A REVIEW OF THE ORDER MECOPTERA IN CANADA

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A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Master of Science.

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Macdonald College of McGill University
Ste. Anne de Bellevue, March, 1987.

ABSTRACT

The ultimate purpose of the present study is to produce a handbook of the Mecoptera in Canada. The specimens preserved in most of the major Canadian insect collections have been studied. Four families are represented, each by a single genus: Panorpidae (*Panorpa*; 12 + spp.), Bittacidae (*Bittacus*; 3 spp.), Meropeidae (*Merope*; 1 sp.) and Boreidae (*Boreus*; 7 spp.). *Panorpa*, *Bittacus* and *Merope* are eastern only and do not extend far into the boreal zone. *Boreus* is divided into eastern and western groups with several of the western species ranging northward through British Columbia into the Yukon and Alaska. All Canadian species extend southward, especially through the Appalachian region. The species have been reviewed, and keys to male and female adults are presented. New characters of taxonomic interest have been noted, including details of the wing markings and the female abdominal terminalia.

RÉSUMÉ

Le but ultime du présent travail est de fournir un guide pratique de l'ordre des Mécoptères du Canada. Des spécimens conservés dans la plupart des principales collections d'insectes canadiennes furent étudiés. Chacune des quatre familles est représentées, par un genre: Panorpidea (*Panorpa*; 12 + spp.), Bittacidae (*Bittacus*; 3 spp.), Meropeidae (*Merope*; 1 sp.) et Boreidae (*Boreus*; 7 spp.). Les genres *Panorpa*, *Bittacus* et *Merope* qui se retrouvent dans l'est du Canada, ne s'étendent que très peu dans la zone boréale. Le genre *Boreus* par contre, se divise en deux groupes: celui de l'est et celui de l'ouest. Plusieurs espèces appartenant au groupe de l'ouest, sont réparties de la Colombie-Britannique jusqu'au Yukon et en Alaska. Toutes les espèces canadiennes son des espèces septentrionales qui s'étendent vers le sud, tout particulièrement à travers la région des Appalaches. Toutes ces espèces furent étudiées, et des clefs d'identification pour les mâles et les femelles sont présentées. De nouveaux traits caracteristiques d'intérêt taxonomique on été observes; ce sont des bandes situées sur les ailes, et l'extrémité de l'abdomen de la femelle.

ACKNOWLEDGEMENTS

I wish to express my profound gratitude to the "FUNDACION GRAN MARISCAL DE AYACUCHO", a Venezuelan Government Scholarship Program, which supported my studies in Canada.

I am very thankful to my supervisor Dr. D. K. McE. Kevan for pointing out the need for this study and for his advice, comments and careful editing of the manuscript.

My co-supervisor Mr. J. A. Downes contributed a great deal to the initial research, gave constant assistance and much guidance, encouragement and criticism, for which I am most grateful.

My thanks also go to the following curators and professors who generously loaned material for this study: Dr. J. K. Liebherr, Cornell University, Ithaca, NY.; Dr. S. B. Peck, Carleton University, Ottawa, ON.; Dr. R. Foottit, Biosystematic Research Centre, Ottawa, ON.; Dr. D. W. Webb, Illinois Natural History Survey, Champaign, IL.; Dr. V. R. Vickery, Lyman Entomological Museum and Research Laboratory, Ste.-Anne-de-Bellevue, QC.; Mr. B. Wright, Nova Scotia Museum, Halifax, NS.; Dr. G. B. Wiggins, Royal Ontario Museum, Toronto, ON.; Mr. S. G. Cannings, The University of British Columbia, Vancouver, BC.; Dr. P. P. Harper, Université de Montréal, Montréal, QC.; Drs. G. E. Ball and J. R. Spence, The University of Alberta, Edmonton, AB.; Dr. S. Marshall, The University of Guelph, Guelph, ON.; Dr. T. G. Galloway, The University of Manitoba, Winnipeg, MB.; Dr. A. Francoeur, Université du Québec à Chicoutimi, Chicoutimi, QC.; Dr. D. Oliveira, Université du Québec a Montréal, Montréal, QC.

I am especially thankful to Dr. G. W. Byers for his advice on identifying two species of *Panorpa* and for some records sent to me.

Special recognition is due to Mr. André Larochelle and Miss Marie-Claude Larivière who kindly lent me their Mecoptera collection, to Marc Dumas and Chantal Hamel who translated the abstract into French, and to Natasha Mukherjee who translated a paper from German into English.

Colleen E. Palmer provided support and encouragement while I was preparing the mass of research material. Colleen is a trusted and valuable friend whose contribution will never be forgotten.

Sincere thanks are extended to my friends Patricia and Douglas Johnson, Christian Poirier, Alba Lina Garrah, Dr. and Mrs. Roland Hall, David Smith, and Mrs. Sheilla Downes for their friendship and hospitality while I was away doing part of my research.

Appreciation is extended to Mr. Pierre Langlois, François Génier and Mrs. Anne Grainger for the technical help, and to Mrs. Janet Taylor and Diane King for assistance.

TABLE OF CONTENTS

	Page
ABSTRACT	i
RESUME	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	v
LIST OF FIGURES	vii
LIST OF MAPS	xii
INTRODUCTION AND LITERATURE REVIEW	1
MATERIALS AND METHODS	4
TAXONOMIC CHARACTERS OF MECOPTERA	8
MECOPTERA Comstock & Comstock	11
Key to adults of suborders and families	13
MEROPEIDAE Esben-Petersen	15
Merope Newman	15
Merope tuber Newman	15
BOREIDAE Stephens	20
Boreus Latreille	21
Key to Canadian species of *Boreus*	
A. Males	23
B. Females	24
Boreus elegans Carpenter	26
Boreus nivoriundus Fitch	29
Boreus pilosus Carpenter	33
Boreus brumalis Fitch	35
Boreus nix Carpenter	39
Boreus reductus Carpenter	42
Boreus californicus Packard	44
Boreus borealis Banks	49
Boreus intermedius Lloyd	50
BITTACIDAE Enderlein	52
Bittacus Latreille	53
Key to adult Canadian *Bittacus* species.	55
Bittacus pilicornis Westwood	55

Bittacus stigmaterus Say 58
Bittacus strigosus Hagen 61
PANORPIDAE Stephens 69
Panorpa Linnaeus 69
Key to adult Canadian species of *Panorpa*.
A. Males 71
B. Females 73
NEBULOSA-GROUP 76
Panorpa submaculosa Carpenter 76
Panorpa latipennis Hine 85
Panorpa nebulosa Westwood 93
Panorpa banksii Hine 100
Panorpa acuta Carpenter 102
RUFESCENS-GROUP 107
Panorpa mirabilis Carpenter 107
Panorpa subfurcata Westwood 109
Panorpa galerita Byers 127
Panorpa anomala Carpenter 138
Panorpa helena Byers 141
Panorpa debilis Westwood 144
Panorpa claripennis Hine 154
SUMMARY 162
LIST OF ABBREVIATIONS 164
FIGURES 165
DISTRIBUTION MAPS 205
REFERENCES 218

LIST OF FIGURES

1. Lateral view of *Merope tuber* Newman, male . . 165
2. Ventral view of terminalia of male *Merope tuber* Newman 166
3. Ventral view of terminalia of female *Merope tuber* Newman 166
4. Lateral view of *Boreus elegans* Carpenter, male 167
5-9. Dorsal view of fore wings of male *Boreus* spp. 5. *Boreus elegans* Carpenter; 6. *Boreus nivoriundus* Fitch; 7. *Boreus pilosus* Carpenter; 8. *Boreus brumalis* Fitch; 9. *Boreus nix* Carpenter 168
10-11. Dorsal view of fore wings of male *Boreus* spp. 10. *Boreus reductus* Carpenter; 11. *Boreus Californicus* Packard 169
12. Lateral view of hind wing of male *Boreus elegans* Carpenter 169
13. Dorsal view of wings of female *Boreus reductus* 169
14-17. Dorsal view of ninth terga of male *Boreus* spp. 14. *Boreus elegans* Carpenter; 15. *Boreus nivoriundus* Fitch; 16. *Boreus pilosus* Carpenter; 17. *Boreus brumalis* Fitch 170
18-20. Dorsal view of ninth terga of male *Boreus* spp. 18. *Boreus nix* Carpenter; 19. *Boreus reductus* Carpenter; 20. *Boreus californicus* Packard 171
21-27. Ninth sterna of male *Boreus* spp. 21. *Boreus elegans* Carpenter; 22. *Boreus nivoriundus* Fitch; 23. *Boreus pilosus* Carpenter; 24. *Boreus brumalis* Fitch; 25. *Boreus nix* Carpenter; 26. *Boreus reductus* Carpenter; 27. *Boreus californicus* Packard 172
28-30. Dorsal view of thorax of female *Boreus* spp.

28. *Boreus elegans* Carpenter; 29. *Boreus nivoriundus* Fitch; 30. *Boreus californicus* Packard 173
31-33. Dorsal view of pronotum of *Boreus* spp. 31. *Boreus pilosus* Carpenter; 32. *Boreus brumalis* Fitch; 33. *Boreus nix* Carpenter . . 174
34. Lateral view of pronotum of *Boreus brumalis* Fitch 174
35-37. Lateral view of thorax of female *Boreus* spp. 35. *Boreus nix* Carpenter; 36. *Boreus reductus* Carpenter; 37. *Boreus californicus* Packard . 175
38. Lateral view of terminalia of female *Boreus pilosus* Carpenter 176
39. Ventral view of eighth sternum of female *Boreus elegans* Carpenter 176
40. Lateral view of dististyle and basistyle of male *Boreus pilosus* Carpenter 176
41. Lateral view of *Bittacus strigosus* Hagen, male 177
42-44. Right fore wings of *Bittacus* spp. 42. *Bittacus pilicornis* Westwood; 43. *Bittacus stigmaterus* Say; 44. *Bittacus strigosus* Hagen. 178
45-47. Terminalia of male *Bittacus* spp., A. lateral view; B. dorsal view. 45. *Bittacus pilicornis* Westwood; 46. *Bittacus stigmaterus* Say; 47. *Bittacus strigosus* Hagen 179
48-50. Ventral view of terminalia of female *Bittacus* spp. illustrating subgenital plates. 48. *Bittacus pilicornis* Westwood; 49. *Bittacus stigmaterus* Say; 50. *Bittacus strigosus* Hagen. 180
51. Lateral view of *Panorpa galerita* Byers. male . 181
52. Right fore wing of *Panorpa* illustrating a hypothetical wing marking 182
53. Right fore wing of *Panorpa* sp. illustrating wing-vein notation 182
54-55. Right fore wings of *Panorpa* spp. 54.

Panorpa submaculosa Carpenter; 55. *Panorpa latipennis* Hine 183
56–57. Right fore wings of *Panorpa* spp. 56. *Panorpa nebulosa* Westwood; 57. *Panorpa banksii* Hine. 184
58–59. Right fore wings of *Panorpa* spp. 58. *Panorpa acuta* Carpenter; 59. *Panorpa mirabilis* Carpenter 185
60–61. Right fore wings of *Panorpa* spp. 60. *Panorpa subfurcata* Westwood; 61. *Panorpa galerita* Byers 186
62–63. Right fore wings of *Panorpa* spp. 62. *Panorpa anomala* Carpenter; 63. *Panorpa helena* Byers. 187
64–65. Right fore wings of *Panorpa* spp. 64. *Panorpa debilis* Westwood; 65. *Panorpa claripennis* Hine 188
66–69. Ventral view of ninth segments of male *Panorpa* spp. 66. *Panorpa galerita* Byers; 67. *Panorpa submaculosa* Carpenter; 68. *Panorpa latipennis* Hine; 69. *Panorpa nebulosa* Westwood 189
70–72. Ventral view of ninth segments of male *Panorpa* spp. 70. *Panorpa banksii* Hine; 71. *Panorpa acuta* Carpenter; 72. *Panorpa mirabilis* Carpenter 190
73–77. Ventral view of ninth segments of male *Panorpa* spp. 73. *Panorpa subfurcata* Westwood; 74.*Panorpa anomala* Carpenter; 75. *Panorpa helena* Byers; 76. *Panorpa debilis* Westwood; 77. *Panorpa claripennis* Hine 191
78–83. Ninth terga of male *Panorpa* spp. 78. *Panorpa submaculosa* Carpenter; 79. *Panorpa latipennis* Hine; 80. *Panorpa nebulosa* Westwood; 81. *Panorpa banksii* Hine; 82. *Panorpa acuta* Carpenter; 83. *Panorpa mirabilis* Carpenter 192
84–89. Ninth terga of male *Panorpa* spp. 84.

Panorpa subfurcata Westwood; 85. *Panorpa galerita* Byers; 86. *Panorpa anomala* Carpenter; 87. *Panorpa helena* Byers; 88. *Panorpa debilis* Westwood; 89. *Panorpa claripennis* Hine 193

90-92. Lateral view of ninth to eleventh segments of female *Panorpa* spp. 90. *Panorpa submaculosa* Carpenter; 91. *Panorpa latipennis* Hine; 92. *Panorpa nebulosa* Westwood 194

93-94. Lateral view of ninth to eleventh segments of female *Panorpa* spp. 93. *Panorpa acuta* Carpenter; 94. *Panorpa mirabilis* Carpenter. 195

95-96. Lateral view of ninth to eleventh segments of female *Panorpa* spp. 95. *Panorpa subfurcata* Westwood; 96. *Panorpa galerita* Byers 196

97-98. Lateral view of ninth to eleventh segments of female *Panorpa* spp. 97. *Panorpa anomala* Carpenter; 98. *Panorpa helena* Byers. 197

99-100. Lateral view of ninth to eleventh segments of female *Panorpa* spp. 99. *Panorpa debilis* Westwood; 100. *Panorpa claripennis* Hine . . 198

101-106. Genital plates of female *Panorpa* spp. 101. *Panorpa galerita* Byers; 102. *Panorpa submaculosa* Carpenter; 103. *Panorpa latipennis* Hine; 104. *Panorpa nebulosa* Westwood; 105. *Panorpa banksii* Hine; 106. *Panorpa acuta* Carpenter 199

107-112. Genital plates of female *Panorpa* spp. 107. *Panorpa mirabilis* Carpenter; 108. *Panorpa subfurcata* Westwood; 109. *Panorpa anomala* Carpenter; 110. *Panorpa helena* Byers; 111. *Panorpa debilis* Westwood; 112. *Panorpa claripennis* Hine 200

113–116. Ventral view of subgenital plates of female *Panorpa* spp. 113–114. *Panorpa submaculosa* Carpenter; 115. *Panorpa latipennis* Hine. 116. *Panorpa nebulosa* Westwood 201

117–120. Ventral view of subgenital plates of female *Panorpa* spp. 117. *Panorpa banksii* Hine; 118. *Panorpa acuta* Carpenter; 119. *Panorpa mirabilis* Carpenter; 120. *Panorpa subfurcata* Westwood 202

121–123. Ventral view of subgenital plates of female *Panorpa* spp. 121. *Panorpa galerita* Byers; 122. *Panorpa anomala* Carpenter; 123. *Panorpa helena* Byers 203

124–125. Ventral view of subgenital plates of female *Panorpa* spp. 124. *Panorpa debilis* Westwood; 125. *Panorpa claripennis* Hine 204

LIST OF MAPS

Page

Map 1. General distribution of Mecoptera in North America 205
Map 2. Distribution of *Merope tuber* Newman in Canada 205
Map 3. Distribution of *Boreus elegans* Carpenter in Canada 206
Map 4. Distribution of *Boreus nivoriundus* Fitch in Canada 207
Map 5. Distribution of *Boreus pilosus* Carpenter in Canada 207
Map 6. Distribution of *Boreus brumalis* Fitch in Canada 208
Map 7. Distribution of *Boreus nix* Carpenter in Canada and Alaska 208
Map 8. Distribution of *Boreus reductus* Carpenter in Canada 209
Map 9. Distribution of *Boreus californicus* Packard in Canada 209
Map 10. Distribution of *Boreus borealis* Banks and *B. intermedius* Lloyd in Alaska. 210
Map 11. Distribution of *Bittacus pilicornis* Westwood in Canada 210
Map 12. Distribution of *Bittacus stigmaterus* Say in Canada 211
Map 13. Distribution of *Bittacus strigosus* Hagen in Canada 211
Map 14. Distribution of *Panorpa submaculosa* Carpenter in Canada 212
Map 15. Distribution of *Panorpa latipennis* Hine in Canada 212
Map 16. Distribution of *Panorpa nebulosa* Westwood

in Canada 213
Map 17. Distribution of *Panorpa banksii* Hine
in Canada 213
Map 18. Distribution of *Panorpa acuta* Carpenter
in Canada 214
Map 19. Distribution o *Panorpa mirabilis* Carpenter
in Canada 214
Map 20. Distribution of *Panorpa subfurcata* Westwood
in Canada 215
Map 21. Distribution of *Panorpa galerita* Byers
in Canada 215
Map 22. Distribution of *Panorpa anomala* Carpenter
in Canada 216
Map 23. Distribution of *Panorpa helena* Byers
in Canada 216
Map 24. Distribution of *Panorpa debilis* Westwood
in Canada 217
Map 25. Distribution of *Panorpa claripennis* Hine
in Canada 217

TO SOMEONE WHO HAS ALWAYS BEEN THERE FOR ME... MY MOTHER.

INTRODUCTION AND LITERATURE REVIEW

The Mecoptera, as an order, comprise one of the small but ancient groups of insects. This order has a supposed ancestral relationship to Diptera, Trichoptera and Lepidoptera and is thus an extremely interesting group of insects and one which is among the oldest neuropteroid or holometabolous orders known from the fossil record (Byers and Thornhill, 1983).

The Order Mecoptera is well known in the Nearctic Region and not much of a general nature can be added to what is already known. However, new characters of taxonomic interest are presented here, such as the intermediate marginal spot on the wings of *Panorpa*, the form of the pleurites of female *Panorpa* and the shape of the subgenital plate of the females of *Bittacus*. All are here considered to have different outlines and sclerotization patterns which assist in the identification of the species. The subgenital plates of some species of *Panorpa* are also considered to be of some taxonomic value.

The 23 species of Mecoptera known in the Canadian fauna have been redescribed. Localities with their respective counties are indicated and maps based on collection data are given for each species since this had not been fully done in previous publications. Information is also given on Alaskan Mecoptera. No new species has been discovered, but *Bittacus stigmaterus*, *Panorpa mirabilis*, *P. helena* and *P. banksii* are recorded for Canada for the first time.

This general treatment of the Mecoptera in Canada is intended to update the taxonomy and distribution of the members of this order by reviewing the

species and retrieving information from pertinent literature.

Perhaps owing to the small number of species of Mecoptera occurring in the Nearctic Region, few general taxonomic revisions have been undertaken. They included, since 1900, "A review of the Panorpidae of America north of Mexico" by Hine (1901), "Revision of the Nearctic Mecoptera" by Carpenter (1931a), "Notes on North American Mecoptera" by Byers (1954). The most-up-to-date contributions are "The Mecoptera of Michigan" by Thornhill and Johnson (1974), "The Mecoptera, or Scorpionflies, of Illinois" by Webb *et al.* (1975), and "A systematic study of the family Boreidae" by Penny (1977). My redescriptions of the species have been based mainly on these works, though in some instances, certain corrections and clarifications have been necessary.

The only specifically Canadian contributions on the order are the record of one species by Pettit (1874), three species (2 *Panorpa*; 1 *Bittacus*) given by Provancher (1877), the label list of six species (3 *Panorpa*; 2 *Bittacus*; 1 *Boreus*) by Brodie and White (1883), observations on the snow scorpionfly *Boreus brumalis* by Shorthouse (1979), a short note on the snow insect fauna of mountainous British Columbia including the members of the family Boreidae by Cannings (1981), the account of stridulation in *Merope* by Sanborne (1982), the documentation of the conditions of the snow surface habitat of *Boreus brumalis* by Courtin *et al.* (1984), and the summary of the Order by Downes (*In* Danks, 1979). The last reports 22 species from Canada (1 Meropeidae; 7 Boreidae; 4 Bittacidae; 10 Panorpidae) and suggests that another 10 species (4 Boreidae; 1 Bittacidae and 5 Panorpidae) might be anticipated. The present study has resulted in a total 23

known Canadian species (1 Meropeidae; 7 Boreidae; 3 Bittacidae; 12 Panorpidae), to which may be added: 2 Boreidae so far known only from Alaska.

The phylogeny of the order has been studied by Tillyard (1918-1919, 1935), who considered "the panorpoid complex" phylogenetically; Crampton (1923, 1930, 1931), who compared the genitalia of some members of the order with those of related insects; and Hinton (1958) who placed the Boreidae in an order (Neomecoptera) of its own. In this he took the ideas of Crampton (1930) a stage further. More recently Mickoleit (1971) again compared the archaic *Notiothauma reedi* phylogenetically with other members of the order; the latter (1978) and Willmann (1981b) gave a modern approach to the phylogenetic relations among the members of the order by using the methods of W. Hennig, works which do not completely agree with that of Penny (1975) "Evolution of the extant Mecoptera"; Boudreaux (1981) reconstructed a cladistical review of the "panorpoid complex", and Hennig (1981) compiled an account of the phylogenetic development of Mecoptera.

What is known of the biology of the order has been very adequately reviewed by Grasse (1951) and, more recently, by Kaltenbach (1978). Schlee and Schlee (1976) compiled perhaps most of the publications on Mecoptera written up to that date, but the most recent and comprehensive bibliography is to be found in "The Biology of the Mecoptera" by Byers and Thornhill (1983), which includes aspects of geographical distribution, phylogeny, adult morphology, eggs and embryological development, morphology of larvae, larval development, pupal physiology, and ecology and behaviour.

MATERIALS AND METHODS.

This research was based on 2555 specimens borrowed from the following insect collections and museums which are indicated in the text by the associated acronyms:

CORNELL Department of Entomology, Cornell University. Ithaca, New York. U.S.A.

C.U. Department of Biology, Carleton University. Ottawa, Ontario.

C.N.C. Canadian National Collection, Biosystematics Research Centre. Agriculture Canada. Ottawa, Ontario.

I.N.H.S. Illinois Natural History Survey, Section of Faunistic Survey and Insect Identification. Champaign, Illinois, U.S.A.

L.E.M. Lyman Entomological Museum and Research Laboratory, Macdonald College of McGill University. Sainte-Anne-de-Bellevue, Quebec.

N.S.M. Nova Scotia Museum. Halifax, Nova Scotia.

R.O.M. Royal Ontario Museum. Toronto, Ontario.

S.E.M. Spencer Entomological Museum, University of British Columbia. Vancouver, British Columbia.

U.D.M. Université de Montréal, Département des Sciences Biologiques, collection entomologique. Montréal, Québec.

U.A. The University of Alberta, Strickland Museum, Department of Entomology. Edmonton, Alberta.

U.G. The University of Guelph, Department of Environmental Biology. Guelph, Ontario.

U.M. The University of Manitoba, Department of Entomology. Winnipeg, Manitoba.

U.Q.A.C. Université du Québec a Chicoutimi, Collection André Francoeur. Chicoutimi, Québec.

U.Q.A.M. Université du Québec à Montréal, Departement de Biologie. Montréal, Québec.

Type-specimens are deposited in the following museums, as indicated in the synonymy of the species:

C.N.C. Canadian National Collection, Biosystematics Research Centre. Agriculture Canada. Ottawa, Ontario.

B.M.N.H. British Museum (Natural History). London, England.

B.M.W.M. Burke Memorial Washington State Museum. Seattle, Washington. U.S.A.

