.* (1979) listed several species of cleptoparasitic Diptera attacking this wasp. These are *Pseudoxenos smithii* (Heyd.), *Metopia argyrocephala* (Meig.), *M. campestris* (Fall.) and *Senotainia trilineata* (Wulp); also listed was the cleptoparasitic nyssonid wasp *Nysson plagiatus* Cr.

Distribution: Southern Canada to Brazil, Peru and Ecuador (Bohart and Menke, 1963).

Material Examined: 40 males; 62 females.



3 *Sphex ichneumoneus*

Sphex pensylvanicus Linnaeus

Fig. 68.

Sphex pensylvanica Linnaeus, 1763a: 30.

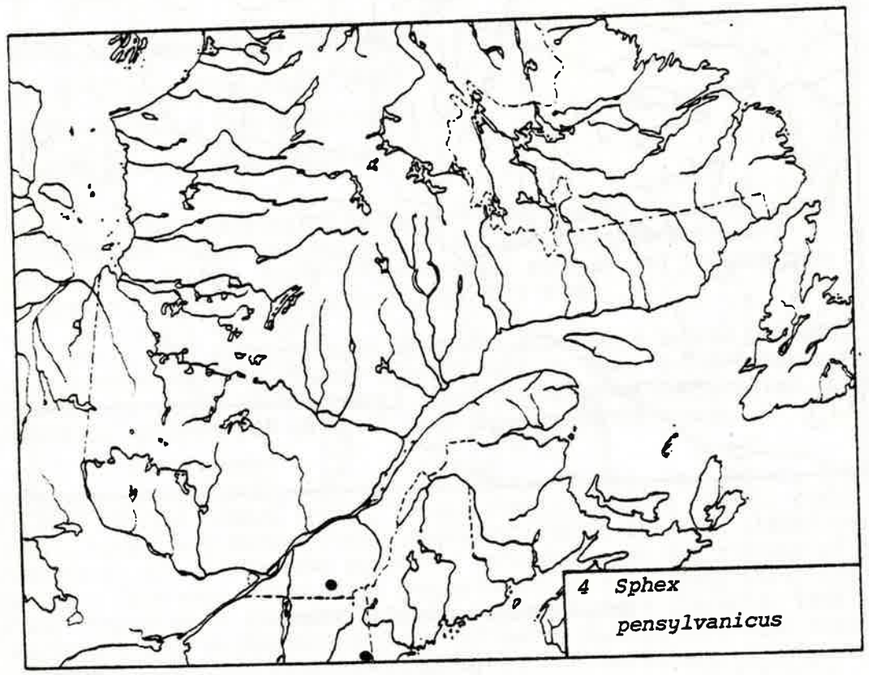
Sphex robustisoma Strand, 1916: 101.

Diagnosis: Body all black; wings black with violaceous tint; erect hair on head and thorax black; male flagellum with placoids on segment V only.

Biology: Reinhard (1929b), Frisch (1938), Rau (1944), Krombein (1955a), Andrewes (1969), Rigley and Hays (1977) and Krombein *et al.* (1979) have provided biological information on this species. This wasp prefers dark sheltered areas for nest sites; the nest consists of one to several cells at the end of a burrow. Prey are Tettigonioidea; Bohart and Menke (1963) listed *Microcentrum retinerve* (Burm.), *M. rhombifolium* (Sauss.) and *Scudderia furcata* Brunner. Krombein *et al.* (1979) listed two cleptoparasitic Diptera attacking this wasp, *Pseudoxenos smithii* (Heyd.) and *Senotainia trilineata* (Wulp).

Distribution: United States north to the 43rd parallel (Bohart and Menke, 1963). In the northeast it has been reported from New Hampshire, Massachusetts and Connecticut. This species has not previously been reported from Quebec and may represent an adventitous record.

Material Examined: 1 female



Genus *Isodontia* Patton

Isodontia Patton, 1881a: 380.

Leontosphex Arnold, 1945: 90.

(*Murrayella*) Bohart and Menke, 1963: 137.

Diagnosis: Spiracular groove of propodeum absent or incomplete; length of basal veinlet of second submarginal cell shorter than anterior veinlet; claw teeth obliquely orientated to inner margin of claw; female usually without foretarsal rake, but when present, rake spines are short.

Of the 54 recognized species, 6 occur in the Nearctic Region and have been keyed by Bohart and Menke (1963).

Isodontia (*Murrayella*) *mexicana* (Saussure)

Fig. 36

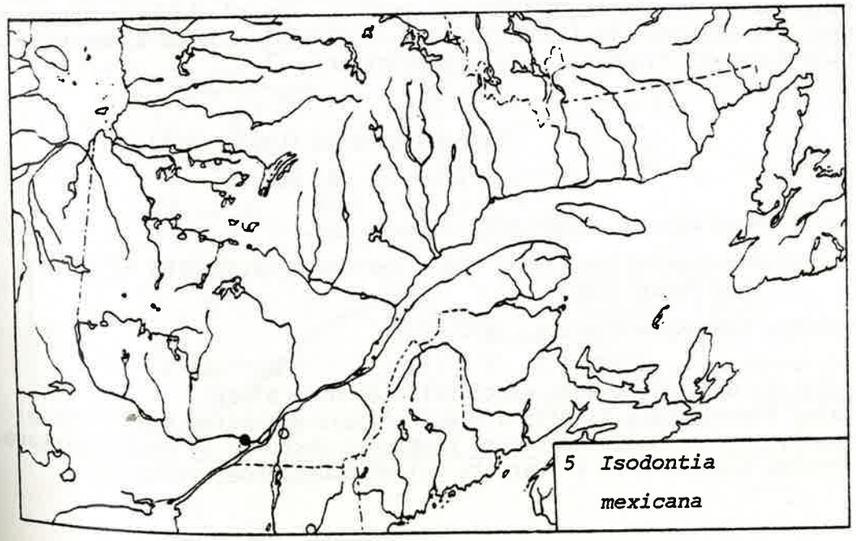
Sphex apicalis Harris, 1835: 588, *nomen nudum*.

Sphex apicalis Saussure, 1867: 38, *nec* F. Smith, 1856.

Sphex apicalis mexicana Saussure, 1867: 38.

Diagnosis: Hindtibia dark; scutum with erect pale grey hair; mandible tridentate.

Biology: Ashmead (1895), Hubbard (1896), Jones (1904), Fernald (1906), Engelhardt (1928), Rau (1935c), Suehiro (1937), Rau (1943), Swezey (1947), C. Lin (1962), Medler (1965), C. Lin (1966), Krombein (1967b, 1970), Andrewes (1969) and Krombein *et al.* (1979) have provided information on this species. This wasp does not dig its own burrow but uses preexisting cavities to construct the nests which are lined with grass. Prey consists of orthopteroids; Krombein *et al.* (1979) recorded the following: Grylloidea: *Oecanthus angustipennis* Fitch [= *O. niveus* (DeGeer)], *O. quadripunctatus* Beut., *O. argentinus* Sauss., *O. fultoni* Wlkr., *O. nigricornis* Wlkr., *O. niveus* (DeG.), *O. fasciatus* Fitch, *Gryllus assimilis* F. [prob. *G. pennsylvanicus* (Burm.)], *Neoxabea bipunctata* (DeG.), *Orocharis saltator* Uhl., *Odontoxiphidium apterum* Morse; Tettigonioidea: *Conocephalus fasciatus* DeG., *Neoconocephalus* sp., *Orchelimum* sp., *Neobarrettia* sp., and *Scudderia* sp. Several cleptoparasitic Diptera were listed by Krombein *et al.* (1979); these are *Amobia distorta* (Wulp), *Senotainia trilineata* (Wulp), *Sarcophaga* sp., *Megaselia aletiae* (Comst.) and *Eustalomyia vittipes* (Zett.).



Distribution: Eastern and southern United States and Mexico (Bohart and Menke, 1963, 1976). This species has not previously been recorded from Quebec.

Material Examined: 2 females.

Genus *Prionyx* van der Linden

Prionyx van der Linden, 1827: 362.

Priononyx Dahlbom, 1843: 28.

Enodia Dahlbom, 1843: 28, *nec* Hubner, 1819.

Harpactopus F. Smith, 1856: 264.

Parasphex F. Smith, 1856: 267.

Gastrosphaeria Costa, 1858: 10.

Pseudosphex Taschenberg, 1869: 420, *nec* Hubner, 1818.

Calosphex Kohl, 1890: 113.

Neosphex Reed, 1894: 627.

Diagnosis: Length of basal veinlet of second submarginal cell greater than anterior veinlet; pectens of inner hindtibial spur coarse; spiracular groove absent; hindtarsal claw with two to five teeth on inner margin; female clypeus entire or with a median notch; male flagellum often with placoids on flagellomeres III to IV.

Prionyx is a cosmopolitan genus of 56 species. Bohart and Menke (1963) have reviewed the 7 Nearctic species, one of which is found in Quebec. Evans and Lin (1956a) and Evans (1959a) provide a description of the larva of *Prionyx atratus* (Lepeletier).

Prionyx atratus (Lepeletier)

Figs. 35, 64, 66, 69.

Sphex labrosa Harris, 1835: 588, *nomen nudum*.

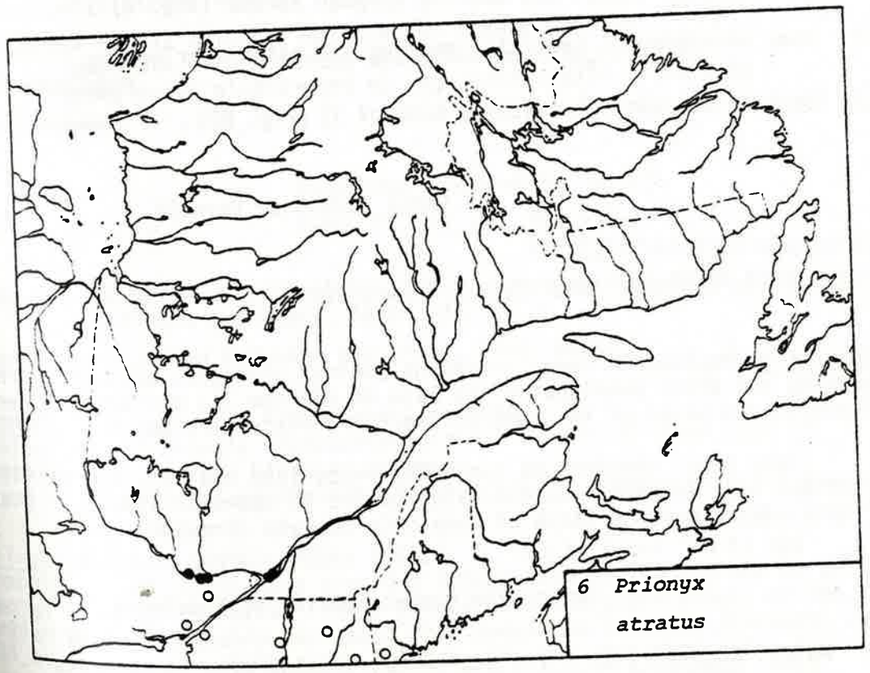
Sphex atrata Lepeletier, 1845: 355. Lectotype designated by Bohart and Menke (1963).

Priononyx brunnipes Cresson, 1872: 213.

Diagnosis: Body all black; erect hairs on body black.
Male; flagellomere VI with a broad placoid extending the length of segment; scutum dull, individual punctures obscured by microsculpture.
Female; clypeus with silvery to golden pubescence; scutum dull.

Biology: Peckham and Peckham (1898), Bradley (1908), Williams (1914b), Rau and Rau (1916a, 1918), Rau (1922, 1938), Strandtmann (1945), Evans (1958c), Andrewes (1969) and Krombein *et al.* (1979) have published information on the biology of this species. This wasp is a solitary ground nester constructing a single cell per nest and provisioning with a single grasshopper of the Family Acrididae. Krombein *et al.* (1979) listed the following prey: Gomphocerinae: *Ageneotettix d. deorum* Scud., *Aulocara elliotti* Thom., *Mermiria neomexicana* Thom.; Oedipodinae [= Locustinae]: *Arphia xanthoptera* Burm., *Dissosteira carolina* L., *Pardalophora phoenicoptera* Burm., *Spharagemon collare* Scud., *Trimerotropis citrina* Scud.; Melanoplinae: *Melanoplus angustipennis* Dodge, *M. arizonae* Scud., *M. bispinosus* Scud., *M. bivittatus* Say, *M. devastator* Scud., *M. differentialis* Thom., *M. femurrubrum* DeG., *M. foedus* Scud., *M. lakinus* Scud., *M. spretus* Walsh [now extinct]; Cyrtacanthacridinae: *Schistocerca lineata* Scud. [= *emarginata* Scud.].

Three species of cleptoparasitic Diptera, *Pseudoxenos duryi* (Pierce), *Metopia argyrocephala* (Meig.) and *Senotainia* sp. were recorded by Krombein *et al.* (1979). Also listed was the cleptoparasitic nyssonid wasp *Stizoides renicinctus* (Say).



6 *Prionyx atratus*

Distribution: United States, southern Canada and northern Mexico (Bohart and Menke, 1963). This species has not previously been reported from Quebec.

Material Examined: 52 males; 29 females.

Subfamily Ammophilinae

Diagnosis: Tarsal claws without teeth in Quebec species; apicoventral setae of hindtarsomere V narrow separated at base by three or more setal widths; tarsi ventrally without plantulae.

Key to Quebec Genera of Ammophilinae
(Adapted from Bohart and Menke, 1976)

1 Episternal sulcus curving back to scobe from subalar fossa, then extending obliquely ventrad to anteroventral area of mesopleuron (Fig. 7) . . . . . *Eremnophila* Menke

1' Episternal sulcus absent or extending straight down from subalar fossa, not passing through scrobe (Fig. 8) 2

2 Apex of sternum I (petiole) meeting and often overlapping base of II (Fig. 86) . . . . . *Podalonia* Fernald

2' Apex of sternum not reaching base of II (Fig. 87) . . *Ammophila* Kirby

Genus *Podalonia* Fernald

Podalonia Fernald, 1927: 11.

Psammophila Dahlbom, 1843: 2, *nec* Brown, 1827.

Diagnosis: Mouthparts long; episternal sulcus straight; apex of sternum I meeting and often overlapping the base of sternum II; spiracle of tergum I positioned basad of the apex of sternum I (lateral view).

This genus contains 66 currently recognized species; Murray (1940) provides keys and distribution data for the 20 Nearctic species. Evans (1964a) describes the larva of *Podalonia robusta* (Cresson).

Key to the Quebec Species of *Podalonia*

1 Males; abdomen with 7 visible terga; antenna with 13 segments . . 2

1' Females; abdomen with 6 visible terga; antenna with 12 segments . . 4

2 Pilosity of thorax black anteriorly, white posteriorly and laterally; third abdominal tergum red at base . . . . . *robusta* (Cresson)

2' Pilosity of thorax entirely black; third abdominal tergum usually with anterior half red 2

3 Metapleural flange lamellate (Fig. 23); clypeus with a slight median emargination (Fig. 131) . . . . . *violaceipennis* (Lepeletier)

3' Metapleural flange not lamellate (Fig. 24); clypeus broadly transverse (Fig. 130) . . . *luctuosa* (F. Smith)

4 Abdomen entirely black . . . . . *luctuosa* (F. Smith)

4' Abdomen with red 5

5 Clypeus strongly bulging; metapleural flange narrowly lamellate (Fig. 24); metapleuron and propodeal side with strong regular ridges . . . . . *robusta* (Cresson)

5' Clypeus weakly bulging; metapleural flange broadly lamellate with a strong emargination (Fig. 23); metapleuron with almost no regular ridges . . . . . *violaceipennis* (Lepeletier)

Podalonia luctuosa (F. Smith)
Figs. 24, 63, 67, 86, 130.

Ammophila luctuosa F. Smith, 1856: 224. Lectotype designated by Menke *in* Bohart and Menke, 1976: 144.

Psammophila pacifica Melander and Brues, 1902: 40-42.

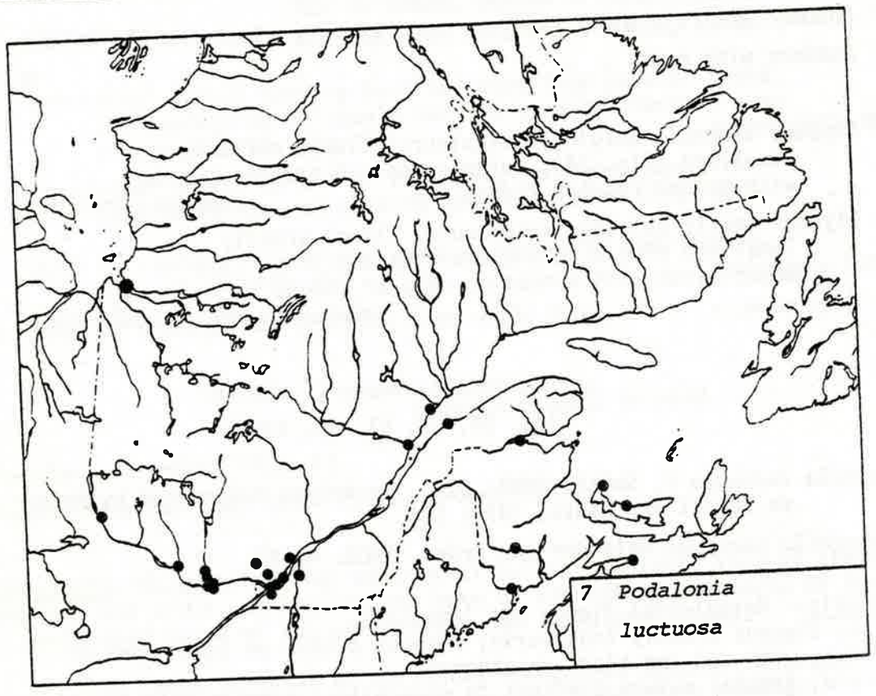
Diagnosis: Metapleural flange not lamellate.
Male; clypeus broadly transverse; without a spur on inner apex of forecoxa; with red and black on abdomen.
Female; frontal suture distinct to midocellus; abdomen entirely black.

Biology: Newcomer (1930), Hicks (1931a, b, 1932), Evans (1970) and Krombein *et al.* (1979) have provided information on the biology of this species although as Murray (1940) points out, the observations of the earlier authors probably represent both *Podalonia communis* (Cresson) as well as *P. luctuosa* since these species were not distinguished. *P. luctuosa* prey on lepidopterous larvae of the Family Noctuidae. The following species have been recorded as prey: *Peridroma saucia* (Hbn.)

from eastern North America; *Euxoa auxiliaris* (Grote) and *E. acornis* Smith from western North America. Murray (1940) reported that females and males are present during the summer and fall; the males die in late summer and fall, while the females hibernate over winter. The female emerges early in spring and begins searching for prey and nest building. Krombein *et al.* (1979) recorded the following cleptoparasites, *Pseudoxenos luctuosae* (Pierce), *Hilarella hilarella* (Zstt.), *Metopia argyrocephala* (Meig.) and *Taxigramma heteroneura* (Meig.).

Distribution: Transcontinental in northern tier of States and Canada as far north as North West Territories and Yukon (Krombein *et al.*, 1979).

Material Examined: 34 males; 94 females.



Podalonia robusta (Cresson)

Ammophila robusta Cresson 1865b: 461.

Diagnosis: Metapleural flange moderately lamellate; abdomen with red and black.

Male; head and thorax moderately punctate; pilosity of thorax black anteriorly, white posteriorly and laterally; mesopleuron not glossy but

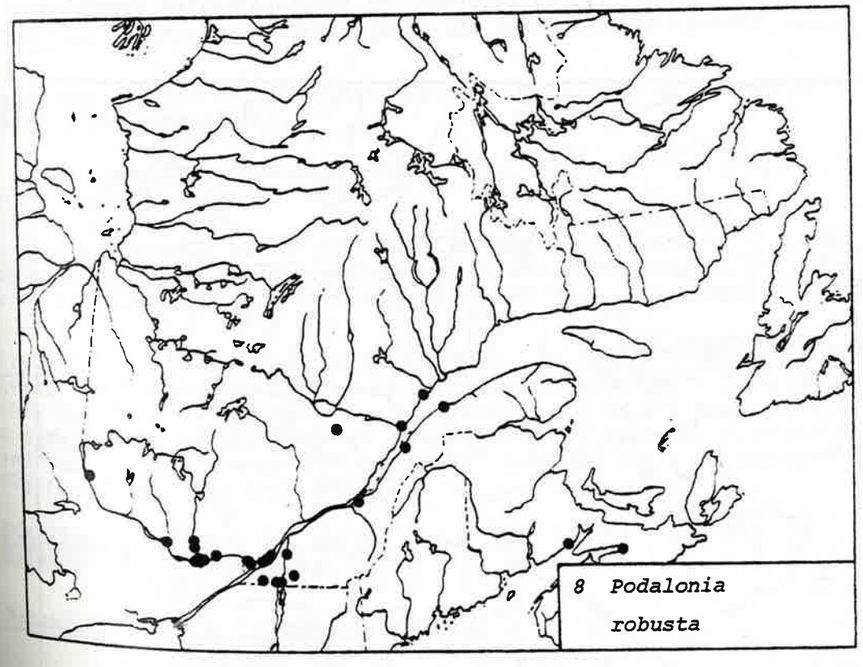
with fine reticulation; propodeum without a pubescent patch on each side of petiole attachment; without a spur on inner apex of forecoxa.

Female; clypeal margin without teeth; clypeus moderately to strongly bulging, and reticulate throughout; propodeum without a prominent pubescent patch on each side of petiole attachment; petiole slender, distinctly longer than hindcoxa.

Biology: Balduf (1936) has supplied the only biological data on this common species under the name *Podalonia violaceipennis* (Lepeletier) which Murray upon examination of the specimens found to be a mixture of *P. violaceipennis* and *P. robusta*. These wasps were found to be preying on the larvae of the notodontid *Symmerista albifrons* Smith and Abbot.

Distribution: Across North America and from Mexico to Costa Rica (Bohart and Menke, 1976).

Material Examined: 65 males; 80 females.



Podalonia violaceipennis (Lepeletier)

Figs. 23, 131

Ammophila violaceipennis Lepeletier, 1845: 370.

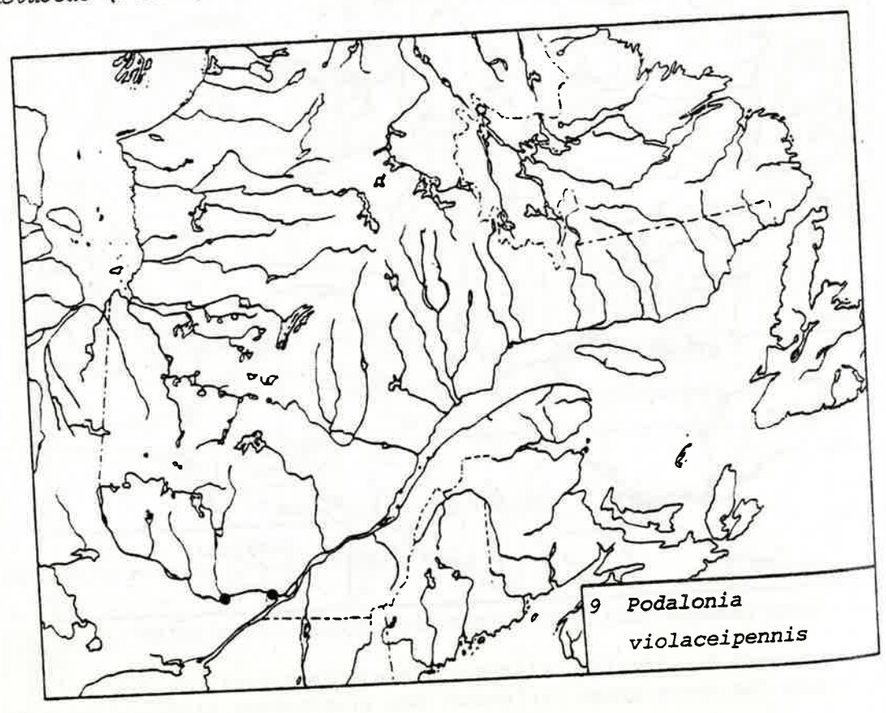
Ammophila cementaria F. Smith, 1856: 224.

Diagnosis: Metapleural flange lamellate, large and usually with a strong emargination; propodeum without a prominent pubescent patch on each side of petiole attachment; abdomen with red and black.

Male; head and pleurae moderately, not coarsely punctate; without a spur on inner apex of forecoxa.

Female; clypeal margin without teeth; clypeus only slightly bulging with many large and tiny punctures, reticulate throughout.

Biology: Parker (1915), Williams (1928b), Balduf (1936) and Krombein *et al.* (1979) have published biological observations on this wasp. Balduf (1936) recorded the notontid *Symmerista albifrons* Smith and Abbot as prey. Krombein *et al.* (1979) recorded the cleptoparasites *Pseudoxenos luctuosae* (Pierce) and *Hilarella* sp.



Distribution: Western half of the United States and southern Ontario in Canada (Murray, 1940). This species has not previously been recorded from Quebec.

Material Examined: 3 males

Genus *Eremnophila* Menke

Eremnophila Menke, 1964b: 875.

Diagnosis: Episternal sulcus curving back to scrobe from subalar fossa, then extending obliquely ventrad to anteroventral area of mesopleuron.

This genus contains 9 primarily Neotropical species but one species ranges as far north as southern Canada. Menke (1964b) provides a key to species.

Eremnophila aureonotata (Cameron)

Fig. 7

Ammophila aurenotata Cameron, 1888: 70.

Diagnosis: Scutum not completely covered by transverse ridges, smooth and shining posteromedially.

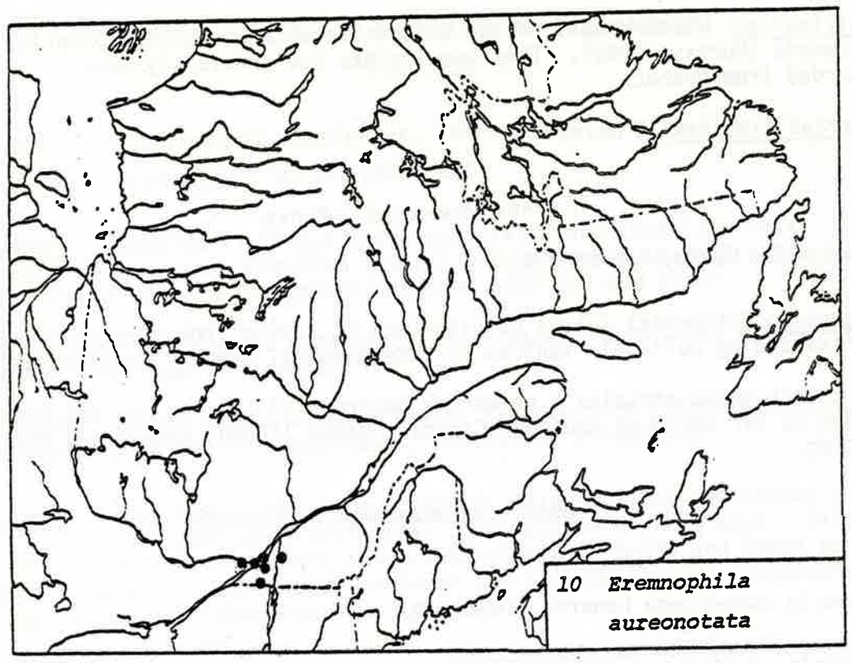
Male; apex of clypeus drawn into a long, narrow process; last sternum with subapical spine.

Female; pronotal collar trilobate in appearance; mesopleuron normal, without an angular bulge or prominent tubercle anteroventrally; scutum with a triangular patch of silver appressed hair anteromedially.

Biology: Peckham and Peckham (1898, 1905), Rau (1922), Krombein (1958c), Evans (1959b) and Krombein *et al.* (1979) have provided information on this species. This wasp excavates a single burrow and provisions with a single larve of the families Notodontidae, *Heterocampa guttivitta* (Wlkr.) and Hesperiidae. Krombein *et al.* (1979) recorded the cleptoparasitic fly *Pseudoxenos lugubris* (Pierce).

Distribution: Canada and United States east of 100th meridian to El Salvador (Bohart and Menke, 1976).

Material Examined: 14 males; 9 females



Genus *Ammophila* Kirby

Ammophila Kirby, 1798: 199.
Ammophylus Latreille, 1802-1803: 332.
Miscus Jurine, 1807: 130.
Ammophilus Latreille, 1829: 322.
Coloptera Lepeletier, 1845: 387.
Argyrammophila Gussakovskij, 1928: 7.
Apycnemia Leclercq, 1961: 211.

Diagnosis: Episternal sulcus not curving back to scrobe; apex of sternum I separated from base of sternum II.

This genus currently contains 187 species of which 60 species are found in America north of Mexico (Bohart and Menke, 1976). There is at present no adequate key to the Nearctic species but the works of Fernald (1934), Murray (1938) and Menke (1964a, 1966, 1967, 1970) are helpful.

Evans and Lin (1956a) have provided larval descriptions of *Ammophila procera* (Dahlbom) and *A. urnaria* Dahlbom; Evans (1964a) described the larva of *A. fernaldi* (Murray) and Krombein (1955b) described the cocoon of *A. procera*.

Key to Quebec Species of *Ammophila*

1 Lateral edges of propodeal enclosure shining with transverse ridges interrupted mesad by coarse punctation or fine reticulation 2

1' Surface of propodeum dull, finely granulate with transverse ridges 4

2 Episternal sulcus long, extending below pronotal lobe to sternal area (Fig. 8) 7

2' Episternal sulcus short not extending below pronotal lobe (Fig. 9) 3

3 Thoracic dorsum transversely ridged . . . . *procera* Dahlbom

3' At least pronotal collar without transverse ridges . . . 9

4 Males; abdomen with 7 visible terga; antenna with 13 segments . 5

4' Females; abdomen with 6 visible terga; antenna with 12 segments 6

5 Episternal sulcus short, evanescent or absent below pronotal lobe (Fig. 9); first gastral segment red except dorsal apex which is black . . . . . *fernaldi* (Murray)

5' Episternal sulcus long, extending well below pronotal lobe (Fig. 8); first gastral segment mostly piceous to black . . . . . *nigricans* Dahlbom

6 First gastral segment and half of second red . . *fernaldi* (Murray)

6' First gastral segment red except hind margin which is black . . . . . *nigricans* Dahlbom

7 Pronotal collar rising vertically for a short distance from neck, then bent posteriorly to form an almost flat gently sloping dorsal surface (Fig. 8) . . . . *evansi* Menke

7 Pronotal collar rising from neck in a continuous slope to the highest point forming an arched dorsal surface (Fig. 10) . 8

8 Metapleural flange lamellate (Fig. 23); pilosity of head white . . . . . *azteca azteca* Cameron

8' Metapleural flange not lamellate (Fig. 24); pilosity of head black . . . . . *mediata* Cresson

9 Costa of forewing at base amber in reflected light; first gastral segment entirely red in both sexes . . . . . *kennedyi* (Murray)

9' Costa of forewing at base black in reflected light; male, first gastral segment red with a dorsal black stripe; female, first gastral segment entirely red . . . . . *urnaria* Dahlbom

Ammophila azteca azteca Cameron

Figs. 10, 87

Ammophila azteca Cameron, 1888: 17.

Sphex pilosus Fernald, 1934: 120.

Sphex aculeatus Fernald, 1934: 145.

Sphex nudus Murray, 1938: 28, *nec* Fernald, 1903.

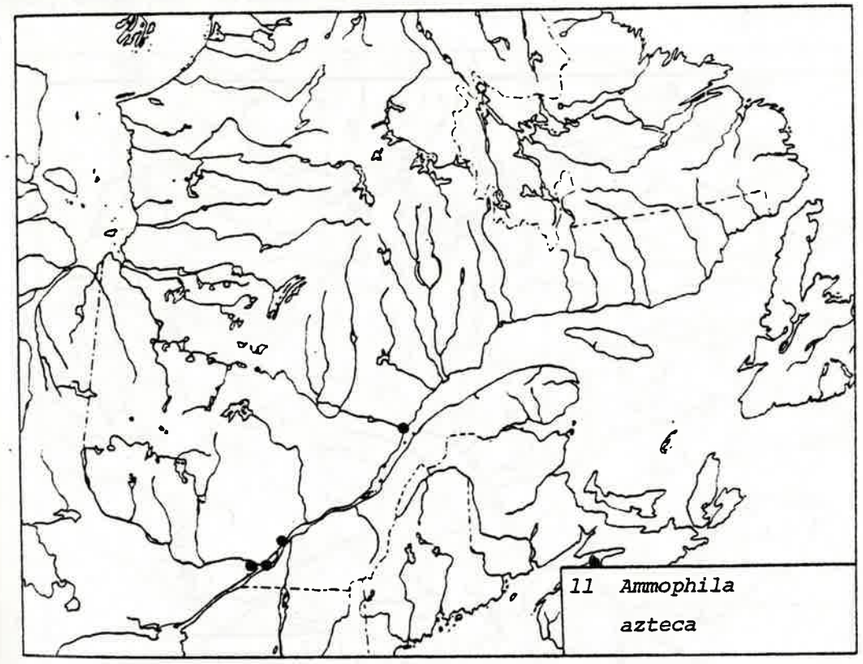
Ammophila brevisericea Murray, 1951: 976. New name for *Sphex pilosus nudus* Murray, 1938.

Diagnosis: Pronotal collar dorsally forming an arched surface with a continuous slope (collar not rising vertically from neck); episternal sulcus long; metapleural flange lamellate; lateral edges of propodeal enclosure shiny with transverse ridges interrupted mesad by coarse punctation or fine reticulation; pilosity of head white.

Biology: Hicks (1933, 1935), Evans (1963, 1965, 1970), Powell (1964), Menke (1965), Andrewes (1969), Bohart and Menke (1976) and Krombein *et al.* have provided information on this species. *A. azteca azteca* has been found to maintain several nests simultaneously within an area less than 30 cm diameter (Evans, 1965). Prey include small hairless larvae of the following: Hymenoptera: Tenthredinidae; Lepidoptera: Geometridae, Gelechiidae, Noctuidae, Sphingidae, Lycaenidae; Coleoptera: Curculionidae: *Hypera postica* (Gyll.); weevil record from Bohart and Menke (1976).

Distribution: Canada and the United States (Bohart and Menke, 1976). Another subspecies *A. a clemente* Menke is found on an island off the coast of California (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 3 males; 7 females.



Ammophila evansi Menke

Fig. 8

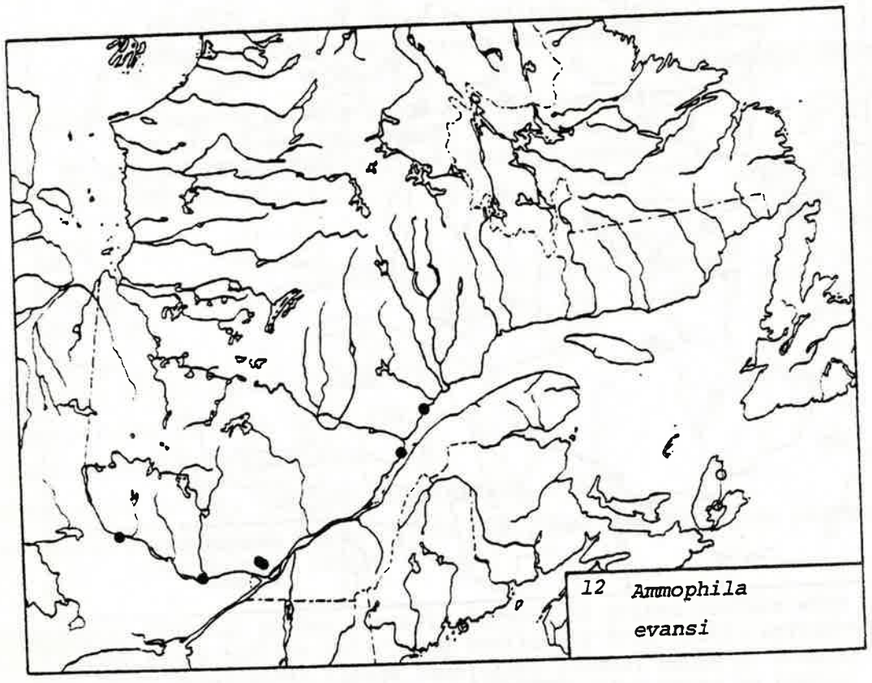
Ammophila evansi Menke, 1964a: 20.

Diagnosis: Pronotal collar rising abruptly from neck forming an almost flat gently sloping dorsal surface; episternal sulcus long extending below pronotal lobe to sternal region; lateral edges of propodeal enclosure shiny with transverse ridges interrupted mesad by coarse punctation or fine reticulation.

Biology: Krombein *et al.* (1979) recorded the cleptoparasitic fly *Pseudoxenos* **lugubris** (Pierce).

Distribution: Eastern United States and southeastern Canada (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 3 males; 2 females. Other records from Menke (1964a), open circles.



Ammophila fernaldi (Murray)

Sphex fernaldi Murray, 1938: 19.

Diagnosis: Surface of propodeum dull, finely granulate with transverse ridges, lateral areas of enclosure not shiny.

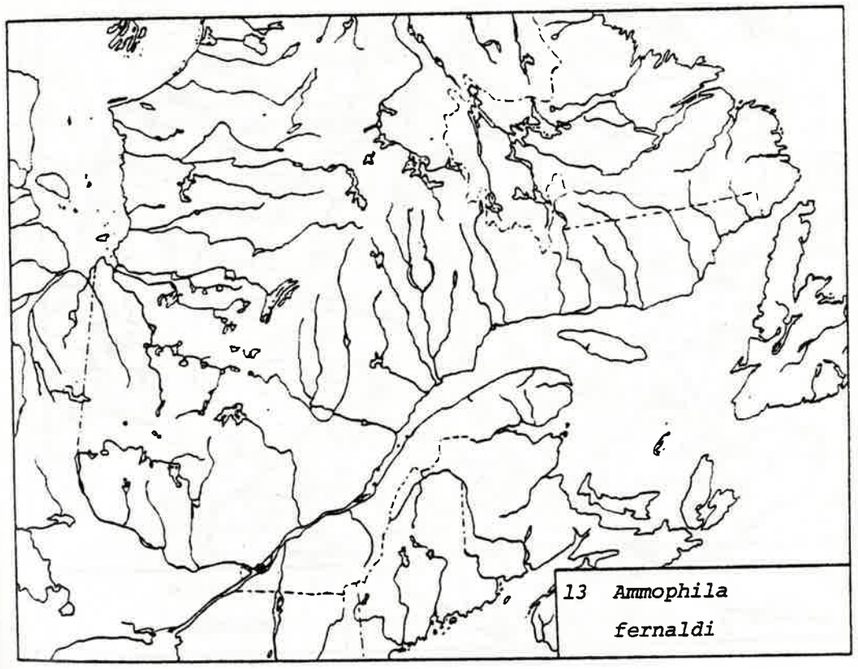
Male; episternal sulcus short; first gastral segment red except dorsal apex which is black.

Female; episternal sulcus long; first gastral segment and half of second red.

Biology: Evans (1964a) observed a single cell which contained a noctuid larva.

Distribution: Eastern United States to Arizona and Mexico (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 17 males; 10 females.



Ammophila kennedyi (Murray)

Ammophila vulgaris Cresson, 1865b: 458, *nec* Kirby, 1798: 202.

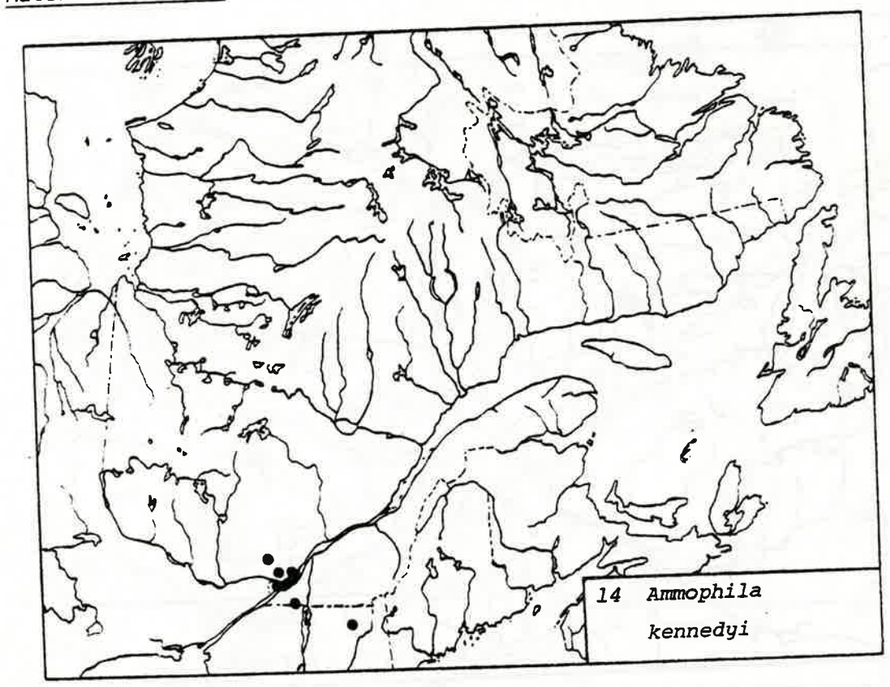
Sphex kennedyi Murray, 1938: 36. New name for *Ammophila vulgaris* Cresson, 1865b.

Diagnosis: Pronotal collar without transverse ridges; episternal sulcus short; costa of forewing at base amber in reflected light; surface of propodeum shining laterally with transverse ridges interrupted mesad by coarse punctation or fine reticulation; first gastral segment red.

Biology: Krombein *et al.* (1979) recorded the cleptoparasitic fly *Pseudoxenos lugubris* (Pierce).

Distribution: Across the continent in the United States (Bohart and Menke, 1976), it is also known from British Columbia, Alberta and Quebec in Canada (Murray, 1938).

Material Examined: 32 males; 32 females.



Ammophila mediata Cresson

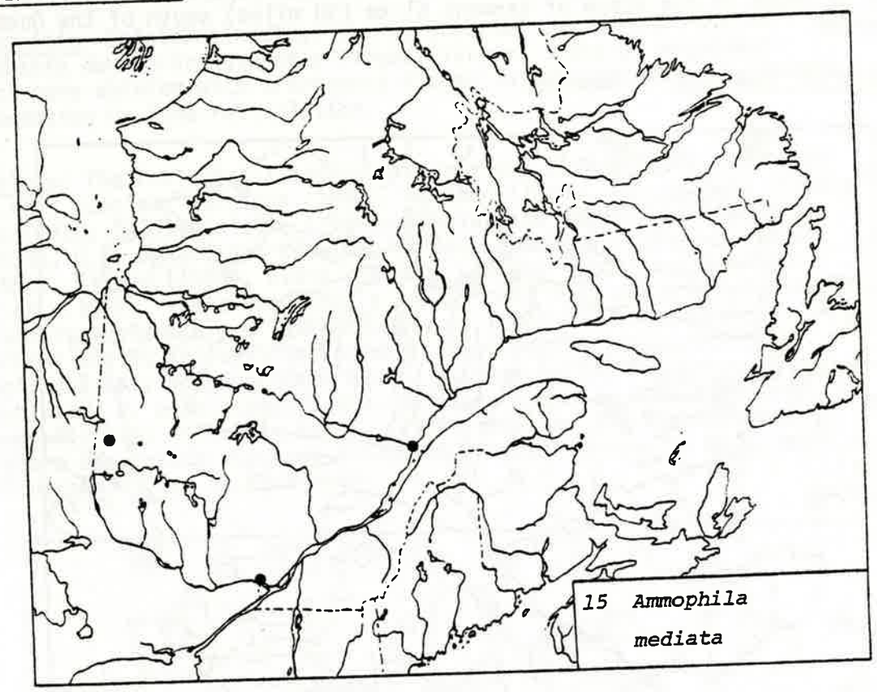
Ammophila mediata Cresson, 1865b: 459.

Diagnosis: Pilosity of head black; pronotal collar rising from neck in a continuous slope to the highest point forming an arched dorsal surface; episternal sulcus long; metapleural flange not lamellate; lateral edges of propodeal enclosure shining with transverse ridges interrupted mesad by coarse punctation or fine reticulation.

Biology: Evans (1970) recorded this species as prey of *Philanthus zebratus* Cresson.

Distribution: Western United States (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 5 females.



Ammophila nigricans Dahlbom

Ammophila nigricans Dahlbom, 1843: 14.

Ammophila intercepta Lepeletier, 1845: 378.

Diagnosis: Episternal sulcus long, extending well below pronotal lobe; surface of propodeum dull, finely granulate with transverse ridges.

Male; first gastral segment mostly black.

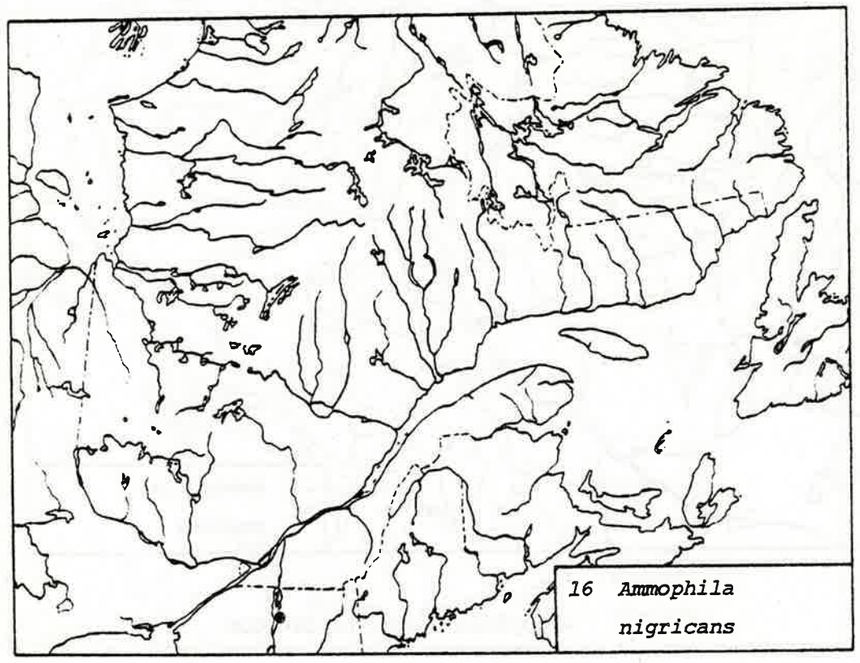
Female; first gastral segment red except hind margin which is black.

Biology: Rau (1934), Strandtmann (1945) and Evans (1959b) have provided information on this species. Prey consists of noctuid larvae. Evans (1959b) reported full grown larvae of *Euparthenos nubilis* Hubner

and *Zale* sp.; Strandtmann (1945) found *Catocala* sp. used as prey.

Distribution: Eastern United States as far north as northern New York and Vermont. Although this species has not been reported from Quebec it is found in the State of Vermont 61 km (38 miles) south of the Quebec border.

Material Examined: 2 females.



Ammophila procera Dahlbom

Ammophila procera Dahlbom, 1843: 15.

Ammophila procera Lepeletier, 1845: 376, *nec* Dahlbom, 1843.

Ammophila saeva F. Smith, 1856: 222. Lectotype designated by Menke *in* Bohart and Menke, 1976: 153.

Ammophila gryphus F. Smith, 1856: 222. Lectotype designated by Menke *in* Bohart and Menke, 1976: 153.

Ammophila barbata F. Smith, 1873: 260.

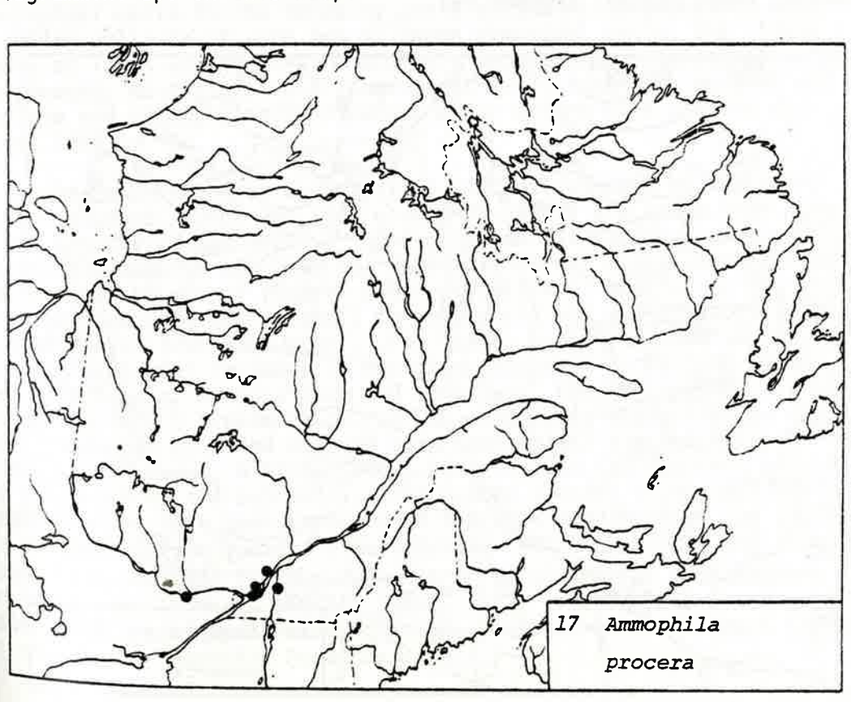
Ammophila ceres Cameron, 1888: 8. Lectotype designated by Menke *in* Bohart and Menke, 1976: 153.

Ammophila championi Cameron, 1888: 9. Lectotype designated by Menke *in* Bohart and Menke, 1976: 153.

Ammophila striolata Cameron, 1888: 10.

Diagnosis: Episternal sulcus short; pronotal collar and rest of thoracic dorsum transversely ridged; lateral sides of propodeal enclosure shining with transverse ridges interrupted mesad by coarse punctation or fine reticulation.

Biology: The following authors have provided biological information on this species: Pergande (1892), Hartman (1905), Rau and Rau (1918), Rau (1922, 1926), Criddle (1924), Wheeler and Wheeler (1924), Hicks (1935), G.E. Bohart and Knowlton (1953), Krombein (1953a, b. 1955b, 1958c), Tilden (1953), Evans (1959b), Linsley (1962) and Krombein *et al.* (1979). This wasp digs a single cell nest and provisions with a single lepidopterous larva usually of the Family Notodontidae. Prey records are as follows: Sphingidae: *Smerinthus cerisyii* (Kirby); Noctuidae sp.; Notodontidae: *Nadata gibbosa* Smith, *Heterocampa manteo* Doubleday, *H. subalbicans* Grote, *Schizura ipomoeae* Doubleday and *Symmerista* sp. Krombein *et al.* (1979) recorded the cleptoparasitic Diptera *Senotainia vigilans* Allen, and *Metopia lateralis* Macq. and Miltogrammini sp. on this wasp.



Distribution: United States, Mexico and Guatemala (Bohart and Menke, 1976.

Material Examined: 10 males; 10 females.

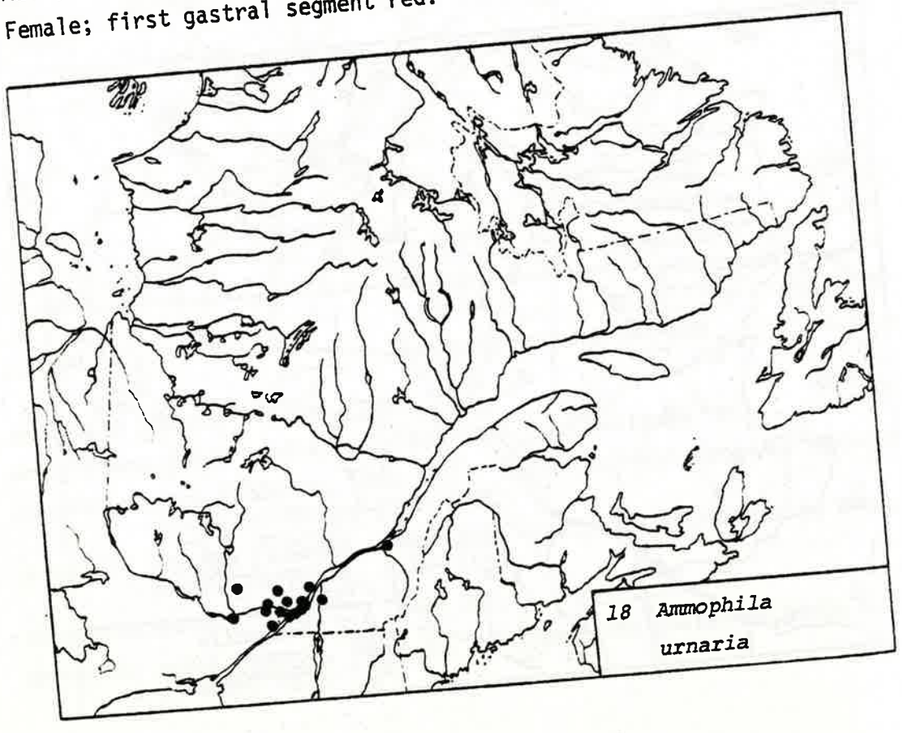
Ammophila urnaria Dahlbom
Fig. 9

Ammophila urnaria Dahlbom, 1843: 14.
Ammophila inepta Cresson, 1872: 209.
Sphex floridensis Fernald, 1934: 126.

Diagnosis: Pronotal collar without transverse ridges; episternal sulcus short; costa of forewing at base black in reflected light; lateral edges of propodeal enclosure shining with transverse ridges interrupted mesad by coarse punctation or fine reticulation.

Male; first gastral segment red with a longitudinal dorsal black stripe.

Female; first gastral segment red.



Biology: Peckham and Peckham (1898, 1905), Parker (1915), Fernald (1933), Frisch (1940), Evans (1959b), Andrewes (1969) and Krombein *et al.* (1979) have contributed information on the biology of this species. The nest is stocked with one to several lepidopterous larvae of the Families Geometridae and Noctuidae. Evans (1959b) recorded the following prey records: Geometridae: Ennominae spp.; Noctuidae: *Autographa* sp., *Panopoda* sp., and *Scoliopteryx libatrix* Linnaeus. Evans (1959b) also determined the identify of the noctuid *Polia adjuncta* Boisduval from a photograph by Parker (1915) who obtained the larva from a nest of *A. urnaria*. Krombein *et al.* (1979) recorded the cleptoparasitic fly *Pseudoxenos lugubris* (Pierce).

Distribution: Eastern United States (Bohart and Menke, 1976).

Material Examined: 138 males; 64 females.

Family Pemphredonidae

Diagnosis: Single midtibial spur; moderate jugal lobe of hindwing; absence of a spoon-shaped distal truncation of hindfemur and either (1) with a sternal petiole or (2) without a petiole and no more than two submarginal cells in the forewing and a stigma as large as the only discoidal cell; or if with two or three discoidal cells, the stigma is nearly as large as the first discoidal; two sessile submarginal cells are present; mandible simple externoventrally; inner eye margins not angulate and hindwing media diverges at or before cu-a (Bohart and Menke, 1976).

The Pemphredonidae contains two subfamilies both of which are found in Quebec. Over 700 species and 28 genera are known from all faunal regions of the world. The Pemphredonidae includes many moderately specialized species but like the Sphecidae is not closely related to the rest of the group (Bohart and Menke, 1976). Species in the family range in size from medium-small to very small and are often difficult to distinguish from each other. The Quebec species of the subfamily Pseninae have been reviewed in Nearctic treatment by Malloch (1933) for *Mimesa, Mimumesa, Pseneo, Psen* and *Psenulus*. Krombein (1950a, b) has updated Malloch's treatment of *Psenulus* and *Pseno* respectively; van Lith (1975) has provided keys to both Neotropical and Nearctic species of *Pseneo* and *Psen*. Gittins (1969) has reviewed the Nearctic genera and subgenera of the subfamily. The Quebec species of the subfamily Pemphredoninae have been reviewed in Nearctic treatment by Fox (1892d) for *Diodontus, Pemphredon* and *Passaloecus*. Mickel (1916b) and Krombein (1939) also reviewed *Diodontus*; Rohwer (1917b) treated some species of *Pemphredon* and Krombein (1938a, 1958b, 1973) treated *Passaloecus* and the eastern species of *Spilomena* and *Stigmus* respectively. Vincent (1979) has revised the Nearctic *Passaloecus*.

Key to Subfamilies of Pemphredonidae
(After Bohart and Menke, 1976)

1 Forewing with three submarginal cells; antennal sockets placed well above clypeal margin, usually near middle of face .. Pseninae

1' Forewing with no more than two marginal cells; antennal sockets placed just above clypeal margin . . . Pemphredoninae

Diagnosis: Sternal petiole present; forewing with three submarginal cells; antennal sockets placed near middle of face.

Key to Quebec Genera of Pseninae
(Adapted from Bohart and Menke, 1976)

1 Hindwing media diverging at or beyond cu-a (Fig. 38) . . *Psenulus* Kohl

1' Hindwing media diverging well before cu-a (Fig. 37) 2

2 Omaulus curving semicircularly forward toward prothorax (Fig. 18), never curving posteriorly nor joining an acetabular carina; hypoepimeral area not well defined, usually more strongly punctate or ridged than median area of mesopleuron . . . . . *Mimesa* Shuckard

2' Omaulus continued by acetabular carina to midventral line (Fig. 19), or ending just as it becomes ventral or as it turns posteriorly (Fig. 20); hypoepimeral area of mesopleuron usually smooth and bulging 3

3 Dorsal surface of petiole longitudinally carinate; with conspicuous outwardly directed hairs along inside of laterodorsal carina (Fig. 92) . . . . . *Mimumesa* Malloch

3' Dorsal surface of petiole polished without longitudinal carinae; outwardly directed hairs along inside of laterodorsal carina present or absent 4

4 Clypeus with apex thickened and transversely bevelled; with a discrete patch of inner distal hair on hind femur; male sterna without apical frimbriae . . . . . *Pseneo* Malloch

4' Clypeus without a thickened or bevelled apex; without inner distal hair patch on hindfemur; male sterna IV and often III with apical frimbriae . . . . . *Psen* Latreille

Genus *Mimesa* Shuckard

Mimesa Shuckard, 1837: 228.

Aporia Wesmael, 1852: 272, *nec* Hubner, 1819.

Aporina Gussakovskij, 1937: 665, *nec* Fuhrmann, 1902.

Diagnosis: Simple occipital carina; pronotal collar with a transverse carina; omaulus present and curving forward toward prothorax; hypoepimeral area of mesopleuron longitudinally striate to granulate, not bulging and shiny; hindwing media diverging well before cu-a.

This genus contains 57 species of which 24 are known from North America. Malloch (1933) provided a key to the Nearctic species but it is much in need of revision.

Key to Quebec Species of *Mimesa*

1 Abdomen entirely black . . . . . *maculipes* (Fox)

1' Abdomen with red 2

2 Propodeal enclosure with fine striations; propodeum entirely without reticulate sculpture . . . . . *cressonii cressonii* Packard

2' Propodeal enclosure usually coarsely striate; lateral and posterior areas of propodeum coarsely reticulate 3

3 Males; pygidial plate absent 4

3' Females; pygidial plate present 7

4 Antennal flagellum with not more than apical six segments bright orange-yellow beneath; petiole flat dorsally . . . . . *basirufa* Packard

4' Antennal flagellum bright orange-yellow on entire underside or with only basal segment dark beneath; petiole flat or convex dorsally . . . 5

5 Petiole flat dorsally (Fig. 91) . . . . *mallochi* Finnamore

5' Petiole convex dorsally (Fig. 89) 6

6 Abdomen with red on tergum II, tergum III black . . *pauper* Packard

6' Abdomen with red on tergum II and part of III . . *foxi* Finnamore

7 Petiole flat dorsally (Fig. 91) 8

7' Petiole convex dorsally (Fig. 89) 10

8 First abdominal tergum completely red; petiole about as long as first tergum, and distinctly wider apically than basally (Fig. 88) . . . . . *basirufa* Packard

8' First abdominal tergum with black; or if almost red then petiole is very nearly of uniform width (Fig. 90) . . . 9

9 Abdomen with red on terga I and II only . . . *mallochi* Finnamore

9' Abdomen with red on terga I to IV . . . *iroquois* Finnamore

10 Abdomen with red on apex of first, all of second and extreme base of third terga; size smaller, less than 7 mm . . . . . *pauper* Packard

10' Abdomen red on apex of first, all of second and all or most of third terga; size larger, greater than 7 mm . . 11

11 Foretibia orange-yellow; pubescence of face silver with sculpture visible beneath . . . . . *foxi* Finnamore

11' Foretibia black; pubescence of face golden, obscuring sculpture beneath . . . . . *huron* Finnamore

Mimesa basirufa Packard

Figs. 37, 88

Mimesa basirufa Packard, 1867: 406.

Mimesa nebrascensis H. Smith, 1908a: 390.

Diagnosis: Male; antennal flagellum with not more than six apical segments bright orange-yellow beneath; hypoepimeral area of mesopleuron longitudinally striate; propodeum with reticulate sculpture and sculpture immediately laterad of enclosure; petiole flat dorsally; abdomen with red on first and second terga.

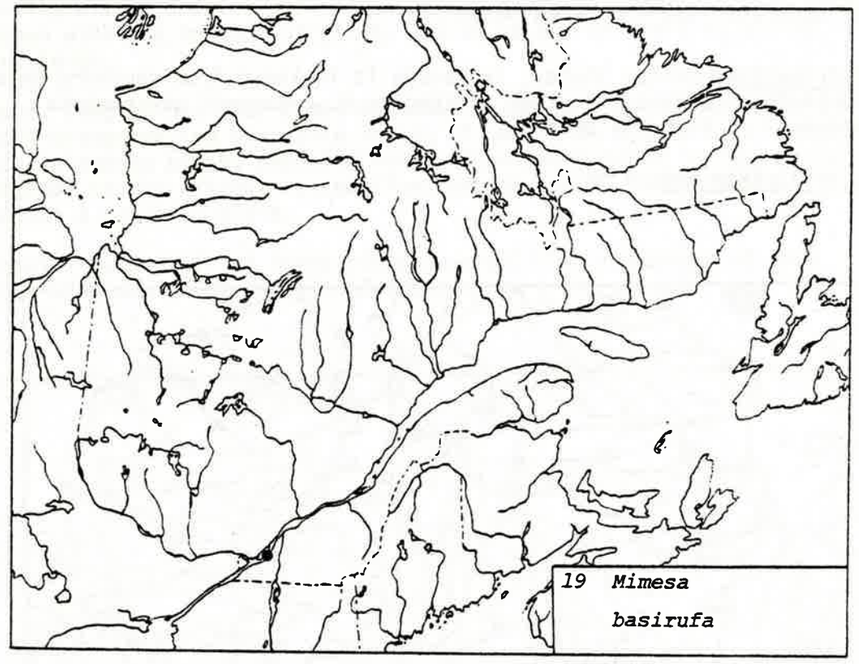
Female; propodeum with reticulate sculpture and sculpture immediately laterad of enclosure; petiole flat dorsally, sides not parallel; abdomen entirely red on first tergum.

Biology: Krombein (1961) and Kurczewski and Lane (1974) have published information on this species. The nest contains several cells and is constructed in sandy soil. Prey consist of leafhoppers (Cicadellidae)

provisioned at the rate of 2-6 individuals per cell. The following species have been reported as prey: *Macropis viridis* (Fitch), *Oncopsis variabilis* (Fitch), *O. sorbrius* (Walker) and *Idiocerus* sp.

Distribution: United States (Bohart and Menke, 1976); it is also found in British Columbia but has not previously been reported from Quebec.

Material Examined: 13 females.



Mimesa cressonii cressoni Packard

Mimesa cressonii Packard, 1867: 405.

Mimesa denticulata Packard, 1867: 406.

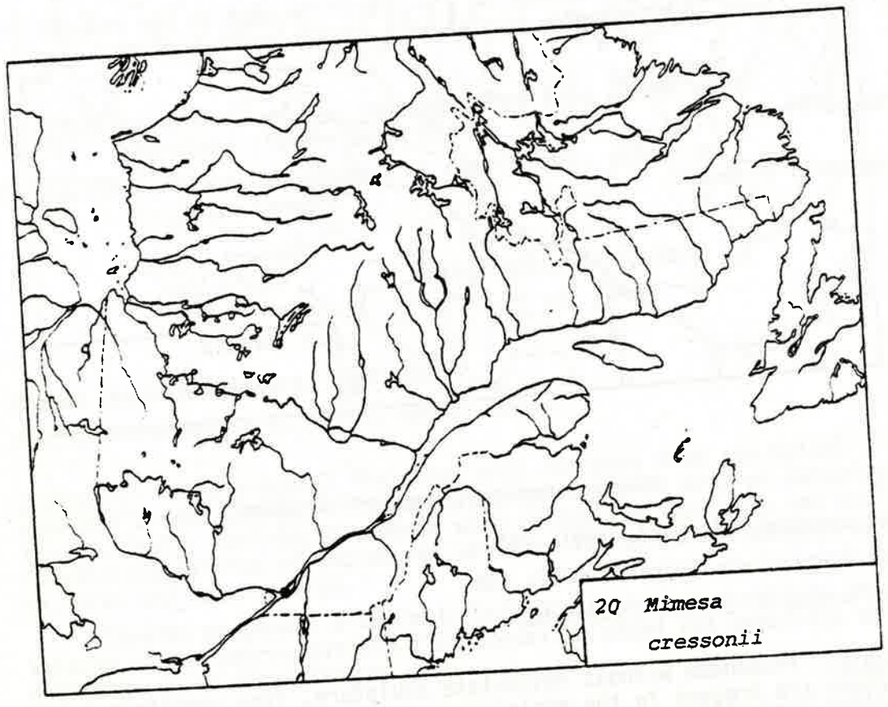
Mimesa conica H. Smith, 1908a: 389.

Diagnosis: Propodeum without reticulate sculpture, fine sometimes faint striations are present in the enclosure and on the dorsolateral areas of the propodeum, becoming faint to obsolescent toward lateral areas; abdomen with red on first and second terga.

Biology: Kurczewski and Lane (1974) have made observations on this species. The nest is located in sandy soil and contains several cells. Prey consist primarily of Cicadellidae but Delphacidae and Psyllidae are also used. Cells are provisioned with 9-17 individuals of the following species: Cicadellidae: *Doratura stylata* (Boheman), *Diplocolenus configuratus* (Uhler), *Athysanella longicauda* Beirne, *Polyamia compacta* (Osborn and Ball), *Laevicephalus melsheimeri* (Fitch), *Scaphytopius* sp.; Delphacidae: *Delphacodes campestris* van Duzee, *Laccocera vittipennis* van Duzee, *Liburniella ornata* (Stal); Psyllidae: *Craspedolepta* sp. The cleptoparasitic fly *Senotainia trilineata* (Wulp) has been recorded from this wasp.

Distribution: United States, in Canada it is known from southern Ontario and southern Quebec. Another subspecies *M. cressonii atriventris* (Malloch) is found in Ontario.

Material Examined: 1 male.



20 *Mimesa cressonii*

Mimesa foxi Finnamore

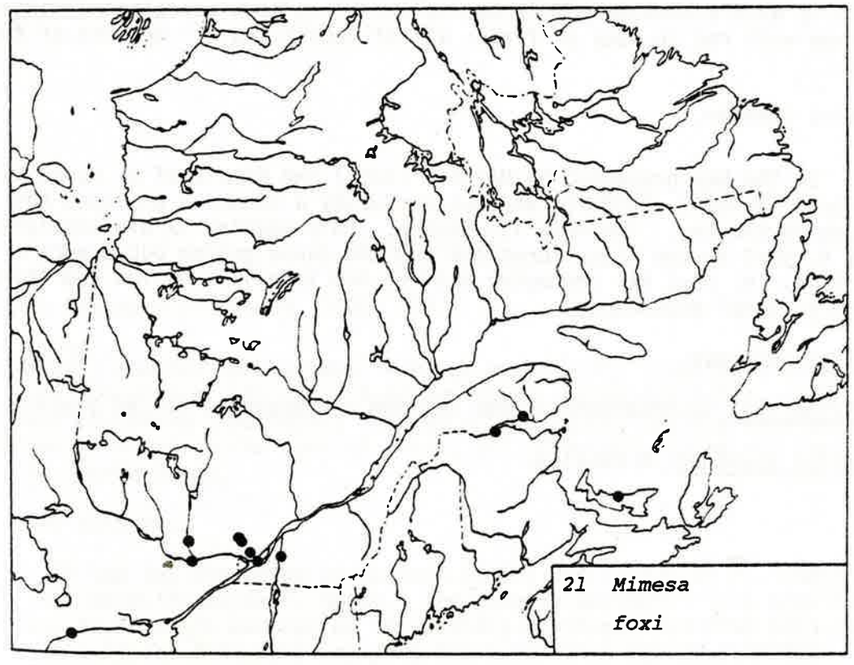
Figs. 18, 89

Mimesa foxi Finnamore, 1980: 293.

Diagnosis: Hypoepimeral area of mesopleuron longitudinally striate; propodeum with reticulate sculpture laterally and posteriorly, with evident sculpture immediately laterad of enclosure; petiole convex dorsally with a shallow piliferous sulcus along each dorsolateral edge; abdomen with red on apex of first, all of second and part or all of third terga.

Male; length, not over 7 mm; antennal flagellum swollen apically and bright orange-yellow on entire length of underside except basal segment which is mostly black; pronotum without toothed lateral angles; apical abdominal tergum without raised lines on its apical fourth which simulate a pygidial plate.

Female; outer half of foretibia orange-yellow; pubescence of face silver with sculpture visible beneath.



21 *Mimesa foxi*

In the key presented by Malloch (1933) both male and female of *M. foxi* key to *M. borealis* F. Smith, which is actually a *Mimmesa* and does not belong in the key.

Biology: Unknown.

Distribution: Canada, east of Rockies from Alberta to Prince Edward Island as well as the northern tier of States.

Material Examined: 25 males; 32 females.

Mimesa huron Finnamore

Fig. 90

Mimesa huron Finnamore, 1980: 296.

Diagnosis: Female; pubescence of face dense golden, obscuring sculpture beneath; foretibia black; hypoepimeral area of mesopleuron longitudinally striate; propodeum with reticulate sculpture posterolaterally and with evident sculpture immediately laterad of enclosure; petiole convex dorsally with a shallow piliferous sulcus along each dorsolateral edge; abdomen with red on apex of first, all of second and all or most of third terga.

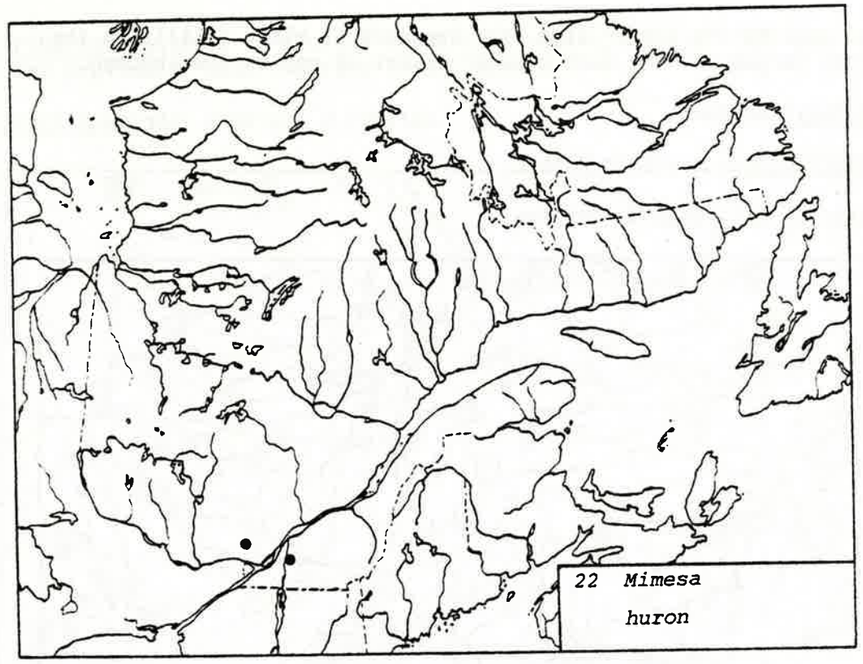
Male; unknown.

In the key presented by Malloch (1933) the female of *M. huron* will key to *M. borealis* F. Smith which is actually a *Mimmesa* and does not belong in the key. The male is unknown. This species is distinguished from *M. foxi* by the black foretibia and the dense golden pubescence of the face. *M. foxi* has the outer half of the foretibia yellow and thinner silvery facial pubescence.

Biology: Unknown.

Distribution: Southwestern Quebec and the northeastern United States.

Material Examined: 6 females.



Mimesa iroquois Finnamore

Figs. 3, 91

Mimesa iroquois Finnamore, 1980: 297.

Diagnosis: Female, hypoepimeral area of mesopleuron longitudinally striate; propodeum with reticulate sculpture posterolaterally, with evident sculpture immediately laterad of enclosure; petiole flat dorsally; abdomen with red on the apex of first, all of second, third and laterally on the fourth terga.

Male; unknown.

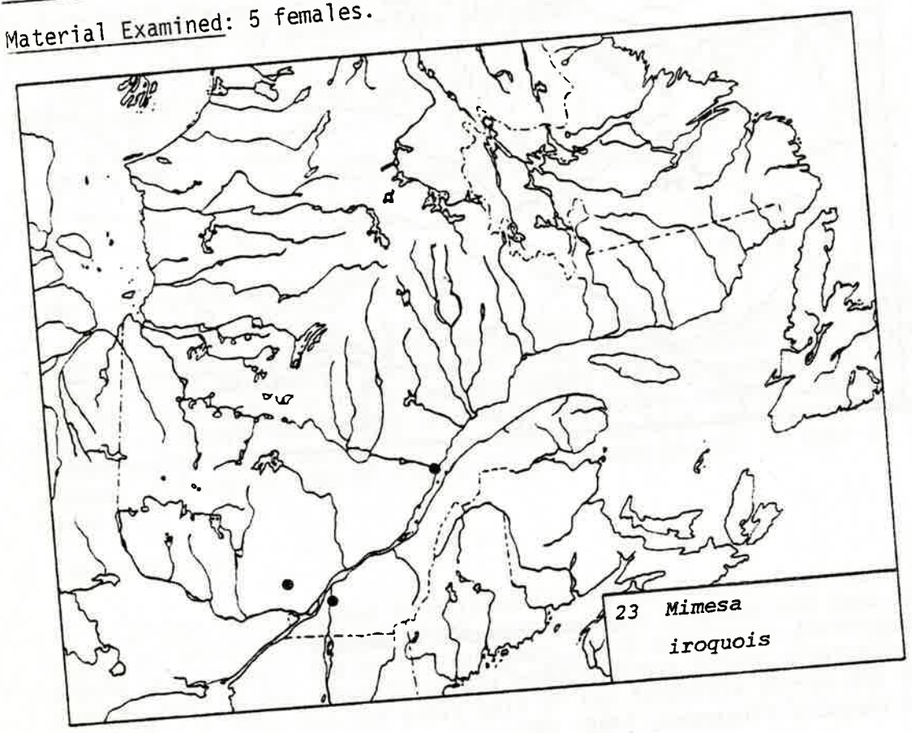
In the key presented by Malloch (1933) the female of *M. iroquois* will key to *M. borealis* F. Smith. The male is unknown. This species is closest to *basirufa* and can be immediately distinguished from both *foxi* and *huron* by the flat petiole; *foxi* and *huron* have convex petioles dorsally. *M. iroquois* is also easily distinguished from *basirufa* and

mallochi by its larger size, the presence of black basally on the first tergum and the much greater extent of red on the abdomen.

Biology: Unknown.

Distribution: southern Quebec.

Material Examined: 5 females.



Mimesa maculipes (Fox)

Psen maculipes Fox, 1893a: 117.
Psen nigrescens Rohwer, 1910a: 168.
Psen perplexa Rohwer, 1910a: 169.

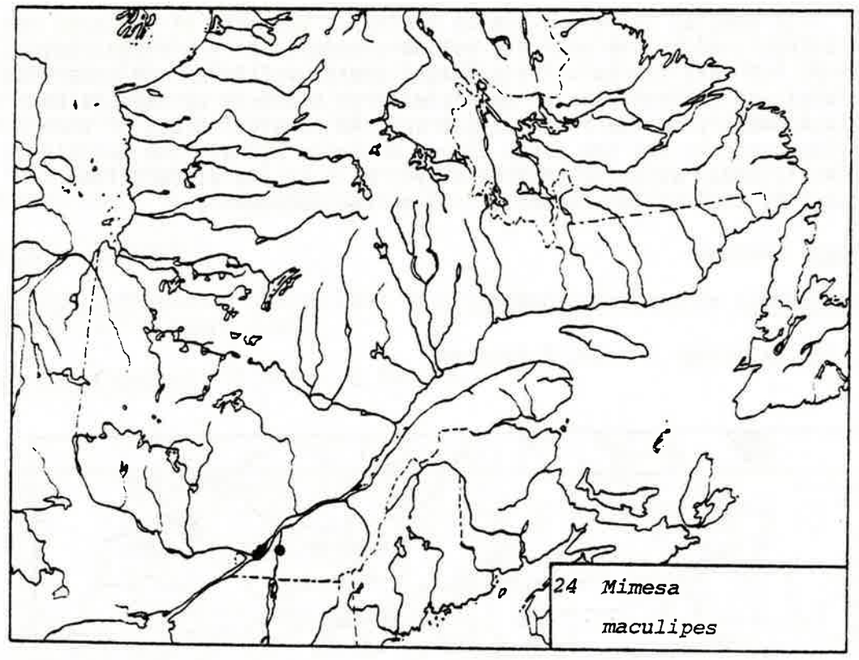
Diagnosis: Abdomen black.

Male; propodeum with reticulate sculpture; first sternum beyond petiole much longer than either second or third.

Biology: Unknown.

Distribution: Ontario to Florida (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 2 males; 2 females.



Mimesa mallochi Finnamore

Mimesa mallochi Finnamore, 1980: 299.

Diagnosis: Hypoepimeral area of mesopleuron longitudinally striate or striatopunctate; propodeum with reticulate sculpture, with evident sculpture immediately laterad of enclosure; petiole flat dorsally, sides parallel.

Male; abdomen with red on apex of first and most of second terga.

Female; abdomen with red on apical half of first and all or most of second terga.

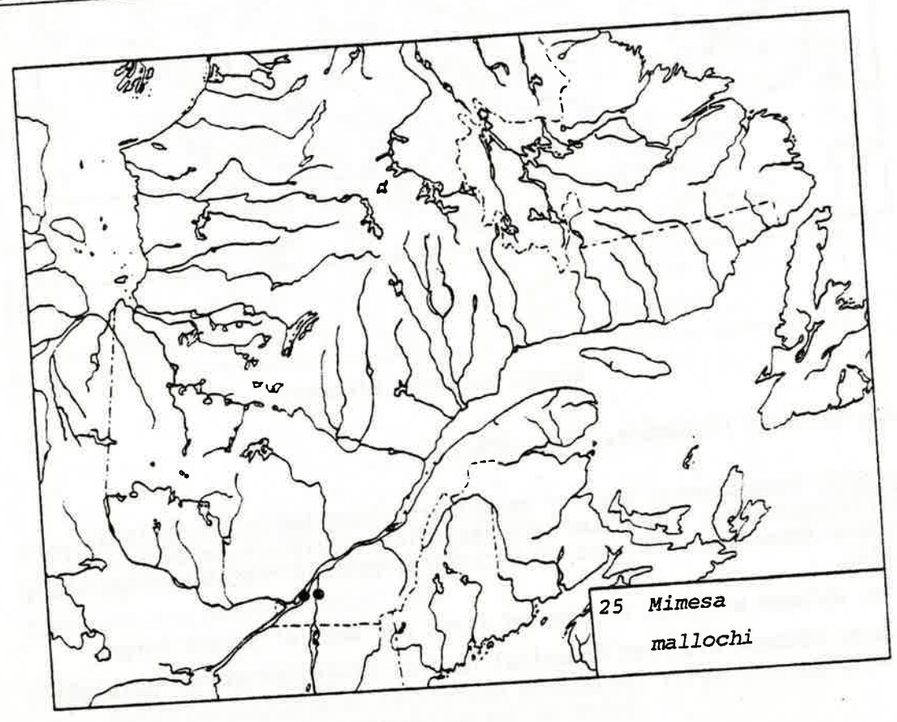
In the key presented by Malloch (1933) the male of *M. mallochi* will key to *pauper* from which it differs by the dorsally flat petiole and black fore and midtibia; *pauper* has a convex petiole and yellow fore and midtibia. The female of *mallochi* will key either to *basirufa* or to *pauper*. The flat petiole will readily separate *mallochi* from *pauper*.

This species is very close to *basirufa*, the male of *mallochi* can be distinguished by the entirely yellow underside of the flagellum; *basirufa* has only the apical six flagellomeres yellow on the underside. The female of *mallochi* can be separated from *basirufa* by the presence of black basally on the first tergum and the parallel sides of the petiole; *basifura* has the first tergum entirely red and the petiole is distinctly wider apically than basally. *M. mallochi* differs from *iroquois* by the smaller amount of red on the abdomen.

Biology: Unknown.

Distribution: southwestern Quebec.

Material Examined: 1 male; 2 females.



25 *Mimesa mallochi*

Mimesa pauper Packard

Mimesa pauper Packard, 1867: 409.

Mimesa cingulata Packard, 1867: 410.

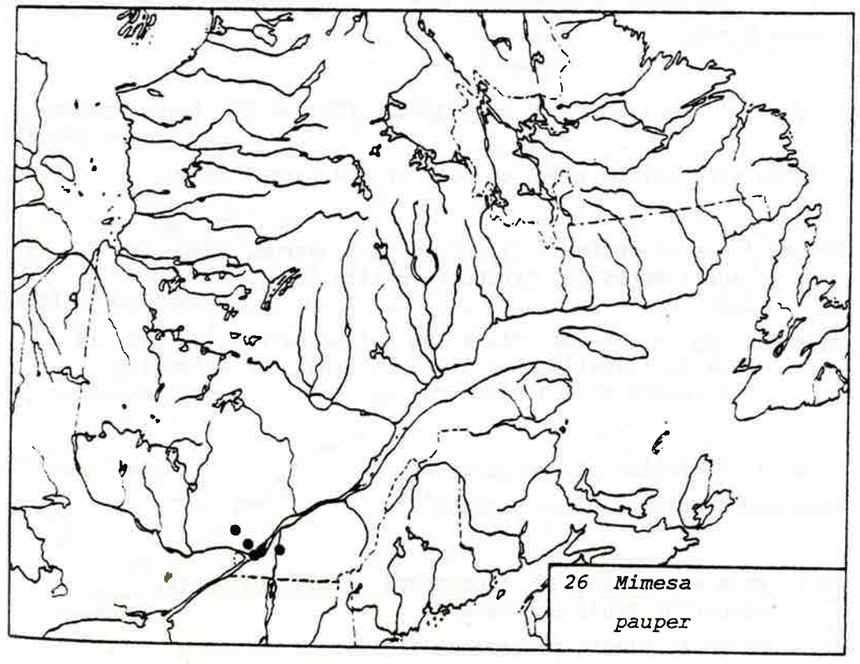
Diagnosis: Hypoepimeral area of mesopleuron longitudinally striate; propodeum with coarsely reticulate sculpture, sculpture evident immediately laterad of enclosure; petiole convex dorsally and shorter than hindfemur; abdomen with red on apex of first and all or most of second terga.

Male; antennal flagellum with entire underside yellow except first segment which is predominantly black; size small, under 7 mm length.

Biology: Unknown.

Distribution: United States east of Rocky Mountains and in Canada from Alberta and southern Quebec.

Material Examined: 15 males; 3 females.



26 *Mimesa pauper*

Genus *Mimumesa* Malloch

Mimumesa Malloch, 1933: 16.

Diagnosis: Omaulus continued by an acetabular carina to midventral line; hypoepimeral area smooth and bulging; hindwing media diverging well before cu-a; dorsal surface of petiole longitudinally carinate, with conspicuous outwardly directed hairs along inside of laterodorsal carina.

Bohart and Menke (1976) list 29 species in this genus of which 15 are Nearctic. Malloch (1933) provides a key to most of the Nearctic species, but some revision is needed.

Key to Quebec Species of *Mimumesa*

1 Males, antenna with 13 segments 2

1' Females; antenna with 12 segments 5

2 Antennal flagellum yellow beneath, flagellomeres 4-6 with a conspicuous raised black area . . . . . *mellipes* (Say)

2' Antenna black 3

3 Antenna with raised lines only on the 7th and 8th flagellomeres . . . . . *nigra* (Packard)

3' Antenna with raised lines on most of the flagellomeres . . . 4

4 Raised lines on antennal flagellum very narrow, those on flagellomeres 3-6 extending entire length of flagellomere . . . . . *propinqua* (Kincaid)

4' Raised lines on antennal flagellum not so narrow, as wide as those on flagellomeres 7 and 8, lines not extending full length of flagellomere . . . . . *leucopus* (Say)

5 Antennal flagellum yellow beneath . . . . . *mellipes* (Say)

5' Antennal flagellum black beneath 6

6 Tarsi pale white beneath; pubescence of clypeus dense, obscuring sculpture beneath . . . . . *leucopus* (Say)

6' Tarsi brown to black; pubescence of clypeus variable . . . 6

7 Pygidial plate with fine but distinct microsculpture; pubescence of clypeus dense, partially obscuring sculpture beneath . . . . . *propinqua* (Kincaid)

7' Pygidial plate shining, microsculpture indistinct or absent; pubescence of clypeus thin, sculpture easily visible . . . . . *nigra* (Packard)

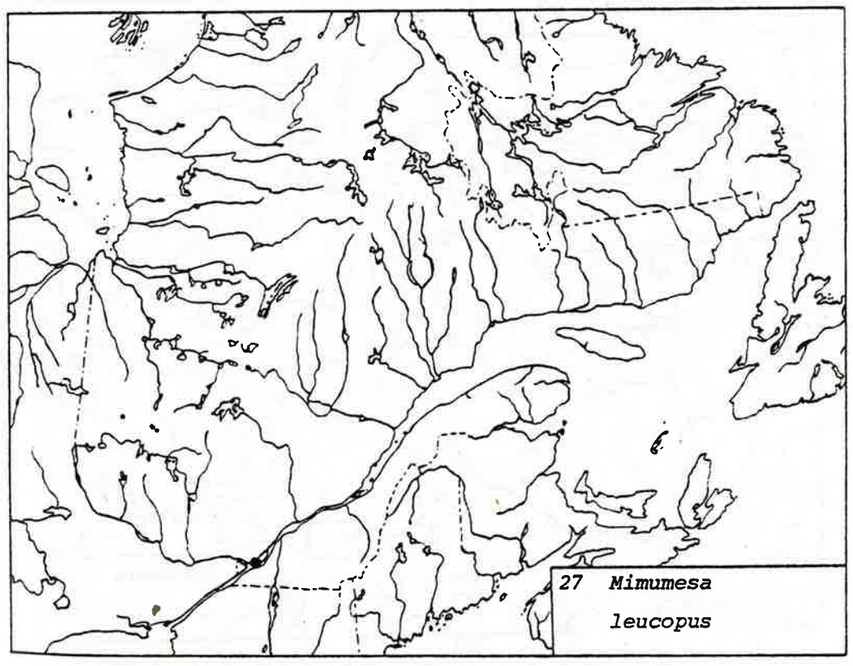
Mimumesa leucopus (Say)

Fig. 92

Psen leucopus Say, 1837: 370.

Psen elongatus Packard, 1867: 400.

Diagnosis: Antennal flagellum black; scutum with longitudinal ridges posteriorly; abdomen black.



27 *Mimumesa leucopus*

Male; raised lines on antennal flagellum about as wide as those on flagellomeres 7 and 8, lines not extending full length of flagellomeres.

Females; head behind ocelli smooth, with few punctures; tarsi white at least beneath; pygidial plate narrow.

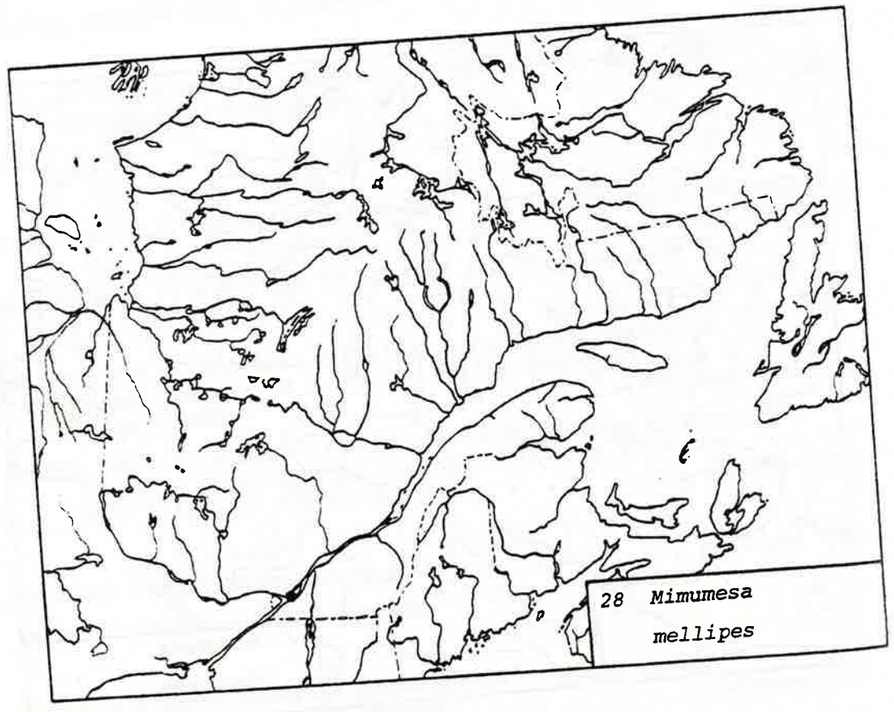
Biology: Unknown.

Distribution: eastern United States, Alberta and Quebec in Canada.

Material Examined: 1 female.

Mimumesa mellipes (Say)

Psen mellipes Say, 1837: 369.
Psen chalcifrons Packard, 1867: 401.



28 *Mimumesa mellipes*

Diagnosis: Antenna yellow beneath; scutum longitudinally striate posteriorly; mesopleuron dull with fine longitudinal striatopunctate sculpturing; abdomen black.

Biology: Unknown.

Distribution: Central and eastern United States (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

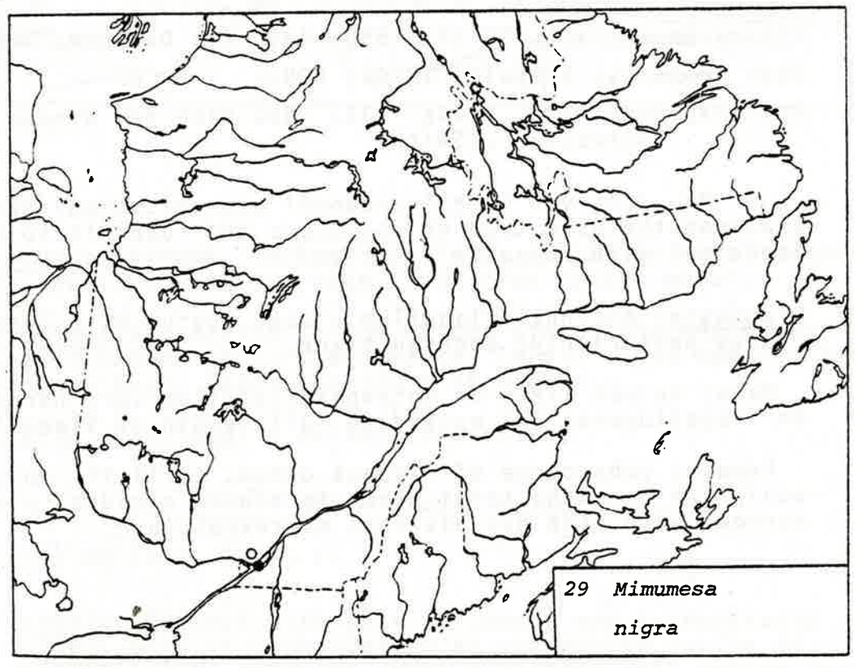
Material Examined: 2 males; 2 females.

Mimumesa nigra (Packard)

Fig. 19

Psen niger Packard, 1867: 399.

Diagnosis: Antennal flagellum black; scutum with longitudinal ridges posteriorly; abdomen black.



29 *Mimumesa nigra*

Male; antennal flagellum with raised lines on only the 7th and 8th flagellomeres.

Female; pubescence of clypeus thin, sculpture easily visible; tarsi brown to black; pygidial plate narrow, shining, microsculpture indistinct or absent.

Biology: Gurney (1951) found a nest of this species containing several cells in a rotting piece of wood. The cells were provisioned with Cicadellidae of the genus *Agallia*.

Distribution: Transition zone of North America (Bohart and Menke, 1976).

Material Examined: 5 males; 1 female. Other records from Malloch (1933), open circles.

Mimumesa propinqua (Kincaid)

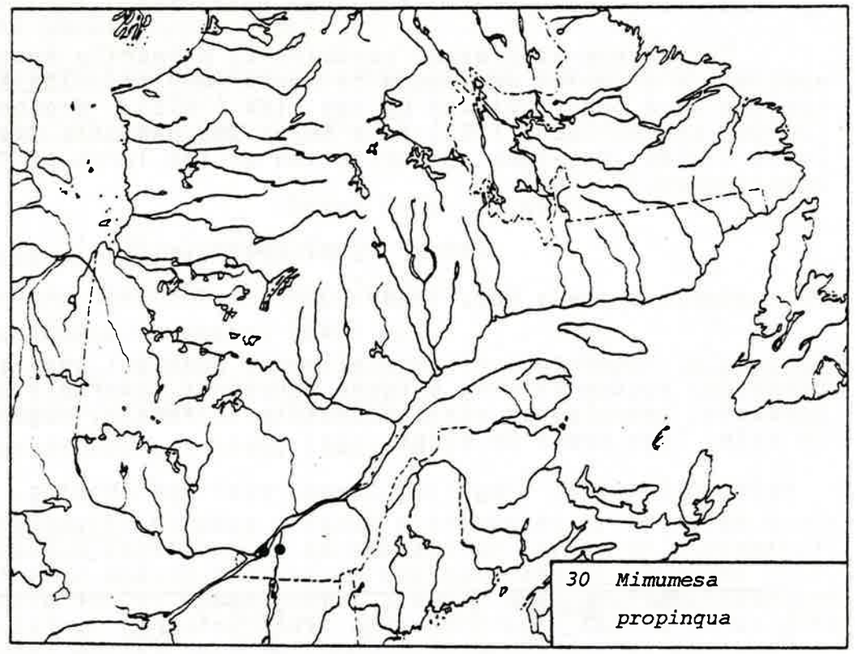
Mimesa borealis F. Smith, 1856: 431, *nec* Dahlbom, 1842:8.
Psen propinqua Kincaid, 1900a: 508.
Psen psychrus Pate, 1944a: 133. New name for *Mimesa borealis* F. Smith.

Mr. J.P. van Lith (personnel communication) has examined the male type of *propinqua* and found it to be identical with *borealis* F. Smith.

Diagnosis: Antennal flagellum black; scutum with longitudinal ridges posteriorly; abdomen black.

Male; raised lines on antennal flagellum very narrow, those on flagellomeres 3-6 extending full length of flagellomere.

Female; pubescence of clypeus dense, partially obscuring sculpture beneath; tarsi brown to black; pygidial plate narrow, with fine but distinct microsculpture.



30 *Mimumesa propinqua*

Biology: Unknown; several specimens in the material examined are labelled with the note "bred from rotten wood".

Distribution: Alaska in the United States and the Hudson Bay area of Canada (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 2 males; 10 females.

Genus *Pseneo* Malloch

Pseneo Malloch, 1933: 7.

Diagnosis: Clypeus with apex thickened and transversely bevelled; omaulus continued by an acetabular carina to midventral line; hindwing media diverging well before cu-a; hindfemur with a distal patch of silver pubescence on the

inner side; dorsal surface of petiole without longitudinal carinae; male sterna without apical frimbriae.

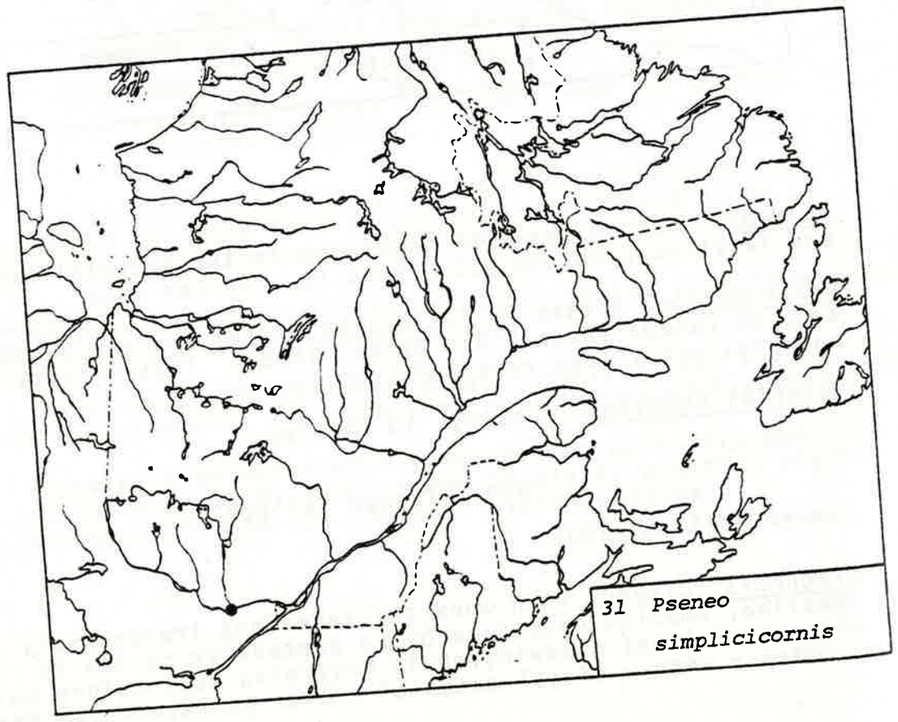
This genus at present contains 23 primarily Neotropical species, 4 of which are found in North America. The American species have been reviewed by van Lith (1975). Krombein (1950b) and Malloch (1933) have keyed the Nearctic species. Evans (1959a) provides a description of the larva of *Pseneo simplicicornis* (Fox).

Pseneo simplicicornis (Fox)

Psen simplicicornis Fox, 1898: 10.

Diagnosis: Pubescence of face silvery; pronotal angles not produced; scutum shining between punctures, coarsely striato-punctate; mesopleuron striatopunctate in female, rugosopunctate in male; legs brown or black.

Male; tyloids of flagellum large, oval and shining.



Biology: Krombein (1950b, 1951, 1963b) found this species nesting in decaying wood and preying on leafhoppers of the genus *Graphocephala*.

Distribution: eastern United States (Bohart and Menke, 1976).

Material Examined: 2 females.

Genus *Psen* Latreille

Psen Latreille, 1796:112.
Psenia Stephens, 1829b: 361.
Dahlbomia Wissmann, 1849: 9.
Mesopora Wesmael, 1852: 279.
Caenopsen Cameron, 1899: 55.
Punctipsen van Lith, 1968: 125.

Diagnosis: Clypeus without a thickened or bevelled apex; omaulus continued by an acetabular carina to midventral line or ending just as it becomes ventral or turns posteriorly; hypoepimeral area of mesopleuron smooth and bulging; hindwing media diverging well before cu-a; without inner distal hair patch on hindfemur; dorsal surface of petiole polished without longitudinal carinae but with conspicuous outstanding hair laterally and ventrally; male sterna IV and often III with apical frimbriae.

There is some disagreement on the exact limits of this genus. Bohart and Menke (1976) do not agree with van Lith (1975). Bohart and Menke (1976) treat *Psen* and *Pseneo* as separate genera which correspond approximately with the subgenera of van Lith (1975); they limit *Psen* to those species with an omaulus which turns posteriorly as it becomes ventral, or if only turning slightly posteriorly then it is not continuous with the acetabular carina. *Psen* and *Pseneo* are treated by van Lith as subgenera of *Psen*, but he points out that some species of subgenus *Psen* have a complete acetabular carina which is continuous with the omaulus, the males of these species having apical frimbriae on the third and fourth sterna, a character absent in *Pseno*. Although I have followed Bohart and Menke (1976) in using two separate genera, I have followed van Lith (1975) in generic limitations and generic diagnosis.

This genus contains 85 species, 4 of which are Nearctic. Malloch (1933) has keyed the North American species while van Lith (1975) has keyed the New World species. A

description of the larva of *Psen barthi* was provided by Evans (1959a).

Key to Quebec Species of *Psen*

1 Abdomen red . . . . . *monticola* (Packard)
1' Abdomen black 2

2 Petiole red . . . . . *erythopus* Rohwer
2' Petiole black . . . . . *barthi* Viereck

Psen barthi Viereck

Psen barthi Viereck, 1907a: 251.
Mimesa myersianus Rohwer, 1909d: 324.

Diagnosis: Colour black; pronotum normal, without projections; scutum finely punctate in rows; scutellum impunctate; acetabular carina complete.

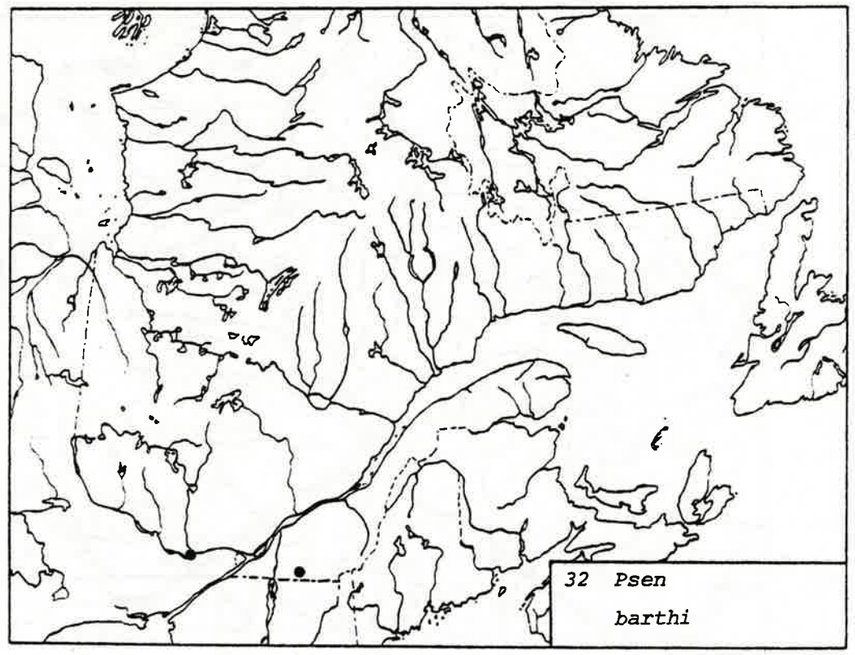
Male; only fourth sternum with apical frimbriae.

Female; pygidial plate narrowly triangular, shining.

Biology: Barth (1907) and Krombein (1963b) found this species nesting in decaying wood or surface detritus. Prey consists of Membracidae and the following Cicadellidae: *Cyrtolobus fenestratus* Fitch, *Atyma inornata* Say and *Micrutalis calva* (Say).

Distribution: eastern United States and the Province of Quebec in Canada.

Material Examined: 1 female. Other records from van Lith (1975).



32 *Psen barthi*

Psen erythopus Rohwer

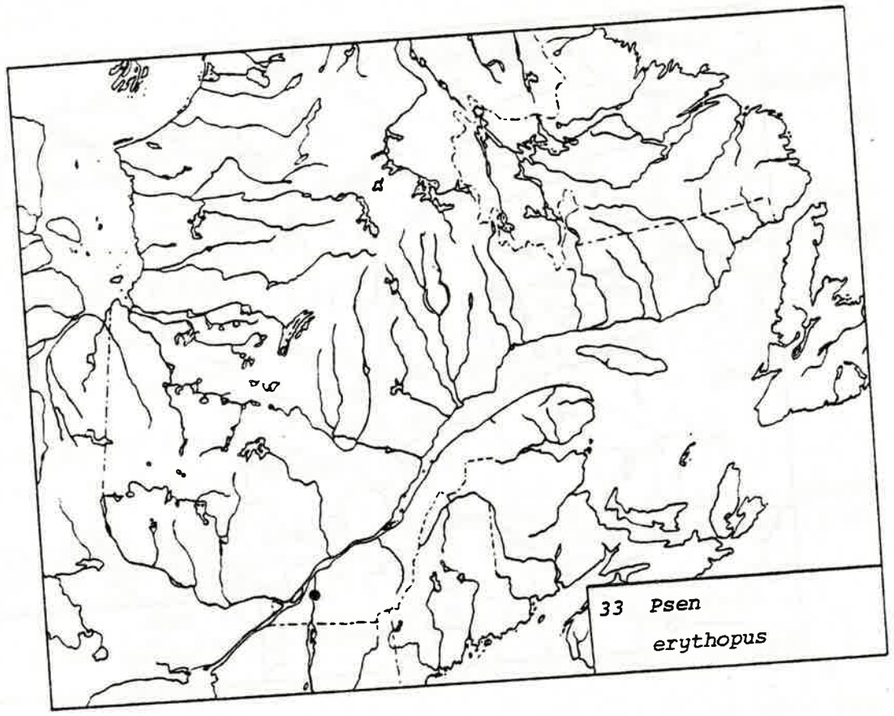
Psen erythopus Rohwer, 1910c: 102.
Psen erythropus Malloch, 1933: 4.

Diagnosis: Pronotum normal; acetabular carina absent; petiole red; abdomen black.

Biology: Malloch (1933) recorded the cercopid *Aphrophora quadrinotata* Say as prey.

Distribution: eastern United States. This species has not previously been reported from Quebec.

Material Examined: 1 female.



Psen monticola (Packard)

Figs. 2, 20.

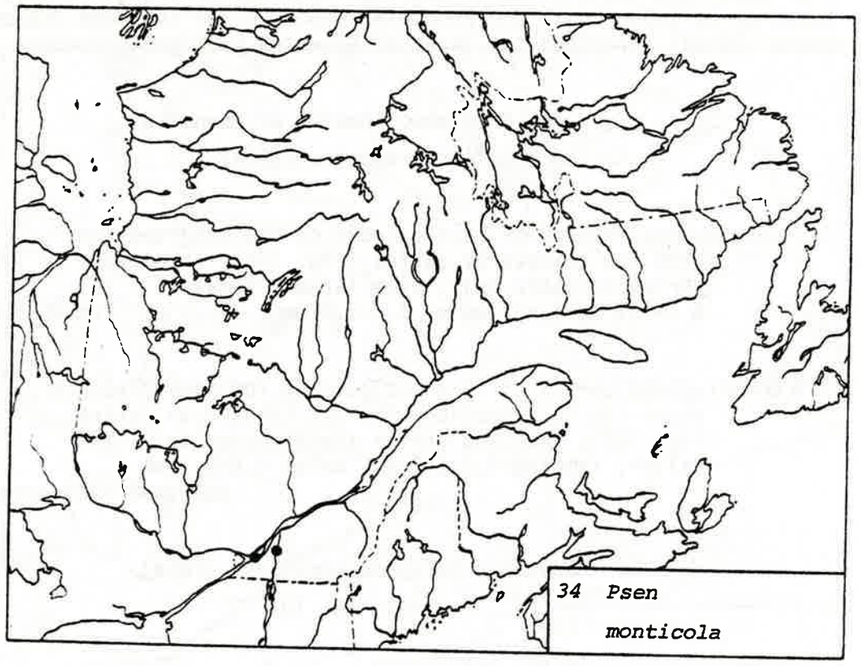
Mimesa monticola Packard, 1867: 407.

Diagnosis: Pronotum normal, without projections; acetabular carina absent; petiole black; abdomen red.

Biology: Unknown.

Distribution: eastern United States and southern Ontario in Canada. This species has not previously been reported from Quebec.

Material Examined: 2 males; 7 females. Other records from van Lith (1975), open circles.



Genus *Psenulus* Kohl

Psenulus Kohl, 1897: 293.

Neofoxia Viereck, 1901: 338.

Stenomellinus Schulz, 1911: 142.

Eopsenulus Gussakovskij, 1934: 84.

Nipponopsen Yasumatsu, 1938: 84.

Diodontus of authors (mainly American).

Diagnosis: Frontal carina raised between antennal bases and connected below with a cross carina, at least in males; hindwing media diverging beyond cu-a; hindcoxa without a downward directed bristle; female without a foretarsal rake.

This genus is the largest in the subfamily with 121 species, 4 of which are found in North America. The Nearctic species have been keyed by Malloch (1933) and Krombein (1950a) under the name *Diodontus*. Evans (1959a) described the larva of *Psenulus pallipes parenosas* (Pate).

Key to Quebec Species of *Psenulus*

(After Krombein, 1950a)

1 Longitudinal carina of face sulcate to its intersection with the transverse carina (Fig. 108); face and vertex punctate only; size larger, females 6.1-7.1 mm long, males 5.6-6.4 mm. . . . *trisulcus* (Fox)

1' Longitudinal carina of face not sulcate for some distance above its intersection with the transverse carina (Fig. 107); face and vertex striatopunctate; size smaller, females 4.4-6.1 mm, males 4.6-6.1 mm . . . . . *pallipes parenosas* (Pate)

Psenulus pallipes parenosas (Pate)

Figs. 38, 107

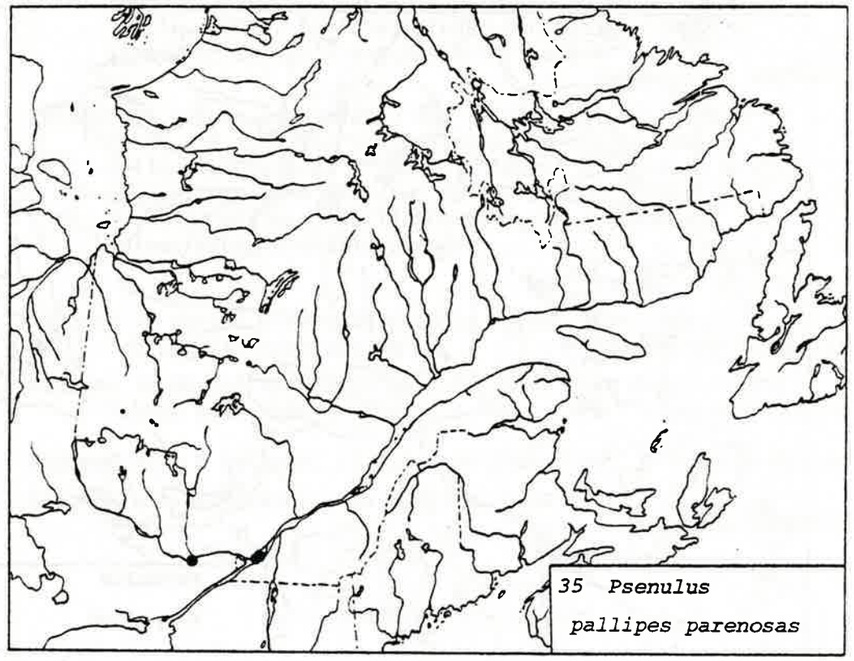
Diodontus parenosas Pate, 1944a: 133.

Diagnosis: Transverse facial carina present; longitudinal carina on face not sulcate for some distance above its intersection with the transverse carina; petiole with a broad median sulcus and lateral carina present for most of its length.

Biology: Krombein (1951, 1955a, 1958a, 1963b, 1967b, 1979) has published observations on the American subspecies. This wasp has been found nesting in hollow canes of *Rubus* and in abandoned beetle borings. The nest contains up to 10 cells provisioned with aphids of various genera. Up to 27 aphids per cell may be provisioned. The following are prey records for the American subspecies: *Macrosiphum* sp., *Therioaphis* sp. ? and *Drepanaphis acerifoliae* (Thomas). Freeman (1938) published information on the European subspecies *Psenulus pallipes pallipes* (Panzer), including the following prey records: *Macrosiphum pisi* (Kalt.), *Megoura viciae* (Kalt.), *Amphorophora cosmopolitanus* Mason, *Aphis* sp., *Myzocallis tiliae* (Linnaeus) and *Myzus* sp.

Distribution: *P. pallipes parenosas* occurs only in the United States and Canada; *P. p. pallipes* is found in Europe, North Africa, Syria and Siberia (Bohart and Menke, 1976). This species had not previously been reported from Quebec.

Material Examined: 5 males; 12 females.



35 *Psenulus pallipes parenosas*

Psenulus trisulcus (Fox)

Fig. 108

Psen trisulcus Fox, 1898: 5.

Diodontus corusanigrens Rohwer, 1920b: 229.

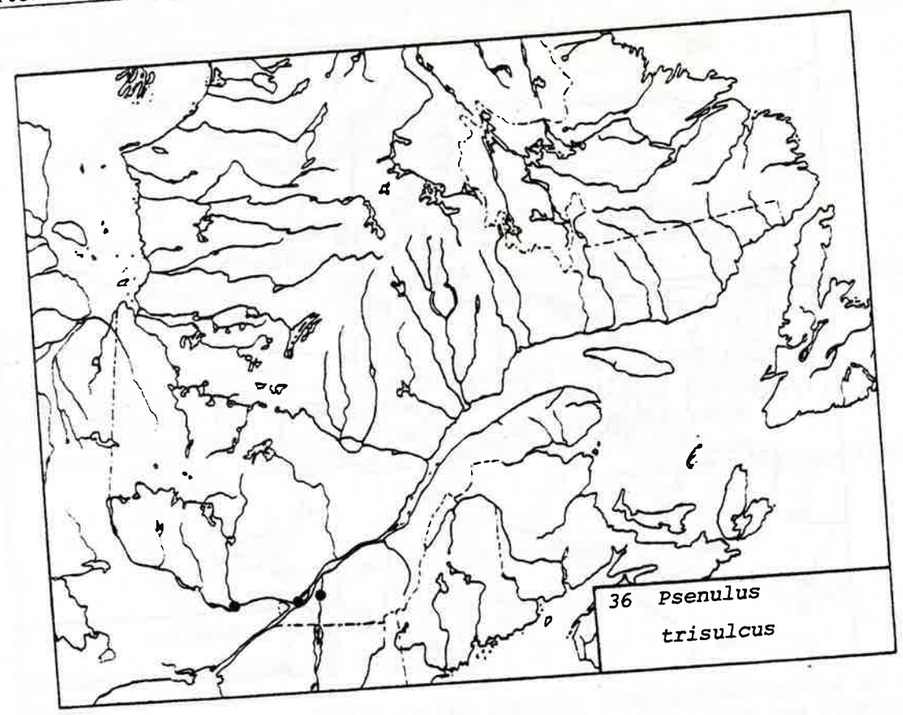
Diodontus sulcatus Malloch, 1933: 6.

Diagnosis: Transverse facial carina present; longitudinal carina on face sulcate to its intersection with transverse carina; petiole with a broad median sulcus and lateral carina present for most of its length.

Biology: Krombein (1951) reported this species being reared from elder stems.

Distribution: Central and eastern United States (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 2 males; 4 females.



Subfamily Pemphredoninae

Diagnosis: Antennal sockets placed just above clypeal margin; forewing with no more than two submarginal cells; sternal petiole present or absent.

Key to Quebec Genera of Pemphredoninae
(Adapted from Bohart and Menke, 1976)

1 Forewing with two recurrent veins and three discoidal cells; stigma small or moderate in size (Fig. 39) 2

1' Forewing with one recurrent vein and two discoidal cells; stigma large (Fig. 40) 4

2 Episternal sulcus well developed, extending from subalar fossa to hypersternaulus and beyond; hypersternaulus horizontal (Fig. 11); labrum with apex entire, usually roundly produced; mandible with two or three teeth; female without pygidial plate; hindtibia without a series of spines along posterior margin . . . . . *Passaloecus* Shuckard

2' Episternal sulcus incomplete, not evident between subalar fossa and hypersternaulus; hypersternaulus rising obliquely posterad (Fig. 12); labrum emarginate or entire; mandible with two to six teeth; female with pygidial plate; hindtibia often with a series of spines along posterior margin 3

3 Abdomen in dorsal view with petiole longer than wide; labrum with apex entire . . . . *Pemphredon* Latreille

3' Abdomen in dorsal veiw with petiole wider than long; labrum with apex entire . . . . *Diodontus* Curtis

4 Abdomen with a petiole; size larger than 3 mm . . *Stigmus* Panzer

4' Abdomen not petiolate; size smaller, less than 3 mm . . . . . *Spilomena* Shuckard

Genus *Diodontus* Curtis

Diodontus Curtis, 1834: text to plate 496.

Xylocelia Rohwer, 1915: 243.

Diagnosis: Mandible with two to six apical teeth; labrum emarginate; episternal sulcus not evident between subalar fossa and hypersternaulus; hypersternaulus rising obliquely posterad; forewing with two recurrent veins and three discoidal cells; hindtibia with a series of spines along posterior margin; abdomen in dorsal veiw with petiole wider than long; female with broadly triangular pygidial plate.

The genus *Diodontus* contains 76 species ranging over most of the world except Australia and South America (Bohart and Menke, 1976). There is at present no adequate key to the 27 Nearctic species but the work of Fox (1892d), Mickel (1916b) and Krombein (1939) are helpful. Evans (1958a) described the larva of *Diodontus franclemonti* (Krombein), the only species occurring in Quebec.

Diodontus franclemonti (Krombein)

Fig. 12

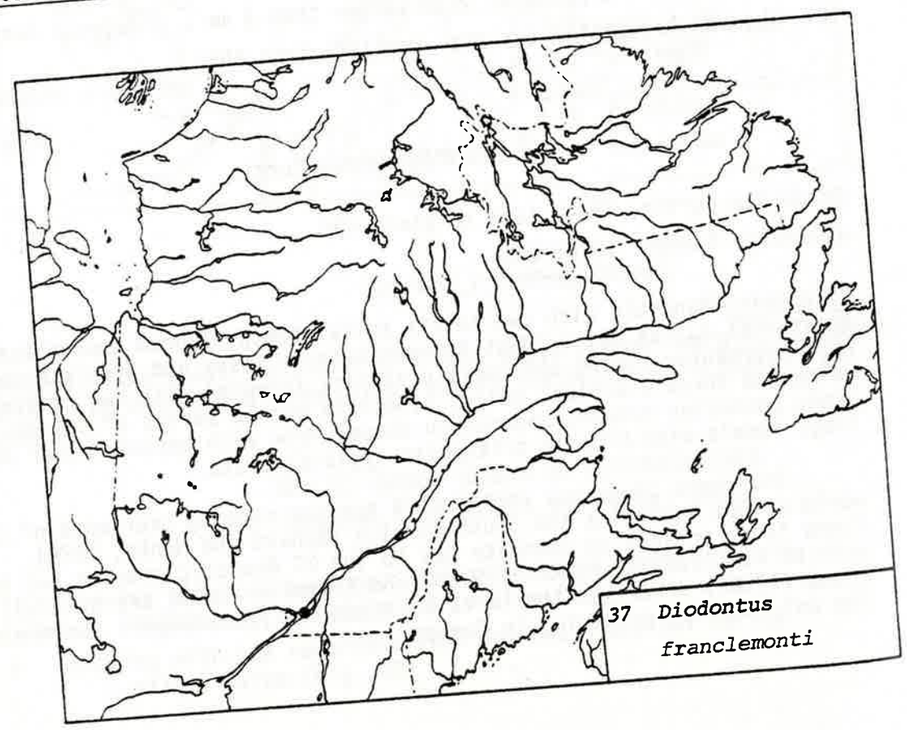
Xylocelia franclemonti Krombein, 1939: 142.

Diagnosis: Mandibles, pronotal lobes, foretibia, midtibia and occasionally hindtibia yellow; scutum evenly punctate or entire surface with distinct microsculpture between the punctures; male antennal flagellum with a yellow spot beneath flagellomeres one or two to ten.

Biology: Krombein *et al.* (1979) reported this species nesting gregariously in sand.

Distribution: northeastern United States (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 3 males; 5 females.



Genus *Pemphredon* Latreille

(*Pemphredon*) Latreille, 1796: 128.
(*Cemonus*) Panzer, 1806: 186.
Cemonus Jurine, 1807: 213.
Cenomus Gimmerthal, 1836: 436.
Dineurus Westwood, 1837: 173.
Ceratophorus Shuckard, 1837: 195.
Diphlebus Westwood, 1840: 81.
Chevrieria Kohl, 1883b: 658.
Susanowo Tsuneki, 1972: 12.

Diagnosis: Mandible with two to six teeth; labrum with apex entire; episternal sulcus not evident between subalar fossa and hypersternaulus; hypersternaulus rising obliquely posterad; forewing with two recurrent veins and three discoidal cells; stigma small; hindtibia with a series of spines along posterior margin; abdomen in dorsal view with petiole longer than wide; female with narrow spoonlike pygidial plate.

Pemphredon is, with one or two exceptions, a Holarctic genus containing 53 described species, 12 of which are found in the Nearctic Region (Bohart and Menke, 1976). There is no adequate key to the Nearctic species but the works of Fox (1892d) and Rohwer (1917b) are useful. Evans (1958a) described the larvae of *P. concolor* Say and *P. inornata* Say; Evans (1964a) described the larva of *P. lethifer* (Shuckard).

Key to Quebec Species of *Pemphredon*

1 Submarginal cells each receiving a recurrent vein . . . . . (*Pemphredon*) 2

1' First submarginal cell receiving both recurrent veins (Fig. 39) . . . . . (*Cemonus*) 3

2 Male scutum with wrinkles, striatopunctate, not smooth between punctures; ridge surrounding propodeal enclosure dull, with coarse microsculpture throughout; enclosure of propodeum irregularly rugose over most of its area; female clypeus slightly emarginate along anterior margin . . . . . *concolor* Say

2' Male scutum without wrinkles, smooth between punctures; ridge surrounding propodeal enclosure shining, microsculpture of ridge absent or very fine; enclosure of propodeum with longitudinal ridges throughout; female clypeus produced into a single median tooth . . . . . *montana* Dahlbom

3 Male with sides of head parallel for some distance behind eyes; flagellomeres 3-10 rounded beneath; scutum with close coarse almost contiguous punctures anteriorly; female clypeus truncate . . . . . *lethifer* (Shuckard)

3' Male with sides of head, not parallel, converging behind eyes; flagellomeres 3-7 or 8 rounded beneath; scutum with well separated (2-4 diameters) punctures anteriorly; female clypeus produced into a single median tooth . . . . *inornata* Say

Pemphredon (*Pemphredon*) *concolor* Say

Fig. 70

Pemphredon concolor Say, 1824: 339.
Pemphredon morio Cresson, 1865a: 486, *nec* van der Linden, 1829: 82.
Pemphredon concolor Say of Provancher, 1882: 78.
Pemphredon cressonii Dalla Torre, 1897: 356.
Pemphredon provancheri Dalla Torre, 1897: 359.
Pemphredon shawii Rohwer, 1917b: 100.

Diagnosis: First submarginal cell receiving one recurrent vein; ridge surrounding propodeal enclosure dull, with coarse microsculpture throughout.

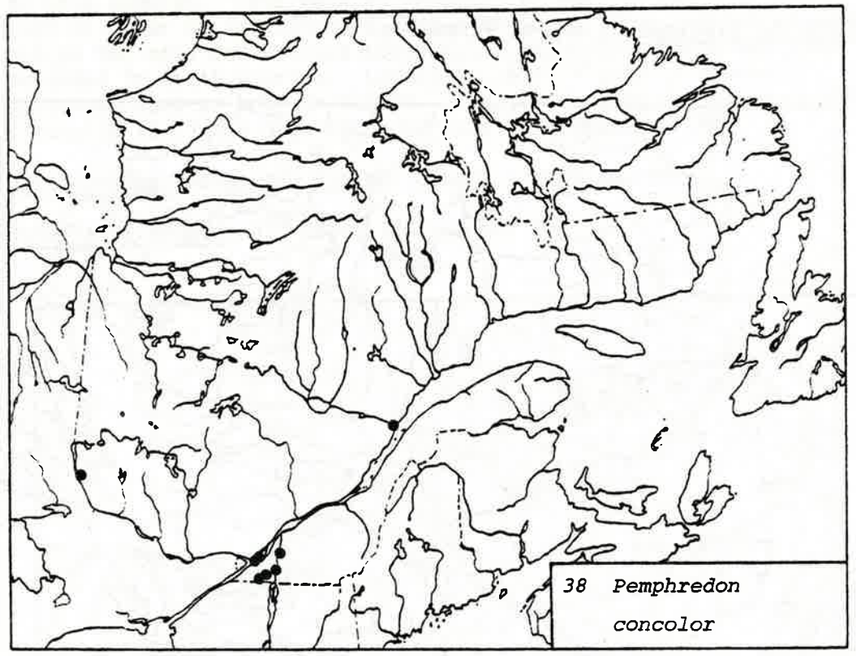
Male; scutum striatopunctate; enclosure of propodeum irregularly rugose over most of its area.

Female; clypeus slightly emarginate along anterior margin.

Biology: Reinhard (1929a) and Krombein *et al.* (1979) reported this species nesting in abandoned beetle borings in an old stump, preying on the aphid *Longistigma caryae* (Harr.) and being parasitized by the chrysidid wasp *Omalus janus* (Haldeman) and the ichneumonids *Perithous mediator pleuralis* (Cr.) and *Phalacrotophora longifrons* (Brues).

Distribution: United States, Transition Zone (Bohart and Menke, 1976).

Material Examined: 1 male; 13 females.



Pemphredon (*Pemphredon*) *montana* Dahlbom

Pemphredon montana Dahlbom, 1845: 508.
Pemphredon angularis Fox, 1892d: 310.

Diagnosis: First submarginal cell receiving one recurrent vein; ridge surrounding propodeal enclosure shining, microsculpture absent or very fine; enclosure of propodeum with long longitudinal ridges throughout.

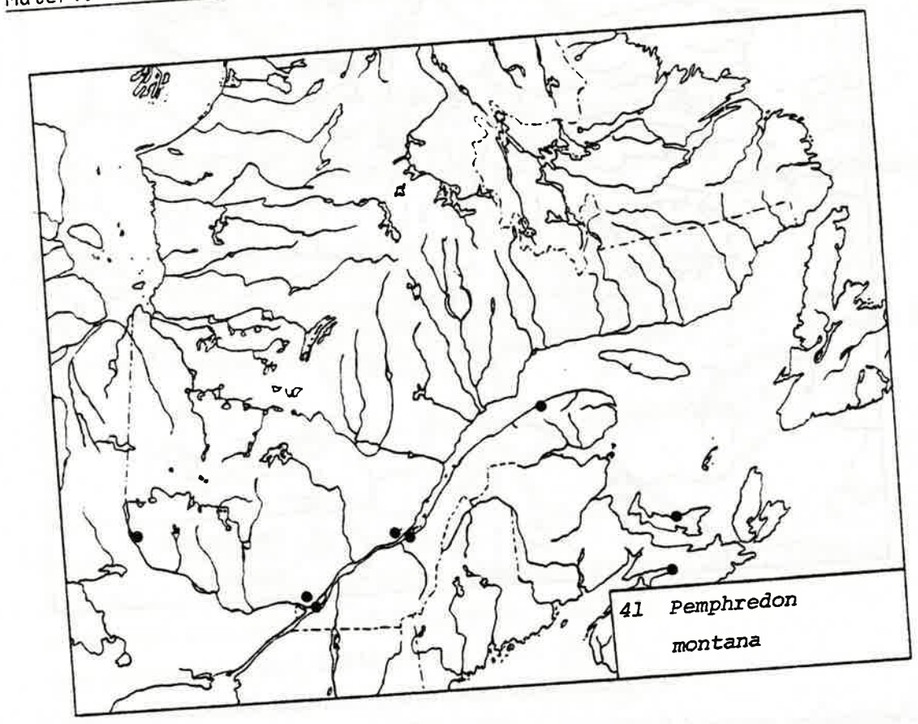
Male scutum without wrinkles, smooth between punctures.

Female clypeus produced into a single median tooth.

Biology: Lomholdt (1975) mentioned that the tunnel system of the nests of this species are often very complicated and several females may use the same entrance.

Distribution: Holarctic Region (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 5 males; 9 females.



Pemphredon (*Cemonus*) *inornata* Say
Fig. 39

Pemphredon inornata Say, 1824: 339.
Cemonus shuckardi A. Morawitz, 1864: 460.
Cemonus dentatus Puton, 1871: 94.
Pemphredon tenax Fox, 1892d: 313.

Diagnosis: First submarginal cell receiving both recurrent veins.

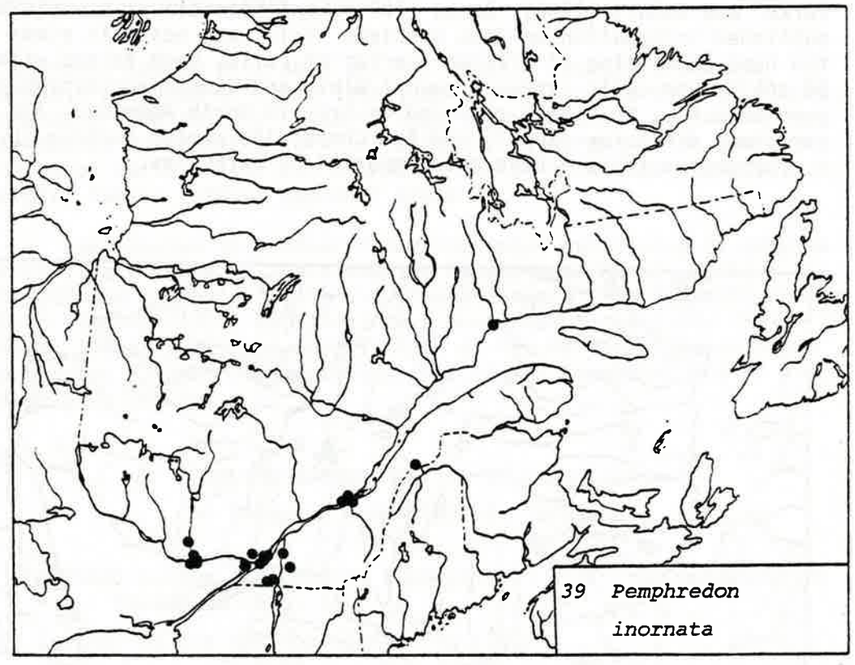
Male scutum with moderate punctures separated by 2-4 diameters on anterior portion.

Female clypeus produced into a single median tooth.

Biology: Rau and Rau (1918), Rau (1928b, 1946), Evans (1958a), Krombein (1963b) and Krombein *et al.* (1979) have published information on this species. This wasp is reported to nest in twigs or stems such as elder or in abandoned beetle borings. Prey consist of aphids but so far only one species *Macrosiphum rudbeckiae* Fitch has been recorded in North America. Lomholdt (1975) listed 11 genera of Aphididae used as prey in Europe. The ichneumonid *Perithous mediator pleuralis* (Cr.) has been recorded as a parasite.

Distribution: Holarctic Region (Bohart and Menke, 1976).

Material Examined: 42 males; 51 females.



Pemphredon (*Cemonus*) *lethifer* (Shuckard)

Cemonus lethifer Shuckard, 1837: 201.
Cemonus strigatus Chevrier, 1870: 269.
Cemonus fabricii Mueller, 1911: 107.
Diphlebus littoralis Wagner, 1918: 143.
Diphlebus fuscatus Wagner, 1918: 143.

Diphlebus neglectus Wagner, 1918: 143.

Diphlebus minutus Wagner, 1918: 143.

Pemphredon confusa Wagner, 1931: 231.

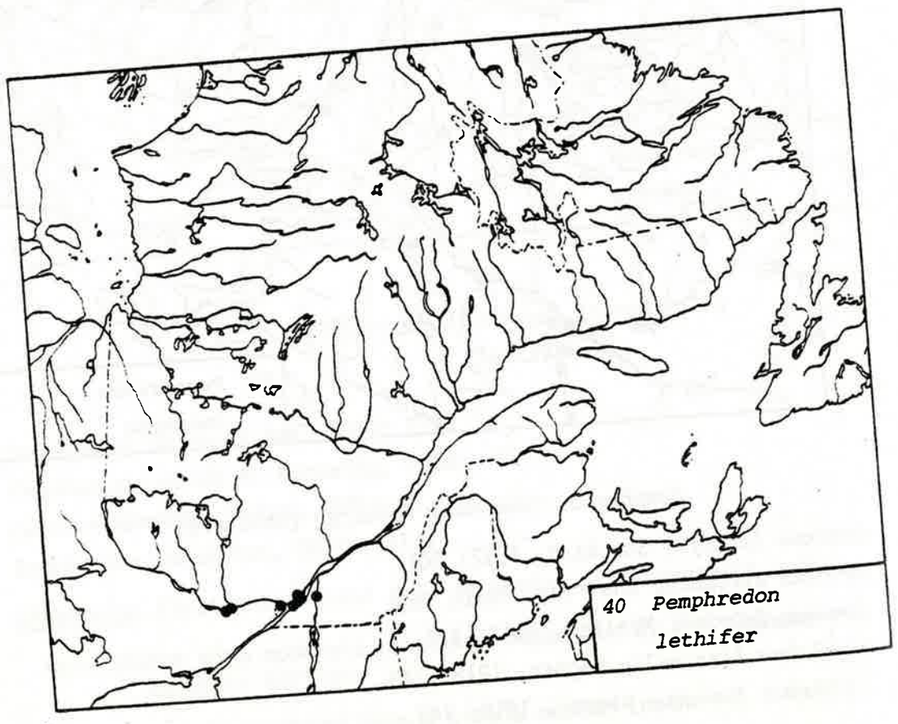
Pemphredon brevipetiola Wagner, 1931: 232.

Diagnosis: First submarginal cell receiving both recurrent veins.

Male scutum with close, coarse, almost contiguous punctation anteriorly.

Female clypeus truncate.

Biology: Rau (1948), Janvier (1960), Krombein (1960, 1963b, 1964b), F.D. Parker and Bohart (1966), Danks (1971), and Krombein *et al.* (1979) have published information on this species. This wasp nests in stems or canes, the nest consisting of a linear series of cells, each packed with about 50 aphids per cell. *Aphis gossypii* Glov. and *Chaitophorus populicola patchae* H.R.L. have been recorded as prey in North America. The ichneumoid *Perithous divinator* (Rossi) and the chrysidids *Omalus auratus* (L.) and *O. purpuratus* (Prov.) have been reported as parasites.



Distribution: Holarctic Region (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 6 males; 8 females.

Genus *Passaloecus* Shuckard

Xyloecus Shuckard, 1837: conspectus of the genera, no. 25, *nec* Serville, 1833.

Passaloecus Shuckard, 1837: 188.

Coeloecus Verhoeff, 1890: 383.

Heroecus Verhoeff, 1890: 383.

Diagnosis: Labrum with apex entire, usually roundly produced; mandible with two or three teeth; episternal sulcus well developed, extending from subalar fossa to hypersternaulus and beyond; hypersternaulus horizontal; forewing with two recurrent veins and three discoidal cells; hindtibia without a series of spines along posterior margin; female without pygidial plate.

Passaloecus is another Holarctic genus containing 21 species of which 11 are found in North America (Bohart and Menke, 1976). Fox (1892d) and Krombein (1938a) have keyed some of the Nearctic species while Vincent (1979) has provided a more recent revision. Evans (1958a, 1959a, 1964a) published descriptions of the larvae of *Passaloecus cuspidatus* F. Smith, *P. monilicornis ithacae* Krombein? and *P. singularis singularis* Dahlbom.

Key to Quebec Species of *Passaloecus*
(Adapted from Vincent, 1979)

1	Scrobal sulcus (separating hypoepimeral area from mesopleuron) foveolate (Fig. 25)	2
1'	Scrobal sulcus not foveolate (Fig. 26)	3
2	Omaulus present (Fig. 25)	*gracilis* (Curtis)
2'	Omaulus absent	*lineatus* Vincent
3	Males	4
3'	Females	7

4 Tergum VI with tubercles on hind margin 5

4' Tergum VI without tubercles; pronotal lobe and trochanters dark brown . . . *singularis singularis* Dahlbom

5 Antennal segments black; hindtrochanters black 6

5' Antennal segments black with apical yellow spots; hindtrochanters yellow . . . *annulatus annulatus* (Say)

6 Median antennal segments spinose beneath (Fig. 142) . . . . . *cuspidatus* F. Smith

6' Median antennal segments rounded beneath (Fig. 141) . . . . . *monilicornis ithacae* Krombein

7 Anterior margin of clypeus tridentate medially; mandibles (except apically) and pronotal lobes white . . . . . *cuspidatus* F. Smith

7' Anterior margin of clypeus produced into a truncate or slightly emarginate median lobe 8

8 Labrum black 9

8' Labrum and pronotal lobes white . . *annulatus annulatus* (Say)

9 Scutum with two median patches of dense pubescence . . . . . *singularis singularis* Dahlbom

9' Scutum without patches of dense pubescence . . . . . *monilicornis ithacae* Krombein

Passaloecus annulatus annulatus (Say)

Pemphredon annulatus Say, 1837: 379.
Passaloecus rivertonensis Viereck, 1904: 243.
Passaloecus equalis Viereck, 1906: 212.

Diagnosis: Male; flagellomeres with apical yellow spots; scrobal sulcus not foveolate; hindtrochanters yellow; tergum VI with tubercles on hind margin.

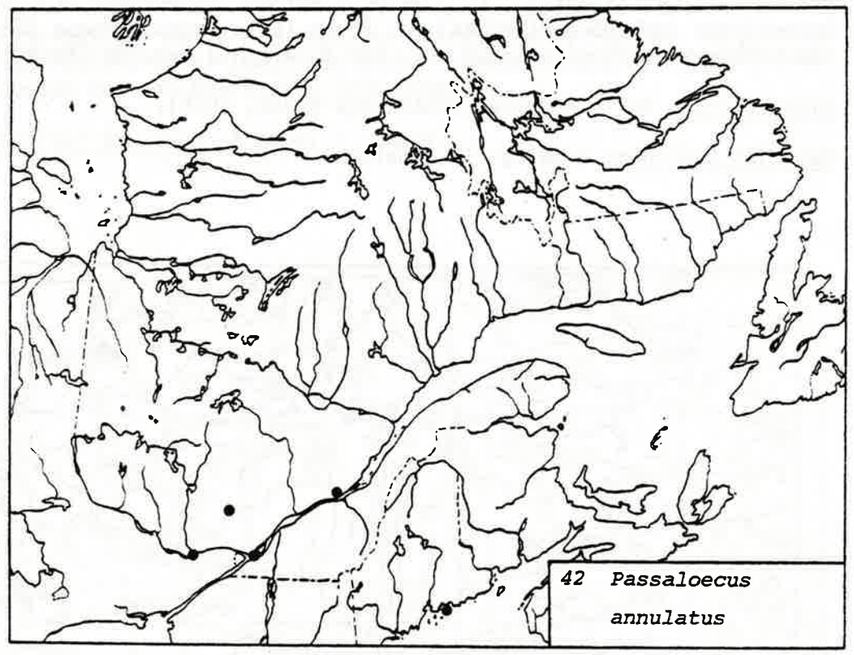
Female: scrobal sulcus not foveolate; clypeus truncate; labrum and pronotal lobes white.

Biology: Peckham and Peckham (1905), Krombein (1955a, 1958a, 1960, 1961, 1963b) and Vincent (1979) have published notes on the biology of this species. This wasp nests in twigs and preys on aphids; the following

species have been recorded as prey: *Drepanaphis* sp. probably *acerifoliae* (Thomas), *Macrosiphum* sp. and *Neothomasia populicola* (Thomas).

Distribution: United States and the province of Ontario in Canada (Bohart and Menke, 1976). Another subspecies is found in Korea (Krombein *et al.*, 1979). This species has not previously been reported from Quebec.

Material Examined: 3 males; 11 females.



Passaloecus cuspidatus F. Smith
Fig. 142

Passaloecus cuspidatus F. Smith, 1856: 427.
Passaloecus mandibularis Cresson, 1865b: 487.
Passaloecus distinctus Fox, 1892d: 319.
Passaloecus dispar Fox, 1892d: 320.

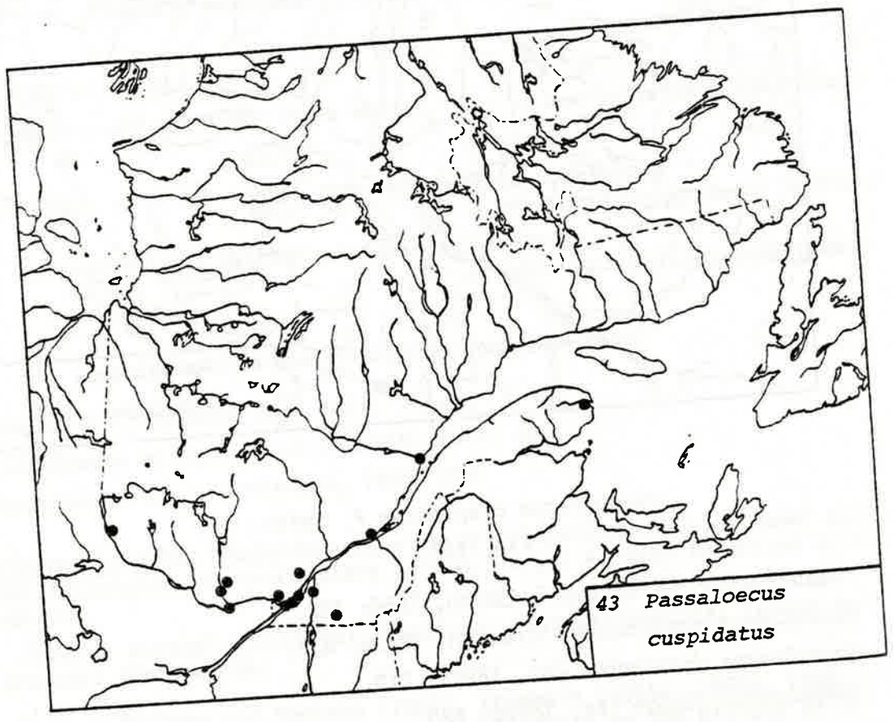
Diagnosis: Male: median antellal segments somewhat spinose beneath; antennal segments and hindtrochanters black; scrobal sulcus not foveolate; tergum VI with tubercles on hind margin.

Female: scrobal sulcus not foveolate; anterior margin of clypeus tridentate.

Biology: Packard (1874), Krombein (1956, 1958a, 1963b, 1967b), Krombein *et al.* (1979), Fye (1965) and Vincent (1979) have published several prey records and observations. This wasp has been observed nesting in elder stems; prey consists of aphids provisioned at the rate of 11 to 52 individuals per cell. The following prey have been recorded: *Cinara abieticola* (Cholodkovsky), *C. formacula* Hottes, *Pterocomma bicolor* (Oest.), *Macrosiphum euphorbiae* (Thomas), *M. rosae* (L.), *Myzus porosus* (Sand.), *Masonaphis* sp., *Rhopalosiphum* sp., and *Euceraphis betulae* (Koch.).

Distribution: North America (Bohart and Menke, 1976).

Material Examined: 6 males; 15 females.



Passaloecus gracilis (Curtis)

Diodontus gracilis Curtis, 1834: 496.

Passaloecus turionum Dahlbom, 1844: 246.

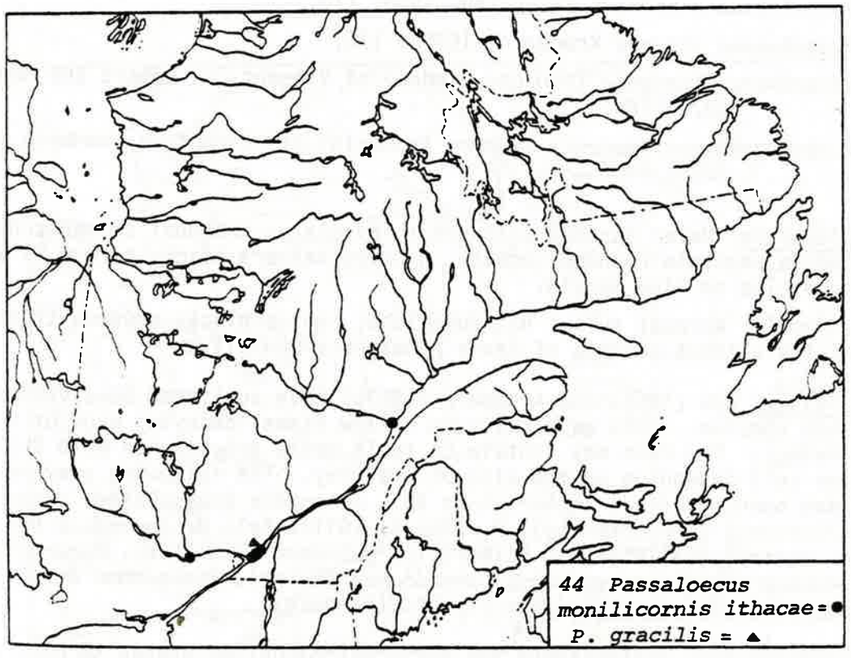
Passaloecus brevicornis Morawitz, 1864: 462.

Diagnosis: Scrobal sulcus foveolate, omaulus present.

Biology: Krombein *et al.* (1979) reported this species nesting in twigs, and its parasites *Perithous divinator* (Rossi) and *Omalus auratus* (L.).

Distribution: western Europe and United States from Pa. to N.J. to Tex. along coast, Ohio, Ind., and Mich. (Krombein *et al.*, 1979). This species has not previously from Quebec.

Material Examined: 1 male; 1 female.



Passaloecus lineatus Vincent

Passaloecus lineatus Vincent, 1979: 162.

Diagnosis: Scrobal sulcus foveolate; omaulus absent.

Biology: Unknown.

Distribution: northeastern and northcentral United States southward to Smoky Mountains and in Canada from British Columbia (Vincent, 1979). This species has not previously been reported from Quebec.

Material Examined: 1 female.

Passaloecus monilicornis ithacae Krombein

Fig. 26.

Passaloecus monilicornis Dahlbom, 1842: 12.
Passaloecus monilicornis var. *dahlbomi* Sparre-Schneider, 1905: 523.
Passaloecus shuckardi Yasumatsu, 1934: 113.
Passaloecus ithacae Krombein, 1938a: 126.
Passaloecus insignis (Van der Linden) of Vincent, *in* Bohart and Menke, 1976: 184.
Passaloecus monilicornis ithacae Krombein, of Vincent *in* Krombein *et al.*, 1979: 1606.

Diagnosis: Male: scrobal sulcus not foveolate; antennal segments black, median segments rounded beneath; hindtrochanters black; tergum VI with tubercles on hind margin.

Female: scrobal sulcus not foveolate; labrum black; clypeus truncate; scutum without patches of dense pubescence medially.

Biology: Fye (1965) and Krombein (1967b) have published observations on this species. This wasp nests in hollow stems, decaying wood or old insect borings. The nest may contain up to 18 cells provisioned with 7-63 aphids per cell depending on the size of the prey. The following prey records have been reported: *Amphorophora* sp., *Anuraphis rosea* Baker, *Cinara abieticola* (Cholodkovsky), *C. braggii* (Gillette), *C. formacula* Hottes, *C. hottesi* (Gillette and Palmer), *C. palmerae* (Gillette), *Euceraphis betulae* (Koch), *Neosymdobius americanus* (Baker), *Pterocomma smithiae* Monnell?, and *Rhopalosiphum fitchii* (Sanders).

Distribution: northeastern and northcentral United States to Alberta and also from Alaska. Typical *monilicornis* occurs in the Palaearctic Region. This species has not previously been reported from Quebec.

Material Examined: 7 females.

Passaloecus singularis singularis Dahlbom

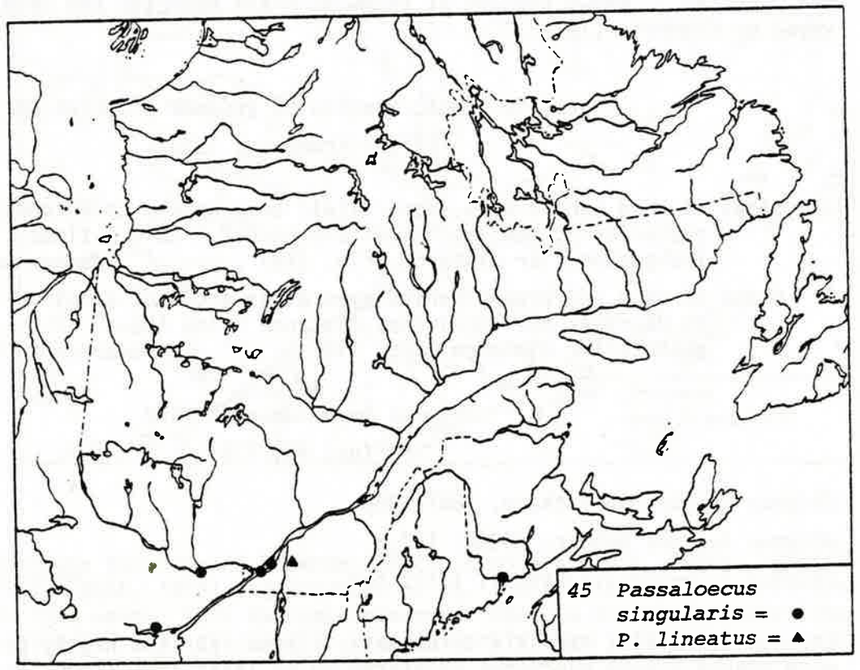
Figs. 11, 25, 141

Passaloecus singularis Dahlbom, 1845: 243.
Passaloecus tenuis A. Morawitz, 1864: 462.
Passaloecus gertrudis Krombein, 1938a: 124.

Diagnosis: Male: scrobal sulcus not foveolate; tergum VI without tubercles; pronotal lobe and trochanters dark brown to black.

Female: scrobal sulcus not foveolate; labrum black; clypeus truncate; scutum with two median patches of dense pubescence.

Biology: Lomholdt (1975) reported this species nesting in pithy stems, abandoned galls or insect tunnels in rotten wood. Krombein *et al.* (1979) reported this species nesting in abandoned burrows of *Pissodes strobi* (Peck). Prey consists of aphids.



Distribution: northeastern United States and southern Canada also from Colorado, Utah and British Columbia. In Old World from Europe through Asia and Japan (Vincent, 1979).

Material Examined: 20 males; 9 females.

Genus *Stigmus* Panzer

Stigmus Panzer, 1804: heft 86, pl. 7.
Antronius Zetterstedt, 1838: 442.
Gonostigmus Rohwer, 1911: 559.
(*Atopostigmus*) Krombein, 1973: 218.

Diagnosis: Frons simple below without a median spinelike process; pronotal collar with a complete transverse carina; subomaulus present; acetabular carina present and continuous with omaulus; forewing with one recurrent vein and two discoidal cells; marginal cell elongate, larger than stigma and closed apically; petiole in dorsal view much longer than wide; female mandible with three teeth; male clypeus covered with appressed silvery pubescence.

Of the 30 known species of *Stigmus*, 8 are Nearctic and have been keyed by Krombein (1973).

Key to Quebec Species of *Stigmus* (Females Only)
(After Krombein, 1973)

1 Sides of head behind eyes subparallel, only weakly convergent posteriorly; ocelloccipital distance 2.4 to 3.0 times the postocellar distance (Fig. 119) . . . . *fraternus* (Say)

1' Sides of head convergent behind eyes at an angle of about 30 degrees; ocelloccipital distance twice the postocellar distance (Fig. 118) . . . . *americanus* Packard

Stigmus americanus Packard
Figs. 40, 118

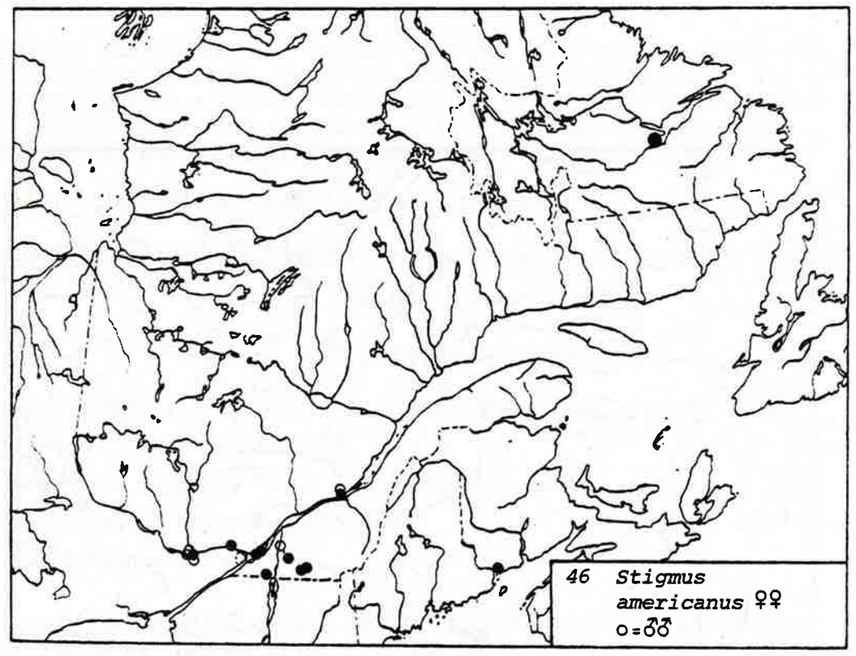
Stigmus americanus Packard, 1867: 386.
Stigmus lucidus Rohwer, 1909a: 102.
Stigmus coloradensis Rohwer, 1911: 559.

Diagnosis: Female; mandible tridentate; clypeal surface highly polished with sparse minute punctures separated by at least four times the puncture diameter; sides of head convergent behind eyes at an angle of about 30

degrees; ocelloccipital distance 2.0 to 2.6 times the postocellar distance; scutum in profile arched on anterior third or more.

Male; median lobe of clypeus extending as far down as lateral lobes, apical margin truncate; clypeal pubescence dense, concealing the punctation; distance between the posterior and anterior ocelli less then the diameter of a posterior ocellus; forebasitarsus cylindrical in cross section and straight; midbasitarsus not dentate or excavate beneath near apex.

Krombein (1973) expressed the opinion that *americanus* may not be distinct from *fraternus* since he was unable to distinguish the two species in the male sex. The male diagnosis above will serve to separate *americanus* and *fraternus* from all other Nearctic species but will not distinguish these two from each other.



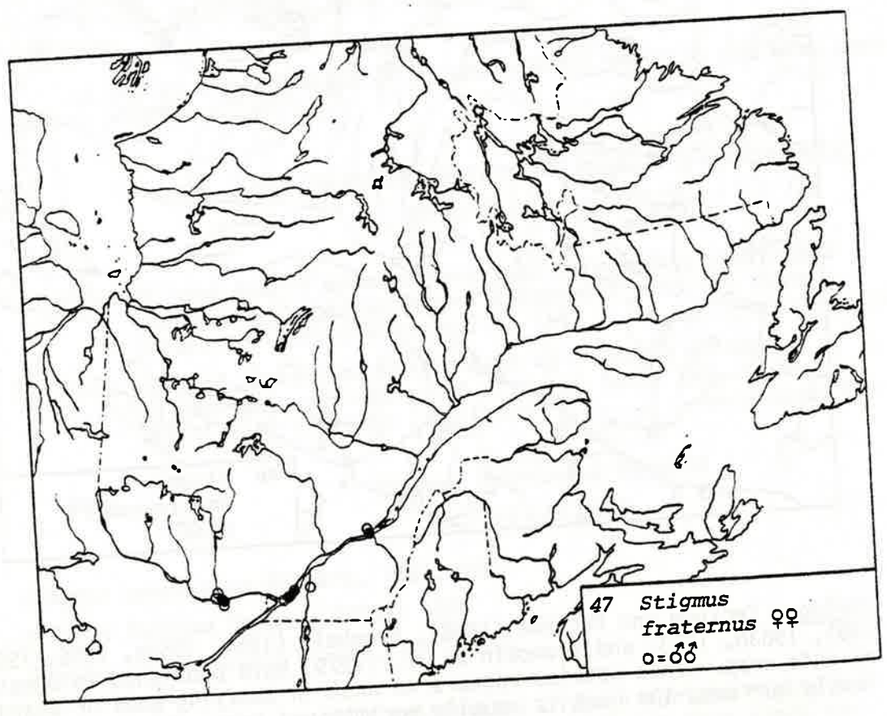
46 *Stigmus americanus* ♀♀ o=♂♂

Biology: Peckham and Peckham (1898), Krombein (1954, 1955a, 1956, 1958a, 1961, 1963b, 1973) and Krombein *et al.* (1979) have published information on this wasp. This species appears to nest in decaying wood or abandoned beetle burrows, the nest is usually partitioned into cells but in at

least one observation (Krombein, 1961) the nest consisted of a single brood chamber with prey and two wasp eggs. Prey consists of nymphs and adults of the following genera and species of aphids: *Anuraphis* sp., *Aphis* sp., *Chaitophorus* sp.?, *Drepanaphis acerifoliae* (Thos.), *Myzocallis* sp.?, *Rhopalosiphum* sp. and *Therioaphis* sp. Three cleptoparasites, all chrysidids, have been recorded; Krombein (1958d) reported *Omalus iridescens* (Norton), Bohart and Campos (1960) reported *O. purpuratus* (Provancher) and Krombein *et al.* (1979) recorded *O. janus* (Hald.)

Distribution: eastern North America, British Columbia and the Northwest Territories of Canada, and Washington State in the United States (Bohart and Menke, 1976).

Material Examined: 19 females; on this and other map, 19 males, open circles.



Stigmus fraternus Say

Fig. 119

Stigmus fraternus Say, 1824: 340.

Stigmus conestogorum Rohwer, 1911: 557.

Stigmus raui Rohwer, 1923: 100.

Diagnosis: Female; mandible tridentate; clypeal surface highly polished with sparse minute punctures separated by at least four times the puncture diameter; sides of head behind eyes subparallel, only weakly convergent posteriorly; ocelloccipital distance 2.4 to 3.0 times the postocellar distance; scutum in profile arched on anterior third or more.

Male; see under *americanus*.

Biology: Rau (1928b) and Krombein (1958a, 1973) have reported this wasp nesting in stems, twigs and abandoned beetle borings. The cells are arranged in a linear fashion (up to 19 per nest) and separated by partitions of fine particles of pith. Aphids of the genera *Therioaphis* and *Monellia* have been recorded as prey.

Distribution: United States and Mexico (Bohart and Menke, 1976).

Material Examined: 12 females; open circles on this and the previous map, 19 males.

Genus *Spilomena* Shuckard

Celia Shuckard, 1837: 182, *nec* Zimmermann, 1832.

Spilomena Shuckard, 1838: 79.

Microglossa Rayment, 1930: 212, *nec* Voigt, 1831.

Microglossella Rayment, 1935: 634.

Taialia Tsuneki, 1971a: 10.

Diagnosis: Occipital carina absent; pronotal collar with complete transverse carina; forewing with one recurrent vein, two discoidal and two closed submarginal cells; marginal cell elongate, larger than stigma and closed apically; abdomen in dorsal view with petiole indistinct.