C.A.S. California Academy of Science. San Francisco, California. U.S.A.

M.C.Z. Museum of Comparative Zoology, Harvard University. Cambridge, Mass. U.S.A.

SNOW Snow Entomological Museum, The University of Kansas. Lawrence, Kansas, U.S.A.

U.S.N.M. United States National Museum of Natural History, Washington D. C., U.S.A.

W.S.M. Washington State Museum, University of Washington. Seattle, Washington, U.S.A.

The symbols and letters used in the records for species are listed below, together with their meanings.

** Specimens not seen (Records sent by G. W. Byers).

D. Day.

M. Male.

Mo. Month.

F. Female.

U. Sex unknown (abdomen missing).

Y. Year.

In order to make collection data citations more accurate, the spelling of locality names given on specimen labels have been modified in some cases to conform with those in various gazetteers of Canadian provinces (Gazetteer of Canada, 1974-1981) and in the Répertoire Toponymique du Québec (1978).

The main methods of collecting adults of Mecoptera, with the exception of *Boreus* species, is to net them from vegetation. *Panorpa* and *Bittacus* can be found in shaded areas and in undergrowth of woodlands where they may be swept and brushed from foliage with a butterfly net; members of *Panorpa* can also be collected in traps baited with raw meat (Thornhill and Johnson, 1974). *Merope tuber* is known to be phototropic (Carpenter, 1931a; 1931b) and has been collected mainly by using Malaise and electric light traps, though some specimens have been caught by means of picric acid, molasses and carbon dioxide traps (Byers, 1973b). Adults of *Boreus* mostly have been found walking or hopping on snow, from November to June.

Specimens were identified by means of their external morphology by examining them with a Wild M5-48944 stereomicroscope. The females of *Panorpa* were dissected only at the tip of the abdomen. The female abdomen was cut off at the 7th segment and placed in 10% KOH overnight to remove soft internal tissues (Webb *et al.*, 1975), with the aid of No. 0 insect pins; cleared genitalia were then transferred to microvials containing glycerol, or mounted on slides with polyvinyl lactophenol (BDH Chemicals); coverslides were sealed with glyptal (Cenco) to preserve the preparations. Slides of wings were also made. The clearing of *Panorpa* male genitalia in 10% KOH was useful to see partially con-

cealed structures such as ventral and dorsal parameres. Measurements of the ovipositor of female *Boreus* were made with a graduated 20-power ocular, using alcohol-preserved specimens since dried ones usually telescope (Penny, 1977).

Drawings were first made in pencil with the aid of a Wild camera-lucida attachment to the microscope. They were later inked with a Rapidograph No 00 and 1 drawing pens.

The redescriptions of the species were based on Webb *et al.* (1975) and Penny (1977). Specimens of the Alaskan *Boreus borealis* and *B. intermedius* were not found in the Canadian fauna, so that the accuracy of the description cannot be vouched for, but for completeness they are included in this review. No drawing of the pleural fold of *Panorpa banksii* is included owing to lack of material.

TAXONOMIC CHARACTERS OF MECOPTERA.

Characters of taxonomic importance for identifying members of the genera *Merope, Boreus, Bittacus* and *Panorpa* are elements of the wings and genitalia. The form of the pronotum is also significant for *Boreus* species.

Merope:

Merope tuber Newman possess rounded and broad wings with numerous veins and crossveins; a circumambient costa is present (Fig. 1). The male terminalia have greatly elongate basistyles and dististyles (Fig. 2).

Boreus:

The presence or absence of bristles (Figs. 28, 30) and medial transverse ridges on the pronotum (Fig. 34) are useful characters as well as the presence of a pair of bristles on the meso- and metanotum in *B. elegans* (Fig. 28). Reduced, triangular fore wings (Figs. 5-11) and slender hind wings (Fig. 12), both with numerous spines on their edges (males), or vestiges (females) are indicative of *B. reductus* (Figs. 13, 36). The genitalia of males of *Boreus* (Fig. 4) consist of a protruding ninth tergum, generally with a rounded anterior margin which, in some species, rises in the form of a hood, and two groups of spines (Fig. 14). The ninth sternum is a thin sclerotized plate (Fig. 21) which articulates laterally with the basistyles. The dististyles or claspers bear a number of spines on about the middle of their length (Fig. 40). The female terminalia are ovipositor-like; this is caused by the joining of the ninth tergum to elongations of the tenth tergum and eighth sternum, the structure terminates in fused and acute cerci (Figs. 38-39).

Bittacus:

The main characters used to recognize *Bittacus* species are the presence or absence of an anal cross-vein (Fig. 42-43), and the wing colour; the size and shape of ninth tergum and of the basistyles, the elongation of cerci, the parameres and the projection of the tenth tergum or uncus (Figs. 48-50). Females differ in the shape of the subdivisions of the subgenital plate and in its pattern of sclerotization (Figs. 48-50).

Panorpa:

The wings have three bands which are usually broken or reduced to spots in some species, including the intermediate marginal spot (Fig. 52); there are also small spots on the basal area (Fig. 52). The form of the wing marking is often diagnostic. The sixth and ninth segments of male panorpids are of particular taxonomic significance: the sixth segment forms or does not form an "anal horn" (Fig. 51); the ninth segment is greatly modified as a genital bulb with the ninth tergum usually emarginate and being of similar form in some species (Figs. 78-89); the ninth sternum is divided into two lateral projections, or "hypovalves" (Fig. 66), joined basally with the ninth tergum; the pleura of the ninth segment have evolved to form large, rounded basistyles containing between them a pair of ventral and dorsal parameres, and supporting apically the dististyles (Fig. 66), which may have accessory lobes (Fig. 73). To differentiate females, the ninth and part of the eighth abdominal segments incorporate a genital plate which presents a distinctive shape and/or length for each species; it usually consists of an apical emarginated distal plate and basal plate (Fig. 104) which occasionally bears an accessory plate (Fig. 109), or lateral projections (Fig. 103). A spermathecal duct has two spermathecal apodemes with free

ends (Fig. 104); the ninth sternum, or subgenital plate, presents, for some species, a conspicuous degree of sclerotization (Fig. 113.; the rather membranous pleurite (laterotergite of Myers, 1962a) joins the ninth tergum and sternum (Fig. 90).

MECOPTERA Comstock & Comstock, 1895.

Panorpatae Brauer, 1885.
Mecaptera Packard, 1886.
Mecoptera Comstock & Comstock, 1895.

DESCRIPTION

Head: with biting mouthparts usually enlarged to form a beak-shaped rostrum (Nannochoristidae, Meropeidae and *Brachypanorpa* without an extended rostrum *per se*); antennae filiform or nearly moniliform (*Merope*) with 16-20 articles (Bittacidae and Boreidae) upwards to about 60 (*Chorista* and *Apteropanorpa*), eyes dichoptic, large or small, sub-rounded (*Apteropanorpa*), oval (*Boreus, Bittacus*), or reniform (Meropeidae); ocelli usually present, absent in *Merope* and *Apteropanorpa*; mouthparts of phytophagous genera (*Boreus*, *Brachypanorpa* and *Notiothauma*) possesing short, thick mandibles with two or more subapical teeth; in predacious forms (Bittacidae) slender, flattened and with a single tooth (Byers and Thornhill, 1983); maxillary and labial palps with 5 and 2 articles respectively. **Thorax:** with two pairs of similar membranous wings, usually elongate, narrow, petiolate (Choristidae, Bittacidae, Panorpidae), but sometimes broad and rounded apically (Meropeidae and Notiothaumidae now Eomeropidae) or shortened (*Brachypanorpa*, females), having numerous veins and cross-veins; subcostal vein not extending to the wing apex, radius with four or five sector branches, anterior cubital vein unbranched (Penny, 1975); wings much reduced in both sexes in Boreidae and *Anomalobittacus*, absent in *Apteropanorpa* and *Apterobittacus*. Legs long, slender,

cylindrical, raptorial in Bittacidae, each tibia bearing two long, sharp spurs, tarsi each with five articles and 1 or 2 claws (latter pectinate in *Panorpa*). **Abdomen:** first segment fused with thorax, generally broad basally and tapered apically, but truncate in Bittacidae, segments subrectangular in lateral view; cerci subapical in males, apical in females.

TAXONOMY AND DISTRIBUTION

According to Crampton (1930) and Tillyard (1935) the Order Mecoptera is divided into 3 living suborders[4], and according to Penny and Byers (1979), and Byers and Thornhill (1983), the Order is grouped in 9 families, with a total of 32 genera and 505 species, as follow:

	Family	No. of Genera	No. of Species	Distribution[5]
	Suborder Protomecoptera			
1.	Meropeidae	2	2	North America and Australia.
2.	Notiothaumidae[6] (now Eomeropidae)	1	1	Chile.

4. Mickoleit (1975, 1978) and Willmann (1981b) do not give validity to these suborders.

5. Map 1. shows a general distribution of the Order in North America.

6. Penny (1975) places this Family in the Suborder Eumecoptera.

	Family	No. of Genera	No. of Species	Distribution
	Suborder Neomecoptera			
3.	Boreidae	3	24	Holarctic Region.
	Suborder Eumecoptera			
4.	Nannochoristidae	2	7	Australia, Tasmania, New Zealand and southern South America.
5.	Choristidae	3	8	Australia.
6.	Bittacidae	15	146	North, Central and South America, Palearctic Region, southern Asia, Africa and Australia.
7.	Apteropanorpidae	1	1	Tasmania.
8.	Panorpodidae	2	13	North America, Japan and Korea.
9.	Panorpidae	3	303	North America, Palearctic Region, southern Asia and Japan.

KEY TO ADULTS OF SUBORDERS AND FAMILIES OF CANADIAN MECOPTERA

1. Body depressed; wings fully developed, broad, R_{s} vein with more than 4 branches, crossveins very numerous and randomly distributed; mouthparts little, if at all, elon

gate; male abdominal terminalia extremely enlarged, female without exserted ovipositor-like structure; ocelli absent (Fig. 1) ... (Suborder Protomecoptera). ..... Family MEROPEIDAE. (*Merope tuber* Newman only).

-- Body cylindrical or compressed; wings fully developed or reduced, if former, then narrow and petiolate, R_m vein with 4 or fewer branches, crossveins, when present, fewer, regularly arranged; mouthparts strongly elongate; male abdominal terminalia in most species enlarged, female sometimes with an exserted ovipositor-like structure; ocelli present ..... 2.

2. Size small, body less than 7 mm.; wings greatly reduced, coriaceous, virtually veinless, elongate-lanceolate in males, scale-like in females; cerci apparently lacking; male abdominal terminalia not swollen; female with an exserted ovipositor-like structure (incorporating cerci) (Fig. 4) .... (Suborder Neomecoptera). ..... Family BOREIDAE.

-- Larger than above, body greater than 7 mm.; wings fully developed or, if reduced, not as above; small cerci distinct; male abdominal terminalia swollen; female lacking an ovipositor-like structure .... (Suborder Eumecoptera) ..... 3.

3. Body and legs elongate; wings with pterostigma but without prominent pigmented spots or bands; legs raptorial, specialized for hanging; tarsi with single claws (Fig. 41) ..... Family BITTACIDAE.

-- Body and legs not distinctly elongate; wings with prominent pigmented spots and/or bands; legs not raptorial or specialized; tarsi 2-clawed (Fig. 51) .... Family PANORPIDAE.

MEROPEIDAE Esben-Petersen, 1921.

Meropeidae Esben-Petersen, 1921.

Meropeidae, or earwigflies, differ from other Mecoptera by being somewhat flattened, lacking ocelli, having reniform eyes; middle article antennal broad; relatively broad wings with numerous veins and cross-veins and a small sclerotized jugum, and by the males possessing long forceps-like claspers.

DISTRIBUTION

The family Meropeidae comprises two known monotypic genera, the one found in southwestern Australia (*Austromerope*) and the other (*Merope*) in eastern North America.

Merope Newman, 1838.

Merope Newman, 1838:180. Type-species: *Merope tuber* Newman (by monotypy). The characters of the genus are covered by the redescription of the type-species which follows:

Merope tuber Newman, 1838.

Merope tuber Newman, 1838:180. Holotype female (B.M.N.H.). Type-locality: UNITED STATES OF AMERICA: *New Jersey*, Trenton Falls.

REDESCRIPTION

Head: Dark yellow to dark brown; ocelli absent. **Thorax:** yellow to dark brown; pronotum shield-like extend-

ing anteriorly over head. Wings (Fig. 1) pale yellow to brown, broad, apex rounded, constricted at base; veins and crossveins numerous and variable in number, branching and origins; C vein circumambient; basal crossveins generally margined; pterostigma and thyridium absent; jugum small, brown, near apex of A2 vein, strongly sclerotized in fore wings. Legs yellow to brown, having a pair of tarsal claws. **Abdomen:** Yellow to brown; segments subrectangular, flattened dorsoventrally, IV and V wider than others. Male genitalia with ninth tergum very short and having a deep V-shaped emargination, forming two lateral pointed lobes (Fig. 2); ninth sternum imparting an inverted T-shape; tenth segment cylindrical, broad at base, placed mesoventrally beneath ninth tergum and extending well beyond apices of latter; basistyles very elongate, subcylindrical, broad basally; dististyles elongate, shorter than basistyles, slender (Fig. 2), apex of each dististyle flattened laterally, emarginated, having a subtriangular depression with a small apical concave disc on the inner aspect; cerci very small, clubbed, situated beneath ninth tergum and lateral to tenth tergum (morphologically, cerci should be between 10th and 11th). Female genitalia lacking sclerotized genital plate; ninth sternum or subgenital plate (Fig. 3) slightly broadened anteriorly, oval, less wide than ninth tergum, divided into two elongate lateral plates separated by a membranous area (*cf.* Mickoleit, 1975).

DISTRIBUTION

In Canada (Map 2), *Merope tuber* has been collected only in southern Ontario and Quebec. It is a widespread species ranging in eastern United States from northern Georgia to Maine, continuing west to Minnesota and Missouri (Banks, 1892; Hine, 1901; Engelhardt, 1915; Carpenter, 1931a, 1932;

Byers, 1954, 1973a; Barnes, 1956; Weidner, 1964; Caron, 1967; Thornhill and Johnson, 1974; Webb *et al.*, 1975; Byers and Covell, 1981). Byers (1973b) reported that the range of this species had been extended westward of the Appalachian Mountains to the upper Mississippi Valley in Minnesota and Wisconsin and to central Missouri.

SEASONAL OCCURRENCE AND HABITAT

Adults have been collected from May 12 to September 29 by means of different types of traps set in the ground among boulders along a small stream, in rotten logs in hardwoods (Byers, 1954); in mesic woods of catalpa (*Catalpa bignonioides*), slippery elm (*Ulmus rubra*), hawthorn (*Crataegus* spp.) and boxelder (*Acer negundo*), with an undergrowth of jewelweed (*Impatiens* sp.), aster (*Aster* spp.), coneflower (*Rudbeckia laciniata*) and burdock (*Arctium* spp.) (Thornhill and Johnson, 1974). Hlavac (1974) provided evidence for the ground dwelling habits of *Merope tuber* by the interlocking mechanism it presents to avoid rupture of the wings, and stridulation in both sexes was reported by Sanborne (1982) as a possible mechanism of defence or communication. Nothing is known on the larvae of this species.

SPECIMENS EXAMINED

15 males, 48 females and 3 sex unknown.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
ONTARIO.								
Carleton Co.								
Ottawa	19-	VII	-1969	J. A. Downes	2	3		L.E.M.
	12-	V	-1970	A. Sauve	1			L.E.M.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	U.	Collection:
Stittsville	15-VIII-1975	M. Sanborne		1		C.U.
	21-VIII-1975	M. Sanborne		1		C.U.
Hastings Co.						
Marmora	18-VIII-1952	J. F. McAlpine	1			C.N.C.
?	15-VI-14-VIII-1979					
		J. A. Downes	1	2		L.E.M.
Lanark Co.						
Innsville	16-VII -1963	W. R. Mason		4		C.N.C.
	22-VII -1963	W. R. Mason		6		C.N.C.
	28-VII -1963	W. R. Mason		4		C.N.C.
	20-VIII-1963	W. R. Mason	1	11		C.N.C.
Leeds Co.						
St. Lawrence Is. Nat. Park						
	20-VI -1976	__ Reid		1		C.N.C.
	10-VIII-1976	__ Carter		1		C.N.C.
Lincoln Co.						
Vineland	06-VII -1944	H. R. Boyce			1	C.N.C.
?	23-VI -1926	W. L. P___			1	C.N.C.
?	10-VII -1926	W. L. P___	1			C.N.C.
Peel Co.						
Cooksville	? -1938	R. O. Pinkney	1			U.G.
Credit Forks	22-VIII-1945	C. E. Hope	1			R.O.M.
Wellington Co.						
Guelph	19-VII -1928	R. H. Ozburn		1		U.G.
	21-VII -1971	J. A. Neary	1			U.G.
	11-VIII-1975	S. Allan		1		U.G.
	17-IX -1983	?		2		U.G.
	20-31-VII-84	K. Gilbert		1		U.G.
	8-15-VIII-84	K. Gilbert	1	3		U.G.
Puslinch	20-25-VII-84	L. D. Coofe		1		U.G

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	U.	Collection:
QUEBEC.						
Deux-Montagnes Co.						
Parc Paul Sauve						
	29-IX -1984	B. Landry	1			L.E.M.
Hull Co.						
Hull, Blvd. Fournier						
	13-VIII-1965	?		1		C.N.C.
	7-14-VIII-84	L. Domouchel	1			C.U.
Gatineau Co.						
Duncan Lake	31-VII -1970	J. F. McAlpine		1		C.N.C.
Old-Chelsea	12-VII -1969	D. D. Munroe	1			C.N.C.
	21-VII -1969	D. D. Munroe		1		C.N.C.
	12-VIII-1969	D. D. Munroe		1		C.N.C.
Pontiac Co.						
Norway Bay	01-IX -1940	G. A. Hobbs	1			C.N.C.
Saint-Maurice Co.						
Sainte Flore,						
Lac Mondor	21-VIII-1951	E. G. Munroe			1	C.N.C.
	08-VIII-1951	E. G. Munroe		1		C.N.C.

BOREIDAE Stephens, 1829.

Boreidae Stephens, 1829.

The snow scorpionflies differ from other Mecoptera by their small size, ninth abdominal tergum and rudimentary wings which in males are coriaceous and lanceolate with a hooked tip, and in females reduced to small vestigial pads. Females also possess an ovipositor-like structure developed from the elongate 8th abdominal sternum, 10th abdominal tergum and fused cerci. The larvae, are scarabaeiform[16]. A number of internal morphological features, summarized in Richards and Davis (1977), set this family apart and seem to justify its treatment as a separate suborder.

DISTRIBUTION

Boreidae, according to Russell (1977) and Penny and Byers (1979), comprise 23 known species grouped in three genera: *Hesperoboreus* (2 spp.), *Caurinus* (1 sp.), both found only in the Nearctic region (western United States), and *Boreus* (23 spp.) (Fig. 4) found in much of the northern Holarctic region.

Boreus Latreille, 1816.

Boreus Latreille, 1816:152-153. Type-species: *Panorpa hiemalis* Linnaeus, 1767.

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16. Members of the family Panorpodidae are said to have larvae of a somewhat similar form (Penny, 1975), but no details have been published.

Ateleptera Dalman, 1823:34. Type-species: same as above. Synonymized by Esben-Petersen (1921).

Euboreus Lestage, 1940:12. Type-species: *Boreus nivoriundus* Fitch, 1847. Synonymized by Cooper (1972).

REDESCRIPTION

General body colour: reddish to reddish brown. General body length: 2.5 to 5.6 mm.

Head: broad with long, tapered rostrum, latter occasionally having numerous setae on anterior aspect near antennal bases; ocelli present in a broad V-shaped formation, but difficult to see; eyes black, oval; antennae light brown to black, filiform, with 18 to 25 articles. **Thorax:** Pronotum subrectangular, anterior margin slightly convex, in dorsal view with or without long, dark bristles at corners, generally having two transverse ridges; meso- and metanotum occasionally with one or two bristles each. Male fore wings broadened and thickened basally, elongate, tapered apically, usually covered with fine setae, with 8 to 23 and 7 to 36 black spines on outer and inner margins respectively, inner margin sometimes rather straight, ending in a sharp, dark, inwardly-directed, spine-like aciculum. Male hind wings covered by forewings, slender, tapered and blunt apically, with 0 to 12 spines. Female fore wings reduced to vestigial, usually suboval or occasionally subtriagular pads, their anterior inner margins usually each with an inwardly-directed small incision always covered with small fine setae. Female hind wings scale-like, covered by fore wings excepting *B. reductus* (see p. 42). Legs yellow to black, relatively long, slender, bearing setae and/or apical femoral spines, tibial spurs usually present, tarsi with two

claws. **Abdomen:** Male genitalia with ninth tergum, or epandrium, protruding posteriorly, broad, usually rounded anteriorly, with a hood-like formation, usually bearing two lateral groups of 15 to 75 small, black spines (denticles of Penny, 1977); ninth sternum, or hypandrium, basally broad and usually convex, constricted at apex, latter emarginated or truncate, always reaching bases of dististyles; latter small, sickle-shaped consisting of two lobes, the outer being upwardly and inwardly directed, stouter, sharper and larger than inner one and having 13 to 30 small dark spines about middle of dorsal margin. Female genitalia forming an ovipositor-like structure by grouping of eighth sternum, ninth and tenth terga, and fused cerci; eighth sternum in ventral view consisting of two narrow, elongate, basally broad plates, apices of plates slightly separated, rounded and bearing numerous small spines; cerci triangular with pointed apices.

DISTRIBUTION

According to Penny and Byers (1979), *Boreus* comprises 21 species, all of which are restricted to the cooler regions of the northern hemisphere. In the Nearctic, they are found in both western and eastern North America; in the Palaearctic, they extend from western Europe to eastern Asia.

In western North America there are 8 species with an overall range from Arizona north to Alaska, of which *B. borealis* and *B. intermedius* are known from Alaska (Map 10) but may possibly be found in Canada in due course, and *B. coloradensis* (Byers, 1955) from the United States only. In the East, 2 are known to occur from northern Tennessee to Ontario and New Brunswick.

KEY TO CANADIAN SPECIES OF *Boreus*.

A. MALES

(Wings slender, strongly sclerotized hook-like with spines along inner and outer margins)

1. Pronotum with bristles..... 2.
-- Pronotum without bristles..... 6.
2. Ninth abdominal sternum truncate or convex..... 3.
-- Ninth abdominal sternum strongly notched at apex.... 5.
3. Ninth abdominal tergum with two rounded groups of spines, its margins outwardly acute (Fig. 14) .... ***B. elegans.***
-- Ninth abdominal tergum with two more or less quadrilateral groups of spines, its margins not outwardly acute..... 4.
4. Ninth abdominal tergum with two parallel, subrectangular areas completely covered by spines (Fig. 15) .... ***B. nivoriundus.***
-- Ninth abdominal tergum with two subquadrate areas of scattered spines (Fig. 16) .... ***B. pilosus.***
5. Ninth abdominal tergum with two roundish groups of spines joined by a common dorsal convex margin (Fig. 17); pronotum, in lateral view, with dorsal profile three-humped (Fig. 34);..... ***B. brumalis.***
-- Ninth abdominal tergum with 2 sub-oval groups of spines and an irregular dorsal margin as in Fig. 18; pronotum, in lateral view, with dorsal profile rather straight (Fig. 35) ..... ***B. nix.***
6. Found in Canada ..... 7.
-- Found in Alaska ..... 8.