The 50 species in this genus occur in all zoogeographical regions; the Nearctic Region is represented by 5 species. Krombein (1958b) keyed three of the four eastern Nearctic species and Krombein (1962) gave the key characters for differentiation of the fourth eastern species.

Key to Quebec Species of *Spilomena*

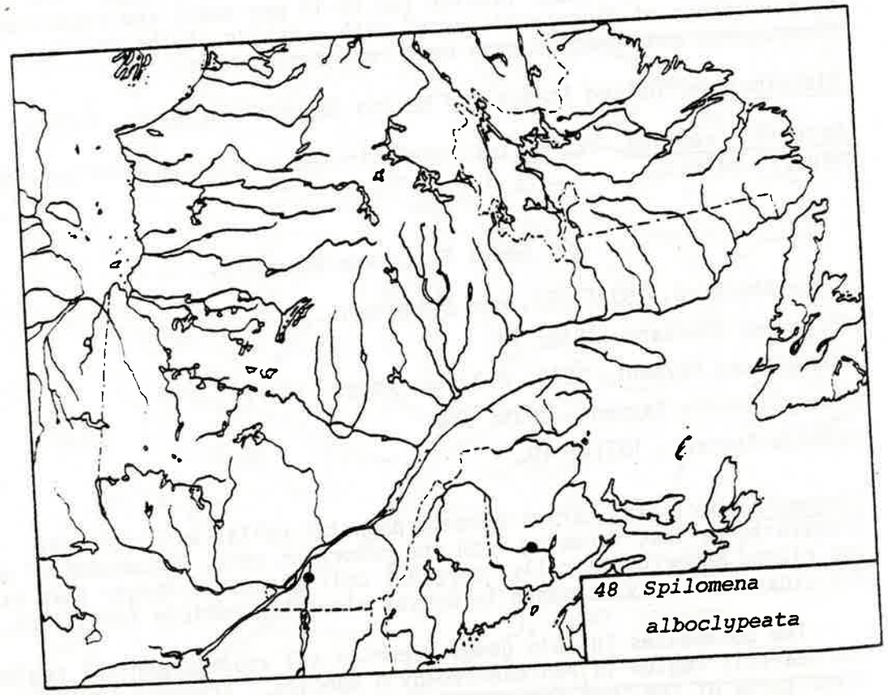
1 Marginal cell of forewing with minute scattered setae; propodeal enclosure not well defined . . *alboclypeata* Bradley

1' Marginal cell of forewing with distinct evenly spaced setae; propodeal enclosure defined by a strong carina . . . . . *barberi* Krombein

Spilomena alboclypeata Bradley

Spilomena alboclypeata Bradley, 1906: 380.

Diagnosis: Pronotum without a faint carina extending from side of pronotal disk onto pronotal lobe; marginal cell of forewing with a few scattered setae (at least in Quebec specimens); propodeal enclosure without a marginal carina.



48 *Spilomena alboclypeata*

Biology: Krombein (1958b) captured several females with prey near their nests in a board of a cowshed wall. Prey consisted of immature Thysanoptera.

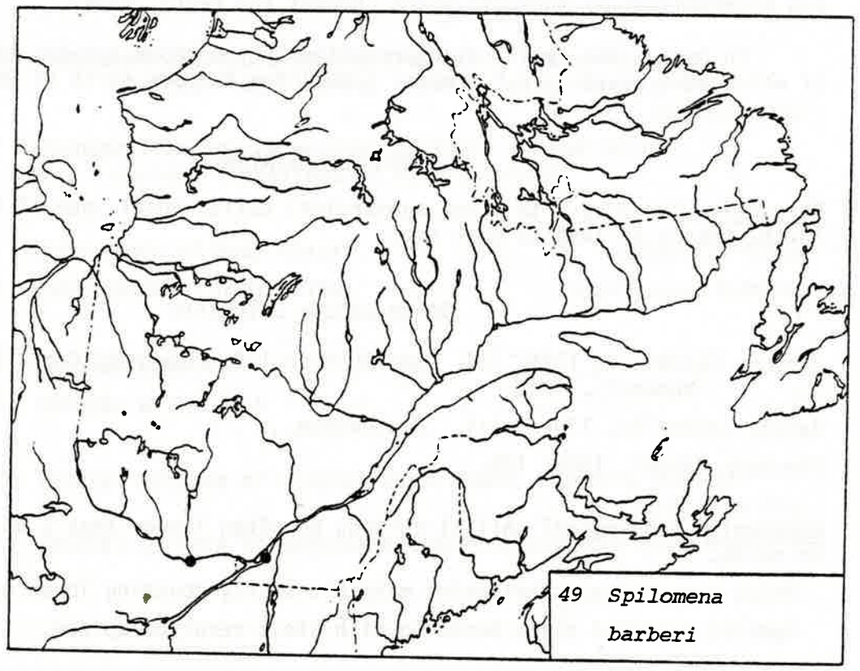
Distribution: United States; British Columbia in Canada (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 male; 3 females.

Spilomena barberi Krombein

Spilomena barberi Krombein, 1962: 12.

Diagnosis: Dense appressed, short silvery pubescence on the front, scutum and apices of the third to sixth terga; pronotum without a faint carina extending from side of pronotal disk onto pronotal lobe; marginal cell of forewing with distinct evenly spaced setae; propodeal enclosure defined by a strong carina.



49 *Spilomena barberi*

Biology: Krombein (1962, 1963b) found this species nesting alongside *S. alboclypeata* in a board of a cowshed wall. Prey consisted of nymphal Thysanoptera of the Family Thripidae, the genera involved were either *Frankliniella* or *Thrips* and *Sericothrips*.

Distribution: United States and Ontario in Canada (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 male; 8 females.

FAMILY ASTATIDAE

Diagnosis: Mandible without a tooth or notch externoventrally; tarsal claws simple; midtibia with two apical spurs; hindwing jugal lobe large, more than half the length of anal area; gaster not petiolate.

The Astatidae consists of two subfamilies, only one of which is found in North America (Astatinae). This family includes about 144 described species found in all zoogeographical regions. The members are medium size wasps with generally low specialization. They are considered to be the most primitive group in the larrine complex (Astatidae, Larridae and Crabronidae) of sphecoid wasps (Bohart and Menke, 1976).

In Quebec the family is represented by the genus *Astata*, the species of which were keyed by F.D. Parker (1962) for America north of Mexico.

SUPERFAMILY ASTATINAE

Diagnosis: Forewing with three submarginal cells; jugal lobe of hindwing large, nearly as long as anal area.

Genus *Astata* Latreille

Astatus Latreille, 1796: 114. See Opinion 139, Internat. Comm. Zool. Nomencl., 1943.

Astata Latreille, 1796: xiii. Emendation.

Dimorpha Panzer, 1806: 126.

Diagnosis: Submarginal cell II as long or often longer than I as measured on media.

Male; compound eyes holoptic; mandible nearly touching lower eye margin.

Female; pygidial plate bordered with stout recurved spines.

Astata includes 76 species distributed on all continents except Australia (Bohart and Menke, 1976). Fourteen species are found in North America, these have been keyed by F.D. Parker (1962). Evans (1958a, 1959a) described the larvae of *Astata unicolor* Say and *A. bicolor* Say, respectively.

Key to Quebec Species of *Astata*
(Adapted from F.D. Parker, 1962)

1	Males; compound eyes holoptic	2
1'	Females; compound eyes dioptic	6
2	Abdomen with red	3
2'	Abdomen completely black	4
3	Abdominal sternum IV emarginate medially; pubescence of body silvery-white	*bicolor* Say
3'	Abdominal sterna not emarginate; pubescence of body black	*nubecula* Cresson
4	Propodeal enclosure with a prominent raised median carina; flagellomeres broadly rounded beneath	*unicolor* Say
4'	Propodeal enclosure without distinct raised median carina; flagellomeres with tyloides	5
5	Pubescence of body black	*nubecula* Cresson
5'	Pubescence of body white	*leuthstromi* Ashmead
6	Abdomen with red	7
6'	Abdomen with black	9
7	Ventral surface of midcoxa bare, small tubercle present	*bicolor* Say
7'	Ventral surface of midcoxa pubescent, tubercle absent	8

8 Vertex and posterior part of scutum heavily punctured; propodeal enclosure with distinct median carina . . . . . *unicolor* Say

8' Vertex sparsely pitted; posterior margin of scutum shining, sparsely punctured; propodeal enclosure at most with a broken, discontinuous median carina . . . . . *nubecula* Cresson

9 Vertex and posterior part of scutum heavily pitted . . *unicolor* Say

9' Vertex sparsely punctured; scutum shining, sparsely punctate . . 10

10 Pubescence of thoracic sterna yellow-white . . *leuthstromi* Ashmead

10' Pubescence of thoracic sterna black . . . . . *nubecula* Cresson

Astata bicolor Say

Astata bicolor Say, 1823: 78.
Astata terminata Cresson, 1872: 218.
Astatus pygidialis 1892c: 234.

Diagnosis: Abdomen red and black.

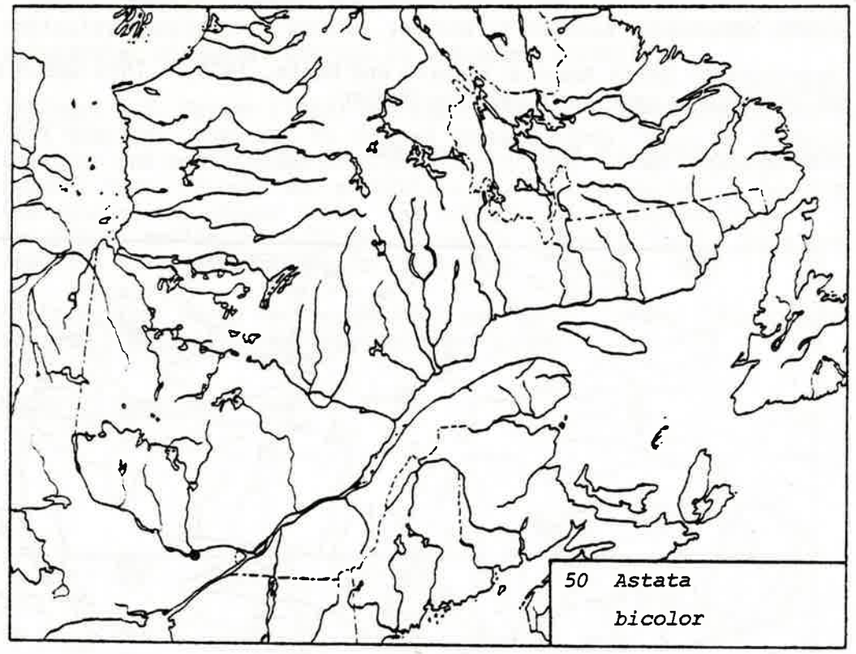
Male; sternum IV emarginate medially.

Female; flagellomere II shorter than I; stigma of wing yellowish, transparent; ventral surface of midcoxa without pubescence and with a small tubercle.

Biology: Peckham and Peckham (1898, 1905) and Mickel (1918b) both reported this species preying on Hemiptera; Mickel (1918b) mentioned that a nymphal pentatomid was being dragged away by the wasp. The nest is multicellular and constructed in the ground.

Distribution: eastern United States and Mexico (Bohart and Menke, 1976).

Material Examined: 1 female.



Astata leuthstromi Ashmead

Astata leuthstromi Ashmead, 1897: 129.

Diagnosis: Abdomen completely black.

Male; flagellomeres with tyloides; distance of ocular contact at most equal to length of flagellomere II; pubescence of body white; pubescence of sterna light, not interspersed with long, dark brown setae; propodeal enclosure without distinct raised median carina, striations of enclosure widely spaced, radiating posteriorly.

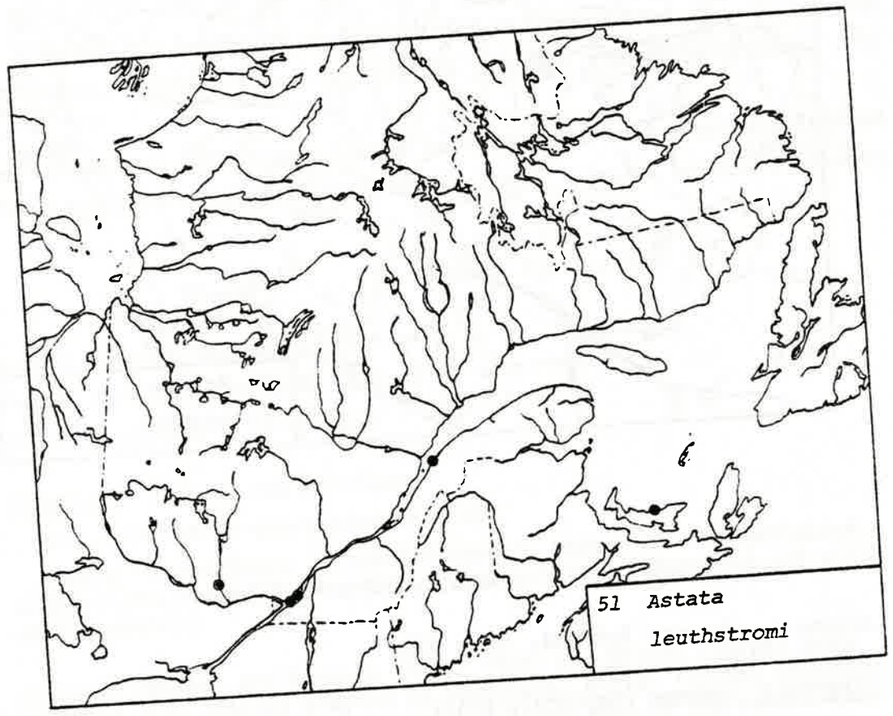
Female; vertex sparsely punctured; scutum shining, sparsely punctured; pubescence of thoracic sterna yellow-white; abdominal sternum II pubescent medially.

Biology: Peckham and Peckham (1898) and Evans (1957c, 1962b) have provided the only observations on this species. This wasp apparently constructs a two celled nest in the ground; the only prey records are of

nymphal pentatomids *Cosmopepla bimaculata* Thom., and *Acrosternum hilare* Say.

Distribution: North America (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 4 males; 4 females.



Astata nubecula Cresson

Astata nubecula Cresson, 1865b: 466.
Astata nigropilosa Cresson, 1881: IV.

Diagnosis: Abdomen black or red and black; pubescence of body black; propodeal enclosure without a distinct raised median carina.

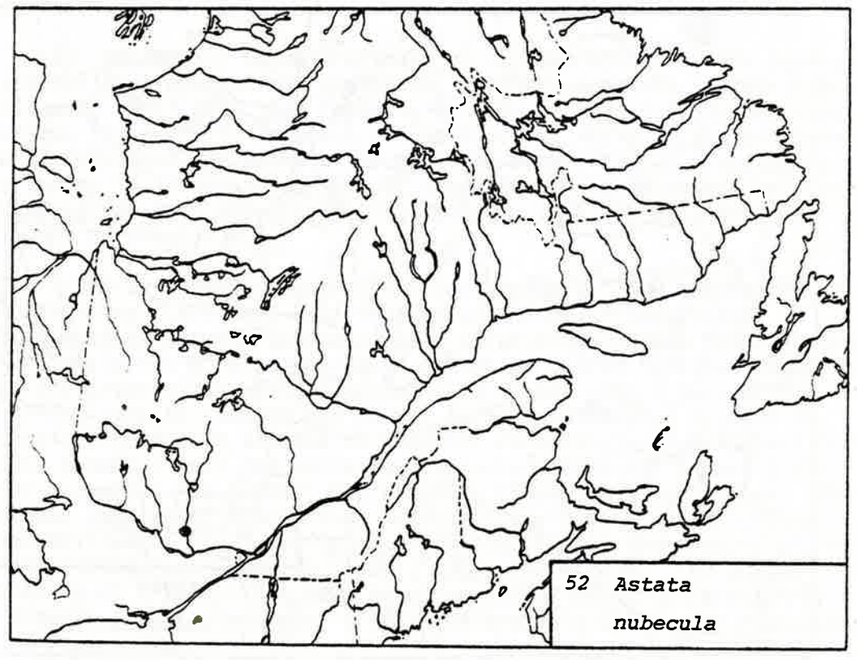
Male; distance of ocular contact at most equal to length of flagellomere I; abdominal sterna not emarginate.

Female; vertex sparsely pitted; mesopleuron shining without reticulate sculpture; ventral surface of midcoxa pubescent, without a tubercle; abdominal sternum II pubescent medially.

Biology: F.D. Parker (1962) and Evans(1970) provided information on this species. The nest is located in hard stony soil; it is multicellular and provisioned with pentatomid bugs. Prey consists of nymphal bugs: *Thyanta* sp. probably *casta* Stal or *pallidovirens* Stal and *Chlorochroa uhleri* Stal. The miltogrammine sarcophagids *Senotainia trilineata* Wulp and *Hilarella hilarella* Zett.? have been reported as cleptoparasites of this wasp.

Distribution: North America (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 male.



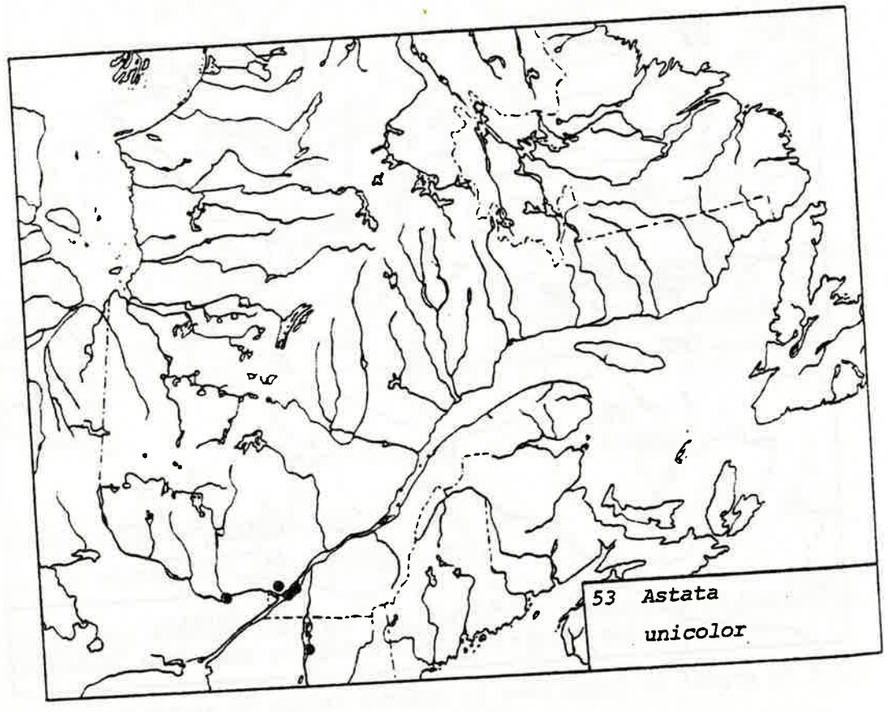
Astata unicolor Say
Figs. 41, 71

Astata unicolor Say, 1824: 337.
Astata insularis Cresson, 1865a: 140.
Astata rufiventris Cresson, 1872: 218.

Diagnosis: Propodeal enclosure with a distinct median raised carina.

Male; flagellomeres broadly rounded beneath; abdomen black.

Female; vertex and posterior part of scutum heavily punctured; pubescence of body white; ventral surface of midcoxa pubescent, without a tubercle; wings at most light brown in colour; abdomen red or black, sternum II pubescent medially.



Biology: Peckham and Peckham (1898, 1905), Barth (1910), Krombein (1936) and Evans (1957c) have published biological information on this species. This wasp constructs a multicellular nest in any type of bare soil. The cells are provisioned with nymphal pentatomids; the following species have been recorded: *Euschistus euschistoides* (Voll.)?, *E. tristigmus* (Say), *Podisus maculiventris* (Say) and *P. modestus* (Dallas). The only cleptoparasite recorded is a chrysidid wasp of the genus *Chrysis*.

Distribution: North America (Bohart and Menke, 1976).

Material Examined: 5 males; 13 females.

Family Larridae

Diagnosis: Gaster without a petiole, composed of sternum only; midtibia with only one apical spur; stigma not enlarged and one of the following combinations:

(1) Hindocelli deformed; jugal lobe of hindwing subequal in length to anal area.

(2) Hindocelli normal; without an oblique scutal carina posterolaterally; propodeum not distinctly toothed; antennal sockets touching clypeus, of if not, then forewing with fewer than three submarginal cells; inner orbits angulate or inner orbits not angulate and forewing with more than one submarginal cell, or more than two discoidal cells or both; if inner orbits are not angulate and forewing has only one submarginal cell then scape of antenna is much shorter than half the length of flagellum.

The Larridae (digger wasps) includes over 2000 species in six subfamilies (Larrinae, Palarinae, Miscophinae, Trypoxylinae, Bothynostethinae and Scapheutinae), three of which are found in Quebec. The family has a relatively high degree of specialization, second only to the Crabronidae which together make up the larger part of the larrine complex (Bohart and Menke, 1976). The Quebec species of Larrinae have been treated in Nearctic revisions by R.M. Bohart and G.E. Bohart (1962) for *Ancistromma*; Banks (1942) and Bohart (1962) for *Tachytes*; Fox (1894b) and Williams (1914a) for *Tachysphex*. The Quebec species of Miscophinae have been dealt with by Fox (1894b) and Williams (1914a) for *Lyroda*, Williams (1960) for *Plenoculus*, and Pate (1937a) and Krombein (1950c, 1968) for *Nitela*. The Quebec species of Trypoxylinae have been treated in Nearctic revision by Richards (1934), Sandhouse (1940) and Krombein (1962) for *Trypoxylon* and *Tryparqilum*.

Key to Quebec Subfamilies of Larridae
(Adapted from Bohart and Menke, 1976)

1 Hindocelli reduced to flat, opaque scars of various shapes (Fig. 121); jugal lobe of hindwing subequal in length to anal area (Fig. 42) . . . . . Larrinae

1' Hindocelli normal; jugal lobe of hindwing small or absent, never more than half length of anal area (Fig. 45) . . 2

2 Inner orbits angulate (Fig. 105) . . . . . Trypoxylinae

2' Inner orbits not angulate . . . . . Miscophinae

Subfamily Larrinae

Diagnosis: Hindocelli deformed; jugal lobe of hindwing subequal in length to anal area.

Key to Quebec Genera of Larrinae
(Adapted from Bohart and Menke, 1976)

1 Ocellar scars very long, golf club or comma-shaped, long axes of scars subparallel, not exceeding an angle of 70 degrees, distance between midocellus and end of tail less than length of scar (Fig. 120); pygidial plate present in both sexes and usually clothed with dense setae which obscure integument . . . . . *Tachytes* Panzer

1' Ocellar scars oblong or oval, or if elongate then long axes of scars forming an angle of 80 degrees or more; distance between midocellus and lower end of scar equal to or greater than length of scar (Fig. 121); pygidial plate usually present in female but bare or sparsely setose, male usually without a pygidial plate 2

2 Female foretarsomere II with three or more rake spines which are long and fine (Fig. 72); male sternum VIII emarginate apically (bispinose) (Fig. 102) . . . . . *Tachysphex* Kohl

2' Female foretarsomere II with not more than two rake spines which are usually bladelike or thornlike (Fig. 73); male sternum VIII rounded apically (Fig. 103) . . . . . *Ancistromma* Fox

Genus *Ancistromma* Fox

Ancistromma Fox, 1894b: 487.

Diagnosis: Ocellar scars commalike; distance between midocellus and lower end of scar equal to or greater than length of scar; petiole-metacoxal cavity completely membraneous; female foretarsomere II with no more than two rake spines which are bladelike; male sternum VIII rounded apically; subalar fossa not bordered below by a sharp carina, mesopleural surface sloping uniformly into fossa.

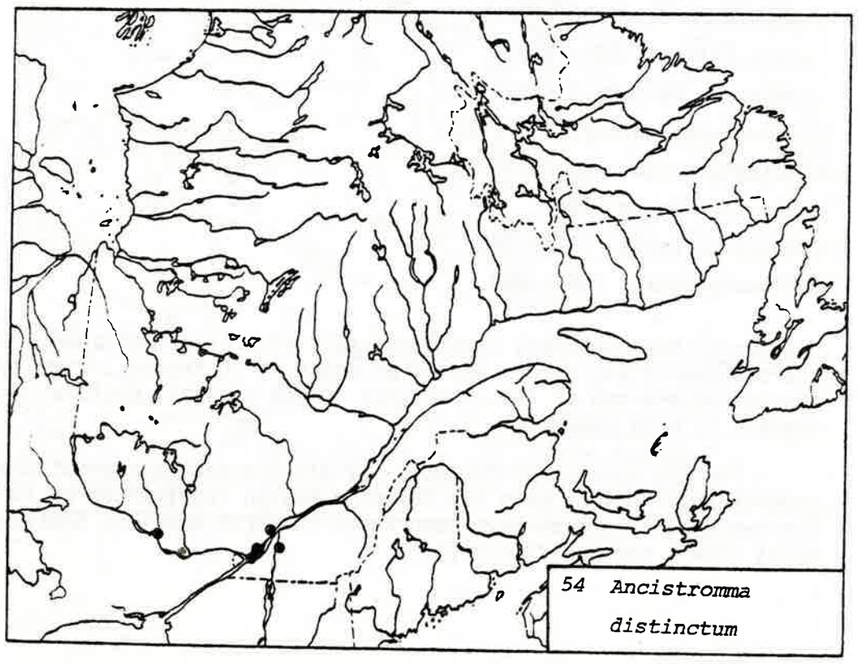
Ancistromma distinctum (F. Smith)

Figs. 73, 103

Larrada distincta F. Smith, 1856: 292.

Larropsis semirufa Banks, 1921: 19.

Diagnosis: Male, first flagellar segment about one half as broad as long, distinctly shorter than second segment; least interocular distance greater than length of first flagellar segment; propodeal enclosure with sculpture about equal to that of scutellum; posterior face of propodeum not enclosed by a ridge; abdomen with or without red.



54 *Ancistromma distinctum*

Female; first flagellar segment about twice as long as broad, shorter than second flagellar segment; femora black; forefemur evenly punctate on outer surface, not highly polished; propodeal enclosure with distinct well separated striae; scutum with median punctures moderate in size, separated by less than a puncture diameter; abdomen black with red in Quebec specimens.

Biology: Evans (1958b) described the nesting behaviour of this species. Nests are constructed at the bottom of preexisting cavities such as mole burrows. The several rather roughly constructed cells were found to contain one to three lightly paralyzed adult females of *Allonemobius fasciatus* (DeGeer) (Grylloptera). Bohart and Menke (1976) report specimens of *A. distinctum* pinned with a nymph of *Gryllus* and an adult female of *Allonemobius allardi* (Alexander and Thomas). Kurczewski (1976) reported this species preying on juvenile *Allonemobius fasciatus*.

Distribution: northern North America (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 4 males; 8 females.

Genus *Tachytes* Panzer

Tachytes Panzer, 1806: 129.
Lyrops Iliger, 1807: 162.
Tachyptera Dahlbom, 1843: 133.
Holotachytes Turner, 1917: 10.
Calotachytes Turner, 1917: 10.
Tachyoides Banks, 1942: 397.
Tachyolena Banks, 1942: 397.
Tachynana Banks, 1942: 398.

Diagnosis: Ocellar scars very long, golf club or commashaped, long axes scars subparallel, not exceeding an angle of 70 degrees, distance between midocellus and end of tail less than length of scar; pygidial plate present in both sexes.

The 268 species of *Tachytes* are distributed throughout the zoogeographical regions with the Nearctic Region represented by 31 species. The two Quebec species have been keyed in North American treatments by Banks (1942) and Bohart (1962).

Key to Quebec Species of *Tachytes*

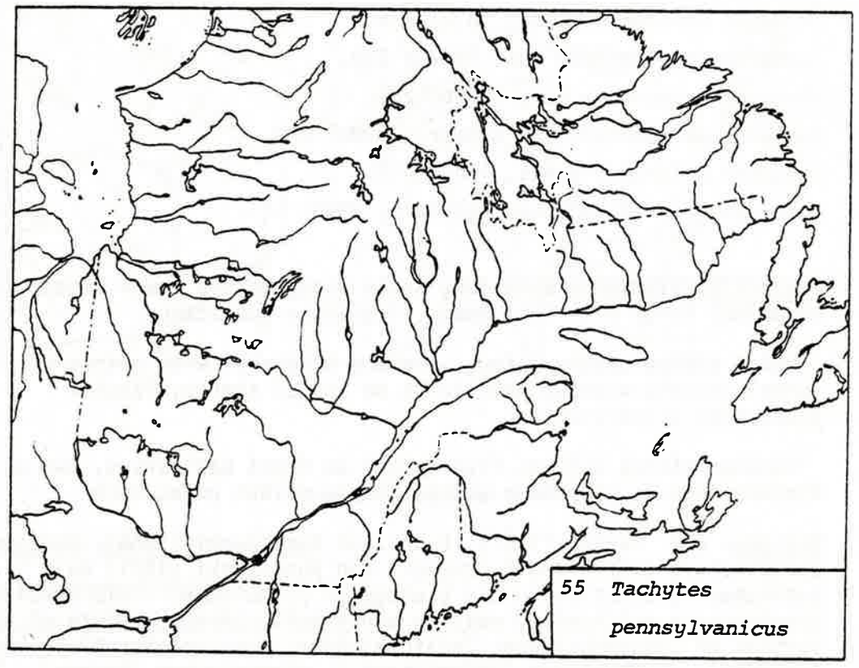
1 Hindfemur with long setae along its lower edge; male with flagellar segments rounded beneath (Fig. 137) ..... *validus* Cresson

1' Hindfemur with only very short appressed setae along lower edge; male flagellar segments not rounded beneath (Fig. 138) .. *pennsylvanicus* Banks

Tachytes pennsylvanicus Banks

Fig. 138

Tachytes pennsylvanicus Banks, 1921: 18.



Diagnosis: Hindfemur without long setae, with only very short appressed setae along lower edge; abdominal segments dark, without red colouration; anteromedian area of scutum without appressed silvery pubescence; clypeus shining above lip along apical margin, punctation more widely spaced than on rest of clypeus; male flagellomere I as long as II; female pygidial plate with dull coppery reflection.

Biology: Unknown.

Distribution: United States (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 male; 1 female.

Tachytes validus Cresson

Figs. 120, 137

Tachytes validus Cresson, 1872: 216.
Tachytes breviventris Fox, 1892b: 239.
Tachytes calcaratus Fox, 1892b: 239.
Tachytes calcaratiformis Rohwer, 1909c: 204.
Tachytes belfragei Banks, 1942: 411.
Tachytes quadrifasciatus Dreisbach, 1948: 151.

Diagnosis: Hindfemur with long setae along entire lower edge; abdominal terga with four bands of silvery pubescence.

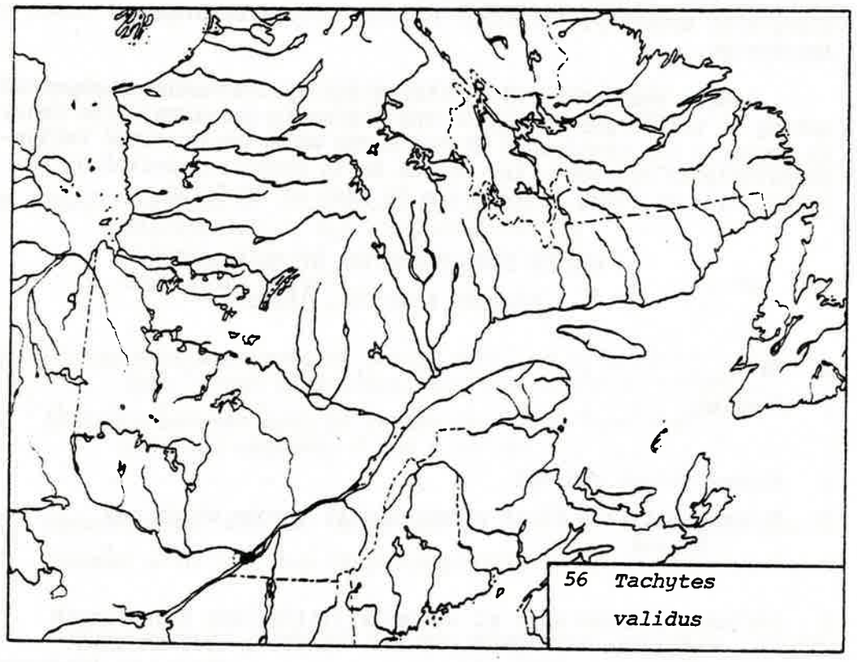
Male; tibiae mostly rufous; mid and hindtarsi with spines of normal length; without hair tufts on apical sterna; fascial pubescence silvery-white.

Female; tibiae rufous; five spines on front basitarsus, two on hindbasitarsus; propodeum without dense golden pubescence.

Biology: J.B. Parker (1921), Evans and Kurczewski (1966), Kurczewski and Ginsburg (1971) and Kurczewski and Kurczewski (1971) have published information on the biology of *T. validus*. This species constructs a multicelled nest in sandy soil. Prey consists of three species of Conocephalidae: Tettigonioidea; *Conocephalus brevipennis* (Scudder), *C. fasciatus* (DeGeer) and *C. nigropleurum* (Bruner). The sarcophagid fly *Senotainia trilineata* Wulp has been recorded as an inquiline in the nest of this wasp.

Distribution: eastern United States to Texas (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 2 males.



Genus *Tachyspex* Kohl

Tachyspex Kohl, 1883a: 166.
Schistosphex Arnold, 1922: 137.
Atelosphex Arnold, 1923: 177.

Diagnosis: Ocellar scars oval, oblong or elongate, if elongate then long axes forming an angle of 80 degrees or more; distance between midocellus and lower end of scar equal to or greater than length of scar; petiole-metacoxal cavity completely membraneous; female foretarsomere II with three or more rake spines which are long and fine; gastral tergum II without a lateral carina; male sternum VIII emarginate apically; forefemur of male with a basoventral notch or depression.

Bohart and Menke (1976) listed 351 species under *Tachysphex* making it the largest genus in the Subfamily Larrinae. The genus is found on all continents of the world with the Nearctic Region containing 62 species. Key to the North American species by Fox (1894b) and Williams (1914a) are in need of revision.

Key to Quebec Species of *Tachysphex*
(Adapted from Fox, 1894b)

1 Males 2
1' Females 7

2 Abdomen black and red 3
2' Abdomen entirely black except apical tergum which may be red 4

3 Distance between eyes at vertex a little less than length of antennal segments 3 and 4 united; abdomen with first two terga red . . . . *quebecensis* (Provancher)
3' Distance between eyes at vertex about equal to length of antennal segments 3 and 4 united; abdomen with red on one or more terga beyond the second . . *tarsatus* (Say)

4 Abdomen completely without bands of silvery pubescence . . . . . *aethiops* (Cresson)
4' Abdomen with three or more bands of silvery pubescence . . . 5

5 Distance between eyes at vertex greater than the length of antennal segments 2 to 4 united . . *terminatus* (F. Smith)
5' Distance between eyes at vertex about equal to length of antennal segments 2 to 4 united 6

6 Frontal carina indistinct . . . . . *acutus* (Patton)
6' Frontal carina distinct, deeply impressed, channel-like . . . . . *similis* Rohwer

7 Distance between eyes at vertex about equal to length of antennal segments 2 and 3 united . . . 8
7' Distance between eyes at vertex greater than length of antennal segments 2 and 3 united . . . 9

8 Dorsal surface of propodeum with fine wrinkles in addition to granular microsculpture; abdomen with red on first two terga only . . . . . *quebecensis* (Provancher)
8' Dorsal surface of propodeum with granular microsculpture but without wrinkles; abdomen with red on one or more terga beyond the second . . . . . *tarsatus* (Say)

9 Distance between eyes at vertex equal to or greater than length of antennal segments 3 and 4 united . . 10
9' Distance between eyes at vertex less than length of antennal segments 3 and 4 united 11

10 Abdomen with last two terga red . . . *terminatus* (Smith)
10' Abdomen with last two terga completely black . . *similis* Rohwer

11 Abdomen without bands of silvery pubescence .*aethiops* (Cresson)
11' Abdomen with three bands of silvery pubescence . . . . . *acutus* (Patton)

Tachysphex acutus (Patton)
Fig. 121

Larra acuta Patton, 1881b: 390.
Tachysphex bruesi Rohwer, 1911: 577.

Diagnosis: Abdomen black, with three bands of silvery pubescence in female and four in male.

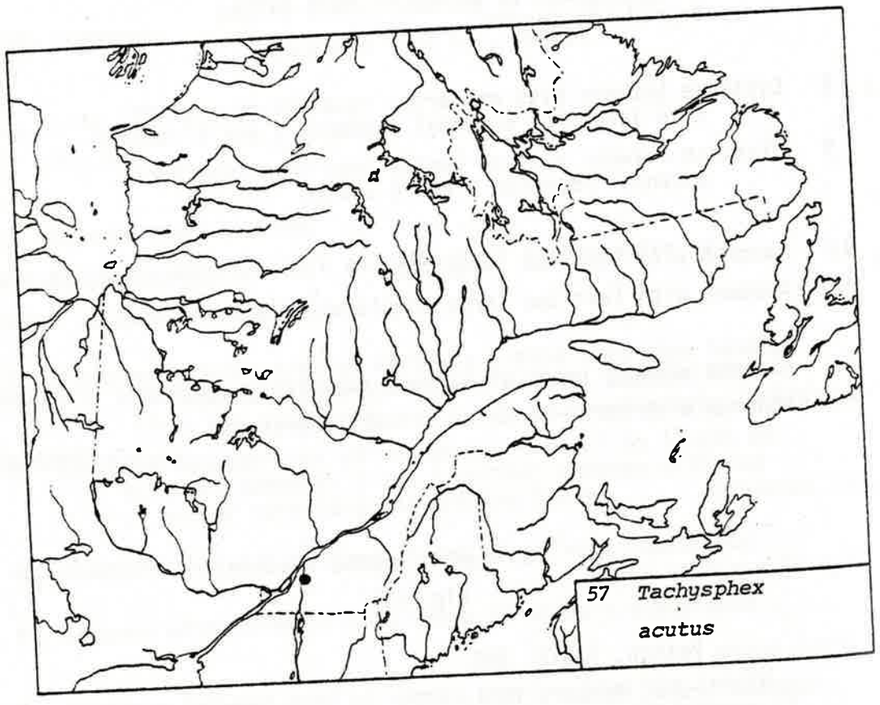
Male; distance between eyes at vertex about equal to length of antennal segments 2 to 4 united; frontal carina of face indistinct, not deeply impressed or channel-like.

Female; distance between eyes at vertex greater than length of antennal segments 2 and 3 united but less than length of 3 and 4 united; propoduem dorsally with fine wrinkles in addition to granular microsculpture; lenth 8-9 mm.

Biology: Unknown.

Distribution: eastern United States (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 female.



Tachysphex aethiops (Cresson)

Fig. 72

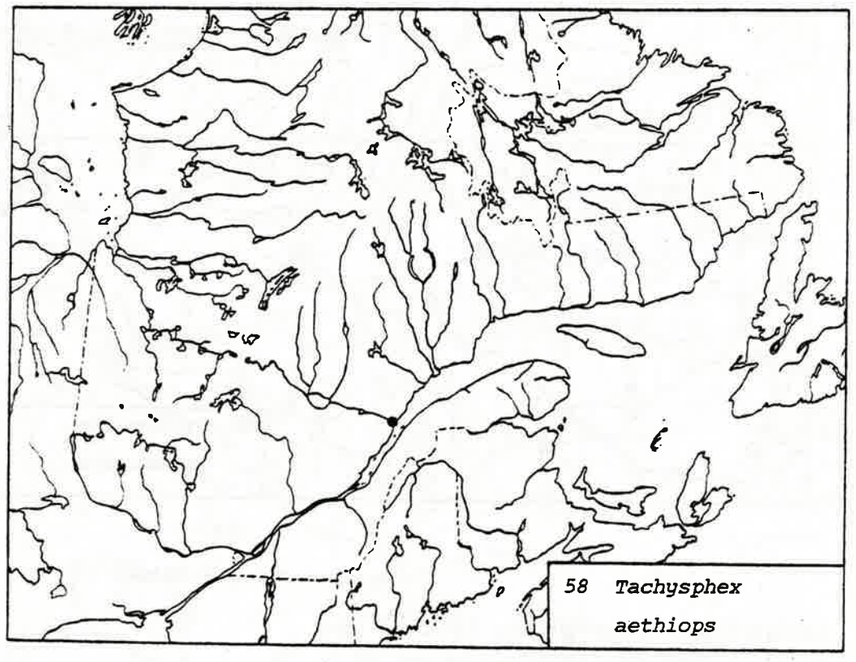
Larrada aethiops Cresson, 1865b: 465.

Diagnosis: Abdomen black, completely without transverse bands of silvery pubescence.

Biology: Evans (1970) found this species nesting in sand and preying on nymphal *Trimerotropis* sp. (Acrididae).

Distribution: western United States (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 female.



Tachysphex quebecensis (Provancher)

Larra quebecensis Provancher: 1882: 50.

Diagnosis: Abdomen black with red on first two terga.

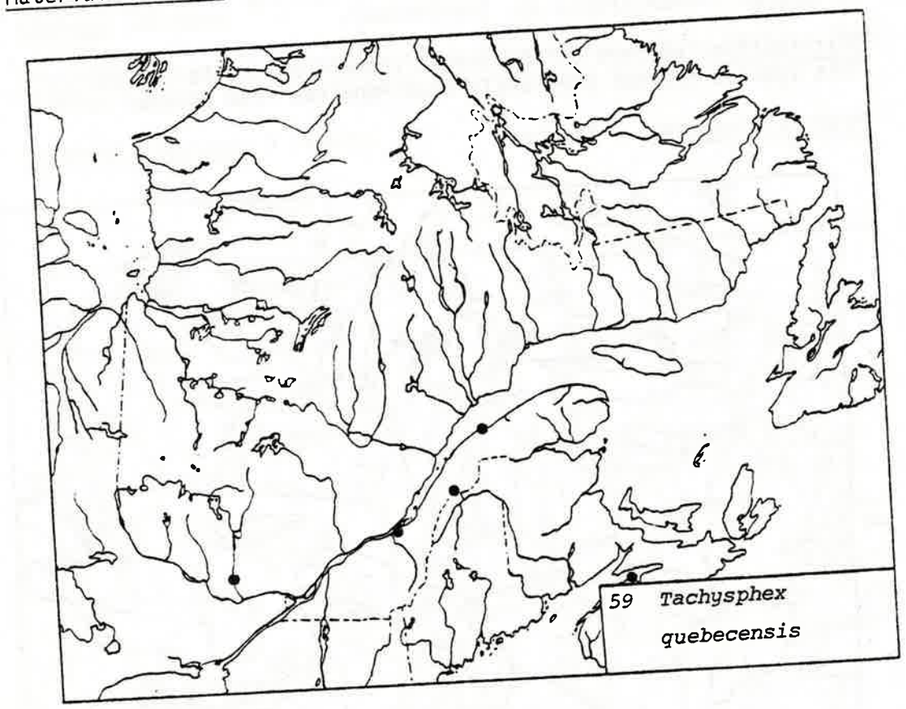
Male; distance between eyes at vertex a little less than length of antennal segments 3 and 4 united.

Female; distance between eyes at vertex about equal to length of antennal segments 2 and 3 united; dorsal surface of propodeum with fine wrinkles in addition to granular microsculpture.

Biology: Unknown.

Distribution: northeastern North America (Bohart and Menke, 1976).

Material Examined: 2 males; 7 females.



Tachysphex similis Rohwer

Tachysphex similis Rohwer, 1910b: 51.
Tachysphex similans Rohwer, 1910b: 52.

Diagnosis: Abdomen entirely black, with four bands of silvery pubescence.

Male; distance between eyes at vertex about equal to length of antennal segments 2 to 4 united; frontal carina distinct, deeply impressed, somewhat channel-like.

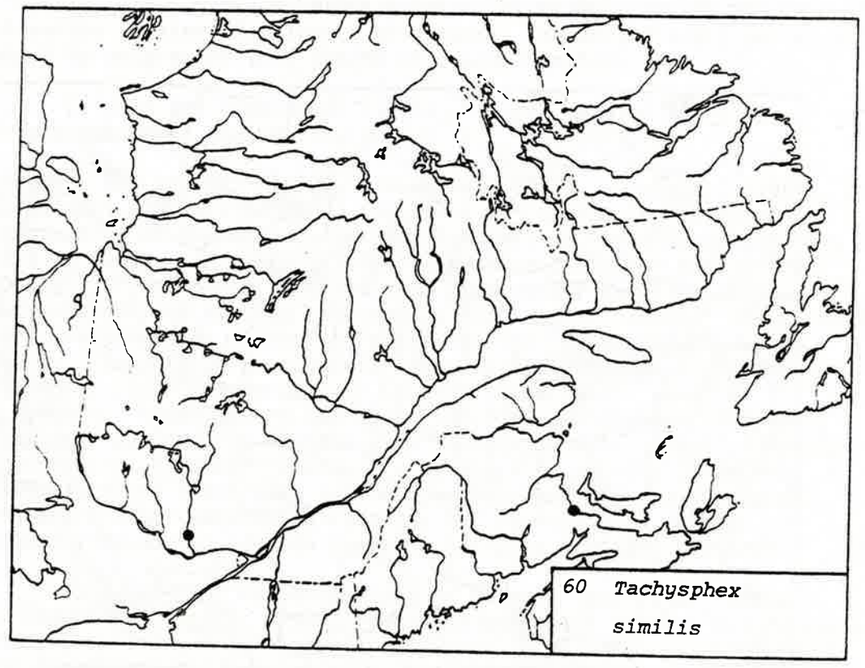
Female; distance between eyes at vertex greater than length of antennal segments 2 and 3 united and equal to or greater than length of 3 and 4 united.

Elliott and Kurczewski (1974a) have studied character displacement.

Biology: Krombein and Evans (1955) reported this wasp nesting on sand flats in Florida. Krombein (1964a) found *T. similis* preying on immature acridid grasshoppers of the genera *Aptenopedes*, *Melanoplus* and *Radinotatum* in Florida. Kurczewski (1966b) described the behaviour of the males which included digging resting burrows and territorial defence. The chrysidid parasite *Hedychridium fletcheri* was reported from *T. similis* nests by Kurczewski (1967).

Distribution: eastern United States (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 2 females.



Tachysphex tarsatus (Say)

Fig. 42

Larra tarsata Say, 1823: 78.

Tachysphex dubius Fox, 1894: 508, *nec* Radoszkowski, 1886.

Tachysphex dubiosus Dalla Torre, 1897: 679. New name for *Tachysphex dubius* Fox.

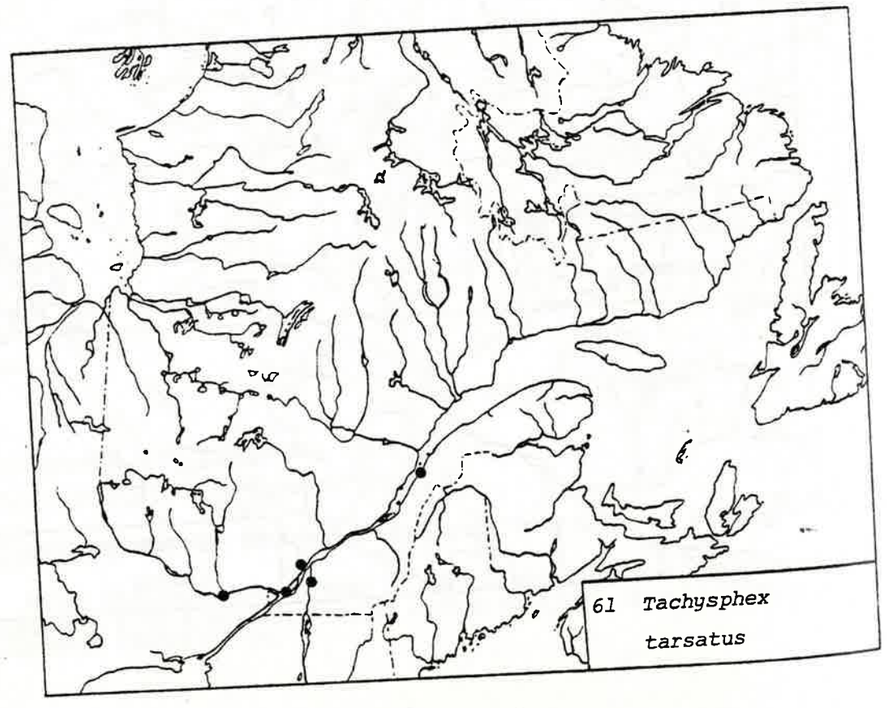
Tachysphex hitei Rohwer, 1908a: 221.

Tachysphex zimmeri Mickel, 1916a: 415.

Diagnosis: Abdomen black with red on one or more terga beyond the second.

Male; distance between eyes at vertex about equal to length of antennal segments 3 and 4 united.

Female; distance between eyes at vertex about equal to length of antennal segments 2 and 3 united; dorsal surface of propodeum with granular microsculpture but without wrinkles.



Biology: Williams (1914) and Evans (1970) found this species nesting in sandy soil; the unicellular nests were provisioned with acridid grasshoppers of the genera *Melanoplus* and *Trimerotropis*.

Distribution: Nearctic Region (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 male; 5 females.

Tachysphex terminatus (F. Smith)

Figs. 93, 102

Larrada terminata F. Smith, 1856: 291.

Larra minor Provancher, 1887: 268.

Diagnosis: Male; abdomen black with red on apical tergum, and with several bands of silvery pubescence; distance between eyes at vertex greater than length of antennal segments 2 to 4 united.

Female; abdomen black with last two terga red; distance between eyes at vertex greater than length of antennal segments 2 and 3 united and equal to or greater than length of 3 and 4 united.

Elliott and Kurczewski (1974a, b) have studied character displacement and seasonal variation in *T. terminatus*.

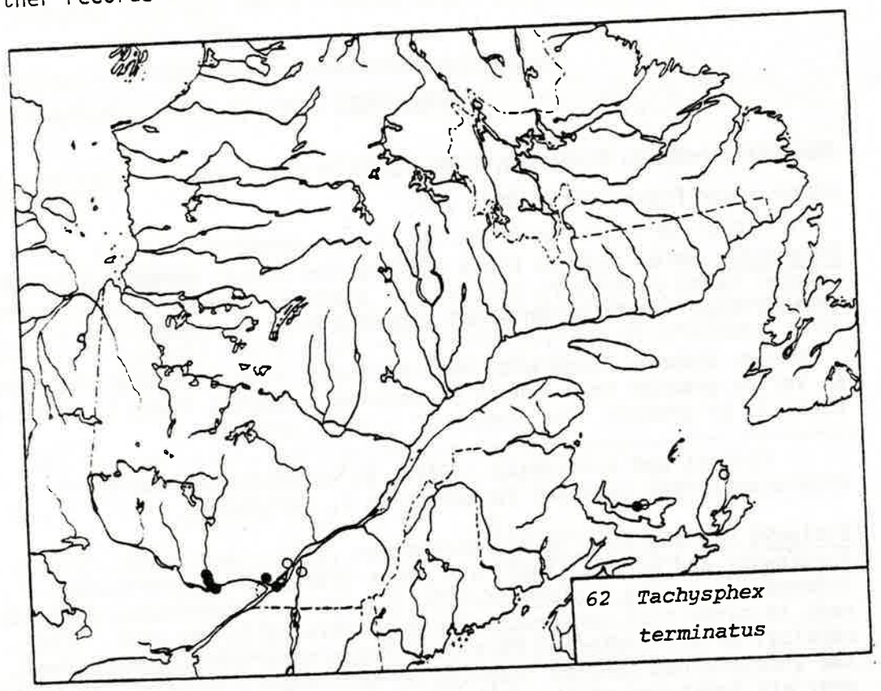
Biology: Rau and Rau (1918), Strandtman (1953), Kurczewski (1966a, b), Kurczewski and Harris (1968) and Evans (1970) have contributed information on the biology of this species. *T. terminatus* digs its nest in sandy soil constructing one to five cells per nest. Prey consists of Acrididae and rarely of Phaneropteridae (*Phaneroptera*, two undetermined species recorded by Kurczewski, 1966a). The acridid prey are immatures of the following species: *Chloealtis conspersa* Harris, *Chorthippus curtipennis* (Harris), *Chortophaga viridifasciata* (DeGeer), *Dichromorpha viridis* Scudder, *Dissosteira carolina* (Linnaeus), *Pardalophora apiculata* (Harris), *Melanoplus bivittatus* (Say), *M. femurrubrum* (DeGeer), *M. keeleri luridus* (Dodge), *Syrbula admirabilis* Uhler and *Tryxalus* [*sic*] sp. V.R. Vickery (personal communication) noted that neither *Phaneroptera* or *Tryxalus* [*sic*] are Nearctic or Neotropical genera; the *Phaneroptera* records are probably *Scudderia* and the *Tryxalus* [*sic*] is probably *Mermiria*.

T. terminatus is parasitized by several species of flies. Kurczewski and Harris (1968) found the bombyliid *Anthrax albofasciatus* (Macquart) and two sarcophagids *Phrosinella fulvicornis* (Coquillett) and *Senotainia trilineata* (Wulp) are cleptoparasitic in the nests of this wasp.

Distribution: Nearctic Region, the Bahamas, Colombia and Brazil (Bohart and Menke, 1976). Northern records for this species including several Quebec records were published by Elliott and Elliott (1973).

Material Examined: 44 males; 45 females.

Other records from Elliott and Elliott (1973), Map 62 open circles.



SUBFAMILY MISCOPHINAE

Diagnosis: Ocelli normal; inner orbits not emarginate; jugal lobe of hindwing small or absent, never more than one half length of anal area; clypeus not divided by vertical sutures into three parts.

Key To Quebec Species of Miscophinae
(Adapted from Bohart and Menke, 1976)

1 Forewing with one submarginal cell . . . . *Nitela* Latreille

1' Forewing with three submarginal cells 2

2 Pronotal collar with three dorsal prominences; submarginal cell II trapezoidal in shape, four to six sided, not petiolate and receiving both recurrent veins or first vein interstitial (Fig. 43) . . . . . *Lyroda* (Say)

2' Pronotal collar arcuate or flat dorsally; second submarginal cell three sided, triangular and petiolate; first recurrent received by first submarginal cell (Fig. 44) . . . *Plenoculus* Fox

Genus *Lyroda* Say

Lyroda Say, 1837: 372.

Morphota F. Smith, 1856: 293.

Odontolarra Cameron, 1900: 35.

Lyrodon Howard, 1901: pl. 6, fig. 5.

Diagnosis: Forewing with three submarginal cells; pronotal collar with three dorsal prominences; submarginal cell II trapezoidal in shape, four to six sided, not petiolate and receiving both recurrent veins although first recurrent vein may be interstitial.

Species of *Lyroda* are found in all regions. Two of the 18 species are found in North America and have been keyed by Fox (1894b) and Williams (1914a). Evans (1964a) described the larva of *Lyroda subita* (Say), the only species occurring in Quebec.

Lyroda subita (Say)
Fig. 43

Lyrops (*Lyroda*) *subita* Say, 1837: 372.

Larrada arcuata Smith, 1856: 293.

Lyroda cockerelli Rohwer, 1909e: 369.

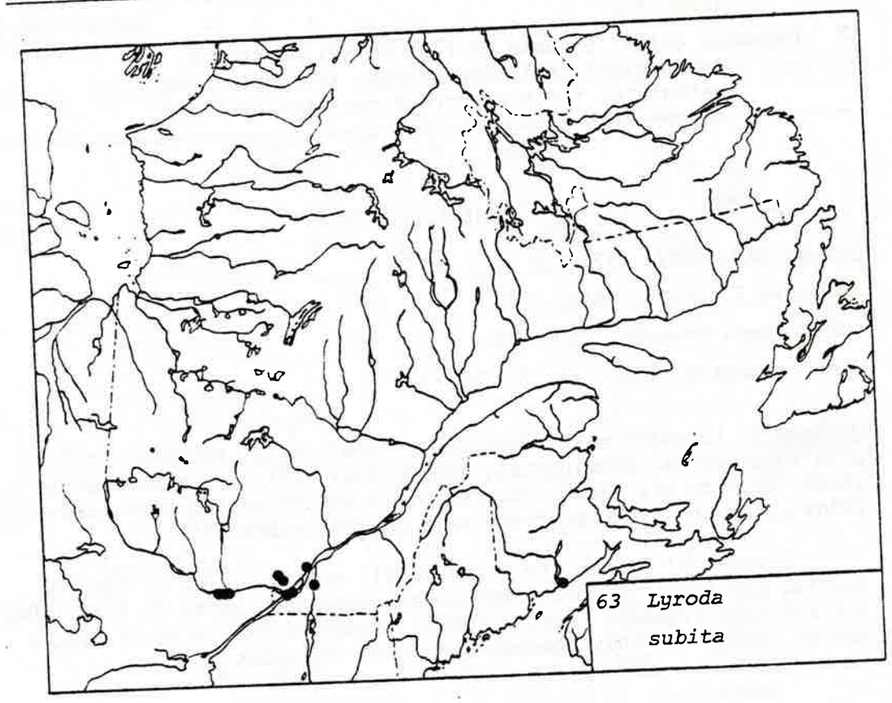
Diagnosis: Male; apical margin of clypeus bilobate medially.

Female; apical margin of clypeus with three teeth laterally; abdomen with silvery pubescence.

Biology: Patton (1892) and Peckham and Peckham (1898) observed this species nesting in sand and preying on crickets of the genus *Nemobius*. V.R. Vickery (personal communication) noted that the crickets are probably *Allonemobius* since *Nemobius* is an European genus.

Distribution: North America (Bohart and Menke, 1976).

Material Examined: 25 males; 40 females.



Genus *Plenoculus* Fox

Plenoculus Fox, 1893b: 554.

Ptygosphex Gussakovskij, 1928: 18.

Pavlovskia Gussakovskij, 1935: 424.

Diagnosis: Forewing with three submarginal cells; pronotal collar arcuate or flat dorsally; second submarginal cell triangular and petiolate; externoventral margin of mandible notched; frons without a V-shaped swelling; pygidial plate broadly triangular, delimited by a lateral carina and usually present in both sexes; male foretrochanter and coxa normal; propodeal dorsum finely granulate; female hindcoxa without a ventral spine or tubercle.

Sixteen of the 18 species in this genus are found in North America ranging as far south as southern Mexico (Bohart and Menke, 1976). One species is known from Quebec and the other two species of the genus are

found in the Old World. The American species of *Plenoculus* were keyed by Williams (1960). Evans (1959a) described the larva of *Plenoculus davisi* Fox.

Plenoculus davisi atlanticus Viereck

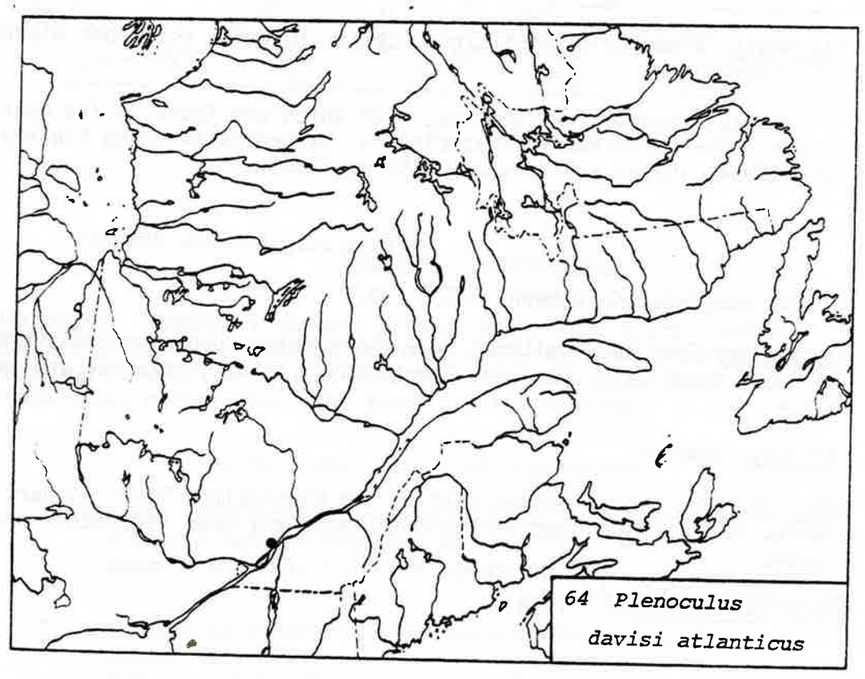
Fig. 44

Plenoculus atlanticus Viereck, 1902: 74.

Diagnosis: Abdomen black, eastern seaboard distribution.

Male; sterna 3-6 more or less transversely tuberculate, or gently undulate; clypeus yellow, with a hair brush on either side; scape pale beneath.

Female; anterior margin of clypeus subtruncately produced, with a median notch and four or five lateral teeth.



Biology: Little is available on the biology of *P. d. atlanticus*, Kurczewski (1968), however compared the behaviour of this subspecies to that of the nominate subspecies. Evans (1961) and Williams (1960) also reported on biological aspects of the nominate subspecies. *P. d. atlanticus* nests in sandy soil, probably constructs several cells per nest and provisions them with bugs of the Family Miridae. The nominate subspecies is known to provision 2 to 24 bugs per cell (Kurczewski, 1968). The only known prey record for *atlanticus* are bugs of the genus *Phytocoris* (Kurczewski, 1968).

Distribution: eastern seaboard and Texas in North America (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 female.

Genus *Nitela* Latreille

Nitela Latreille, 1809: 77.
Rhinonitela Williams, 1928a: 97.

Diagnosis: Hindwing without closed cells; forewing with open discoidal cell.

Nitela contains 45 species, 5 of which are found in the Nearctic Region. The North American species can be separated using the keys of Pate (1934, 1937a) and Krombein (1950c, 1968).

Nitela virginiensis Rohwer

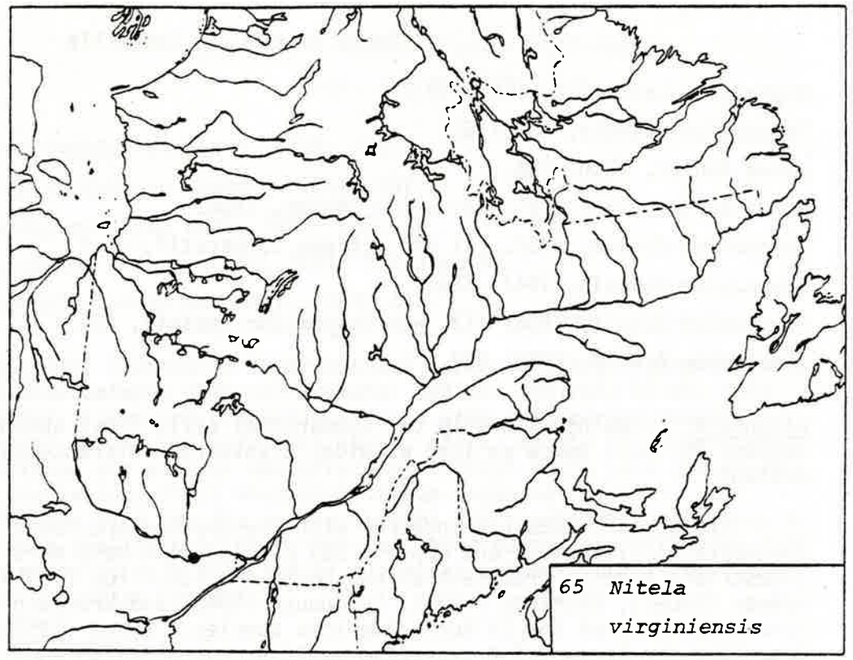
Nitela virginiensis Rohwer, 1923: 100.

Diagnosis: Eyes bare, without very short setae; pronotum transversely carinate anteriorly; head and thorax shiny, black; antennae and legs black.

Biology: Unknown.

Distribution: United States east of the Mississippi River (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 female.



65 *Nitela virginiensis*

Subfamily Trypoxylinae

Diagnosis: Hindocelli normal; without an oblique scutal carina posterolaterally; propodeum not distinctly toothed; antennal sockets touching clypeus, or if not then forewing with fewer than three submarginal cells; eyes with inner orbits angulate.

Key to Quebec Genera of Trypoxylinae

1 Transverse interantennal carina present, frons abruptly elevated between antennal sockets (Fig. 105); abdomen entirely black in Quebec species . . . . . *Trypoxylon* Latreille

1' Transverse interantennal carina absent, frontal surface between and above antennal sockets continuously flat except for frontal carina (Fig. 106); second abdominal segment with red in Quebec species . . . . . *Trypargilum* Richards

Genus *Trypoxylon* Latreille

Trypoxylon Latreille, 1796: 121.
Tripoxilon Spinola, 1806: 65.
Apius Panzer, 1806: 106.
Apius Jurine, 1807: 140, *nec Apius* Panzer, 1806.
Trypoxilon Jurine, 1807: 141 and tableau comparatif, p. 2.
Trypoxylum Agassiz, 1847: 380.
Trypoxylum Schulz, 1906: 212, *nec Trypoxylum* Agassiz, 1847,
Asaconoton Arnold, 1959: 322.

Diagnosis: Forewing with only one submarginal cell; first abdominal segment at least twice as long as wide; transverse interantennal carina present.

The genus *Trypoxylon* together with *Trypargilum* are found in all zoogeographical regions and contain 359 species with many more undescribed species from Central and South America. Fox (1891), Rohwer (1909f), Richards (1934), Sandhouse (1940) and Krombein (1962) have keyed most of the 39 North American species. Evans (1957b, 1959a) described the larvae of *Trypargilum collinum rubrocinctum* and *Trypoxylon frigidum frigidum* F. Smith.

Key to Quebec Species of *Trypoxylon*

(Adapted from Sandhouse, 1940 and Bohart and Menke, 1976)

1 First abdominal tergum nearly uniformly wide, not much wider apically than basally, about six times longer than width at base and with very little constriction between first and second terga (Fig. 98)
. . . . . *pennsylvanicum pennsylvanicum* Saussure

1' First abdominal tergum expanded apically, not uniformly wide for its entire length, less than six times longer than basal width and with a distinct constriction between first and second terga (Fig. 99) 2

2 Supra-antennal area uniformly granular; hair on mesopleuron short and straight; male with apical flagellar segment twice as long as preceding segment (Fig. 139)
. . . . . *frigidum frigidum* F. Smith

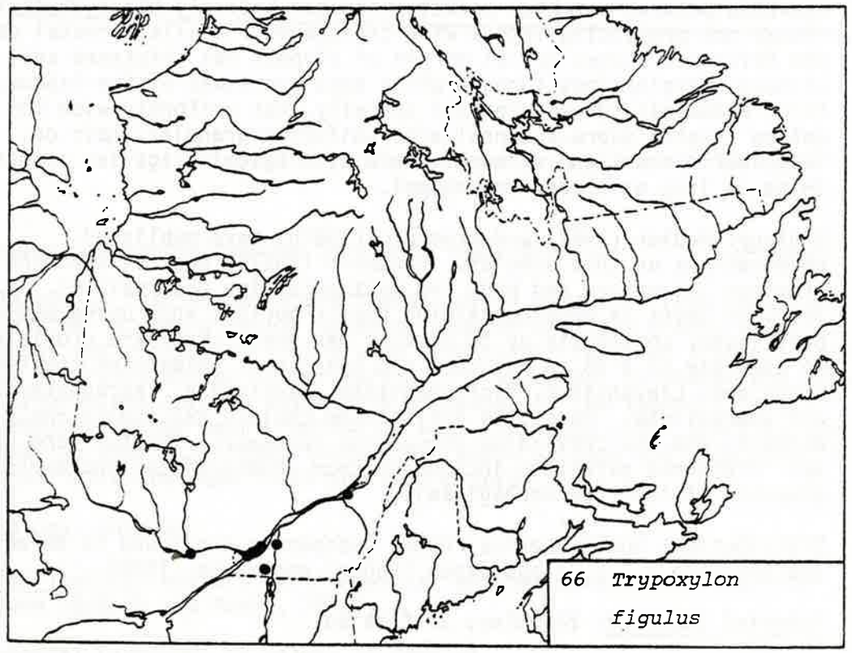
2' Supra-antennal area granular between shallow punctures; hair on mesopleuron long with tips bent posteriorly; male with apical flagellar segment four times longer than preceding segment (Fig. 140) . . . *figulus figulus* (Linnaeus)

Trypoxylon figulus figulus (Linnaeus)

Figs. 45, 99, 140

Sphex figulus Linnaeus, 1758: 570.
Sphex fuliginosa Scopoli, 1765: 292.
Trypoxylon majus Kohl, 1883: 657.
Trypoxylon apicalis Fox, 1891: 136 and 142.
Trypoxylon minus Beaumont, 1945: 477.

Diagnosis: Transverse interantennal carina present, frons abruptly elevated between antennal sockets; abdomen entirely black; metapleural flange not projecting into a wide transparent lamella; frontal carina not bifurcate above; apical margin of clypeus not thickened and without emarginations through which pass processes of the labrum; first abdominal tergum expanded apically, not uniformly wide for its entire length; supra-antennal area granular between shallow punctures; hair on mesopleuron long with tips bent posteriorly; male with apical flagellar segment four times longer than preceding segment.



66 *Trypoxylon figulus*

Biology: Although there is no material concerning the American members of this species, Richards (1934) summarized an earlier work and reported European members of this species nesting in cylindrical cavities in wood or plant stems, constructing several cells and stocking them with small spiders chiefly of the Family Epeiridae. Freeman (1938) reported English members preying on the genus *Bathyphantes* (Linyphiidae) and providing about 10 spiders per cell. Jussila and Kapyla (1975) found *T. f. figulus* being parasitized by the ichneumonid *Townesia tenuiventris* (Holmgren).

Distribution: Holarctic Region, six other subspecies are distributed over Europe, Morocco, Japan and Korea (Bohart and Menke, 1976).

Material Examined: 14 males; 16 females.

Trypoxylon frigidum frigidum F. Smith

Figs. 105, 139

Trypoxylon frigidum F. Smith, 1856: 381.

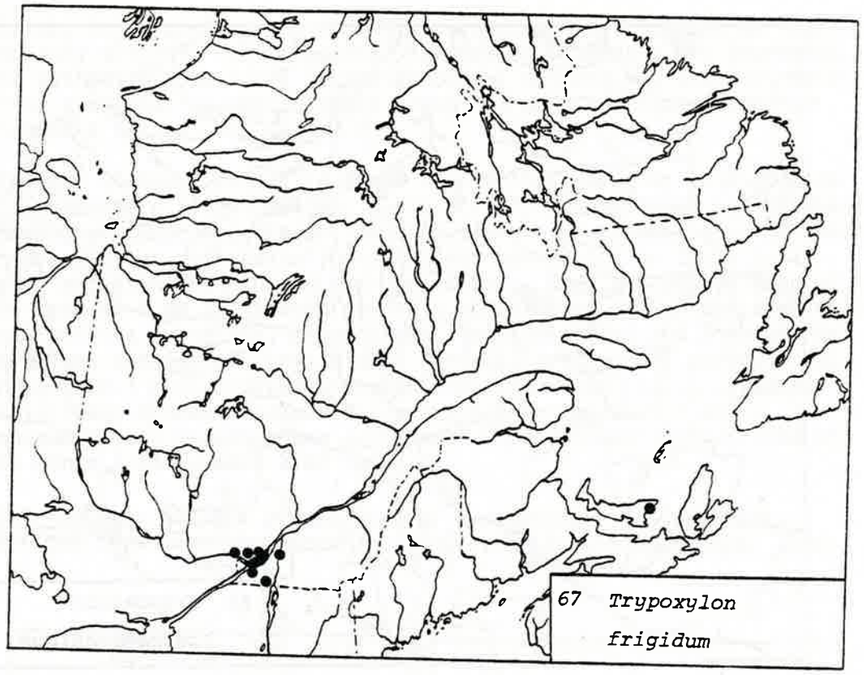
Trypoxylon plesium Rohwer, 1920b: 229.

Diagnosis: Transverse interantennal carina present, frons abruptly elevated between antennal sockets; abdomen entirely black; metapleural flange not projecting into a wide transparent lamella; frontal carina not bifurcate above; apical margin of clypeus not thickened and without emarginations through which pass processes of the labrum; first abdominal tergum expanded apically, not uniformly wide for its entire length; supra-antennal area uniformly granular; hair on mesopleuron short and straight; male with apical flagellar segment twice as long as preceding segment.

Biology: Medler (1967) and Krombein (1967b) have published observations on this species. Krombein (1967b) has reviewed the previous literature and made the most extensive observations. *T. f. frigidum* nests in wood containing beetle borings and, using mud partitions, constructs up to 8 cells per nest. Prey are provisioned at the rate of 4 to 16 per cell and consist of spiders of the families Araneidae, Linyphiidae, Micryphantidae, Salticidae, Tetragnathidae and Theridiidae. Parasites include the chalcid *Melittobia chalybii* Ashmead, and the chrysidids *Chrysogona verticalis* (Patton) and *Chrysis* sp. Dipterous parasites include *Anthrax* (Bombyliidae) and *Amobia distorta* (Allen) (Sarcophagidae).

Distribution: North America; other subspecies are found in Korea, southeastern U.S.S.R. and Japan (Bohart and Menke, 1976).

Material Examined: 24 males; 27 females.



Trypoxylon pennsylvanicum pennsylvanicum Saussure

Fig. 98

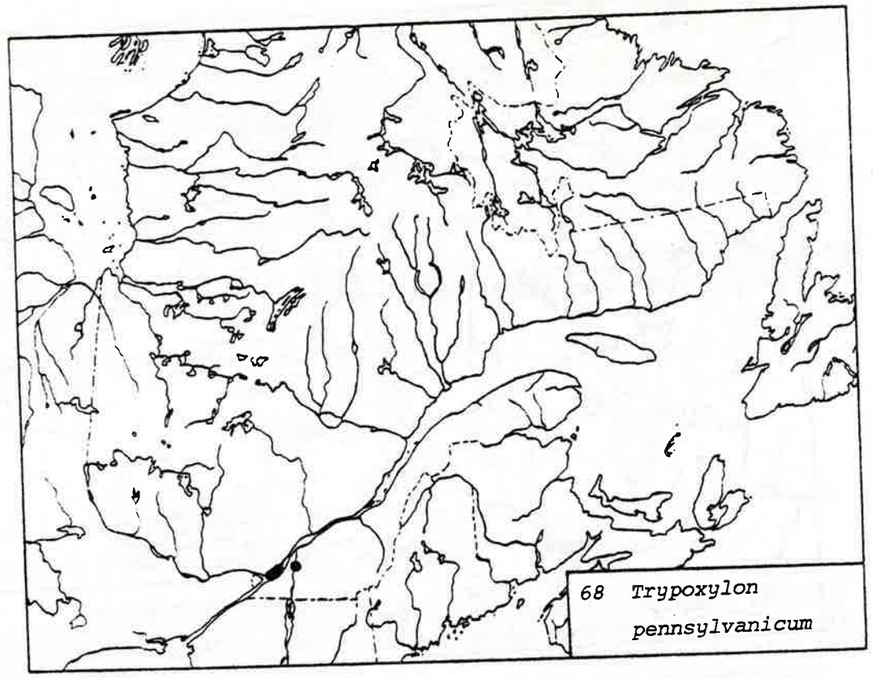
Trypoxylon pennsylvanicum Saussure, 1867: 82.

Diagnosis: Transverse interantennal carina present, frons abruptly elevated between antennal sockets; abdomen entirely black; metapleural flange not projecting into a wide transparent lamella; frontal carina not bifurcate above; apical margin of clypeus not thickened and without emarginations through which pass processes of the labrum; first abdominal tergum nearly uniformly wide, not much wider apically than basally, about six times longer than width at base and with very little constriction between first and second terga.

Biology: Unknown.

Distribution: eastern North America; another subspecies occurs in Japan (Bohart and Menke, 1976).

Material Examined: 11 males; 25 females.



68 *Trypoxylon pennsylvanicum*

Genus *Trypargilum* Richards

Trypargilum Richards, 1934: 191.

Diagnosis: Forewing with one submarginal cell; first abdominal segment at least twide as long as wide; transverse interantennal carina absent.

Krombein *et al.* (1979) have recently removed this genus from *Trypoxylon*.

Trypargilum collinum rubrocinctum (Packard)

Figs. 13, 106

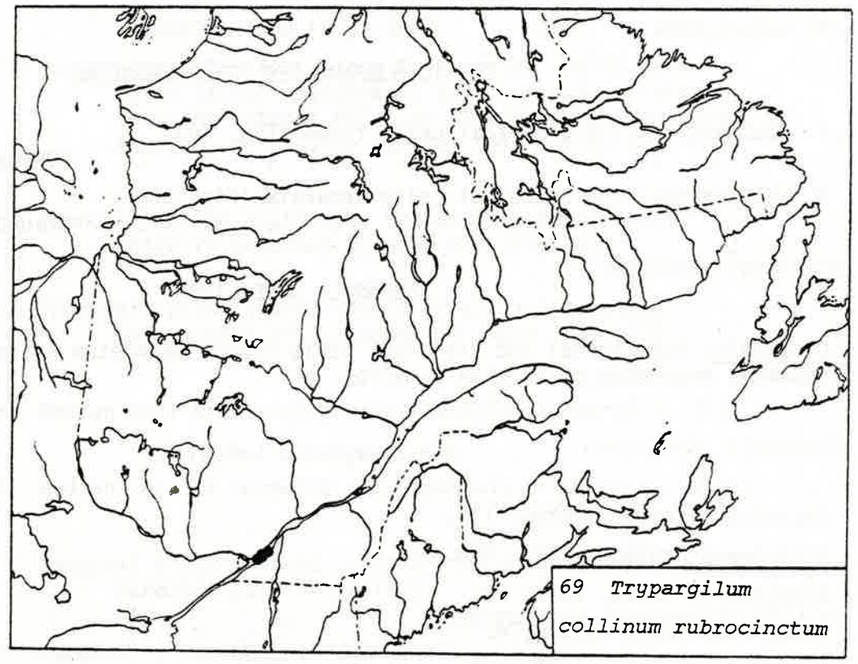
Trypoxylon rubrocinctum Packard, 1867: 416.

Diagnosis: Transverse interantennal carina absent, frontal surface between and above antennal sockets continuously flat except for frontal

carina; intercoxal carina strongly curved; metapleural flange small and only slightly convex; dorsal surface of propodeum not depressed and without projections; second abdominal segment red basally; male first abdominal segment without a ventral hook and hindtrochanter without a spine.

Biology: Richards (1934) reviewed the earlier works on this species while Krombein (1954, 1967b), Medler (1967) and Matthews and Matthews (1968) have made more recent contributions. *T. c. rubrocinctum* nests in preexisting cylindrical cavities and constructs up to 15 cells using agglutinated sand or mud partitions. Prey are provisioned at the rate of 5 to 23 spiders per cell, consisting of various species of the Families Araneidae, Linyphiidae, Tetragnathidae and Theridiidae. Parasites consist of Chrysididae: *Chrysis* (*Trichrysis*) *carinata* Say, *Chrysis* (*C.*) *pellucidula* Aaron and *Chrysogona verticalis* (Patton); Mutillidae: *Sphaeropthalma* (*S.*) *pennsylvanica scaeva* (Blake); Ichneumonidae: *Messatoporus compressicornis* Cushman; Bombyliidae of the genus *Anthrax* were also found.

Distribution: eastern United States; the nominate subspecies is confined to the southeastern United States (Bohart and Menke, 1976).



69 *Trypargilum collinum rubrocinctum*

Material Examined: 4 females.

FAMILY CRABRONIDAE

Diagnosis: Gaster not petiolate; midtibia with one apical spur; forewing with one submarginal cell, stigma normal; ocelli normal; scutum without an oblique carina posterolaterally; propodeum not toothed; antennal sockets close to clypeus; scape nearly to fully half as long as flagellum; inner orbits entire, not at all emarginate.

The Crabronidae contains over 1200 species and is considered to be the most specialized group in the superfamily (Bohart and Menke, 1976). Two subfamilies, Oxybelinae and Crabroninae, comprise the family; both of them are found abundantly in Quebec. The species of Oxybelinae found in Quebec fall entirely in the genus *Oxybelus* and have been keyed by Bohart and Schlinger (1957). The Quebec species of the superfamily Crabroninae have been keyed in Nearctic treatments by Bohart (1974, 1976) for *Rhopalum* and *Crabro* respectively; Pate (1943) for *Crossocerus* subgenus *Blepharipus* and Bohart and Kimsey (1979) for *Ectemnius*. The genera *Anacrabro*, *Lindenius*, *Crossocerus* and *Lestica* are in need of comprehensive Nearctic treatments.

KEY TO SUBFAMILIES OF CRABRONIDAE

1 Submarginal and discoidal cells fused (Fig. 46) . . . . . Oxybelinae

1' Submarginal and discoidal cells separate (Fig. 50) . . . . . Crabroninae

SUBFAMILY OXYBELINAE

Diagnosis: Submarginal and discoidal cells fused; metanotum often with squamae; propodeum often with a mucro.

Genus *Oxybelus* Latreille

Oxybelus Latreille, 1796: 129.
Notoglossa Dahlbom, 1845: 514.
Alepidaspis Costa, 1882: 35.
Anoxybelus Kohl, 1923: 274.
Gonioxybelus Pate, 1937b: 28.

Orthoxybelus Pate, 1937b: 45.
Latroxybelus Noskiewicz and Chudoba, 1950: 300.

Diagnosis: Abdominal terga 3 to 5 without lateral carina; both metanotal squamae and propodeal mucro present; acetabular carina present; scutellum with a median longitudinal carina at least posteriorly.

With more than 215 species, *Oxybelus* is the largest genus in the family, and is distributed over all regions except Australia (Bohart and Menke, 1976). About 40 species are found in North America, of which 6 occur in Quebec. Bohart and Schlinger (1957) have keyed the North American species. Evans (1957b) described the larvae of *Oxybelus bipunctatus* Olivier and *O. uniglumis* (Linnaeus).

Key to Quebec Species of *Oxybelus*

(Adapted from Bohart and Schlinger, 1957)

1 Mucro flaring toward apex, sides usually very divergent toward apex which is emarginate; squama with an uneven posterior margin, lateral point plainly equalled or surpassed by strongly developed submedian lobe (Fig. 28) . . . . . *emarginatus* Say

1' Murco nearly parallel-sided or tapering toward apex which is not emarginate; squama evenly incurved from the lateral point or if with an uneven margin then not surpassing lateral point (Fig. 29) . . . 2

2 Pronotal carina distinctly broken at humeral angle, which is somewhat rounded off (Fig. 21) . . . . . *subulatus* Robertson

2' Pronotal carina sharp, hardly at all interrupted, not rounded off at pronotal angle (Fig. 22) . . . 3

3 Median cell of forewing rather evenly setose (Fig. 47) . . . . . *uniglumis* (Linnaeus)

3' Median cell of forewing very sparsely or unevenly setose . . 4

4 Temporal ridge present, originating at inferior angle of mandible base (Fig. 122) . . . . . *bipunctatus bipunctatus* Olivier

4' Temporal ridge absent 5

5 Thorax and abdomen entirely black . . . *niger* Robertson

5' Thorax and abdomen with pale markings . . *laetus laetus* Say

Oxybelus bipunctatus bipunctatus Olivier

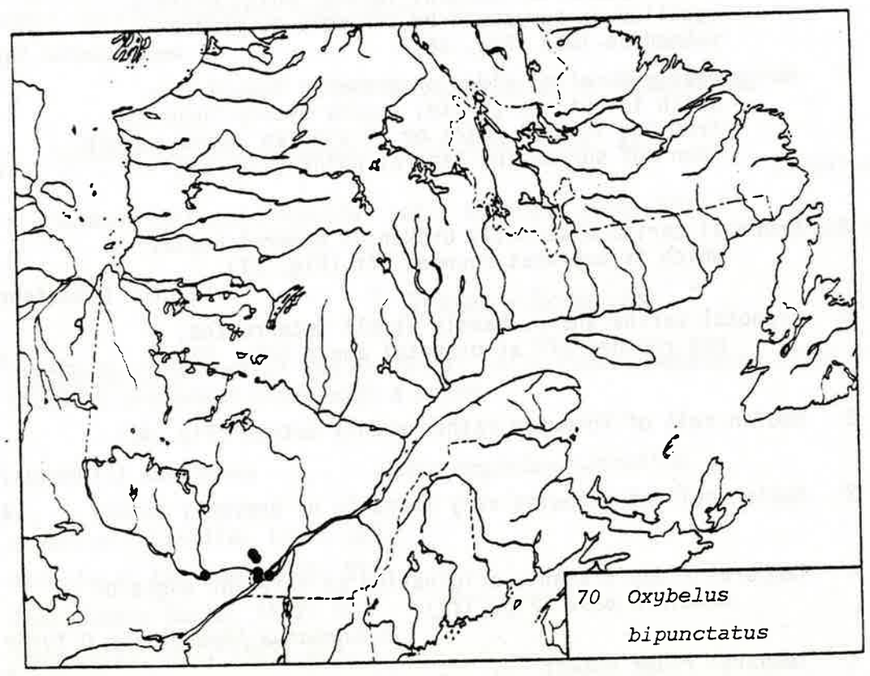
Fig. 122

Oxybelus bipunctatus Olivier, 1811: 597.

Oxybelus nigroaeneus Shuckard, 1837: 113.

Oxybelus laevigatus Schilling, 1848: 105.

Diagnosis: Vertex without a shiny median tubercle; first abdominal segment with black ground colour; propodeum in dorsal view without dense silvery pubescence; mucro nearly parallel sided; submedian lobe of squama not surpassing lateral point; pronotal carina sharp hardly at all interrupted, not rounded off at pronotal angle; median cell of forewing very sparsely setose; temporal ridge present.



Biology: Peckham, Kurczewski and Peckham (1973) have published the only observations on this species. *O. bipunctatus bipunctatus* constructs a one to four-celled nest in sandy soil and provisions the cells with various families of Diptera. The mechanism of prey carriage is somewhat unusual in that some wasps of this genus carry the prey impaled on the sting rather than holding it with the legs as do most other species. Peckham *et al.* (1973) observed *O. b. bipunctatus* carrying the prey to a short distance from the nest entrance then landing and impaling the prey with the sting before entering the nest. Prey records include the following families of Diptera: Stratiomyidae, Rhagionidae, Therevidae, Dolichopodidae, Platypezidae, Pipunculidae, Syrphidae, Lonchaeidae, Milichiidae, Anthomyiidae, Muscidae, Calliphoridae, Sarcophagidae and Tachinidae (Peckham *et al.* 1973).

Distribution: Europe, Japan, eastern United States and eastern Canada; another subspecies occurs in Algeria and Morocco (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 7 males;7 females.

Oxybelus emarginatus Say

Fig. 28

Oxybelus emarginatus Say, 1837: 375.

Oxybelus dilutus Baker, 1896: 159.

Oxybelus trifidus Cockerell and Baker, 1896: 23.

Notoglossa americanus Robertson, 1901: 204.

Notoglossa pacificus Rohwer, 1909a: 119.

Notoglossa minor Mickel, 1916a: 428.

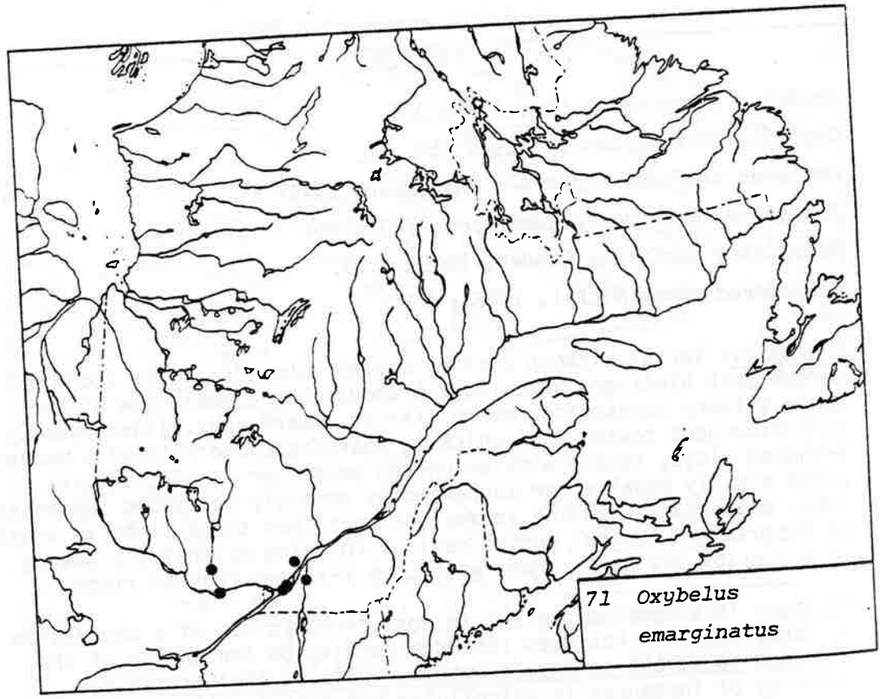
Diagnosis: Vertex without a shiny median tubercle; first abdominal tergum with black ground colour; propodeum in dorsal view without dense silvery pubescence; mucro flaring toward apex, sides usually very divergent toward apex which is emarginate and without a median Y-shaped ridge; squama with an uneven posterior margin, lateral point plainly equalled or surpassed by strongly developed submedian lobe; metanotum including squama not more than three times as broad as its greatest length; median cell of forewing extensively setose in posterior one half; frons without a V-shaped frontal ridge.

Biology: This species prefers to nest on the sides of a depression in sandy soil and has been recorded nesting on the inside of the entrance to an ant colony (Krombein, 1964a). The nest in the majority of instances is unicellular but occasionally contains two

cells. As many as three nests may be completed (including provisioning) in a single day (Peckham *et al.*, 1973). This species is one of a few in the genus that carries its prey with its legs, rather than impaled on the sting (Krombein and Kurczewski, 1963; Krombein, 1964a; Peckham *et al.*, 1973). Prey consist of a broad range of Diptera, Snoddy (1968) observed *O. emarginatus* hovering over cattle and attacking simuliids in the fur of these animals. He also reported this wasp imbibing blood from the open wounds of the cattle but did not mention whether or not the simuliids attacked by the wasp has taken a blood meal. The following families of Diptera have been recorded as prey: Chaoboridae, Certatopogonidae, Chironomidae, Simuliidae, Cecidomyiidae, Stratiomyidae, Empididae, Dolichopodidae, Pipunculidae, Syrphidae, Otitidae, Platystomatidae, Tephritidae, Sepsidae, Lauxaniidae, Sphaeroceridae, Milichiidae, Ephydridae, Drosophilidae, Chloropidae, Agromyzidae, Anthomyziidae, Anthomyiidae, Muscidae, and Tachinidae (Krombein and Kurczewski, 1963; Krombein, 1964a; Peckham *et al.*, 1973; Snoddy, 1968).

Distribution: southern Canada, United States and Mexico (Bohart and Menke, 1976).

Material Examined: 19 males; 10 females.



Oxybelus laetus laetus Say

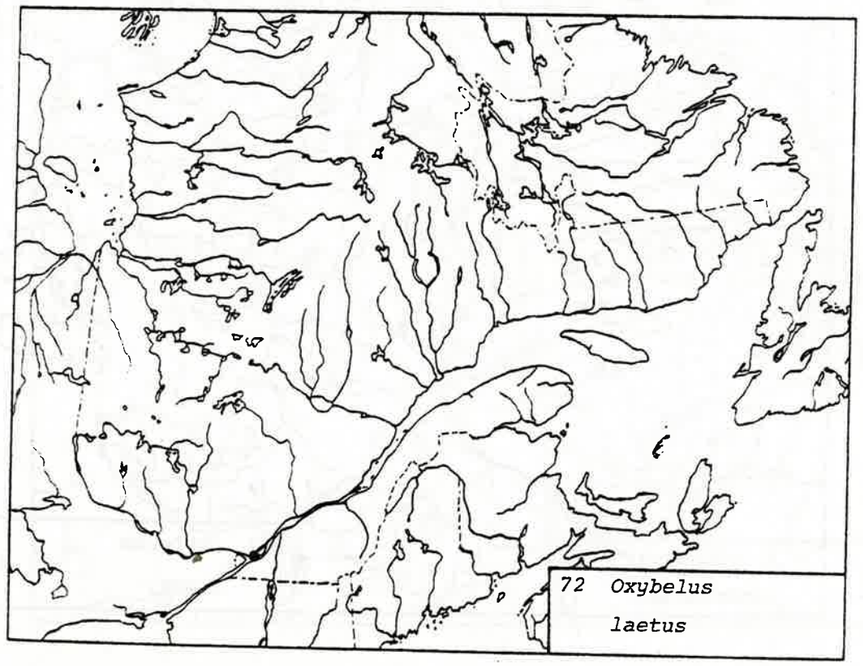
Oxybelus laetus Say, 1837: 375.

Diagnosis: Vertex without a shiny median tubercle; first abdominal tergum with black ground colour; propodeum in dorsal view without dense silvery pubescence; mucro nearly parallel sided, apex not emarginate; squama evenly incurved from lateral point; pronotal carina sharp, hardly at all interrupted, not rounded off at pronotal angle; median cell of forewing very sparsely setose; temporal ridge absent; abdominal segments with whitish maculations; female with tergum II polished toward middle and finely punctured; male with midtooth along clypeal apex depressed and not protruding farther than submedian tooth.

Biology: Unknown.

Distribution: eastern United States; another subspecies is found along the coast in southeastern areas (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 female.



Oxybelus niger Robertson

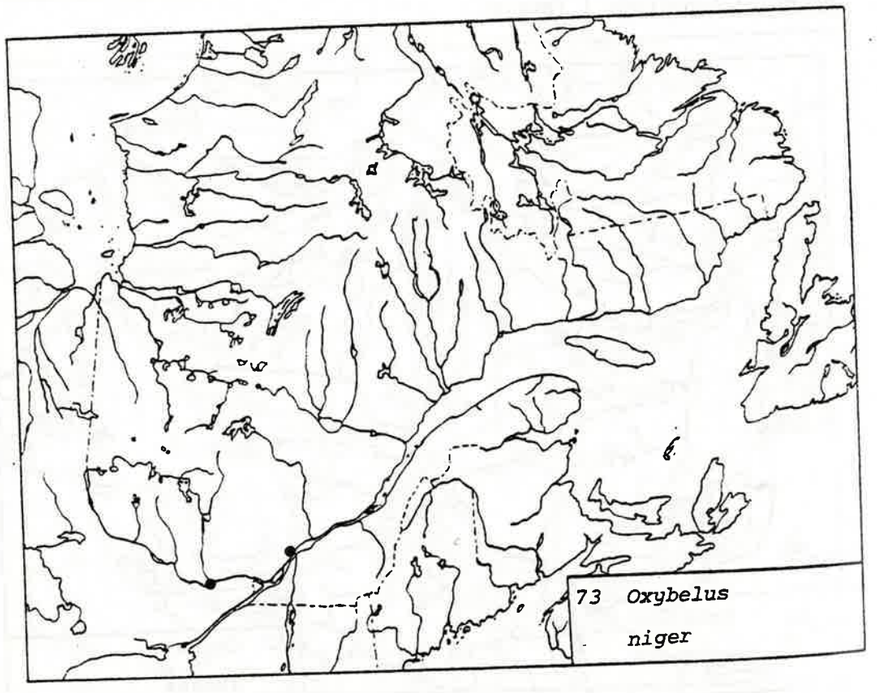
Oxybelus niger Robertson, 1889: 82.

Diagnosis: Vertex without a shiny median tubercle; thorax and abdomen entirely black; propodeum in dorsal view without dense silvery pubescence; mucro nearly parallel sided, apex not emarginate; squama evenly incurved from the lateral point to the middle of the metanotum; pronotal carina sharp, hardly at all interrupted, not rounded off at pronotal angle; median cell of forewing very sparsely setose; temporal ridge absent.

Biology: Unknown.

Distribution: southeastern Canada and the eastern United States (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 7 males.



Oxybelus subulatus Robertson

Fig. 21

Oxybelus mucronatus Packard, 1867: 436, *nec* Fabricius, 1793.

Oxybelus subulatus Robertson, 1889: 79.

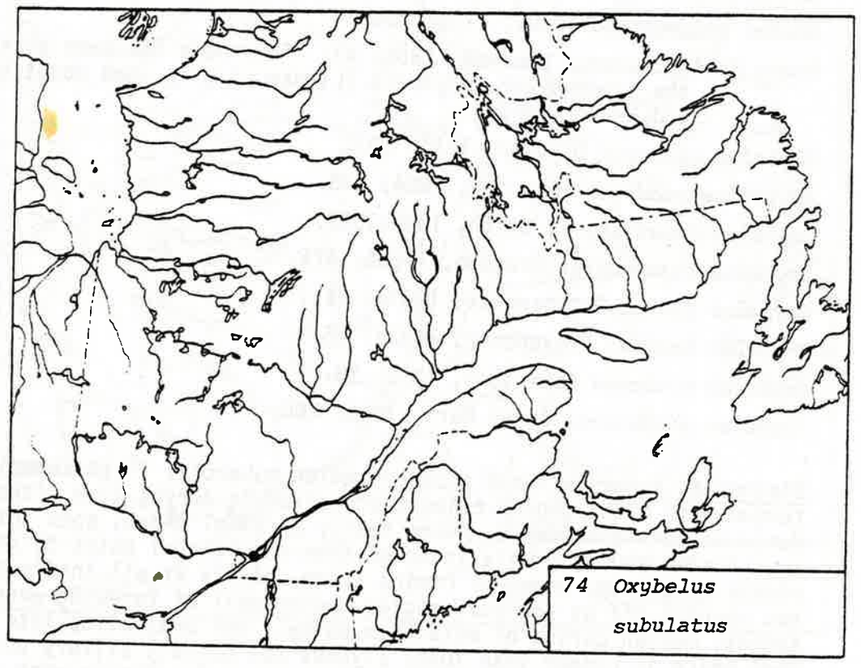
Oxybelus packardi Dalla Torre, 1890: 203, *nec* Robertson, 1889.

Oxybelus acutus Baker, 1896: 61.

Oxybelus albosignatus H. Smith, 1908a: 407.

Oxybelus mottensis Mickel, 1918a: 323.

Diagnosis: Vertex without a shiny median tubercle; first abdominal tergum with black ground colour; propodeum in dorsal view without dense silvery pubescence; mucro nearly parallel sided, apex not emarginate; squama evenly incurved to middle of metanotum from lateral point; pronotal carina distinctly broken at humeral angle, which is somewhat rounded off; median cell of forewing sparsely setose in broad central area; eyes grayish.



Biology: Pate (1940) briefly mentioned this species in a behavioural comparison with *Belomicrus* species. The most detailed account of *O. subulatus* is provided by Peckham *et al.* (1973). The nest is excavated in sandy soil bordered by mixed hardwood forests; one to six cells are constructed. Prey are impaled on the sting for transportation to the nest. Fully provisioned cells contained 3 to 11 males of two genera of Therevidae (Diptera). Sarcophagid flies were found as parasites in several nests of this species.

Distribution: United States (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 2 males.

Oxybelus uniglumis (Linnaeus)

Figs. 22, 29, 46, 47

Vespa uniglumis Linnaeus, 1758: 573.

Vespa uniglummis Christ, 1791: 246, *lapsus*.

Nomada punctata Fabricius, 1793: 346.

Crabro tridens Fabricius, 1793: 298.

Vespa decimmaculatus Donovan, 1806: 43. This name has been placed in the synonymy of *uniglumis* (Linnaeus) with some doubt by Bohart and Menke (1976).

Oxybelus pygmaeus Olivier, 1811: 597.

Oxybellus quadrinotatus Say, 1824: 338.

Oxybelus impatiens F. Smith, 1856: 390.

Oxybelus interruptus Cresson, 1865b: 475.

Oxybelus fallax Gerstaecker, 1867a: 91.

Oxybelus brodiei Provancher, 1883a: 35.

Oxybelus montanus Robertson, 1889: 78.

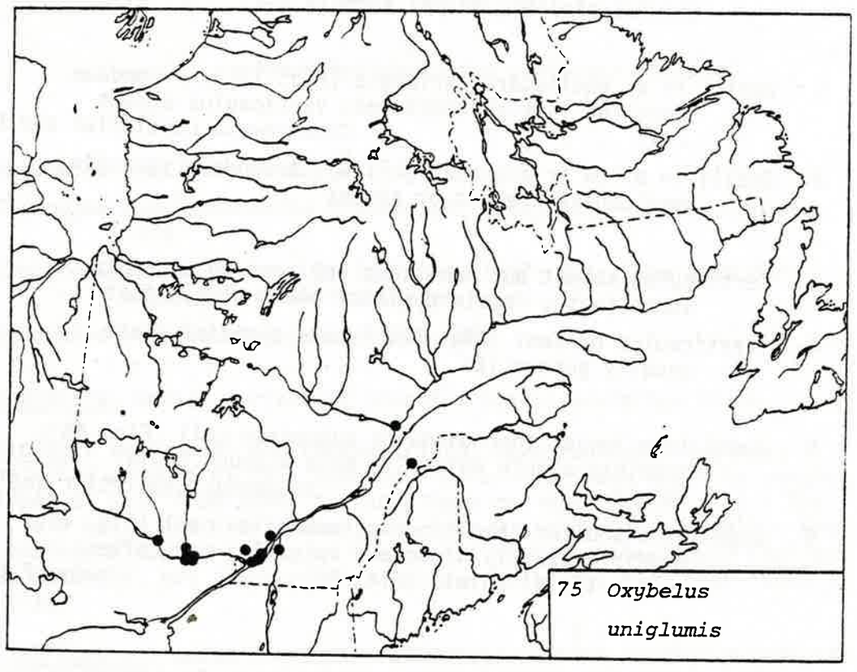
Oxybelus hispanicus Giner Mari, 1943: 260.

Diagnosis: Vertex without a shiny median tubercle; first abdominal tergum with black ground colour; propodeum in dorsal view without dense silvery pubescence; mucro nearly parallel sided, apex not emarginate; squama evenly incurved from the lateral point to the middle metanotum; pronotal carina sharp, hardly at all interrupted, not rounded off at pronotal angle; median cell of forewing evenly setose; median carina of metanotum normal, not projecting into a keel which is higher than long; clypeus not densely silvery pubescent; abdominal segments without red colouration; male clypeus with three teeth on apical margin.

Biology: A number of workers have contributed short notes on the biology of this species, concentrating for the most part on the prey carrying behaviour. They all agree that prey carriage is by impalement on the sting but disagree whether or not the prey is further supported with the legs (Peckham and Peckham, 1898; J.B. Parker, 1915; Williams, 1936; Strandtmann, 1945; Krombein, 1956; Andrewes, 1969). The most detailed observations on *O. uniglumis* are found in Evans (1970) and Peckham *et al.* (1973). This wasp nests in bare sandy soil excavating a burrow containing one to five cells. Prey consists mostly of male Diptera of the following families: Stratiomyidae, Rhagionidae, Bombyliidae, Dolichopodidae, Syrphidae, Platystomatidae, Lauxaniidae, Anthomyiidae, Calliphoridae, Sarcophagidae, Muscidae and Tachinidae. Several species of Sarcophagidae are also known as parasites of this wasp.

Distribution: Europe to Mongolia and across most of North America (Bohart and Menke, 1976).

Material Examined: 17 males; 41 females.



75 *Oxybelus uniglumis*

SUBFAMILY CRABRONINAE

Diagnosis: Submarginal and discoidal cells separate; metanotum without squamae; propodeum without a mucro.

Key to Quebec Genera of Crabroninae
(Adapted from Bohart and Menke, 1976)

1 Terga I-IV laterally carinate and sharply folded under (Fig. 4); mandible simple apically . . . *Anacrabro* Packard

1' Terga I-IV not carinate laterally; mandible often dentate apically 2

2 Gaster pedunculate, slender, elongate; first tergum nodose at apex (Fig. 5); omaulus absent; palpal formula 5-3 . . . . . *Rhopalum* Stevens

2' Gaster sessile or subsessile; first tergum not nodose; omaulus present; palpal formula 6-4 3

3 Ocelli in an equilateral triangle (Fig. 125); propodeum smooth or finely sculptured; verticaulus absent . . . . . *Crossocerus* Lepeletier and Brullé

3' Ocelli in a low triangle (Fig. 124); propodeum variable; verticaulus present or absent 4

4 Verticaulus absent but sometimes replaced by an angle or sharp tooth; female pygidial plate always flat . . . 5

4' Verticaulus present (Fig. 6); female pygidial plate usually gutterlike 6

5 Jugal lobe longer than hindwing submedian cell (Fig. 48); mandible simple apically; male without tibial shield . . . . . *Lindenius* Lepeletier and Brullé

5' Jugal lobe shorter than hindwing submedian cell (Fig. 49); mandible usually bidentate apically; male often with a tibial shield (Fig. 80) . . . *Crabro* Fabricius

6 Orbital foveae absent or shallow and evanescent, if limited by a fine inner ridge then upper frons without close moderate to coarse punctation . . . . . *Ectemnius* Dahlbom

6' Orbital foveae distinct (Fig. 123); upper frons with coarse or moderate and close punctation . . . . . *Lestica* Billberg

Genus *Anacrabro* Packard

Anacrabro Packard, 1866: 67.

Diagnosis: Terga I-IV laterally carinate and bent under; sterna flat or concave.

Anacrabro is a new world genus of 12 species only two of which are found in North America (Bohart and Menke, 1976). Evans (1957b) described the larva of *Anacrabro ocellatus* Packard. The two North American species were separated by Cockerell (1895).

Anacrabro ocellatus ocellatus Packard

Figs. 4, 128

Anacrabro ocellatus Packard, 1866: 68.

Thyreopus rugosopunctatus Provancher, 1882: 130, *nec* Taschenberg, 1875.

Crabro rugosulopunctatus Dalla Torre, 1897: 624. New name for *rugosopunctatus* Provancher.

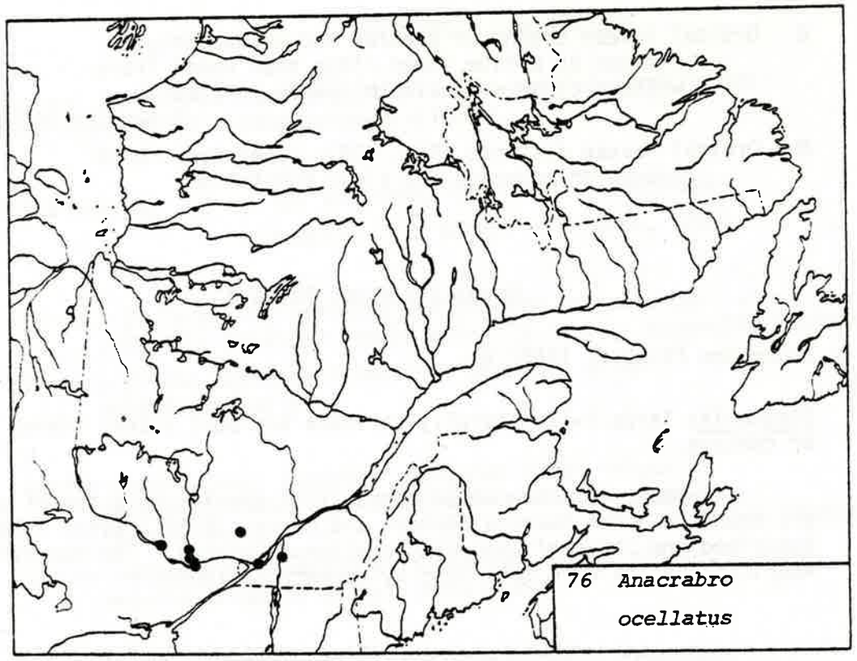
Anacrabro robertsoni Rohwer, 1920a: 58.

Diagnosis: Dorsal surface of pronotum black; scutellum black.

Biology: Kurczewski and Peckham (1970) have published the most detailed account of this species. *A. o. ocellatus* nests in varying types of soil from sandy to sandy loam and hard packed soil. The 2 to 9 cells are provisioned with 4 to 9 mirid bugs per cell. Prey consists almost entirely of the adults of *Lygus lineolaris* (Palisot de Beauvois) but *Plagiognathus politus* Uhler has also been found in cells.

Distribution: eastern and central United States; another subspecies occurs in central and southern Mexico (Bohart and Menke, 1976).

Material Examined: 16 males; 16 females.



Genus *Lindenius* Lepeletier and Brullé

Lindenius Lepeletier and Brullé, 1834: 791.

Chalcolamprus Wesmael, 1852: 590.

Trachelosimus A. Morawitz, 1866: 249.

Diagnosis: Mandible with apex simple, externoventral margin entire; scapal basin ecarinate; palpal formula 6-4; pronotal collar with a median notch; ocellar triangle broad and low; verticaulus absent; jugal lobe of hindwing longer than submedian cell.

Lindenius comprises a genus of 58 species found throughout the Holarctic Region. At present there is no key to the 10 Nearctic species, only one of which occurs in Quebec.

Lindenius armaticeps (Fox)

Figs. 48, 124

Crabro armaticeps Fox, 1895a: 185.

Crabro flaviclypeus Fox, 1895a: 186.

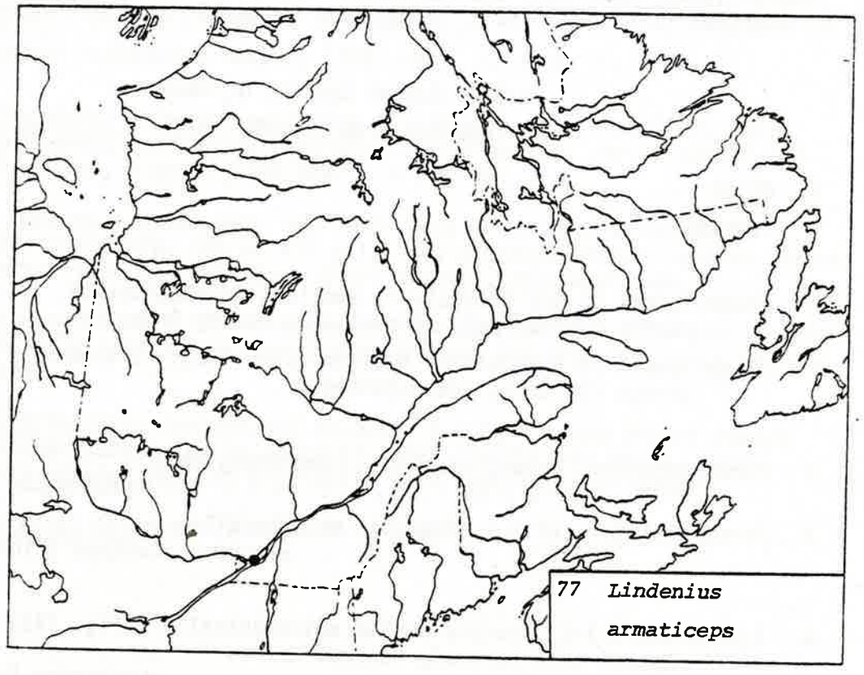
Crabro zellus Rohwer, 1909b: 151.

Diagnosis: Clypeus and scape yellow; hindtibia yellow beyond base.

Biology: Miller and Kurczewski (1975) have made observations on this species. *L. armaticeps* nests in hard packed sand or soil, excavating 3 to 11 cells. The authors noted that this species employs two types of prey transport; when the female returned with prey to a normally open nest entrance, the prey was carried with the legs, but if the nest entrance became blocked the female would land and impale the prey with the sting before proceeding to remove the obstruction in the nest entrance. Prey consist of flies of the family Chloropidae, chiefly *Parectecephala eucera* (Loew) but several other species and genera are also used. The sarcophagid *Phrosinella fulvicornis* (Coquillett) was observed larvipositing around closed nest entrances.

Distribution: southern Canada, northeastern United States south to Texas and Colorado (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 2 females.



Genus *Rhopalum* Stephens

Euplilis Risso, 1826: 227. See Menke, Bohart and Richards (1974b).

Rhopalum Stephens, 1829a: 34. See also Internat. Comm. Zool. Nomencl., Opinion 1106, 1978: 237.

Physoscelus Lepeletier and Brulle, 1834: 804.

Physoscelis Westwood, 1839: 80.

(*Corynopus*) Lepeletier and Brulle, 1834: 802.

Dryphus Herrich-Schaeffer, 1840: 123.

Alliognathus Ashmead, 1899: 219.

Although *Eupilis* has priority over *Rhopalum* a petition was submitted to the Interantional Commission on Zoological Nomenclature to suppress *Euplilis* on the basis that European workers who have published most of the major works on the genus still use *Rhopalum* (Menke, Bohart, and Richards, 1974b). This petition was upheld in Opinion 1106 of the Internat. Comm. Zool. Nomencl. (1978).

The 111 species of this genus are found over most of the world. Bohart (1974) published a key to the 7 North American species. Evans (1957b, 1964a) described the larvae of *Rhopalum coarctatum* (Scopoli), *R. clavipes* (Linnaeus) and *R. rufigaster* Packard.

Key to Quebec Species of *Rhopalum*
(Adapted from Bohart, 1974)

1 Males 2
1' Females 5

2 Flagellomere II not irregularly swollen; forebasitarsus nearly cylindrical; clypeal apex nearly truncate . . . 3
2' Flagellomere II irregularly swollen (Fig. 143); forebasitarsus flattened and expanded 4

3 Foretrochanter brown; hindtibia completely dark . . . . . *occidentale* (Fox)
3' Foretrochanter yellow; hindtibia pale basally . . . . . *clavipes clavipes* (Linnaeus)

4 Flagellomere I-II sharply angled apicoventrally (Fig. 143); clypeal apex narrowly rounded . . . . . *rufigaster* Packard

4' Flagellomere I-II rounded beneath (Fig. 144); clypeal apex broadly rounded . . . . *coarctatum* (Scopoli)

5 Clypeus sharply pointed or very narrowly rounded distally . . . . . *coarctatum* (Scopoli)
5' Clypeus nearly truncate distally or broadly rounded . . 6

6 Pygidium with distinct microsculpture, not at all polished; midtibia entirely pale . . *clavipes clavipes* (Linnaeus)
6' Pygidium without microsculpture, polished; midtibia partly or entirely black 7

7 Scape dark in front except for a small basal spot; midtibia all black; palpi dark . . *occidentale* (Fox)
7' Scape yellow in front; midtibia pale basally; palpi pale . . . . . *rufigaster* Packard

Rhopalum (*Rhopalum*) *clavipes clavipes* (Linnaeus)

Sphex clavipes Linnaeus, 1758: 569.

Crabro rufiventre Panzer, 1799: Heft. 72, tab. 12.

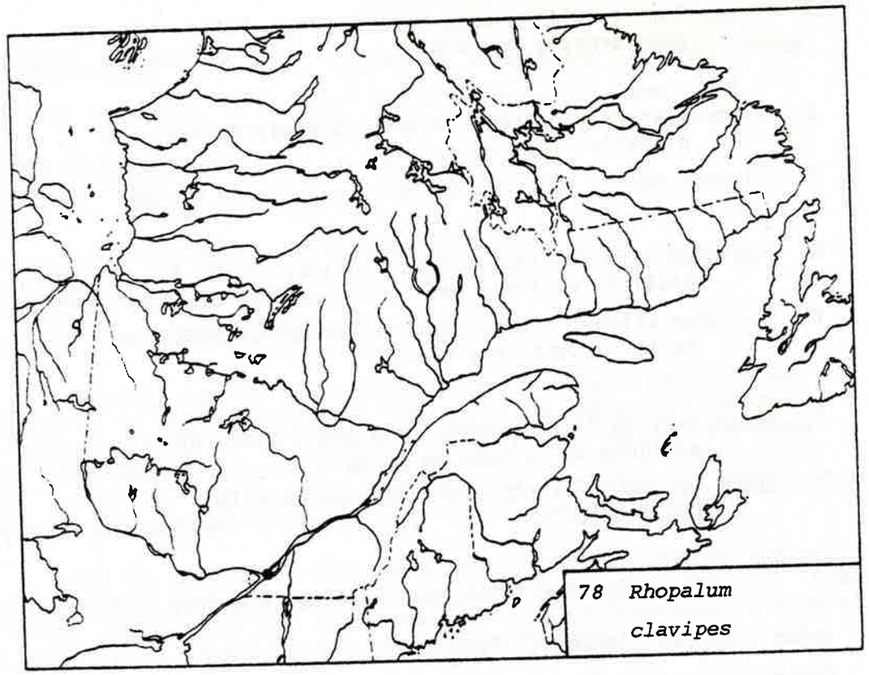
Diagnosis: Male; flagellomere II not irregularly swollen; forebasitarsus cylindrical; foretrochanter yellow; vertex normal not depressed, clypeal apex nearly truncate.

Female; clypeal apex nearly truncate; pygidial plate with microsculpture, not at all polished; pronotum with a rounded transverse ridge followed by a short grooved, polished area.

Biology: Bohart (1974) expressed the opinion that this species was probably introduced from Europe through the transportation of rose canes.

Distribution: central and southern Europe and the United States; another subspecies is found in Japan (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 male; 1 female.



Rhopalum (*Corynopus*) *coarctatum* (Scopoli)

Figs. 5, 144.

Sphex coarctata Scopoli, 1763: 293.

Crabro crassipes Fabricius, 1798: 270.

Crabro tibialis Fabricius, 1798: 271.

Rhopalum modestum Rohwer, 1908b: 257.

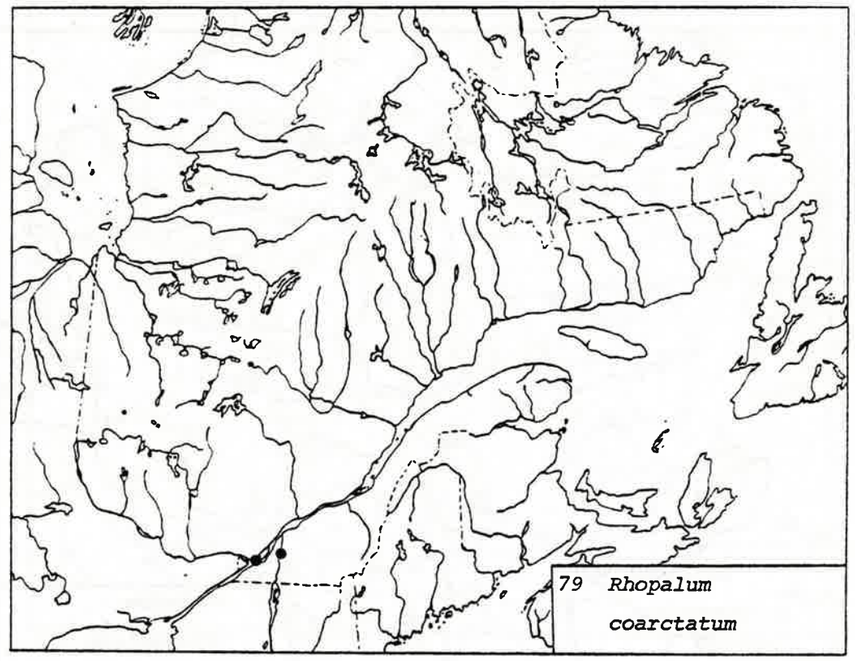
Diagnosis: Male; midbasitarsus strongly asymmetrical; flagellomere I-II rounded beneath, II irregularly swollen; forebasitarsus flattened and expanded.

Female; clypeus narrowly rounded; midtibia extensively dark; scape with an inner dark spot.

Biology: Bohart (1974) suggested that this species like the preceding one was introduced from Europe through the importation of rose canes.

Distribution: Holarctic Region but not west of the Rocky Mountains in North America (Bohart, 1974; Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 2 males; 4 females.



Rhopalum (*Corynopus*) *occidentale* (Fox)

Crabro occidentalis Fox, 1895a: 200.

Rhopalum carolina Banks, 1921: 17.

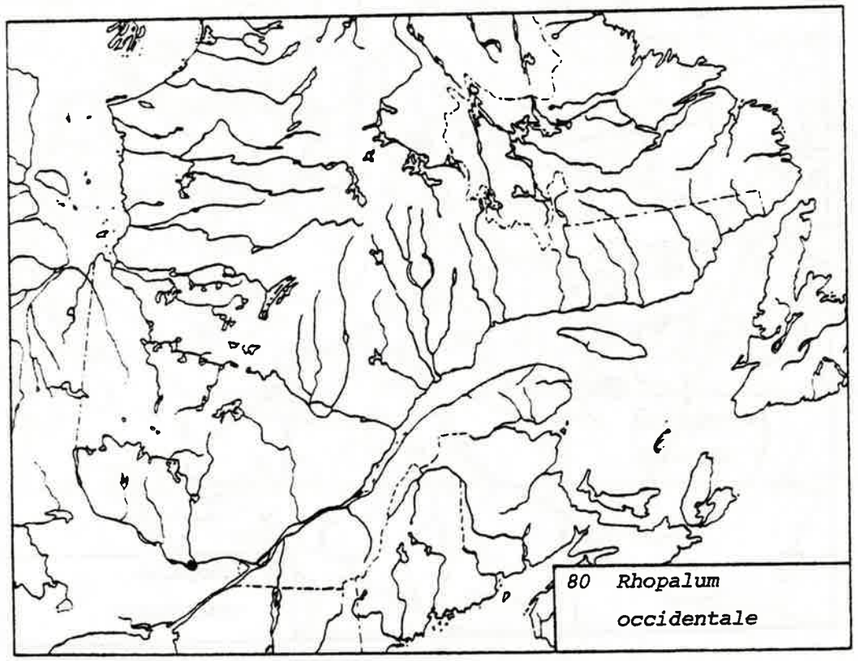
Diagnosis: Male; flagellomere II not irregularly swollen; fore-trochanter brown; hindtibia all dark; vertex without depressions.

Female; clypeus nearly truncate; midtibia all dark; palpi dark.

Biology: Bohart (1974) indicated that *R. occidentale* may be ground nesting because of its relatively broad and flat pygidial plate.

Distribution: United States; Pacific states in mountainous areas above 4500 feet elevation and Atlantic states (Bohart, 1974). This species has not previously been reported from Quebec.

Material Examined: 2 females.



Rhopalum (*Corynopus*) *rufigaster* Packard
Fig. 143

Rhopalum rufigaster Packard, 1867: 382.
Rhopalum lucidum Rohwer, 1909d: 324.

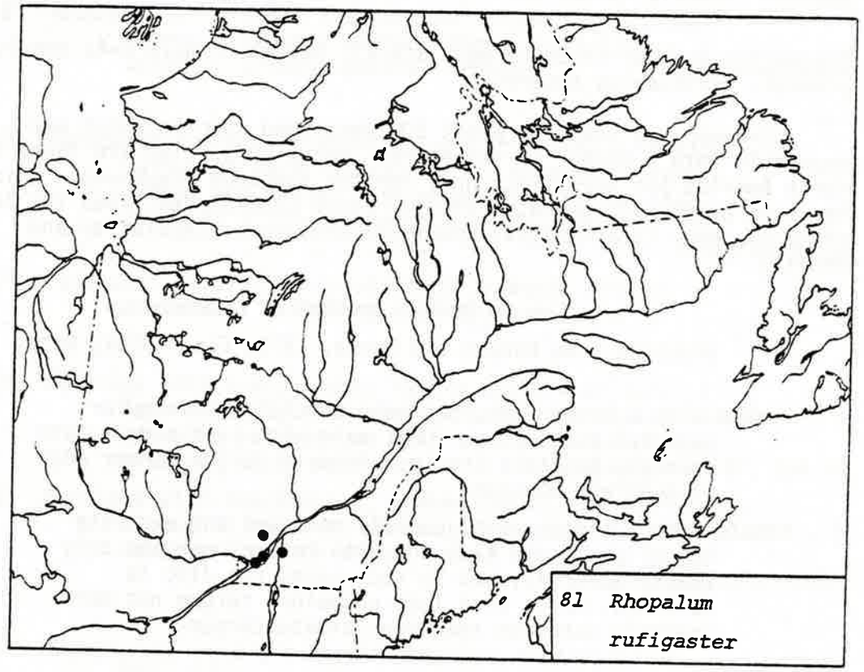
Diagnosis: Male; flagellomere II irregularly swollen, I-II sharply angled apicoventrally; forebasitarsus flattened and expanded; clypeal apex narrowly rounded.

Female; clypeal apex broadly rounded; pygidial plate polished; midtibia pale basally; palpi pale.

Biology: Unknown.

Distribution: eastern Canada and the United States east of the 100th meridian (Bohart, 1974).

Material Examined: 1 male; 9 females.



Genus *Crossocerus* Lepeletier and Brulle

Crossocerus Lepeletier and Brullé, 1834: 763.
Stenocrabro Ashmead, 1899: 216.
Synorhopalum Ashmead, 1899: 218.
Ischnolynthus Holmberg, 1903: 472.
Yuchiha Pate, 1943: 272.
(*Ablepharipus*) Perkins, 1913: 390.
(*Blepharipus*) Lepeletier and Brullé, 1834: 728.
Coelocrabro Thomson, 1874: 262.
Dolichocrabro Ashmead, 1899: 216.
Acanthocrabro Perkins, 1913: 391.
Nothocrabro Pate, 1943: 314.

Stictoptila Pate, 1943: 315.

Neoblepharipus Leclercq, 1968a: 98.

Fentis Tsuneki, 1971b: 13.

~~*Brunius*~~ Tsuneki, 1971b: 15.

Brunius

Diagnosis: Ocellar triangle equilateral; palpal formula 6-4; omaulus present; verticaulus absent.

Crossocerus contains about 200 described species which are separable into a number of subgenera. About 30 species are found in North America but keys exist only for the subgenus *Blepharipus* which has been dealt with by Pate (1943). Evans (1957b) described the larva of *Crossocerus* (*Blepharipus*) *annulipes annulipes* (Lepeletier and Brullé).

Key to Quebec Species of *Crossocerus*

(Adapted from Bohart and Menke, 1976; Fox, 1895a; Pate, 1943)

1 Female with a broad flat, coarsely punctate, triangular pygidial plate (Fig. 100); male with last tergum more coarsely punctate than penultimate tergum; inner edge of mandible edentate 19

1' Female with pygidial plate usually narrowed and excavate apically, rarely flat and with lateral margins only weakly incurved, but in such cases the disc is polished; males with last abdominal tergum not more coarsely punctate than penultimate tergum 2

2 Mandible edentate on inner margin 5

2' Mandible with medial tooth on inner margin (Fig. 129) . . 3

3 Mesopleuron without precoxal tubercle . . *nitidiventris* (Fox)

3' Mesopleuron with precoxal tubercle (Fig. 14) 4

4 Female mandibular apex tridentate; male with forebasitarsus sinuate or twisted spirally . . . *maculipennis* F. Smith

4' Mandibular apex bidentate; male forebasitarsus simple . . . . . *unicus* (Patton)

5 Males 6

5' Females 12

6 Abdomen with seventh sternum furnished with a V- or Y-shaped ridge medially between the inflexed prongs of the seventh tergum (Fig. 104); hindfemora usually with a ventral lengthwise sharp edge; mesopleuron often with a small tubercle before midcoxa 7

6' Abdomen with seventh sternum and tergum simple, the former without a median ridge, the latter without inflexed ventral prongs 9

7 Foretarsi spirally distorted; pronotum with a vertical carina at each lateral angle; foretrochanters, femora and tibiae flattened beneath, the last two with a thin brush of hair of hair ventrally . . . . . *tarsalis* (Fox)

7' Foretarsi simple, not distorted; pronotum without a vertical carina at each lateral angle . . . 8

8 Forelegs with trochanters, femora and tibiae more or less strongly flattened beneath with a dense brush of hair; mesosternum with a conspicuous, heavy brush of white hair . . . *impressifrons* (F. Smith)

8' Forelegs with trochanters, femora and tibiae not much flattened nor with dense hair brushes ventrally; mesosternum with normal amount of hair . . . . . *nigricornis* (Provancher)

9 Mesopleuron with a tubercle anterior to midcoxa (Fig. 14); propodeum coarsely sculptured, the posterior face coarsely areolate . . . . . *cinctipes* (Provancher)

9' Mesopleuron without a tubercle anterior to midcoxa; propodeum more finely sculptured, posterior face never coarsely aerolate 10

10 Foretarsi and tibiae strongly expanded, tarsi flattened; tibiae pubescent ventrally; foretrochanters angulate posteriorly; forefemora angulate at base (Fig. 74) . . . . *annulipes annulipes* (Lepeletier and Brullé)

10' Foretarsi and tibiae not at all expanded but flattened; foretrochanters not angulate posteriorly; forefemora not angulate at base 11

11 Foretrochanters, femora and tibiae flattened ventrally, the latter two with a dense brush of hair ventrally . . . . . *barbipes* (Dahlbom)

11' Foretrochanters clylindrical; foretibiae and tarsi flattened but completely without ventral pubescence . . . . *cinctipes* (Provancher)

12 Mesopleuron with a small tubercle anterior to midcoxa (Fig. 14) 13

12' Mesopleuron without such a tubercle 16

13 Hindfemora rounded, without a ventral lengthwise sharp edge; propodeum relatively coarsely sculptured, the dorsal face with a well defined enclosure .. *cinctipes* (Provancher)

13' Hindfemur with a ventral lengthwise sharp edge; propodeum relatively weakly sculptured, dorsal surface usually without a well defined enclosure 14

14 Pronotum with a vertical carina at each lateral angle; vertex with sparse very small punctures; propodeum with dorsal enclosure defined . . . *tarsalis* (Fox)

14' Pronotum without a vertical carina at each lateral angle; vertex distinctly punctate 15

15 Dorsal enclosure of propodeum with very little indication of a posterior limiting carina, dorsal and posterior surfaces of propodeum continuous; immaculate black forms . . . . . *nigricornis* (Provancher)

15' Propodeum with a comparatively well defined dorsal enclosure; pronotum and scutellum yellow . . . . . *impressifrons* (F. Smith)

16 Clypeal apex produced into large submedian teeth separated by a deep semicircular emargination (Fig. 110) . . *annulipes annulipes* (Lepeletier and Brullé)

16' Clypeal apex produced into a rounded or truncate median lobe .. 17

17 Pygidium not abruptly elevated at base into closely punctate trigonal platform but bisected by a fine carina; propodeum with well defined dorsal enclosure . . . . . *barbipes* (Dahlbom)

17' Pygidium abruptly elevated at base into a closely punctate trigonal platform and not bisected by a fine carina; propodeum with poorly defined dorsal enclosure 18

18 Vertex with sparse very small punctures; dorsal enclosure of propodeum at most very faintly defined . . . . . *harringtonii* (Fox)

18' Vertex distinctly punctate; propodeum with a relatively well defined dorsal enclosure . . . . . *cinctipes* (Provancher)

19 Males 20

19' Females 24

20 Foretarsi greatly expanded . . . *planipes* (Fox)

20' Foretarsi not expanded 21

21 Posterior face of propodeum rugose at apex only; clypeus spotted with yellow . . . *maculiclypeus* (Fox)

21' Posterior face of propodeum transversely striate; clypeus variable but not spotted 22

22 Mandibles mostly yellow; scutellum black .. *minimus* (Packard)

22' Mandibles expect apices, black; scutellum variable . . 23

23 Scutellum black; basal third of midtibia yellow; two spots on pronotum . . *elongatulus elongatulus* (van der Linden)

23' Scutellum mostly yellow; midtibia yellow on outside; pronotum with a yellow band . . . *lentus* (Fox)

24 Midtibia yellow at base only 25

24' Midtibia yellow on entire outer side . . . 26

25 Scutellum with a small yellow spot . . . *planipes* (Fox)

25' Scutellum black . . *elongatulus elongatulus* (van der Linden)

26 Clypeus with two yellow spots . . . *maculiclypeus* (Fox)
26' Clypeus black 27

27 Scutellum with a yellow spot . . . . . *lentus* (Fox)
27' Scutellum black . . . . . *minimus* (Packard)

Crossocerus (*Crossocerus*) *elongatulus elongatulus* van der Linden
Fig. 100

Crabro elongatulus van der Linden, 1829: 62.
Crossocerus affinis Lepeletier and Brullé, 1834: 781.
Crossocerus annulatus Lepeletier and Brullé, 1834: 787.
Crossocerus luteipalpis Lepeletier and Brullé, 1834: 785.
Crossocerus morio Lepeletier and Brullé, 1834: 781.
Crossocerus pallidipalpis Lepeletier and Brullé, 1834: 779.
Crossocerus varipes Lepeletier and Brullé, 1874: 773.
Crabro hyalinus Shuckard, 1837: 161.
Crabro obliquus Shuckard, 1837: 167.
Crabro propinquus Shuckard, 1837: 168.
Crabro proximus Shuckard, 1837: 156.
Crabro transversalis Shuckard, 1837: 162.
Crossocerus elongatus Lepeletier, 1845: 193, *lapsus* for *elongatulus*.
Crabro brevis Eversmann, 1849: 418.
Crabro scutellaris F. Smith, 1851b: 121, *nec* Gimmerthal, 1836.
Crabro sulcus Fox, 1895a: 187.
Ischnolynthus foveolatus Holmberg, 1903: 472.
Stenocrabro plesius Rohwer, 1912: 472.
Crabro berlandi Richards, 1928: 223.

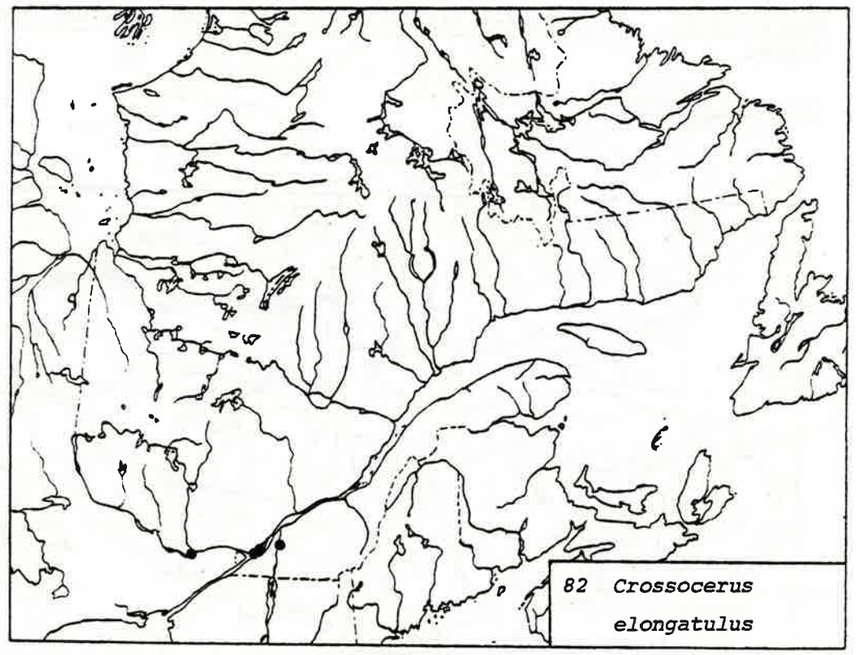
Diagnosis: Male with last tergum more coarsely punctate than penultimate tergum; inner edge of mandible edentate; foretarsi not expanded; posterior face of propodeum transversely striate; scutellum black; basal third of midtibia yellow.

Female; with broad flat coarsely punctate, triangular pygidial plate; midtibia yellow at base; scutellum black.

Biology: Hamm and Richards (1926) reviewed the European literature for this species. This wasp nests in sand and preys on various species of Diptera. A list of European prey records was supplied by these authors. Evans (1964b) reported several females of *C.* (*C.*) *e. elongatulus* sharing a nest entrance.

Distribution: eastern United States, western Palaearctic Region south of the Arctic Circle, north Africa and Argentina; another subspecies is found on Sicily (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 male; 7 females.



Crossocerus (*Crossocerus*) *lentus* (Fox)

Crabro scutellatus Say, 1824: 341, *nec* Scheven, 1781.
Crabro lentus Fox, 1895a: 190.
Crabro scutellifer Dalla Torre, 1897: 625.

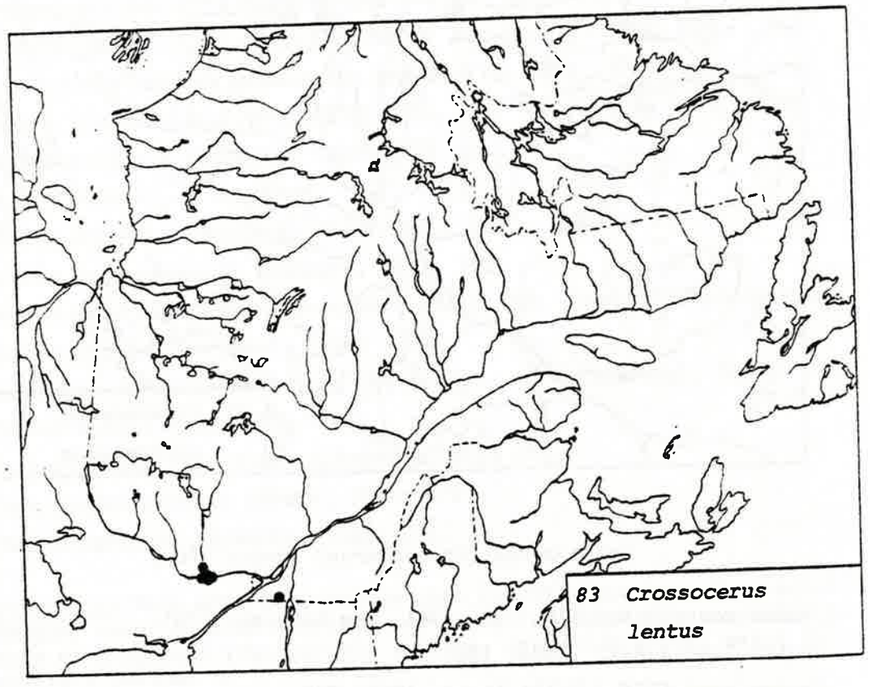
Diagnosis: Male; with last tergum more coarsely punctate than penultimate tergum; inner edge of mandible edentate; foretarsi not expanded; posterior face of propodeum transversely striate; scutellum mostly yellow.

Female with broad flat coarsely punctate triangular pygidial plate; midtibia yellow on entire outer side; clypeus black; scutellum with a yellow spot.

Biology: This species has been observed nesting in ground and was reported by Peckham and Peckham (1905) to have provisioned both a fly and two bugs in a single cell.

Distribution: Canada and the eastern United States (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 10 females.



83 *Crossocerus lentus*

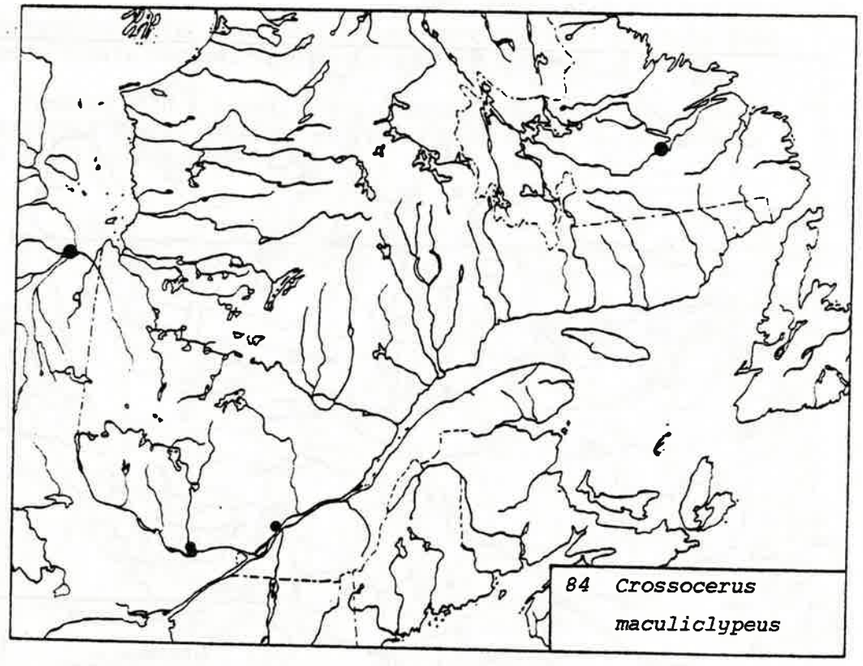
Crossocerus (*Crossocerus*) *maculiclypeus* (Fox)

Crabro maculiclypeus Fox, 1895a: 189.

Thyreopus daeckei Rohwer, 1910b: 51.

Diagnosis: Male; with last tergum more coarsely punctate than penultimate tergum; forebasitarsus not expanded; clypeus with two yellow spots; posterior face of propodeum rugose at apex only.

Female; with broad flat coarsely punctate, triangular pygidial plate; midtibia yellow on entire outer side; clypeus with two yellow spots.



84 *Crossocerus maculiclypeus*

Biology: Kurczewski, Burdick and Gaumer (1969a) have examined a number of nests of this species and report that it nests in sand, constructing up to 9 cells per nest and provisioning a wide variety of Diptera at the rate of 9 to 20 flies per cell. Evans (1970) also listed a number of prey records. The following families are taken as prey but for the most part Kurczewski *et al.* (1969) found the empid fly *Platypalpus holosericus* Melander serving as the dominant provision; other families are Chironomidae, Agromyzidae,

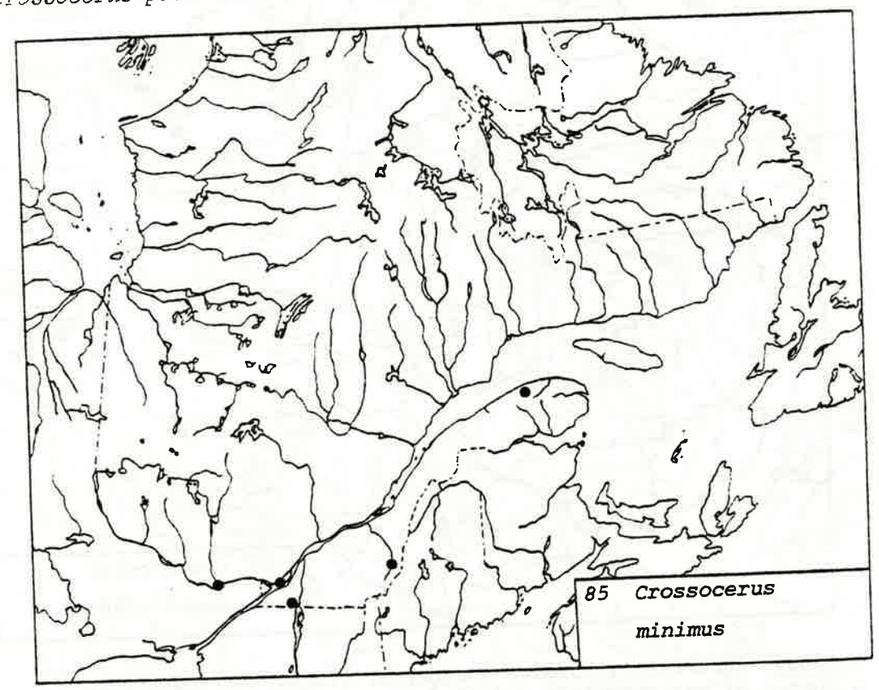
Dolichopodidae, Psilidae, Ephydridae, Chloropidae, Tephritidae, Chamaemyiidae and Muscidae.

Distribution: Canada as well as western and central United States (Bohart and Menke, 1976).

Material Examined: 16 males; 10 females.

Crossocerus (*Crossocerus*) *minimus* (Packard)

Blepharipus minimus Packard, 1867: 377.
Crabro propinquus Fox, 1895a: 189.
Crossocerus pelas Pate, 1943: 280.



85 *Crossocerus minimus*

Diagnosis: Male; with last tergum more coarsely punctate than penultimate tergum; foretarsus not expanded; posterior face of propodeum transversely striate; mandibles mostly yellow; scutellum black.

Female; with broad flat coarsely punctate, triangular pygidial plate; midtibia yellow on entire outer side; clypeus and scutellum black.

Biology: Unknown.

Distribution: eastern Canada and across the United States (Bohart and Menke, 1976).

Material Examined: 2 males; 4 females.

Crossocerus (*Crossocerus*) *planipes* (Fox)

Crabro planipes Fox, 1895a: 193.
Crabro incavus Fox, 1895a: 188.
Crabro cockerelli Rohwer, 1908b: 255.

Diagnosis: Male; with last tergum more coarsely punctate than penultimate tergum; foretarsus greatly expanded.

Female; with a broad, flat, coarsely punctate, triangular pygidial plate; midtibia yellow at base only; scutellum with a small yellow spot.

86 *Crossocerus planipes*

Biology: This species was observed nesting in a clay bank by Rau (1922). Krombein (1963a) found this species nesting in bare soil and preying on empid flies of the genus *Drapetis* and *Chersodromia*. Flies were provisioned at the rate of 13 to 16 individuals per cell.

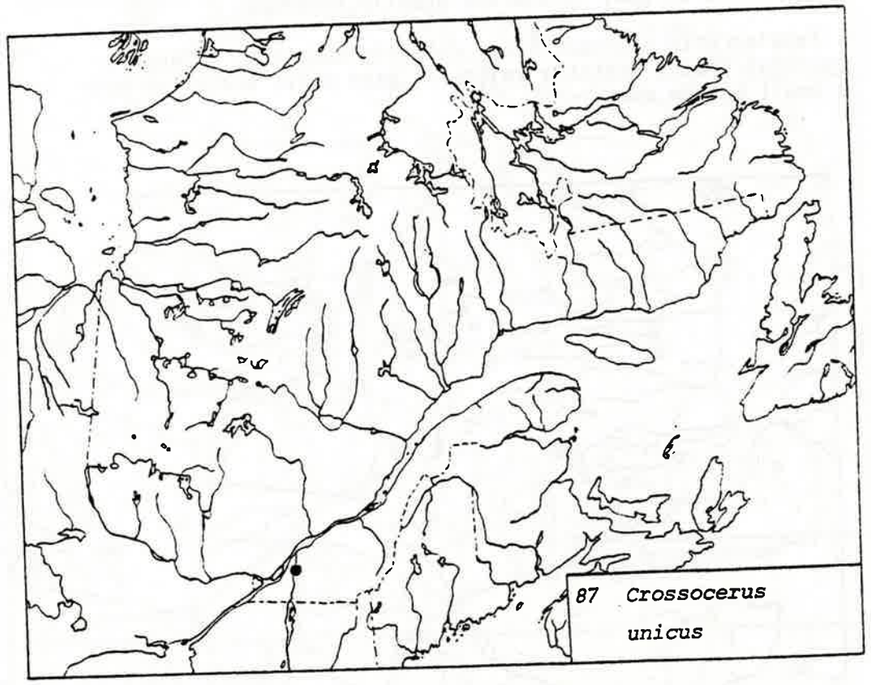
Distribution: United States and Canada (Bohart and Menke, 1976).

Material Examined: 1 male; 4 females.

Crossocerus (*Ablepharipus*) *unicus* (Patton)

Fig. 129

Blepharipus unicus Patton, 1879a: 214.
Stenocrabro nelli Viereck, 1904: 241.



Diagnosis: Mandible with a median tooth on inner margin and a bidentate apex; mesopleuron with a precoxal tubercle.

Male; with last abdominal tergum not more coarsely punctate than penultimate tergum; forebasitarsus simple.

Female; with pygidial plate slightly narrowed and excavate, lateral margins only weakly incurved.

Biology: Krombein (1951) recorded this species on dead hemlock.

Distribution: United States from New York and Pennsylvania (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 female.

Crossocerus (*Blepharipus*) *annulipes annulipes* (Lepeletier and Brullé)

Figs. 74, 110, 125

Blepharipus annulipes Lepeletier and Brullé, 1834: 729.
Crossocerus gonager Lepeletier and Brullé, 1834: 785.
Crabro nigritus Gimmerthal, 1836: 435.
Crabro ambiguus Dahlbom, 1842: 14.
Crabro capito Dahlbom, 1845: 524.
Belpharipus parkeri Banks, 1921: 17.
Blepharipus davidsoni Sandhouse, 1938: 1.

Diagnosis: Mandible edentate on inner margin; mesopleuron without precoxal tubercle.

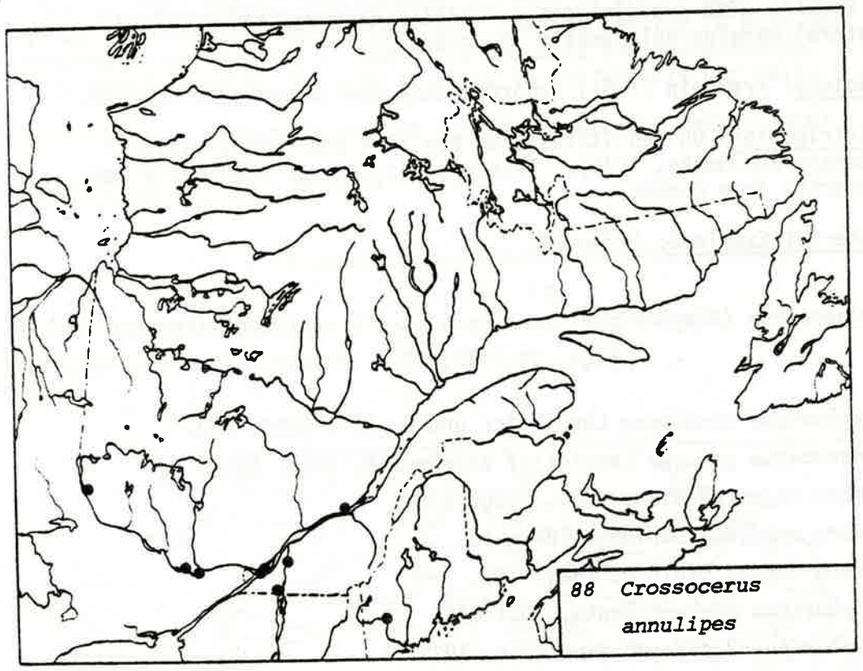
Male; with last abdominal tergum not more coarsely punctate than penultimate tergum; abdomen with seventh sternum simple; propodeum finely sculptured, posterior face never coarsely aerolate; foretarsus and tibia strongly expanded; foretrochanter angulate posteriorly and forefemur angulate at base.

Female; with pygidial plate narrowed and excavate apically; clyeal apex produced into two large submedian teeth separated by a deep semicircular emargination.

Biology: This wasp excavates its nest in rotting wood and provisions its cells with leafhoppers (Davidson and Landis, 1938; Hamm and Richards, 1926). The number of prey provisioned per cell varies from 4 to 46 depending on the size of the leafhoppers. About 30 species are used as prey; the genera involved are *Empoasca*, *Erythroneura* and *Typhlocyba* (Davidson and Landis, 1938).

Distribution: Holarctic Region; another subspecies occurs on the Japanese island of Hokkaido.

Material Examined: 8 males; 43 females.



Crossocerus (*Blepharipus*) *barbipes* (Dahlbom)

Crabro barbipes Dahlbom, 1845: 521.
Crabro ater Cresson, 1865b: 477, *nec* Olivier, 1791.
Crabro hirtipes A. Morawitz, 1866: 258.
Dolichocrabro wickhamii Ashmead, 1899: 215.
Crossocerus pammelas Pate, 1943: 299.

Diagnosis: Mandible edentate on inner margin; mesopleuron without a precoxal tubercle.

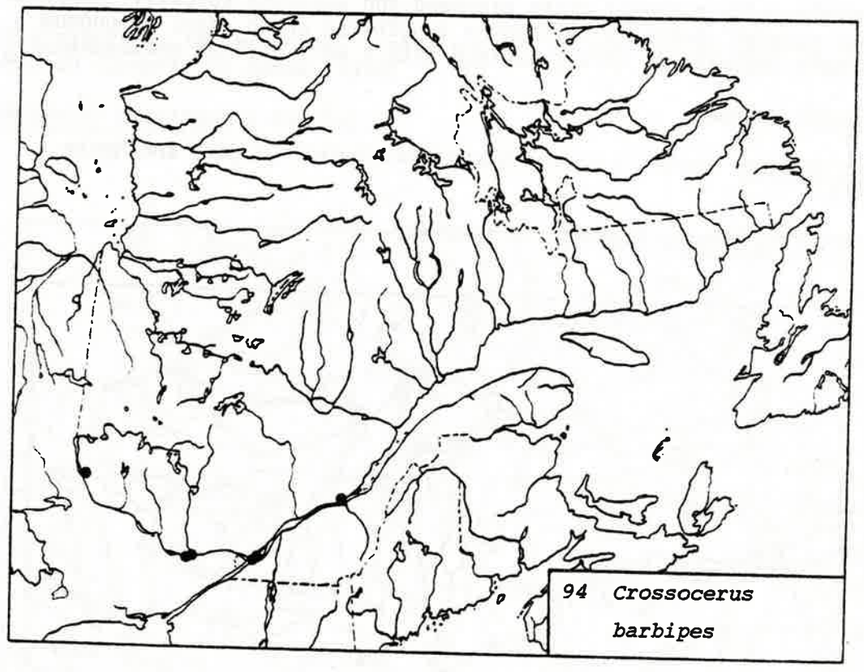
Male; with last abdominal tergum not more coarsely punctate than penultimate tergum; abdomen with seventh sternum and tergum simple; foretarsus and tibia not at all expanded; foretrochanter, femur and tibia flattened ventrally, the latter two with a dense ventral hair brush.

Female with pygidial plate narrowed and excavate apically; clypeal apex produced into a rounded or truncate median lobe; propodeum with a well defined dorsal enclosure.

Biology: This species was observed entering a nest between roof shingles and carrying an adult female leafhopper *Empoasca* sp. (Steyskal, 1944).

Distribution: United States (Bohart and Menke, 1976). Quebec, Ontario, Alberta and British Columbia (Pate, 1943).

Material Examined: 3 males; 7 females.



Crossocerus (*Blepharipus*) *cinctipes* (Provancher)

Blepharipus cinctipes Provancher, 1882: 133.
Crabro niger Provancher, 1888: 419, *nec* Lepeletier and Brullé, 1834.
Crabro nigror Fox, 1895a: 196.
Crabro nigrior Fox, 1896a: 196. Emendation.
Crabro servus Dalla Torre, 1897: 626.
Stenocrabro cinctitarsus Ashmead, 1901: 185.

Blepharipus columbiae Bradley, 1906: 380.

Thyreopus stygius Mickel, 1916a: 422.

Thyreopus utensis Mickel, 1916a: 421.

Diagnosis: Mandible edentate on inner margin; mesopleuron with a precoxal tubercle.

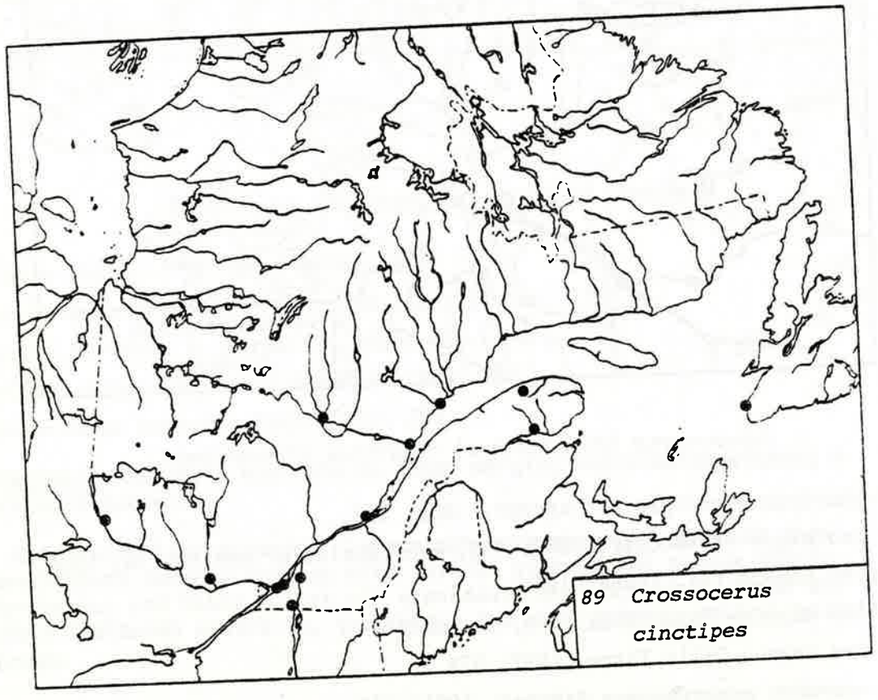
Male; with last abdominal tergum not more coarsely punctate than penultimate tergum; abdomen with seventh sternum and tergum simple; propodeum with posterior face coarsely aerolate.

Female; with pygidial plate narrowed and excavate apically; hind-femur rounded ventrally, without a lengthwise sharp edge; propodeum coarsely sculptured, dorsal surface with a well defined enclosure.

Biology: Unknown.

Distribution: northern United States and Canada (Bohart and Menke, 1976).

Material Examined: 5 males; 10 females.



89 *Crossocerus cinctipes*

Crossocerus (*Blepharipus*) *harringtonii* (Fox)

Crabro harringtonii Fox, 1895a: 195.

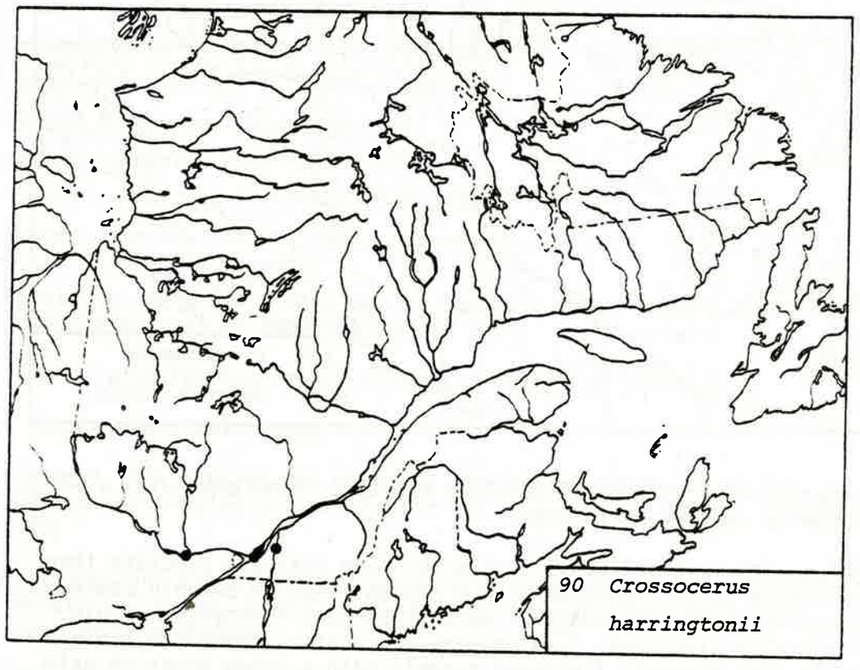
Diagnosis: Male; unknown.

Female; with pygidial plate narrowed and excavate apically; inner margin of mandible edentate; mesopleuron without precoxal tubercle; clypeal apex produced into a rounded or truncate median lobe; dorsal surface of propodeum with a very faintly defined enclosure.