7. Pronotum, in lateral view, with dorsal profile

straight (Fig. 36); wings separated by wide gap, bearing whitish setae throughout (Fig. 10); legs black; ninth abdominal sternum in form of an inverted T (Fig. 26); eighth abdominal tergum and sternum not fused ... . *B. reductus.*

-- Pronotum, in lateral view, with dorsal profile three-humped (Fig. 37); wings separated by a narrow gap (Fig. 11); legs yellowish; ninth abdominal sternum with a widely truncate apex (Fig. 27); eighth abdominal tergum and sternum fused ..... *B. californicus.*

8. Found only in St. Paul Island, in the Pribilof, Alaska[17] ..... *B. borealis.*

-- Found only in the Wrangell Range, Alaska[35] .... *B. intermedius*

B. FEMALES (Modified from Penny, 1977).
(Wings in form of short, sclerotized scale-like pads; abdomen ending in an ovipositor-like structure)

1. Fore wing vestiges subtriangular, not covering hind wings (Fig. 13, 36) ..... *B. reductus.*

-- Fore wing vestiges oval, covering hind wings (Fig. 35) ..... 2.

2. Pronotum with bristles (Figs. 31-34) ..... 4.

-- Pronotum without bristles (Figs. 36-37) ..... 3.

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17. Taken from Penny (1977).

3. Legs yellowish with darker coloured spines.....
..... *B. borealis* and **B. *californicus*[12]**

-- Legs yellowish brown with stout setae and apical femora spine dark brown ..... ***B. intermedius.***

4. Body colour reddish rusty-brown ; "ovipositor" at least 1.4 mm. long..... 5.

-- Body colour yellow or dark brown to black; "ovipositor" less than 1.4 mm. long..... 6.

5. Rostrum with 25 or more spines on posterior aspect; meso- and metanotum each normally with 2 bristles (Fig. 28); "ovipositor" 1.54 mm long.. ***B. elegans.***

-- Rostrum with 24 or fewer spines on posterior aspect; meso- and metanotum occasionally with 2 bristles each; "ovipositor" 1.4 mm. long..... ***B. nivoriundus.***

6. Thoracic and abdominal pilosity as long as pronotal bristles; "ovipositor" more than 1.2 long ..... 7.

-- Thoracic and abdominal pilosity shorter than pronotal bristles; "ovipositor" 1.2 mm long.... ***B. brumalis.***

7. Legs reddish to brown..... ***B. nix.***

-- Legs yellowish brown..... ***B. pilosus.***

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12. Females of *B. californicus* are separated from those of *B. borealis* only by locality (Penny, 1977).

Boreus elegans Carpenter, 1935.

Boreus elegans Carpenter, 1935:119, fig. 8, 12. Holotype male (C.A.S.). Type-locality CANADA: *British Columbia*, Vancouver.

Euboreus elegans (Carpenter) Lestage, 1940.

REDESCRIPTION

General body colour in dry specimens: rusty brown. General body length of specimens in alcohol: male 3.57 mm.; female 5.6 mm.

Head: apex dark brown, rostrum reddish, eyes dark brown to black. **Thorax:** reddish to dark brown. Pronotum without conspicuous transverse ridge, with 2 to 3 dark bristles on corners of both anterior and posterior margins, 2 to 4 bristles on mesonotum and 2 on metanotum (Fig. 28). Male fore wings (Fig. 5) yellowish, tapering evenly to apex, covered with small fine setae, inner margin rather straight and with 16 sharp spines, outer one with 12. Female fore wings yellowish, covered with numerous small setae. Legs pale yellow, with dark brown spines and apical femoral spine. **Abdomen:** reddish. Male genitalia (Fig. 4) with ninth tergum (Fig. 14) rather 8-shaped with apices outwardly acute; ninth sternum (Fig. 21) broad basally, tapered, apex broadly truncate; dististyles with about 30 spines along mid-legth of dorsal margin. Female genitalia with "ovipositor" about 1.54 mm. long from eighth sternum to apices of cerci.

DISTRIBUTION

In North America, *B. elegans* has a limited range between southern British Columbia in Canada (Map 3) and western Washington in the United States (Carpenter, 1935; Penny, 1977).

SEASONAL OCCURRENCE AND HABITAT

Adults have been collected from October 26 to May 15. The region where this species occurs has abundant rainfall and "warm-winter" climatic conditions at elevations below 488 m. (Penny, 1977). *B. elegans* has also been found in the rain at 4 C. (information taken from specimen label).

REMARKS

This species can be mistaken for *B. nivoriundus* which occurs in eastern Canada (Map 4), but can be separated from it by its large size and more numerous stout setae on the back of the rostrum (Penny, 1977). It can be separated from other western boreids by its rusty coloration (see cover plate).

SPECIMENS EXAMINED

49 males, 39 females.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M. F. U.	Collection:
BRITISH COLUMBIA.				
Garibaldi Prov. Park				
- Diamond Head Trail				
	15- V -1982	S. G. Cannings	1	S.E.M.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	U.	Collection:	
	23- I -1983	S. G. Cannings	1	4		S.E.M.	
	02- I -1984	J. N. M. Smith	1	1		S.E.M.	
Manning Park	18-II -1983	S. G. Cannings	3	2		S.E.M.	
	06-III-1983	S. G. Cannings		1		S.E.M.	
- Castle Creek							
	14-II -1982	S. G. Cannings		1		S.E.M.	**
- Flash Creek							
	11-XI -1982	S. G. Cannings	2			S.E.M.	
- Strawberry Flats							
	20-II -1982	S. G. Cannings	1	1		S.E.M.	**
Rainbow	14-II -1985	J. Lancaster	4	3		S.E.M.	
Springhouse	26- X -1975	J. R. Spence		1		U.A.	
Squamish	26- I -1964	P. G. Grant	5	6		S.E.M.	
	23-II -1964	P. R. Grant		1		S.E.M.	
- Diamond Head Trail							
	12-XII-1981	S. G. Cannings	1			SNOW	**
	19-XII-1981	S. G. Cannings		5		S.E.M.	**
- Round Mountain							
	03- I -1981	S. G. Cannings	1			S.E.M.	
- Paradise valley							
	24-VI -1963	P. R. Grant	1			S.E.M.	
	24-XI -1963	P. R. Grant	12			S.E.M.	
- Coquitlam	25- I -1964	P. R. Grant	10	13		S.E.M.	
- Horseshoe Bay (Black Mountain)							
	14-XII-1963	P. R. Grant	5	4		S.E.M.	
- Hollyburn Mountain							
	22-II -1964	P. R. Grant	3	1		S.E.M.	
- Paul Ridge	02- I -1981	S. G. Cannings	1			S.E.M.	
Vancouver, Lyn Creek							
	22-II -1981	S. G. Cannings		1		S.E.M.	

Boreus nivoriundus Fitch, 1947.

Boreus nivoriundus Fitch, 1847:277. Lectotype male (M.C.Z.). Type-locality UNITED STATES OF AMERICA: eastern *New York*.
Euboreus nivoriundus (Fitch) Lestage (1940).

REDESCRIPTION

General body colour of dry specimens: rusty brown. General body length of alcohol specimens: male 3.0 mm; female 4.3 mm.

Head: reddish to brown, rostrum yellowish. **Thorax:** brown to dark brown. Pronotum (Fig. 29) smooth, having no transverse incisions, with 1 or 2 bristles on corners of both anterior and posterior margins; meso- and metanotum (Fig. 29) usually each with 2 dark bristles. Male fore wings (Fig. 6) yellowish, covered with small fine setae, having 16 to 18 inner and 16 outer spines, inner margin rather straight. Female fore wings covered by small fine setae. Legs dark brown, each with apical femoral spine. **Abdomen:** reddish to dark brown. Male genitalia with ninth tergum (Fig. 15) rounded anteriorly, a vertical cleft dividing it into two subrectangular parts, which are grouped numerous small black spines; ninth sternum (Fig. 22) tapered, basally broad, rounded apically; dististyles with about 20 spines along mid-length of dorsal margin. Female genitalia ca. 1.4 mm. long eighth sternum to apices of cerci.

DISTRIBUTION

B. nivoriundus and *B. brumalis* (pp. 35) are the only

two species of *Boreus* to be found, so far, in eastern North America. In Canada (Map 4), *nivoriundus* is known to occur in southern Ontario and Quebec, as well as in New Brunswick and Nova Scotia, with an outlying record from eastern Manitoba. In the United States, it ranges from Maine southwestward to Kentucky and Tennessee (Hine, 1901; Engelhardt, 1915; Carpenter, 1931a, 1935, 1936, 1939; Byers, 1954; Webb *et al.*, 1975; Penny, 1977).

SEASONAL OCCURRENCE AND HABITAT

Adults have been collected from January 26 until May 2. They have been found in deciduous forests from 1230 m. (Byers, 1954), occasionally to 1525 m. (Penny, 1977).

REMARKS

Males of *B. nivoriundus* can be separated from those of *B. elegans* by the shape of the ninth tergum and sternum. Females differ by the smaller size as well as in geographical distribution.

SPECIMENS EXAMINED

23 Males and 39 females.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
MANITOBA.								
Wallace Lake	22-	II	-1975	E. N. Pruitt	1	1		C.N.C.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	U.	Collection:
NEW BRUNSWICK.						
York Co.						
Fredericton	29-III-1935	?	1	3		C.N.C.
NOVA SCOTIA.						
Hants Co.						
Glen Brook	30-IV -1979	B. Wright	2	1		N.S.M.
ONTARIO.						
Algoma Dist.						
Sowerby	16-III-1965	J. E. Martin & J. F. McAlpine		3		C.N.C.
Haliburton Co.						
Haliburton	15-III-1965	J. E. Martin & J. F. McAlpine		1		C.N.C.
Nipissing Dist.						
Mattawa	06-IV -1965	J. E. Martin & J. F. McAlpine		1		C.N.C.
Parry Sound Dist.						
Magnetawan River	16-III-1965	J. E. Martin & J. F. McAlpine		1		L.E.M.
Marine Base Rd.	16-III-1965	J. E. Martin & J. F. McAlpine	1	1		C.N.C.
Pointe-au-Baril	16-III-1965	J. E. Martin & J. F. McAlpine	1			C.N.C.
Serpent Rapids	16-III-1965	J. E. Martin & J. F. McAlpine	3	5		C.N.C.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	U.	Collection:
Sudbury Dist.						
Nairn	16-III-1965	J. E. Martin & J. F. McAlpine		1		C.N.C.
Wentworth Co.						
Ancaster	25-III-1967	J. E. Martin		3		C.N.C.
QUEBEC.						
Gatineau Co.						
Lac La Peche	26- I -1974	F. Brodo	1			C.U.
Maniwaki	05-IV -1965	J. E. Martin & J. F. McAlpine	1			C.N.C.
Lac-Saint-Jean-Ouest Co.						
Quaquakamaksis River	17-IV -1982	P. P. Harper		1		U.D.M.
Pontiac Co.						
La Verendrye Park, - Lac Roland	05-IV -1965	J. E. Martin & J. F. McAlpine	1	1		C.N.C.
- Lac des Fourches	05-IV -1965	J. E. Martin & J. F. McAlpine		1		C.N.C.
Portneuf Co.						
Lac Sergent	02- V -1965	A. Francoeur	1	1		U.Q.A.C.
Terrebonne Co.						
St. Hippolyte	28-III-1967	P. P. Harper		1		U.D.M.
	30-III-1972	P. P. Harper	1			U.D.M.
	03-IV -1972	P. P. Harper	5	9		U.D.M.
	30-III-18-IV-72	P. P. Harper	4	1		U.D.M.
	19-III-1973	P. P. Harper		3		U.D.M.

Boreus pilosus Carpenter, 1935.

Boreus pilosus Carpenter, 1935:114-115, fig. 10. Holotype male (M.C.Z.). Type-locality CANADA: *British Columbia*, Kaslo.

Euboreus pilosus (Carpenter) Lestage, 1940.

REDESCRIPTION

General body colour of alcohol specimens: yellow to reddish. General body length in alcohol specimens: male 4.12 mm; female 4.5 mm.

Head: apex and upper rostrum dark brown, mouthparts reddish, eyes black. **Thorax:** brown to reddish. Pronotum (Fig. 31) having no conspicuous transverse ridges, with one or two dark bristles on each corner of anterior and posterior margins; meso- and metanotum each occasionally with two bristles. Male fore wings (Fig. 7) tapered, slender at mid-length, with 16 to 19 outer and 19 to 22 inner sharp black spines, inner margin straight, covered with numerous fine setae. Female fore wings whitish to cream coloured, suboval, covered with fine setae. Legs dark yellow to reddish, with numerous dark brown and white setae, apical femoral spine present. **Abdomen** dark brown, pleura whitish to cream. Male genitalia with ninth tergum (Fig. 16) divided into two subquadrate areas bearing groups of numerous small spines, hood extending laterally to mid-length of groups of spines; ninth sternum (Fig. 23) triangular-truncate, apex slightly concave, extending to bases of dististyles; latter (Fig. 40) having 17 small spines along middle of dorsal margin; inner lobe of dististyle blunt. Female genitalia (Fig. 38) with "ovipositor" about 1.38 mm from eighth sternum to apices of cerci.

DISTRIBUTION

B. pilosus is not widely known in North America. In Canada (Map 5), it has been found in the Yukon near the border of Alaska, as well as in Alberta and southern British Columbia. In the United States, it is only known from one region in Montana (Carpenter, 1935; Penny, 1977). These localities suggest that the species occurs from the Wrangell Mountains in Alaska and along the Rocky Mountains throughout British Columbia and into Montana.

SEASONAL OCCURRENCE AND HABITAT

Adults have been collected from October 4 until April 28. Penny (1977) reported this species to have been found from 1220 to 1891 m. and at a temperature of about -5° C.; in the Yukon, specimens were collected at a temperature of between -5 and +5° C.

REMARKS

B. pilosus can be separated from other Canadian boreids by its long pilosity.

SPECIMENS EXAMINED

2 males and 2 females.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M. F. U.	Collection:
ALBERTA.				
Jasper Nat. Park	2-4-X -1964	?	1 1	U.A.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M. F. U.	Collection:	
BRITISH COLUMBIA.					
Glacier Nat. Park					
	09-IV -1980	J. G. Woods	1	C.N.C.	
Mt. Fidelity Nat. Park					
	07-XII-1979	J. G. Woods	1	C.N.C.	
YUKON.					
Kluane Nat. Park					
- Christmas Creek					
	14-IV -1982	S. G. Cannings	1	S.E.M.	**
	28-IV -1982	S. G. Cannings	1	S.E.M.	**

Boreus brumalis Fitch, 1847.

Boreus brumalis Fitch, 1847:278. Lectotype male (designated by Penny, 1977) (M.C.Z.). Type-locality UNITED STATES OF AMERICA: eastern *New York*.
Euboreus brumalis (Fitch) Lestage, 1940.

REDESCRIPTION

General body colour in dry specimens: black; in alcohol specimens: reddish to black. General body length: male 2.8 mm; female 3.8 mm.

Head: apex dark reddish, eyes black, rostrum dark yellow. Thorax: reddish to brown. Pronotum (Figs. 32, 34) with two transverse sulci, giving it laterally a three-humped aspect, anterior and posterior margins usually having two bristles on each corner in dorsal view. Male fore wings

(Fig. 8) slender, elongate, tapered, with 20 inner and 15 outer spines, apex terminating in a black, sharp, inwardly-directed spine. Female fore wings suboval pads. Legs reddish to brown, with numerous setae. **Abdomen:** reddish to dark brown. Male genitalia with ninth tergum (Fig. 17) rounded dorsally, having a small medial cleft, notched ventrally, laterally bearing numerous short spines; ninth sternum (Fig. 24) suboval, apex emarginate and forming two small lateral lobes reaching bases of dististyles; latter elongate, curved dorsally, with numerous small, dark spines in middle of dorsal margin, apex sharp, inner lobe with a truncate apex. Female genitalia with "ovipositor" 1.2 mm. long from eighth sternum to apices of cerci.

DISTRIBUTION

In Canada (Map 6), *B. brumalis* is known to occur in southern Ontario and Quebec. In the United States it extends from New Hampshire west to Michigan and thence south to Tennessee and Virginia, with isolated records from Minnesota, Wisconsin and Illinois (Banks, 1892; Hine, 1901; Engelhardt, 1915; Carpenter, 1931a, 1935, 1939; Cole, 1938; Goslin, 1950; Byers, 1954, 1962b; Stannard, 1957; Thornhill and Johnson, 1974; Webb *et al.*, 1975; Penny, 1977).

SEASONAL OCCURRENCE AND HABITAT

Adults have been collected from November 14 to April 6. Byers (1954) reported that adults and pupae inhabit mosses of the genera *Anomodon* or *Dicranella* at bases of oak trees (*Quercus* spp.) in deciduous woodlands; Penny (1977) also reported that larvae of *B. brumalis* can be collected throughout the year on rhizoids of *Atrichum angustatum*.

REMARKS

This species more or less resembles *B. nix*, but it can be separated from that species by its smaller size and usually by the less numerous setae on the pronotum.

SPECIMENS EXAMINED

45 males and 63 females.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M. F. U.	Collection:
ONTARIO.				
Carleton Co.				
Bells Corners	19-II -1967	A. Smetana	1	C.N.C.
Kanata	26-XI -1967	J. M. Campell	1	C.N.C.
South March	13-III-1968	J. R. Vockeroth	1	C.N.C.
Haliburton Co.				
Haliburton	15-III-1965	J. E. Martin & J. F. McAlpine	1	C.N.C.
Harcourt	15-III-1965	J. E. Martin & J. F. McAlpine	4 10	C.N.C.
Hastings Co.				
Maynooth,	16-III-1958	J. F. McAlpine	5 2	C.N.C.
- Mink Lake	11-III-1967	J. E. Martin	2 2	C.N.C.
- Graphite Lake	18-XI -1967	J. E. Martin	5 4	C.N.C.
Lanark Co.				
Carleton Pl.	26-X-14-XI-80	S. J. Miller	1 1	C.N.C.
Stanleyville	07-III-1985	J. A. Downes	1	L.E.M.
Muskoka Dist.				
Utterson	15-III-1965	J. E. Martin & J. F. McAlpine	1	C.N.C.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	U.	Collection:
Parry Sound Dist.						
Marine Base Rd.						
	16-III-1965	J. E. Martin & J. F. McAlpine	2	1		C.N.C.
Magnetawan River						
	16-III-1965	J. E. Martin & J. F. McAlpine	1	2		L.E.M.
Serpent Rapids						
	16-III-1965	J. E. Martin & J. F. McAlpine		5		C.N.C.
Peel Co.						
Fork of the Credit						
	18-XII-1968	P. P. Harper		1		U.D.M.
	17- I -1969	P. P. Harper		1		U.D.M.
Perth Co.						
Trout Creek	03-II -1977	T. Rupert	1			U.G.
Peterborough Co.						
Apsley	28-II -1980	W. E. Ralley		1		U.G.
Simcoe Co.						
Black Ash Cr.	04-III-1956	F. P. Ide	1	2		R.O.M.
Sudbury Dist.						
Nairn	16-III-1965	J. E. Martin & J. F. McAlpine	2	1		C.N.C.
Sudbury	12-II -1977	J. D. Shorthouse		2	1	C.U.
	02-IV -1980	G. B. Wiggins	1	1		R.O.M.
Wentworth Co.						
Ancaster	01- I -1967	J. E. Martin	9	9		C.N.C.
	25-III-1967	J. E. Martin		2		C.N.C.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
QUEBEC.								
Gatineau Co.								
Duncan Lake	23-	III-	1969	J. F. McAlpine	1	1		C.N.C.
Lac Kingmere	16-	XII-	1982	A. Smetana		1		C.N.C.
Old-Chelsea	04-	III-	1951	J. R. Vockeroth		1		C.N.C.
	17-	III-	1951	W. Mason		1		C.N.C.
Pontiac Co.								
La Verendrye	05-	IV	-1965	J. E. Martin & J. F. McAlpine		1		C.N.C.
Temiscamingue Co.								
Opimica	06-	IV	-1965	J. E. Martin & J. F. McAlpine		1		C.N.C.
Terrebonne Co.								
St. Hippolyte	28-	III-	1967	P. P. Harper		1		U.D.M.
	?	-IV	-1967	P. P. Harper	1			U.D.M.
	30-	III-	1972	P. P. Harper		2		U.D.M.
	03-	IV	-1972	P. P. Harper	1			U.D.M.
	08-	IV	-1972	P. P. Harper	1			U.D.M.
	26-	XI	-1973	D. Rey	1			U.D.M.
	19-	XI	-1976	?	1	4		U.D.M.
Vaudreuil Co.								
Île-Perrot	06-	II	-1972	V. R. Vickery		1		L.E.M.

Boreus nix Carpenter, 1935

Boreus nix Carpenter, 1935:114, fig. 7. Holotype male (M.C.Z.). Type-locality UNITED STATES OF AMERICA: *Montana*, Gird's Creek, Ravalli Co.

Boreus gracilis Carpenter, 1935:118. Holotype female, missing, (B.M.W.M.). Type-locality UNITED STATES OF AMERICA: *Alaska*, between Kennecott and McCarthy.

Synonymized by Penny (1977).

Euboreus nix (Carpenter) Lestage, 1940.

Euboreus gracilis (Carpenter) Lestage, 1940.

REDESCRIPTION

General body colour of dry specimens: dark brown to black. General body length of alcohol specimens: male 3.57 mm.; female 4.75 mm.

Head: Apex dark brown to black, rostrum brown to reddish. **Thorax:** reddish to brown. Pronotum (Figs. 33, 35) with two indistinct transverse ridges, having 2 to 4 long bristles on each corner of anterior and posterior margins, generally also with short bristles; meso- and metanotum each occasionally with 2 bristles. Male fore wings (Fig. 9) constricted in middle, covered with numerous fine setae, inner margin not straight, with 15 outer and 16 inner (some may be hidden), sharp black marginal spines. Female fore wings suboval, covered with numerous short setae. Legs reddish to brown, with numerous dark setae and a long white one. **Abdomen:** dark brown. Male genitalia with ninth tergum (Fig. 18) having a short hood in middle of anterior margin, a cleft in middle of posterior margin dividing it into 2 suboval groups of small dark spines on each side; ninth sternum (Fig. 25) rounded laterally, tapered at mid-length, convex basally, apex emarginate, forming 2 short, lateral, rounded lobes; dististyles having 20 small spines in middle of dorsal region. Female genitalia with "ovipositor" about 1.37 mm. long from eighth sternum to apices of cerci.

DISTRIBUTION

In North America, *B. nix* has been collected in the Wran-

gell Mountains of Alaska, in southern British Columbia, Canada (Map 7), and in western Montana in the United States (Carpenter, 1935, 1936; Penny, 1977), this suggests that the species may inhabit the length of the Rocky mountains in British Columbia.

SEASONAL OCCURRENCE AND HABITAT

Adults have been collected from December 21 to April 21. Penny (1977) reported this species to be found at an elevations between 427 to 610 m.

REMARKS

In *B. nix* the pronotum generally bears numerous short setae and two indistinct ridges.