Biology: Unknown.

Distribution: south central Canada and the United States west to New Mexico (Bohart and Menke, 1976).

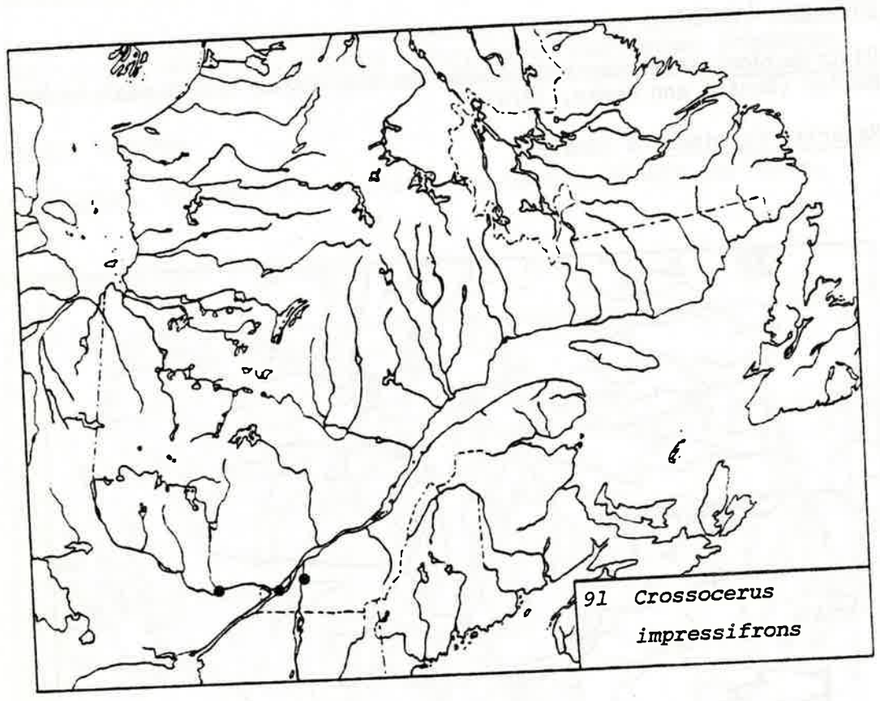
Material Examined: 5 females.



90 *Crossocerus harringtonii*

Crossocerus (*Blepharipus*) *impressifrons* (F. Smith)

Crabro tibialis Say, 1824: 340, *nec* Olivier, 1791.
Crabro pusillus Harris, 1835: 68, *nomen nudum*.
Crabro impressifrons F. Smith, 1856: 417.
Blepharipus scutellatus Packard, 1867: 376.
Blepharipus harrisii Packard, 1867: 376.
Crabro tridentatus Rohwer, 1909b: 150, *nec* Fabricius, 1775.



Diagnosis: Inner margin of mandible edentate; hindfemur with a lengthwise ventral sharp edge.

Male; with last abdominal tergum not more coarsely punctate than penultimate tergum; abdomen with a median ridge on seventh sternum between the inflexed prongs of seventh tergum; foretarsus simple, not spirally distorted; foreleg with trochanter, femur and tibia more or less strongly flattened beneath with a dense brush of hair ventrally.

Female; with pygidial plate narrowed and excavate apically; mesopleuron with a precoxal tubercle; pronotum without a vertical carina at each lateral angle; vertex distinctly punctate; propodeum with a weakly defined dorsal enclosure; pronotum and scutellum yellow.

Biology: Krombein *et al.* (1979) reported this species in dead logs and preying on Diptera of the families Dolichopodidae, Tephritidae, Empididae, Syrphidae and Chironomidae. One record of Trichoptera was also reported.

Distribution: United States and Canada east of the 100th meridian (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 male; 6 females.

Crossocerus (*Blepharipus*) *maculipennis* (F. Smith)
Fig. 14

Crabro maculatus Lepeletier and Brullé, 1834: 730, *nec* Fabricius, 1782.
Crabro pictus F. Smith, 1856: 417, *nec* Fabricius, 1793.
Crabro maculipennis F. Smith, 1856: 417.
Crabro confertus Fox, 1895a: 181.
Crabro ventralis Fox, 1895a: 183.
Crabro canonicola Viereck, 1907b: 402.
Crabro albertus Carter, 1925: 135.

Diagnosis: Mandible with a median tooth on inner margin; precoxal tubercle present on mesopleuron.

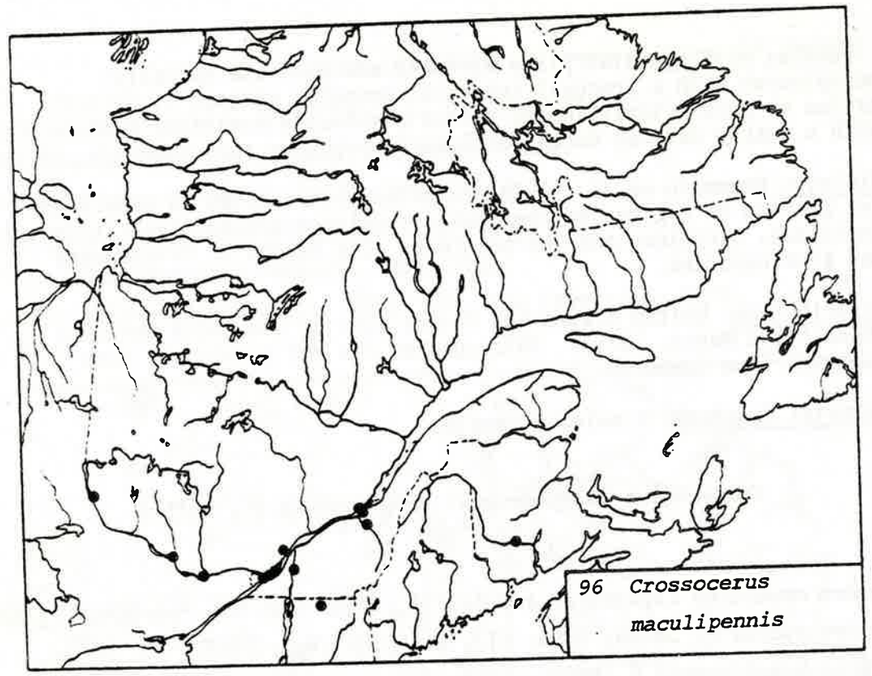
Male; with forebasitarsus sinuate or spirally twisted.

Female; mandibular apex tridentate.

Biology: This species was observed nesting in abandoned beetle borings and preying on the tipulid fly *Pales tenuis* (Loew) (Erikson, 1940).

Distribution: Transition and Upper Austral Zones of North America (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 5 males; 19 females.



Crossocerus (*Blepharipus*) *nigricornis* (Provancher)

Fig. 104

Blepharipus nigricornis Provancher, 1888: 294.

Diagnosis: Mandible edentate on inner margin; hindfemur with a ventral longitudinal sharp edge.

Male; with last tergum not more coarsely punctate than penultimate tergum; abdomen with median ridge on seventh sternum between the lateral inflexed prongs of the seventh tergum; foretarsus simple, not spirally distorted; foreleg with trochanter, femur and tibia not much flattened and without dense hair brushes ventrally.

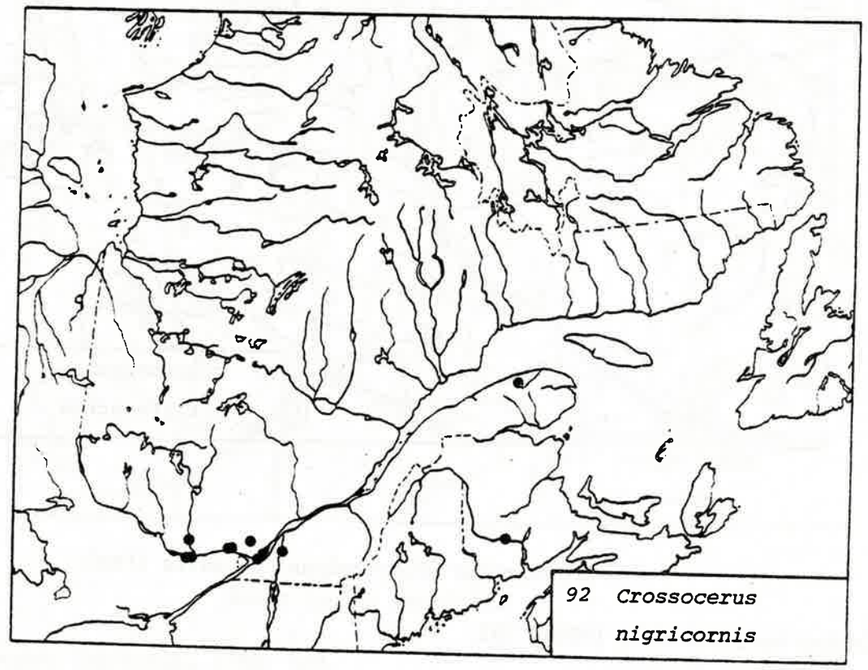
Female; with pygidial plate narrowed and excavate apically; mesopleuron with a precoxal tubercle; pronotum without a vertical carina at each lateral angle; dorsal enclosure of propodeum not defined; pronotum and scutellum black.

Biology: Pate (1943) reported this species nesting in elder stems and preying on a variety of Diptera including Empididae, Dolichopidae,

Muscidae, Anthomyiidae and Ceratopogonidae.

Distribution: United States (Bohart and Menke, 1976). Quebec, Ontario, Alberta and British Columbia (Pate, 1954).

Material Examined: 6 males; 18 females.



Crossocerus (*Blepharipus*) *nitidiventris* (Fox)

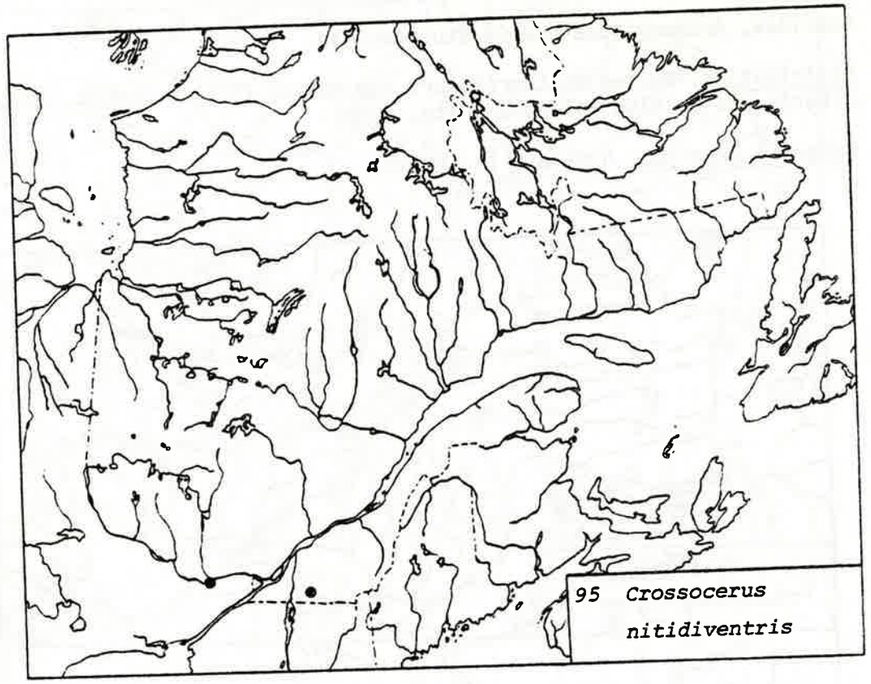
Crabro nitidiventris Fox, 1892a: 9.

Diagnosis: Mandible with a median tooth on inner margin; precoxal tubercle absent on mesopleuron.

Biology: Krombein *et al.* (1979) reported the tipulid *Nephrotoma virescens* L.W. as prey.

Distribution: eastern United States (Bohart and Menke, 1976); this species has not previously been reported from Quebec.

Material Examined: 1 male; 1 female.



Crossocerus (*Blepharipus*) *tarsalis* (Fox)

Crabro tarsalis Fox, 1895a: 193.

Diagnosis: Inner edge of mandible edentate; hindfemur with a ventral lengthwise sharp edge; pronotum with a vertical carina at each lateral angle.

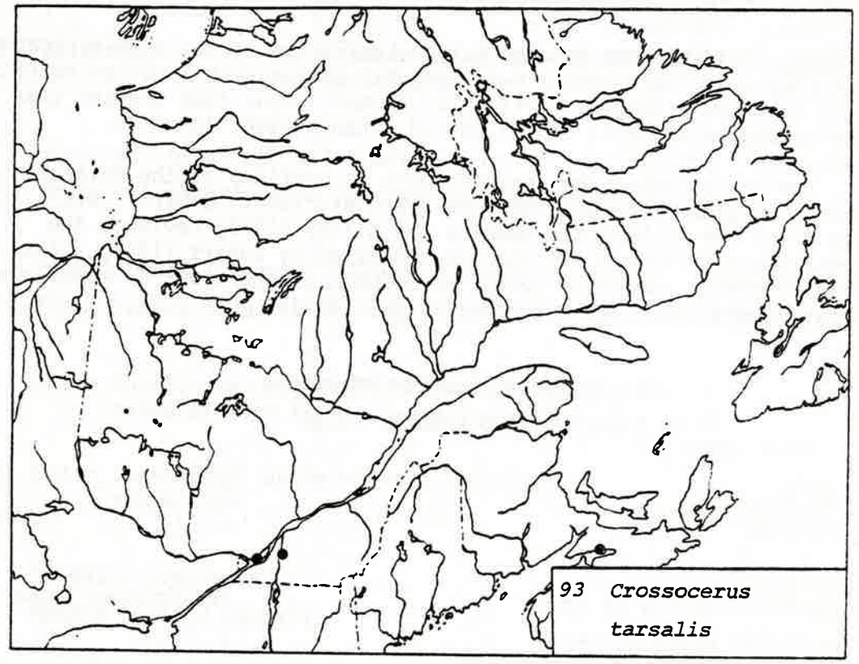
Male; with last abdominal tergum not more coarsely punctate than penultimate tergum; abdomen with a median ridge on seventh sternum between inflexed prongs of seventh tergum; foretarsus spirally distorted.

Female; with pygidial plate narrowed and excavate apically; mesopleuron with a precoxal tubercle; propodeum with a moderately well defined dorsal enclosure.

Biology: Unknown.

Distribution: United States (Bohart and Menke, 1976). Quebec (Pate, 1943).

Material Examined: 1 male; 3 females.



Genus *Crabro* Fabricius

Crabro Fabricius, 1755: 373.
Carabro Say, 1823: 78.
Thyreopus Lepeletier and Brullé, 1834: 751.
Thyreocnemus Costa, 1871: 64.
Anothyreus Dahlbom, 1845: 526.
Paranothyreus Ashmead, 1899: 213.
Synothyreopus Ashmead, 1899: 213.
Pemphilis Pate, 1944b: 340.
Agnosicrabro Pate, 1944b: 349.
Dyscolocrabro Pate, 1944b: 349.
Hemithyreopus Pate, 1944b: 349.

Parathyreopus Pate, 1944b: 349.

Norumbega Pate, 1947: 12.

Diagnosis: Mandible not notched externoventrally; vertex simple; scapal basin simple; palpal formula 6-4; pronotal collar with a median notch; ocelli in a low triangle; verticaulus absent; jugal lobe shorter than hindwing submedian cell; tibial shield often present in males.

The genus *Crabro* for the most part is confined to the Holarctic Region. At present 87 species have been described. Bohart (1976) keyed 47 of the 49 Nearctic species and Miller (1976) reviewed the *hilaris* group including two species not keyed by Bohart (1976). The larvae of *Crabro advena* F. Smith, *C. argusinus* Bohart and *C. monticola* (Packard) were described by Evans (1975b, 1959a).

Key to Quebec Species of *Crabro*

(Adapted from Bohart, 1976)

1 Males 2

1' Females 10

2 Mandible simple at apex . . . . . *tenuiglossa* Packard

2' Mandible bifid at apex 3

3 Foretarsomere V simple (Fig. 77) 4

3' Foretarsomere V with a large lateral projection ending in a curved spine; foretarsus broadened and somewhat deformed (Fig. 76) 5

4 Outer forefemoral angle produced backward into a long, curved, needlelike spine . . . *vernalis* (Packard)

4' Outer forefemoral angle obtuse and not produced backward . . . . . *advena* F. Smith

5 Silver border along inner orbit of compound eye broadened above to three or more midocellus diameters . . . . . *argusinus* Bohart

5' Silver border along inner orbit of compound eye narrow, less than three midocellus diameters 6

6 Tibial shield yellow or whitish toward posterior tip which consists of a discrete membraneous area which may be broken into a fringe (Fig. 79) . . . . . *latipes* F. Smith

6' Shield colour variable toward posterior tip without a discrete membraneous area 7

7 Scape all or almost all black . . . *cribrellifer* (Packard)

7' Scape extensively pale in front or laterally 8

8 Flagellomere I about 1.5 times as broad as long . . . *tenuis* Fox

8' Flagellomere I nearly as long as broad or longer than broad . . 9

9 Outer forefemoral angle with fingerlike projection perpendicular to flattened inner face (Fig. 83) . . . . . *digitatus* Bohart

9' Outer forefemoral angle without a fingerlike projection . . . . . *monticola* (Packard)

10 Mandible simple apically . . . . *tenuiglossa* Packard

10' Mandible bifid apically 11

11 Mandible and/or scape all dark but in any case scape not all pale in front 12

11 Mandible and scape pale marked or scape all pale in front 13

12 Mesopleuron finely sculptured and dull, scutal punctures fine and well separated; mandibles black . . . . . *vernalis* (Packard)

12' Upper half of mesopleuron distinctly polished, without microsculpture; mandible with a yellow spot . . . . . *cribrellifer* (Packard)

13 Propodeal enclosure with rather straight, or slightly curving, regular and nearly parallel longitudinal ridges . . . . . *latipes* F. Smith

13' Propodeal enclosure with irregular ridges, unevenly curved, often enclosing small or large areolae . . . 14

14 Flagellomeres I and II about equal in length; clypeus with free edge of median lobe nearly straight and sharply angled laterally; orbital silver border broadly diffusing toward center of frons . . . . . *argusinus* Bohart

14' Flagellomere I much longer than II; orbital silver border narrow 15

15 Scutum without or with hardly any polished areas of two puncture diameters in extent . . . *advena* F. Smith

15' Scutum with several polished areas of two or more puncture diameters . . . *monticola* (Packard)

Crabro advena F. Smith

Figs. 49, 77, 78

Crabro advena F. Smith, 1856: 421.

Crabro succinctus Cresson, 1865b: 479.

Thyreopus pegasus Packard, 1867: 362.

Thyreopus signifer Packard, 1867: 361.

Thyreopus advenus "F. Smith" of Packard, 1867: 368. Emendation.

Crabro discretus Fox, 1895a: 165.

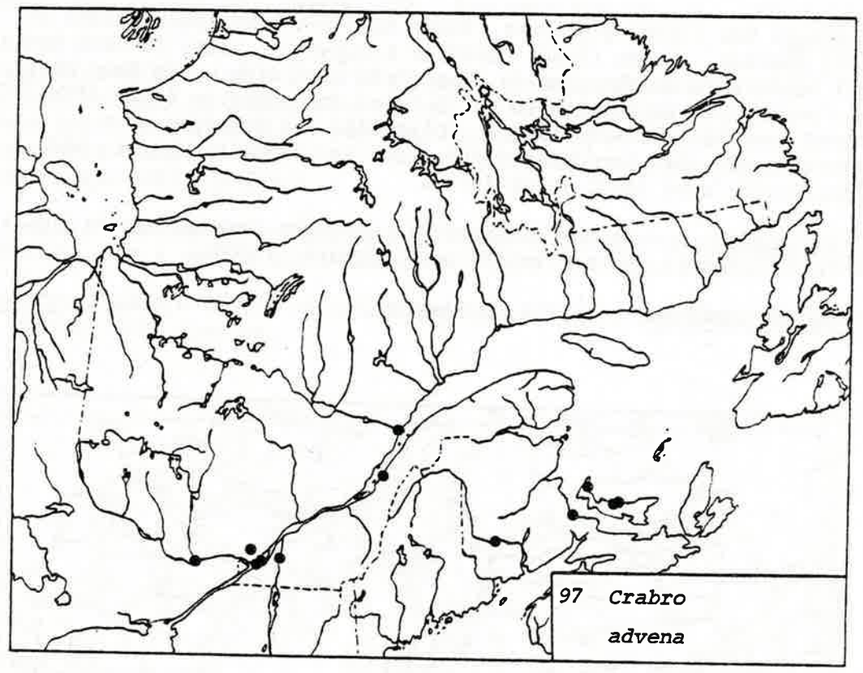
Diagnosis: Male; mandible bifid at tip; foretarsomere V simple; outer forefemoral angle obtuse, not produced backward; tibial shield as in Fig. 78.

Female; mandible bidentate at apex; scape extensively yellow; propodeal enclosure with somewhat irregular ridges, several small and large areolae; body markings yellow; forewing with submarginal cell distinctly stained; flagellomere I much longer than II; scutum without or with very few polished areas of two puncture diameters in extent.

Biology: Patton (1897), Krombein (1951, 1958b), Evans (1960), Kurczewski and Acciavatti (1968), and Kurczewski, Burdick and Gaumer (1969b) have provided information on this species. Evans (1960) observed two nests of this species both in hard rocky soil. The larger nest contained 8 cells provisioned with Diptera of the families Rhagionidae, Tabanidae, Otitidae, Muscidae, Calliphoridae and Sarcophagidae.

Distribution: United States from the east coast to the Rocky Mountain crest; in Canada it is widespread in the southern areas east of the Rockies, and can also be found in British Columbia (Bohart, 1976).

Material Examined: 4 males; 19 females.



Crabro argusinus Bohart

Fig. 80

Thyreopus argus Packard, 1867: 359, *nec Sphex argus* Christ, 1791.

Crabro argusinus Bohart, in Bohart and Menke, 1976: 407. New name for *argus* Packard.

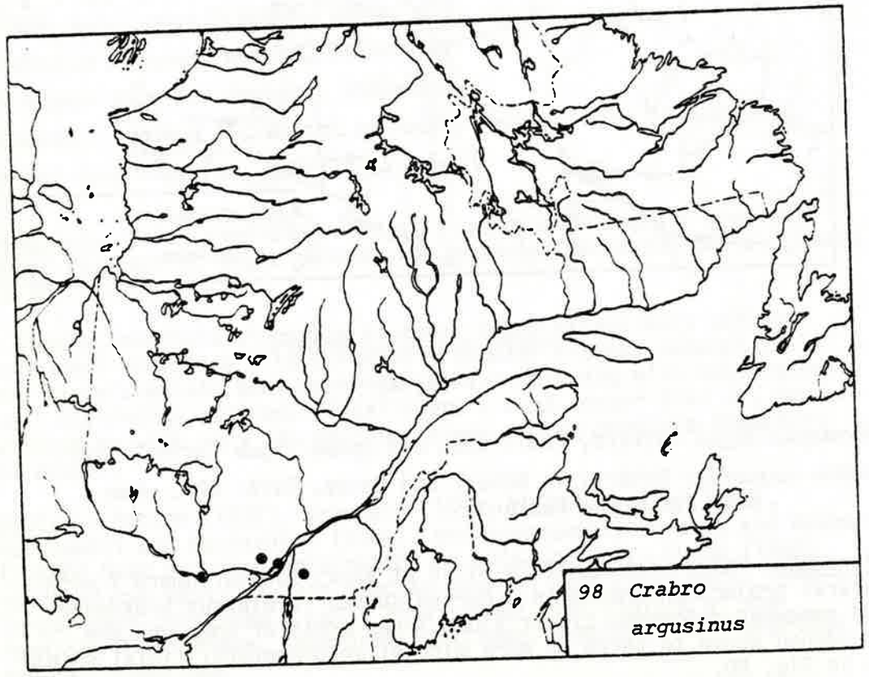
Diagnosis: Male; with mandible bifid at apex; foretarsomere V with a lateral projection ending in a curved spine; foretarsus broadened and somewhat deformed; silver along inner orbit of compound eye broadened above to three or more midocellar diameters; tibial shield as in Fig. 80.

Female with mandible bidentate apically; scape entirely yellow; propodeal enclosure with irregular ridges enclosing several large areolae; body markings yellow; forewing with submarginal cell distinctly stained; flagellomeres I and II about equal in length; clypeus with free edge of median lobe nearly straight and sharply angled laterally; orbital silver border broadly diffusing toward center of frons.

Biology: Dow (1930) and Evans (1960) have provided observations on this species. Evans (1960) observed a number of nests in sand banks. All nests were constructed in fine grain sand with up to four cells and were provisioned with 10 to 19 flies depending on their size. Three families: Dolichopodidae, Ephydridae and Muscidae were provisioned. Two sarcophagid flies of the genera *Senotainia* and *Phrosinella* were found as parasites.

Distribution: Across the continent in southern Canada, but in the United States it is rare in the west (Bohart, 1976).

Material Examined: 11 males; 3 females.



Crabro cribrellifer (Packard)

Fig. 81

Thyreopus cribrellifer Packard, 1867: 358.

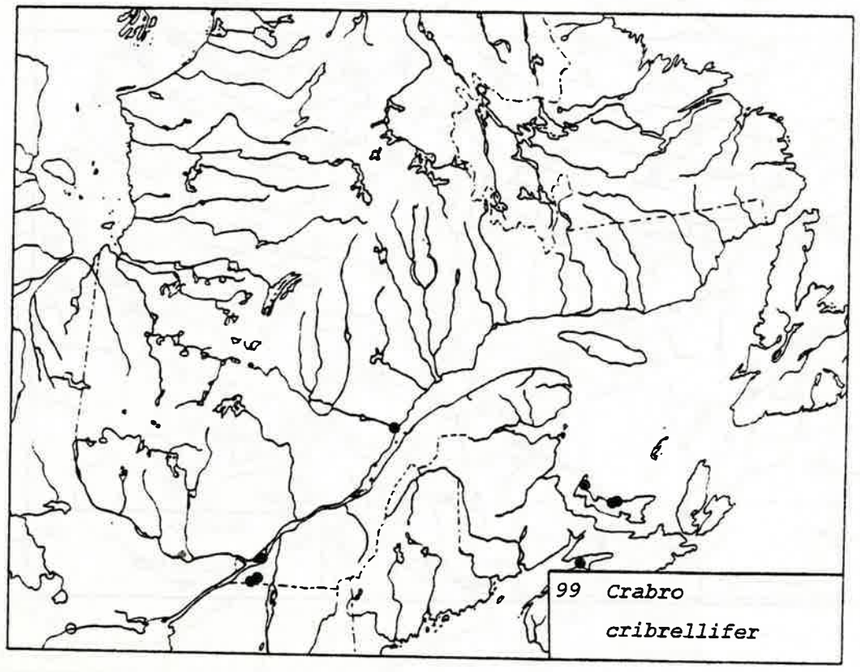
Thyreopus sinuatus Provancher, 1883b: 664, *nec* Fabricius, 1804.

Crabro provancheri Fox, 1895a: 168. New name for *sinuatus* Provancher.

Diagnosis: Male; mandible bifid at apex; foretarsomere V with a lateral projection ending in a curved spine; silver border along inner orbit of compound eye narrow, less than three midocellus diameters; tibial shield (Fig. 81) without a discrete membraneous area; scape entirely black.

Female; with mandible bidentate at apex; scape entirely black; mandible with a yellow spot; mesopleuron with polished areas.

Biology: Krombein (1951) reported *Ommatius tibialis* Say (Asilidae) as prey of this species.



Distribution: eastern United States and eastern Canada (Bohart, 1976).

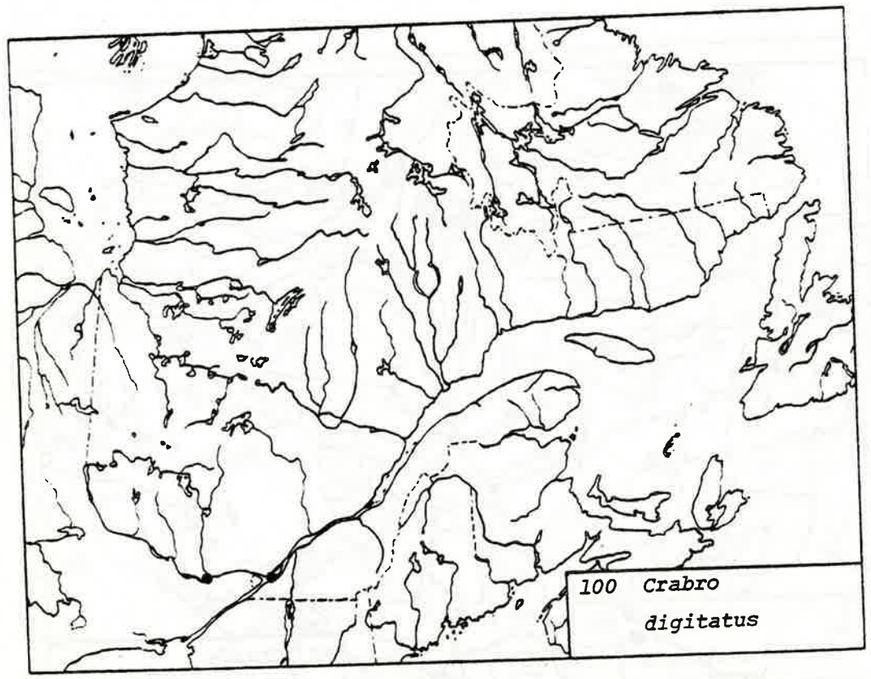
Material Examined: 14 males; 5 females.
Other record from Provancher (1883b) open circle.

Crabro digitatus Bohart
Figs. 82, 83

Crabro digitatus Bohart, 1976: 267.

Diagnosis: Male; mandible bifid at apex; foretarsomere V with a large lateral projection ending in a curved spine; outer foremoral angle with a fingerlike projection perpendicular to flattened inner surface (Fig. 83); tibial shield as in Fig. 82.

Female; unknown.



Biology: Unknown.

Distribution: northern United States from Minnesota to New York and in Canada from Ontario (Bohart, 1976). This species has not previously been reported from Quebec.

Material Examined: 2 males.

Crabro latipes F. Smith
Figs. 76, 79

Crabro latipes F. Smith, 1856: 479.

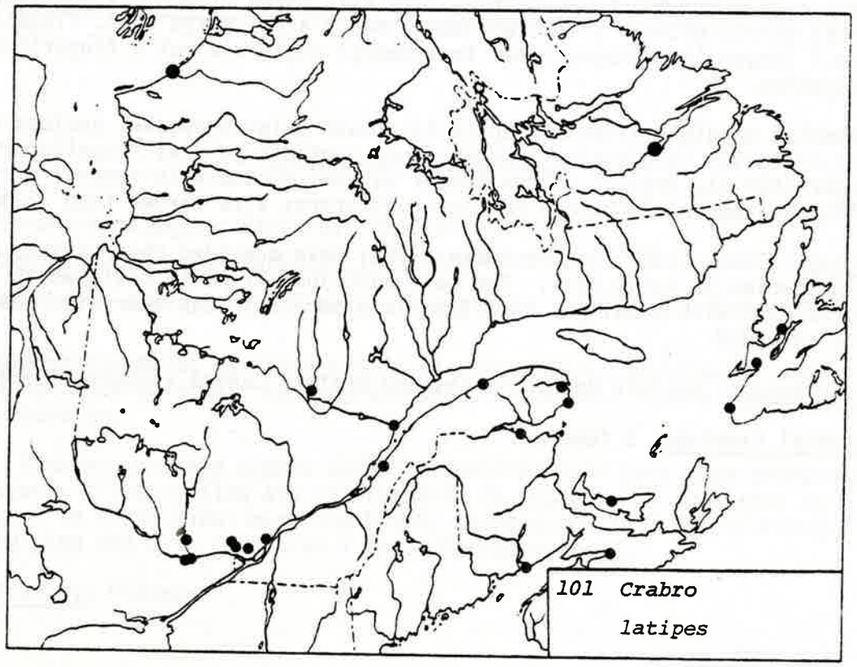
Crabro vicinus Cresson, 1865b: 479.

Thyreopus coloradensis Packard, 1867: 356.

Thyreopus elongatus Provancher, 1888: 293.

Crabro canadensis Dalla Torre, 1897: 585. Unnecessary new name for *elongatus* Provancher.

Crabro pratus Carter, 1925: 133.



Diagnosis: Male; mandible bifid at apex; foretarsomere V with a large lateral projection ending in a curved spine; tibial shield (Fig. 79) yellow or whitish toward posterior tip consists of a discrete membraneous area which is often broken into a fringe.

Female; with mandibular apex bidentate; scape mostly pale; markings on body whitish (a northern locality or high altitude phenomonon according to Bohart, 1976); propodeal enclosure with rather straight, nearly parallel, longitudinal ridges.

Biology: Bohart (1976) observed an incomplete nest in stony soil, prey consisted of muscoid flies.

Distribution: 37 males; 31 females.

Crabro monticola (Packard)

Thyreopus monticola Packard, 1867: 367.

Crabro monticolus Packard; Fox, 1895a: 163. Emendation.

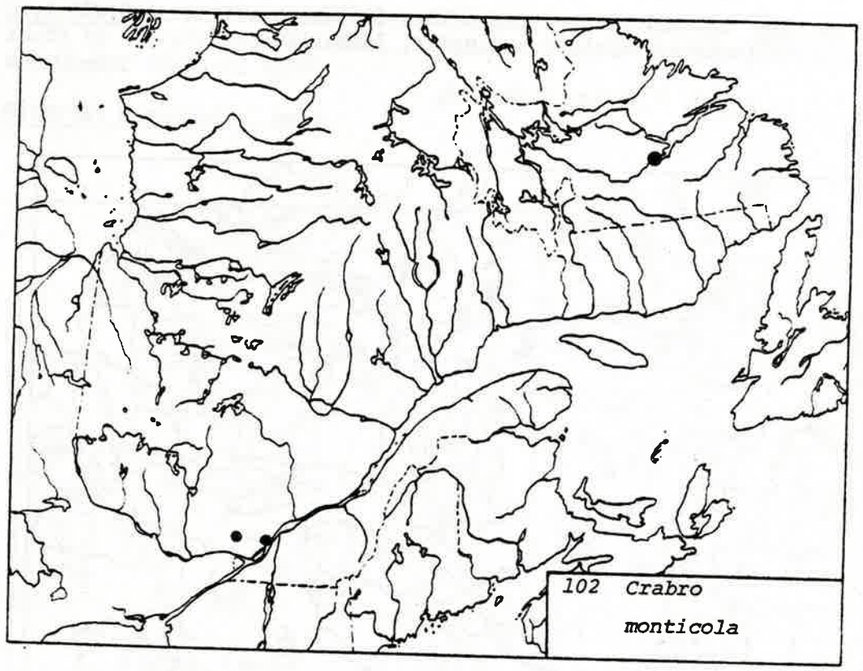
Diagnosis: Male; with mandible bifid at apex; foretarsomere V with a large lateral projection ending in a curved spine; silver border along inner edge of compound eye narrow, less than three midocellus diameters; tibial shield without a discrete membraneous area; scape pale; flagellomere I longer than broad; outer forefemoral angle without a fingerlike projection.

Female; mandible bidentate apically; scape pale; propodeal enclosure with irregular longitudinal ridges; body markings yellow; flagellomere I longer than II; orbital silver border narrow; scutum with several polished areas of 2 or more puncture diameters; size larger than 13 mm.

Biology: Evans (1960) and Pechuman (1963) have provided observations on this species in sandy soil. The nest contained 11 to 15 cells which were provisioned with usually 3 to 5 Tabanidae per cell; one therevid was also recorded.

Distribution: eastern United States and eastern Canada (Bohart, 1976).

Material Examined: 3 females.



Crabro tenuiglossa Packard

Crabro tenuiglossa Packard, 1866: 98.

Thyreopus discifer Packard, 1867: 363.

Thyreopus tenuiglossus Packard; Provancher, 1889: 292. Emendation.

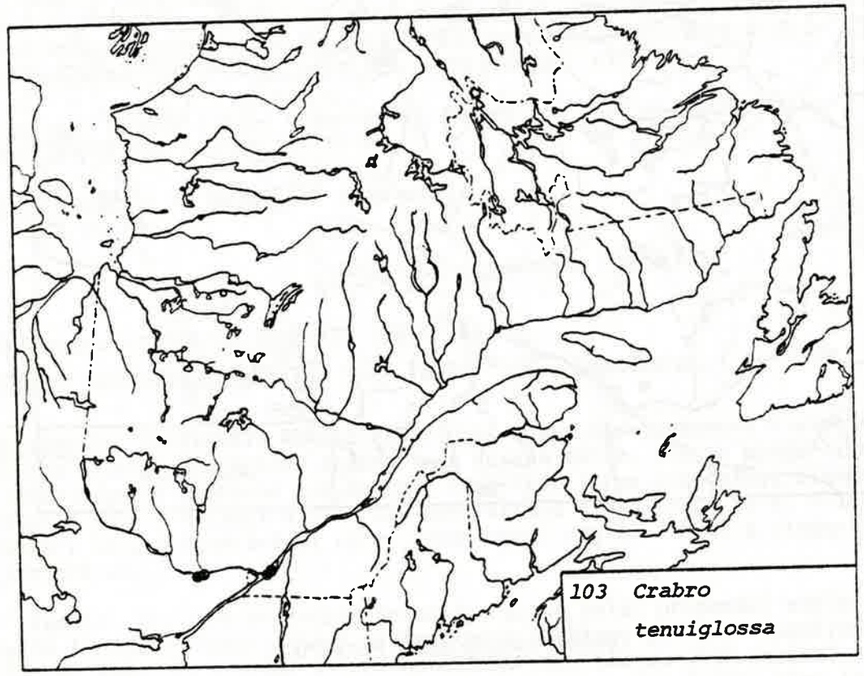
Diagnosis: Male; mandible simple at apex, black; mesopleuron with long dense pale hair ventrally; base of forefemur with a dorsal extension.

Female; mandible simple apically; orbital hair band much broadened above, silver-yellow and not reaching to top of vertical area as seen in front view; mandible black; mesopleuron in front of midcoxa bulging and with punctures 1 to 5 diameters apart.

Biology: Unknown.

Distribution: central and eastern United States as well as Alberta and Ontario in Canada (Bohart and Menke, 1976).

Material Examined: 5 males; 7 females.



- *Crabro tenuis* Fox

Crabro tenuis Fox, 1895a: 166.
Crabro juniatae Krombein, 1938b: 469.

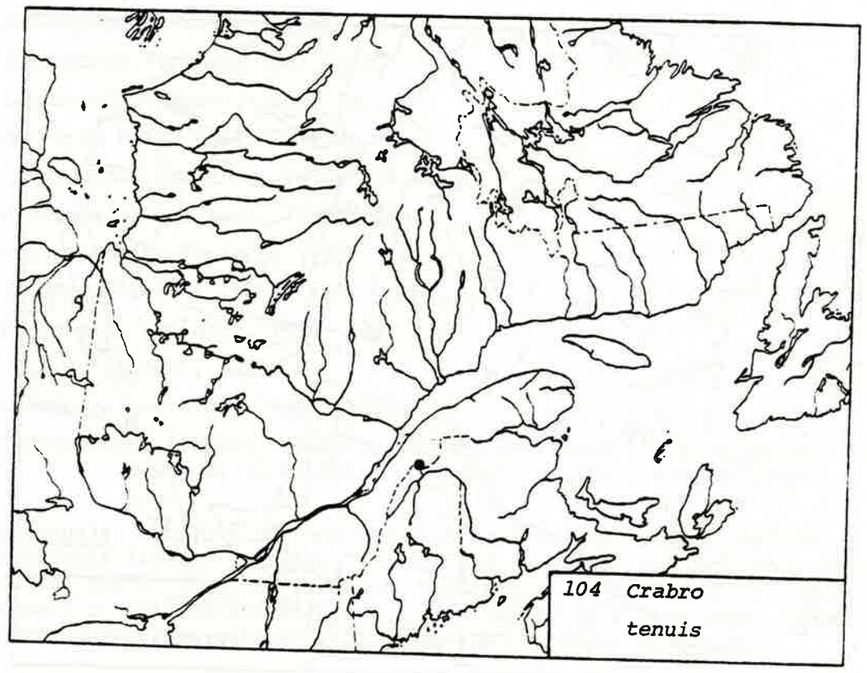
Diagnosis: Male; mandible bifid at apex; foretarsomere V with a large lateral projection ending in a curved spine; orbital silver border narrow, less than three midocellus diameters; tibial shield without membraneous fringe; scape pale; flagellomere I about 1.5 times broader than long.

The female of this species was not included in the key presented by Bohart (1976) and I have not seen an example of this sex.

Biology: Unknown.

Distribution: United States from Michigan to Colorado and Washington, south to Georgia and Oklahoma; in Canada it is known from Alberta and Quebec (Bohart, 1976).

Material Examined: 1 male.



Crabro vernalis (Packard)

Thyreopus vernalis Packard, 1867: 369.
Crabro brachycarpae Rohwer, 1908b: 252.
Crabro gilletti Rohwer, 1908c: 418.

Diagnosis: Male; mandible bifid at apex; foretarsomere V simple; outer forefemoral angle produced backward into a long curved needlelike spine.

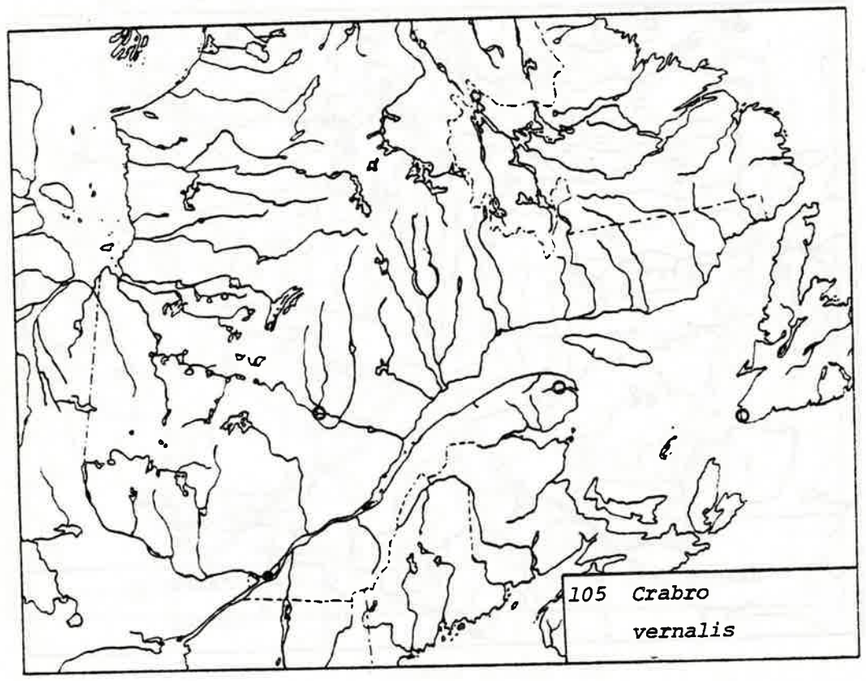
Female; with mandible bidentate apically, black; scape mostly black; mesopleuron finely sculptured and dull; scutal punctures fine and well separated.

Biology: Unknown.

Distribution: Boreal Region of North America (Bohart, 1976).

Material Examined: 1 male.

Other records from Bohart (1976), open circles.



Genus *Ectemnius* Dahlbom

Ectemnius Dahlbom, 1845: 389.
Clytochrysus A. Morawitz, 1864: 453.
Thyreocerus Costa, 1871: 65.
Mesocrabro Verhoeff, 1892: 70.
Hypocrabro Ashmead, 1899: 168.
Pseudocrabro Ashmead, 1899: 169.
Xestocrabro Ashmead, 1899: 169.
Xylocrabro Ashmead, 1899: 169.

Metacrabro Ashmead, 1899: 169.
Protothyreopus Ashmead, 1899: 170.
Nesocrabro Perkins, 1899: 25.
Oreocrabro Perkins, 1902: 146.
Hylocrabro Perkins, 1902: 147.
Melanocrabro Perkins, 1902: 147.
Xenocrabro Perkins, 1902: 148.
Lophocrabro Rohwer, 1916: 667.
Merospis Pate, 1941: 121.
Cameronitus Leclercq, 1950a: 14.
Apoctemnius Leclercq, 1950b: 200.
Protoctemnius Leclercq, 1951: 105.
Yanonius Tsuneki, 1956: 129.
Policrabro Leclercq, 1958: 106.
Iwataia Tsuneki, 1959: 8.
Leocrabro Leclercq, 1968b: 300.
Ceratocrabro Tsuneki, 1970: 1. Bohart and Menke (1976) expressed some doubt as to whether *Ceratocrabro* is an *Ectemnius* or not.

Diagnosis: Mandible not notched externoventrally; scapal basin ecarinate laterally; palpal formula 6-4; pronotal collar with a median notch; ocelli in a low triangle; venticaulus present; orbital foveae absent or shallow and evanescent, if limited by a fine inner ridge then upper frons without close moderate to coarse punctation.

Ectemnius occurs in all regions of the world and contains about 160 species. The North American species number about 130 and can be keyed using Bohart and Kimsey (1979). Evans (1957b, 1959a, 1964a) has described the larvae of *Ectemnius atriceps* (Cresson). *E. continuus* (Fabricius) and *E. stirpicola* (Packard).

Key to Quebec Species of *Ectemnius*

1 Thoracic dorsum striated transversely on the anterior and longitudinally toward the posterior 5

1' Thoracic dorsum either densely punctate or striatopunctate, but not as above 2

2 Flagellomere I at least twice as long as II; mandible without an inner tooth; female with golden pubescence on face and clypeus 6

2' Flagellomere I usually about equal to II, if twice as long then mandible with an inner tooth; facial pubescence variable 3

3 First abdominal tergum with moderate to coarse punctation; all femora with some red; female pygidial plate broadly triangular . . . *rufifemur rufifemur* (Packard)

3' First abdominal tergum with fine to moderate punctation; not all femora, if any with red; female pygidial plate narrowed excavate apically 4

4 Scapal basin faintly margined by a transverse carina at upper middle (Fig. 109); abdominal terga II to V maculated; notauli shining and distinctly raised; dorsal propodeal enclosure well defined by a raised carina; if scapal carina is indistinct then mandibles are black 7

4' Scapal basin not at all margined above; maculations on terga variable; notauli usually indistinct or slightly raised, if raised and shining then mandible with some yellow and/or dorsal propodeal enclosure not defined by a raised carina 9

5 Propodeal side with fine longitudinal striations which are not continuous with the coarse striations of the metapleuron; penultimate abdominal tergum usually completely yellow; ventral surface of male forefemur without a spine . . . . *cephalotes* (Olivier)

5' Propodeal side with coarse longitudinal striations which are continuous with the coarse striations of the metapleuron; penultimate abdominal tergum with two yellow maculations; ventral surface of male forefemur with a spine . . . . . *maculosus* (Gmelin)

6 Female with posterior face of propodeum separated from lateral faces by raised vertical carinae at the posterolateral angles, transverse striations of posterior face not continuous with longitudinal striations of lateral faces; male forefemur black and yellow . . . . . *lapidarius* (Panzer)

6' Female with posterior face of propodeum continuous with lateral faces, without vertical carinae at posterolateral angles, transverse striations of posterior face continuous with longitudinal striations of lateral faces; male forefemur red with black and yellow stripes . . . *ruficornis* (Zetterstedt)

7 Female pygidial plate with apical half smooth and shiny, without punctures or microsculpture; male antennal scape dark on outer half except apically; pronotum with two widely separated spots; forebasitarsus flattened and equal to or longer than tarsal segments combined; sixth abdominal tergum without a yellow band . . . . *borealis* (Zetterstedt)

7' Female pygidial plate punctate throughout, not smooth and shining on apical half; male antennal scape entirely yellow or at least half yellow on outer side; pronotal spots variable; forebasitarsus flattened or normal and equal to or less than length of remaining tarsal segments combined; sixth abdominal tergum with or without a transverse yellow stripe 8

8 Mandibles black in both sexes; posterior face of propodeum in female with distinct radiating striations; midbasitarsus of male not angular . . . . . *atriceps* (Cresson)

8' Mandibles with pale markings in female and usually in male; posterior face of propodeum in female with indistinct striations; midbasitarsus of male angular (Fig. 75) . . . *dives* (Lepeletier and Brullé)

9 Tergum I with fine widely separated punctures (2 to 4 diameters in female) 10

9' Tergum I with close medium size punctation separated by 1 to 2 diameters in female 11

10 Abdominal terga I and III without maculations; female with dorsal surface of propodeum continuous with posterior face; male with segments I and II of midtarsus distinctly produced at apex . . . . *continuus continuus* (Fabricius)

10' Abdominal tergum III in both sexes usually with yellow maculations and tergum I in males occasionally with small yellow spots; dorsal face of propodeal enclosure at least weakly separated from posterior face; male with segments I and II of midtarsus not distinctly produced at apex . . . . . *trifasciatus* (Say)

11 Abdominal terga I and usually III without maculations; size small 5 to 8 mm; female pygidial plate without a lateral fringe of stiff golden hair . . *stirpicola* (Packard)

11' Abdominal terga I to V in female and I to VI in male maculated; size large 10 to 15 mm; female pygidial plate with a lateral fringe of stiff golden hair . . . . . *arcuatus* (Say)

Ectemnius arcuatus (Say)

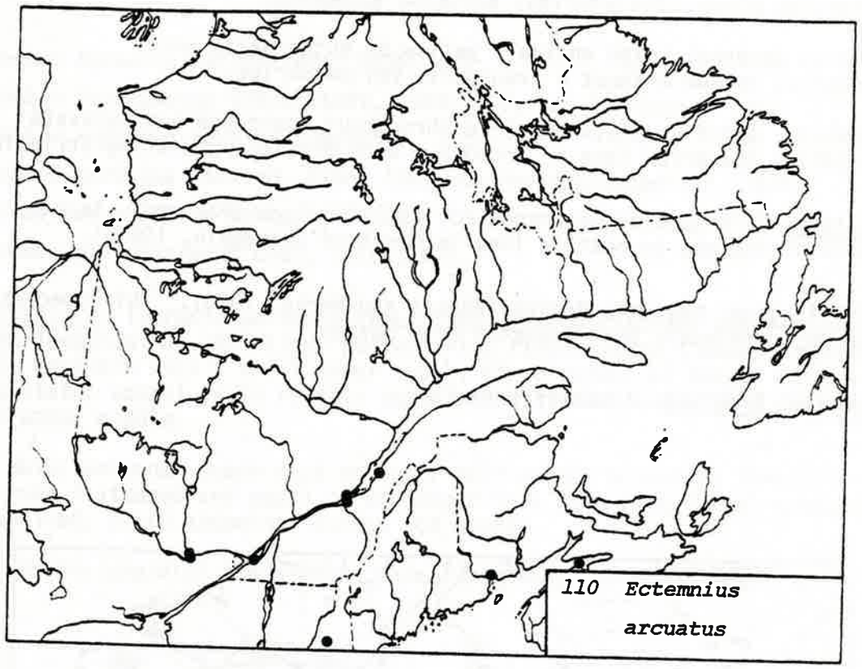
Crabro arcuatus Say, 1837: 377.
Crabro packardii Cresson, 1865b: 477.
Crabro honestus Cresson, 1865b: 485.
Crabro villosifrons Packard, 1866: 84.
Crabro nokomis Rohwer, 1908b: 251.
Solenius nokonis Rohwer, 1917a: 242.

Diagnosis: Thoracic dorsum not striated transversely on anterior and longitudinally on posterior; mandible with an inner tooth; first abdominal tergum with medium punctation; femora without red markings; scapal carina absent; all terga maculated except apical tergum; notauli not all or very slightly raised; size large 10 to 15 mm; female pygidial plate with a distinct fringe of stiff golden hair.

Biology: Krombein *et al.* (1979) reported this species nesting in logs and preying on *Musca domesticus* Linnaeus.

Distribution: Mexico and east of the Rocky Mountains in the United States (Bohart and Menke, 1976).

Material Examined: 7 males; 5 females.



110 *Ectemnius arcuatus*

Ectemnius atriceps (Cresson)

Crabro atriceps Cresson, 1865b: 483.
Crabro pauper Packard, 1866: 95.
Crabro brunneipes Packard, 1866: 102.
Crabro corrugatus Packard, 1866: 107.
Crabro foxii Kincaid, 1900a: 356.
Crabro operus Rohwer, 1908b: 247.
Crabro drymocallidis Rohwer, 1908b: 255.

Diagnosis: Thoracic dorsum without transverse striations anteriorly and longitudinal striations posteriorly; flagellomere I about equal to II; mandible with a tooth on inner margin; first abdominal tergum with moderate punctation; femora without red; abdominal terga II to V maculated; notauli shining and distinctly raised; dorsal propodeal enclosure well defined by a raised carina; scapal carina indistinct;

mandibles black.

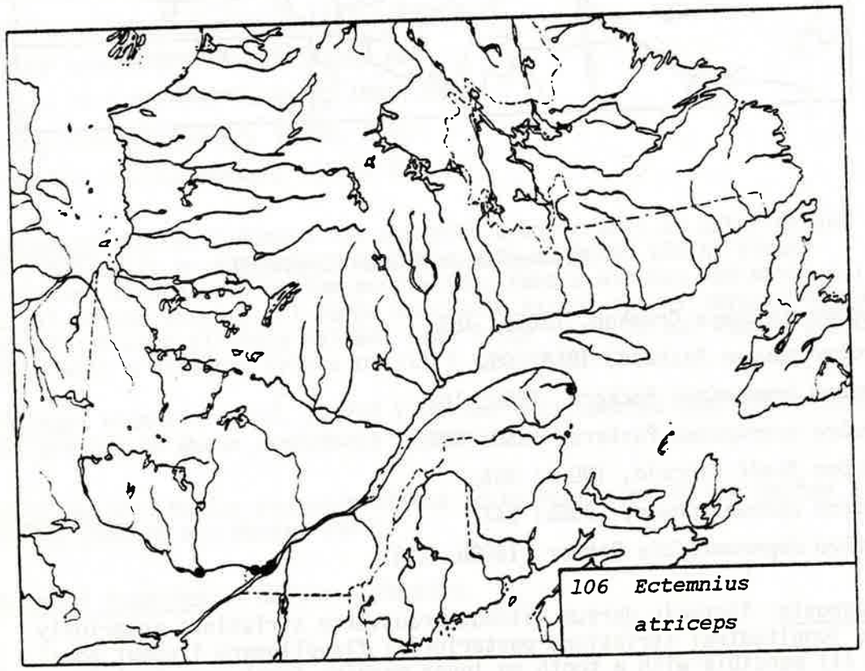
Male; antennal scape entirely yellow on outer half; sixth abdominal tergum without a transverse yellow stripe.

Female; pygidial plate punctate throughout, narrowed and excavate apically; posterior face of propodeum with distinct radiating striations.

Biology: This species was reported, as *brunneipes* (Packard), to be multivoltine and to nest in logs in Maryland (Krombein, 1963b).

Distribution: Nearctic Region (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 2 males; 4 females.



106 *Ectemnius atriceps*

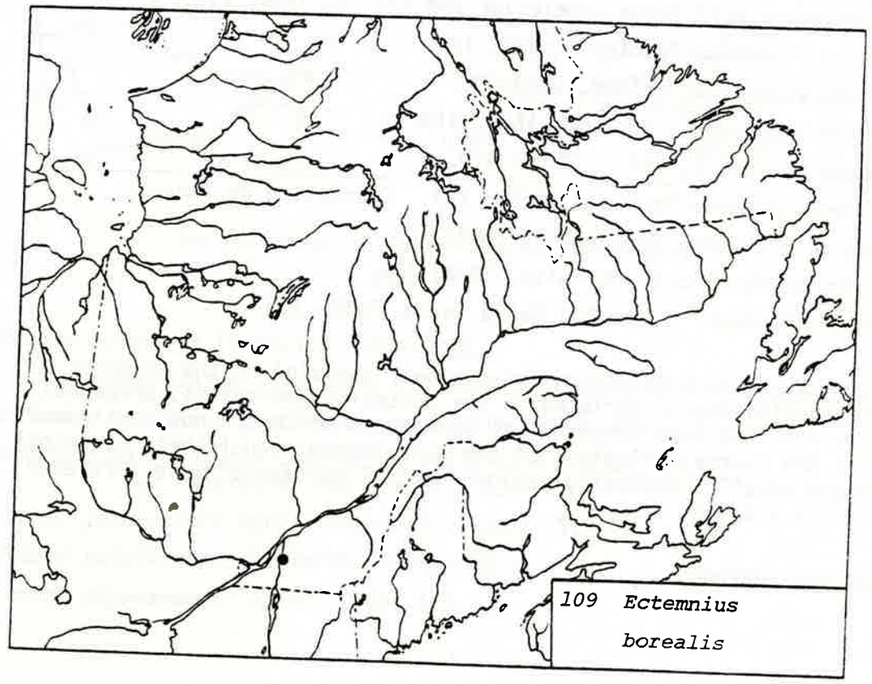
Ectemnius borealis (Zetterstedt)

Crabro borealis Zetterstedt, 1838: 443.
Crabro bipunctatus Zetterstedt, 1838: 443, *nec* Fabricius, 1787.
Crabro nigrinus Herrich-Schaeffer, 1841: 181.
Crabro parvulus Packard, 1866: 108, *nec* Herrich-Schaeffer, 1841.
Lindenius gredleri Kohl, 1877: 707.
Crabro proletarius Michel, 1916a: 426.

Diagnosis: Thoracic dorsum without transverse striations anteriorly and longitudinal striations posteriorly; flagellomere I about equal to II; mandible with a small inner tooth; first abdominal tergum finely punctate; scapal basin faintly but distinctly margined with a carina at upper middle.

Male; antennal scape dark on outer half except apically; forebasitarsus flattened and equal to or longer than remaining tarsal segments combined; sixth abdominal tergum not banded.

Female; pygidial plate impunctate, smooth and shining.



109 *Ectemnius borealis*

Biology: Unknown.

Distribution: Nearctic Region (Bohart and Menke, 1976).

Material Examined: 1 male; 1 female.

Ectemnius cephalotes (Olivier)

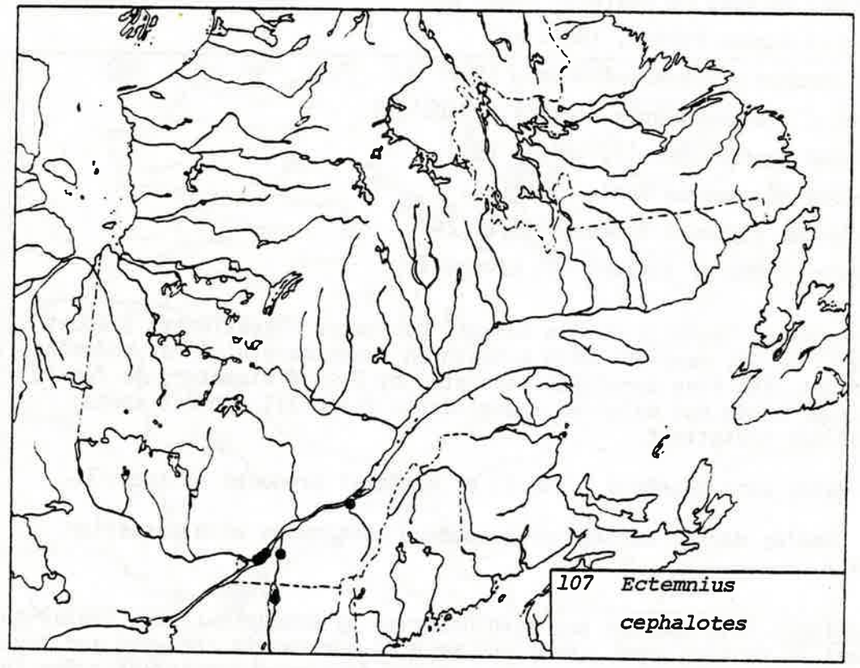
Crabro cephalotes Olivier, 1791: 513.
Crabro floralis Olivier, 1791: 517.
Crabro geniculatus Olivier, 1791: 517.
Crabro tibialis Olivier, 1791: 513.
Crabro cephalotes Panzer, 1799: 62, *nec* Olivier, 1791: 513. Doubtful synonymy (Bohart and Menke, 1976).
Crabro striatus Lepeletier and Brullé, 1834: 707.
Crabro ornatus Lepeletier and Brullé, 1834: 709.
Certatocolus striatus Lepeletier and Brullé, 1834: 744, *nec* Lepeletier and Brullé, 1834: 707.
Blepharipus striatulus Lepeletier and Brullé, 1834: 737.
Crabro lindenius Shuckard, 1837: 143.
Crabro shuckardi Dahlbom, 1838: 98.
Crabro interruptus Dahlbom, 1845: 418.
Crabro fargeii F. Smith, 1856: 410.
Crabro lindensis Inchbald, 1859: 199. Emendation or *lapsus*.
Crabro aciculatus Provancher, 1882: 108.
Crabro ruthenicus F. Morawitz, 1892: 174.
Crabro lindenii "Inchbald" Dalla Torre, 1897: 621.

Diagnosis: Thoracic dorsum transversely striated on the anterior and longitudinally striated on the posterior two thirds; propodeal side with the fine longitudinal striations which are not continuous with the coarse striations of the metapleuron; penultimate abdominal tergum usually completely yellow; ventral surface of male forefemur without a spine.

Biology: Unknown.

Distribution: Europe and the eastern United States (Bohart and Menke, 1976).

Material Examined: 16 males; 35 females.



Ectemnius continuus continuus (Fabricius)

Fig. 6

Crabro continuus Fabricius, 1804: 312.
Crabro sexmaculatus Say, 1824: 341, *nec* Olivier, 1791.
Solenius punctatus Lepeletier and Brullé, 1834: 720.
Ceratocolus punctatus Lepeletier and Brullé, 1834: 749, *nec* Lepeletier and Brullé, 1834: 720.
Crabro fuscitarsis Herrich-Schaeffer, 1841: 181.
Crabro sulphureipes F. Smith, 1856: 415.
Crabro impressus F. Smith, 1856: 401.

Crabro fuscitarsus "Herrich-Schaeffer" Schenck, 1857: 70.
Crabro vagatus F. Smith, 1869: 208.
Crabro granulatus Walker, 1871: 26.
Crabro rugosopunctatus Taschenberg, 1875: 385.
Crabro validus De Stefani, 1884: 218.
Crabro vagans Fokker, 1887: xx.
Xylocrabro slossonae Ashmead, 1902: 5.
Crabro bisexmaculatus Viereck, 1910: 681.
Crabro sayi Cockerell, 1910: 61.
Crabro hispanicus Kohl, 1915: 81.
Solenius giffardi Rohwer, 1917a: 242.
Crabro vagus of authors not Linnaeus.

Diagnosis: Thoracic dorsum densely punctate; flagellomere I about equal to II; mandible with a tooth on inner margin; first abdominal tergum with fine punctures separated by 2 to 4 diameters in female; scapal basin not margined above; terga I and III without spots; notulae indistinct.

Male; with segments I and II of midtarsi produced at apex.

Female; dorsal surface of propodeum continuous with posterior face.

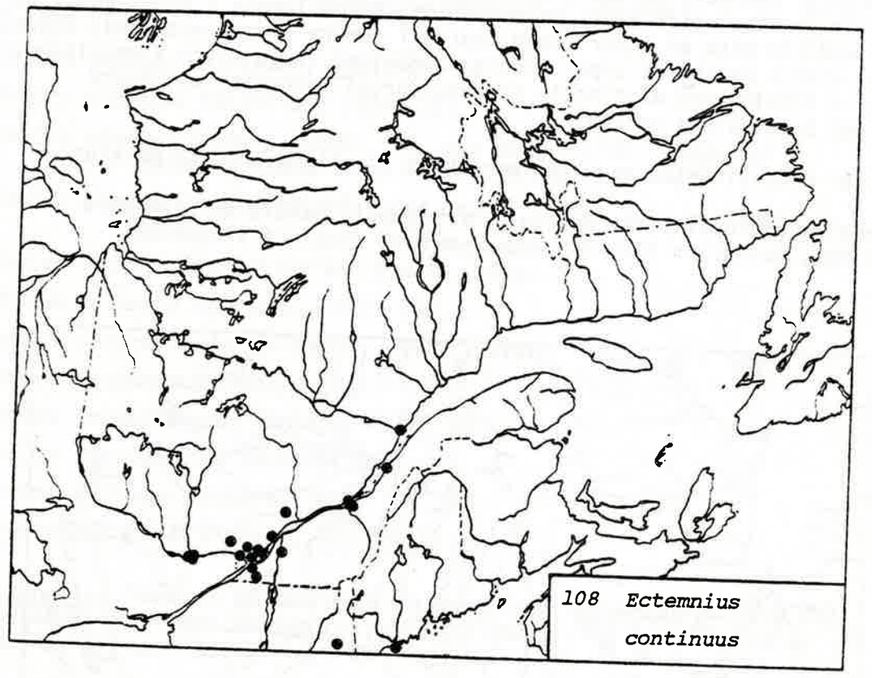
Biology: This species has been observed by Krombein (1961, 1963a) to nest in rotting wood. He found several burrows in the wood and seven or eight cells with the remains of the dipterous provisions. The families of Diptera noted as prey included Calliphoridae: *Pollenia rudis* (Fabricius), *Phaenicia* sp.; Tachinidae: *Winthemia* sp., *Archytas aterrimus* (R.D.); Muscidae and Sarcophagidae.

I have also observed *E. c. continuus* in a nearby apple orchard nesting in a rotting maple branch at ground level during early September. The nest contained two adult females one of which was captured with prey as she tried to enter the nest. The other and much larger of the two females was found with her head blocking the nest entrance possibly as a defense against the numerous cleptoparasitic flies in the area. The nest itself was incomplete with one tunnel about 10 cm long leading to a partly provisioned cell. No egg was found. Prey consisted of 7 flies including one calliphorid: *Pollenia rudis* (Fabricius); one tephritid: *Rhagoletis pomonella* (Walsh) (the apple maggot); three muscids: *Spilogona suspecta* (Mall.) and two tachinids: *Admontia* sp. Specimens were determined at the Biosystematics Research Institute in Ottawa as follows:

Calliphoridae by B.E. Cooper, Tephritidae by J.F. McAlpine, Muscidae by H.C.W. Walther and Tachinidae by D.M. Wood.

Distribution: Holarctic Region; another subspecies on the Canary Islands (Bohart and Menke, 1976).

Material Examined: 50 males; 79 females.



Ectemnius dives (Lepeletier and Brullé)
Figs. 50, 75, 109

Solenius dives Lepeletier and Brullé, 1834: 716.
Solenius octonotatus Lepeletier and Brullé, 1834: 719.
Crabro alatulus Dahlbom, 1838: 85.
Crabro pictipes Herrich-Schaeffer, 1841: pl. 5.
Selenius 8-notatus Dahlbom, 1845: 388.
Crabro auratus F. Smith, 1856: 398.
Crabro montanus Cresson, 1865b: 484, *nec* Gistel, 1857.

Crabro cristatus Packard, 1866: 101.

Crabro cubiceps Packard, 1866: 105.

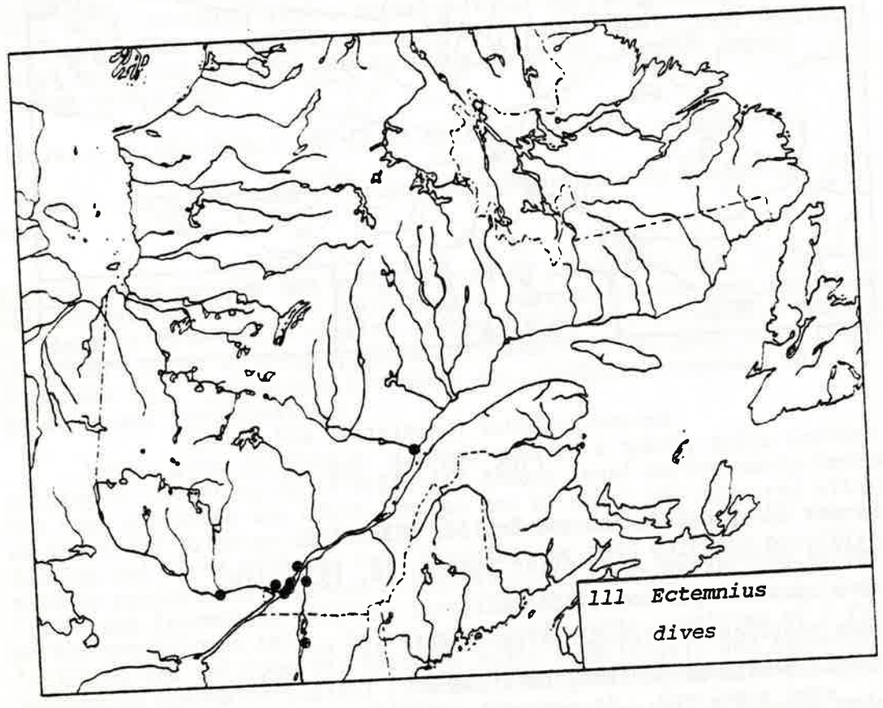
Crabro heraclei Rohwer, 1908b: 253.

Crabro montivagans Strand, 1917: 98.

Diagnosis: Thoracic dorsum without transverse striations on anterior and longitudinal striations on posterior; flagellomere I about equal to II; mandible with an inner tooth; not all femora if any with red; scapal basin with a carina at upper middle; abdominal terga II to V maculated; notauli shining and distinctly raised; dorsal propodeal enclosure defined by a raised carina.

Male; midbasitarsus angular; mandibles usually with pale markings.

Female; pygidial plate punctate throughout; mandibles with pale markings; posterior face of propodeum with distinct striations.



Biology: This species nests in logs, timber and stems; prey consists of muscoid Diptera (Krombein, 1951).

Distribution: Holarctic Region (Bohart and Menke, 1976).

Material Examined: 11 males; 9 females.

Ectemnius lapidarius (Panzer)

Crabro lapidarius Panzer, 1804: pl. 12.

Crabro sinuatus Fabricius, 1804: 310.

Crabro cinctus Spinola, 1806: 104, *nec* Rossi, 1790. Doubtful synonymy (Bohart and Menke, 1976).

Crabro chrysostomus Lepeletier and Brullé, 1834: 704, *nec* Gmelin, 1790.

Crabro comptus Lepeletier and Brullé, 1834: 705.

Crabro xylurgus Shuckard, 1837: 139.

Crabro interstinctus F. Smith, 1851a: cxxvi.

Crabro obscurus F. Smith, 1856: 418.

Crabro gracilissimus Packard, 1866: 78.

Crabro denticulatus Packard, 1866: 78.

Crabro effossus Packard, 1866: 104.

Crabro papagorum Viereck, 1907b: 401.

Diagnosis: Thoracic dorsum without transverse ridges anteriorly and longitudinal ridges posteriorly; flagellomere I at least twice as long as II; mandible without an inner tooth.

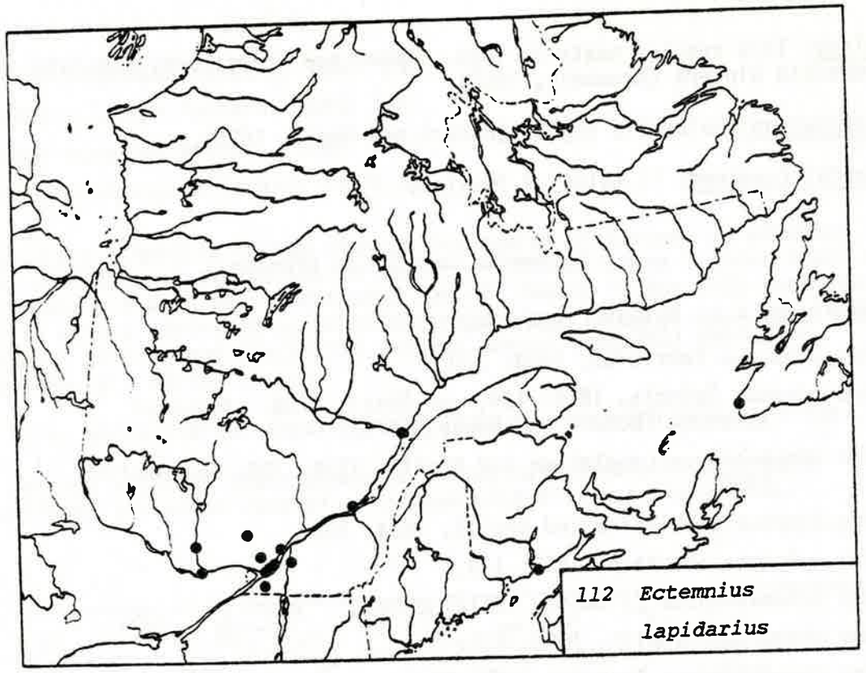
Male; forefemur black and yellow.

Female; posterior face of propodeum separated from lateral faces by raised vertical carinae at the posterolateral angles.

Biology: This species nests in rotting wood and in Europe preys on Syrphidae and occasionally Anthomyidae (Krombein, 1951).

Distribution: Holarctic Region (Bohart and Menke, 1976).

Material Examined: 15 males; 49 females.



Ectemnius maculosus (Gmelin)

Crabro maculatus Fabricius, 1782: 470, *nec Vespa maculata* Linnaeus, 1763a, now in *Vespula*.

Vespa maculosus Gmelin, 1790: 2761.

Crabro singularis F. Smith, 1856: 417.

Crabro frigidus F. Smith, 1856: 419.

Crabro quadrangularis Packard, 1866: 85.

Crabro 14-maculatus Packard, 1866: 87.

Crabro oblongus Packard, 1866: 88.

Crabro trapezoideus Packard, 1866: 89.

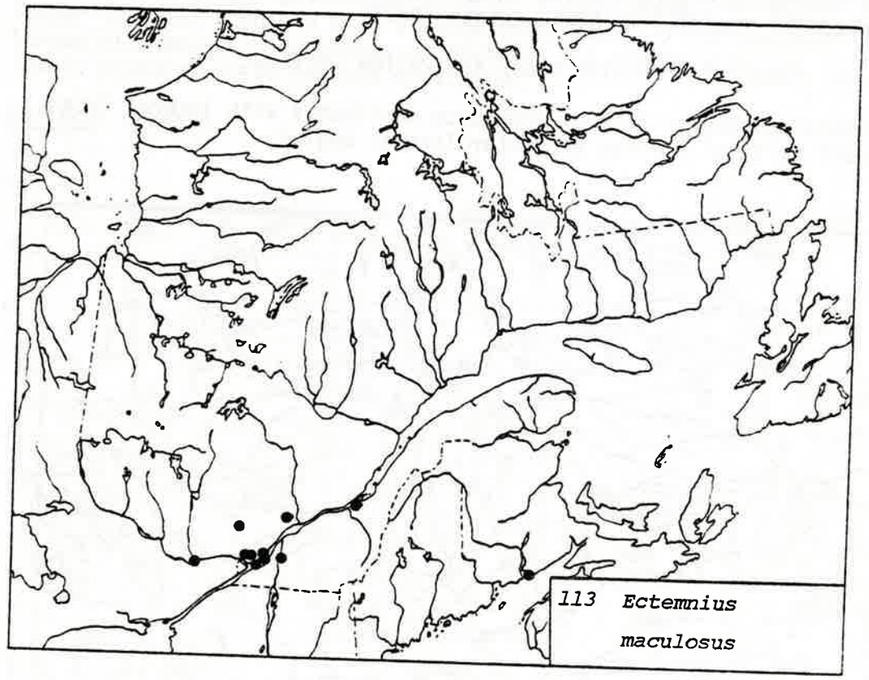
Ectemnius quadrangulus E.T. Cresson, Jr., 1928: 55. *Lapsus.*

Diagnosis: Thoracic dorsum striated transversely on anterior and longitudinally on posterior; propodeal side with coarse longitudinal striations which are continuous with the coarse striations of the metapleuron; penultimate abdominal tergum with two yellow spots; ventral surface of male forefemur with a spine.

Biology: This species has been recorded preying on the syrphid fly *Tubifera arbustorum* (Linnaeus) (Krombein, 1951).

Distribution: United States east of the 100th meridian (Bohart and Menke, 1976).

Material Examined: 17 males; 29 females.



Ectemnius ruficornis (Zetterstedt)

Crabro ruficornis Zetterstedt, 1838: 443.

Crabro aurilabris Herrich-Schaeffer, 1841: 12.

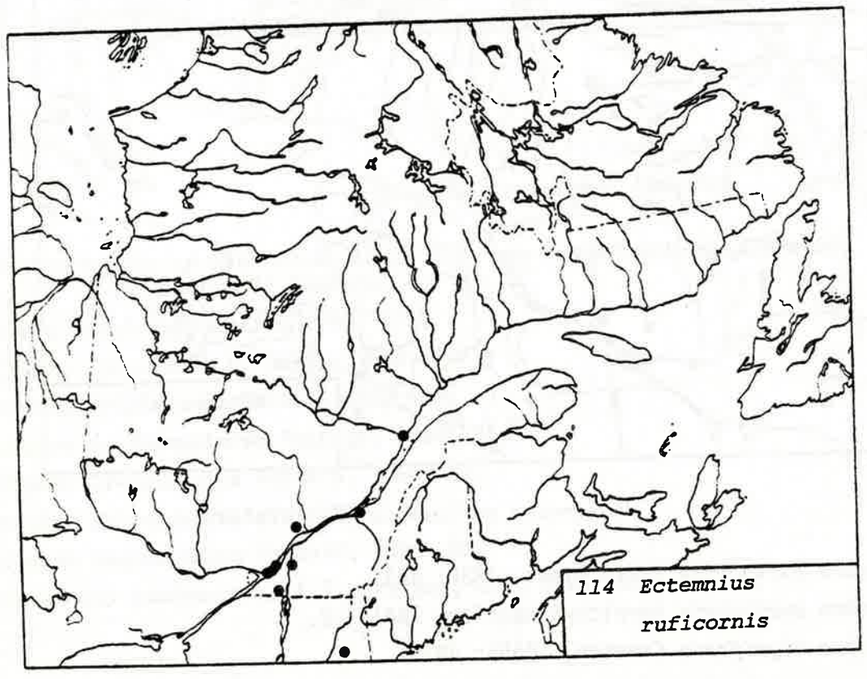
Crabro nigrifrons Cresson, 1865b: 482.

Crabro contiguus Cresson, 1865b: 484.
Crabro septentrionalis Packard, 1866: 110.
Crabro planifrons Thomson, 1870: 173.
Crabro hector Cameron, 1891: 147.
Crabro longipalpis Verhoeff, 1892: 70.
Crabro vestor Ashmead, 1899: 173.
Crabro lineatotarsis Matsumura, 1911: 103.
Crabro chipsanii Matsumura, 1911: 102.

Diagnosis: Thoracic dorsum without transverse striations anteriorly and longitudinal striations posteriorly; flagellomere I at least twice as long as II; mandible without an inner tooth.

Male; forefemur red with black and yellow stripes.

Female; posterior face of propodeum continuous with lateral faces, without vertical carinae at posterolateral angles.



114 *Ectemnius ruficornis*

Biology: Krombein (1936) captured a female carrying a syrphid fly *Syrphus ribesii* (Linnaeus) as prey.

Distribution: Holarctic Region and Mexico (Bohart and Menke, 1976).

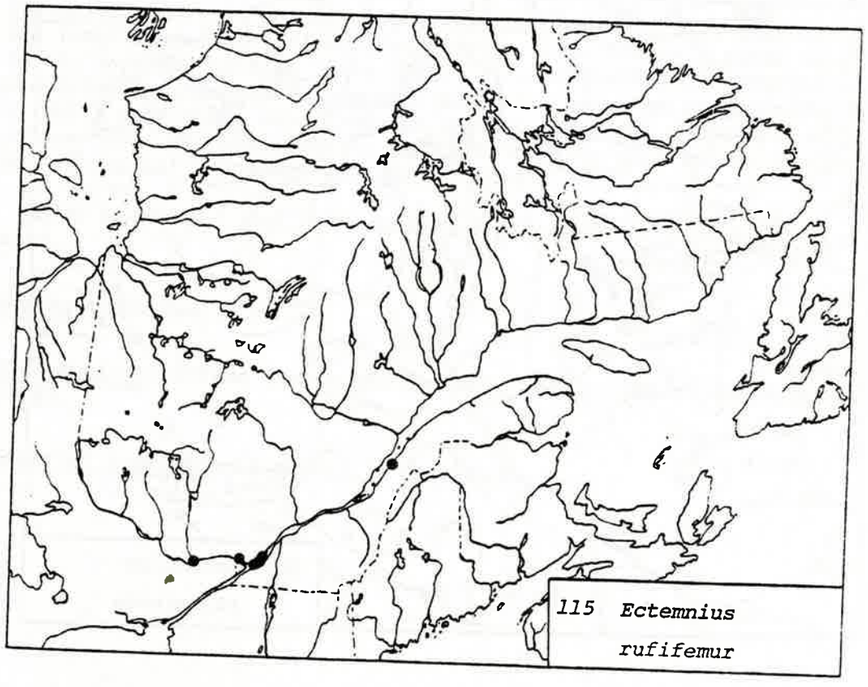
Material Examined: 19 males; 7 females.

Ectemnius rufifemur rufifemur (Packard)

Crabro rufifemur Packard, 1866: 81.

Diagnosis: Thoracic dorsum without transverse striations anteriorly and longitudinal striations posteriorly; flagellomere I slightly longer than II; mandible with a large inner tooth; first abdominal tergum with moderate to coarse punctation; all femora with red; female pygidial plate broadly triangular.

Biology: Unknown.



115 *Ectemnius rufifemur*

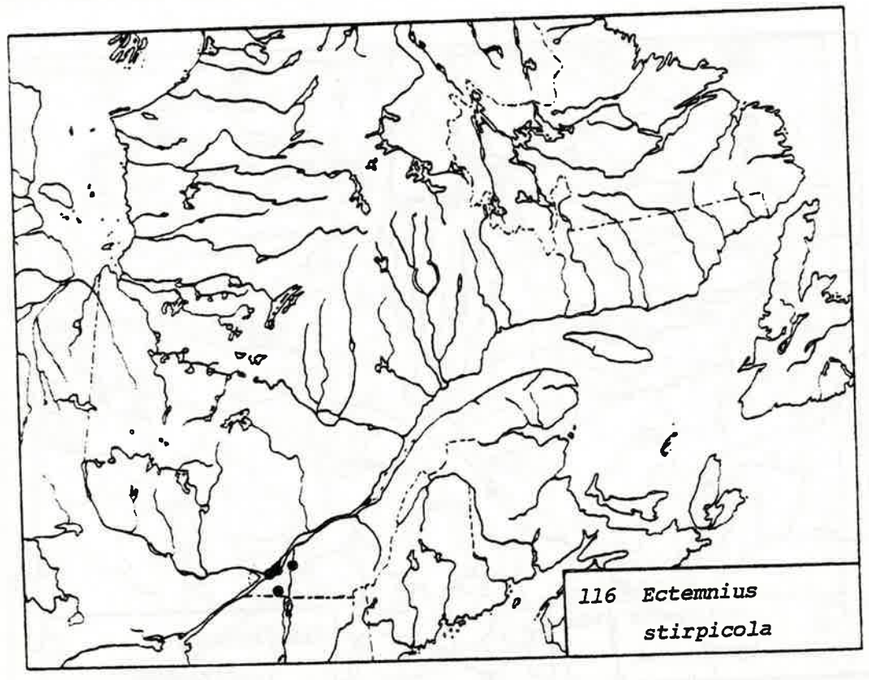
Distribution: Nearctic Region; another subspecies is known from Mexico (Bohart and Menke, 1976).

Material Examined: 7 males; 6 females.

Ectemnius stirpicola (Packard)

Crabro stirpicola Packard, 1866: 111.

Diagnosis: Thoracic dorsum without transverse striations anteriorly and longitudinal striations posteriorly; flagellomere I about equal to II; mandible with an inner tooth; femora without red; scapal basin not at all margined above; first and third terga usually without yellow spots; mandible usually with yellow; dorsal propodeal enclosure not well defined; tergum I with close medium size punctation; size small, 5 to 8 mm; female pygidial plate without a lateral fringe of stiff golden hair.



116 *Ectemnius stirpicola*

Biology: This species has been recorded nesting in both rotting wood and pithy twigs (Rau and Rau, 1918; Krombein, 1963b). The nest in wood consisted of several branching tunnels with cells while the twig nest consited of a linear arrangement of cells. Prey consist of a number of Diptera, Rau and Rau (1918) recorded the following: Anthomyiidae: *Phorbia* sp.; Calliphoridae: *Lucilia* sp., *Phormia regina* Meigen; Dolichopodidae: *Condylostylus sipho* (Say); Sarcophagidae: *Ravinia derelicta* (Walker), *Sarcodexia* sp.; Tachinidae: *Cryptomeigenia eumyothyroides* (Townsend), *Paradidyma singularis* (Townsend); Xylomyidae: *Solva pallipes* (Loew).

Distribution: United States east of the 100th meridian (Bohart and Menke, 1976).

Material Examined: 9 males; 5 females.

Ectemnius trifasciatus (Say)

Crabro trifasciatus Say, 1824: 342.

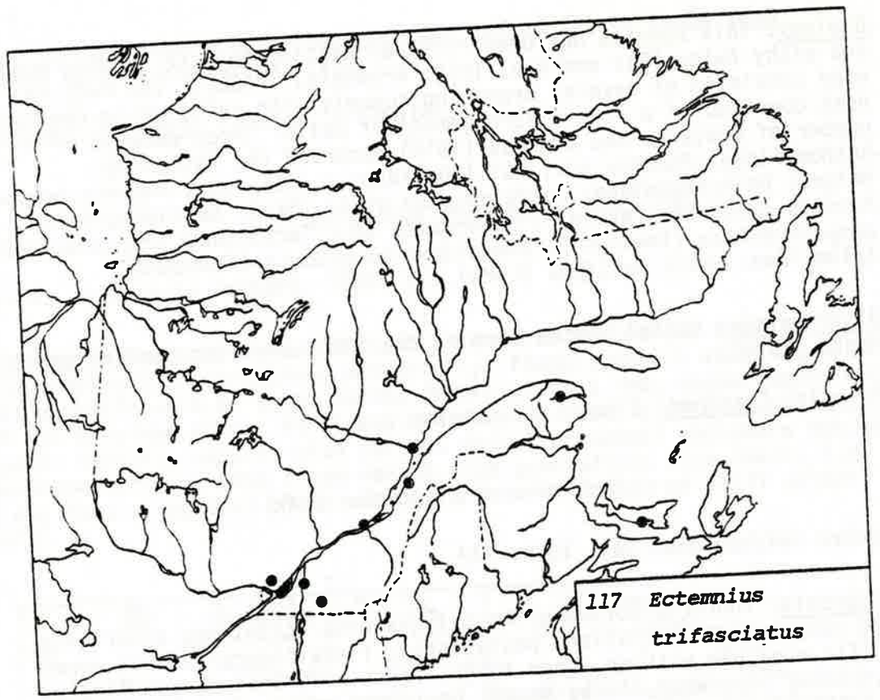
Diagnosis: Thoracic dorsum without transverse striations anteriorly and longitudinal striations posteriorly; flagellomere I about equal to II; mandible with an inner tooth; first abdominal tergum finely punctate; hindfemur black; scapal basin not margined above; notauli slightly developed; mandible with yellow; abdominal tergum III with yellow spots and occasionally tergum I in males with yellow spots; dorsal face of propodeum weakly defined.

Male; segments I and II of midtarsus not distinctly produced at apex.

Biology: Unknown.

Distribution: United States and southern Canada (Bohart and Menke, 1976).

Material Examined: 19 males; 17 females.



Genus *Lestica* Billberg

Lestica Billberg, 1820: 107.
Solenius Lepeletier and Brullé, 1834: 713.
Ceratocolus Lepeletier and Brullé, 1834: 739.
Thyreus Lepeletier and Brullé, 1834: 716, *nec Thyreus* Panzer, 1806.
Hypothyreus Ashmead, 1899: 171.
Clypeocrabro Richards, 1935: 167.
Ptyx Pate, 1947: 13.

Diagnosis: Mandible not notched externoventrally; scapal basin ecarinate laterally; palpal formula 6-4; pronotal collar with a median notch; ocelli in a low triangle; thoracic sculpture coarse; verticaulus present;

orbital foveae distinct; upper frons with coarse or moderate and close punctation.

Lestica with 38 described species is represented on all continents. There is at present no key to the three Nearctic species.

Key to Quebec Species of *Lestica*

1 First abdominal tergum coarsely punctate with well developed yellow maculations; male usually with well developed yellow maculations on dorsal surface of pronotum, metanotum and sometimes scutellum . . . . . *confluenta* (Say)

1' First abdominal tergum more finely and closely punctate, rarely with well developed yellow maculations; male thoracic dorsum usually completely black, rarely with small distinct yellow spots on dorsal surface of pronotum . . . . . *producticollis* (Packard)

Lestica (*Solenius*) *confluenta* (Say)

Fig. 123

Solenius interruptus Lepeletier and Brullé, 1834: 716, *nec Thyreopus interruptus* Lepeletier and Brullé, 1834: 755.

Crabro confluentus Say, 1837: 376.

Crabro dubius F. Smith, 1856: 417. New name for *Solenius interruptus* Lepeletier and Brullé, 1834. Article 59c of the rules of Zoological Nomenclature precludes the use of *interruptus* as valid name of this species since F. Smith rejected it as a secondary homonym before 1960.

Crabro confluens LeConte, 1859: 758. *Lapsus.*

Crabro bellus Cresson, 1865b: 481.

Crabro atrifrons Cresson, 1865b: 483.

Crabro eburneus Taschenberg, 1875: 383.

Crabro cinctibellus Viereck, 1907b: 401.

Crabro opwana Rohwer, 1908b: 248.

Crabro townsendi Rohwer, 1911: 563.

Crabro planaris Mickel, 1916a: 427.

Solenius seamansi Carter, 1925: 135.

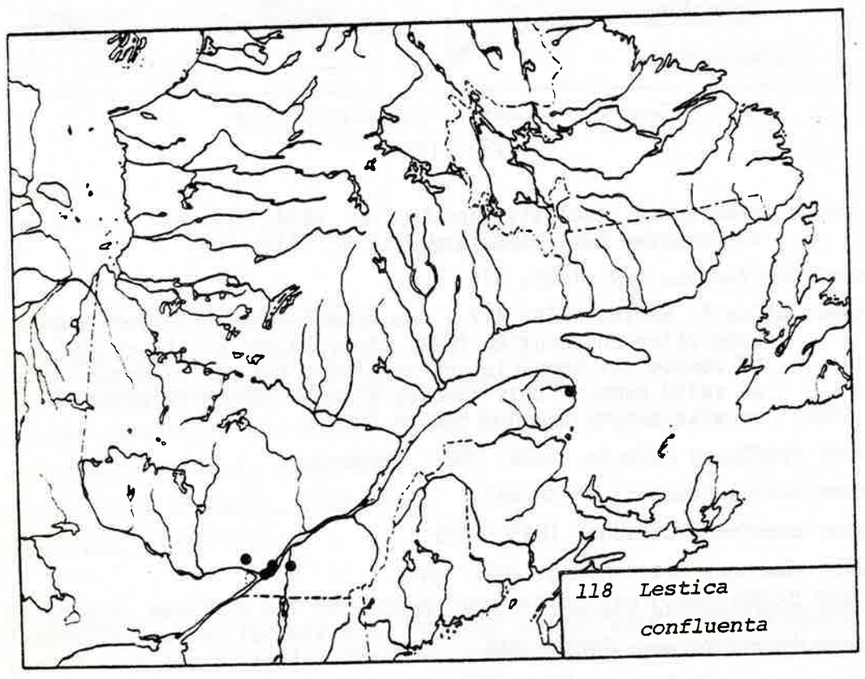
Diagnosis: First abdominal tergum with deep coarse punctation; colour quite variable but first abdominal tergum usually with well developed yellow maculations which do not meet in the middle.

Male; usually with well developed yellow maculations on the dorsal surface of the pronotum, metanotum and more rarely on the scutellum as well.

Biology: This species was reported nesting in logs and preying on pterophorid moths (Krombein, 1951).

Distribution: United States and southern Canada (Bohart and Menke, 1976).

Material Examined: 12 males; 19 females.



118 *Lestica confluenta*

Lestica (*Solenius*) *producticollis* (Packard)

Crabro producticollis Packard, 1866: 76.

Crabro 4-punctatus Provancher, 1883b: 653, *nec* Fabricius, 1793.

Crabro 4-maculatus Provancher, 1883b: 654, *nec* Fabricius, 1793.

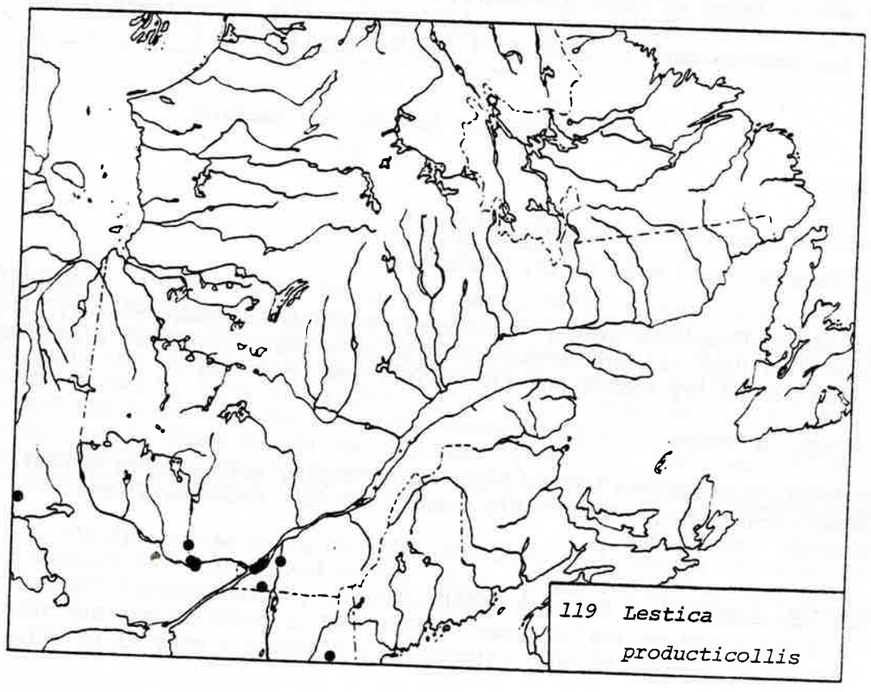
Diagnosis: First abdominal tergum more finely and closely punctate; colour variable but first tergum rarely with well developed maculations.

Male; thoracic dorsum usually completely black, rarely with small indistinct yellow spots on dorsal surface of pronotum.

Biology: Unknown.

Distribution: United States (Bohart and Menke, 1976).

Material Examined: 22 males; 8 females.



119 *Lestica producticollis*

Family Mellinidae

Diagnosis: Midtibia with two apical spurs; gaster pedunculate, omaulus absent; oblique scutal carina absent.

The family Mellinae contains the single genus *Mellinus* which in Quebec is represented by a single species. A review of the genus was published by Siri and Bohart (1974).

Genus *Mellinus* Fabricius

Mellinus Fabricius, 1790: 226.

Millimus Gimmerthal, 1836: 449.

Diagnosis: See under Family diagnosis.

Mellinus is considered at present to represent a relict genus which diverged rather early from the nyssonine group (Bohart and Menke, 1976). Of the ten described species eight are found in the New World, three of these are Nearctic in distribution. One species *Mellinus bimaculatus* Packard, reaches as far north as southern Quebec. The ten species were keyed by Siri and Bohart (1974).

Mellinus bimaculatus Packard

Fig. 51

Mellinus bimaculatus Packard, 1867: 419.

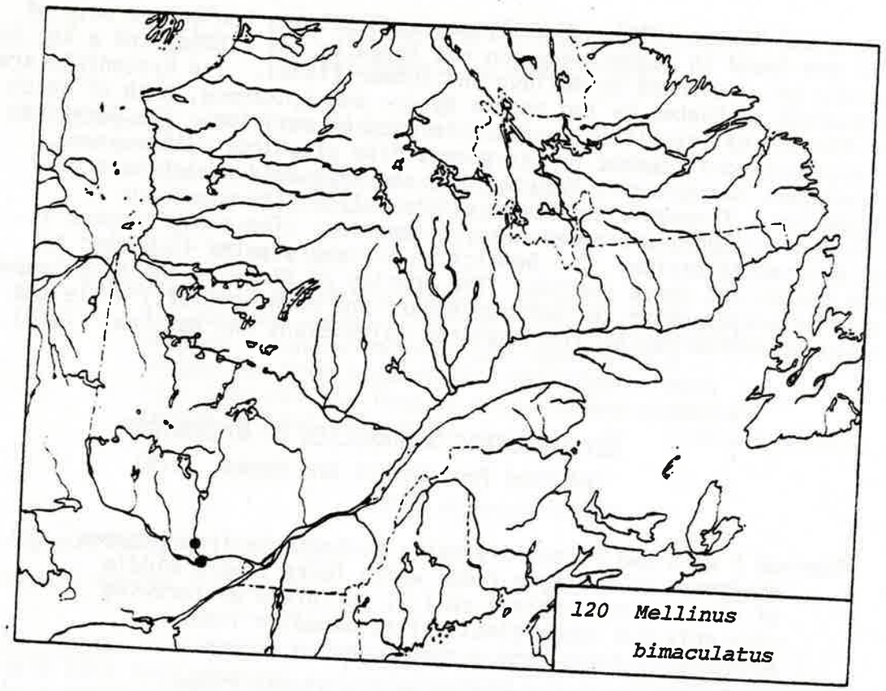
Mellinus wolcotti H.S. Smith, 1908b: 299.

Diagnosis: Propodeum weakly sculptured, enclosure without ridges; abdomen without red but tergum III with pale spots; antennal flagellum yellow ventrally; femora and tibia light red or yellow.

Biology: Unknown.

Distribution: eastern United States and ranging southward to Mexico (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 male; 1 female.



Family Nyssonidae

Diagnosis: Midtibia with two apical spurs, rarely one or none; if with two midtibial spurs then mandible simple externoventrally and jugal lobe of hindwing less than half length of anal area. If midtibia has only one apical spur, then hindocelli are normal and forewing contains two to three submarginal cells with a moderate size stigma; an oblique scutal carina is present posterolaterally, or propodeum bears a small sharp dorsal tooth posterolaterally. The Bembicini can be recognized by the single apical midtibial spur, deformed or reduced hindocelli and a jugal lobe equal to about the anal area of the hindwing.

The Nyssonidae contains over 1400 described species representing six subfamilies (Bohart and Menke, 1976). Four subfamilies are found in Quebec: Alyssoninae, Nyssoninae, Bembicinae and Gorytinae. The Nyssonidae are believed to be derived from pre-larrine stock and are considered to form a separate evolutionary line in sphecid phylogeny

(Bohart and Menke, 1976). The Alyssoninae contains two genera both of which are found in Quebec; *Alysson* was keyed by Fox (1894a) and a key to *Dideneis* was presented by Malloch and Rohwer (1930). The Nyssoninae are represented in Quebec by two genera *Nysson* and *Synnevrus*, both of which were treated by Fox (1896b) and are in need of revision. The Gorytinae are represented in Quebec by six genera five of which, *Ochleroptera*, *Argogorytes*, *Lestiphorus*, *Pseudoplisus* and *Hoplisoides* each have only one species. Taxonomic treatment exists only for *Pseudoplisus* in which Bohart (1968) presented a key to species. The genus *Gorytes* is also in need of review. The Bembicinae are represented in Quebec by three genera and three species. The species of *Bicyrtes* and *Microbembex* can be separated using the work of Bohart and Horning (1971) while the species of *Bembix* can be distinguished using Evans and Matthews (1968).

Key to Quebec Subfamilies of Nyssonidae
(Adapted from Bohart and Menke, 1976)

1 Sternum I with two ridges diverging posteriorly from between hindcoxae or a single ridge which forks toward middle of sternum; submarginal cell II petiolate or forewing with only two submarginal cells; admedian lines essentially fused into a single median groove . . . 2

1' Sternum I basomedially simple or with a single ridge which does not bifurcate posteriorly 3

2 Oblique scutal carina present (Fig. 27); median groove of scutum strong; body sculpture usually coarse; pronotal collar ridgelike . . . . . Nyssoninae

2' Oblique scutal carina absent; median groove of scutum faint and present only anteriorly; body sculpture rather fine except for propodeum; pronotal collar broadly rounded . . . . . Alyssoninae

3 Hindocelli deformed and scarlike . . . . . Bembicinae

3' Hindocelli normal . . . . . Gorytinae

Subfamily Alyssoninae

Diagnosis: Pronotal collar rounded and as long as or longer than scutellum; second submarginal cell petiolate; no oblique scutal carina; omaulus present and episternal carina evanescent above.

Key To Genera of Alyssoninae
(After Bohart and Menke, 1976)

1 Forewing media diverging beyond cu-a or very near it (Fig. 52); male with last antennal segment incurved but not strongly opposed by a projection from segment XII; metapleuron about half as long as high; second abdominal tergum almost always with a pair of pale spots . . . . . *Alysson* Panzer

1' Forewing media diverging before cu-a by at least the latters length (Fig. 53); last male antennal segment strongly incurved and opposed by a projection from segment XII; metapleuron much less than half as long as high; second abdominal tergum without pale spots . . . *Dideneis* Wesmael

Genus *Alysson* Panzer

Alysson Panzer, 1806: 169.

Alyson Jurine, 1807: 195.

Diagnosis: Forewing media diverging beyond cu-a or very near it; male with last antennal segment incurved but not strongly opposed by a projection from segment XII; metapleuron about half as long as high; second abdominal tergum almost always with a pair of pale spots.

Alysson contains 30 recognized species and ranges over the Holarctic, Ethiopian and Oriental Regions (Bohart and Menke, 1976). Of the 8 Nearctic species 5 are found in Quebec and were keyed by Fox (1894a). Evans and Lin (1956b) and Evans (1959a) described the larva of *Alysson melleus* Say.

Key to Quebec Species of *Alysson*
(Adapted from Fox, 1894a)

1 Males 2

1' Females 6

2 Propodeal enclosure forming a triangle posteriorly (Fig. 30) 3

2' Propodeal enclosure roundly triangular or U-shaped (Fig. 31) 4

3 Face below antennal sockets entirely yellow . . . . . *triangulifer triangulifer* Provancher

3' Face below antennal sockets with black and yellow . . . . . *guignardi* Provancher

4 Propodeal enclosure without reticulate sculpture . . . . . *conicus* Provancher

4' Propodeal enclosure with coarsely reticulate sculpture . . . 5

5 Femora and clypeus black . . . . . *oppositus* Say

5' Femora reddish; clypeus yellow . . . . *melleus* Say

6 Propodeal enclosure forming a triangle posteriorly (Fig. 30) . . 7

6' Propodeal enclosure roundly triangular or U-shaped posteriorly (Fig. 31) 8

7 Abdomen black . . . . . *guignardi* Provancher

7' Abdomen with red on terga I and II . . . . *triangulifer triangulifer* Provancher

8 Thorax with red . . . . . *melleus* Say

8' Thorax black 9

9 Abdomen with red on terga I and II . . . *oppositus* Say

9' Abdomen black . . . . . *conicus* Provancher

Alysson conicus Provancher

Fig. 31

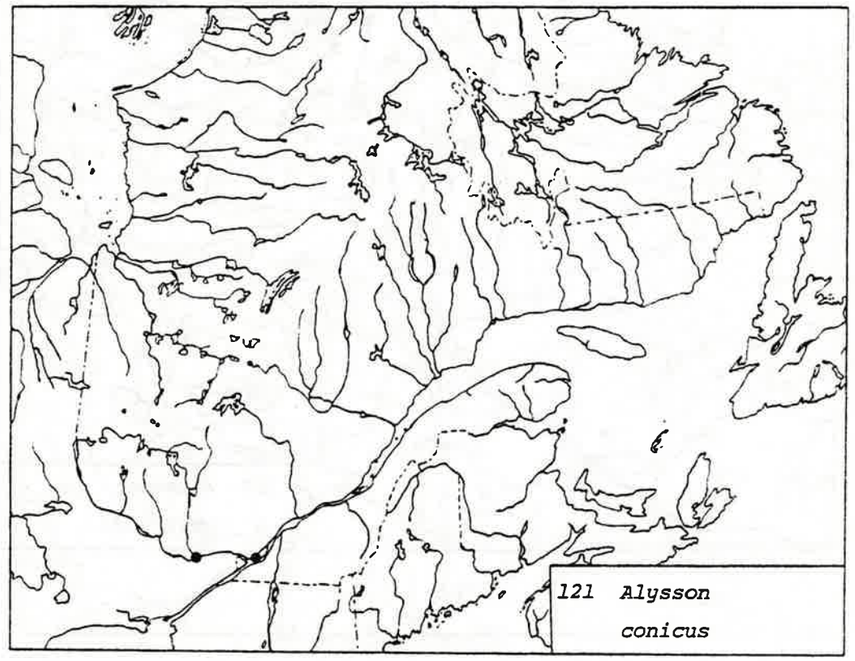
Alyson conicus Provancher, 1887: 271.

Diagnosis: Propodeal enclosure U-shaped and without reticulate sculpture; thorax and abdomen black, without red.

Biology: O'Brien and Kurczewski (1979) found this species nesting in damp sand; the nest contained two cells, one stocked with 7 *Empoa albicans* Walsh and the other stocked with 5 *E. albicans* and 2 *E. venusta* (McAtee) (Cicadellidae).

Distribution: North America (Bohart and Menke, 1976).

Material Examined: 2 males; 3 females.



Alysson guignardi Provancher

Figs. 30, 52

Alyson guignardi Provancher, 1887: 271.

Alyson interstitialis Cameron, 1902: 375.

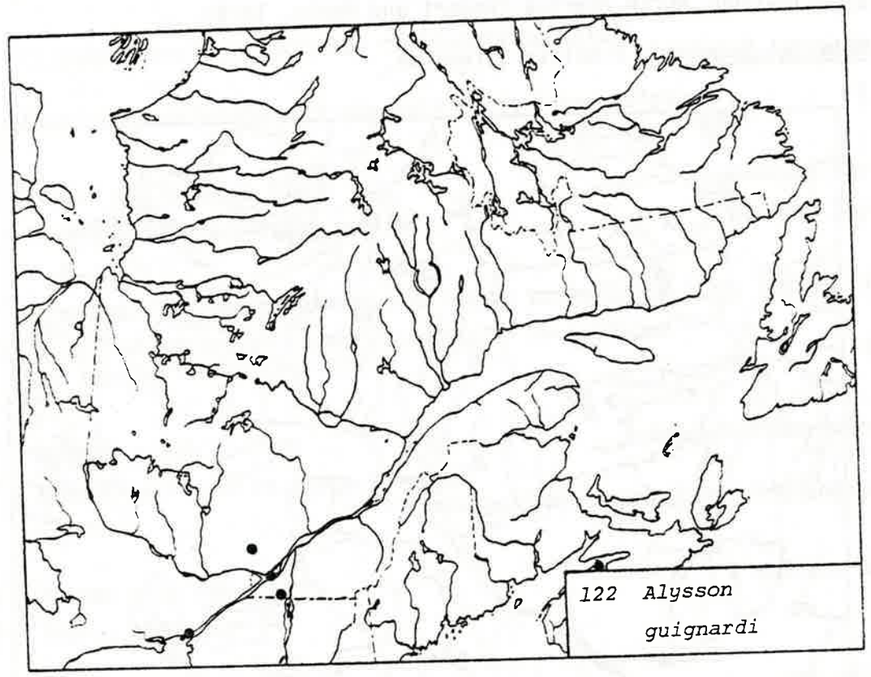
Alyson petiolatus Cameron, 1902: 374.

Diagnosis: Propodeal enclosure forming a triangle posteriorly; abdomen black; face below antennal sockets black in female, black and yellow in male.

Biology: Unknown.

Distribution: North America (Bohart and Menke, 1976).

Material Examined: 4 males; 6 females.



Alysson melleus Say

Alyson melleus Say, 1837: 380.

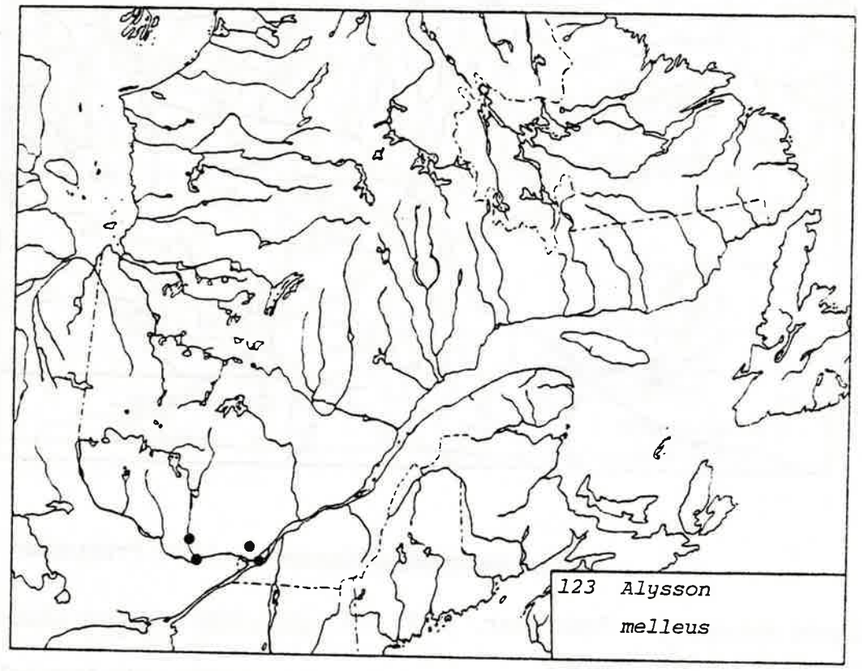
Diagnosis: Propodeal enclosure roundly triangular posteriorly with reticulate sculpture; femora reddish; clypeus yellow; thorax extensively red in female.

Biology: This species has been observed by Hartman (1905), Rau and Rau (1918) and also by Evans (1966a) who summarized the previous literature and added his own extensive observations. This wasp prefers damp sandy clay or sandy soil in shaded areas. The nest is several centimeters deep ending in a terminal cell; as many as four other cells are added along the main tunnel. Prey consist of Cicadellidae of which 3 to 23

may be provisioned in a cell. A list of 22 prey records was provided by Evans (1966a). The only observed parasites were sarcophagid flies reared from several cells by Evans (1966a).

Distribution: North America east of the 100th meridian (Bohart and Menke, 1976).

Material Examined: 2 males; 12 females.



Alysson oppositus Say

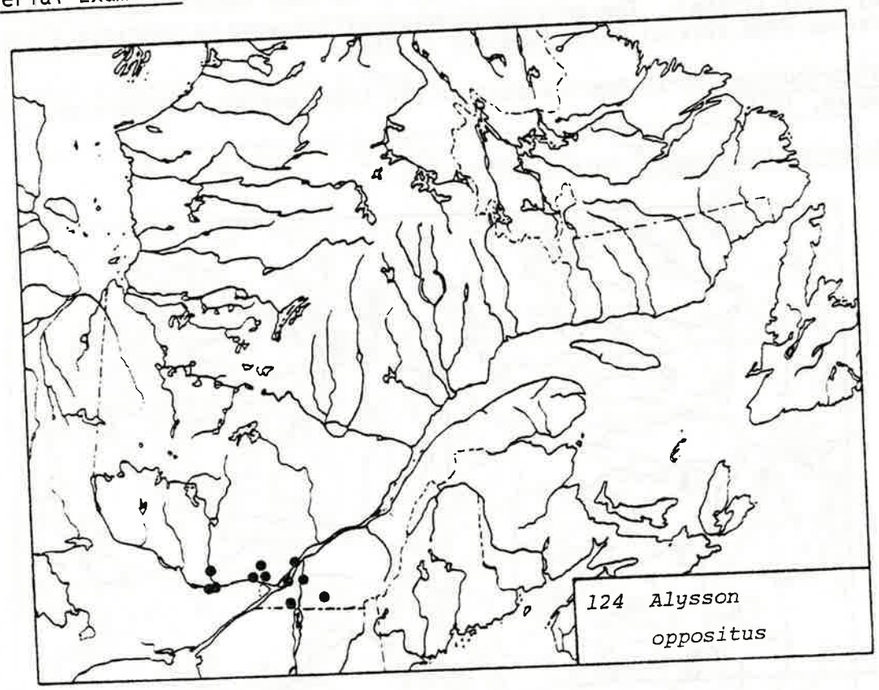
Alyson oppositus Say, 1837: 380.

Diagnosis: Propodeal enclosure U-shaped posteriorly and with reticulate sculpture; femora black; clypeus black in male, yellow in female; abdominal terga black in male, I and II red in female.

Biology: Unknown.

Distribution: North America, east of Rocky Mountains (Bohart and Menke, 1976).

Material Examined: 11 males; 20 females.



Alysson triangulifer triangulifer Provancher

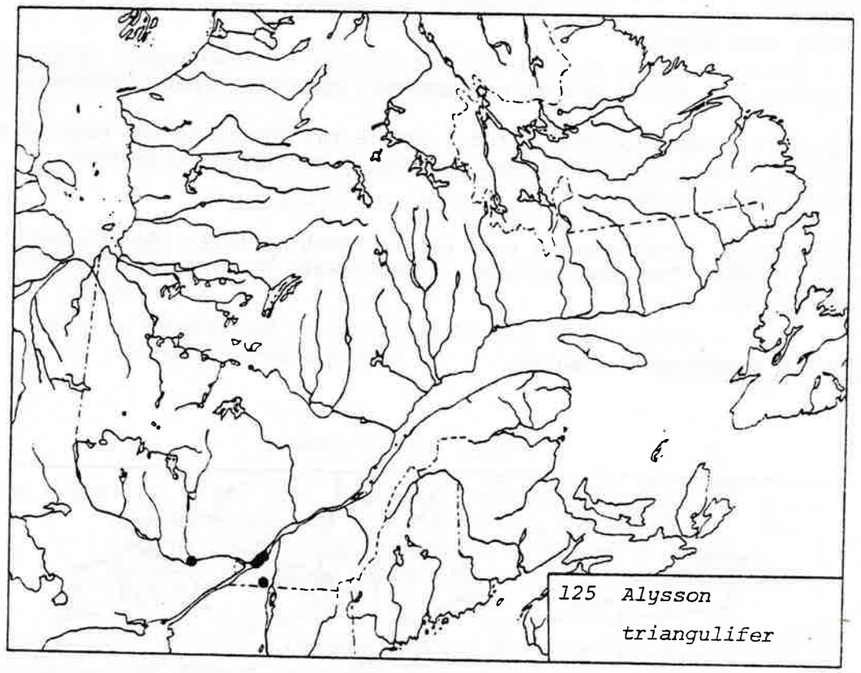
Alyson triangulifer Provancher, 1887: 272.

Diagnosis: Propodeal enclosure triangular posteriorly; male face yellow below antennal sockets; female with tergum I of abdomen red.

Biology: Unknown.

Distribution: North America, east of 100th meridian; another subspecies is found in the western United States and Canada (Bohart and Menke, 1976).

Material Examined: 6 males; 6 females.



Genus *Didineis* Wesmael

Didineis Wesmael, 1852: 109.

Diagnosis: Second abdominal tergum without pale spots; forewing media diverging before cu-a.

Didineis contains 26 species all from the Holarctic Region except one Oriental (Bohart and Menke, 1976). Seven species are Nearctic with one species found in Quebec. A key to species in North America was presented by Malloch and Rohwer (1930).

Didineis texana (Cresson)

Fig. 53

Alyson texanus Cresson, 1872: 226.

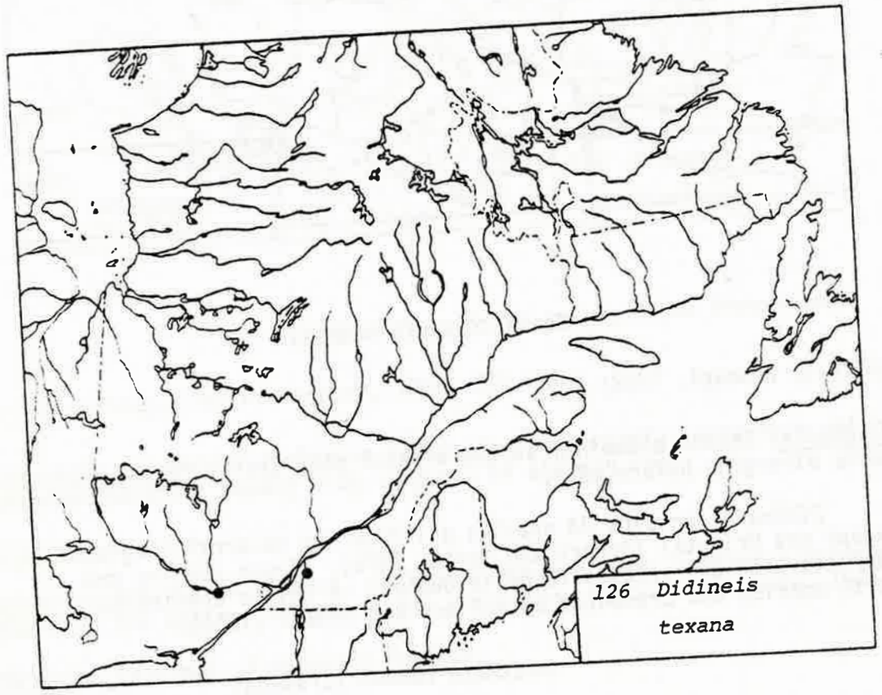
Diagnosis: Males with foretarsi not flattened; forefemora cylindrical, not thin and concave beneath; basal segments of antennal flagellum simple; head black.

Females with thorax black; abdomen red; apex of clypeus yellow.

Biology: Strandtman (1945) noted a female running along the edge of a field in Texas. The female was carrying a paralyzed Fulgoridae, *Cixius stigmatus* Say.

Distribution: North America east of the 100th meridian (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 3 females.



Subfamily Nyssoninae

Diagnosis: Propodeum with lateral prongs; sternum I with a double ridge; oblique scutal carina present; integument armored.

Key to Quebec Genera of Nyssoninae
(Adapted from Bohart and Menke, 1976)

1 Posterior margins of terga simple, not thickened or double edged . . . . . *Nysson* Latreille

1' Posterior margins of terga thickened and double edged at least dorsolaterally . . . . *Synnevrus* Costa

Genus *Nysson* Latreille

Nysso Latreille, 1796: 125. Apparently a printers *lapsus* for *Nysson*. Although *Nysso* has priority it has not been used. The Internat. Comm. Zool. Nomencl. was asked to suppress *Nysso* in favour of *Nysson* (Menke, Bohart and Richards, 1974a).

Nysson Latreille, 1796. Emendation of *Nysso*, see Internat. Comm. Zool. Nomencl., Opinion 1115, 1979: 175.

Nyssonus Rafinesque-Schmaltz, 1815: 124.

Diagnosis: Forewing with three submarginal cells; posterior margins of terga simple,not thickened or double edged; sterna simple without lateral modifications; hindtibia simple, without teeth or spines along posterior margin.

Nysson at present contains 83 described species, 24 of which are found in the Nearctic Region, and only two of these occur in Quebec. There is at present no satisfactory key to the species nor have any larvae been described.

Key to Quebec Species of *Nysson*

1 Hindwing media diverging at cu-a (Fig. 54) . . *lateralis* Packard

1' Hindwing media diverging beyond cu-a (Fig. 55) . . . . . *trichrus* (Mickel)

Nysson lateralis Packard
Fig. 54

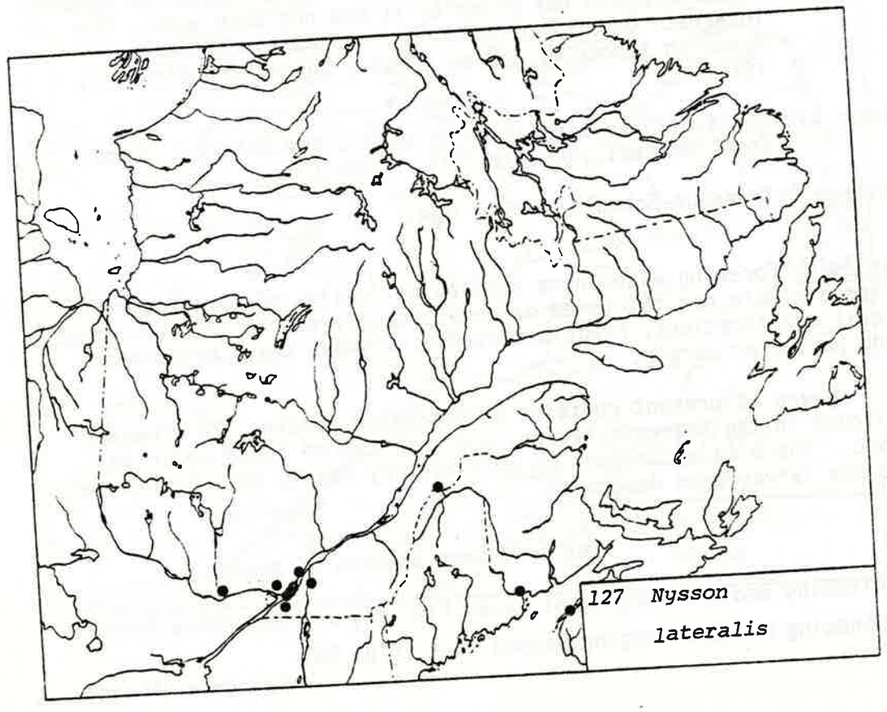
Nysson lateralis Packard, 1867: 440.

Diagnosis: Hindwing media diverging at cu-a; at least first three abdominal terga with a pair of lateral spots; male tergum VII bispinose.

Biology: This species was observed entering and leaving a nest of the sphecid wasp *Gorytes canaliculatus* Packard and is presumed to be cleptoparasitic on that species (Evans, 1966a).

Distribution: United States (Bohart and Menke, 1976).

Material Examined: 40 males; 10 females.



Nysson trichrus (Mickel)
Fig. 55

Nysson nigripes Provancher, 1887: 269, *nec* Spinola, 1808.

Brachystegus trichrus Mickel, 1916a: 400.

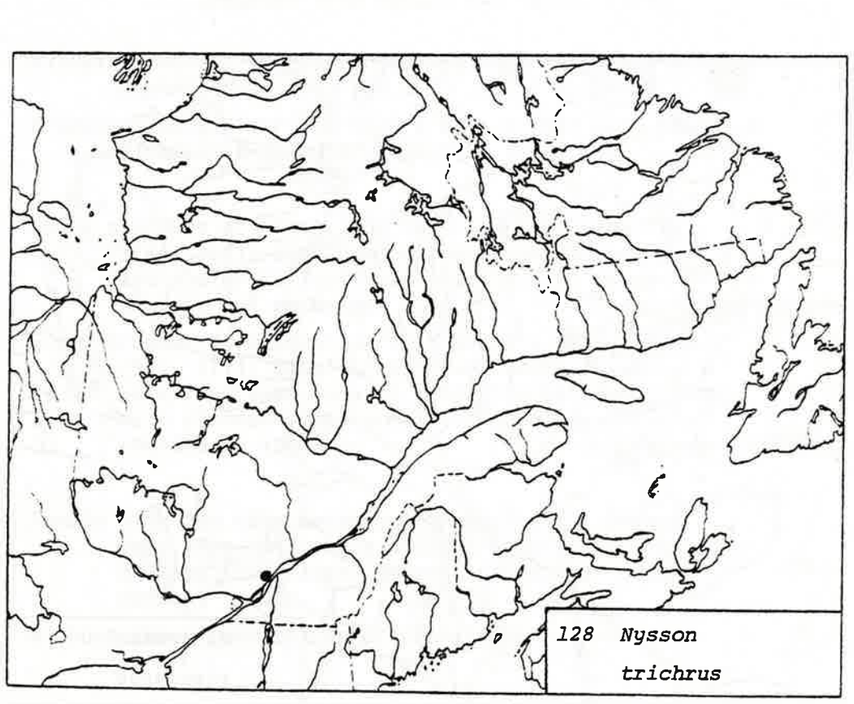
Nysson melanoplus Pate, 1938: 130.

Diagnosis: Hindwing media diverging well beyond cu-a; first abdominal tergum with at least a small amount of red colouration; male tergum VII trispinose.

Biology: Unknown.

Distribution: United States east of the 100th meridian (Bohart and Menke, 1976).

Material Examined: 1 male.



Genus *Synnevrus* Costa

Synnevrus Costa, 1859: 16.

Synneurus Gerstaecker, 1867b: 79.

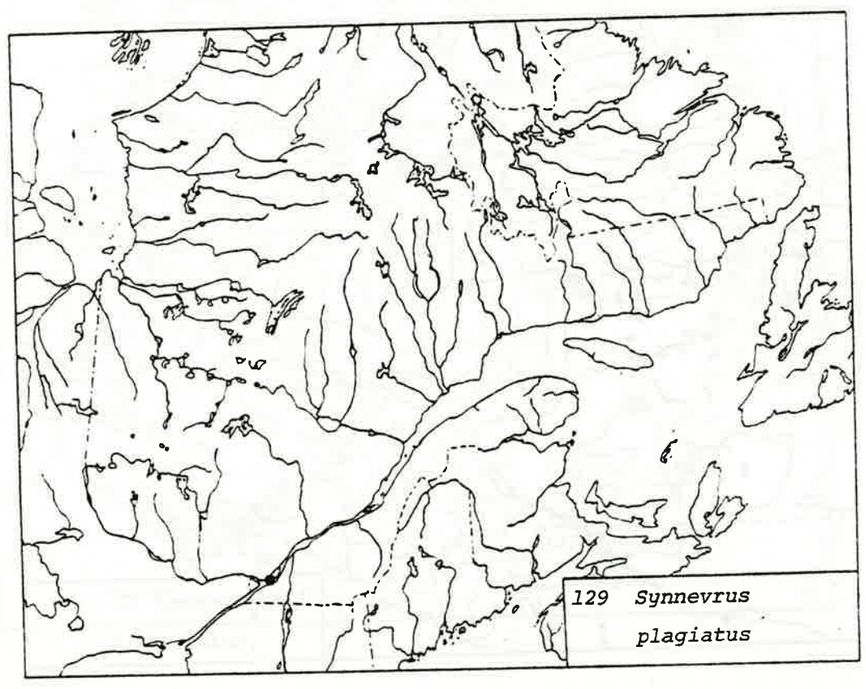
Diagnosis: Posterior margins of terga thickened and double edged especially toward lateral angles; hindwing media diverging at cu-a; abdominal sterna simple, without lateral modifications; hindtibia simple, with teeth or spines.

This genus includes 20 species found over the Holarctic Region and north Africa. Five species are Nearctic of which one is found in Quebec. At present there is no adequate key to species.

Synnevrus plagiatus (Cresson)

Fig. 27

Nysson plagiatus Cresson, 1882: 276.



Diagnosis: First abdominal segment with lateral spots covering almost entire tergum.

Biology: Unknown.

Distribution: United States (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 2 females.

Subfamily Gorytinae

Diagnosis: Sternum I with a single median ridge toward base; hindocelli normal.

Key to Quebec Genera of Gorytinae
(Adapted from Bohart and Menke, 1976)

1 Hindwing media diverging more than 1.0 midocellus diameter beyond cu-a (Fig. 56) 2

1' Hindwing media diverging before cu-a or not more than 1.0 midocellus diameter beyond it (Fig. 57) 3

2 Frons narrower at midocellus than shortly below it (Fig. 112); omaulus continued ventrally as an acetabular carina; male sternum VIII sword shaped, not exserted . . . . . *Argogorytes* Ashmead

2' Frons broader at midocellus than shortly below it (Fig. 111); omaulus continued ventrally only as a fine seam, ending ventrally before midline; male sternum VIII normally concealed, broadly rounded at apex . . . . . *Ochleroptera* Holmberg

3 Female with two rake setae on forebasitarsus before apex (Fig. 84); male without special modifications on last four flagellomeres; spiracular groove present 4

3' Without above combination of characters 5

4 Propodeal enclosure with sculpture or longitudinal ridging, at least along anterior sulcus . . . *Gorytes* Latreille

4' Propodeal enclosure without longitudinal ridging or general sculpture except sometimes in anterolateral corners, bounding sulci of enclosure simple or appearing pitted . . . . . *Pseudoplisus* Ashmead

5 Segment I of abdomen pedunculate, tergum strongly humped toward apex (Fig. 94) . . . . . *Lestiphorus* Lepeletier

5' Segment I sometimes narrowed but tergum evenly curved, not strongly humped toward apex (Fig. 95) . . *Hoplisoides* Gribodo

Genus *Ochleroptera* Holmberg

Ochleroptera Holmberg, 1903: 487.

Paramellinus Rohwer, 1912: 469.

Diagnosis: Hindwing media diverging more than 1.0 midocellus diameter beyond cu-a; frons broader at midocellus than shortly below it; omaulus continued ventrally as a fine seam ending before midline; male sternum VIII normally concealed, broadly rounded at apex.

This genus contains 12 species most of which are found in South America. One species is found in the United States and Quebec: *Ochleroptera bipunctata* (Say). The larva of this species was described by Evans and Lin (1956b).

Orchleroptera bipunctata (Say)

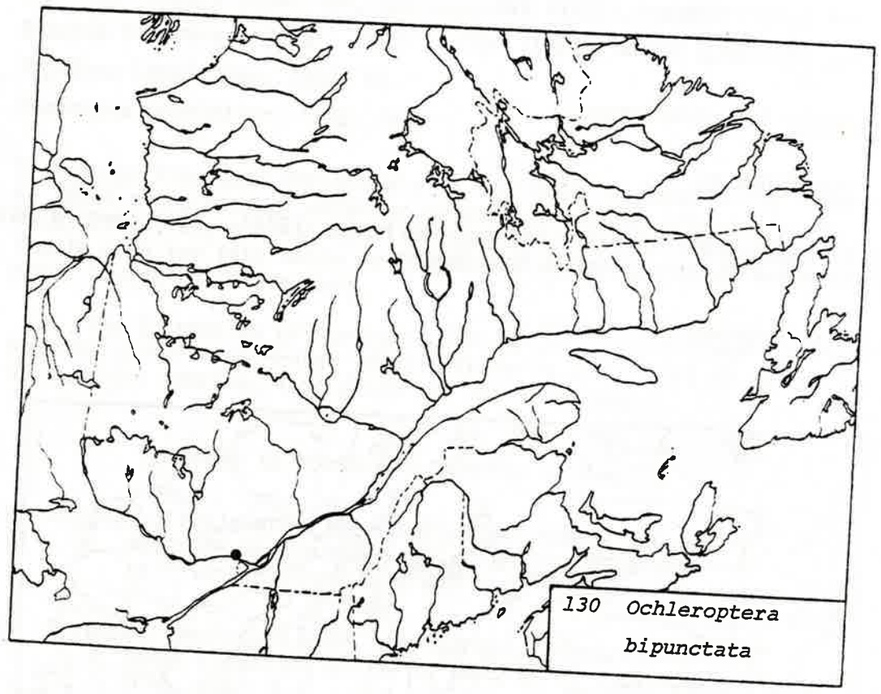
Gorytes bipunctatus Say, 1824: 338.

Diagnosis: See under genus.

Biology: A number of observations on this species were published by Evans (1966a). This wasp nests in small patches of coarse sand and constructs a nest of one to three cells. Prey consists of five families of Homoptera: Cicadellidae, Cercopidae, Membracidae, Fulgoridae and Psyllidae. Evans (1966a) provided a table of species used as prey. The cells are provisioned with 6 to 18 paralyzed individuals.

Distribution: United States south to Yucatan (Krombein, 1951). This species has not previously been reported from Quebec.

Material Examined: 1 female.



Genus *Argogorytes* Ashmead

Argogorytes Ashmead, 1899: 324.

Archaroactus Pate, 1937b: 10.

Diagnosis: Frons narrower at midocellus than shortly below it; omaulus continued ventrally as an acetabular carina; hindwing media diverging more than 1.0 midocellus diameter beyond cu-a; male sternum VIII sword shaped.

This genus contains 24 species known from all faunal regions except the Ethiopian (Bohart and Menke, 1976). Two species are found in North America, only one of which occurs north of the southwestern United States. There is at present no key to species.

Argogorytes nigrifrons (F. Smith)
Figs. 56, 112

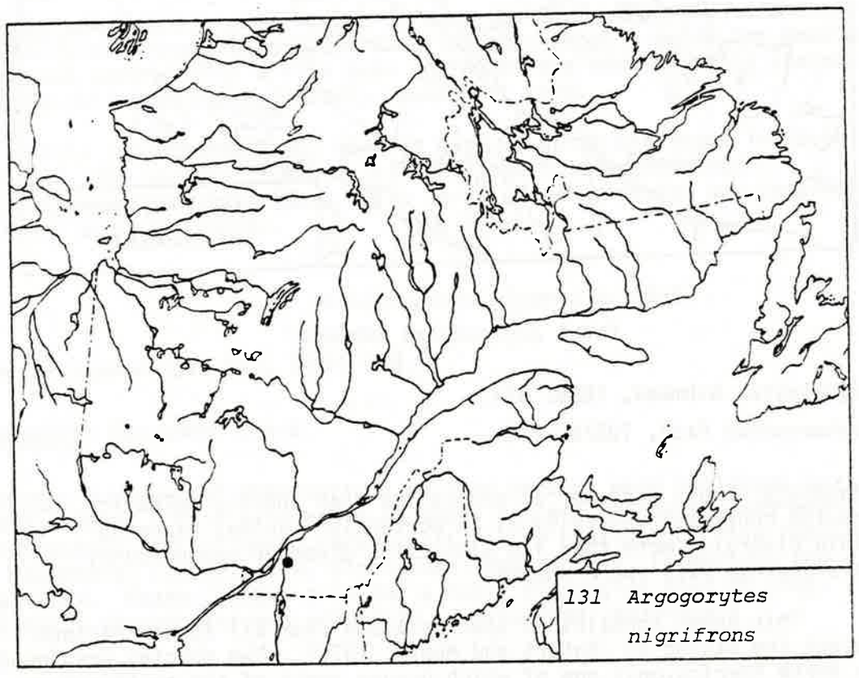
Gorytes nigrifrons F. Smith, 1856: 368.
Gorytes bollii Cresson, 1872: 225.
Gorytes neglectus Rohwer, 1911: 567.

Diagnosis: See under genus.

Biology: Unknown.

Distribution: North America (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 female.



Genus *Gorytes* Latreille

Gorytes Latreille, 1804: 180.
Arpactus Panzer, 1805: heft 98, text for pl. 17.
Arpactus Panzer, 1806: 164, *nec Arpactus* Panzer, 1805.
Euzonia Stephens, 1829b: 363.
Hoplisus Lepeletier, 1832: 61.
Euspongus Lepeletier, 1832: 66.

Diagnosis: Propodeal enclosure with sculpture or longitudinal ridging at least along most of anterior sulcus; spiracular groove present; male without any special modifications on last four flagellomeres; female with two rake setae on forebasitarsus before apex; hindwing media diverging before cu-a.

The 55 species of *Gorytes* occur in the Holarctic and Ethiopean Regions (Bohart and Menke, 1976). There is at present no key to the 16 Nearctic species, 4 of which are found in Quebec.

Key to the Quebec Species of *Gorytes*

1 Propodeal enclosure with longitudinal ridges along anterior margin only, not extending more than half length of enclosure (Fig. 32) . . . . . *simillimus* F. Smith

1' Propodeal enclosure with longitudinal ridges extending to or almost to posterior margins of enclosure (Fig. 33) 2

2 Metapleural suture non foveolate above metapleural pit (Fig. 17); propodeum with a pair of yellow spots . . . . . *deceptor* Krombein

2' Metapleural suture foveolate above metapleural pit (Fig. 16); propodeal spots present or absent . . . 3

3 Propodeal enclosure with about four longitudinal ridges on each side of furrow; propodeal sides and posterior coarsely rugose up to edge of enclosure; mandibles yellow at base; supraclypeal area yellow . . . . . *canaliculatus* Packard

3' Propodeal enclosure with more than four parallel longitudinal ridges on each side of furrow; ridges continued at least a little beyond enclosure to sides and posterior of propodeum; mandibles usually black; male with black supraclypeal area . . . . . *atricornis* Packard

Gorytes atricornis Packard

Fig. 33

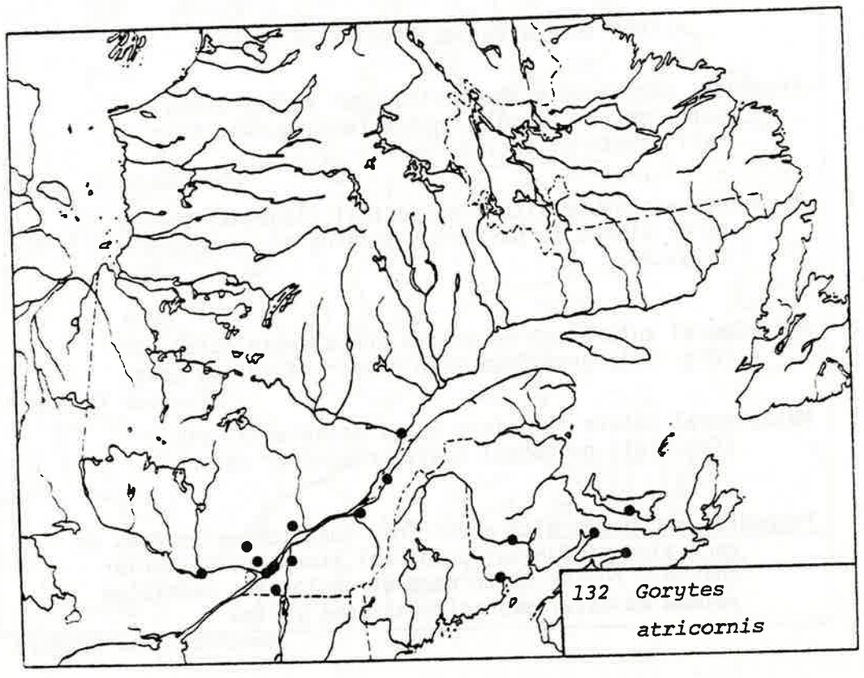
Gorytes atricornis Packard, 1867: 428.

Gorytes rugosus Packard, 1867: 427.

Gorytes decorus Fox, 1896c: 535.

Hoplisus elegantulus H.S. Smith, 1908a: 346.

Diagnosis: Metapleural suture foveolate above metapleural pit; propodeal enclosure with more than four parallel longitudinal ridges on each side of furrow; ridges continued beyond enclosure to sides of propodeum; males with black supraclypeal area.



Biology: The only observations on this common species are two prey records; a cercopid, *Aphrophora parallela* (Say) (Evans, 1966a) and a membracid, *Cyrtolobus tuberosus* (Fairmaire) (Pate, 1946).

Distribution: North America (Bohart and Menke, 1976).

Material Examined: 56 males; 40 females.

Gorytes canaliculatus Packard

Fig. 16

Gorytes canaliculatus Packard, 1867: 428.

Gorytes geminus Handlirsch, 1888: 478.

Gorytes asperatus Fox, 1896c: 534.

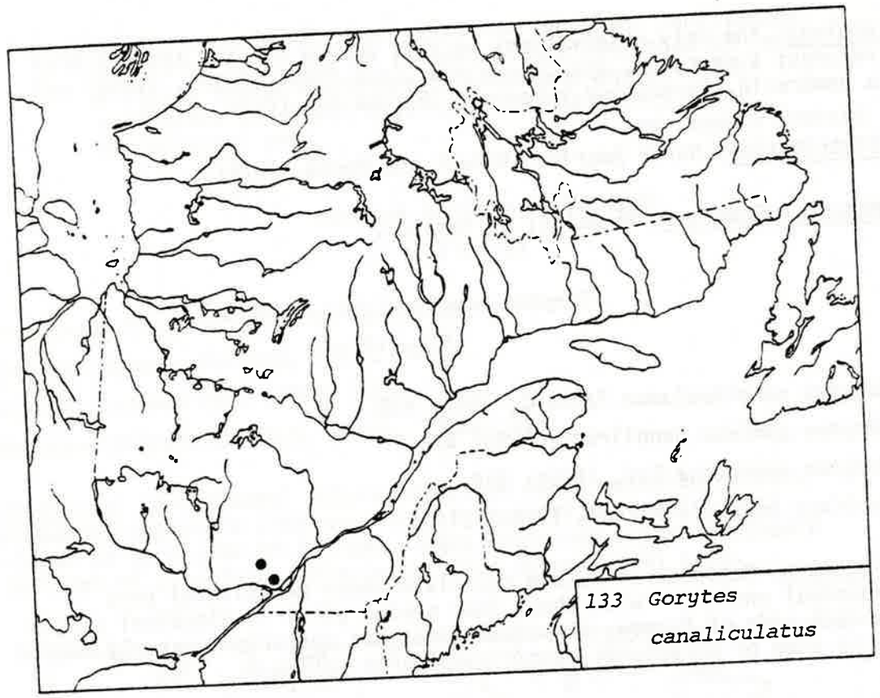
Hoplisus corrugis Mickel, 1918a: 319.

Diagnosis: Metapleural suture foveolate above metapleural pit; propodeal enclosure with about four semiparallel longitudinal ridges on each side of furrow; propodeal sides and posterior coarsely rugose up to edge of enclosure; supraclypeal area yellow.

Biology: The most extensive observations on this species were made by Evans (1966a). The nest consists of up to four cells and is located in fine grain sandy areas. The entrance is closed while the female is hunting and left open while the female is in the nest. Prey consist primarily of Cicadellidae of the genus *Idiocerus* but Fulgoridae are occasionally used. Both nymphs and adults are used in provisioning and between 6 and 20 prey are provisioned per cell depending on prey size. Evans (1966a) also noted that any prey taken by an individual wasp tend to be all of the same species. Several parasites were also listed by Evans (1966a), these include two miltogrammine sarcophagids *Prosinella* sp. and *Metopia argyrocephala* (Mg.); the mutillid wasp *Timulla leona* Blake and two sphecids, *Nysson daeckei* Viereck and *N. lateralis* Packard. The observations of Evans (1966a) were recently supplemented by Powell (1974) who observed the behaviour and larval development of this wasp in California.

Distribution: Transcontinental in the United States (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 male; 1 female.



Gorytes deceptor Krombein

Fig. 17

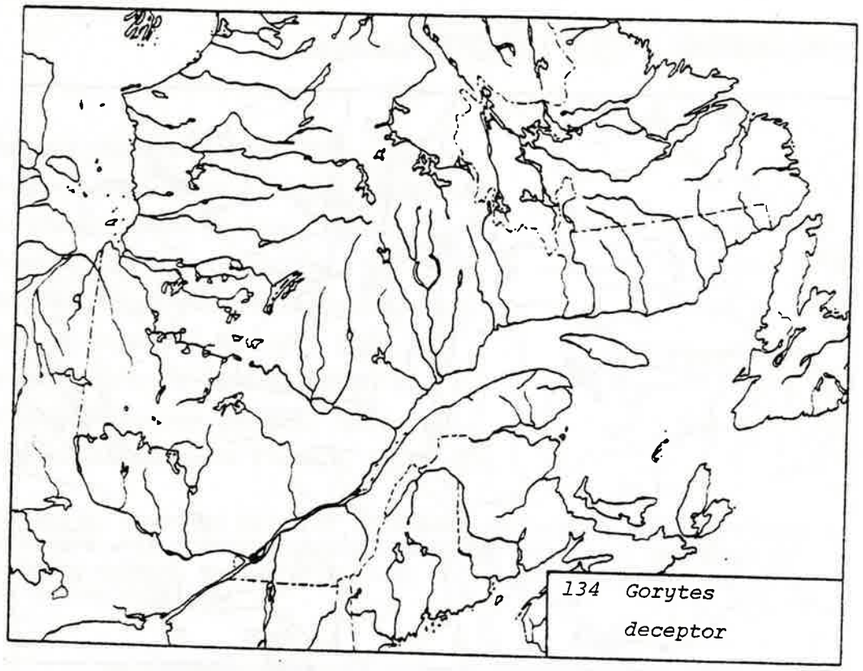
Gorytes deceptor Krombein, 1958b: 62.

Diagnosis: Propodeal enclosure with longitudinal ridges extending to posterior margins of enclosure; metapleural suture non foveolate above metapleural pit.

Biology: Krombein (1958b) reported one prey record of a membracid which Evans (1966a) reported as *Spissistilus constans* (Wlk.).

Distribution: eastern United States (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 2 males.



Gorytes simillimus F. Smith

Figs. 32, 57

Gorytes simillimus F. Smith, 1856: 367.

Gory ephippiatus Packard, 1867: 426.

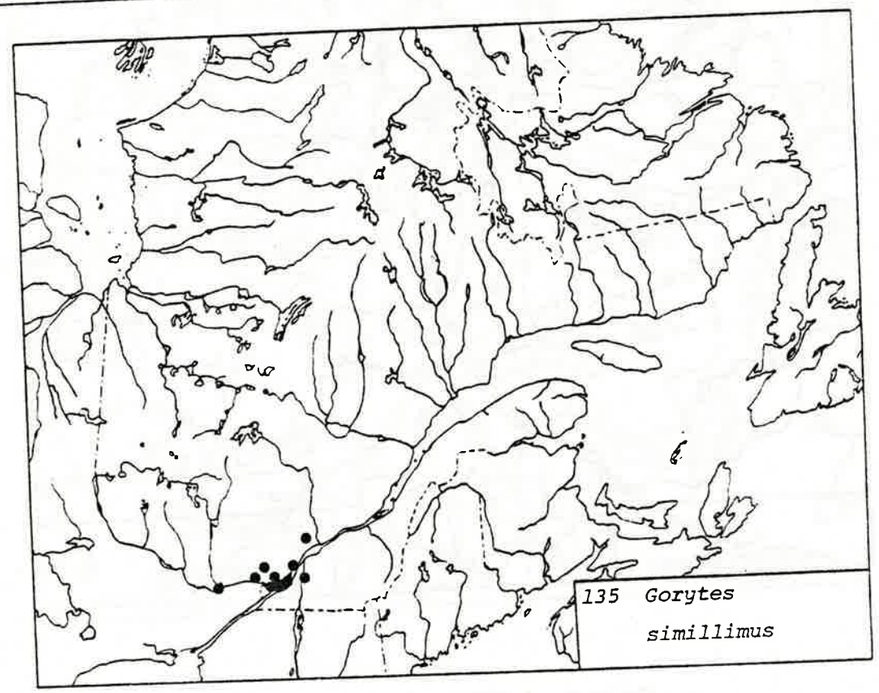
Gorytes gyponacinus Rohwer, 1911: 568.

Diagnosis: Propodeal enclosure with longitudinal ridges along anterior margin only, and not extending more than half length of enclosure.

Biology: Evans (1966a) has reviewed the literature on this species and observed it nesting in sandy locations similar to *G. canaliculatus*. The only two nests excavated thus far contained only one cell and were probably incomplete. Prey consist of large species of Cicadellidae; three species have been recorded: *Gyponana flavolineata* (Fitch), *G. octolineata* (Say) and *Scaphoideus productus* Osborne. No parasites have been recorded.

Distribution: North America (Bohart and Menke, 1976).

Material Examined: 44 males; 25 females.



Genus *Pseudoplisus* Ashmead

Pseudoplisus Ashmead, 1899: 323.
Laevigorytes Zavadil, *in* Zavadil and Šnoflák, 1948: 66.

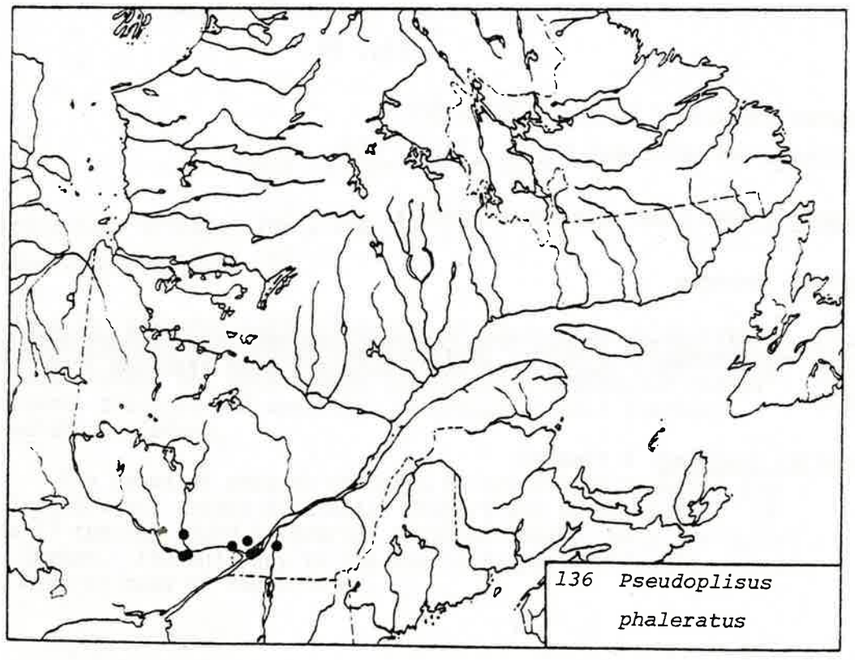
Diagnosis: Hindwing media diverging before cu-a; female with two rake setae on forebasitarsus before apex; male without modifications on last four flagellomeres; spiracular groove present; propodeal enclosure without longitudinal ridging.

Of the 33 species found in *Pseudoplisus*, 28 occur in the United States or Mexico; one species is found in Europe and four in Africa (Bohart and Menke, 1976). One species belonging to the *phaleratus* group is found in Quebec and can be distinguished from other species in the genus using the key presented by Bohart (1968).

Pseudoplisus phaleratus (Say)
Fig. 84

Gorytes phaleratus Say, 1837: 367.
Gorytes fulvipennis F. Smith, 1856: 367.
Gorytes modestus Cresson, 1865b: 473.
Gorytes flavicornis Packard, 1867: 429.
Gorytes rufoluteus Packard, 1867: 425.
Gorytes alpestris Cameron, 1890: 83.
Gorytes alticola Cameron, 1890: 81.
Gorytes papagorum Viereck, 1907b: 400.
Gorytes subaustralis Viereck, 1907b: 398.

Diagnosis: Bounding sulci of propodeal enclosure simple, not pitted; enclosure with a median groove which does not reach the anterior bounding sulcus; scutum with black or red central area; scutellum not entirely yellow.



Biology. Unknown.

Distribution: North America (Bohart and Menke, 1976).

Material Examined: 28 males; 28 females.

Genus *Lestiphorus* Lepeletier

Lestiphorus Lepeletier, 1832: 70.
Lestophorus Agassiz, 1847: 208.
Hypomellinus Ashmead, 1899: 299.
Mellinogastra Ashmead, 1899: 300.

Diagnosis: Hindwing media diverging at cu-a; spiracular groove absent; sternaulus present; segment I of abdomen pedunculate, tergum strongly arched toward apex; mesopleuron sparsely and finely punctate.

Lestiphorus contains 17 primarily Holarctic species; one species is known from South America and one from Africa (Bohart and Menke, 1976). Of the three Nearctic species, only one is known from Quebec. There is at present no key to species.

Lestiphorus cockerelli (Rohwer)

Fig. 94

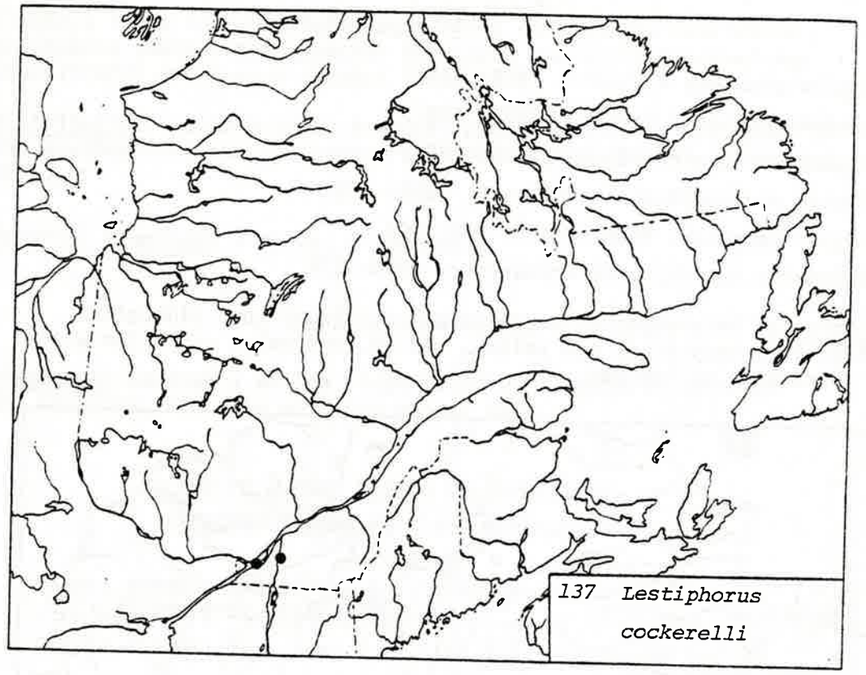
Gorytes cockerelli Rohwer, 1909e: 371.
Mellinogastra williamsi Mickel, 1916a: 402.

Diagnosis: See under generic diagnosis.

Biology: Unknown.

Distribution: United States from Colorado and Nebraska (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 2 females.



137 *Lestiphorus cockerelli*

Genus *Hoplisoides* Gribodo

Hoplisoides Gribodo, 1884: 276.
Icuma Cameron, 1905a: 21.

Diagnosis: Hindwing media diverging at cu-a; spiracular groove absent; sternaulus present and complete; tergum I of abdomen evenly arched, not with a hump toward apex; acetabular carina present, distinct and complete; propodeum without coarsely areolate sculpture.

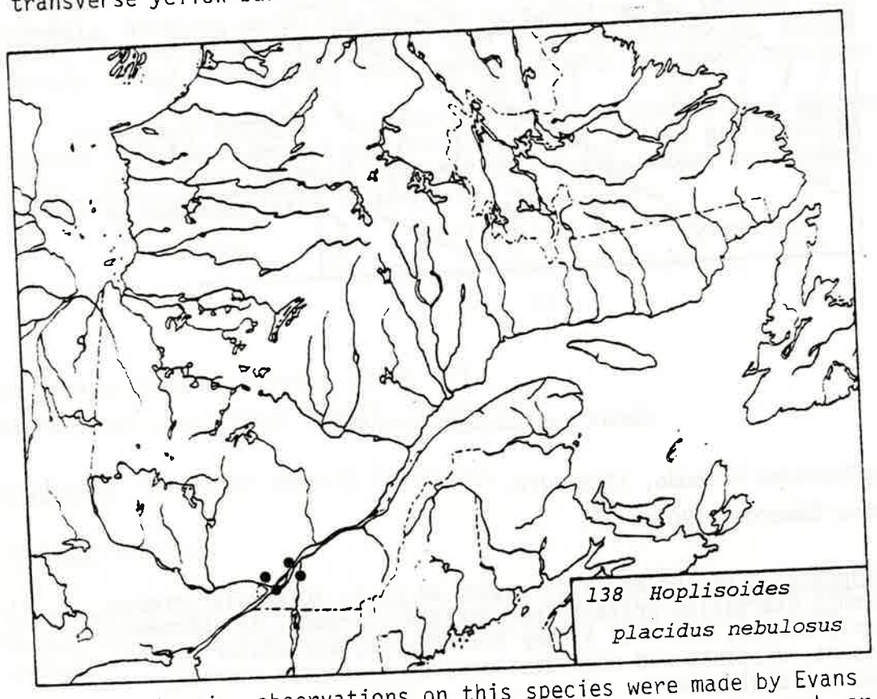
The genus at present contains 68 species distributed over all continents except Australia (Bohart and Menke, 1976). Of the 17 species found in America north of Mexico, only one occurs in Quebec. The only key to the American species (Bradley, 1920) is much in need of revision.

Hoplisoides placidus nebulosus (Packard)

Figs. 15, 95

Gorytes placidus F. Smith, 1856: 368.
Gorytes nebulosus Packard, 1867: 424.
Gorytes armatus Provancher, 1887: 272.
Gorytes microcephalus Handlirsch, 1888: 405.
Gorytes pergandei Handlirsch, 1888: 407.
Philanthus harringtonii Provancher, 1888: 278.

Diagnosis: Anteroventral metapleural pit larger than midocellus (Fig. 15); body black and yellow, red on legs only; scutellum with a transverse yellow bar.



Biology: Extensive observations on this species were made by Evans (1966a). This wasp nests in open sandy areas usually near woods or scrub where abundant supplies of membracids may be obtained. The nest consists of one to three cells which are provisioned with 4 to 20 membracids per cell depending on the size of the prey; both adults and nymphs were used. Prey consist of the following genera: *Campylenchia*, *Enchenopa*, *Entylia*, *Microcentris*, *Palonica*, *Publilia*, *Spissistilus*, *Telamona*, and *Vanduzea*. Bohart and Menke (1976) added *Cerasa* and *Tylopelta* to this list. Several parasites were listed by Evans

(1966a); these include the miltogrammine sarcophagid *Senotainia trilineata* (Wulp), the sphecids *Epinysson basilaris tuberculatus* (Handlirsch) and *Nysson daeckei* Viereck.

Distribution: eastern North America; other subspecies are found in the southeastern and southwestern United States (Bohart and Menke, 1976).

Material Examined: 3 males; 6 females.

Subfamily Bembicinae

Diagnosis: Sternum I with a ridge basally; hindocelli deformed and scarlike; midtibia with one apical spur.

Key to Quebec Genera of Bembicinae
(Adapted from Bohart and Menke, 1976)

1 Palpal formula 6-4 (Fig. 127); propodeum projecting backward at lateral angles . . . . *Bicyrtes* Lepeletier

1' Palpal formula less than 6-4 (Fig. 126); propodeum normal . . 2

2 Marginal cell in distal half slightly bent away from wing margin (Fig. 59) . . . . *Microbembex* Patton

2' Marginal cell in distal half adhering to wing margin (Fig. 60) . . . . . *Bembix* Fabricius

Genus *Bicyrtes* Lepeletier

Bicyrtes Lepeletier, 1845: 53.
Bembidula Burmeister, 1874: 122.
Dumonela Reed, 1894: 608.

Diagnosis: Ocellar scars not depressed below level of surrounding face; palpal formula 6-4; lateral angles of propodeum projecting backward.

Bicyrtes is a New World genus of 23 species, 9 of which are found in the Nearctic Region (Bohart and Menke, 1976). A key to the species of North America was presented by Bohart and Horning (1971). The larva of the single Quebec species *Bicyrtes ventralis* (Say) was described by Evans and Lin (1956b).

Bicyrtes ventralis (Say)

Figs. 58, 127

Monedula ventralis Say, 1824: 337.