SPECIMENS EXAMINED

13 males and 8 females.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	U.	Collection:
BRITISH COLUMBIA.						
Ashnola						
- Flat Iron Mountain						
	02-IV -1961	P. R. Grant		1		S.E.M.
	08-IV -1962	P. R. Grant	5			S.E.M.
	18-IV -1964	P. R. Grant	2			S.E.M.
- Valley floor						
	23-II -1963	P. R. Grant	1			S.E.M.
	23-II -1963	P. R. Grant	2	1		C.N.C.
Madeline Lake	24-XII-1980	S. G. Cannings	1			S.E.M.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M. F. U.	Collection:	
Manning Park	06-III-1983	S. G. Cannings	1	S.E.M.	
Okanagan Falls	23-XII-1981	S. G. Cannings	1	S.E.M.	**
Penticton	21-IV -1976	J. A. Garland	1	L.E.M.	
	21-XII-1982	S. G. Cannings	2	S.E.M.	
- Campbell Mountain	24-XII-1982	S. G. Cannings	1 1	S.E.M.	
Vaseux Lake	23-XII-1980	R. J. Cannings	1 1	S.E.M.	

Boreus reductus Carpenter, 1933.

Boreus reductus Carpenter, 1933:94-95, fig. 1A. Holotype male (C.N.C.). Type-locality CANADA: *British Columbia*, Kaslo.

Euboreus reductus (Carpenter) Lestage, 1940.

REDESCRIPTION

General body colour of dry specimens: black with white pleura; alcohol specimens: dark brown to black with white pleura. General body length in alcohol specimens: male 2.88 mm; female 3.7 mm.

Head: rostrum with many long fine setae near bases of antennae. **Thorax** (Fig. 36): smooth, having neither conspicuous transverse ridges nor bristles on pro-, meso- and metanotum. Male fore wings (Fig. 10) slender, having 16 to 19 outer and 19 inner black, sharp spines, inner margin smoothly curved, covered with rather long, thin whitish setae. Female fore wings (Figs. 13, 36) reduced to small, subtriangular vestiges, not overlapping hind

wings. Legs with both whitish and dark setae. **Abdomen:** Male genitalia with ninth tergum (Fig. 19) divided into 2 narrowly joined rectangular groups of small, dark spines, anterior margin with a hood extending to mid-length of each rectangular area, without medial cleft; ninth sternum (Fig. 26) of a inverted T-shape, convex basally, apex truncate, almost reaching bases of dististyles; latter with about 13 small spines situated from near apex to mid-length of outer lobe's dorsal margin. Female genitalia with "ovipositor" 1.34 mm. long from eighth sternum to apices of cerci.

DISTRIBUTION

In North America, *B. reductus* is known to occur in Canada (Map 8) from southern British Columbia, whence it extends southward to Washington, Montana, Idaho and Nevada in the United States (Carpenter, 1933, 1935; Byers, 1954; Chapman, 1954; Penny, 1977).

SEASONAL OCCURRENCE AND HABITAT

Adults have been collected from December 21 until February 23. They are known to inhabit clubmosses of the genus *Selaginella* (Penny, 1977).

REMARKS

Males of *B. reductus* can easily be recognized by the long, whitish pilosity of the wings. In the female this is the only species with subtriangular wing vestiges.

SPECIMENS EXAMINED

17 males and 33 females.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M. F. U.	Collection:
BRITISH COLUMBIA.				
Ashnola, valley floor				
	23-II -1963	P. R. Grant	1	C.N.C.
Gillies Creek	27-XII-1981	S. G. Cannings	1	S.E.M.
Kamloops	04-II -1945	E. R. Buckell	6 9	C.N.C.
Kaslo	29-XII-1906	?	2	U.A.
	29-XII-1906	?		
		(HOLOTYPE)	1	C.N.C.
	29-XII-1906	?		
		(ALLOTYPE)	1	C.N.C.
Lillooet	? - I -1917	F.A.Y.		
		(PARATYPE)	1	C.N.C.
Madeline	24-XII-1980	S. G. Cannings	6 13	S.E.M.
Penticton	21-XII-1982	S. G. Cannings	1	S.E.M.
Skaha Lake	27-XII-1981	S. G. Cannings	2 3	S.E.M. **
Vaseux Lake	23-XII-1980	R. J. Cannings	4 4	S.E.M.

Boreus californicus Packard, 1870.

Boreus californicus Packard, 1870:408. Lectotype male (M.C.Z.). Type-locality UNITED STATES OF AMERICA: *California*, Ft. Bidwell, Siskiyou.

Boreus unicolor Hine, 1901:256. Lectotype female (U.S.N.M.). Type-locality UNITED STATE OF AMERICA: *Montana*, Helena. Synonymized by Penny (1977).

Boreus isolatus Carpenter, 1935:115, fig. 11. Holotype male (M.C.Z.). Type-locality UNITED STATES OF AMERICA: *Montana*, Como Lake, Ravalli Co.

Boreus californicus fuscus Carpenter, 1935:117-118. (M.C.Z.). Synonymized by Penny (1977).

Euboreus isolatus (Carpenter) Lestage, 1940.

Euboreus unicolor (Hine) Lestage, 1940.
Euboreus californicus (Packard) Lestage, 1940.

REDESCRIPTION

General body colour of dry specimens: black. General body length of specimens in alcohol: male 3.3 mm; female 4.95 mm.

Head: apex brown to black, rostrum yellowish to brown. **Thorax:** reddish to dark brown. Pronotum (Figs. 30, 37) smooth, shiny, with 2 indistinct transverse sulci giving it, laterally, a three-humped aspect, without bristles. Male fore wings (Fig. 11) yellow to dark yellow, narrow at middle where wings become more slender, covered with numerous fine setae, with 15 to 23 inner and 7 to 13 outer black sharp spines. Female fore wings (Fig. 30), yellowish, covered with fine setae. Legs yellowish with dark spines. **Abdomen:** reddish to black. Male genitalia with ninth tergum boomerang-shaped (Fig. 20), with a hood in middle, a vertical cleft dividing it into two lateral downward projections, latter with about 26 black spines; ninth sternum (Fig. 27); dististyles bearing numerous spines along mid-dorsal margin of outer lobe, inner lobe blunt. Female genitalia with the "ovipositor" about 1.54 mm. long from eighth sternum to apices of cerci.

DISTRIBUTION

In North America, *B. californicus* has a wide western range. There are isolated boreal records from the Yukon and northern Manitoba, but the central distribution is in Alberta, southern British Columbia (Map 9), Washington, Mon

tana, Idaho and Oregon, from where it continues southwards to California, Nevada and Arizona (Hine, 1901; Carpenter, 1931a, 1935; Byers, 1954; Chapman, 1954; Penny, 1977). It is possible that this species may be found in the Wrangell Mountains of Alaska.

SEASONAL OCCURRENCE AND HABITAT

Adults have been collected from October 3 until June 12, so that *B. californicus* has the longest seasonal occurrence of any Canadian species of the genus. Adults have been found at elevations between 1220 and 3142 m. in the Rockies of central Arizona to British Columbia (Penny, 1977), and in the Yukon from 808 to 976 m. Recorded temperatures at times of collection are between -5 and +3° C., on both fresh and old snow as well as on ice.

REMARKS

This is the only Canadian species to have yellowish legs with dark spines. It can also be separated from other boreids, except *B. reductus*, by the lack of bristles on the pronotum.

SPECIMENS EXAMINED

69 males, 114 females.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
ALBERTA.								
Banff	?	-II	-1920	N. B. Sansor	1	1		C.N.C.
Jasper Nat. Park								
- Cavell Cr.	03-	X	-1964	A. Nimmo	13	39		U.A.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	U.	Collection:	
- Cavell Cr.	2-4-X -1964	?		1		U.A.	
Kananaskis	30-III-1949	W. C. McGuffin	4	3		C.N.C.	
BRITISH COLUMBIA.							
Akolkolex Creek and Columbia River	24-II -1980	J. G. Woods	1			S.E.M.	
Chekamus Lake	15-III-1980	L. Pope	1	2		S.E.M.	
Ellis Creek	21-XII-1982	S. G. Cannings		2		S.E.M.	
Gillies Creek	27-XII-1981	S. G. Cannings		1		S.E.M.	
Kaslo	29-XII-1906	?	3	1		U.A.	
	29-XII-1906	?	1	1		C.N.C.	
	01-III-1908	J. W. Cockle	7	8		C.N.C.	
Lillooet	? - I -1917	F. A. Y.	3			C.N.C.	
Lytton,							
- Botaniel	31-III-1983	C. S. Guppy	1	3		S.E.M.	
Madeline Lake	24-XII-1980	S. G. Cannings	1			S.E.M.	
Manning Park,							
- Chuwanten Creek	01-III-1981	S. G. Cannings	1			S.E.M.	
- Fat Dog Creek	31-XII-1983	R. J. Cannings		1		S.E.M.	
- Lighting Lakes	18-II -1983	S. G. Cannings	1			S.E.M.	
- Similkameen River	20-II -1982	S. G. Cannings	4			S.E.M.	**
Mara	? -1927	H. J. Blurton	1			C.N.C.	
Mt. Revelstoke Nat. Park	26-XI -1978	J. G. Woods	2	2		C.N.C.	
	17-XII-1979	J. G. Woods		2		S.E.M.	
	10-II -1980	J. G. Woods		2		S.E.M.	
	14-III-1980	J. G. Woods	5	4		C.N.C.	

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:	
Nelson,									
- Barret G.	08-	III-	1982	P. W. Wood	1	2		S.E.M.	
- Ymir	10-	I -	1982	P. W. Wood	2	5		S.E.M.	
Okanagan Falls									
	23-	XII-	1981	S. G. Cannings	1			S.E.M.	**
Penticton	24-	XII-	1980	S. G. Cannings		3		S.E.M.	
	21-	XII-	1982	S. G. Cannings		1		S.E.M.	
	17-	XI -	1984	S. G. Cannings		1		S.E.M.	
Salmon Arm	05-	III-	1925	E. R. Buckell		1		C.N.C.	
	24-	XI -	1932	H. B. Leech	15	14		S.E.M.	
	24-	XI -	1932	H. B. Leech		2		U.A.	
Slocan,									
- South Slocan									
	05-	I -	1982	P. W. Wood		1		S.E.M.	
- Lemon Cr.	21-	III-	1983	P. W. Wood	1	1		S.E.M.	
Springhouse	26-	X -	1975	J. R. Spence	1	4		U.A.	
Squamish,	23-	II -	1964	P. R. Grant		2		S.E.M.	
- Paradise Valley									
	24-	XI -	1963	P. R. Grant		2		S.E.M.	
Vaseux Lake	23-	XII-	1980	R. J. Cannings	2	2		S.E.M.	
MANITOBA.									
Churchill, Farnworth Lake									
	12-	VI -	1952	J. G. Chillcott	1			C.N.C.	
YUKON.									
Kluane Nat. Park									
- Boutellier Creek									
	26-	IV-	1982	S. G. Cannings	2			S.E.M.	**
- Christmas Creek									
	26-	IV-	1982	S. G. Cannings	1			S.E.M.	**
- Hungry Lk.	15-	VI-	1982	S. G. Cannings	1			S.E.M.	**

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:	
- Sheep Cr.	29-	IV-	1982	S. G. Cannings	5			S.E.M.	**
- Silver Cr.	19-	IV-	1982	S. G. Cannings	4	1		S.E.M.	**
	23-	IV-	1982	S. G. Cannings		1		SNOW	**
	12-	IV-	1982	S. G. Cannings	1			SNOW	**
Sulphur Lake	20-	IV-	1982	S. G. Cannings		2		S.E.M.	**

Boreus borealis Banks, 1923.

Boreus borealis Banks, 1923:158, plate 9, fig. 8. Syntypes male and female (M.C.Z.). Type-locality UNITED STATES OF AMERICA: *Alaska*, St. Paul Island, Bering Sea.

DESCRIPTION

General body length of pinned specimens: male 5 mm.; female 5.4 mm.

Head: apex dark brown shading to light brown on rostrum. **Thorax:** dark brown. Pronotum with two lateral incisions and without bristles; meso- and metanotum without bristles. Male fore wings yellowish-brown, abruptly narrowed at mid-length, with 36 inner and 13 outer fore wing spines. Female fore wings oval, covering hind wings. Legs light brown with numerous lighter coloured setae. **Abdomen:** of males glossy black with some blue reflections; of females dark brown dorsally and lighter brown ventrally. Male genitalia with ninth tergum bearing a large hood extending laterally to outer edge of spinose area; ninth sternum smoothly rounded at apex, reaching to bases of dististyles; latter with about 21 spines. Female genitalia having a

ratio length of ovipositor to rostrum, of 1.05.

DISTRIBUTION

B. borealis has been collected only from St. Paul Island in the Pribilofs, Alaska (Map. 10), which has a maximum elevation of about 62 m. and a dominant vegetation of cottonsedge tundra.

REMARKS

This species is structurally similar to *B. californicus*; males can be identified by the large number of setae lining the tergal hood; females can only be determined by locality.

SPECIMENS EXAMINED

None. (Description taken from Banks, 1923, and Penny, 1977)

Boreus intermedius Lloyd, 1934.

Boreus intermedius Lloyd, 1934:119-120. Holotype male (W.S.M.). Type-locality UNITED STATES OF AMERICA: *Alaska*, between Kennicott and McCarthy.

DESCRIPTION.

General body length of pinned specimens: male 3.5 mm.; female 4.5 mm.

Head: black shading to yellowish brown on rostrum. **Thorax:**

dark brown on nota becoming yellowish brown on pleural and sternal regions. Pronotum with indistinct ridge at mid-length, no bristles; meso- and metanotum without bristles. Male fore wings yellowish brown, with 33 inner and 10 outer fore wings spines. Female fore wings yellowish brown, oval, covering hind wings. **Abdomen:** male with segments 1 through 8 dark brown, segment 9 yellowish brown; female with first 7 segments black, last 3 visible segments yellowish brown. Male genitalia with ninth tergum having a large hood, extending laterally to lateral margins of spine groups of about 75 each; ninth sternum truncate apically, reaching bases of dististyles. Female genitalia having a ratio of length of ovipositor to rostrum of 1.14.

DISTRIBUTION

This species has only been collected between Kennicott and McCarthy in the Wrangell Range in Alaska (Map 10).

REMARKS

Males of *B. intermedius* can be separated from those of *B. californicus* and *B. borealis* by the septum of the ninth tergal hood which is short and deeply divided ventrally.

SPECIMENS EXAMINED

None. (Description taken from Lloyd, 1934, and Penny, 1977)

BITTACIDAE Enderlein, 1910.

Bittacidae Enderlein, 1910:385-399.

Long-legged hangingflies, slender Mecoptera having tarsi with single claw adapted for grasping by folding against tarsomere 4 basal region of wing tapered, Sc vein shortened, M4b vein absent, and a pterostigmal vein present (Penny, 1975).

DISTRIBUTION

According to Byers (1979), Penny and Byers (1979), and Villegas and Byers (1981), the Bittacidae comprise 146 known species which are grouped into 15 genera distributed throughout the world. The most widespread genus is *Bittacus* which occurs in Europe, Asia, Africa and North and South America. Six other genera are to-day confined to South and Central America: *Kalobittacus* (3 spp.; Mexico, Honduras, Panamá), *Nannobittacus* (2 spp.; Panamá, Colombia, Venezuela, Brazil), *Pazius* (6 spp.; Panamá, Venezuela, Ecuador, Perú, Brazil), *Issikiella* (1 sp.; Brazil), *Neobittacus* (2 spp.; Brazil) and *Anabittacus* (1 sp.; Chile, Argentina). Four genera are endemic to Australia: *Austrobittacus* (1 sp.), *Edriobittacus* (1 sp.), *Harpobittacus* (12 spp.) and *Tytthobittacus* (1 sp.). *Anomalobittacus* (1 sp.) is confined to south Africa. Three genera are found only in North America: *Apterobittacus* (1 sp.) and *Orobittacus* (1 sp.) both restricted to California, and *Hylobittacus* (1 sp.) in eastern United States. *Bittacus* (Fig. 41) is the only genus considered here.

Bittacus Latreille, 1805.

Bittacus Latreille, 1805:20. Type-species: *Bittacus italicus* Müller.

Leptobittacus Hine, 1898:108.

Thyridates Navás, 1908:412; *Diplostigma* Navás, 1908:413; *Haplodictyus* Navas, 1908:413. Synonymized by Banks (1913).

Klugius Navás, 1926.

REDESCRIPTION

Head: small, yellow to dark brown; eyes large; ocelli large, forming an inverted triangle; antennae long, filiform, sometimes pilose, with 16 to 20 articles; maxillary and labial palpi consisting of five and two articles respectively. **Thorax:** yellow to dark brown. Wings long, narrow basally, usually tinged with yellow or brown, some species with maculate wings (Byers, 1965; Londt and Byers, 1974); pterostigma pale to brown; cross-veins usually with dark margins; [the Nearctic fauna presents three notable features of cross-vein venation which are of importance in identification (Carpenter, 1931a): presence or absence of anal cross-vein; position of Sc cross-vein with respect to first fork of Rs vein; and, usually, two pterostigmal cross-veins (Fig. 42)]. Legs yellow to reddish, elongate, slender; coxae large, stout, tapered apically; hind femora (especially in males) often swollen; tibiae long, slender, with two long sharp spurs; tarsi with 5 articles bending inward and with a single opposable claw. **Abdomen:** elongate, narrow basally, pale yellow to dark brown. Male genitalia with ninth tergum consisting of two large and partially diverging lateral lobes or claspers usually extending beyond apices of basistyles, covering dorsal parts of genitalia;

uncus (of Setty, 1940), in form of an elongate process of tenth tergum situated above anus, generally projecting outwards and upwards between lobes of ninth tergum; cerci variable; basistyles broad, fused ventrally , each holding a very small dististyle; aedeagus thick basally with a coiled phallic filament differing greatly in length according to species; parameres lateral elongate, lobe-shaped, anteriorly curved. Female genitalia lacking genital plate, abdomen truncate apically; subgenital plate formed by fusion of ninth and tenth sterna divided into two sclerotized subtriangular plates, a triangular membranous area or conjunctiva (of Setty, 1940) lying between latter, each plate bearing several small fine setae anteriorly and dark thicker ones posteriorly; cerci variable in length, usually slender, unsegmented.

DISTRIBUTION

Bittacus is represented by 111 described species (Penny and Byers, 1979) found in the Nearctic, Neotropical (Central and South America), Palaearctic (southern Europe, China, Korea, Japan), Oriental (India, Thailand), Ethiopian (eastern, central, southern Africa) and Australian regions. In North America, eight species of this genus extend from Mexico throughout central and eastern United States, only three of these are known to occur in Canada, in southern Manitoba, Ontario and Quebec. One other species occupies a disjunct range in western California.

Bittacus occidentis has been recorded from "Canada" by Webb *et al.* (1975) based on Hine's (1901) record (pers. comm.). However, I did not find specimens of the aforementioned species in any of the insect collections examined.

KEY TO ADULT CANADIAN *Bittacus* SPECIES.

1. Anal cross-vein present (Fig. 42); projection of tenth abdominal tergum of male conspicuous; apices of cerci pointed; outer edge of female subgenital plate concave near mid-length (Fig. 48)..... ..... ***B. pilicornis.***

-- Anal cross-vein absent (Figs. 43, 44); projection of tenth abdominal tergum largely obscured or concealed by ninth tergum; apices of cerci rounded ..... 2.

2. Wings uniformly pale amber-coloured, pterostigma slightly darker (Fig. 43); legs dark yellow; femora slightly swollen; outer edge of female subgenital plate outwardly curved from base to three-quarters of its length (Fig. 49)..... ***B. stigmaterus.***

-- Wings clear, margins of cross-veins slightly darkened, pterostigma pale brown (Fig. 44); legs yellow, hind femora cylindrical; outer edge of female subgenital plate with a small acute protuberance in middle (Fig. 50)..... ***B. strigosus.***

Bittacus pilicornis Westwood, 1846.

Bittacus pilicornis Westwood, 1846:196. Type-specimen missing (Byers, 1962a). Type-locality UNITED STATES OF AMERICA, America Septentrionale.

REDESCRIPTION

Head: Brown to dark brown; antennae with long fine pile. **Thorax:** reddish brown to dark brown. Wings (Fig. 42) usually pigmented; pterostigma very pale, lighter than in *B. strigosus*; Sc cross-vein basal to first fork of

Rs vein; two pterostigmal cross-veins present; anal cross-vein present. Legs yellowish to reddish; hind femora cylindrical not swollen. **Abdomen:** Reddish to brown. Male genitalia (Fig. 45) ninth tergal lobes, in lateral view, basally constricted, broad in the middle, pointed at apex, not reaching apices of basistyles, in dorsal view, broad anteriorly, lobes of inner margins forming a deep V-shaped emargination, rounded at base, apex pointing outward; tenth tergum (uncus) broad basally, emerging between inwardly projecting tergal lobes, divided into two fine branches, posterior wider than anterior, both with numerous brown setae spines; basistyles broad, rounded at apices; aedeagus broad at base, tapering into a coiled thread; parameres spatulate, rounded at apices, constricted at bases, curved inwards, covering coiled thread-like apex of aedeagus; cerci relatively elongate, reaching apices of basistyles. Female genitalia with subgenital plate (Fig. 48) divided along medial line, each plate produced into subsidiary protuberance on outer edge, the latter forming a median concavity; a heavily sclerotized band along of outer margin, basally more submarginal.

DISTRIBUTION

In Canada (Map 11), *Bittacus pilicornis* has been collected only in a few localities in southern Ontario and Quebec. In the United States, it ranges from New Hampshire, westwards to Minnesota, continuing southwards to Mississippi, Alabama and Georgia (Banks, 1892; Hine, 1901; Sherman, 1908; Engelhardt, 1915; Carpenter, 1931a, 1932; Setty, 1940; Cole and Gillespie, 1950; Byers, 1954, 1958, 1973a; Barnes, 1956; Caron, 1967; Thornhill and Johnson, 1974; Webb *et al.*, 1975; Byers and Covell, 1981).

SEASONAL OCCURRENCE AND HABITAT.

Adults have been collected as early as June 4, and thereafter until August 17. Byers (1954) reported this species as being found in deep-shaded, damp, cool woodlands with leafy undergrowth, and Webb *et al.* (1975) found it to inhabit jewelweed (*Impatiens* sp.), stinging wood nettle (*Laportea* sp.) and wild gooseberry (*Ribes* sp.).

REMARKS

This species is darker and slightly larger than *B. strigosus*. It possesses setae on antenna longer than usual, has an anal cross-vein which easily separates it from both the latter and from *B. stigmaterus*. Males possess pointed cerci; the subgenital plate of the female has a more or less convex sclerotization facing the outer margin.

SPECIMENS EXAMINED

14 males and 21 females.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	U.	Collection:
ONTARIO.						
Essex Co.						
Point Pelee	08-VII -1927	F. P. Ide	1			C.N.C.
Haldimand Co.						
Fishers Glen	01-VII -1925	G. S. Walley	1	1		C.N.C.
Normandale	29-VI -1925	G. S. Walley		1		C.N.C.
	10-VII -1925	G. S. Walley		1		C.N.C.
	27-VI -1939	G. S. Walley	1			C.N.C.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
QUEBEC.								
Deux-Montagnes Co.								
La Trappe	06-	VII	-1934	J. Ouellet	1			U.D.M.
	05-	VII	-1943	J. Ouellet	1			U.D.M.
	21-	VII	-1943	J. Ouellet		1		U.D.M.
	31-	VII	-1943	J. Ouellet	1			U.D.M.
	27-	VII	-1944	J. Ouellet		1		U.D.M.
	01-	VII	-1944	J. Ouellet		1		U.D.M.
	17-	VIII	-1944	J. Ouellet		1		U.D.M.
Vaudreuil Co.								
Ile-Perrot	04-	VI	-1975	J. A. Garland	1	3		L.E.M.
	26-	VI	-1975	J. A. Garland	1			L.E.M.
	28-	VI	-1975	J. A. Garland	2	2		L.E.M.
	29-	VI	-1980	J. A. Garland	1	4		L.E.M.
	24-	VI	-1980	J. A. Garland	3	3		L.E.M.
	06-	VII	-1980	J. A. Garland		1		L.E.M.
	23-	VII	-1985	J. A. Downes		1		L.E.M.