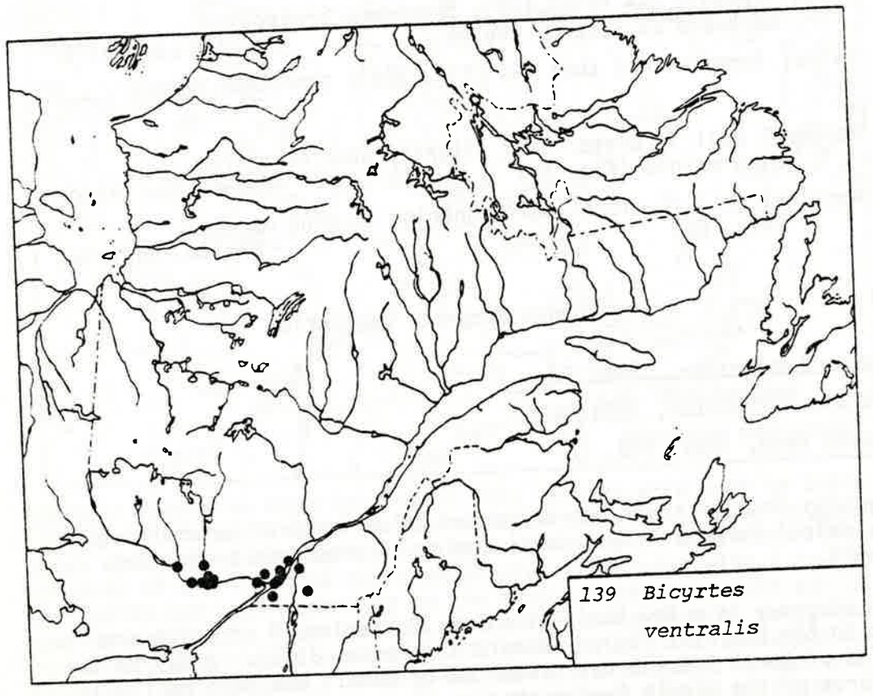
Bicyrtes servillii Lepeletier, 1845: 53.

Monedula parata Provancher, 1888: 416.

Bembidula meliloti Johnson and Rohwer, 1908: 376.

Diagnosis: Male; sternum II without a bare median longitudinal line, carina or tooth; clypeus without a basal spot; midfemur with a prominent basoventral tooth.

Female; tergum VI with pygidial plate not well developed; clypeus mostly yellow with dark markings apically, without a basal spot; submarginal cell not more darkly stained than second or third submarginal cells; legs black and yellow; mesopleuron medially with somewhat irregular punctures separated by several puncture diameters.



Biology: Evans (1966a) reviewed the observations of J.B. Parker (1917) and added his own notes on this species. The nest is usually located in open sandy gravel areas with one to three cells being constructed. Prey consist of immature pentatomid bugs although Evans (1966a) noted one record of Coreidae. The prey are provisioned at the rate of 3 to 11 per cell depending on size and occasionally progressive provisioning may occur where the female continues to provide prey after the egg has hatched. The following species have been recorded as prey: Coreidae: *Anasa tristis* De Geer; Pentatomidae: *Banasa dimidiata* Say, *Cosmopepla bimaculata* Thom., *Elasmostethus cruciatus* Say, *Euschistus euschistoides* Voll., *E. tristigmus* Say, *E. variolarius* P.B., *Menecles incertus* Say, *Mormidia lugens* Fabr., *Thyanta pallidovirens accerra* McAtee and *Trichopepla semivittata* Say. Evans (1966a) noted two parasite records, which were found by Allen (1926), both of which are miltogrammine sarcophagid flies, *Senotainia trilineata* (Wulp) and *S. vigilans* Allen.

Distribution: United States, southern Canada and northern Mexico (Bohart and Menke, 1976).

Material Examined: 57 males; 50 females.

Genus *Microbembex* Patton

Microbembex Patton, 1879: 364.

Diagnosis: Ocellar scars not depressed below level of surrounding face; palpal formula 3-1; marginal cell partially removed from edge of forewing; propodeum without projecting lateral angles.

This genus at present contains 21 species all from the New World (Bohart and Menke, 1976). The 7 North American species were keyed by Bohart and Horning (1971). Only one species occurs in eastern North America and it is found in Quebec. The larva of *Microbembex monodonta* (Say) was described by Evans and Lin (1956b).

Microbembex monodonta (Say)

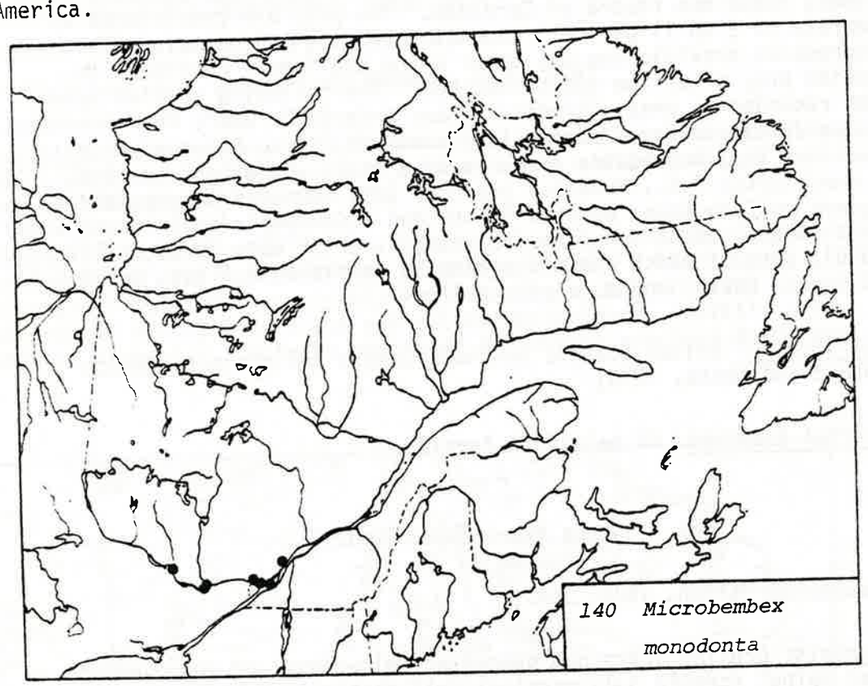
Fig. 59

Bembex monodonta Say, 1824: 335.

Microbembex occidentalis Johnson and Rohwer, 1908: 375.

Microbembex tarsalis Rohwer, 1914: 516.

Diagnosis: Forewing radius along front of first submarginal cell brown, not contrasting strongly with basal part of radius; labrum with a median black stripe; male with last four flagellomeres dull beneath; keel on male sternum II with ventral edge evenly rounded; this species is the only one in the genus found east of the Continental Divide in North America.



Biology: Several authors have made observations on this species; Evans (1966a) reviewed the former work, including that of Stoehr (1917) who recorded observations from Quebec, and added his own notes to the literature. This species forms nesting aggregations in fine grain sandy soil. The nest consists of a single cell several centimeters below the surface which is progressively provisioned with dead arthropods or arthropod parts. This wasp is unusual in its feeding habits in that it is a broad range scavenger, unlike wasps in related genera which are much more specialized in their feeding habits. Prey include members of Arachnida: Phalangida and Araneida; Insecta: Ephemeroptera, Orthoptera, Psocoptera, Hemiptera, Neuroptera, Trichoptera, Lepidoptera, Coleoptera, Diptera and Hymenoptera. A number of authors have noted the construction of sleeping burrows near the nesting sites. These burrows are temporary tunnels 3 to 6 cm long and often occur in very high density; they are used to pass the night and periods of inclement weather. Competition in this species is often intense both for nesting space and food. Evans (1966a)

observed female aggression in situations of high nest density where one female would grasp another female attempting to enter a nearby nest and in a few cases bodily lift the offending female into the air and dump her on the sand several centimeters away. Competition for prey can be more intense; one female will often attempt to steal prey from another and while the two are rolling about on the sand a third female will occasionally seize the prey. Prey are also seized from ants or other wasps when they deposit it momentarily at a nest entrance. Parasites of this species include miltogrammine sarcophagids, the bombyliid *Exoprosopa fascipennis* Say and the mutillid wasp *Dasymutilla bioculata* Cresson.

Distribution: North and Central America east of the Continental Divide (Bohart and Menke, 1976).

Material Examined: 31 males; 53 females.

Genus *Bembix* Fabricius

Bembix Fabricius, 1775: xxiii.
Bembyx Fabricius, 1775: 361.
Bembex Fabricius, 1776: 122.
Apobembex Pate, 1937b: 9.
Epibembex Pate, 1937b: 26.

Diagnosis: Ocellar scars not depressed below the level of surrounding face; palpal formula 4-2, rarely 3-1; marginal cell of forewing adhering to wing margin along its entire length; propodeum without projecting lateral angles.

Bembix with 329 species is the largest genus in the family (Bohart and Menke, 1976). Only one subspecies is found in Quebec *Bembix americana spinolae* Lepeletier. The 23 North American species were keyed by Evans and Matthews (1968). The larva of the Quebec species was described by Evans and Lin (1956b).

Bembix americana spinolae Lepeletier

Figs. 60, 126

Bembix americana Fabricius, 1793: 250.
Bembex spinolae Lepeletier, 1845: 277.
Bembex similans Fox, 1895b: 358.

Bembex connexus Fox, 1895b: 360.

Bembex primaaestate Johnson and Rohwer, 1908: 378.

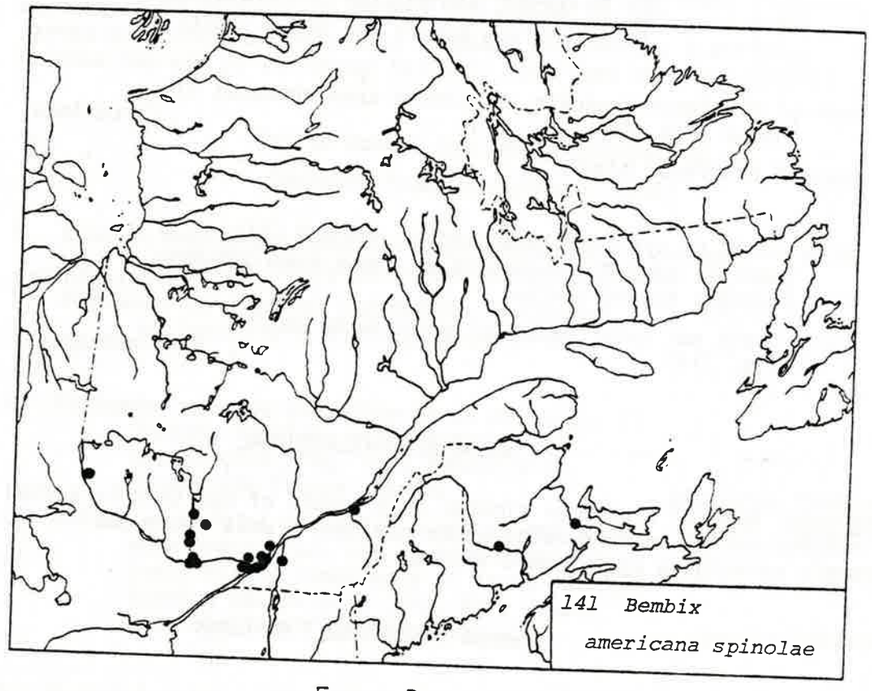
Diagnosis: Male; tergum VII simple, without a pygidial area; ocellar lenses obsolete; sterna II and VI with median processes, VI without lateral processes; median process on sternum VI flattened beneath and pointed apically; midfemur with a denticulate longitudinal sharp edge beneath; flagellomere VI without a spine; maculations on tergum II not enclosing black spots; maculations at least with a tinge of yellow, often maculations are absent on apical tergum.

Female; labrum shorter than eye height, straight in lateral view, not angulate or dentate at point where mandibles cross; ocellar lenses obsolete; wings clear, not clouded with brown; forebasitarsus with six spines; midtibial spur not approaching middle of midbasitarsus; maculations of terga not attenuated medially nor reduced to lateral spots but maintain about the same width across the terga; clypeus entirely pale; length of forewing not exceeding 12 mm; abdominal maculations grey; apical tergum black or rarely maculated.

Biology: Much information has been published concerning various aspects of the biology of this wasp; Evans (1957a) reviewed the work of Peckham and Peckham (1898), J.B. Parker (1917), Webb and Wells (1924) as well as several others. This species is generally less restricted in nesting areas than other members of the genus; open sand such as beaches, dunes or sand pits are the choice areas but flat sparsely vegetated sandy soil, sandy earth and sandy gravel are also used. Evans (1957a) reported the nest structure as simple, consisting of a tunnel excavated at a 45 degree angle into the soil for a distance of at least 13 cm before terminating in a single cell. Alcock (1972) found some variation in cell number and observed 1 to 3 cells per nest. Using marked wasps Alcock (1972) noted that the female excavated a single celled nest first and only then is a second nest constructed with up to two other cells being excavated after the initial cell was completed and provisioned. The egg is laid on a small fly placed in the bottom of the cell; this small fly acts as a pedestal for the egg and is not consumed by the hatching larva. The larva is progressively provisioned after the egg hatches. Prey include flies of the families Stratiomyidae, Tabanidae, Bombyliidae, Therevidae, Asilidae, Syrphidae, Otitidae, Muscidae, Calliphoridae, Sarcophagidae and Tachinidae. Evans (1966a) added Sciomyzidae to the prey list. The provisions in a cell usually include several species among the 16 to 24 flies per cell. In areas with a high nest density some prey stealing has been reported between females of this species. Parasites recorded include the miltogrammine Sarcophagidae: *Prosinella fulvicornis* (Coq.), *Senotainia vigilans* Allen and *Opsidia gonioides* Coq.; Bombyliidae: *Exoprosopa fascipennis* (Say); Conopidae: *Physocephala texana* Will.; the mutillid wasp *Dasymutilla bioculata* Cresson, and the rhipiphorid beetle *Macrosiagon flavipennis* Lec.

Distribution: North America except the Pacific Coast; other subspecies are found on the Pacific Coast of North America, on islands off California, on the Virgin Islands, Puerto Rico and Cuba (Bohart and Menke, 1976).

Material Examined: 39 males; 40 females.



Family Philanthidae

Diagnosis: Midtibia with one apical spur; stigma small; ocelli normal; scutum without an oblique carina posterolaterally; propodeum without teeth at posterolateral angles; antennal sockets placed above clypeus by at least one third of a socket diameter; forewing with three submarginal cells.

The Philanthidae contains about 1100 species representing four subfamilies. Three subfamilies are found in Quebec, Philanthinae, Aphilanthopinae and Cercerinae. The Philanthidae are considered to have been derived from the larrine complex but have strongly diverged from the larrine group (Bohart and Menke, 1976). The subfamily Philanthinae is represented in Quebec by one genus *Philanthus*, the species of which were reviewed by Strandtmann (1946) and more recently by Bohart and Grissell (1975). The subfamily Aphilanthopinae is

represented in Quebec by a single species of the genus *Aphilanthops* which may be separated from other species using the key presented by Bohart (1966). The third subfamily Cercerinae is again represented in Quebec by a single genus *Cerceris*, the species of which may be separated using the work of Scullen (1965).

Key to Quebec Subfamilies of Philanthidae

(Adapted from Bohart and Menke, 1976)

1 Apex of hindfemur truncate, flattened area somewhat kidney shaped (Fig. 85) . . . . . Cercerinae

1' Apex of hindfemur simple 2

2 Inner orbit of eye sharply angled or notched (Fig. 113) (weak in some *Philanthus* males whose eyes converge strongly toward vertex) . . . . . Philanthinae

2' Inner orbit not interrupted by an angle or notch (Fig. 114) . . . . . Aphilanthopinae

Subfamily Philanthinae

Diagnosis: Apex of hindfemur simple; inner orbit of eye sharply angled or notched except in some males which may have a weak notch but strongly converging eyes toward vertex.

Genus *Philanthus* Fabricius

Philanthus Fabricius, 1790: 224.
Symblephilus Panzer, 1806: 171.
Simblephilus Jurine, 1807: 185.
Cheilopogonus Westwood, 1834: 441.
Philianthus Guérin-Méneville, 1835: pl. 71, fig. 8.
Anthophilus Dahlbom, 1844: 190.
Chilopogon Kohl, 1897: 329.
Epiphilanthus Ashmead, 1899: 294.
Pseudanthophilus Ashmead, 1899: 294.
Ocliocletes Banks, 1913: 423.
Ococletes Mickel, 1916a: 407.

Diagnosis: Last antennal segment somewhat rounded apically and with a partly ventral, oval polished spot; first gastral segment usually broader than long.

Philanthus contains about 135 species ranging over all continents except Australia and South America (Bohart and Menke, 1976). Of the 31 species found in America north of Mexico, 6 are found in Quebec and were keyed by Strandtmann (1946) and Bohart and Grissell (1975). The larvae of *Philanthus bilunatus* Cresson, *P. gibbosus* (Fabricius), *P. politus* Say and *P. solivagus* Say were described by Evans (1957b).

Key to Quebec Species of *Philanthus*

(Adapted from Strandtmann, 1946)

1 Abdomen highly polished, without punctures; propodeal enclosure highly polished, impunctate . . . 2

1' Abdomen with distinct punctation; propodeal enclosure with distinct sculpture . . . 3

2 Posterior margins of yellow bands on tergum II forming complete or almost complete semicircles (Fig. 96); female with incomplete frontal carina . . . *bilunatus* Cresson

2' Posterior margins of yellow bands on tergum II more transverse, not forming complete semicircles, inner ends of bands rarely turning posteriorly (Fig. 97); female with complete frontal carina . . . *lepidus* Cresson

3 Pronotal collar with an anterior transverse carina . . . . . *ventilabris* Fabricius

3' Anterior margin of pronotum rounded, without a transverse carina 4

4 Abdomen with five bands, the one on the first tergum much the broadest, the band on the second the narrowest . . . . . *solivagus* Say

4' Abdomen not coloured as above 5

5 Band on second tergum complete and at least twice as wide as any other abdominal band; abdomen with very large almost contiguous punctures . . . *gibbosus* (Fabricius)

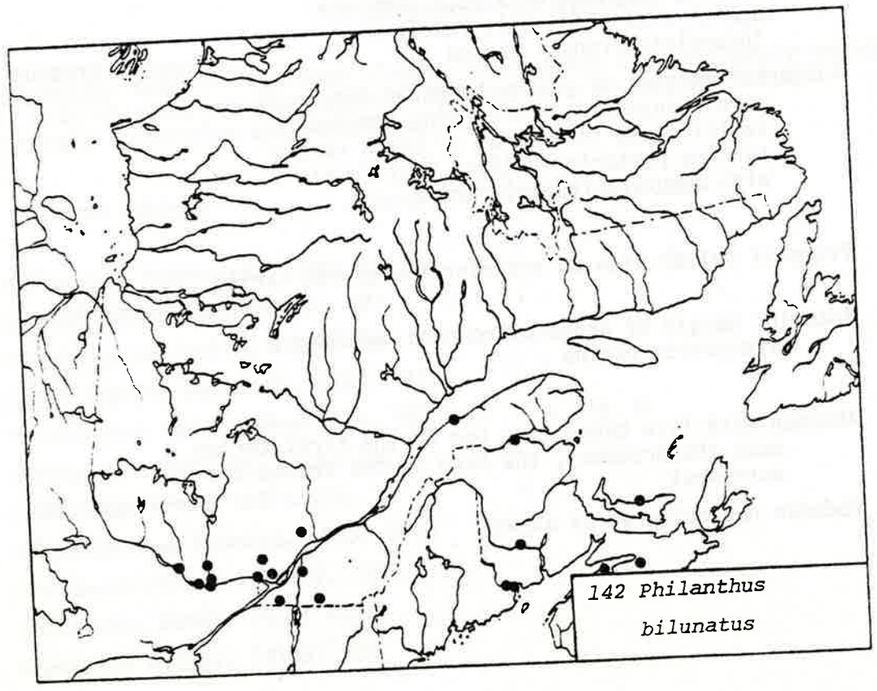
5' Band on second tergum complete or incomplete and subequal in width to band on third tergum; abdominal terga with moderate punctation . . . . ***politus*** Say

Philanthus bilunatus Cresson

Figs. 96, 113

Philanthus bilunatus Cresson, 1865c: 97.
Philanthus scelestus Cresson, 1879: monthly proc. xxxiii.
Philanthus assimilis Banks, 1915: 404, *nec* Banks, 1913.
Philanthus consimilis Banks, 1923: 21, *nec* Kohl, 1891.

Diagnosis: Abdomen and propodeal enclosure highly polished, impunctate; posterior margins of bands on tergum II forming complete or almost complete semicircles; frontal carina incomplete in female.



Biology: Armitage (1965) has reviewed the work of Evans and Lin (1959) on this species. *P. bilunatus* nests in vertical sandy slopes and preys on bees of the families Colletidae: *Hylaeus*; and Halictidae: *Halictus*, *Lasioglossum* and *Augochlorella*.

Distribution: United States east of Rocky Mountains and Ontario in Canada (Bohart and Menke, 1976).

Material Examined: 30 males; 33 females.

Philanthus gibbosus (Fabricius)

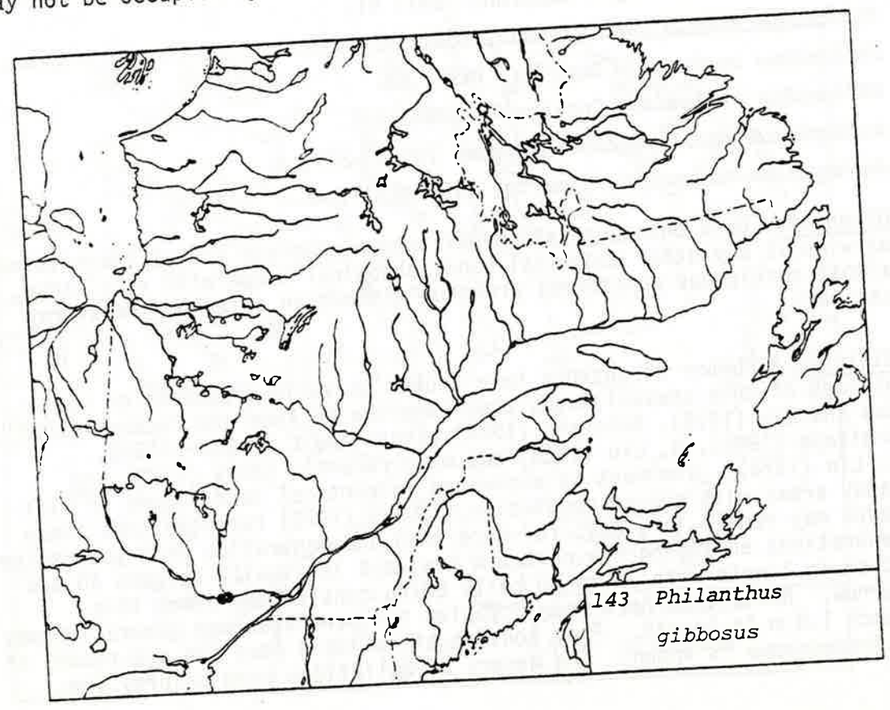
Vespa gibbosus Fabricius, 1775: 370.
Philanthus punctatus Say, 1824: 342.
Cheilopogonus punctiger Westwood, 1835: 441.
Anthophilus gibbosus Dahlbom, 1845: 192, 497.
Anthophilus nodosus Klug, 1846: 42.
Philanthus xanthostigma Cameron, 1891: 91.
Philanthus maculifrons Cameron, 1891: 91.
Philanthus cockerelli Dunning, 1897: 69.
Philanthus chilosidis Cockerell, 1898: 141.
Anthophilus maculiventris Cameron, 1905b: 377.
Anthophilus melanaspis Cameron, 1905b: 377.

Diagnosis: Band on second abdominal tergum complete and at least twice as wide as any other abdominal band; abdominal terga with very large, almost contiguous punctures; pronotum without an anterior transverse carina.

Biology: A number of authors have looked at various aspects of the biology of this unusual wasp; these include Peckham and Peckham (1898), Rau and Rau (1918), Reinhard (1924), Evans and C.S. Lin (1959), Armitage (1965), N. Lin (1968) and more recently Evans (1973) and N. Lin (1978). The nest is excavated in vertical sand slopes or flat sandy areas with sparse vegetation. Evans (1973) reported that these wasps may remain in a nest for more than one generation with successive generations enlarging the nest. A new nest is usually between 40 and 70 cm in length with up to 20 cells being constructed along this burrow. Nests that have been occupied for more than one generation may reach 1.5 m in length. Prey consist of halictid bees but one record of a *Crossocerus* is known. The genera of Halictidae used as prey are

Halictus, *Lasioglossum*, *Sphecodes*, *Agapostemon*. *Augochlora*, *Augochlorella*, and *Augochloropsis*. Prey hunting by the female involves severent different techniques; the female may enter the nest of the halictid bees, wait for returning bees at their nest, pounce at bees leaving their nests, make midair captures of bees or hunt around flowers (N. Lin, 1978). The females, once they have located a good hunting area, establish individual hunting territories usually within a small area around a bee nest; this area is actively defended against other females of the species (N. Lin, 1978).

As was mentioned above, the nest of this species may be used for more than one generation; coupled with this is burrow sharing in which males and females occupy the same burrow overnight (Reinhard, 1924 and N. Lin, 1968) and also communal use of the nesting burrows first observed by Peckham and Peckham (1898) and explored in detail by Evans (1973). Evans (1973) noted that communal use of nesting burrows is a common but temporary phenomenon, occurring at the beginning of the season when newly emerged individuals live together in the parental burrow for several days before females disperse to excavate new nests. It is believed that one of the larger of these females remains behind and enlarges the parental nest. Males may continue to occupy the original nest for life or they may move to another nest which may or may not be occupied by other males and/or females.



Distribution: Transcontinental in North America, south to El Salvador (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 male; 1 female.

Philanthus lepidus Cresson

Fig. 97

Philanthus lepidus Cresson, 1865c: 92.

Philanthus carolinensis Banks, 1913: 422.

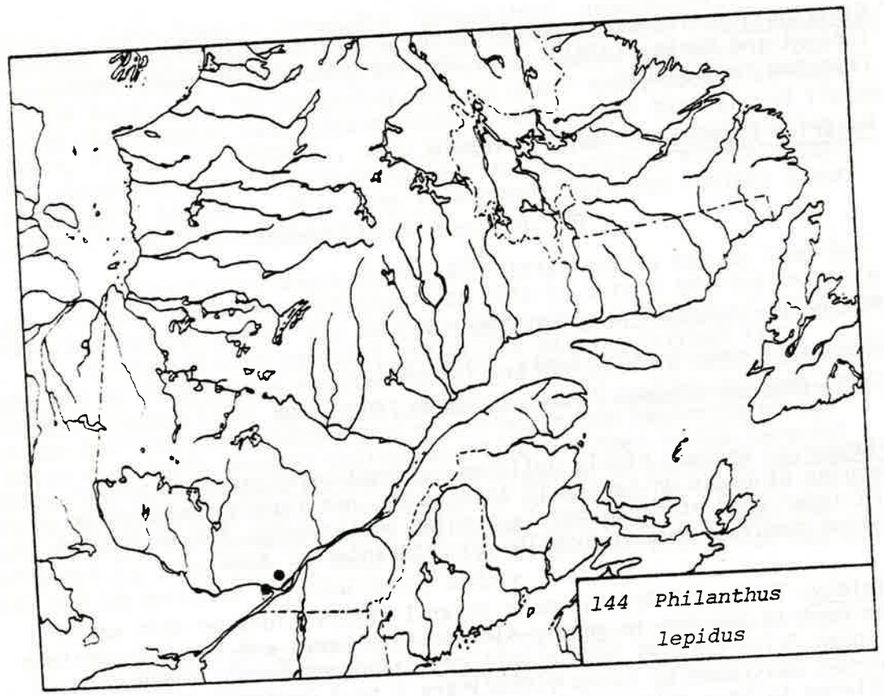
Philanthus carolinensis reductus Banks, 1921: 18.

Diagnosis: Abdomen highly polished, without punctures; posterior margins of bands on tergum II transverse, not forming semicircles and inner ends of bands rarely turning posteriorly; female frontal carina complete from midocellus to interantennal area.

Biology: Evans (1964c) has made several observations on this wasp. The nest is located in gently sloping sand banks and is characterized by open false burrows near a well concealed entrance. These false burrows described by Evans (1964c) are 1 to 9 cm deep and are believed to be a response to parasite pressure. The nest consists of an almost vertical tunnel about 24 cm long and reaching 17 to 19 cm under the soil surface where it terminates blindly. Two cells were found slightly below the terminus of the tunnel. Prey consists primarily of halictid bees which are stored for a time in the tunnel before being provisioned at the rate of 9 to 11 bees per cell. Prey recorded were Andrenidae: *Pseudopanurgus*; Halictidae: *Augochlora*, *Augochlorella*, *Dialictus*, *Evylaeus* and *Halictus*. No parasites were recorded from the cells although miltogrammine sarcophagids and mutillid wasps were searching the area.

Distribution: eastern United States west to Texas and Colorado (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 male; 1 female.



Philanthus politus Say

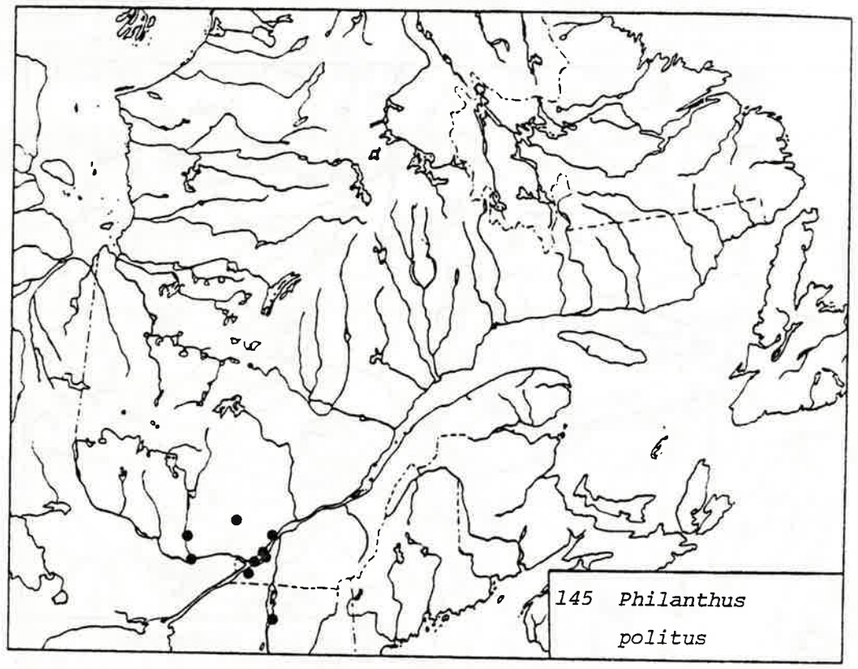
Philanthus politus Say, 1828: 113.
Philanthus dubius Cresson, 1865c: 96.
Philanthus texanus Banks, 1913: 422.

Diagnosis: Abdominal terga with moderate punctation; band on second tergum complete or incomplete and subequal in width to band on third tergum; anterior margin of pronotum rounded.

Biology: Evans and C.S. Lin (1959) reported this species nesting in patches of bare sand. Prey include Ichneumonidae: *Diplazon*; Braconidae: *Chelonus*; Vespidae: *Stenodynerus*; Sphecidae: *Solierella*, *Diodontus*; Colletidae: *Hylaeus*; Andrenidae: *Colliopsis*, *Perdita*; Halictidae: *Halictus*, *Lasioglossum* and *Augochlorella*.

Distribution: eastern United States and southeastern Canada (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 32 males; 13 females.



Philanthus solivagus Say

Philanthus solivagus Say, 1837: 383.
Philanthus solidagus Howard, 1901: pl. 3, fig. 31, *lapsus*.

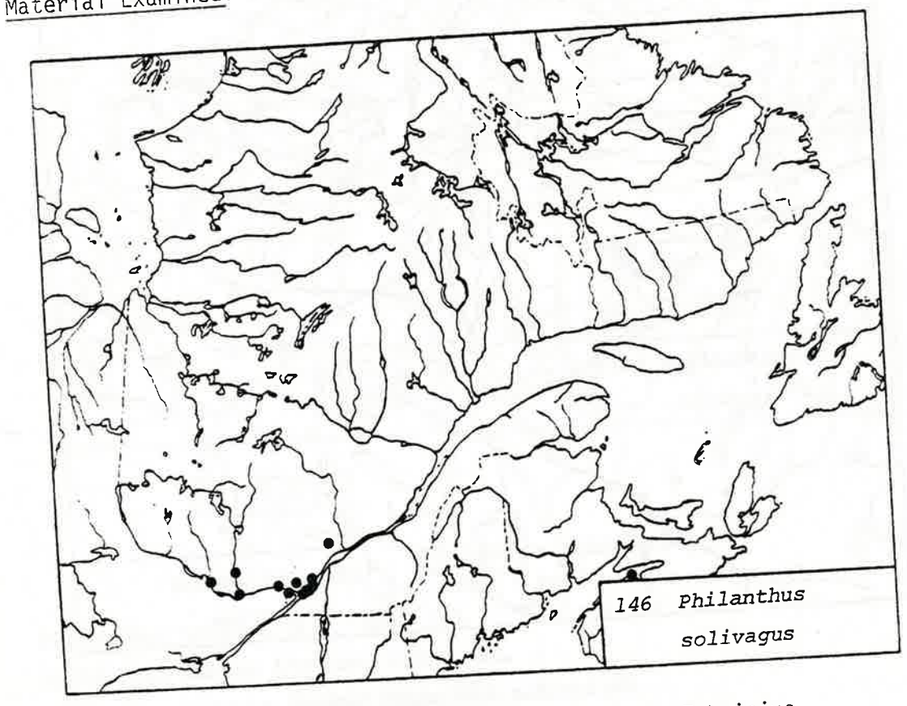
Diagnosis: First abdominal tergum with the widest band, second tergum with the narrowest band; anterior margin of pronotum rounded; abdomen with distinct punctation.

Biology: Evans and C.S. Lin (1959) found this species nesting on steep sand banks. Prey include Vespidae: *Ancistrocerus*; Sphecidae: *Ectemnius*, *Lestica*; Colletidae: *Colletes*; Andrenidae:

Andrena; Halictidae: *Halictus*, *Lasioglossum*, *Sphecodes*, *Agapostemon*, *Augochlora*, *Augochlorella* and *Augochloropsis*.

Distribution: northeastern United States and Quebec in Canada (Bohart and Menke, 1976).

Material Examined: 34 males; 32 females.



Philanthus ventilabris Fabricius

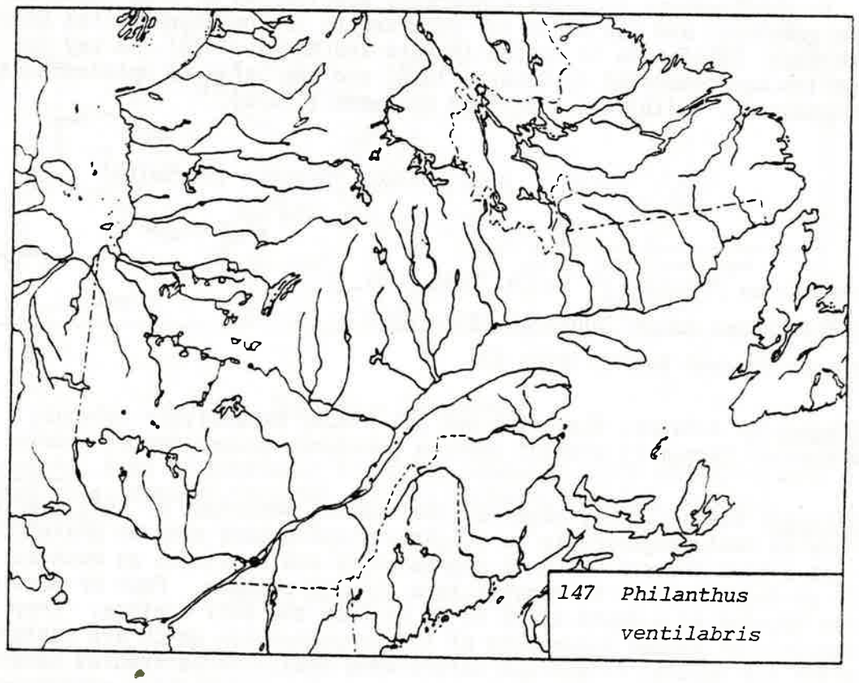
Philanthus ventilabris Fabricius, 1798: 268.
Philanthus frontalis Cresson, 1865c: 99, *nec* Gerstaecker, 1857.
Liris rugosus Provancher, 1895: 130, *nec* Kohl, 1891.
Philanthus "ventralis, Fabr." of Ashmead, 1899: 296.
Philanthus "ventralis" of Howard, 1901: pl. 3, fig. 33.
Philanthus completus Banks, 1915: 406.

Diagnosis: Pronotal collar with an anterior transverse carina; abdomen with distinct punctation.

Biology: This species nests in flat sandy soil and preys on halictid bees of the genus *Halictus* (Evans and C.S. Lin, 1959). Alcock (1975) published a note on male mating strategies of this species. The males presumably form aggregations on tall weeds or bushes; the abdomen is dragged over a stem releasing a pheromone which attracts conspecific males and females. Alcock (1975) reported that no perch was occupied for more than one hour.

Distribution: Transcontinental in North America (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 male.



Subfamily Aphilanthopinae

Diagnosis: Inner orbits not angled or notched; apex of hindfemur simple; female with pygidial plate (weak in *Philanthus*).

Genus *Aphilanthops* Patton

Aphilanthops Patton, 1881c: 401.

Diagnosis: Hindwing media diverging beyond cu-a; ocellocular distance (distance from hindocellus to eye margin) about two hindocellus diameters or more; metanotum with a carina behind base of hindwing but no angular lamina overhanging lateral sinus on metanotum; female pygidial plate triangular, apex rounded; female sternum VI simple; female clypeus toothed toward apical middle.

Aphilanthops contains 4 Nearctic species, two of them found across the continent and the other two confined to southwestern United States and Baja California in Mexico (Bohart and Menke, 1976). A key to species was presented by Bohart (1966) and the larva of *Aphilanthops frigidus* (F. Smith) was described by Evans (1957b).

Aphilanthops frigidus (F. Smith)

Fig. 114

Philanthus frigidus F. Smith, 1856: 475.

Aphilanthops bakeri Dunning, 1896: 203.

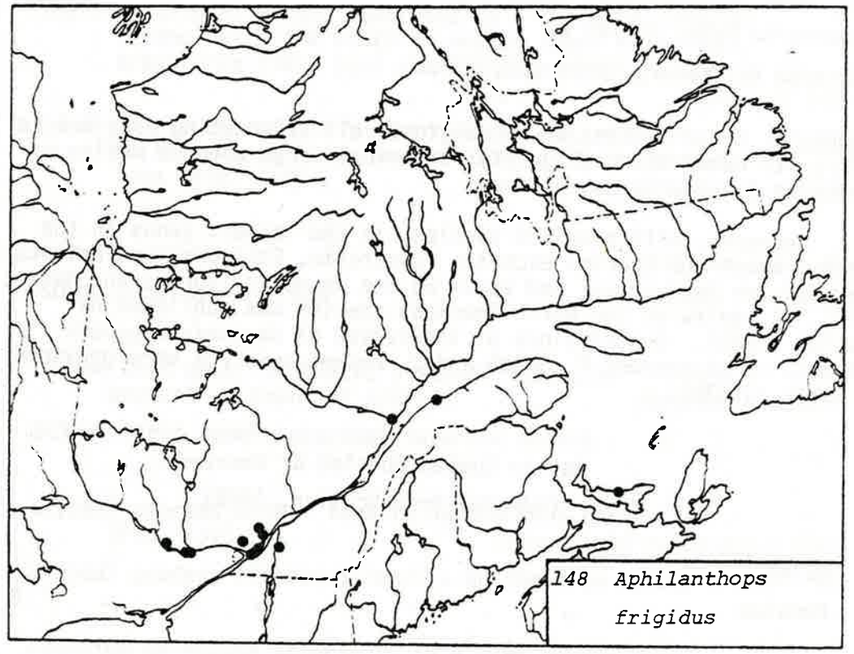
Nomada dawsoni Swenk, 1912: 83.

Diagnosis: Antennal flagellum not all black, extensively fulvous; abdominal tergum II without obvious punctures toward dorsal middle.

Biology: Evans (1962a) observed the nesting behaviour of this species. Females nest gregariously in slightly sloping bare sand or gravel; the nest enters the soil at a 45 degree angle and continues as much as 25 cm deep where it terminates in a storage chamber. Four or more cells are located at a depth of 25 to 45 cm from the soil surface. Prey consists of winged queen ants of the genus *Formica* which are captured after the nuptial flight but before wing loss. Three species have been recorded as prey, *Formica fusca* Linnaeus, *F. pallidefulva nitidiventris* Emery and *F. neogagates* Emery. Only two or three ants are provisioned per cell. Several miltogrammine sarcophagids including *Senotainia trilineata* (Wulp) have been recorded in or around the nests of this species.

Distribution: United States, transcontinental (Bohart and Menke, 1976).

Material Examined: 17 males; 36 females.



Subfamily Cercerinae

Diagnosis: Apex of hindfemur truncate; hindwing media diverging well beyond cu-a; apex of marginal cell in forewing rounded; scrobal sulcus deep.

Genus *Cerceris* Latreille

Cerceris Latreille, 1802-1803: 367.

Nectanebus Spinola, 1839: 489.

Diamma Dahlbom, 1844: 225, *nec* Westwood, 1835.

Didesmus Dahlbom, 1845: 502.

Paracerceris Brèthes, 1913: 127.

Apiraptrix Shestakov, 1923: 101.

Bucerceris Minkiewicz, 1933: 253.

Stercobata Gussakovskij, 1935: 445.

Apicerceris Pate, 1937b: 8.

Apiratryx Balthasar, 1972: 387, 397.

Diagnosis: Outer veinlet of submarginal cell III meeting marginal cell before its outer third (Fig. 61); abdominal terga without median or submedian transverse depressions.

Cerceris, with over 850 species, is the largest genus in the family; about 200 species each are Palearctic, Ethiopian and Oriental, over 100 are Neotropical and about 85 are Nearctic (Bohart and Menke, 1976). A review of the North American species was published by Scullen (1965). Descriptions of the larvae of *Cerceris clypeata* Dahlbom, *C. nigrescens* F. Smith and *C. robertsonii* Fox were provided by Evans (1957b).

Key to Quebec Species of *Cerceris*

(Adapted from Scullen, 1965)

1 Males 2

1' Females 8

2 Stigma very dark to black; length not over 9 mm; complete bands on terga I to VI . . . *finitima* Cresson

2' Stigma light amber 3

3 Median lobe of clypeus less than half as wide as lateral lobe . . . . *robertsonii robertsonii* Fox

3' Median lobe of clypeus subequal to or wider than lateral lobe . 4

4 Band on tergum II distinctly wider than bands on other terga 5

4' Bands on all terga subequal 6

5 Small species, about 8 mm in length . . . *melanthe* Banks

5' Larger species, 10 to 12 mm in length . . . . . *clypeata clypeata* Dahlbom (probably also *atramontensis* Banks)

6 Teeth on clypeal margin separated by a distance subequal to one fifth the width of median lobe; a distinct transverse ridge just above the teeth (Fig. 117) . . . . . *deserta* Say

6' Teeth on clypeal margin in approximate conjunction; no transverse ridge on the surface of the median lobe (Fig. 116) 7

7 Markings yellow . . . . . *dentifrons* Cresson

7' Markings white to cream . . . . . *nigrescens* F. Smith

8 Stigma dark amber or black; precoxal tubercle present in front of midcoxa . . . . *finitima* Cresson

8' Stigma light amber; precoxal tubercle absent 9

9 Clypeal process with a lamella on the free border (Fig. 132) . . . . . *robertsonii robertsonii* Fox

9' Clypeal process without a lamella on the free border . . . 10

10 Pygidium narrowing anteriorly to a very narrow base (Fig. 101) . . . . . *melanthe* Banks

10' Pygidium not narrowing anteriorly to a very narrow base . . 11

11 Lateral apices of the clypeal processes prolonged, giving the appearance of a half moon (Fig. 136) . . . . . *dentifrons* Cresson

11' Lateral apices of clypeal process not, if any, greatly prolonged 12

12 Clypeal process width distinctly shorter than the length (Fig. 135) . . . . . *clypeata clypeata* Dalbom

12' Clypeal process width subequal to or greater than the length 13

13 Clypeal process very short, little more than a curved carina (Fig. 134) . . . . . *deserta* Say

13' Clypeal process length subequal to its width . . . 14

14 Sides of clypeal process subparallel (Fig. 133); facial markings white . . . . . *nigrescens* F. Smith

14' Sides of clypeal process converging (Fig. 115); facial markings yellow . . . . *atramontensis* Banks

Cerceris atramontensis Banks

Fig. 115

Cerceris atramontensis Banks, 1913: 425.

Cerceris arbuscula Mickel, 1916a: 410.

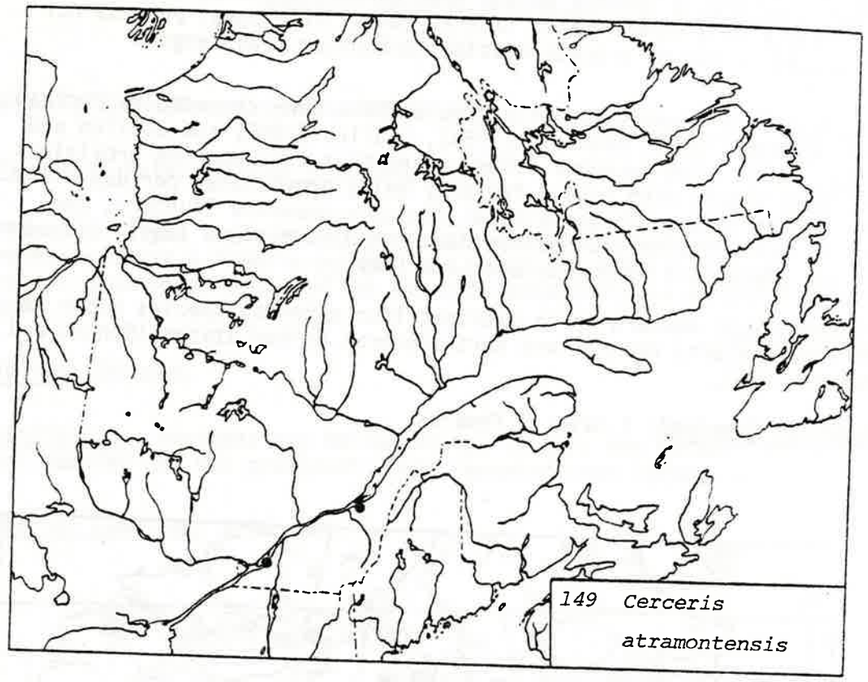
Diagnosis: Male; indistinguishable from other closely related species particularly *Cerceris clypeata* Dahlbom (Scullen, 1965).

Female; sides of clypeal process converging, length of process subequal to its width, lateral apices not greatly prolonged, free border of process without a lamella; pygidium not narrowed at base; precoxal tubercle absent; stigma light amber; facial markings yellow.

Biology: Several authors have noted prey records for this species; Krombein (1956) reported the use of the curculionids, *Conotrachelus naso* LeConte and *C. posticatus* Boheman. Scullen (1965) added *C. nenuphar* (Herbst) to the list; Scullen and Wold (1969) recorded no new prey records but Evans (1971) reported a number of beetles pinned with this species in the Museum of Comparative Zoology among which included *C. nenuphar*, *C. anaglypticus* Say and *Hyperodes sparsus* Say.

Distribution: central and northeastern United States (Bohart and Menke, 1976).

Material Examined: 3 females.



149 *Cerceris atramontensis*

Cerceris clypeata clypeata Dahlbom

Fig. 135

Cerceris clypeata Dahlbom, 1845: 221.

Cerceris imitator Cresson, 1865c: 125, *nec* F. Smith, 1856.

Cerceris imitatoria Schletterer, 1887: 494.

Cerceris chryssipe Banks, 1912: 18.

Cerceris clymene Banks, 1912: 20.

Cerceris zobeide Brimley, 1929: 194.

Cerceris zosma Brimley, 1929: 195.

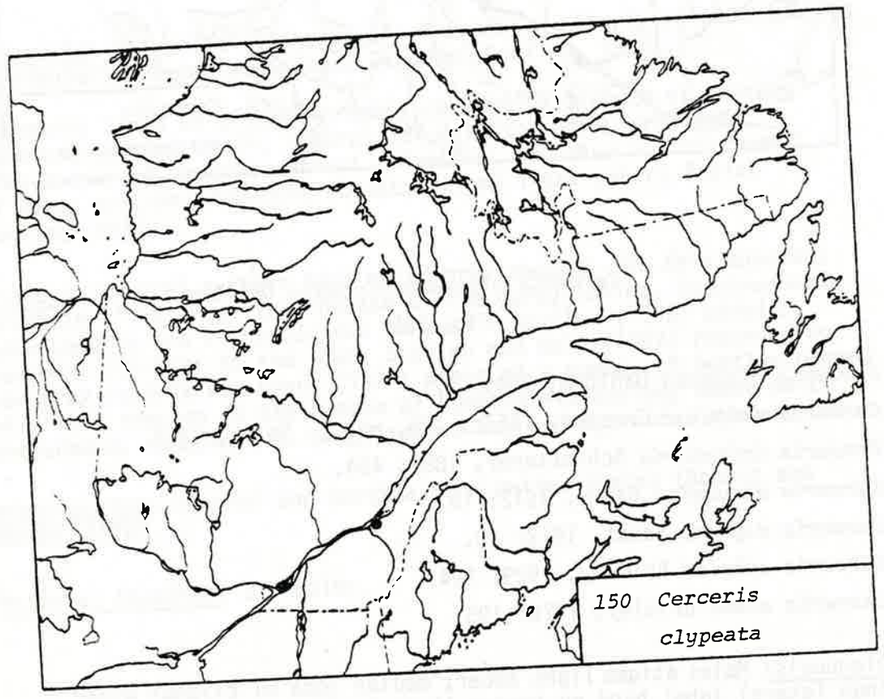
Diagnosis: Male; stigma light amber; median lobe of clypeus wider than lateral lobe; band on tergum II much wider than bands on other terga; size larger, 10 to 12 mm in length.

Female; stigma light amber; precoxal tubercle absent; clypeal process without a lamella on the free border; pygidium not narrowed anteriorly to a narrow base; lateral apices of clypeal process not prolonged, width of process distinctly shorter than length.

Biology: Prey records for this species have been recorded by Peckham and Peckham (1898), Krombein (1954), Scullen (1965) and Scullen and Wold (1969). The Peckhams (1898) noted that this species provisions its nest slowly with only a few prey being provisioned per day. The provisions include Chrysomelidae: *Chalepus dorsalis* Thunberg, *Lema trilineata* (Olivier); Curculionidae: *Curculio nasicus* (Say), *Pissodes strobi* (Peck) and *Tanymecus confusus* (Say).

Distribution: eastern North America; four other subspecies occur in Mexico, eastern, central and north central United States (Bohart and Menke, 1976).

Material Examined: 1 male; 3 females.



150 *Cerceris clypeata*

Cerceris dentifrons Cresson

Fig. 136

Cerceris dentifrons Cresson, 1865c: 124.

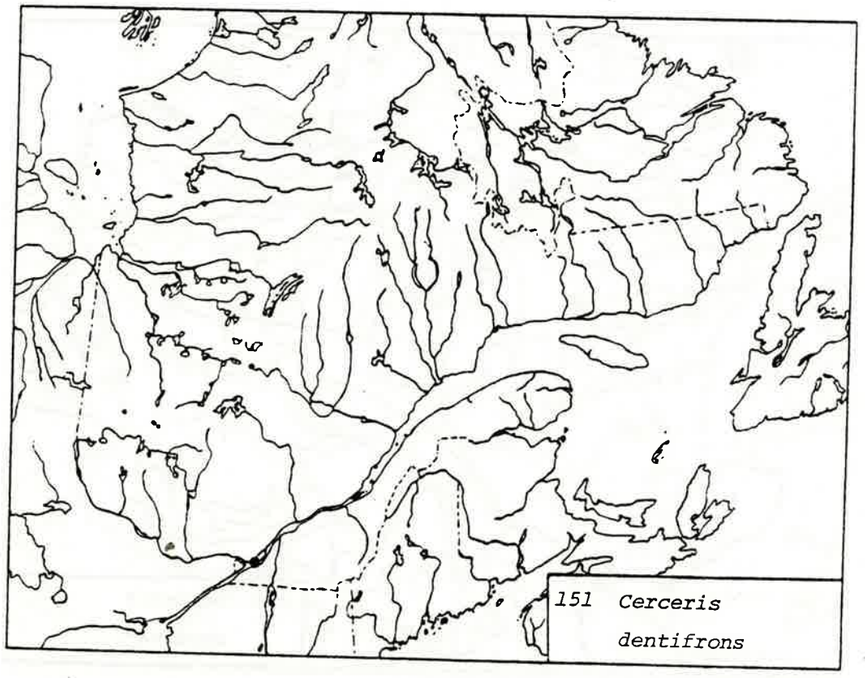
Diagnosis: Male; unknown (Scullen, 1965).

Female; stigma light amber; precoxal tubercle absent; clypeal process without a lamella on the free border, lateral apices of process prolonged; pygidium not narrowed anteriorly to a narrow base.

Biology: Unknown.

Distribution: northeastern United States (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 3 females.



151 *Cerceris dentifrons*

Cerceris deserta Say

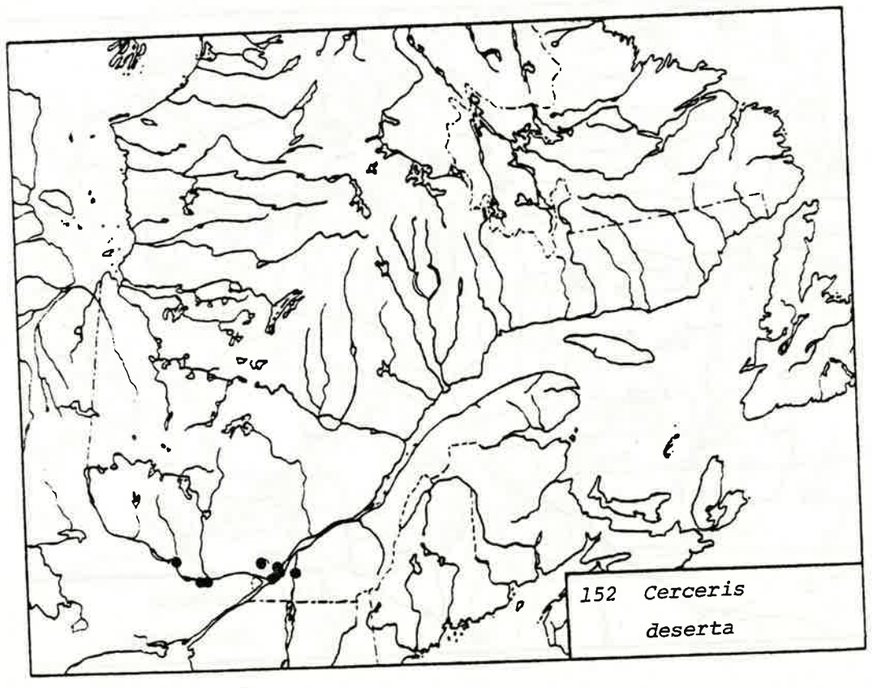
Figs. 85, 117, 134

Cerceris deserta Say, 1824: 344.
Cerceris fulvipes Cresson, 1865c: 126, *nec* Eversmann, 1849.
Cerceris fulvipediculata Schletterer, 1887: 492.

Diagnosis: Male; teeth on clypeal margin separated by a distance subequal to one fifth the width of the median lobe; a distinct transverse ridge present just above the clypeal teeth; bands on all abdominal terga subequal in width; stigma light amber.

Female; clypeal process very short, little more than a curved carina, lateral apices not prolonged, free border without a lamella; pygidium not narrowed at base; stigma light amber.

Biology: Unknown. Although Peckham and Peckham (1898) provided observations, Scullen (1965) raises doubts as to the identification of the observed wasp.



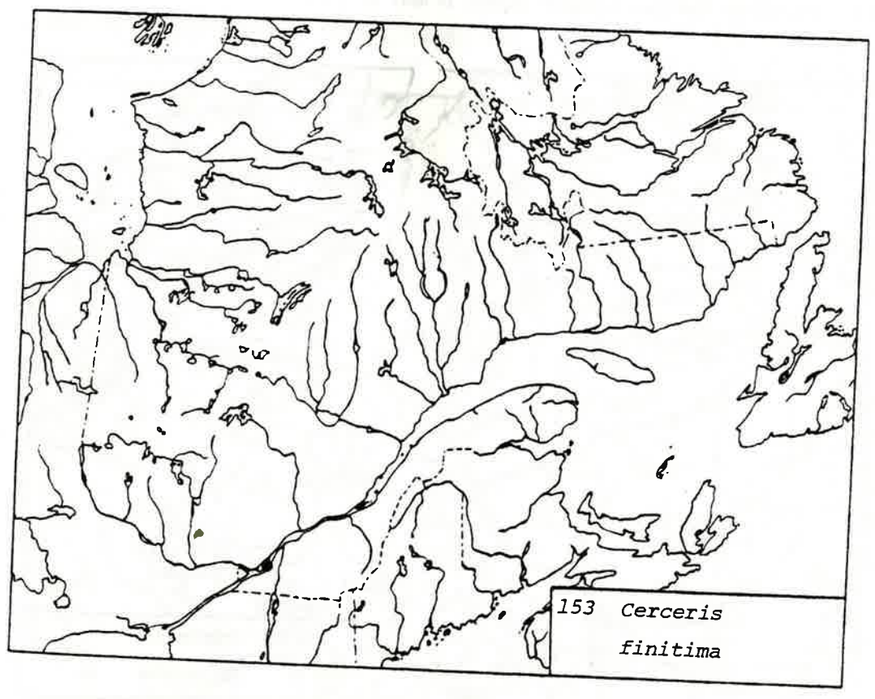
Distribution: north central and northeastern United States and Canada (Bohart and Menke, 1976).

Material Examined: 9 males; 4 females.

Cerceris finitima Cresson

Cerceris finitima Cresson, 1865c: 125.
Cerceris nigroris Banks, 1912: 27.
Cerceris vierecki Banks, 1947: 30.
Cerceris vierecki Scullen, 1960: 80, *nec* Banks, 1947.
Cerceris citrina Scullen, 1965: 380.
Cerceris morelos Scullen, 1972: 25.

Diagnosis: Stigma dark amber or black; male with complete bands on terga I to VI, length not over 9 mm; female with a precoxal tubercle in front of midcoxa.



Biology: This species was found nesting in sandy clay soil by Strandtmann (1945); the nest contained 9 specimens of the chrysomelid, *Chaetocnema pulicaria* Melsheimer, placed in a single enlarged cell.

Distribution: widespread in the United States, Mexico and Central America (Bohart and Menke, 1976). This species has not previously been reported from Quebec.

Material Examined: 1 male.

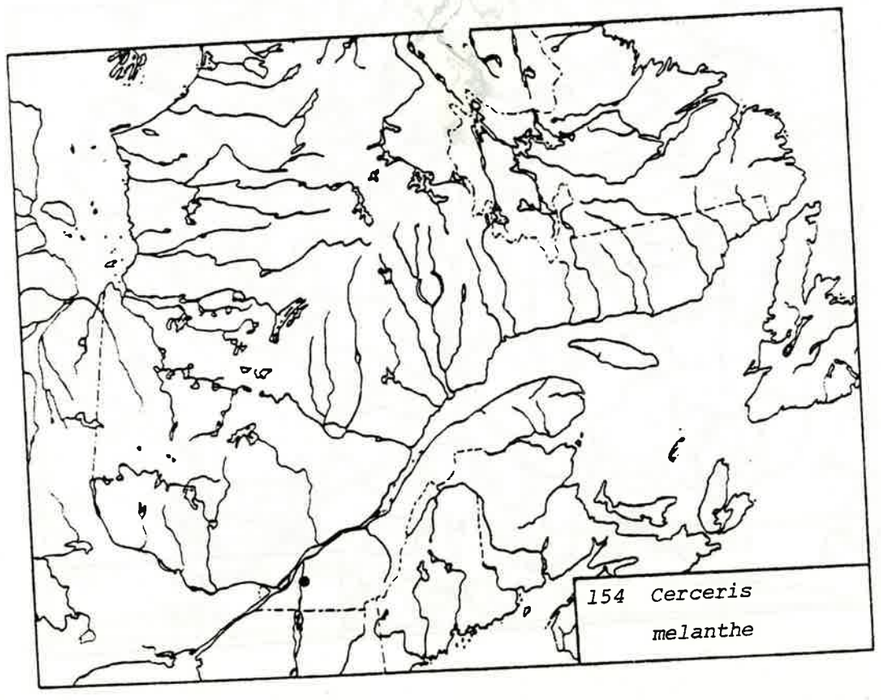
Cerceris melanthe Banks

Fig. 101

Cerceris nitida Banks, 1913: 424, *nec* Wesmael, 1852.

Cerceris melanthe Banks, 1947: 21.

Diagnosis: Male; stigma light amber; median lobe of clypeus subequal in width to lateral lobe; band on tergum II distinctly wider than bands on other terga; length about 8 mm.



154 *Cerceris melanthe*

Female; stigma light amber; precoxal tubercle absent; clypeal process without a lamella on the free border; pygidium narrowing anteriorly to a very narrow base.

Biology: Unknown.

Distribution : eastern and southeastern United States (Bohart and Menke, 1976).

Material Examined: 1 female.

Cerceris nigrescens F. Smith

Figs. 61, 116, 133

Cerceris nigrescens F. Smith, 1856: 466.

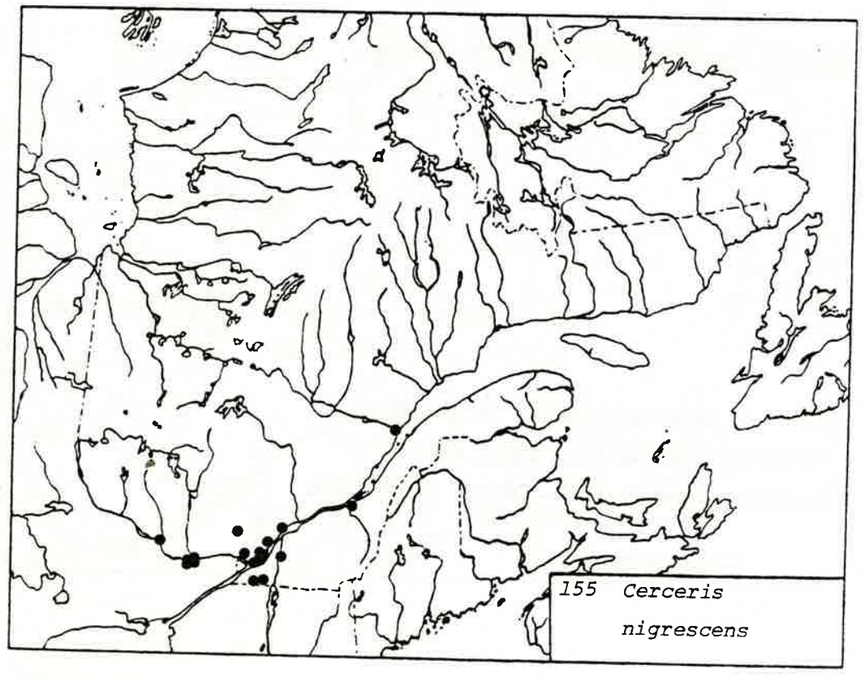
Cerceris arelate Banks, 1912: 18.

Cerceris nigritulus Banks, 1915: 402.

Cerceris munda Mickel, 1918a: 337.

Cerceris abbreviata Banks, 1919: 84.

Cerceris crawfordi Brimley, 1928: 199.



155 *Cerceris nigrescens*

Diagnosis: Male; stigma light amber; median lobe of clypeus wider than lateral lobe, teeth on clypeal margin in approximate conjunction; no transverse ridge on the median clypeal lobe above the teeth; bands on all abdominal terga subequal in width; markings white to cream.

Female; stigma light amber; precoxal tubercle absent; clypeal process without a lamella on the free border; lateral apices of clypeal process not greatly prolonged, width of process subequal to length, sides of process parallel; pygidium not narrowed at base.

Biology: Krombein (1936) observed members of this species nesting in flat sandy soil with each entrance concealed beneath a tuft of grass. Two species of curculionids were recorded as prey: *Hyperodes delumbis* (Gyllenhal) and *Sitona hispidula* (Fab.). Later Krombein (1938c) added the curculionid *Gymnetron antirrhini* Paykull to the prey list and commented on the presence of the miltogrammine sarcophagid *Senotainia trilineata* (Wulp). Evans (1971) reported prey are provisioned at the rate of 16 to 23 beetles per cell and found *Calomycterus setarius* Roelofs, *Sitona scissifrons* (Say) and *S. hispidula* (Fabricius) being used as prey.

Distribution: widespread in the United States (Bohart and Menke, 1976).

Material Examined: 98 males; 94 females.

Cerceris robertsonii robertsonii Fox

Fig. 132

Cerceris robertsonii Fox, 1893a: 555.
Cerceris austrina Fox 1893a: 556.
Cerceris pleuralis H.S. Smith, 1908a: 366.

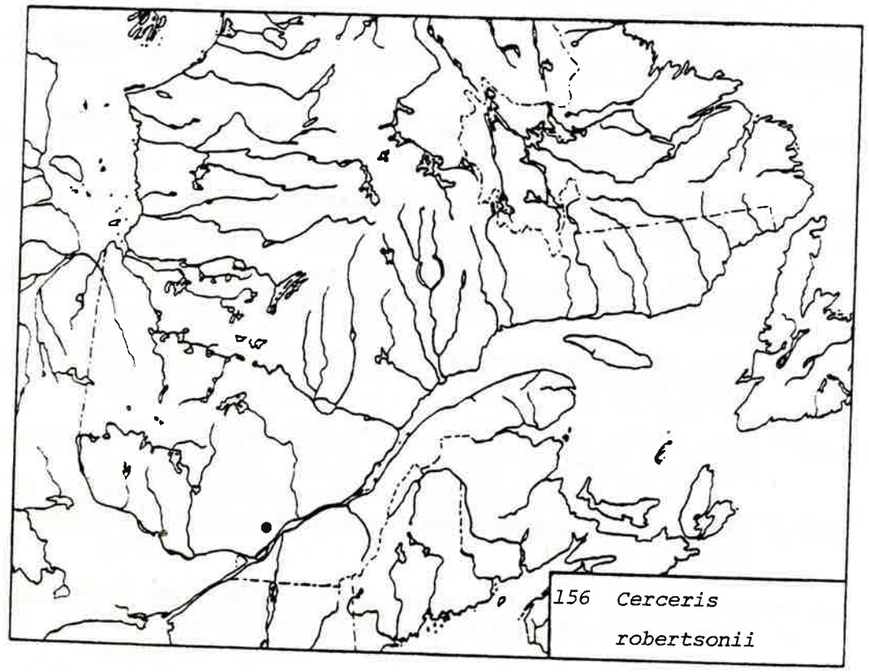
Diagnosis: Male; stigma light amber; median lobe of clypeus less than half as wide as lateral lobe.

Female; stigma light amber; precoxal tubercle absent; clypeal process with a lamella on the free border.

Biology: This species was observed by Krombein (1953b) who found a nesting colony in a sandy area with scattered grass. Three species of chrysomelid beetles were reported as prey, *Cryptocephalus notatus* Fabricius, *Pachybrachis dilatatus* Suffrian and *Rhabdopterus picipes* (Olivier). Evans (1971) found this species nesting both in coarse sandy gravel and flat fine grain sand. In one nest he located 3 cells at a depth of 25 to 27 cm; one fully provisioned cell contained 8 chrysomelid beetles which proved to be *Tymnes tricolor* Fabricius.

Distribution: eastern United States; three other subspecies are found, one each in Florida, southeastern United States and North Carolina (Bohart and Menke, 1976).

Material Examined: 1 male; 1 female.



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Glossary of Morphological Terms
(Adapted from Bohart and Menke, 1976)

acetabular carina: transverse carina on anterior part of mesothoracic venter, often connecting lower end of omaulus (Fig. 19).

admedian lines: most median pair of lines originating anteriorly on scutum (Fig. 2).

anal area of hindwing: posterobasal part of wing behind first or only anal vein and marked at wing margin by anal excision, usually divided into anal lobe and jugal lobe, the two separated by a fold and the jugal excision at the wing margin (Figs. 34, 37).

antenna: a basal scape, pedicel and terminal flagellum, the latter composed of a series of articles called flagellomeres (Fig. 137).

anteroventral metapleural pit: see metapleural pits.

areolate: relatively large, basinlike, irregular reticules; see reticulate.

arolium: a saclike organ between claws.

basal vein: in forewing, that part of the media between its divergence from Cu and its fusion with radial sector (Fig. 34).

basitarus: the basal most tarsomere.

cu-a: cubito-anal crossvein of each wing, forming outer end of submedian cell (Fig. 34).

episternal sulcus: originating in subalar fossa and extending ventrally on mesopleuron; when complete, reaching anteroventral margin of mesothorax (Figs. 7, 8).

flagellomere: one of the units or articles of the flagellum (Fig. 137).

frontal line or carina: median groove or carina leading, when complete, from midocellus to interantennal area (Fig. 111).

frontoclypeal suture: forms upper margin of clypeus (Fig. 105).

gaster: definitive abdomen composed of true second and following morphological segments, of which the first segment consists of tergum I and sternum I in this treatment.

humeral angles: dorsolateral corners of pronotal collar (Fig. 2).

hypersternaulus: groove originating anteriorly at lower part of episternal sulcus, usually horizontal (Figs. 11, 12).

hypoepimeral area: dorsoposterior area of mesopleuron defined by episternal sulcus and scrobal sulcus (Fig. 1).

inner orbit: inner margin of compound eye (Fig. 105).

intercoxal carina: a ridge or carina extending from dorsal rim of mesocoxal cavity to same area of metacoxal cavity (Fig. 13).

jugal lobe: posterobasal lobe of anal area on hindwing; when present, marked by jugal excision (Figs. 34, 37).

lateral carina: a carina or line usually found on first tergum and positioned laterad of spiracle (Fig. 93).

lower metapleural area: that part of metapleuron beneath trans-metapleural line, its definition dependent on presence of metapleural sulcus or line between upper and lower metapleural pits (Fig. 1).

lower metapleural pit: see metapleural pits.

malar space: area between compound eye and mandible socket.

mandibular notch: externoventral emargination or stepped angulation (Fig. 128).

mesopleural suture: posterior margin of mesopleuron extending from midcoxal cavity to beneath wings (Fig. 1).

metapleural flange: carina or lamelliform extension of metapleuron surrounding hindwing base (Fig. 23).

metapleural pits: three landmarks, upper metapleural pit on upper part of metapleural sulcus or line, anteroventral metapleural pit, and lower metapleural pit directly above hindcoxa (Fig. 15).

midtibial spurs: one or two moveable, spinelike processes which are usually much larger than nearby setae, arising from rings set in membraneous area at inner apex of midtibia; spur pectinate along its shaft (Figs. 70, 71).

mucro: dorsobasal median projection of propodeum, usually spinelike and pointing obliquely upward (Fig. 28).

notalus (*-i*): paired lines or grooves on scutum, originating anteriorly and outside admedian lines (Fig. 2).

oblique scutal carina: short line or carina originating at lateral edge of scutum usually opposite tegula and setting off posterolateral, often deflected corner of scutum (Fig. 27).

ocellar scars: flattened opaque remnants of ocelli (Fig. 120).

omaulus: ridge or carina originating at lower base of pronotal lobe and extending posteroventrally (Fig. 3).

orbital foveae: depressed, oval or elongate areas with a distinct rim, usually located along upper inner orbits (Fig. 123).

palpal formula: number of segments in maxillary palpus compared with those in labial palpus as for instance, 6-4 (Figs. 126, 127).

pedicel: second antennal segment, located between scape and flagellum (Fig. 137).

peduncle: applied to basal segment of gaster; a narrowed, clavate stem attaching gaster to propodeum (Fig. 5).

petiole: slender, parallel-sided, or cylindrical stalk (Fig. 1).

petiole socket: orifice on posterior end of propodeum in which gaster is inserted.

placoid (*s*): special platelike, flat, or curved areas on male flagellomeres that are bounded by ridges or depressed below level of surrounding integument.

plantulae: small oval pads, which may be found apicomedially on underside of tarsomeres (Fig. 65).

precoxal area of mesopleuron: area in front of midcoxa on lateral pleural surface.

pronotal collar: raised posterior part of pronotum (Fig. 1).

pronotal lobe: posterolateral part of pronotum covering mesothoracic spiracle (Fig. 1).

propodeal enclosure: area of propodeal dorsum usually delimited by grooves or carinae, sometimes extending onto posterior face of propodeum (Fig. 2).

propodeal side: lateral, vertical face of propodeum.

propodeum: true first abdominal segment that forms an integral part of thorax, delimited anteriorly by posterior margin of metanotum and by metapleural sulcus (Figs. 1, 2).

pygidial plate: specialized area of tergum VI in female and VII in male, usually flattened and delimited by carinae or grooves (Figs. 2, 101).

rake: linear series of setae on outer margin of foretarsus, which function as a rake; occurring in most females and some males (Fig. 72).

recurrent veins: m-cu crossveins between media and cubitus of forewing, used with reference to their termination at submarginal cells (Fig. 34).

reticulate: sculpture with appearance of relatively fine meshwork.

scapal basin: depression above antennal sockets within which scapes may rest (Fig. 109).

scape: basal segment of antenna (Fig. 137).

scrobal sulcus: a horizontal mesopleural groove that passes through scrobe.

scrobe: pit or mark somewhat above and behind middle of mesopleuron (Fig. 1).

scutellum: small posterior mesonotal plate between scutum and metanotum (Figs. 1, 2).

scutum: large anterior mesonotal plate (Figs. 1, 2).

sessile gaster: one in which gaster swells uniformly and abruptly from point of insertion (Fig. 6).

spiracular groove: extending from propodeal spiracle toward metacoxa (Fig. 1).

sternaulus: horizontal lateroventral carina of mesopleuron extending from lower end of omaulus toward precoxal sulcus (Fig. 15).

stigma: sclerotized area on leading edge of forewing basad of marginal cell and in front of first submarginal cell (Fig. 34).

subalar fossa: depressed area of mesopleuron beneath forewing insertion, containing one to several pits (Fig. 1).

subantennal area: triangular or pentagonal sclerite of frons contiguous with clypeus and between antennal sockets (Fig. 105).

sulcus: a secondary impression on a sclerite which does not represent a cleavage line between two sclerites.

suture: cleavage line between two sclerites.

tarsomere: one of tarsal units, of which the first is often called basitarsus.

tegula: ovid plate over base of forewing (Figs. 1, 2).

tylus (*-i*): linear welt or cariniform swelling on male flagellomeres.

upper metapleural area: that part of metapleuron above trans-metapleural line (Fig. 1).

upper metapleural pit: see metapleural pits.

vertex of head: top of head from ocellar triangle to top of occipital carina (Fig. 123).

verticaulus: mesopleural carina originating in front of midcoxa and extending dorsad vertically or obliquely (Fig. 6); often continuous with sternaulus.

ILLUSTRATIONS

Figures 1 to 144

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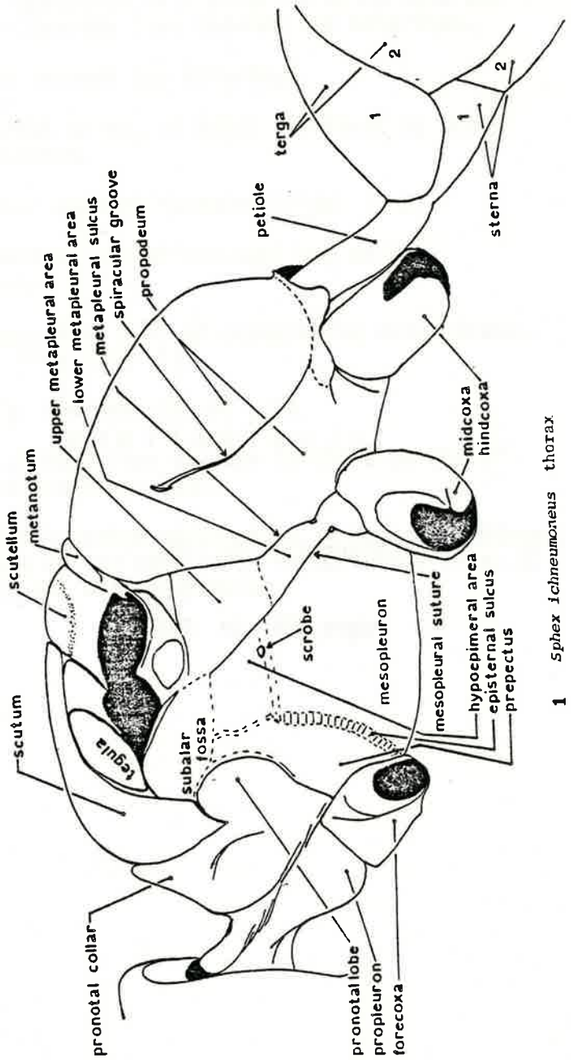
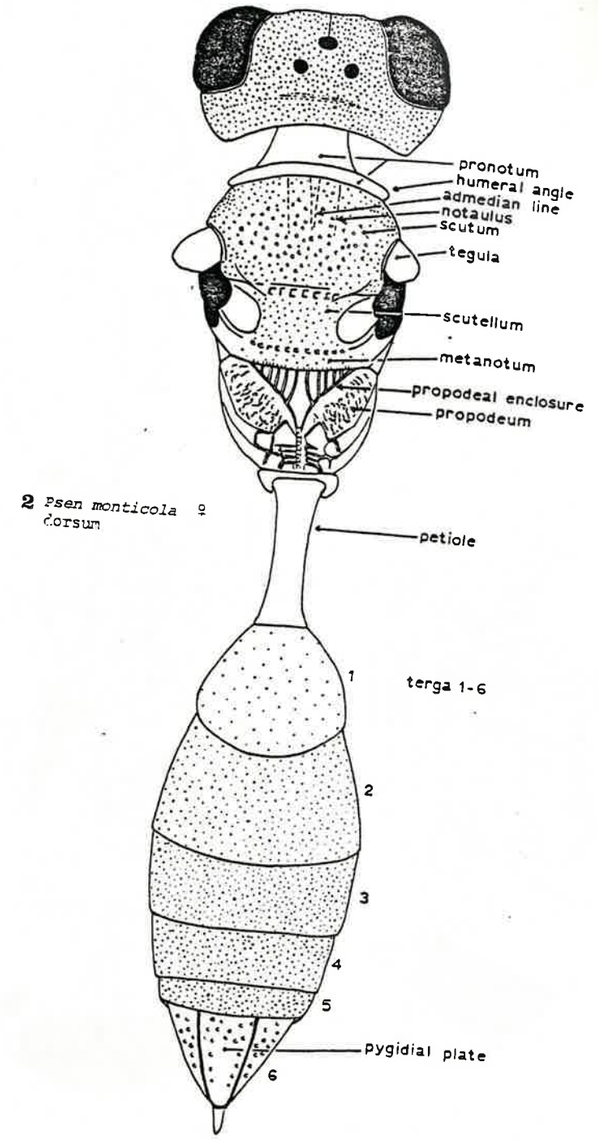
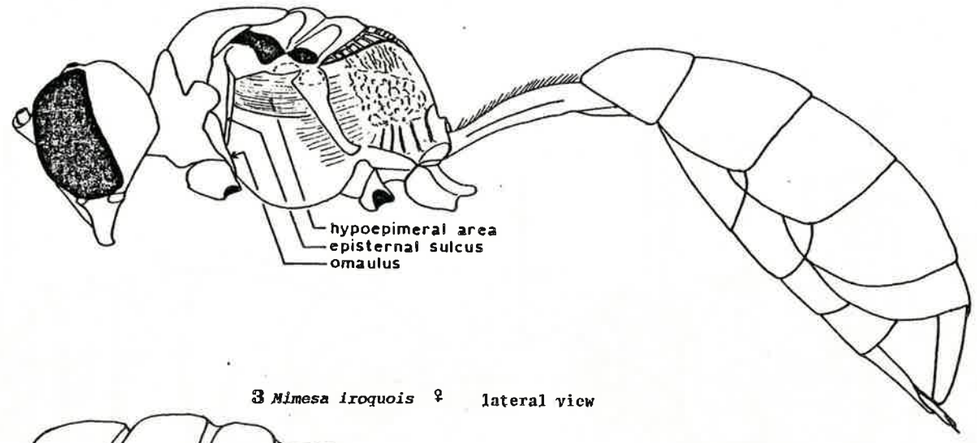


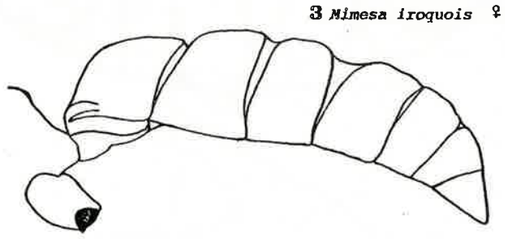
1 *Sphex ichneumoneus* thorax



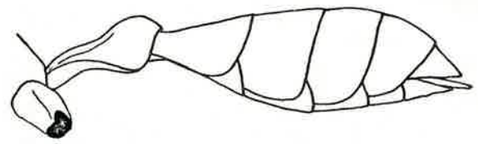
2 *Psen monticola* ♀
dorsum



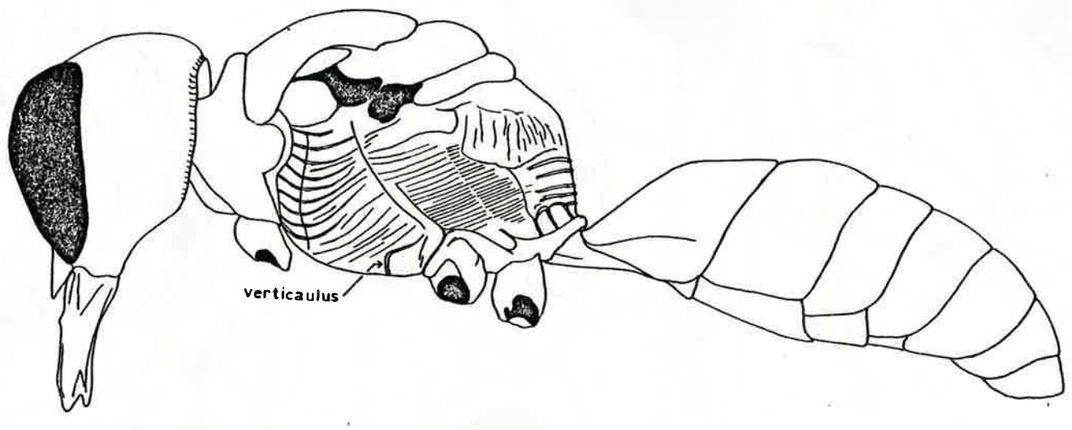
3 *Mimesa iroquois* ♀ lateral view



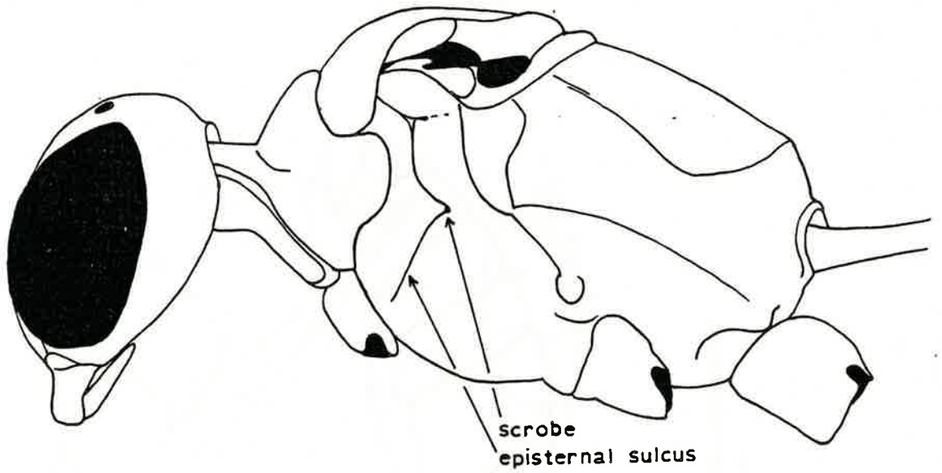
4 *Anacrabro ocellatus* ♂
abdomen



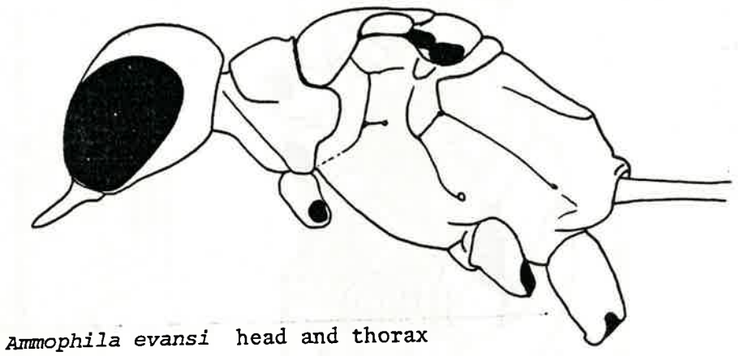
5 *Rhopalum coarctatum* ♀
abdomen



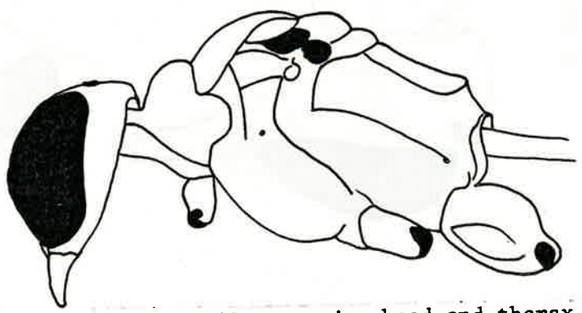
6 *Ectemnius continuus* ♂ lateral view



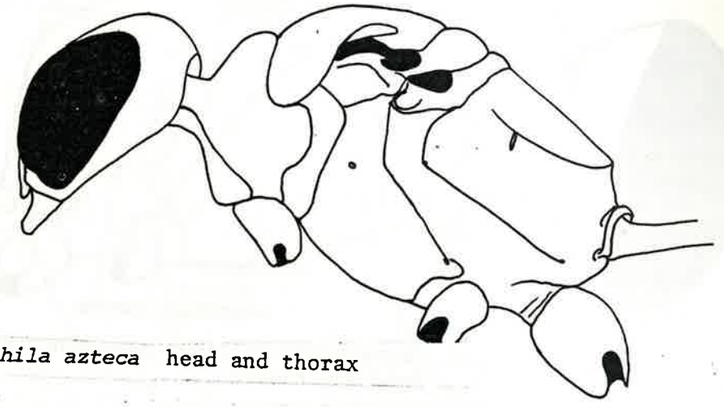
7 *Eremnophila aureonotata* head and thorax



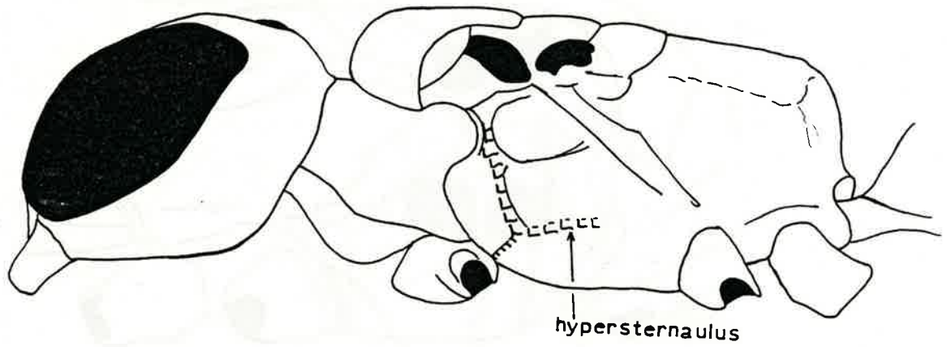
8 *Ammophila evansi* head and thorax



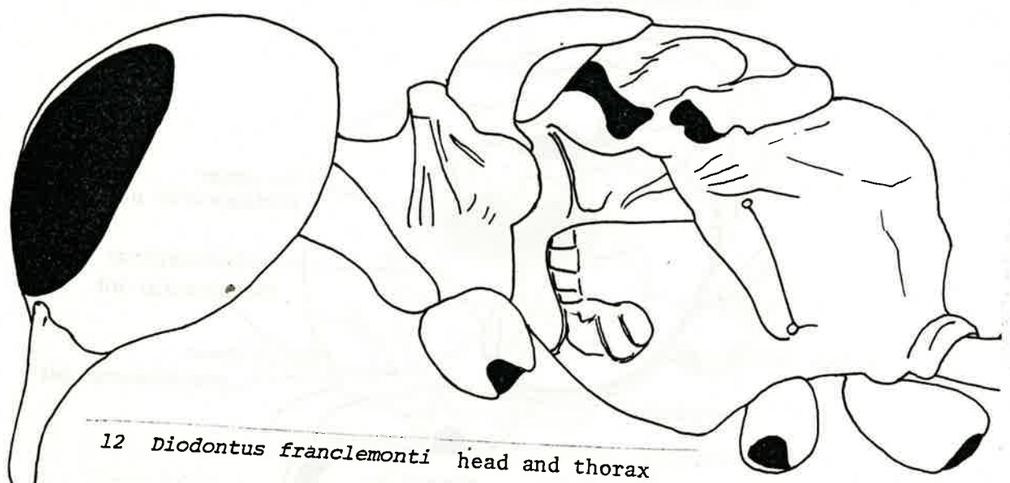
9 *Ammophila urnaria* head and thorax



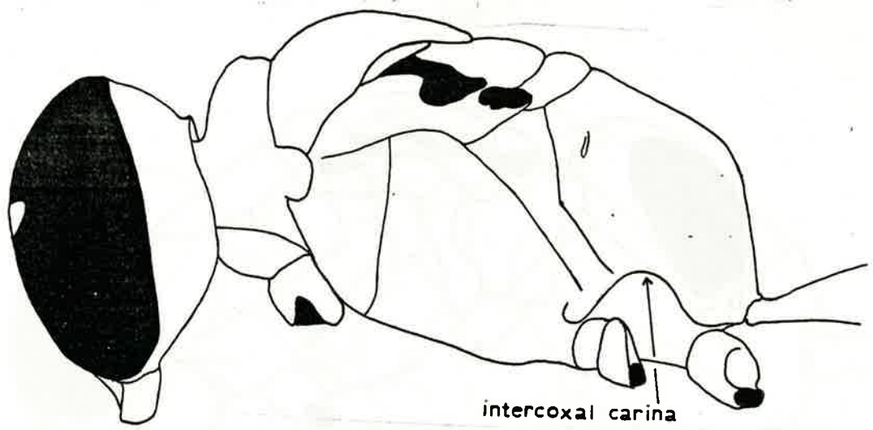
10 *Ammophila azteca* head and thorax



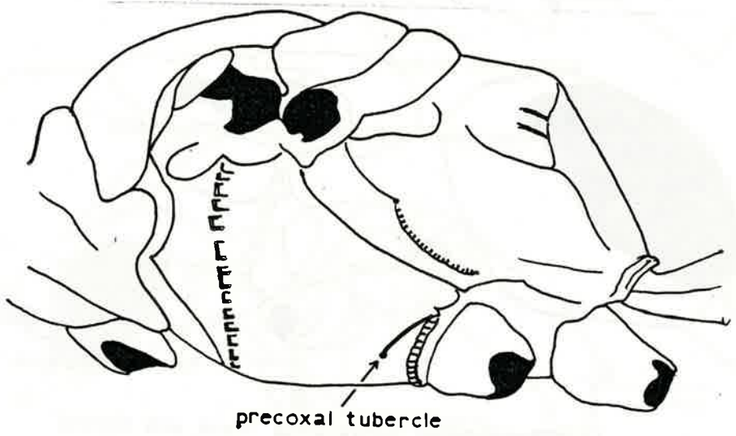
11 *Passaloecus singularis* head and thorax



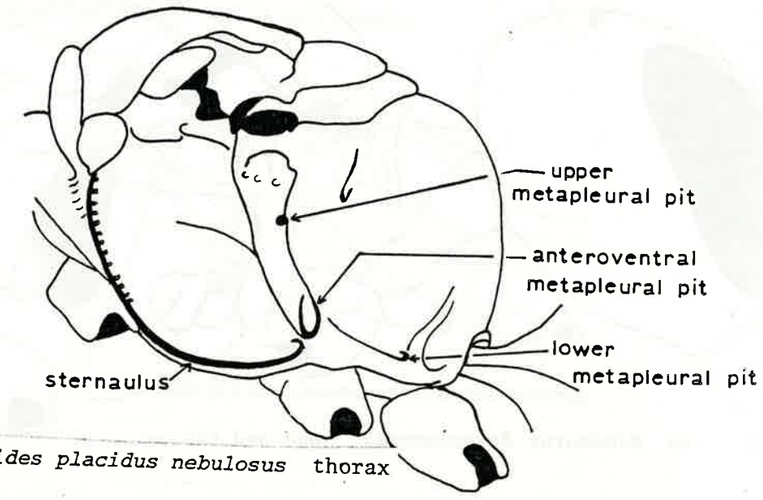
12 *Diodontus franclemonti* head and thorax



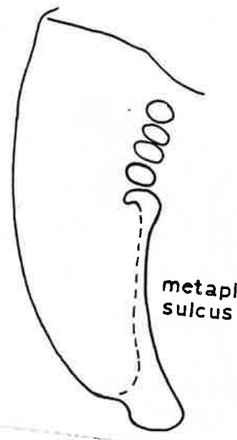
13 *Trypargilum collinum rubrocinctum* head and thorax



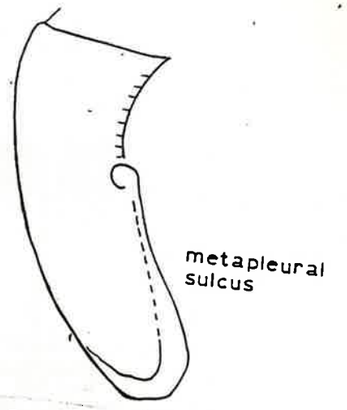
14 *Crossocerus maculipennis* thorax



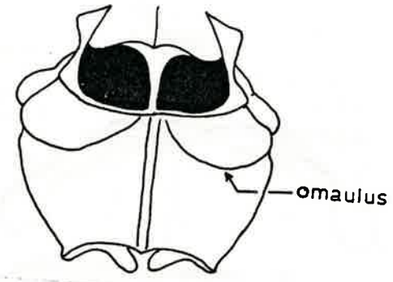
15 *Hoplisoides placidus nebulosus* thorax



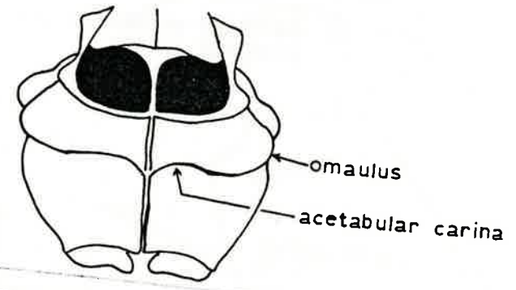
16 *Gorytes canaliculatus* metapleuron



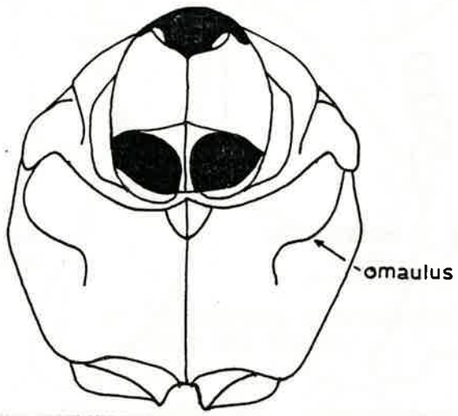
17 *Gorytes deceptor* metapleuron



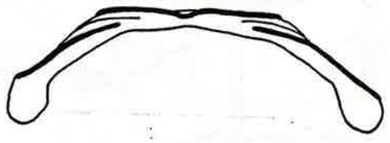
18 *Mimesa foxi* thorax, ventral



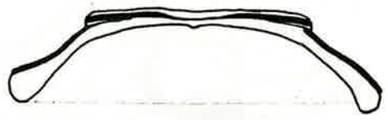
19 *Mimumesa nigra* thorax, ventral



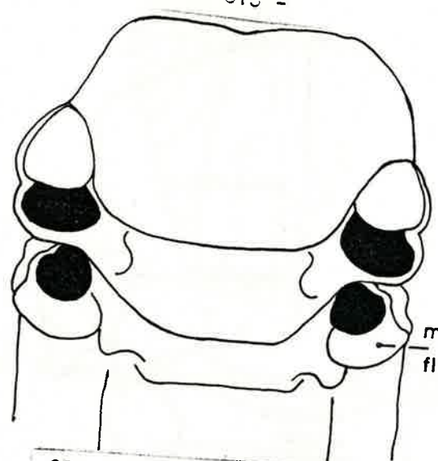
20 *Psen monticola* thorax, ventral



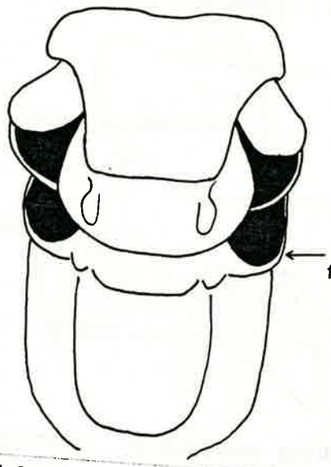
21 *Oxybelus subulatus*
pronotal collar



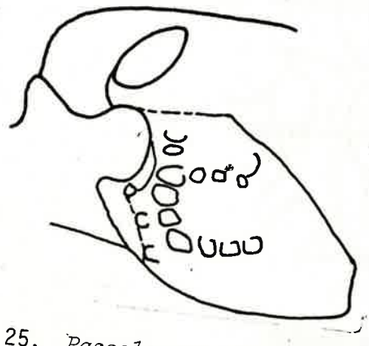
22 *Oxybelus uniglumis*
pronotal collar



23 *Podalonia violaceipennis* ♂
dorsal anterior of thorax

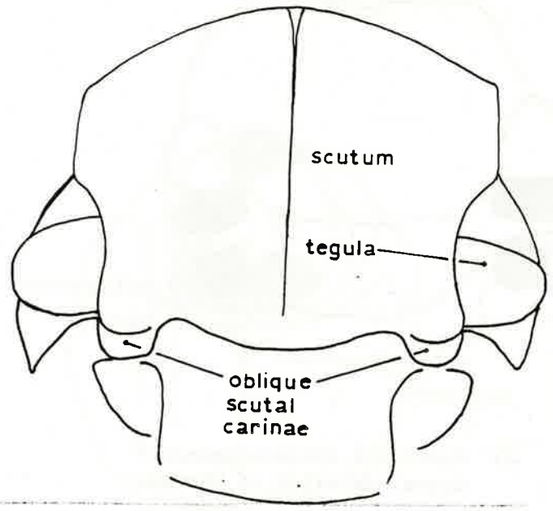


24 *Podalonia luctuosa* ♂ thoracic dorsum

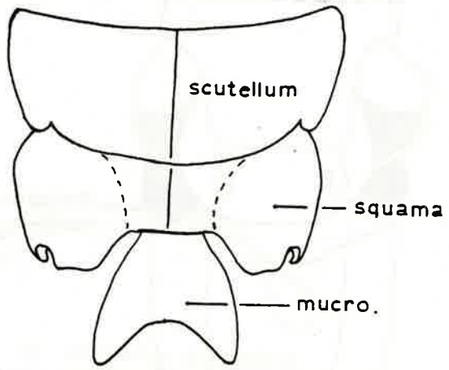


25. *Passaloecus gracilis*

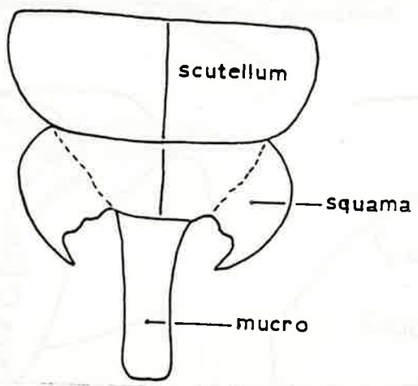
26. *Passaloecus singularis*



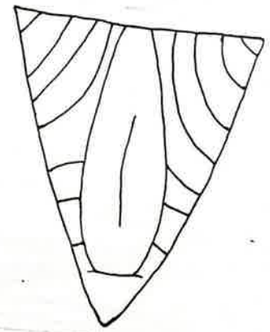
27 *Synnevrus plagiatus* scutum and scutellum



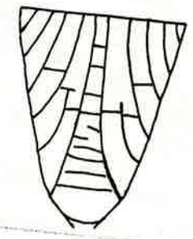
28 *Oxybelus emarginatus* metanotum



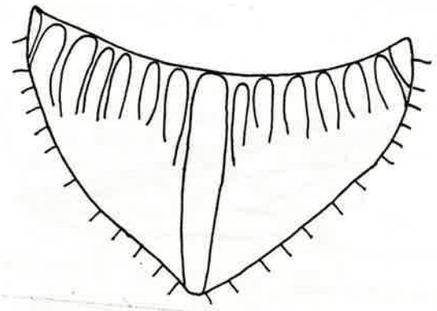
29 *Oxybelus uniglumis* metanotum



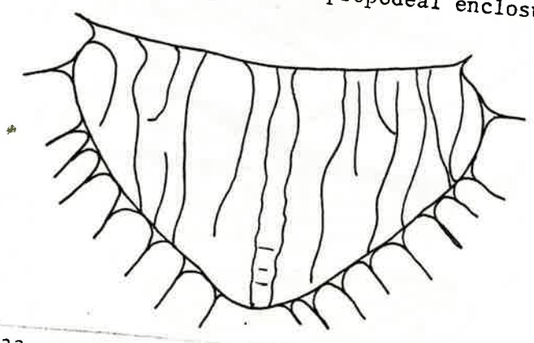
30 *Alysson guignardi* propodeal enclosure



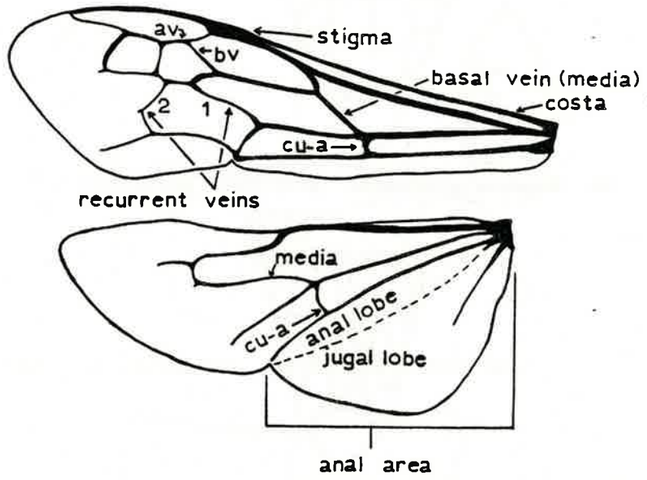
31 *Alysson conicus* propodeal enclosure



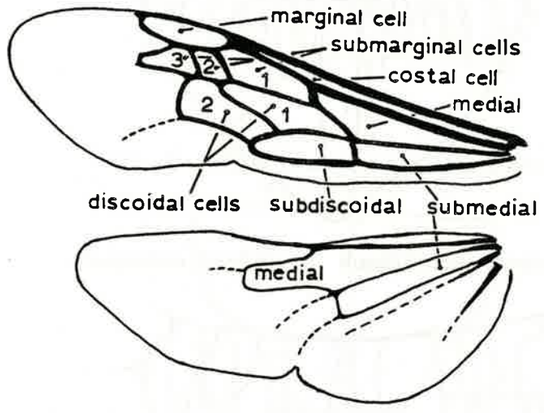
32 *Gorytes simillimus* propodeal enclosure



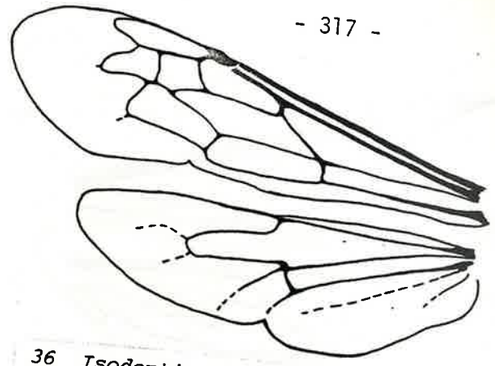
33 *Gorytes atricornis* propodeal enclosure



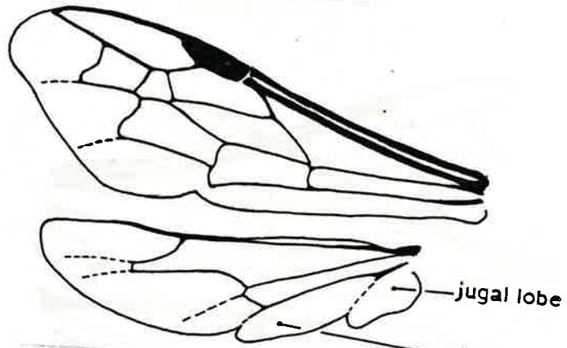
34 Chalybion californicum wing veins;
av anterior veinlet, bv basal veinlet.



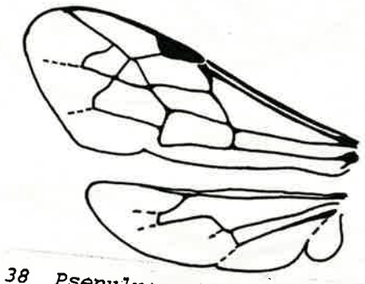
35 Prionyx atratus wing cells



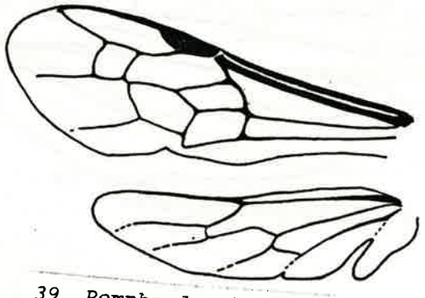
36 Isodontia mexicana



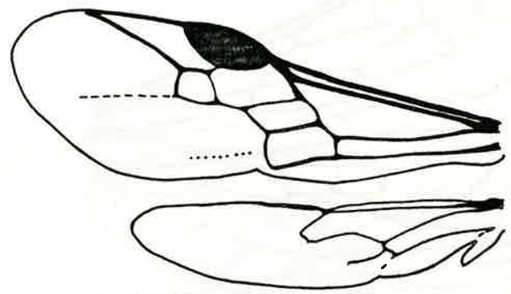
37 Mimesa basirufa



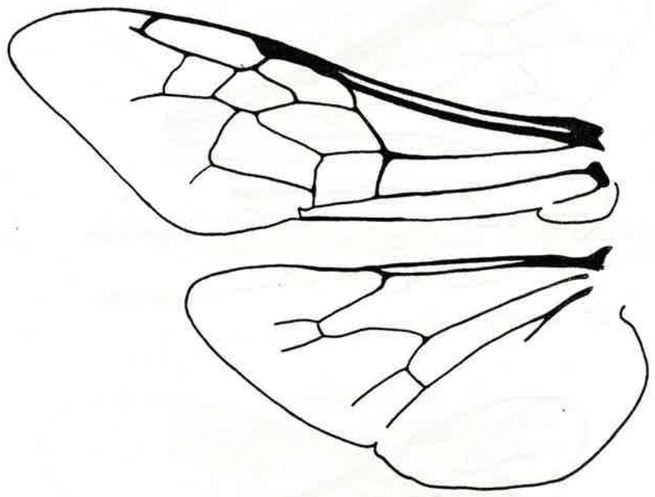
38 Psenulus pallipes parenosas



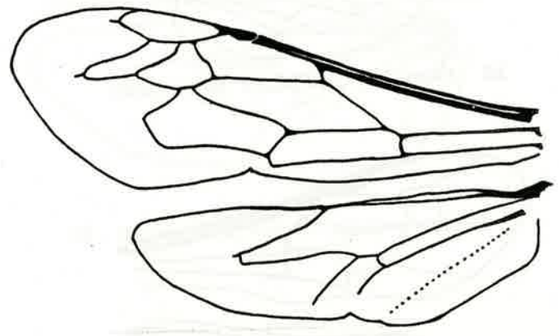
39 Pemphredon inornata



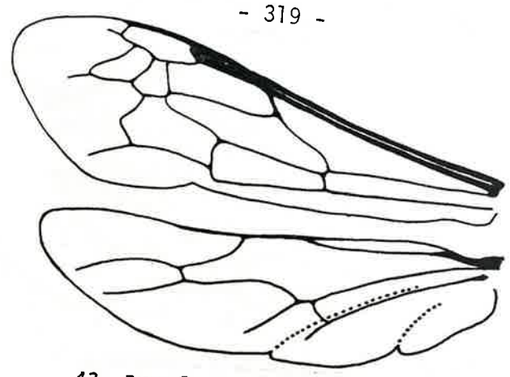
40 *Stigmus americanus*



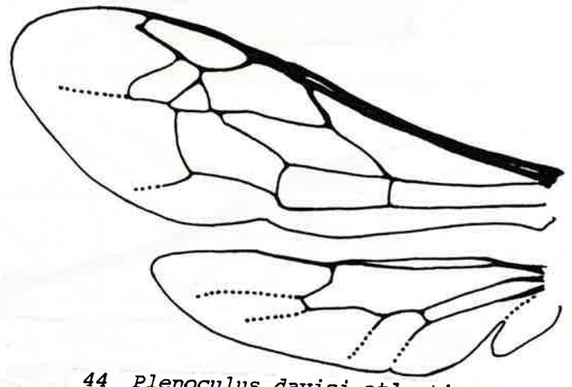
41 *Astata unicolor*



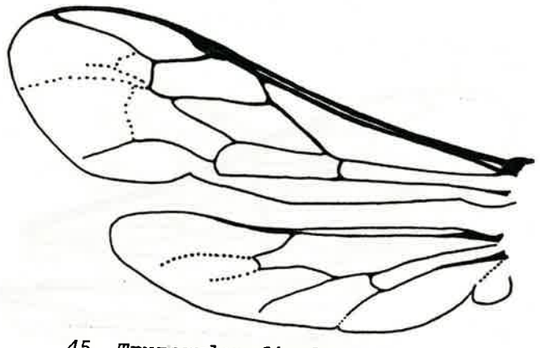
42 *Tachysphex tarsatus*



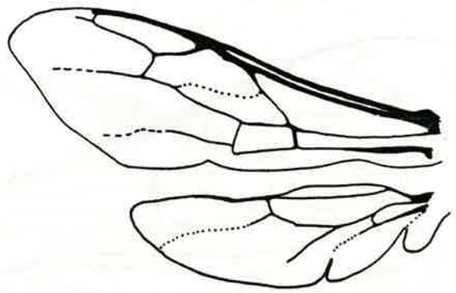
43 *Lyroda subita*



44 *Plenoculus davisi atlanticus*

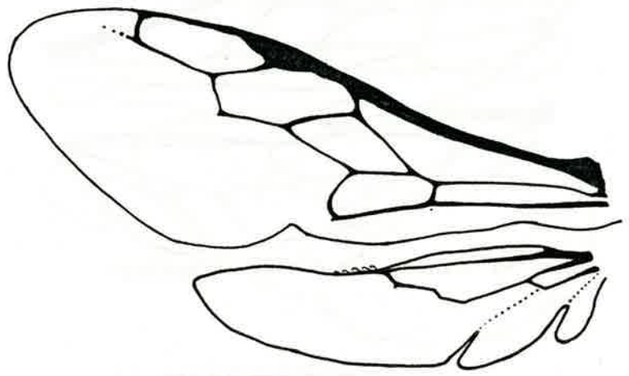


45 *Trypoxylon figulus*

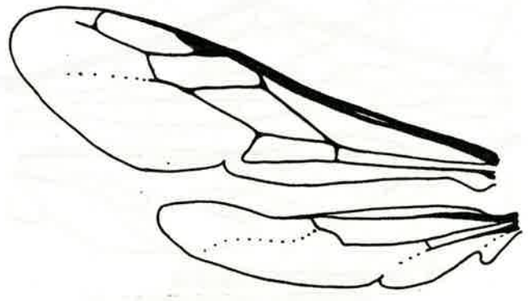


46 Oxybelus uniglumis

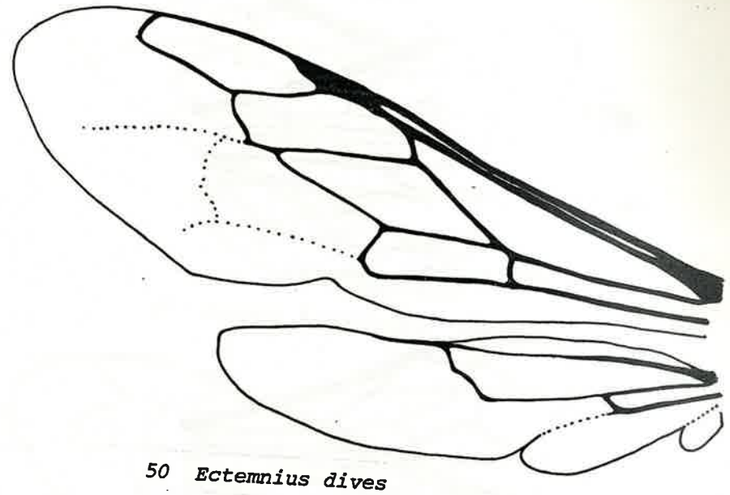
47 Oxybelus uniglumis median cell



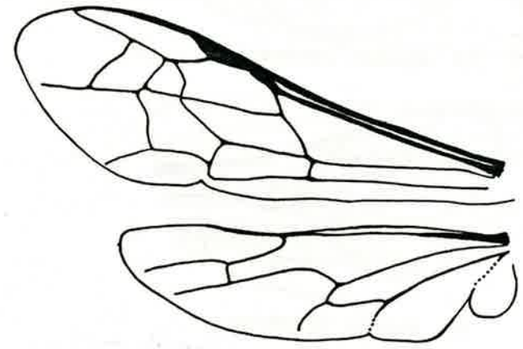
48 Lindenius armaticeps



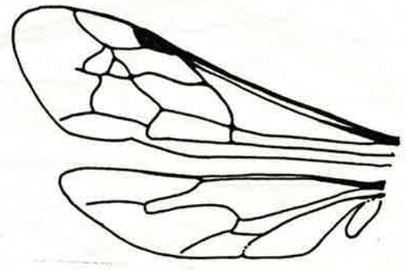
49 Crabro advena



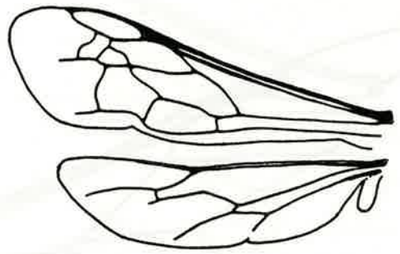
50 Ectemnius dives



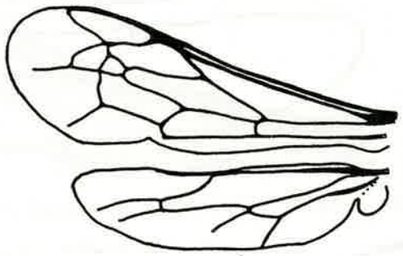
51 Mellinus bimaculatus



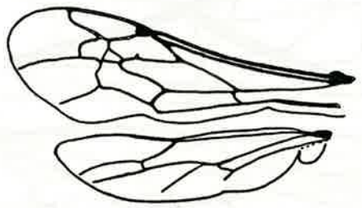
52 Alysson guignardi



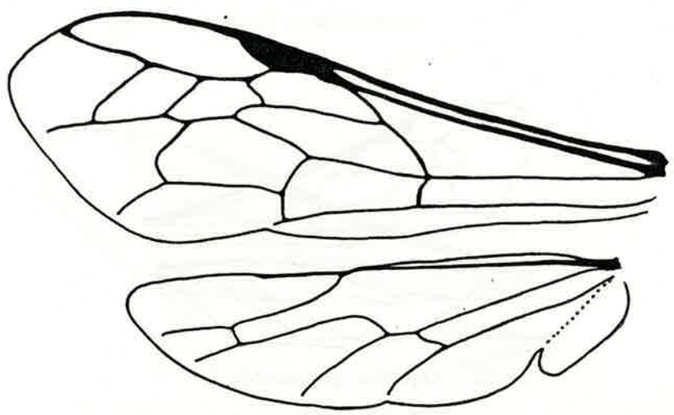
53 *Didineis texana*



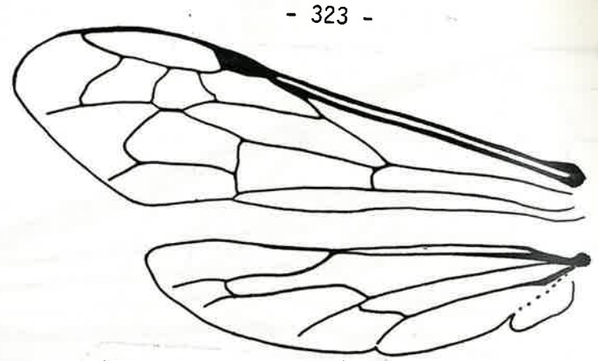
54 *Nysson lateralis*



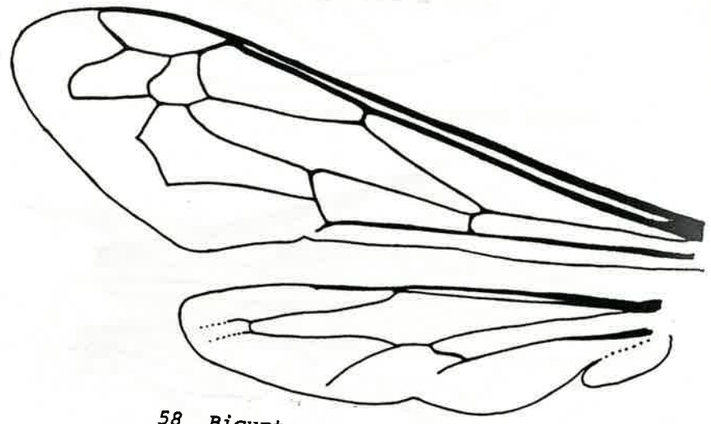
55 *Nysson trichrus*



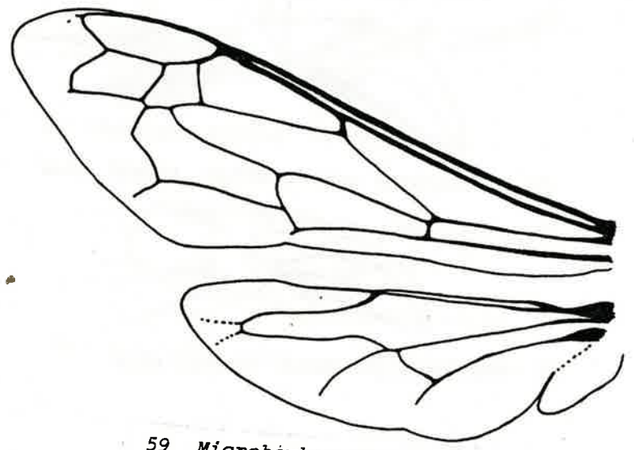
56 *Argogorytes nigrifrons*



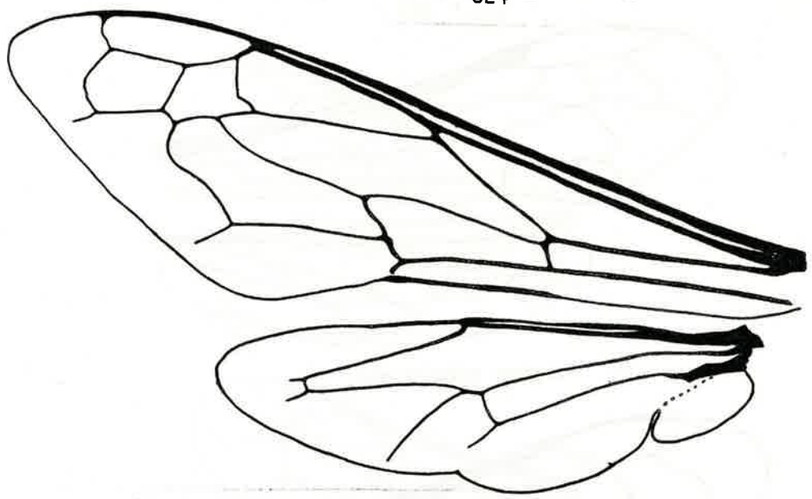
57 *Gorytes simillimus*



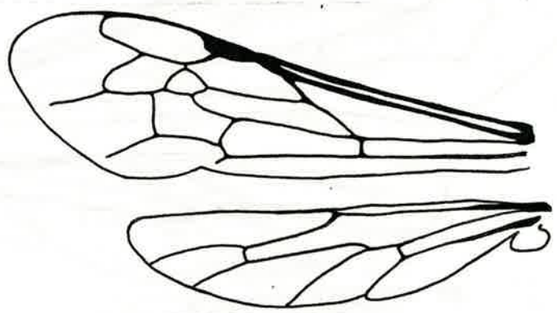
58 *Bicyrtes ventralis*



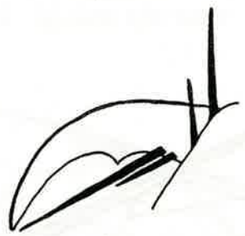
59 *Microbembex monodonta*



60 *Bembix americana spinolae*

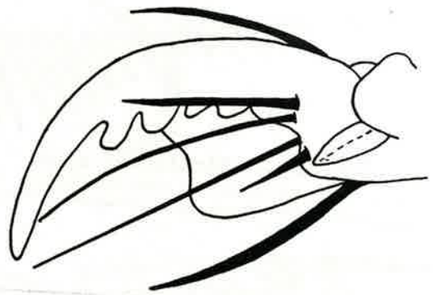


61 *Cerceris nigrescens*

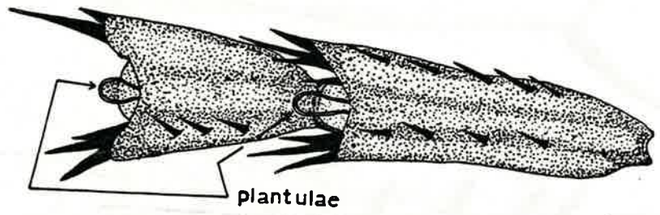


62 *Sceliphron caementarium* tarsal claw

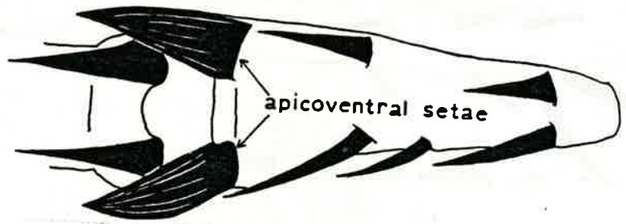
63 *Podalonia luctuosa* tarsal claw



64 *Prionyx atratus* tarsal claw

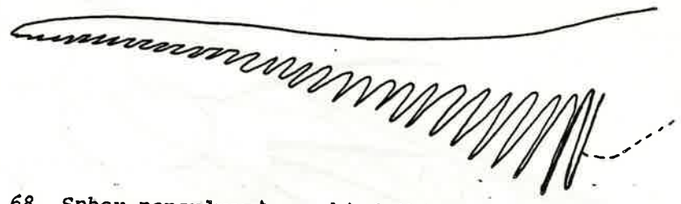


65 *Sceliphron caementatium* tarsomeres



66 *Prionyx atratus* hindtarsomere V

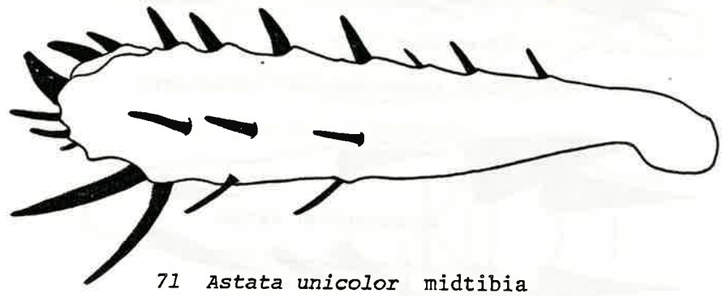
67 *Podalonia luctuosa* hindtarsomere V



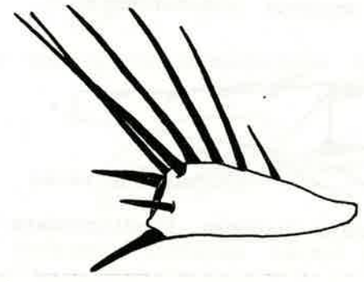
68 *Sphex pensylvanicus* hindtibial spur

69 *Prionyx atratus* hindtibial spur

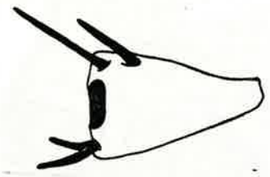
70 *Pemphredon concolor* midtibia



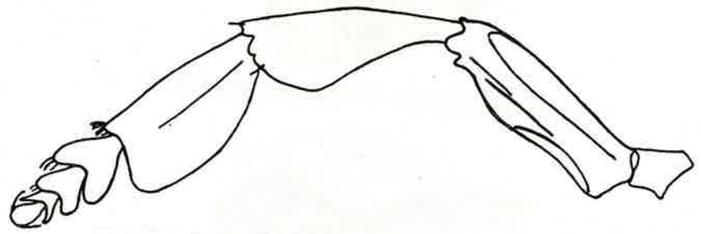
71 *Astata unicolor* midtibia



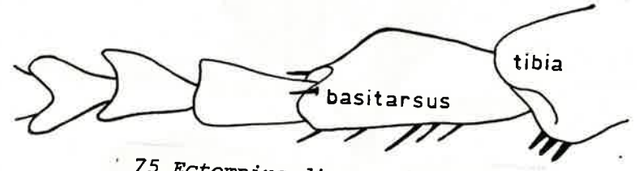
72 *Tachysphex aethiops* ♀ foretarsomere II



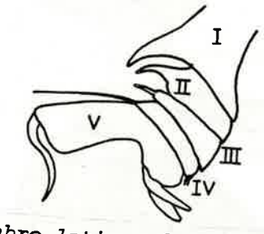
73 *Ancistromma distinctum* ♀ foretarsomere II



74 *Crossocerus annulipes* ♂ foreleg

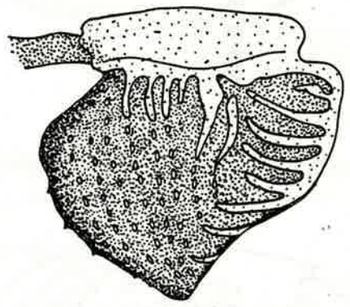


75 *Ectemnius dives* midbasitarsus

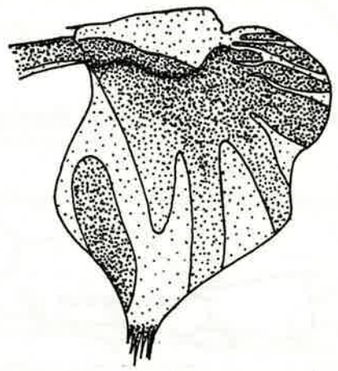


76 *Crabro latipes* ♂ foretarsomeres I-V

77 *Crabro advena* ♂ foretarsomeres I-V

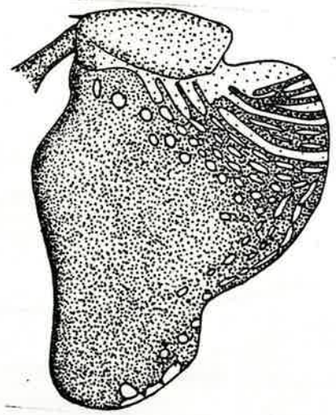


78 Crabro advena ♂ tibial shield

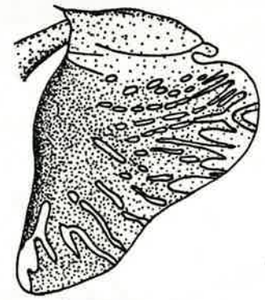


79 Crabro latipes ♂ tibial shield

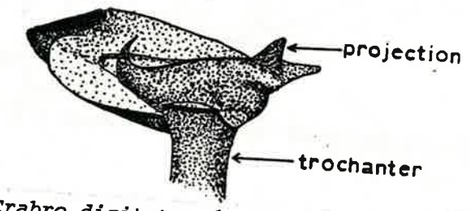
80 Crabro argusinus ♂ tibial shield



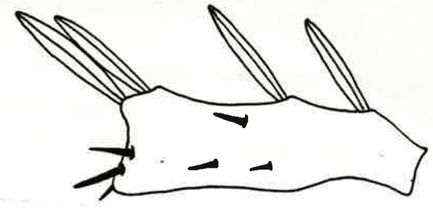
81 Crabro cribrellifer ♂ tibial shield



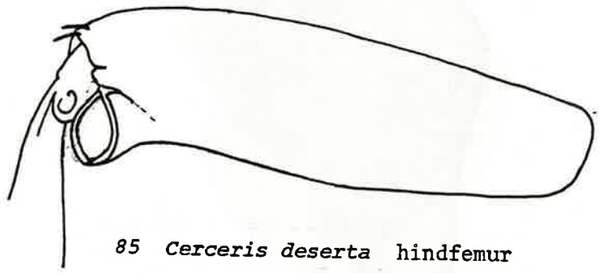
82 Crabro digitatus ♂ tibial shield



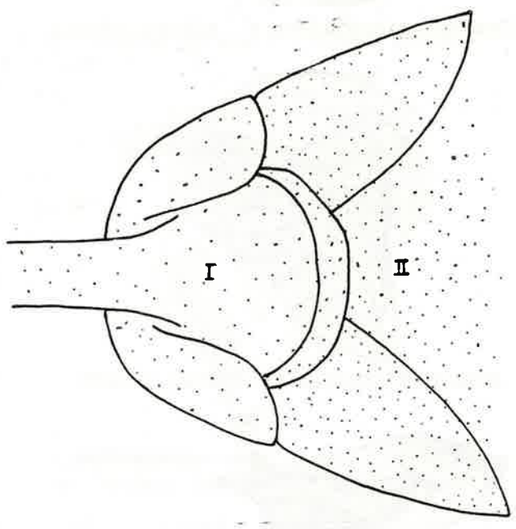
83 Crabro digitatus ♂ inner ventral view of forefemur



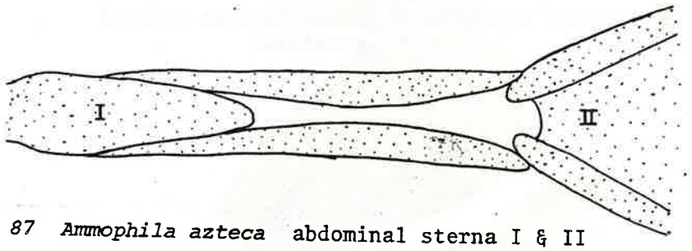
84 Pseudoplisus phaleratus ♀ forebasitarsus



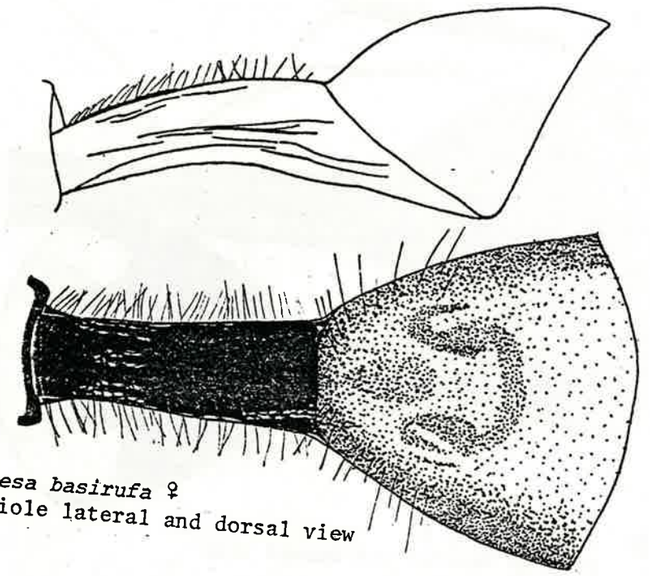
85 *Cerceris deserta* hindfemur



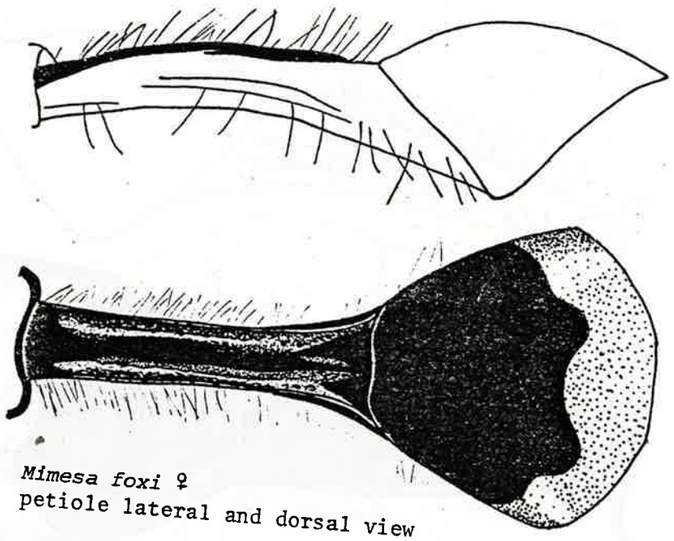
86 *Podalonia luctuosa* abdominal sterna I & II



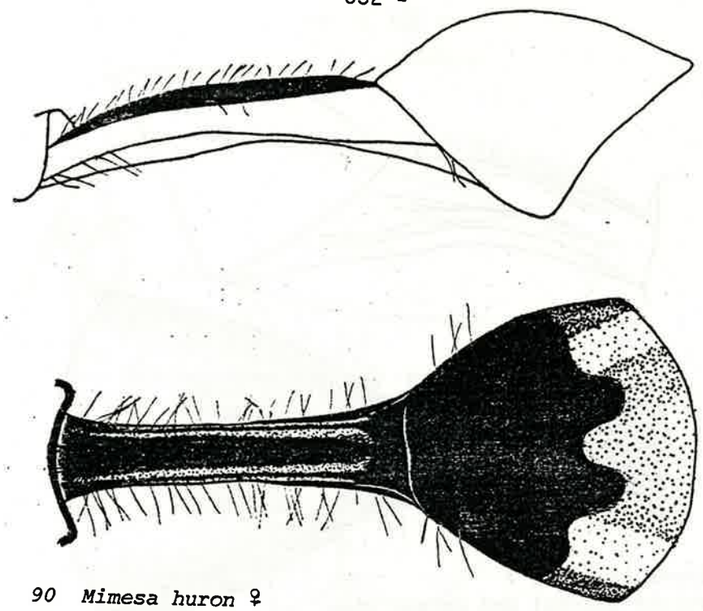
87 *Ammophila azteca* abdominal sterna I & II



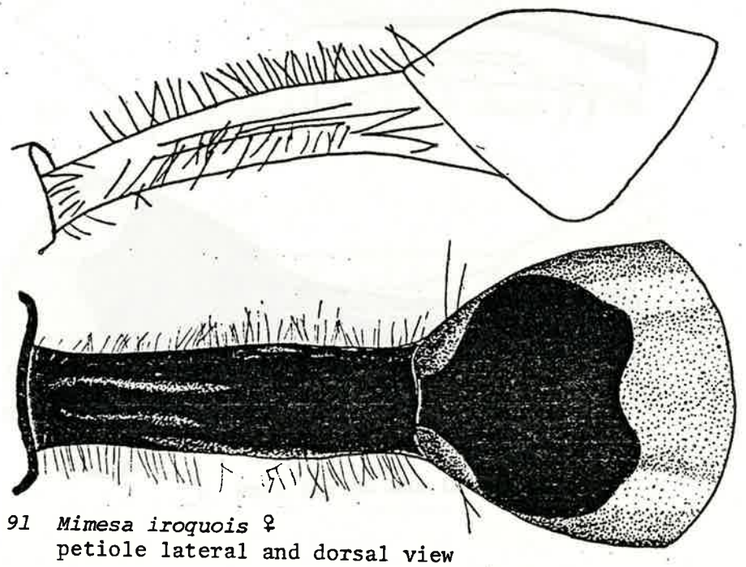
88 *Mimesa basirufa* ♀
petiole lateral and dorsal view



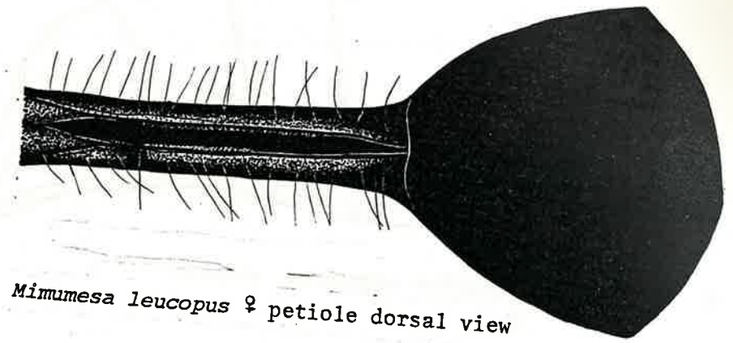
89 *Mimesa foxi* ♀
petiole lateral and dorsal view



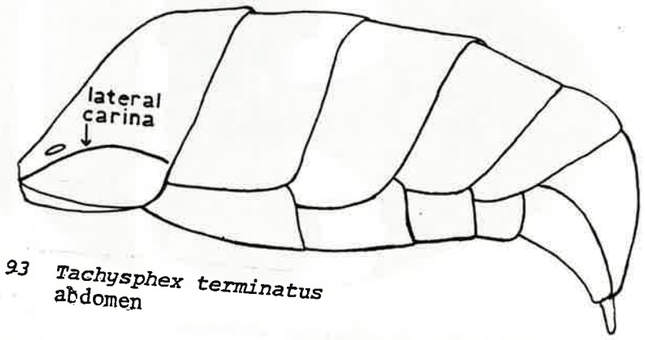
90 *Mimesa huron* ♀
petiole lateral and dorsal view



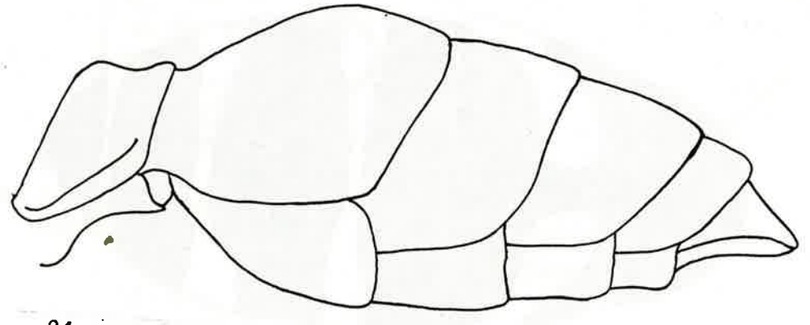
91 *Mimesa iroquois* ♀
petiole lateral and dorsal view



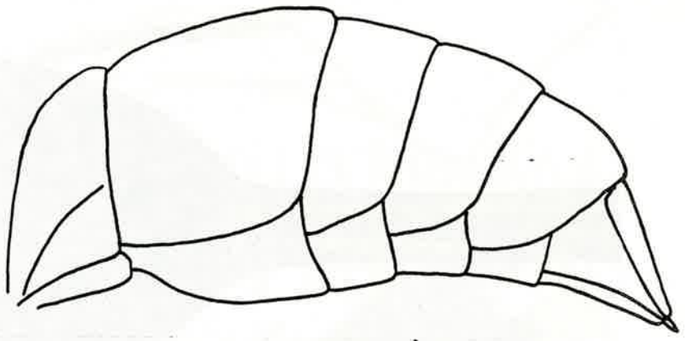
92 *Mimumesa leucopus* ♀ petiole dorsal view



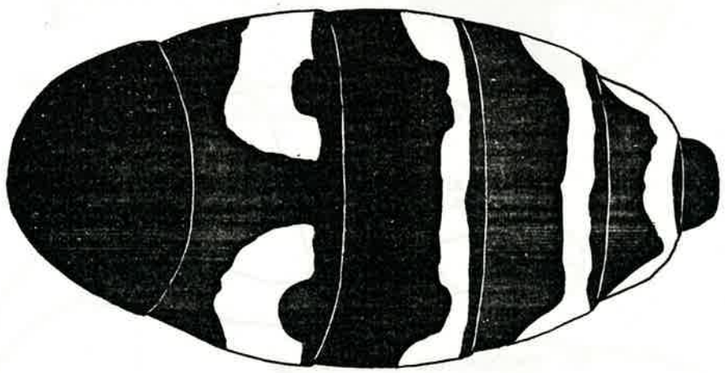
93 *Tachysphex terminatus*
abdomen



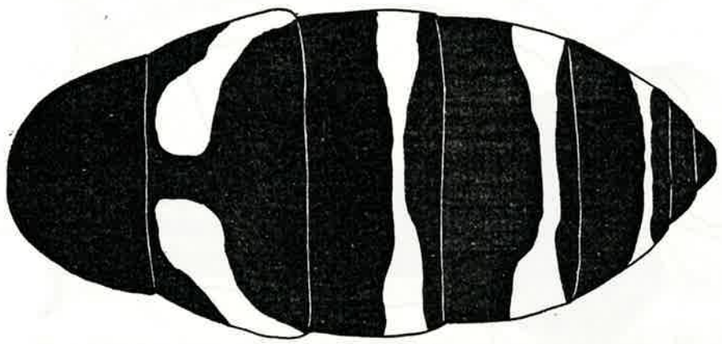
94 *Lestiphorus cockerelli* abdomen



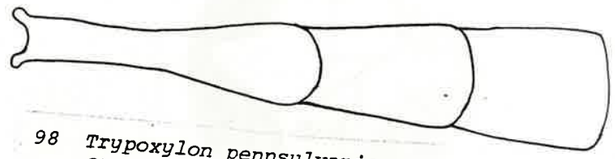
95 *Hoplisoides placidus nebulosus* abdomen



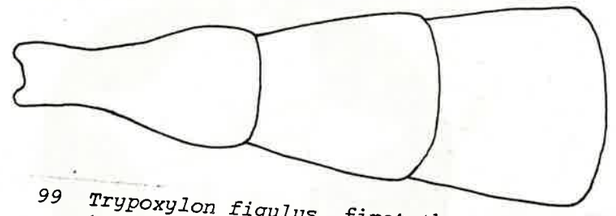
96 *Philanthus bilunatus* abdomen



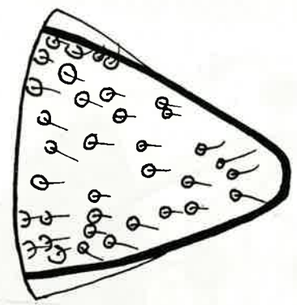
97 *Philanthus lepidus* abdomen



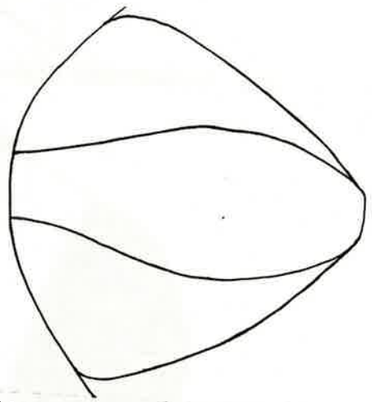
98 *Trypoxylon pennsylvanicum* first three abdominal terga



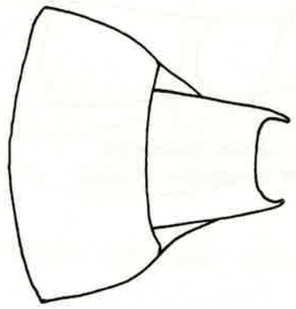
99 *Trypoxylon figulus* first three abdominal terga



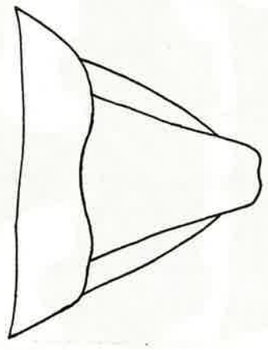
100 *Crossocerus elongatulus* ♀ pygidial plate



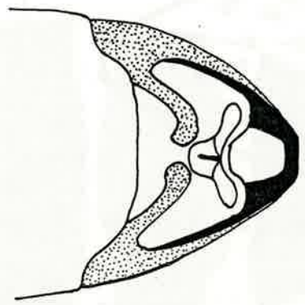
101 *Cerceris melanthe* ♀ pygidial plate



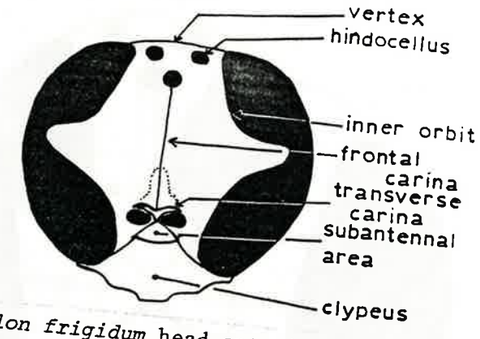
102 *Tachysphex terminatus* ♂ sterna VII & VIII



103 *Ancistromma distinctum* ♂ sterna VII & VIII



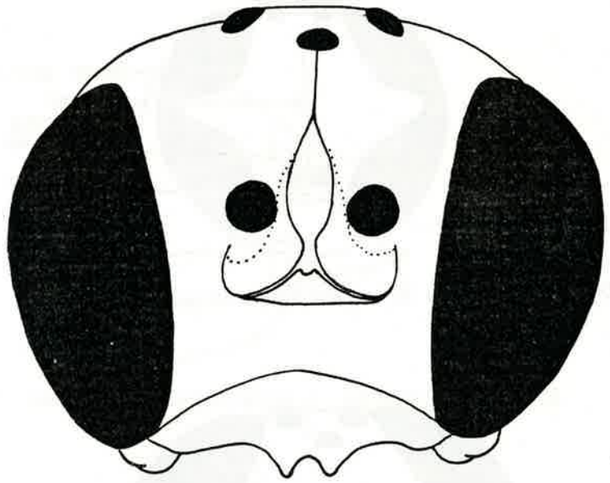
104 *Crossocerus nigricornis* ♂ sterna VI, VII & VIII with inflexed prongs of tergum VII



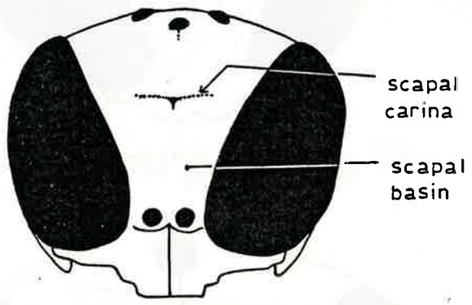
105 *Trypoxylon frigidum* head anterior

106 *Trypoxylon collinum rubrucinctum* head anterior

107 *Psenulus pallipes parenosas* head anterior

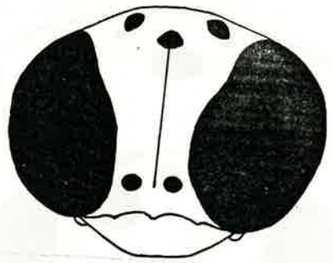


108 Psenulus trisulcus head anterior



109 Ectemnius dives head anterior

110 Crossocerus annulipes head anterior

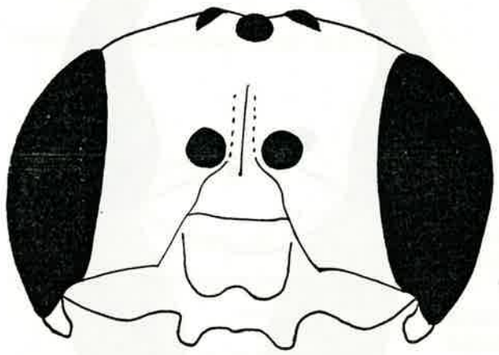


111 Ochleroptera bipunctata head anterior

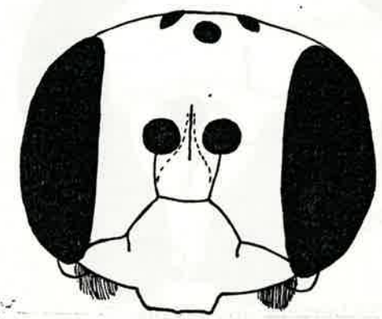
112 Argogorytes nigrifrons head anterior

113 Philanthus bilunatus
head anterior

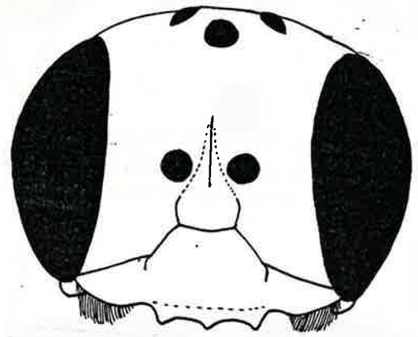
114 *Aphilanthops frigidus* head anterior



115 *Cerceris atramontensis* head anterior

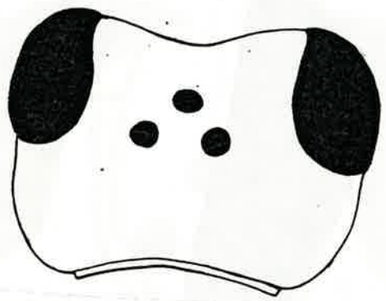


116 *Cerceris nigrescens* ♂ head anterior

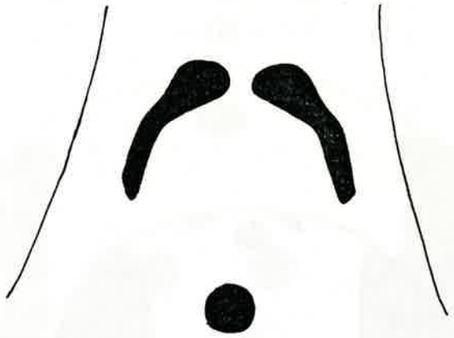


117 *Cerceris deserta* ♂ head anterior

118 *Stigmus americanus* ♀ head dorsal

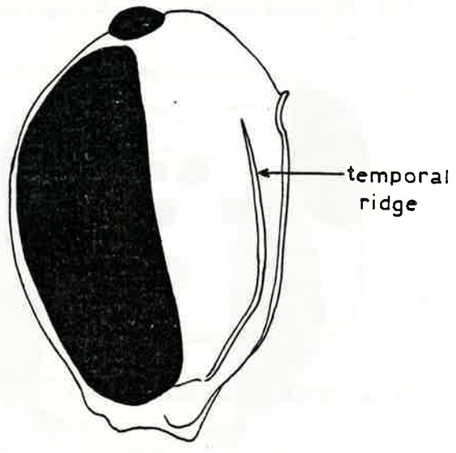


119 *Stigmus fraternus* ♀ head dorsal



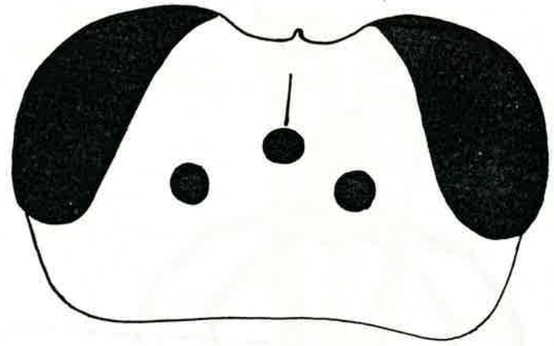
120 *Tachytes validus* ocellar region

121 *Tachysphex acutus* ocellar region



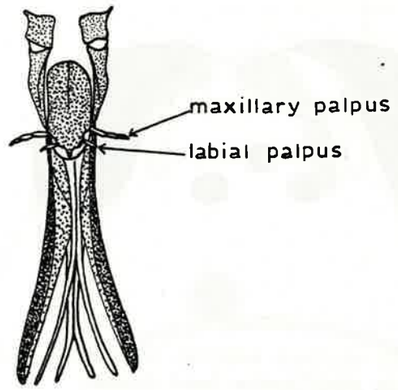
122 *Oxybelus bipunctatus* head lateral

123 *Lestica confluenta* head dorsal

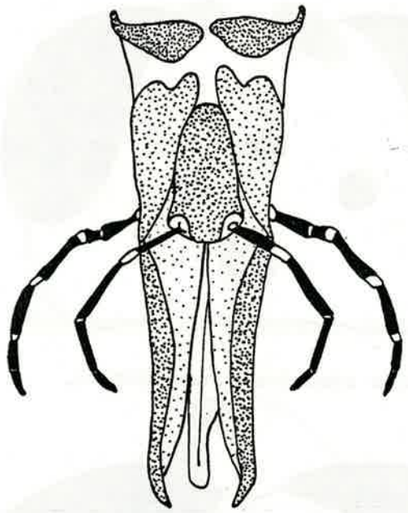


124 *Lindenius armaticeps* head dorsal

125 *Crossocerus annulipes* head dorsal

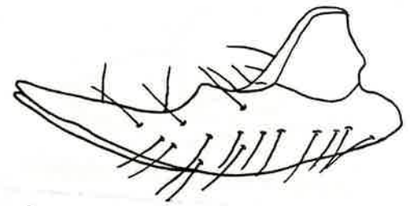


126 *Bembix americana spinolae* palpal formula 4-2



127 *Bicyrtes ventralis* palpal formula 6-4

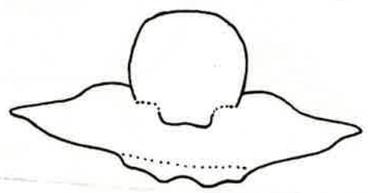
128 *Anacrabro ocellatus* mandible



129 *Crossocerus unicus* mandible

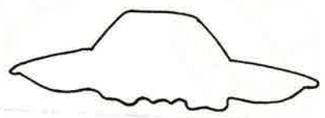
130 *Podalonia luctuosa* ♂ clypeal margin

131 *Podalonia violaceipennis* ♂ clypeal margin

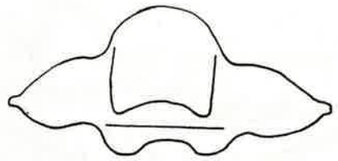


132 *Cerceris robertsonii* ♀ clypeus

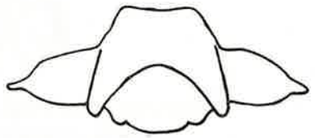
133 *Cerceris nigrescens* ♀ clypeus



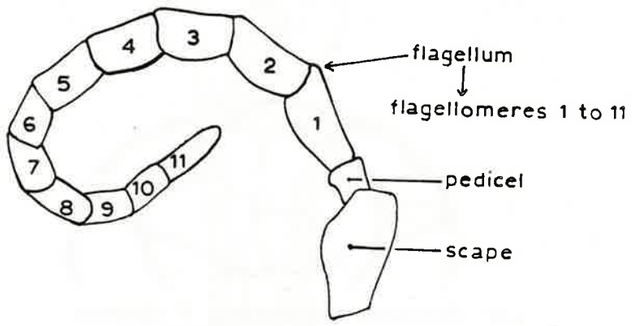
134 *Cerceris deserta* ♀ clypeus



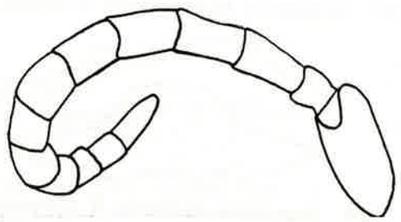
135 *Cerceris clypeata* ♀ clypeus



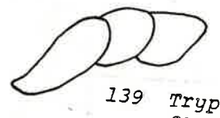
136 *Cerceris dentifrons* ♀ clypeus



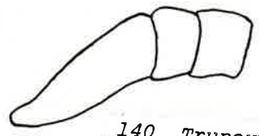
137 *Tachytes validus* ♂ antenna



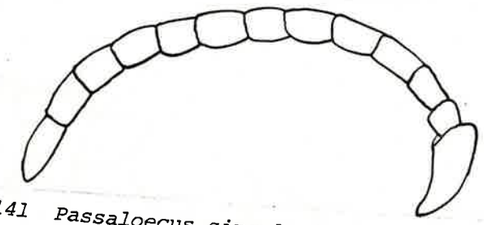
138 *Tachytes pennsylvanicus* ♂ antenna



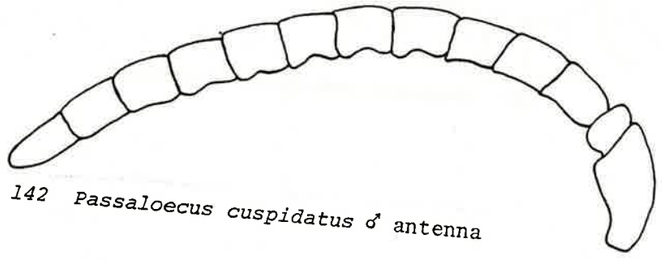
139 *Trypoxylon frigidum* ♂ apical 3 flagellomeres



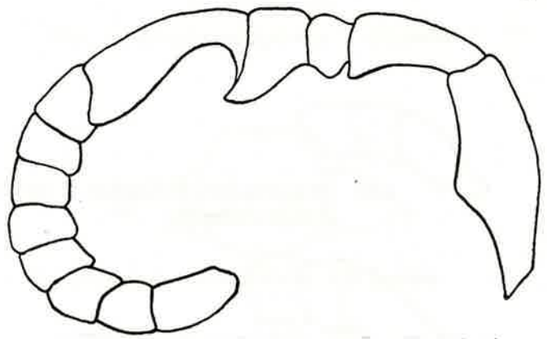
140 *Trypoxylon figulus* ♂ apical 3 flagellomeres



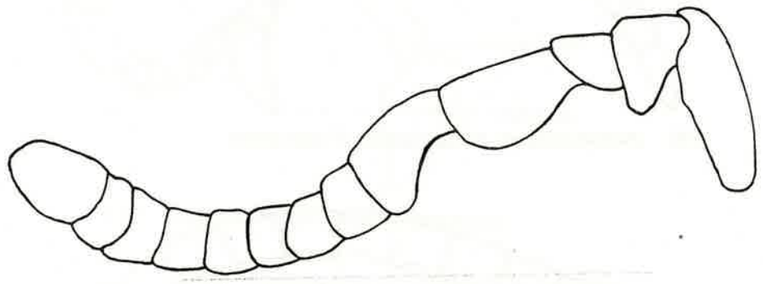
141 *Passaloecus singularis* ♂ antenna



142 *Passaloecus cuspidatus* ♂ antenna



143 Rhopalum rufigaster ♂ antenna



144 Rhopalum coarctatum ♂ antenna