Bittacus stigmaterus Say, 1823.

Bittacus stigmaterus Say, 1823:164. Type-specimen missing (Webb *et al.*, 1975). Type-locality UNITED STATES OF AMERICA: *Missouri*, Fort Osage.

Bittacus pallidipennis Westwood, 1846:195. Syntype male (B.M.N.H.). Type-locality unknown. Synonymized by Hagen, 1861.

REDESCRIPTION

Head: Yellow to dark brown. Thorax: yellow to dark brown. Wings (Fig. 43) pale amber-coloured ; pterostigma

pale; cross-veins usually margined; Sc cross-vein basal to first fork of Rs vein; two pterostigmal cross-veins present; anal cross-vein absent. Legs dark yellow; femora slightly swollen. **Abdomen:** Pale yellow to dark brown. Male genitalia (Fig. 46) with ninth tergal lobes, in lateral view, elongate, narrowly rectangular, extending beyond apices of basistyles; in dorsal view pointing inwards, elongate, with two small medial projections and a small patch of spines on inner side of each lobe; tenth tergum (uncus) tapered upwards, tip curved to point posteriorly, concealed between ninth tergal lobes; basistyles broad; dististyles short, pointed apically; aedeagus thickened basally; parameres each reduced to a small roundish protuberance; cerci slender, narrow, somewhat rounded apically, extending beyond apices of basistyles. Female genitalia with subgenital plate (Fig. 49) divided along median line, outer margin curved outward from base to two-thirds of its length, a median wedge-shaped sclerotization enclosed in each half of plate.

DISTRIBUTION

Bittacus stigmaterus has rarely been collected in Canada (Map. 12), only three localities in southern Ontario being known. In the United States of America, it has been recorded from some central and many eastern states, ranging from Connecticut westward to Minnesota, continuing southward to Texas, the southernmost locality (Banks, 1892; Hine, 1898, 1901; Engelhardt, 1915; Carpenter, 1931a, 1936; Setty, 1940; Byers, 1954, 1958, 1973a; Barnes, 1956; Caron, 1967; Thornhill and Johnson, 1974; Webb *et al.*, 1975; Byers and Covell, 1981).

SEASONAL OCCURRENCE AND HABITAT

Adults of *B. stigmaterus* were collected from August 6 to September 10. Thornhill and Johnson (1974) recorded this species as occurring in mesic deciduous forest with an undergrowth of lobelia (*Lobelia* sp.), sunflower (*Helianthus* sp.), bramble (*Rubus* spp.) and horse-balm (*Collinsonia canadensis*).

REMARKS

This species can be differentiated from *B. strigosus* by its amber-coloured wings. Males have slender, more or less straight, cerci. The subgenital plate of the female has a darkened wedge-shaped sclerotization within each half.

SPECIMENS EXAMINED

1 male, 1 female and 1 sex unknown.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	U.	Collection:
ONTARIO.						
Essex Co.						
Kingsville	06-VIII-1973	R. E. Roughley	1			U.G.
Kent Co.						
Rondeau Park	10-IX -1954	W. R. Mason		1		C.N.C.
Lambton Co.						
Petrolia	20-VIII-1979	K. L. Runciman			1	U.G.

Bittacus strigosus Hagen, 1861.

Bittacus strigosus Hagen, 1861:246. Syntypes: 2 males[7], 1 female (M.C.Z.), Type-locality UNITED STATES OF AMERICA: *Illinois*, Chicago; *Missouri*, St. Louis; Washington D.C.

Leptobittacus strigosus (Hagen, 1861) Hine, 1898, pl. 1, figs. 1-6, 9-11; pl. 2, figs. 5, 6.

REDESCRIPTION

Head: brown to dark brown. **Thorax:** yellow to reddish brown. Wings (Fig. 44) clear; pterostigma pale brown; cross-veins margined, several apical ones only faintly so; Sc cross-vein basal to first fork of Rs vein; two pterostigmal crossveins present; anal cross-vein present. Legs yellow; hind femora cylindrical. **Abdomen:** reddish to dark brown. Male genitalia (Fig. 47) ninth tergum lobes, in lateral view, broad basally, narrow apically, apex rounded and with long, black setae and spines, extending beyond apices of dististyles; lobes in dorsal view constricted basally, outer margins of lobes curved inward, inner margins forming a deep, V-shaped emargination; tenth tergum (uncus) slender, tapered, curved inward in lateral view, with several short fine setae at tip, usually concealed between ninth tergal lobes; basistyles subrectangular, posterior aspect rounded, bearing numerous short fine setae; dististyles broad, elongate, rounded at tip; aedeagus stout at base, projecting in form of a long, slender coiled thread;

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7. One of these males should later be designated as lectotype, but as they have not been examined, no such designation is yet possible.

parameres elongate, rounded at apices, rather flat, spatulate, pointing upwards and lacking setae; cerci broad basally, elongate, apices curved upwards, extending to tip of ninth tergal lobes. Female genitalia with subgenital plate (Fig. 50) divided along medial line, each part elongate, with a central strongly sclerotized, rounded region, outer edge with a small acute protuberance in middle.

DISTRIBUTION

B. strigosus (Fig. 41) has a wide distribution in eastern and central North America. In Canada (Map 13), it is the commonest species of *Bittacus*. It is found in southern Manitoba, Ontario and Quebec. In the United States, it extends from New England to Montana and North Dakota, continuing south to Louisiana and thence to North Carolina (Banks, 1892; Hine, 1898, 1901; Engelhardt, 1915; Carpenter, 1931a, 1932, 1936, 1939; Setty, 1940; Cole and Gillespie, 1950; Byers, 1954, 1958, 1973a; Caron, 1967; Thornhill and Johnson, 1974; Webb *et al.*, 1975; Byers and Covell, 1981).

SEASONAL OCCURRENCE AND HABITAT.

Adults of *B. strigosus* have been collected from June 10 to September 22. They are known to inhabit shady moist woodlands (Engelhardt, 1915; Carpenter, 1931a) of sugar maple (*Acer saccharum*), chinquapin oak (*Quercus* sp.), American elm (*Ulmus americana*) and black hickory (*Carya* sp.) (Byers, 1954).

REMARKS

The wings of this species are clear and do not possess

an anal cross-vein. The ninth tergum of the male bears long dark setae at the tip and long, more or less twisted, cerci; the subgenital plate of the female has a rounded sclerotization in middle of each side.

SPECIMENS EXAMINED

157 males, 183 females and 23 sex unknown.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	U.	Collection:
MANITOBA.						
Beaconia	23-VII -1976	E. E. Adams		1		U.M.
Glenlea	13-20-VII-84	-?	8	4		U.M.
Barrier (Bay or Lake ?)						
	15-VII -1980	R. W. Currie	2	1		U.M.
	23-VIII-1980	R. W. Currie	1			U.M.
Morden	10-VIII-1985	J. L___		1		U.M.
St. Francois Xavier						
	20-VII -1978	E. E. Adams	1	1		U.M.
St. Norbert	29-VII -1978	K. M. McGinnis		1		U.M.
Rathwell	06-IX -1970	D. G. Delf			1	U.M.
Winnipeg	06-VIII-1935	R. R. Lejeune	1	3	1	U.M.
	25-VII -1978	P. Kok		1		U.M.
	18-VII -1983	T. V. Suzanski			?	U.M.
?	15-VIII-1971	K. Hof		1	1	U.G.
ONTARIO.						
Carleton Co.						
Bells Corners	23-VIII-1970	F. Brodo	1			C.U.
Merivale	19-VII -1930	J. J. deGryse		1		C.N.C.
	28-VII -1930	J. J. deGryse		1		C.N.C.
	04-VIII-1930	J. J. deGryse		1		C.N.C.
	16-VIII-1930	J. J. deGryse	3			C.N.C.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	U.	Collection:
Ottawa	28-VII -1946	A. R. Brooks		1		C.N.C.
	12-VIII-1962	B. S. Heming		1		U.G.
Richmond	28-VII -1971	J. E. Martin	3	6		C.N.C.
	25-VII -1972	J. E. Martin	1			C.N.C.
	30-VII -1972	J. E. Martin	1			C.N.C.
Elgin Co.						
Port Stanley	01-VIII-1922	?		2	2	U.G.
Saint Thomas	25-VII -1924	H. G. D___	1			C.N.C.
Essex Co.						
Kingsville	12-VIII-1973	R. E. Roughley	1			U.G.
	08-VII -1977	A. A. Konecny	3			U.G.
	08-VII -1977	E. A. Innes	1	2		U.G.
	08-VII -1977	W. A. Attwater	1	2	1	U.G.
	08-VII -1977	K. Barber	3	1		U.G.
	06-VIII-1978	R. E. Roughley	1			U.G.
Point Pelee	09-IX -1954	C. D. Miller		1		C.N.C.
	30-VI -1978	W. A. Attwater		1		U.G.
	01-VII -1978	R. O. Kreuzer		1	1	U.G.
	28-VII -1978	W. A. Attwater		1		U.G.
	30-VII -1978	W. A. Attwater		1		U.G.
	30-VII -1978	D. Morris		2		U.G.
	30-VII -1978	J. Cappleman			1	U.G.
	31-VII -1978	W. A. Attwater	3	2	2	U.G.
	31-VII -1978	D. Morris		1		U.G.
	24-VII -1979	D. Morris		2		U.G.
Pelee Island	15-VII -1956	J. Kalff		1	1	U.G.
Windsor	24-VII -1984	M. T. Kasserra	1	1		U.G.
Woodslee	16-VIII-1976	J. F. Fortin	2	1	1	U.G.
Grenville Co.						
Prescott	11-VIII-1985	J. R. Vockeroth		1		C.N.C.
Spencerville	17-VIII-1979	H. Goulet		1		C.N.C.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	U.	Collection:
Haldimand Co.						
Simcoe	12-VII -1943	T. N. Freeman	1	2		C.N.C.
Halton Co.						
Halton Hills	17-VII -1981	J. Kircher	1	2		U.G.
Kelso	23-VII -1981	J. Kircher		1		U.G.
Milton	01-VIII-1974	P. G. Mason		1		U.G.
Hastings Co.						
Marmora	21-VII -1952	J. R. Vockeroth	1			C.N.C.
Tweed	15-VII -1944	G. S. Walley		1		C.N.C.
	18-VII -1944	G. S. Walley		1		C.N.C.
Kent Co.						
Rondeau Park	10-IX -1954	W. R. Mason		1		C.N.C.
Wheatly	21-VII -1976	E. A. Innes	1	1		U.G.
Lambton Co.						
Grand Bend	14-VII -1939	G. E. Shewell	9	5		C.N.C.
	19-VII -1939	G. E. Shewell	6	8		C.N.C.
Lanark Co.						
Glen Tay	20-VII -1985	J. A. Downes	4	4		L.E.M.
Stanleyville	27-VII -1985	J. A. Downes	1	3		L.E.M.
	27-VII -1985	A. Aranguren & J. A. Downes	2			L.E.M.
	22-IX -1985	J. A. Downes		3		L.E.M.
Leeds Co.						
Rockport	05-VIII-1985	J. R. Vockeroth		1		C.N.C.
St. Lawrence Is. Nat. Park						
- Grenadier Island						
	21-VII -1975	J. E. Martin & __ Parks	1	4		C.N.C.
	01-VIII-1975	E. Sigler		1		C.N.C.
- Lindsey Island						
	18-VII -1976	__ Carter	2			C.N.C.
	04-VIII-1976	__ Reid		1		C.N.C.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	U.	Collection:
- McDonald Island						
	14-VII -1976	__ Carter		1		C.N.C.
	15-VII -1976	__ Reid		1		C.N.C.
	18-VII -1976	__ Carter		1		C.N.C.
	20-VII -1976	__ Reid		1		C.N.C.
	30-VII -1976	__ Reid		1		C.N.C.
	14-VIII-1976	__ Carter		1		C.N.C.
- Thwartway Island						
	10-VII -1975	E. Sigler		1		C.N.C.
	17-VII -1976	__ Carter			1	C.N.C.
	06-VIII-1976	__ Carter	1			C.N.C.
	19-VIII-1976	__ Reid		1		C.N.C.
Lincoln Co.						
Clinton	29-VII -1963	J. D. Van Loon		1		U.G.
Vineland	28-VII -1938	D. A. Ross	1			U.G.
Middlesex Co.						
Lobo	27-VIII-1924	H. F. Hudson	2	1		C.N.C.
Peel Co.						
Caledon East	24-VII -1979	S. Beierl		1		U.G.
Erindale	25-VII -1933	E. M. W___		3		R.O.M.
	26-VII -1933	E. M. W___	2	2	1	R.O.M.
Snelgrove	30-VII -1952	G. E. Wiggins	1			R.O.M.
Simcoe Co.						
Essa	29-VIII-1935	G. M. Walter		1	1	R.O.M.
Welland Co.						
Welland	? -1932	C. O. Selburn	1			U.G.
Wellington Co.						
Aberfoyle	23-VII -1974	N. Wilcox	1	2		U.G.
	23-VII -1974	P. G. Mason	3	1		U.G.
Guelph	08-VIII-1974	G. J. Umphrey	2	2		U.G.
	01-VIII-1984	M. D. Forward		1		U.G.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
Wentworth Co.								
Dundas	15	VII	-1975	J. M. Cummings	3		1	U.G.
York Co.								
Scarborough	04	VIII	-1934	F. P. Ide		2		R.O.M.
Toronto	10	VI	-1981	L. Coote		1		U.G.
QUEBEC.								
Berthier Co.								
Berthierville								
	23	VII	-1950	A. Robert	3	4		U.D.M.
	30	VII	-1950	A. Robert	5	1		U.D.M.
	20	VIII	-1950	A. Robert	3			U.D.M.
Deux-Montagnes Co.								
La Trappe	19	VII	-1943	J. Ouellet	1			U.D.M.
	28	VII	-1943	J. Ouellet		2		U.D.M.
	31	VII	-1943	J. Ouellet	4	1		U.D.M.
	03	VIII	-1943	J. Ouellet	1	5		U.D.M.
	05	VIII	-1943	J. Ouellet	3	1		U.D.M.
	19	VIII	-1943	J. Ouellet	1	1		U.D.M.
	20	VIII	-1943	J. Ouellet	1	2		U.D.M.
	11	VII	-1944	J. Ouellet	1			U.D.M.
	17	VII	-1944	J. Ouellet		1		U.D.M.
	20	VII	-1944	J. Ouellet	1	1		U.D.M.
Gatineau Co.								
Champlain Lookout								
	11	VIII	-1985	A. Aranguren & J. A. Downes	2	4		L.E.M.
Ile-de-Montreal Co.								
Sainte-Anne-de-Bellevue								
	19	VIII	-1938	?			1	L.E.M.
	19	VIII	-1938	?		1		L.E.M.
	22	VII	-1941	?			1	L.E.M.

Locality:	Date:	Collector:	Sex:			Collection:
	D. Mo. Y.		M.	F.	U.	
	19-VII - ?	A. Robert	6	5	3	U.D.M.
	17-VII -1945	A. Robert	10	5		U.D.M.
	19-VII -1945	A. Robert	1	2		U.D.M.
	27-VIII-1945	A. Robert		2		U.D.M.
	23-VI -1985	A. Aranguren		2		L.E.M.
	23-VII -1985	A. Aranguren	2			L.E.M.
	30-VII -1985	A. Aranguren	2	5		L.E.M.
	04-VIII-1985	A. Aranguren	4	3		L.E.M.
Missisquoi Co.						
Philipsburg	15-VII -1974	A. C. Sheppard		1		L.E.M.
Vaudreuil Co.						
Ile-Perrot	19-VII -1939	?			1	L.E.M.
	04-VII -1975	J. A. Garland	3	1		L.E.M.
	05-VII -1975	J. A. Garland	1			L.E.M.
	26-VII -1975	J. A. Garland	3	5		L.E.M.
	02-VIII-1975	J. A. Garland	5	5		L.E.M.
	09-VIII-1975	J. A. Garland	2	5		L.E.M.
	16-VIII-1975	J. A. Garland	3	3		L.E.M.
	27-VIII-1978	J. A. Garland	4	2		L.E.M.
	23-VII -1985	A. Aranguren	1			L.E.M.

PANORPIDAE Stephens, 1835.

Panorpidae Stephens, 1835.

Panorpidae, or typical scorpionflies (Fig. 51), are separated from other Canadian Mecoptera by the presence of serrate tarsi narrow, moderately elongate wings with distinctive markings, and by the bulbous male genitalia held on the strongly upwardly curving posterior segments of abdomen.

DISTRIBUTION

Panorpidae, according to Penny and Byers (1979), comprise 303 spp. in three genera: *Leptopanorpa* (13 spp.), *Neopanorpa* (95 spp.), both found in the Oriental region, and *Panorpa* (195 spp.) which is is widely distributed in both the Holarctic and Oriental regions and found in the Canadian fauna.

Panorpa Linnaeus, 1758.

Panorpa Linnaeus, 1758:551. Type-species: *Panorpa communis* Linnaeus.

Panorpha (*sic*) Radermacher, 1779, 1:100.

Aulops Enderlein, 1910:390. Synonymized by Esben-Petersen (1915).

Estenalla Navás, 1912:356. Synonymized by Esben-Petersen (1915).

REDESCRIPTION

Head: Yellow to dark brown; ocelli amber forming an inverted triangle; antennae filiform with more than 30

segments; rostrum elongated, tapered, mandibles large, strongly sclerotized with two subapical indentations; maxillary and labial palps with five and two segments respectively. **Thorax:** Yellowish to dark brown. Wings with membranes colourless to yellow and basal cross-veins usually with margins; wing pattern divided into pale to dark brown bands and spots which may vary in size and position depending, not only on the species, but in certain respects on the individual; thyridium at bifurcation of M vein. Legs yellow to brown with paired serrate claws. **Abdomen:** Yellowish to dark brown; sixth abdominal tergum of males of some species have an "anal" horn. Male genitalia with ninth tergum rounded at base, truncated or emarginate at apex, forming two lateral lobes; ninth sternum or hypovalves consisting mainly of two subparallel arms united only towards base, sometimes reaching base of dististyles; basistyles broad, oval, usually longer than dististyles; latter curved inward, scythe-shaped, simple or with large mesal lobes on ventral aspect; ventral parameres (ventral pseudoparameres of Willmann, 1981a) elongate, barbed, curved or rather straight, sometimes branched; dorsal parameres (dorsal pseudoparameres of Willmann, 1981a) variable in size and shape. Female genitalia usually well sclerotized, consisting of an oval, elongate, distal plate with emarginate apex, and often a basal plate with two lateral lobes and a medial bifurcation at free ends of spermathecal apodemes; subgenital plate usually oval, occasionally rounded, apex either pointed or notched, rounded at base, often with a strongly sclerotized but thin internal sheath; pleurites usually membranous, occasionally heavily sclerotized, usually triangular, posterior aspect notched, with a pleural fold extending from anterior to posterior aspect, formed by a lateral projection of internal lining of subgenital plate.

DISTRIBUTION

Panorpa is the largest genus in the Order Mecoptera. It contains 195 known species (Penny and Byers, 1979) found in the Nearctic, Palearctic and more northerly Oriental regions. In North America, *Panorpa* extends from central Mexico through the eastern and central United States (with isolated mountain records from Colorado and Utah) to east and central Canada; it is represented by 45 species of which only 12 are found in Canada, which occur from Newfoundland (Byers, 1969), across Quebec and Ontario only as far north as about 500 kilometers northwest of the St. Lawrence River and only as far west as eastern Manitoba. It is not known from Labrador.

In addition to the 12 species noted above, *P. rufescens* has been recorded from "Canada" by Hine (1901); however, Dr. D. W. Webb (pers. comm.) writes that this is the sole reason for the record in his paper (1975)[8]. I did not find specimens of the latter in any of the collections examined and there is no other evidence known to me that this species extends to Canada.

KEY TO ADULT CANADIAN SPECIES OF *Panorpa*.

A. MALES.

(With upwardly-curved bulbous apex of abdomen)

1. Anal horn absent, apical and pterostigmal wing bands usually divided into small spots..... .....(*nebulosa*-group)..... 2.

-- Anal horn present (Fig. 51), apical and pterostigmal wing bands usually entire, apical branch of pterostigmal wing band usually broken...(*rufescens*-group)... 6.

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8. The "record" goes back to Brodie and White (1883).

2. Upper inner margin of dististyles strongly concave, lower margin with an acute indentation (Fig. 42) .... ***P. submaculosa.***

-- Upper inner margin of dististyles slightly concave, lower margin without indentation..... 3.

3. Dististyles having a small, slender finger-like projection on inner margin of ventral aspect; [small suboval lobe in middle of inner distal margin between basistyles; a dark more or less V-shaped stripe at base of dorsal parameres (Fig. 68)] ..... ***P. latipennis.***

-- Dististyles without finger-like projection..... 4.

4. Ventral parameres curved inwardly, usually crossing at apices; [a rather well defined vertical line present at mid-length of dististyles (Fig. 69)]... ***P. nebulosa.***

-- Ventral parameres not crossing at apices..... 5.

5. Dorsal parameres elongate, rounded at tips, constricted at middle, reaching mid-length of distisles (Fig. 70); ninth abdominal sternum arms elongate, tapered, curved inwardly and extending slightly beyond bases of distyles (Fig. 70) ..... ***P. banksii.***

-- Dorsal parameres slender, elongate, outwardly-directed, wider and rounded at apices, reaching bases of dististyles (Fig. 71); ninth abdominal sternum arms curved outward, extending almost to bases of dististyles (Fig. 71) ..... ***P. acuta.***

6. Dististyles with accessory lobes..... 7.

-- Dististyles without accessory lobes..... 9.

7. Accessory lobes and ventral parameres of dististyles greatly elongate (Fig. 72)..... ***P. mirabilis.***

-- Accessory lobes reaching only to about mid-length of disistyles..... 8.

8. Accessory lobes inwardly-directed, spatulate; ventral parameres passing through space between dististyles and its lobes (Fig. 73); ninth abdominal sternum arms

very slender (Fig. 73) ..... *P. subfurcata.*

-- Accessory lobes with 2 sharp indentations; ventral parameres more or less concealed between dististyles and its lobes (Fig. 66); ninth abdominal sternum widened at middle of inner margin (Fig. 66) .... *P. galerita.*

9. Ventral parameres branched apically, forming an open loop (Fig. 74) ..... *P. anomala.*

-- Ventral parameres unbranched..... 10.

10. Inner distal margin of basistyles with a small upwardly-directed lobe..... 11.

-- Inner distal margin of basistyles without a small lobe, usually having 2 long, stout setae on inner apical corners of basistyles (Fig. 75)..... *P. helena.*

11. Basistylar lobe slender, apically 2-branched; ventral parameres inwardly-curved with apices usually touching or crossing to form an arc (Fig. 76). *P. debilis.*

-- Basistylar lobe stouter, suboval; dististyles with a small ear-like projection near base of inner margins (Fig. 77) ..... *P. claripennis.*

B. FEMALES.

(Abdomen tapered with apical cerci)

1. Apical and pterostigmal wing bands divided into small spots.....(*nebulosa*-group)..... 2.

-- Apical and pterostigmal wing bands usually continuous .....(*rufescens*-group)..... 5.

2. Genital plate consisting of distal and basal plates; spermathecal duct oval in middle of distal plate; spermathecal apodemes extending beyond basal plate ..... 3, 4.

-- Genital plate consisting of distal plate only; spermathecal duct and apodemes not conspicuous (Fig.

102); pleural fold imparting a lump-like appearence to ventral aspect (Fig. 90) ..... *P. submaculosa.*

3. Basal plate subrectangular and with lateral and basal narrow, stripe-like, membranous projections (Fig. 103); pleurites more or less sclerotized loop-like pleural fold as in Fig. 91. ..... *P. latipennis.*

-- Basal plate oval and with a narrow membranous stripe covering lower part (Fig. 105) .... *P. banksii.*

4. Distal plate suboval and rounded basally; distal and basal plates with similar length, latter rounded at base and wider in upper part (Fig. 106); pleurites deeply notched (Fig. 93) ..... *P. acuta.*

-- Distal plate constricted basally smallerthan basal plate, latter rounded basally and 2 lateral "arms" in upper part (Fig. 104); pleurites notched, pleural fold protruding posteriorly (Fig. 92); ..... *P. nebulosa.*

5. Genital plate with long, widely-spread, free ends of spermathecal apodemes and a rather small distal plate (Fig. 107); pleural fold sclerotized in middle having a large protuberance to dorsum (Fig. 94) ..... *P. mirabilis.*

-- Genital plate with free ends of spermathecal apodemes less widely spread and a rather large distal plate..... 6.

6. Accessory plate present; latter formed by 2 membranous sheaths, covering lateral and basal areas of distal plate (Fig. 109); dorsal aspect of pleurites wider than ventral (Fig. 97)..... *P. anomala.*

-- Accessory plate absent..... 7, 8.

7. Distal plate, tapered apically; a deep straight and vertical emargination forming 2 narrow lobes; spermathecal apodemes rather short (Fig. 112); pleural fold in form of a acute triangle, its dorsal

margin longer than ventral (Fig. 100). ***P. claripennis.***

-- Distal plate, tapered and rounded basally; a concave emargination at apex imparting a rather a heart-like shape (Fig. 101); pleurites heavily sclerotized imparting a "hump-like" aspect to dorsum (Fig. 96) ..... ***P. galerita.***

8. Distal plate constricted at mid-length separating upper and lower aspects; upper one with a rounded emargination, lower one slightly curved at base; free ends of spermathecal apodemes widely separated (Fig. 108); pleurites more or less 8-shaped (Fig. 95) ..... ***P. subfurcata.***

-- Distal plate without constriction wider at apex, with a membranous sheath covering basal area ..... 9.

9. Membranous sheath of distal plate in form of lateral stripes; spermathecal apodemes rather short with free ends slightly separated (Fig. 111); pleurites poorly sclerotized as in Fig. 99 ..... ***P. debilis.***

-- Membranous sheath of distal plate oval, covering first portion of spermathecal apodemes; free ends of latter outwardly-directed (Fig. 110); pleurites as in Fig. 98. ..... ***P. helena.***

Panorpa species were divided into six groups by Hine (1901); Carpenter (1931a) and Webb *et al.* (1975) divided them into three groups. The Canadian species represent two of these groups only: The *nebulosa*- and the *rufescens*-groups, separable by means of the following characters:

nebulosa-group:

1. Wing membrane usually clear and wing bands usually reduced to numerous spots.

2. Males without an "anal horn" on the sixth abdominal tergum.
3. Male seventh and eighth abdominal segments short.

rufescens-group:

1. Wing membranes clear to yellowish; the apical and pterostigmal band usually continuous.
2. Males with an "anal horn" on the sixth abdominal tergum.
3. Male seventh and eighth abdominal segments somewhat longer.

NEBULOSA-GROUP

(see pp. 75)

Panorpa submaculosa Carpenter, 1931.

Panorpa submaculosa Carpenter, 1931a:255. Holotype male (U.O.M.). Type-locality: UNITED STATES OF AMERICA: *Michigan*, Ann Arbor.

Panorpa utahensis Gurney, 1937:223, figs 1-6. (Male only *cf.* Gurney, 1938:52).

REDESCRIPTION

Head: yellowish to dark brown. **Thorax:** yellowish to brown. Wings (Fig. 54) with membrane clear, cross-veins with margins darkened; markings dark brown; apical band divided into two curved lines of spots; pterostigmal band broad anteriorly, narrow posteriorly, broken into poorly defined apical and basal branches; intermediate marginal spot extending from C vein through R_1 cell to reach R_{2+3}

vein, a small spot present on R cell above M vein bifurcation; basal band broken, forming two dark spots; only first basal spot present. Legs yellowish to brown. **Abdomen:** yellowish to dark brown. Male genitalia (Fig. 67) with ninth tergum (Fig. 78) broad and rounded basally, apex narrowing; arms of ninth sternum of much the same width throughout, tips rounded; dististyle short, each with a large basimesal lobe and a sharp, inward indentation at base on ventral side; ventral parameres unbranched, barbed, extending beyond basimesal lobes of dististyles; dorsal parameres subtriangular, apex with 2 small upright lobes, extending well beyond bases of dististyles. Female genitalia with genital plate (Fig. 102) comprising distal part only, rounded, deeply emarginate apically to form two lateral projections, axial portion of base lacking distinctive form or sclerotization; spermathecal apodemes not visible; subgenital plate (Fig. 113) oval, conspicuously wider than ninth tergum (Fig. 114), usually slightly notched at tip, constricted near base, latter heavily sclerotized with outward projections extending to a distance equal to maximum width of plate itself; pleurites (Fig. 90) rather well sclerotized, subrectangular, more or less membranous with a pleural fold imparting a "lump-like" appearance to ventral aspect, anterior part joining heaviest sclerotization of base of subgenital plate, posterior aspect notched.

DISTRIBUTION

Although a rather common and widespread species, *P. submaculosa* seems not to have been previously recorded in Canada (Map 14); it has, however, been collected in Ontario, Quebec, New Brunswick, Prince Edward Island and Nova Scotia. In the United States, it is known from Tennessee and Ken-

tucky, to Georgia and South Carolina, extending to Maryland, Pennsylvania, and Maine, continuing west to Ohio, Michigan, Minnesota and Wisconsin (Carpenter, 1931a, 1932, 1935, 1936, 1939; Byers, 1954, 1958; Barnes, 1956; Caron, 1967; Thornhill and Johnson, 1974; Webb *et al.* (1975); Byers and Covell, 1981) with a doubtful record in Utah (Gurney, 1938).

SEASONAL OCCURRENCE AND HABITAT

Adults occur from May 26 until August 11, in shaded often damp habitat of deciduous forest of birch (*Betula* spp.), maple (*Acer* spp.) and hemlock (*Tsuga* spp.). However, Byers (1954), Thornhill and Johnson (1974), and Webb *et al.*, 1975 reported this species to inhabit situations.

REMARKS

The wing markings of this species are very similar to those of *P. acuta* and *P. nebulosa*, but *P. submaculosa* males can be distinguished from both by means of the genitalic structures (see Fig. 67). The female has a poorly sclerotized genital plate consisting of a "distal plate" only.

SPECIMENS EXAMINED

87 males, 96 females and 1 sex unknown.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
NEW BRUNSWICK.								
Kent Co.								
Kouchibouguac Nat. Park	11-	VII	-1978	D. B. Lyons		1		C.N.C.
York Co.								
Fredericton	04-	VII	-1976	A. T. Finnamore		1		L.E.M.
NOVA SCOTIA.								
Annapolis Co.								
Annapolis Royal	24-	VI	-1928	W. J. Brown	1			C.N.C.
Kings Co.								
Kentville	18-	VI	-1924	R. P. Gorham	1			C.N.C.
Lunenburg Co.								
Bridgewater	30-	VI	-1965	B. Wright	1			N.S.M.
Maitland	11-	VII	-1976	B. Wright		1		N.S.M.
ONTARIO.								
Carleton Co.								
Constance Bay	19-	VI	-1976	H. & A. Howden		1		C.U.
Ottawa	05-	VII	-1969	A. Sauve		1		C.U.
	26-	VII	-1970	A. Soponis		1		C.U.
Durham Co.								
Kendal	15-	VI	-1964	G. B. Wiggins		1		R.O.M.
	06-	VII	-1967	J. E. Riotte & __ Kohalmi		1		R.O.M.
	21-	VI	-1955	G. B. Wiggins	1			R.O.M.
Elgin Co.								
Orwell	14-	VI	-1978	W. A. Attwater	1			U.G.
Essex Co.								
Kingsville	08-	VII	-1977	W. A. Attwater		1		U.G.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
Halton Co.								
Bronte Creek	21	VI	-1983	S. A. Marshall	1	1		U.G.
Hastings Co.								
Chatterton	07	VI	-1955	J. C. Martin		1		C.N.C.
Foxboro	07	VII	-1963	A. F. Johnson		1		U.G.
Madoc	06	VII	-1955	J. C. Martin		1		C.N.C.
Marmora	07	VI	-1952	J. R. Vockeroth	1			C.N.C.
	18	VI	-1952	J. R. Vockeroth		1		C.N.C.
	19	VI	-1952	J. R. Vockeroth	1			C.N.C.
	27	VI	-1952	J. R. Vockeroth	1			C.N.C.
	27	VI	-1952	C. Boyle		1		C.N.C.
	29	VI	-1952	C. Boyle		2		C.N.C.
Kent Co.								
Rondeau	19	VI	-1962	S. M. Clark	2			C.N.C.
Lambton Co.								
Pinery Prov. Park								
	02	VII	-1977	B. Marshall		1		R.O.M.
	08	VIII	-1977	W. Maddison	1			R.O.M.
Lanark Co								
Black Lake	19-26	VII	-1971	?	1			L.E.M.
	?		-1971	J. A. Downes	1			L.E.M.
	?		-1971	J. A. Downes	1			L.E.M.
	01	VII	-1985	J. A. Downes	1	1		L.E.M.
Glen Tay	17	VI	-1985	J. A. Downes	1			L.E.M.
Stanleyville	17	VI	-1985	J. A. Downes	1			L.E.M.
	01	VII	-1985	J. A. Downes		1		L.E.M.
Waba Island	24	VI	-1978	E. Fuller & __ Gunderman		1		R.O.M.
Leeds Co.								
Chaffeys Locks								
	23	VI	-1966	I. M. Smith		1		R.O.M.
	19	VI	-1969	J. C. Riotte	1			R.O.M.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
	22-	VI	-1969	J. C. Riotte		1		R.O.M.
	26-	VI	-1969	J. C. Riotte	1			R.O.M.
	27-	VI	-1969	J. C. Riotte	1			R.O.M.
	29-	VI	-1969	J. C. Riotte		1		R.O.M.
	10-	VI	-1970	J. C. Riotte		1		R.O.M.
	19-	VI	-1970	J. C. Riotte		1		R.O.M.
	24-	VI	-1970	J. C. Riotte	1	1		R.O.M.
	29-	VI	-1970	J. C. Riotte	1	1		R.O.M.
	02-	VII	-1970	J. C. Riotte		1		R.O.M.
	16-	VI	-1971	J. C. Riotte		1		R.O.M.
	14-	VI	-1972	J. C. Riotte	1			R.O.M.
	26-	VI	-1972	J. C. Riotte		1		R.O.M.
	28-	VI	-1973	J. C. Riotte	1			R.O.M.
	04-	VII	-1976	J. C. Riotte	1			R.O.M.
Gananoque	08-	VII	-1941	G. S. Walley	1	1		C.N.C.
	09-	VII	-1941	G. S. Walley		1		C.N.C.
St. Lawrence Is. Nat. Park								
	11-	VI	-1975	C. M. Yosimoto		1		C.N.C.
	19-	VI	-1975	R. J. McMillan		2		C.N.C.
	25-	VI	-1975	E. Sigler		2		C.N.C.
	02-	VII	-1975	E. Sigler		1		C.N.C.
	11-	VIII	-1975	E. Sigler	1			C.N.C.
	22-	VI	-1976	__ Carter & __ Reid			1	C.N.C.
Lincoln Co.								
Vineland	06-	VI	-1974	B. Merchant		1		U.G.
	06-	VI	-1979	B. Merchant	1			U.G.
	06-	VI	-1979	F. L. Runciman	1			U.G.
	07-	VI	-1979	S. Beierl		1		U.G.
Norfolk Co.								
Simcoe	30-	VI	-1939	G. S. Shewell	1			C.N.C.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
Northumberland Co.								
Crowe Bridge	19	VII	-1979	W. A. Attwater	1			U.G.
Fenella	30	V	-1975	V. Burachynsky	1			U.G.
Peel Co.								
Erindale	16	VI	-1932	F. P. Ide		1		R.O.M.
Peterborough Co.								
Havelock	16	VI	-1979	J. W. McCreadie	1			U.G.
Renfrew Co.								
Calabogie	26	VI	-1978	E. Fuller		1		R.O.M.
Egansville	22	VI	-1978	M. Gunderman		1		R.O.M.
Haley Station	16	VI	-1978	E. Fuller		1		R.O.M.
Welland Co.								
Niagara Glen	10	VI	-1926	G. S. Walley	1	1		C.U.
	10	VI	-1926	G. S. Walley	3			C.N.C.
	23	VI	-1926	G. S. Walley		1		C.N.C.
Wellington Co.								
Guelph	15	VII	-1976	W. A. Attwater	1			U.G.
Wentworth Co.								
Dundas	07	VI	-1975	G. J. Umphrey		1		U.G.
	01	VI	-1978	J. Cappleman	1			U.G.
	22	VI	-1978	G. Sevean	1			U.G.
	14	VI	-1982	R. Young		1		U.G.
Hamilton	25	VI	-1979	S. Beirl		1		U.G.
	25	VI	-1979	K. L. Runciman	1			U.G.
	03	VII	-1979	D. Lewis	2	3		U.G.
	03	VII	-1979	L. Templin		1		U.G.
	03	VII	-1979	B. Merchant	2	1		U.G.
	03	VII	-1979	L. Runciman		1		U.G.
	03	VII	-1979	K. J. Bailey	1			U.G.
	02	VI	-1982	A. W. Schaafama		2		U.G.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
QUEBEC.								
Berthier Co.								
Berthierville	15-VI		-1938	A. Robert	1			U.D.M.
	04-VII		-1940	A. Robert		1		U.D.M.
	03-VII		-1948	A. Robert	2			U.D.M.
	02-VII		-1950	A. Robert	1			U.D.M.
	26-VII		- ?	A. Robert		1		U.D.M.
Lanoraie Station								
	04-VII		-1976	D. N. Duffy	1			L.E.M.
	07-VII		-1977	D. N. Duffy		1		L.E.M.
Chambly Co.								
Mt. St. Bruno	21-VI		-1985	B. Landry		1		L.E.M.
Chateauguay Co.								
Cairnside	12-VI		-1981	A. Larochelle & M-C. Lariviere		1		L.E.M.
Chateauguay	14-VI		-1984	A. Larochelle & M-C. Lariviere		1		L.E.M.
Ste. Clotilde	24-VI		-1985	A. Aranguren	1	2		L.E.M.
Gatineau Co.								
Aylmer	09-VII		-1924	C. B. Hutchings		1		C.N.C.
	21-VII		-1924	C. B. Hutchings	1			C.N.C.
	30-VI		-1952	R. S. Bigelow	1			C.N.C.
Black Lake	17-VI		-1975	R. Manuel	1			L.E.M.
Chelsea	08-VI		-1963	E. C. Becker	2			C.N.C.
Duncan Lake	07-VII		-1970	J. F. McAlpine		1		C.N.C.
	16-VII		-1971	J. F. McAlpine		1		C.N.C.
	29-VII		-1971	J. F. McAlpine		1		C.N.C.
Harrington Lake								
	09-VI		-1954	H. J. Huckel	1			C.N.C.
Luskville Falls								
	17-VII		-1972	F. Brodo	1			C.U.

Locality:	Date:			Collector:	Sex:			Collection:
	D.	Mo.	Y.		M.	F.	U.	
Mont King	20	VI	-1974	L. Crozier	1			L.E.M.
	16	VI	-1984	A. Larochelle & M-C. Lariviere		1		L.E.M.
	06	VII	-1984	A. Larochelle & M-C. Lariviere	1			L.E.M.
Old-Chelsea	25	VI	-1962	J. E. Martin	1			C.N.C.
	26	V	-1963	J. G. Chillcott		1		C.N.C.
	02	VI	-1963	J. R. Vockeroth	1			C.N.C.
	04	VI	-1963	J. R. Vockeroth		1		C.N.C.
	08	VI	-1963	J. R. Vockeroth	1			C.N.C.
	14	VI	-1963	J. R. Vockeroth	2	4		C.N.C.
	16	VI	-1963	J. G. Chillcott	1			C.N.C.
	25	VI	-1963	J. R. Vockeroth	2	1		C.N.C.
	22	VI	-1968	J. F. McAlpine		1		C.N.C.
	08	VI	-1970	H. J. Teskey	1			C.N.C.
Hull Co.								
Hull	19	VII	-1916	A. Gibson		1		C.N.C.
Huntingdon Co.								
Covey Hill	14	VII	-1924	G. S. Walley	2			C.N.C.
Iberville Co.								
Mount Johnson	01	VI	-1941	?	1	1		L.E.M.
Ile-de-Montreal Co.								
Sainte-Anne-de-Bellevue								
	28	VI	-1966	W. Boyle	1			L.E.M.
Missisquoi Co.								
Philipsburg	13	VI	-1982	A. Larochelle & M-C. Lariviere		1		L.E.M.
Papineau Co.								
Montebello	19	VI	-1983	A. Larochelle & M-C. Lariviere		1		L.E.M.
Pontiac Co.								
Beech-Grove	07	VI	-1955	R. Lambert	1			C.N.C.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
Danford Lake	30	VI	-1953	E. C. Becker	1			C.N.C.
Norway Bay	03	VII	-1938	G. A. Hobbs	1			C.N.C.
	15	VI	-1939	E. G. Lester	1	1		U.G.
	02	VII	-1940	E. G. Lester	1	1		U.G.
Quebec Co.								
Cap Rouge	09	VII	-1953	O. Peck		1		C.N.C
Rouville Co.								
Mount Saint Hilaire								
	27	VI	-1931	A. F. Winn	1			L.E.M.
	12	VII	-1978	P. Bibean		1		U.Q.A.M.
	15	VI	-1979	M. Sharkey	1	1		L.E.M.
Saint-Jean Co.								
Lacolle	13	VI	-1982	A. Larochelle & M-C. Lariviere		2		L.E.M.
Vaudreuil Co.								
Ile-Perrot	05	VII	-1975	J. A. Garland	1	1		L.E.M.
	13	VI	-1985	A. Aranguren	1	1		L.E.M.
Rigaud	24	VI	-1939	A. Robert	1			U.D.M.
	11	VI	-1941	J. Ouellet	1			U.D.M.
	18	VI	-1974	L. C___		2		L.E.M.
	15	VI	-1981	A. Larochelle & M-C. Lariviere		1		L.E.M.
Vaudreuil	24	VI	-1982	A. Larochelle & M-C. Lariviere		1		L.E.M.

Panorpa latipennis Hine, 1901.

Panorpa latipennis Hine, 1901:228, figs. 1, 3, 32.

Syntypes male and female (U.S.N.M.). Type-locality UNITED STATES OF AMERICA: *Michigan*, Detroit and *New*

York, Sea Cliff, Long Island. These Syntypes have not been examined by me, the male *should* be designated as Lectotype.

Panorpa longipennis Banks, 1911:349. Synonymized by Carpenter, 1931a.

REDESCRIPTION:

Head: yellowish to dark brown. **Thorax:** yellowish to reddish. Wings (Fig. 55) with membrane clear and crossveins margined; bands and spots brown to pale brown, variable in size; apical band usually completely broken into quadrangular and/or triangular spots; pterostigmal band broad anteriorly, occasionally indistinctly delineated, apical branch broken into spots or absent; intermediate marginal spot varying in shape from a small macula to a short streak; basal band usually broken into two large spots; first basal spot present. Legs yellowish to reddish. **Abdomen:** reddish to dark brown. Male genitalia (Fig. 68) with ninth tergum (Fig. 79) rounded at base, tapered, apex emarginate and forming two small, lateral projections; ninth sternum moderately broad, rounded at tips, reaching to three-quarters of length of basistyles; dististyles in ventral aspects bearing a slender, finger-like projection near base; ventral parameres tapered, narrow, barbed, unbranched, extending slightly beyond bases of dististyles; dorsal parameres large, rather outwardly-directed, straight, apex slightly folded in, extending to bases of dististyles. Female genitalia with distal plate (Fig. 103) deeply emarginate, resulting in presence of two upwardly directed, lateral projections or lobes; basal plate shorter, rectangular, a membrane projecting lateral and basally over latter; spermathecal apodemes broad, bifurcate, each divided into two overlapping layers, inner apodemes wider and longer

than outer ones; subgenital plate (Fig. 115) oval, elongate, usually notched at tip, straight at base; pleurites (Fig. 91) triangular and with a small, strongly sclerotized area on internal lining of subgenital plate near posterior region, a moderately sclerotized "loop-like" pleural fold extending from posterior to anterior parts of it.

DISTRIBUTION

P. latipennis is widespread in the eastern part of North America. In Canada (Map 15), it has been collected only in southern Ontario and Quebec, with a disjunct record from Thunder Bay District of Ontario. In the United States, the species ranges from eastern Kentucky and Tennessee to North Carolina, continuing north to Vermont, thence west to Wisconsin and Ohio (Hine, 1901; Banks, 1911; Engelhardt, 1915; Carpenter, 1931a, 1932, 1935; Cole and Gillespie, 1950; Byers, 1954, 1973a; Caron, 1967; Thornhill and Johnson, 1974; Webb *et al.*, 1975).

SEASONAL OCCURRENCE AND HABITAT

Adults of *P. latipennis* have been collected from May 2 to August 7. They inhabit ferns, forests of beech-maple (*Fagus-Acer* spp.), oak-hickory (*Quercus-Carya* spp.) (Thornhill and Johnson, 1974) and red oak-white pine (*Quercus rubra-Pinus strobus*) (Webb *et al.*, 1975) as well as dense growths of herbaceous vegetation (Byers, 1954).

REMARKS

The dististyles of the male abdominal terminalia of this species possess two small, finger-like structures when viewed from the ventral aspect. Females usually have a

sclerotized spot on the internal lining of the subgenital plate.

SPECIMENS EXAMINED

67 males, 76 females, 2 sex unknown.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
ONTARIO.								
Brant Co.								
Brantford	06	VI	-1952	J. Doane		1		U.G.
Bruce Co.								
Hepworth	31	V	-1977	E. A. Innes		1		U.G.
Carleton Co.								
Black Rapids Creek								
	20	V	-1927	W. J. Brown		1		C.N.C.
Jock River	21	V	-1927	G. S. Walley	2	3		C.N.C.
	23	V	-1927	G. S. Walley	2			C.N.C.
Merivale	08	VI	-1980	J. J. deGryse			1	C.N.C.
Essex Co.								
Harrow	13	VI	-1962	R. S. Dickout	1			U.G.
Frontenac Co.								
Bobs Lake	18	VI	-1970	L. L. Pechuman	1			CORNELL
Grey Co.								
Owen Sound	04	VII	-1979	B. Wit		1	1	U.G.
Singhamton	23	V	-1930	W. E. Ricker		1		R.O.M.
	23	VI	-1930	F. P. Ide		1		R.O.M.
Halton Co.								
Campbellville	10	VI	-1977	E. A. Innes		1		U.G.
	10	VI	-1977	E. A. Innes	2	1		U.G.
	10	VI	-1977	W. A. Attwater	1			U.G.
	27	V	-1982	R. Young		1		U.G.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
Halton Hills	27	V	-1982	A. John	1			U.G.
Milton	04	VI	-1976	E. A. Innes		1		U.G.
	09	VI	-1978	P. Jursevski	1			U.G.
Hastings Co.								
Bell Rapids	05	VI	-1982	W. Punchihewa		1		U.G.
Chatterton	27	V	-1969	R. H. Parry	1			C.U.
Foxboro	19	VI	-1961	C. J. Edwards		1		U.G.
Marmora	07	VI	-1939	G. H. Hammond		1		C.N.C.
	12	VI	-1943	G. H. Hammond	1	1		C.N.C.
	19	VI	-1952	J. R. Vockeroth		1		C.N.C.
	30	VI	-1952	J. R. Vockeroth		1		C.N.C.
Stirling	20	VI	-1972	E. Coldwell		1		U.G.
Tweed	16	VI	-1974	N. Wilcox		1		U.G.
Leeds Co.								
Brockville	11	VI	-1978	E. Fuller	1			R.O.M.
Lincoln Co.								
Vineland	20	V	-1980	D. Yu		2		U.G.
Norfolk Co.								
Clear Creek	04	VII	-1962	__ Kelton &				
				__ Brumpton	1			C.N.C.
Fishers Glen	01	VII	-1925	G. S. Walley	1	2		C.N.C.
Simcoe	20	VI	-1939	G. E. Shewell	1	1		C.N.C.
	23	VI	-1939	G. S. Walley		1		C.N.C.
	30	VI	-1939	G. S. Walley	1			C.N.C.
Northumberland Co.								
Fenella	30	V	-1975	V. Burachynsky	2	5		U.G.
Peel Co.								
Belfountain	01	VII	-1975	G. F. Umphrey	1	1		U.G.
	23	V	-1975	J. M. Cumming		1		U.G.
Peterborough Co.								
Havelock	16	VI	-1977	J. W. McCreadie	3			U.G.
	15	VII	-1977	J. W. McCreadie		1		U.G.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
Renfrew Co.								
Chalk River	30	VI	-1969	R. L.Richardson	1			U.G.
Griffith	25	VI	-1978	E. Fuller		1		R.O.M.
Simcoe Co.								
Midland	02	V	-1959	J. G. Chillcott		2		C.N.C.
	26	V	-1959	J. G. Chillcott		1		C.N.C.
Stormont								
Cornwall	29	VI	-1925	F. D. Ide	1			C.N.C.
Thunder Bay Dist.								
Parry	15	VI	-1977	R. G. Bennett		1		U.G.
	02	VII	-1973	R. J. Hellewell	1			U.G.
	01	VIII	-1973	R. J. Hellewell	1			U.G.
	07	VIII	-1973	R. J. Hellewell	1			U.G.
Saint Ignace	22	V	-1959	J. G. Chillcott		1		C.N.C.
Waterloo Co.								
Preston	29	VI	-1971	B. K. Akey		1		U.G.
Welland Co.								
Fonthill	08	VI	-1962	__ Kelton &				
				__ Thorpe		1		C.N.C.
	05	VI	-1970	E. C. Becker	1	1		C.N.C.
Niagara Glen	01	VI	-1926	G. S. Walley	1			C.N.C.
	08	VI	-1926	G. S. Walley	3	1		C.N.C.
	09	VI	-1926	G. S. Walley	1			C.U.
	09	VI	-1926	G. S. Walley	1	1		C.N.C.
	23	VI	-1926	G. S. Walley	2			C.N.C.
	24	VI	-1926	G. S. Walley		2		C.N.C.
Wellington Co.								
Arkell	08	VI	-1977	A. A. Konecny	1			U.G.
Wentworth								
Ancaster	18	VI	-1955	J. E. Martin	1			C.N.C.
	24	VI	-1955	O. Peck		1		C.N.C.
	05	VI	-1984	J. E. Martin	1	6		C.N.C.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
	07	VI	-1984	J. E. Martin	4	1		C.N.C.
Dundas	11	VI	-1980	C. Bolter		1		U.G.
	18	V	-1982	C. Hare	1			U.G.
Hamilton	03	VII	-1979	B. Merchant	1			U.G.
QUEBEC.								
Brome Co.								
Covey Hill	02	VII	-1924	G. S. Walley		1		C.N.C.
Knowlton	13	VI	-1928	G. H. Fisk	1			C.N.C.
	05	VI	-1963	J. R. Vockeroth		1		C.N.C.
Deux-Montagnes Co.								
La trappe	29	V	-1944	J. Ouellet		1		U.D.M.
	08	VI	-1935	J. Ouellet		1		U.D.M.
Sainte-Scholastique								
	06	VI	-1972	P. W. Arntfield	1			L.E.M.
Hull Co.								
Fairy Lake	01	VI	-1927	G. S. Walley	1			C.N.C.
Ile-de-Montreal Co.								
Montreal	?			?	1			L.E.M.
Sainte-Anne-de-Bellevue								
	09	VII	-1953	?		1		L.E.M.
	07	VI	-1954	?	1			L.E.M.
	11	VI	-1954	?		1		L.E.M.
	04	VII	-1967	W. Boyle	1			L.E.M.
	22	VII	-1967	W. Boyle		1		L.E.M.
	09	VI	-1979	J. A. Garland	1			L.E.M.
Ile-Jesus Co.								
?	07	VI	-1924	J. Ouellet		1		U.D.M.
Gatineau Co.								
Gatineau Park	03	VI	-1954	H. J. Huckel	1			C.N.C.
	05	VI	-1954	E. E. Stern	1	1		C.N.C.
	08	VI	-1954	W. R. Richards	1			C.N.C.

Locality:	Date:			Collector:	Sex:			Collection:
	D.	Mo.	Y.		M.	F.	U.	
	10-VI		-1954	H. J. Huckel	1			C.N.C.
	16-VI		-1954	H. J. Huckel	1			U.G.
Missisquoi Co.								
Philipsburg	13-VI		-1982	A. Larochelle & M-C. Lariviere		1		L.E.M.
	25-V		-1982	A. Larochelle & M-C. Lariviere	1			L.E.M.
Montcalm Co.								
Mont Tremblant								
	01-VII		-1957	A. Robert		1		U.D.M.
	18-VII		-1958	A. Robert		1		U.D.M.
Rouville Co.								
Abbotsford	30-V		-1968	D. M. Wood	1			C.N.C.
Mont Saint Hilaire								
	10-VI		-1977	A. T. Finnamore	1	1		L.E.M.
	23-VI		-1977	A. T. Finnamore		1		L.E.M.
	10-VI		-1978	D. J. Leprince		1		U.Q.A.C.
	15-VI		-1979	M. Sharkey		2		L.E.M.
Saint-Jean Co.								
Lacolle	13-VI		-1982	A. Larochelle & M-C. Lariviere	3	1		L.E.M.
Vaudreuil Co.								
Rigaud	21-V		-1982	A. Larochelle & M-C. Lariviere	1			L.E.M.
Vaudreuil	15-VII		-1982	A. Larochelle & M-C. Lariviere	1	1		L.E.M.

Panorpa nebulosa Westwood, 1846.

Panorpa nebulosa Westwood, 1846:188-189. Holotype female (B.M.N.H.). Type-locality UNITED STATES OF AMERICA: *New York*, Trenton Falls.

REDESCRIPTION:

Head: yellowish to dark brown. **Thorax:** yellowish to dark brown. Wings (Fig. 51) with membranes clear and cross-veins slightly margined; bands and spots brown; apical band broken into two curved lines (sometimes not well definited) of numerous pale brown spots; pterostigmal band broad anteriorly, branches broken; intermediate marginal spot usually extending from Sc_1 cell at end of Sc vein to R_1 cell; a small spot also found in R cell below and beyond Rs vein bifurcation ; basal band divided into two spots; only first basal spot present. Legs yellowish to reddish. **Abdomen:** Yellowish to dark brown. Male genitalia (Fig. 69) with ninth tergum (Fig. 80) basally broad and rounded, narrowed at apex, latter emarginate, forming two lateral projections; ninth sternum basally and apically narrowed; dististyles shorter than basistyles; ventral parameres barbed, unbranched, usually crossing at tips; dorsal parameres rather constricted at middle, broad at upper part imparting a heart-like structure. Female genitalia with distal plate (Fig. 104) consisting of an upper portion with apex deeply emarginate, forming two lateral projections or lobes, basally constricted, and a lower portion bearing two lateral "arms"; basal plate rounded at base; spermathecal apodemes elongate, bifurcate basally, divided into three overlapping layers; subgenital plate (Fig. 116) oval, narrowed at tip, dorsal aspect with an interior, thin but strongly sclerotized sheath (Byers, 1962b); pleurites

(Fig. 92) triangular, membranous, poorly sclerotized, posterior aspect notched, pleural fold extending from anterior to posterior parts where it protrudes.

DISTRIBUTION

Panorpa nebulosa is a wide-ranging eastern species in North America. In Canada (Map 16), it occurs in Ontario, Quebec and Nova Scotia. In the United States, it extends from Maine to Wisconsin, thence to Missouri, and southward to Georgia and Mississippi (Banks, 1892; Hine, 1901; Sherman, 1908; Engelhardt, 1915; Carpenter, 1931a, 1939; Byers, 1954, 1962b; Caron, 1967; Thornhill and Johnson, 1974; Webb *et al.*, 1975; Byers and Covell, 1981).

SEASONAL OCCURRENCE AND HABITAT

Adults have been collected from May 20 until August 23 and have been found in wet and dry situations (Webb *et al.*, 1975), deciduous and beech-maple (*Fagus-Acer* spp.) forests (Thornhill and Johnson, 1974), among jewelweed (*Impatiens* sp.), in a river floodplain and in dense broad-leaved herbage along small streams (Byers, 1954).

REMARKS

Males of *P. nebulosa* can be distinguished by the position of the ventral parameres (Fig. 69). The female has a genital plate similar to that of *P. acuta*, but differs from it by having the "distal plate" of the genital plate divided into upper and lower parts; its pleurites are poorly sclerotized.

SPECIMENS EXAMINED

71 males and 81 females.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
NOVA SCOTIA.								
Victoria Co.								
Cape Breton Nat. Park (Highlands)	09	VI	-1983	H. Goulet	2			C.N.C.
ONTARIO.								
Algoma Dist.								
Searchmont	11	VIII	-1984	S. P. Schweiger		1		U.G.
Wabos	13	VII	-1984	D. Poirier & __ Logan		1		U.G.
Carleton Co.								
Ottawa	07	VI	-1940?	G. A. Hobbs		1		U.G.
	07	VI	-1940?	G. A. Hobbs		2		C.N.C.
Elgin Co.								
Orwell	14	VI	-1978	M. Lichtenberg		1		U.G.
	15	VI	-1978	W. A. Attwater	1			U.G.
Essex Co.								
Leamington	10	VI	-1929	L. J. Milne	1			C.N.C.
Haldimand								
Port Ryerse	27	VI	-1939	G. E. Shewell		1		C.N.C.
Haliburton Co.								
Minden	30	VII	-1957	P. W. McMullen	1	2		U.G.
Halton Co.								
Halton Hills	26	VI	-1981	J. Cairns	1	2		U.G.
	26	VI	-1981	J. Kircher		1		U.G.
	02	VII	-1981	J. Cairns	1			U.G.
Hastings Co.								
Marmora	25	VI	-1946	C. H. Hammond		1		C.N.C.
	20	V	-1949	J. F. McAlpine	1			U.G.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
	29-	VI	-1952	C. Boyle	2			C.N.C.
	08-	VII	-1952	C. Boyle	1	2		C.N.C.
Lambton Co.								
Pinery Prov. Park								
	08-	VII	-1977	W. Maddison		2		R.O.M.
Leeds Co.								
Lyn	26-	VI	-1929	F. P. Ide		3		R.O.M.
St. Lawrence Is. Nat. Park								
	19-	VI	-1975	R. J. McMillan	4	5		C.N.C.
	25-	VI	-1975	E. Sigler	1	4		C.N.C.
	25-	VI	-1975	__ Grenadier	2	3		C.N.C.
Lincoln Co.								
Balls Falls	28-	VI	-1926	G. S. Walley		1		C.N.C.
Jordan	18-	VI	-1926	G. S. Walley	2	1		C.N.C.
Niagara Glen	24-	VI	-1926	G. S. Walley	1			C.N.C.
	30-	VI	-1926	G. S. Walley	2	2		C.N.C.
Muskoka Dist.								
Port Sydney	25-	VII	-1919	N. K. Bigelow		1		R.O.M.
Norfolk Co.								
Fishers Glen	01-	VII	-1925	G. S. Walley		1		C.N.C.
	02-	VII	-1925	G. S. Walley		1		C.N.C.
Normandale	08-	VII	-1925	G. S. Walley	1			C.U.
	08-	VII	-1925	G. S. Walley	1			C.N.C.
Ontario Co.								
Glen Major	07-	VIII	-1928	W. E. Ricker		1		R.O.M.
Parry Sound Co.								
Burk's Falls	09-	VII	-1926	F. P. Ide	1	1		C.N.C.
	13-	VII	-1926	F. P. Ide		3		C.N.C.
Waubamic	03-	VII	-1915	H. S. Parish		1		CORNELL
	28-	VI	-1915	H. S. Parish		1		CORNELL
	06-	VII	-1915	H. S. Parish		1		CORNELL

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
Peel Co.								
Belfountain	06-	VII	-1982	R. Young	2			U.G.
	06-	VII	-1982	C. Hare	1			U.G.
	07-	VII	-1982	A. John	2			U.G.
Simcoe Co.								
De Grassi Point								
	26-	VI	-1912	E. M. Walker	1			R.O.M.
	23-	VI	-1918	E. M. Walker		1		R.O.M.
	24-	VI	-1918	E. M. Walker		1		R.O.M.
	07-	VIII	-1929	E. M. Walker	1	1		R.O.M.
Midland	30-	VII	-1956	J. G. Chillcott	1			C.N.C.
Orillia	30-	VII	-1924	H. L. Viereck	1	1		C.N.C.
Wellington Co.								
Guelph	24-	VI	-1983	G. Abayo	1			U.G.
Wentworth Co.								
Ancaster	24-	VI	-1955	O. Peck	1	2		C.N.C.
	30-	VI	-1962	J. E. Martin	1	1		C.N.C.
York Co.								
Toronto	01-	VII	-1891	W. Brodie Collection		1		R.O.M.
QUEBEC.								
Berthier Co.								
Berthierville	09-	VI	-1938	J. Ouellet		1		U.D.M.
	18-	VI	-1938	J. Ouellet		1		U.D.M.
	21-	VI	-1938	J. Ouellet		1		U.D.M.
	24-	VI	-1938	J. Ouellet		1		U.D.M.
	02-	VII	-1938	J. Ouellet		1		U.D.M.
	20-	VI	-1948	A. Robert	2			U.D.M.
	03-	VII	-1948	A. Robert	1	1		U.D.M.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
Brome Co.								
Bromont	08-	VII	-1975	R. L___	1			U.Q.A.C.
Mont Sutton	19-	VI	-1984	A. Larochelle & M-C. Lariviere		2		L.E.M.
Knowlton	23-	VI	-1929	J. McDunnough	1			C.N.C.
	29-	VI	-1929	G. S. Walley	1	1		C.N.C.
	02-	VIII	-1929	J. McDunnough	1			C.N.C.
	04-	VII	-1932	F. P. Ide	1			R.O.M.
Chateauguay Co.								
Ste.-Clotilde	24-	VI	-1985	A. Aranguren	1			L.E.M.
Deux-Montagnes Co.								
La Trappe	07-	VIII	-1942	J. Ouellet		1		U.D.M
Gatineau Co.								
Duncan Lake	31-	VII	- ?	J. F. McAlpine		1		C.N.C.
Gatineau Park	16-	VI	-1954	E. E. Sterns	1			C.N.C.
Lytton	19-	VI	-1980	A. Larochelle & M-C. Lariviere	1			L.E.M.
Meach Lake	12-	VII	-1941	G. A. Hobbs	1			C.N.C.
Huntingdon Co.								
Covey Hill	02-	VII	-1924	G. S. Walley	2			C.N.C.
	14-	VII	-1924	G. S. Walley	1			C.N.C.
	17-	VII	-1924	G. S. Walley	1			C.N.C.
	18-	VI	-1927	G. S. Walley	1			C.N.C.
Hemmingford	29-	VI	-1925	G. H. Hammond	1	1		C.N.C.
	09-	VII	-1925	G. H. Hammond		1		C.N.C.
	12-	VII	-1925	G. H. Hammond	1			C.N.C.
Ile-de-Montreal Co.								
Montreal	09-	VII	- ?	J. Ouellet		1		U.D.M.
Sainte-Anne-de-Bellevue								
	13-	VI	-1903	?		2		CORNELL
	28-	VI	-1939	?	1			L.E.M.
	31-	VII	-1940	?	1			L.E.M.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
Ile-de-Montreal Co.								
Sainte-Anne-de-Bellevue								
	22-VI		-1966	R. Lalonde		1		L.E.M.
	30-VI		-1966	W. Boyle	1			L.E.M.
	?			A. Robert		1		U.D.M.
Missisquoi Co.								
Philipsburg	24-VI		-1977	A. C. Sheppard		1		L.E.M.
Pontiac Co.								
Chapeau	23-VIII		-1968	M. J. Dadswell	1			C.U.
Fort-coulonge	23-VI		-1984	A. Larochelle & M-C. Lariviere		1		L.E.M.
Saguenay Co.								
Lake Kenogami	26-VII		-1981	M. Boudreau	2			U.Q.A.C.
Saint-Jean Co.								
Ste. Therese Island								
	17-VII		-1910	W. Chagnon	1			L.E.M.
Temiscamingue Co.								
Laniel	14-VI		-1942	O. Peck	1			C.N.C.
Temiscouata Co.								
Les-Etroits	19-VII		-1984	A. Larochelle & M-C. Lariviere		1		L.E.M.
Vaudreuil Co.								
Ile-Perrot	28-VI		-1975	J. A. Garland	1			L.E.M.
	05-VII		-1975	J. A. Garland	2			L.E.M.
	23-VI		-1985	A. Aranguren	1			L.E.M.
	13-VII		-1985	A. Aranguren	1			L.E.M.
Rigaud	04-VII		-1972	C. Boyle	1	2		L.E.M.
	18-VI		-1974	P. W. Arntfield		2		L.E.M.
	11-VII		-1984	A. Larochelle & M-C. Lariviere		1		L.E.M.

Panorpa banksii Hine, 1901.

Panorpa affinis (*nec* Leach,1815); Banks, 1895:315. Syntype male. Type-locality UNITED STATES OF AMERICA: *New York*, Sea Cliff. Original name preoccupied. Renamed by Hine (1901), as follow:

Panorpa banksii Hine, 1901:247, fig. 28. Holotype male (M.C.Z.). Type-locality UNITED STATES OF AMERICA: *New York*, Sea Cliff.

Panorpa chelata Carpenter, 1931a:251, figs. 36, 63. Holotype male (M.C.Z.). Type-locality UNITED STATES OF AMERICA: *Massachusetts*, Wollaston. Synonymized by Byers (1974).

REDESCRIPTION

Head: reddish to brown. **Thorax:** yellowish to reddish. Wings (Fig. 57) with membranes clear to pale yellow, having basal cross-veins margined; bands and spots brown to dark brown; apical band entire apically, occasionally with one clear spot, broken into several spots basally; pterostigmal band broad anteriorly, broken into spots posteriorly; intermediate marginal spot varying from a narrowed stripe to a division of the latter into two; basal band broken into two large spots; only first basal spot present. Legs yellowish to brown. **Abdomen:** reddish to brown. Male genitalia (Fig. 70) with ninth tergum (Fig. 81) rounded at base, elongate, with a deep square sided emargination forming two narrow lateral projections, constricted at three-quarters of distance from base; ninth sternum elongate, tapered, narrowed, wider in middle of inner edge; dististyles with an oval hole-like depression in middle of ventral surface; ventral parameres barbed, elongated, reaching the hole-like depression of the dististyles; dorsal

parameres elongate, constricted at middle, apex oval, extending beyond bases of dististyles. Female genitalia with distal plate (Fig. 105) deeply emarginate forming two lateral, slightly inwardly directed projections; basal plate elongate, broader in middle, tapered at base; spermathecal apodemes broad, widely divided into two overlapping layers; subgenital plate (Fig. 117) oval, rounded at base, constricted at tip, forming a pointed or a slightly emarginate apex, interior lining moderately sclerotized.

DISTRIBUTION

In Canada (Map 17), it is known only from southern Ontario. In the United States, it ranges from Maine west to Wisconsin and Illinois, continuing south to Tennessee and Georgia with a southernmost distribution in Mississippi (Carpenter, 1931a, 1936; Byers, 1962b, 1973a; Caron, 1967; Thornhill and Johnson, 1974; Webb *et al.*, 1975; Byers and Covell, 1981).

SEASONAL OCCURRENCE AND HABITAT

Adults of Canadian specimens were collected from June 14 to June 23. Thornhill and Johnson (1974), however, reported the seasonal occurrence in Michigan as being from May 25 to August 21. Adults are known to live in both moist and dry conditions such as oak-hickory (*Quercus-Carya* spp.) forests with little undergrowth, dry gravel hillsides among wild roses, and narrow, steep ravines in cultivated areas (Byers, 1954; Thornhill and Johnson, 1974; Webb *et al.*, 1975).

REMARKS

P. banksii is a species easy to recognize at a glance by the apical wing band which is usually reduced to a large "spot" or macula.

SPECIMENS EXAMINATED

4 males and 4 females.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
ONTARIO.								
Essex Co.								
Ojibway, Praire Reserve	18-	VI	-1980	J. D. Cashaback		1		U.G.
	18-	VI	-1980	S. Beierl		1		U.G.
Windsor	23-	VI	-1976	J. F. Fortin	1			U.G.
Kent Co.								
Rondeau	21-	VI	-1923	A. W. Baker	1			U.G.
Norfolk Co.								
Simcoe	23-	VI	-1939	G. S. Walley	2	1		C.N.C.
Delhi	14-	VI	-1962	G. Brumpton		1		C.N.C.

Panorpa acuta Carpenter, 1931.

Panorpa acuta Carpenter, 1931a:253-254, Fig. 38. Holotype male (M.C.Z.). Type-locality UNITED STATES OF AMERICA: *Tennessee*, Smoky Mountains.

REDESCRIPTION:

Head: yellowish to reddish. **Thorax:** yellowish to reddish. Wings (Fig. 58) membranes clear, cross-veins with margins; bands and spots pale brown to brown; apical band divided into two curved lines of spots; pterostigmal band broad anteriorly, branches broken, latter not well defined; intermediate marginal spot at or near end of Sc, vein extending to cell Rs; a small spot also present on cell R beyond the bifurcation of vein Rs; basal band reduced to two small spots; only first basal spot present. Legs yellowish. **Abdomen:** reddish to brown. Male genitalia (Fig. 71) with ninth tergum (Fig. 82) rounded and slightly constricted at base, apex either truncated or with a shallow emargination; ninth sternum divergent apically, broad at three-quarters of distance from base, tips ending at base of dististyles; ventral parameres narrow, barbed, unbranched, extending beyond base of dististyles; dorsal parameres elongate, slender, slightly outwardly-curved, rounded and wider at apex, extending beyond bases of dististyles. Female genitalia having distal plate (Fig. 106) with deep, rounded emargination; basal plate constricted at base; spermathecal apodemes elongate, pointing moderately outward, consisting of three overlapping layers, inner less sclerotized and not well developed; pleurites (Fig. 93) triangular, moderately sclerotized, deeply notched posteriorly, a longitudinal pleural fold extending from anterior to posterior parts, generally similar to that of *P. submaculosa*.

DISTRIBUTION

P. acuta is an eastern species in North America. In Canada (Map 18), it is known, so far, only

from Ontario and Quebec. In the United States, it has been reported along the Appalachian Mountains from Georgia northwards to Vermont and New Hampshire (Carpenter, 1931a, 1932, 1936; Caron, 1967; Byers, 1973a, 1981; Webb *et al.*, 1975). There is also an isolated record for Michigan (Thornhill and Johnson, 1974). It is likely to be found in Maine, even though it has yet not been collected in that state, though it may not reach as far as New Brunswick.

SEASONAL OCCURRENCE AND HABITAT

In Canada adults of *P. acuta* have been collected from May 29 to August 12. It inhabits moist, cool, shaded courses of small streams at relatively high elevations (Byers, 1954).

REMARKS

P. acuta cannot be separated from *P. nebulosa* and *P. submaculosa* by means of the wing markings, in which all three are very similar, but the genitalic structures differ. Males of *P. acuta* can be identified by the long, straight, slender ventral parameres. The female has a genital plate divided into "distal" and "basal plates".

SPECIMENS EXAMINATED

42 males, 36 females and 1 sex unknown.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
ONTARIO.								
Elgin Co.								
Orwell	14-	VI	-1978	M. Lichtenberg		1		U.G.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
	14-	VI	-1978	D. Morris	1			U.G.
	15-	VI	-1978	W. A. Attwater	2		1	U.G.
	15-	VI	-1978	G. Sevean		4		U.G.
QUEBEC.								
Brome Co.								
Knowlton	05-	VI	-1963	J. R. Vockeroth	1			C.N.C.
Chicoutimi Co.								
St. Bruno	20-	VI	-1977	M. Ross		1		U.Q.A.M.
Deux-Montagnes Co.								
La Trappe	04-	VII	-1934	J. Ouellet		1		U.D.M.
	06-	VII	-1934	J. Ouellet	2	2		U.D.M.
	02-	VI	-1942	J. Ouellet	1	1		U.D.M.
	02-	VI	-1942	J. Ouellet	1			U.D.M.
	03-	VI	-1942	J. Ouellet	1			U.D.M.
	21-	VII	-1943	J. Ouellet	1			U.D.M.
	31-	VII	-1943	J. Ouellet		1		U.D.M.
	20-	VIII	-1943	J. Ouellet	1			U.D.M.
	29-	V	-1944	J. Ouellet	1			U.D.M.
	02-	VII	-1949	J. Ouellet	1			U.D.M.
Île-de-Montreal Co.								
Sainte- Anne-de-Bellevue								
	21-	VI	-1945	A. Robert	1			U.D.M.
	05-	VII	-1945	A. Robert	1	2		U.D.M.
	19-	VII	-1945	A. Robert	2			U.D.M.
	20-	VII	-1949	?		1		L.E.M.
	17-	VI	-1952	?		1		L.E.M.
	07-	VII	-1952	?	1			L.E.M.
	14-	VI	-1962	V. R. Vickery		1		L.E.M.
	14-	VI	-1966	W. Boyle		1		L.E.M.
	22-	VI	-1966	R. Lalonde		1		L.E.M.
	22-	VI	-1966	W. Boyle	1	3		L.E.M.

Locality:	Date:			Collector:	Sex:			Collection:
	D.	Mo.	Y.		M.	F.	U.	
	22-	VI	-1966	W. Boyle & J. Lalonde	3	1		L.E.M.
	27-	VI	-1966	W. Boyle		1		L.E.M.
	28-	VI	-1966	W. Boyle	1	4		L.E.M.
	30-	VI	-1966	W. Boyle	2	1		L.E.M.
	22-	VII	-1967	W. Boyle	5	1		L.E.M.
	20-	VI	-1973	C. Boyle	1			L.E.M.
	26-	VI	-1974	C. F. Boyle		1		L.E.M.
	11-	VI	-1975	R. L. Manuel	1	1		L.E.M.
	18-	VI	-1975	R. L. Manuel	1			L.E.M.
		?		A. Robert		2		U.D.M.
Île-Jesus Co.								
?	01-	VII	-1924	J. Ouellet	1			U.D.M.
Levis Co.								
Levis		?		T. W. Fyles		1		L.E.M.
Lauzon	01-	VII	-1939	J. Ouellet	1	2		U.D.M.
Montcalm Co.								
Mont Tremblant[9]								
	12-	VIII	-1978	M. Laforge	1			U.Q.A.M
Rouville Co.								
Mont Saint Hilaire								
	27-	VI	-1931	A. R. Winn	1			L.E.M.
	10-	VI	-1978	D. J. Leprince	1			U.Q.A.C.
	10-	VI	-1978	D. J. Leprince	1			U.Q.A.C.
	15-	VI	-1979	M. Sharkey	1			L.E.M.
Terrebonne Co.								
Ste. Agathe	13-	VI	-1975	H. Manuel	1			L.E.M.

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9. Mont Tremblant Provincial Park belongs to several counties as follow: Montcalm, Joliette and Terrebonne.

Vaudreuil Co.

Rigaud 21-VII -1935 A. Robert 1 U.D.M.

RUFESCENS-GROUP

(see pp. 76)

Panorpa mirabilis Carpenter, 1931.

Panorpa mirabilis Carpenter, 1931a:229, figs. 10, 48. Holotype male (U.S.N.M.). Type-locality UNITED STATES OF AMERICA: *New Jersey*, Andover.

REDESCRIPTION:

Head: brownish. Thorax: Reddish. Wings (Fig. 59) with membrane clear, cross-veins without dark margins; bands and spots dark brown; apical band entire with one or two clear spots; pterostigmal band entire, broad anteriorly, apical branch broken and reduced to a spot; intermediate marginal spot broad anteriorly, occasionally joining basal band; latter usually entire, joined to first basal spot; marginal and second basal spots absent. Legs yellowish to reddish. Abdomen: Reddish to brown. Male genitalia (Fig. 72) unusually large with both ninth tergum (Fig. 83) and sternum very similar to those of *Panorpa galerita* (p. 127, Fig. 121); dististyles longer than basistyles, each having a large lobe with two small indentations in ventral and dorsal sides of base; ventral parameres narrow, elongate, unbranched, barbed, almost reaching apices of dististyles, concealed between basistyles and its lobes; dorsal parameres elongate, narrowed at upper part. Female genitalia very similar to those of *P. galerita*, but distal plate (Fig. 107) more elongate and spermathecal apodemes longer; subgenital plate (Fig.

119) almost triangular, lateral margins smoothly curved, base broad and concave, slightly sclerotized and with a broadly inverted V-shape; pleurites (Fig. 94) triangular, with a sclerotized pleural fold in middle, having a large protuberance dorsad, posterior aspect pointed.

DISTRIBUTION

In Canada, *P. mirabilis* has been collected only in three counties of southern Ontario (Map 19). In the United States, it is known from a rather restricted northeastern area including Pennsylvania, New Jersey and New York (Carpenter, 1931a) and from Michigan (Thornhill and Johnson, 1974).

SEASONAL OCCURRENCE AND HABITAT

The Canadian records for this species show a very short adult seasonal occurrence from May 29 to June 16 only, possibly owing to lack of material. In the United States, however, Thornhill and Johnson (1974) reported the occurrence of this species from May 17 to July 25. These authors and Byers (1954) recorded it as inhabiting moist situations, in areas of deciduous woodland and in elm-red maple (*Ulmus* spp.-*Acer rubrum*) forests.

REMARKS

Males of *P. mirabilis* can be separated from those of *P. galerita* by the greatly elongate abdominal terminalia; females may be recognized by the greatly elongate spermathecal apodemes of the genital plate.

SPECIMENS EXAMINED:

2 males and 4 females.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
ONTARIO.								
Kent Co.								
Bothwell	29-	V	-1929	G. S. Walley	1	1		C.N.C.
Rondeau Prov. Park								
	06-	VI	-1955	D. H. Pengelly		1		U.G.
	15-	VI	-1977	D. Maddison & B. Marshall	1			R.O.M.
Middlesex Co.								
London		?		W. Saunders		1		U.G.
Wellington Co.								
Guelph	16-	VI	-1983	S. A. Marshall		1		U.G.

Panorpa subfurcata Westwood, 1846.

Panorpa subfurcata Westwood, 1846:191. Lectotype male (B.M.N.H.). Type-locality CANADA: *Nova Scotia*.

Panorpa signifer Banks, 1900:251. Holotype male (M.C.Z.). Type-locality UNITED STATES OF AMERICA: *Michigan*, Gaylord. Synonymized by Byers (1962a).

Panorpa modesta Carpenter, 1931a:233, fig. 14. Holotype male (M.C.Z.). Type-locality UNITED STATES OF AMERICA: *Michigan*, Douglas Lake. Synonymized by Byers (1974).

REDESCRIPTION

Head: reddish. **Thorax:** reddish to brown. Wings (Fig. 60) with membranes clear, cross-veins without margins; bands and spots brown to dark brown; apical band incorporating small clear spots; pterostigmal band broad anteriorly with apical branch occasionally continuous, latter usually less dark than posterior fork; intermediate marginal spot large, broad anteriorly, usually extending C vein to R cell beyond and below Rs vein bifurcation; basal band typically entire, rarely broken; marginal spots variable in colour intensity. Legs yellow to reddish. **Abdomen:** Reddish to brown. Male genitalia (Fig. 73) with ninth tergum (Fig. 84) basally broad and rounded, gradually compressed from base to apex; latter emarginate, forming two lateral lobes; ninth sternum slender, extended, ending before bases of dististyle, its edges with a tendency to be twisted; dististyles curved inward, almost equal in length to basistyles, characterized by having large medial lobes or accessory lobes (of Thornhill and Johnson, 1974) on ventral aspect; ventral parameres very slender, elongate, tip pointed, extending beyond middle of dististyle, concealed between dististyle and its lobes; dorsal parameres tapered, thin, slightly inwardly-curved, apex largely stretched in, reaching bases of dististyles. Female genitalia with genital plate (Fig. 108) comprising distal part only, rounded basally, depressed in middle, apex widely emarginate; spermathecal apodemes long, basally broad, tips pointing outwards; subgenital plate (Fig. 120) oval, apex constricted, basally expanded; pleurites (Fig. 95) 8-shaped triangularly notched posteriorly, having one distinctive, heavily sclerotized pleural fold extending from anterior to posterior parts.

DISTRIBUTION

P. subfurcata has the widest and most northerly range of any species of the genus in Canada (Map 20). It has been collected in eastern Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland (Byers, 1969). This species has been reported in the eastern United States, from North Carolina to west Virginia, extending north to New Hampshire and Maine, thence west to Michigan and Minnesota (Banks, 1892; Sherman, 1908; Engelhardt, 1915; Carpenter, 1931a; Byers, 1962b, 1973a; Thornhill and Johnson, 1974; Webb *et al.*, 1975).

SEASONAL OCCURRENCE AND HABITAT

Adults occur, from June 10 to September 13, in the undergrowth of maple (*Acer* spp.) and birch (*Betula* spp.) forests. In the United States, they have also been found in floodplain forests along watercourses and the wooded edges of marshes and swamps (Thornhill and Johnson, 1974).

REMARKS

P. subfurcata usually has less dark wing markings than *P. mirabilis* and *P. galerita*. Males of this species are the only ones with dark needle-like, ventral parameres. Females can be identified by the presence of heavily sclerotized pleurites.

SPECIMEN EXAMINED

162 males, 229 females and 14 sex unknown.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	O.	Collection:
MANITOBA.								
Pinawa	?			?	1			C.N.C.
NEW BRUNSWICK.								
Charlotte Co.								
St. Andrews	03	VIII	1957	G. E. Shewell	1			C.N.C.
	25	VI	1978	S. A. Marshall	1			U.G.
Gloucester Co.								
Bathurst	15	VII	1939	W. J. Brown	1			C.N.C
Health Steele	12	VII	1977	?	1			C.N.C.
Tracadie	02	VIII	1939	J. McDunnough		1		C.N.C.
Younghall	05	VII	1908	A. Gibson		1		C.N.C.
	06	VII	1908	A. Gibson	1			C.N.C.
Kent Co.								
Kouchibouguac	?	VIII	1978	S. J. Miller	1			C.N.C.
Northumberland Co.								
Priceville	07	VII	1971	B. V. Peterson	1			C.N.C.
Tabusintac	20	VII	1939	W. J. Brown	2			C.N.C.
	21	VII	1939	W. J. Brown		1		C.N.C.
Wayerton	06	VII	1959	__ Warcsh		1		C.U.
Queens Co.								
Minto	26	VII	1966	?		1		C.N.C.
Youngs Cove	29	VII	1973	K. G. Hamilton		1		C.N.C.
Restigouche Co.								
Campbellton	13	VI	1914	F. M. Mckenzie	1			U.G.
	13	IX	1934	C. E. Atwood	1			R.O.M.
Jacquet River	20	VII	1974	P. P. Harper	1			U.D.M.
York Co.								
Fredericton	1-17	VII	70	C. Yoshimoto	1			C.N.C.
Kouchibouguac	06	VII	1978	H. Goulet		1		C.N.C.
	16	VII	1978	D. B. Lyons		1		C.N.C.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	O.	Collection:
NOVA SCOTIA.								
Antigonish Co.								
Monastery	13	VIII	1973	K. G. Hamilton		1		C.N.C.
Colchester Co.								
Truro	26	VII	-1913	R. Matheson	1			CORNELL
	12	VIII	1913	R. Matheson		1		CORNELL
	?	VI	-1916	R. Matheson	1			CORNELL
	10	VIII	1919	R. Matheson		1		CORNELL
Cumberland Co.								
Parrsboro, West Bay Rd.								
	21	VIII	1943	J. McDunnough	1			C.N.C.
	22	VIII	1943	J. McDunnough		1		C.N.C.
Digby Co.								
Digby	30	VII	-1950	?		1		N.S.M.
Halifax Co.								
Bedford	05	VIII	1973	K. G. Hamilton	1	1		C.N.C.
Inverness Co.								
Cape Breton Nat. Park,								
Cheticamp R.	09	VI	-1983	H. Goulet	3	1		C.N.C.
	28	VI	-1983	J. R. Vockeroth		1		C.N.C.
Whycocomagh	22	VIII	1974	B. Wright	1	1		N.S.M.
Lunenburg Co.								
New Ross	07	VIII	1976	E. Claridge		1		N.S.M.
Pictou Co.								
Stellarton	22	VIII	1974	B. Wright		1		N.S.M.
Queens Co.								
White Point Beach								
	14	VIII	1935	J. McDunnough	1			C.N.C.
	17	VIII	1935	J. McDunnough		1		C.N.C.
	14	VIII	1936	J. McDunnough	2			C.N.C.
	29	VIII	1936	J. McDunnough	1			C.N.C.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	O.	Collection:
Victoria Co.								
Baddeck	22	VI	-1936	T. N. Freeman		1		C.N.C.
	23	VI	-1936	T. N. Freeman	1			C.N.C.
Mackenzie Mountain								
	15	VII	-1983	J. R. Vockeroth	1			C.N.C.
	01	VIII	-1983	J. E. Bright		1		C.N.C.
Highland Rd.	4-5	VII	-1983	B. Wright		1		N.S.M.
North Mtn.	01	VII	-1983	J. R. Vockeroth		1		C.N.C.
	07	VII	-1983	J. R. Vockeroth	1	1		C.N.C.
	11-19	VII	-83	L. Masner	1			C.N.C.
	11-21	VII	-83	L. Masner		1		C.N.C.
	10	VIII	-1983	J. E. Martin		1		C.N.C.
Paquette Lake	04	VII	-1983	J. R. Vockeroth		1		C.N.C.
	07	VII	-1983	J. R. Vockeroth		2		C.N.C.
	29	VII	-1983	J. E. Bright	1			C.N.C.
ONTARIO.								
Algoma Dist.								
Kirkwood	01	VII	-1964	J. L. Martin	1			L.E.M.
Pancake Bay	23	VII	-1976	D. H. Pengelly		1		U.O.G.
Thessalon	05	VII	-1963	R. G. Brumpton	1			U.G.
Wabos	13	VII	-1984	D. Poirier & C. Logan		1		U.G.
Bruce Co.								
Crane River	16	VII	-1977	D. C. Murrell		1	1	U.G.
Southampton	06	VIII	-1939	G. S. Walley	1			C.N.C.
	05	IX	-1939	G. S. Walley		2		C.N.C.
Carleton Co.								
Constance Bay	24	VIII	-1932	L. J. Milne		1		C.N.C.
	21	VI	-1933	G. S. Walley	1			C.N.C.
	08	VII	-1935	F. A. Urquhart	1			C.N.C.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	O.	Collection:
Ottawa	05-	VI	-1971	E. M. Arnason		1		C.U.
Stittsville	05-	VIII	-1975	M. Sanborne		1		C.U.
Cochrane Dist.								
Low Bush River, Lake Abitibi								
	14-	VI	-1925	N. K. Bigelow	2			R.O.M.
	30-	VI	-1925	N. K. Bigelow	1	1		R.O.M.
	06-	VII	-1925	N. K. Bigelow	2	4		R.O.M.
	19-	VII	-1925	N. K. Bigelow	1	4		R.O.M.
Ogoki	19-	VI	-1952	J. B. Wallis	1			C.N.C.
	22-	VII	-1952	J. B. Wallis		1		C.N.C.
Dufferin Co.								
Horning's Mill								
	13-	VI	-1928	F. P. Ide		1		R.O.M.
	15-	VI	-1928	W. E. Ricker	1			R.O.M.
	08-	VII	-1928	W. E. Ricker		1		R.O.M.
	11-	VII	-1928	W. E. Ricker		1		R.O.M.
Frontenac Co.								
Wagarville	14-	VII	-1967	H. J. Teskey		1		C.N.C.
Grenville Co.								
Merrickville	22-	VIII	-1978	E. Fuller & __ Gunderman	1			R.O.M.
Haliburton Co.								
Algonquin Pk.	17-	VIII	-1902	E. M. Walker		1		R.O.M.
	15-	VIII	-1903?	?		1		R.O.M.
	30-	VII	-1916	E. M. Walker	2	1		R.O.M.
(Cache lake)	19-	VI	-1936	?	1			R.O.M.
(Cache lake)	19-	VII	-1936	?		1		R.O.M.
	20-	VII	-1961	Tran Van Quynh		1		U.G.
	07-	VII	-1962	R. J. Frey		1		U.G.
	21-	VIII	-1965	M. W. L.		1		U.G.
	20-	VII	-1974	P. G. Mason	1			U.G.
	31-	VIII	-1974	P. G. Mason	1			U.G.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	O.	Collection:
Haliburton	18-VII -1968	P. W. Arntfield	1			U.G.
Hastings Co.						
Chatterton	16-VII -1968	R. H. Parry	1			U.G.
Marmora	25-VIII-1959	L. K. Smith	1	1		C.N.C.
Maynooth	19-VI -1953	J. F. McAlpine		2		C.N.C.
Kenora Dist.						
Blue Lake Prov. Park						
	18-VIII-1980	D. H. Pengelly		1		U.G.
Malachi	26-VII -1947	W. Y. Watson			1	R.O.M.
Rushing River Prov. Park						
	18-VIII-1969	?		1		R.O.M.
Lanark Co.						
Pooles Corners						
	17-VII -1978	E. Fuller & __ Jaagumagi		1		R.O.M.
Stanleyville	11-VIII-1985	A. Aranguren & J. A. Downes	5	1		L.E.M.
Leeds Co.						
Westport	13-VIII-1978	E. Fuller & __ Gunderman	1			R.O.M.
Lennox and Addington Co.						
Richmond	25-VII -1972	J. E. Martin	1			C.N.C.
Fraserburg	2-3-VII-1968	L. L. Kohalmi		1		R.O.M.
Norway Point, Lake of Bays						
	14-VII -1929	J. McDunnough		1		C.N.C.
Port Sydney	24-VI -1919	N. K. Bigelow	1			R.O.M.
	01-VIII-1922	?		1		U.G.
Nipissing Co.						
Timagami	24-VII -1932	A. W. A. Brown		1		R.O.M.
	27-VIII-1932	A. W. A. Brown		1		R.O.M.
Parry Sound Dist.						
Hills	14-VII -1978	M. Lichtenberg	1			U.G.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M. F. O.	Collection:
Parry Sound	16-VII -1977	R. G. Bennet	1	U.G.
Pointe au Baril				
	22-VI -1982	R. Young	1	U.G.
Powassan	11-VII -1978	S. M. Ball	1	U.G.
	14-VII -1978	S. M. Ball	1	U.G.
Rainy River Dist.				
North Branch	18-VII -1960	S. M. Clark	1	C.N.C.
One Sided Lk.	20-VI -1960	S. M. Clark	1	C.N.C.
	26-VII -1960	M. Clark	1	C.N.C.
	28-VII -1960	S. M. Clark	1	C.N.C.
Simcoe Co.				
Baxter	24-VIII-1959	J. L. Martin	1	L.E.M.
Collingwood	22-VIII-1948	F. P. Ide	1	R.O.M.
De Grassi Point				
	19-VII -1916	G. M. W___	1	R.O.M.
	20-VIII-1929	E. M. Walker	2	R.O.M.
Lefroy	15-VI -1982	R. Young	1	U.G.
Tiny	05-VIII-1968	J. C. Riotte	1	R.O.M.
Sudbury Dist.				
Sudbury	?	?	1	R.O.M.
Westree	28-VII -1929	H. S. Fleming	1	[illegible]
Thunder Bay Dist.				
Beardmore	? -VIII-1985	V. & M. [illegible]kery	1	L.E.M.
Macdiarmid	? -VI -1922	?	1	R.O.M.
	28-VII [illegible] 2	N. K. Bigelow	1	R.O.M.
	[illegible]-VI -1923	N. K. Bigelow	1	R.O.M.
Manitouwadge	31-VII -1977	M. Eymann	1	U.G.
Wellington Co.				
Eramosa	28-VI -1959	R. E. Crawford	1	U.G.
Guelph	24-VII -1973	G. Abayo	1	U.G.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	O.	Collection:
PRINCE EDWARD ISLAND.								
Prince Co.								
Alberton	15-	VII	-1940	G. S. Walley	3	1		C.N.C.
	16-	VII	-1940	G. S. Walley		1		C.N.C.
Queens Co.								
Brackley Beach Nat. Park								
	26-	VII	-1940	G. S. Walley	1			C.N.C.
Dalvay Nat. Park								
	19-	VII	-1940	G. S. Walley	1			C.N.C.
Holland Cove	23-	VIII	-1955	E. MacDougall			1	C.U.
QUEBEC.								
Abitibi Co.								
Duparquet	18-	VII	-1937	G. S. Smith		1		S.E.M.
	24-	VI	-1938	G. S. Smith		1		S.E.M.
	07-	VII	-1981	A. Larochelle & M-C. Lariviere	1			L.E.M.
Ile-Nepawa	03-	VII	-1981	A. Larochelle & M-C. Lariviere	2			L.E.M.
	08-	VIII	-1983	A. Larochelle & M-C. Lariviere		1		L.E.M.
La Morandiere	07-	VII	-1981	A. Larochelle & M-C. Lariviere		1		L.E.M.
La Sarre	04-	VII	-1981	A. Larochelle & M-C. Lariviere		1		L.E.M.
Senneterre	04-	VIII	-1983	A. Larochelle & M-C. Lariviere		1		L.E.M.
Saint-Vital-de-Clermont								
	09-	VIII	-1983	A. Larochelle & M-C. Lariviere	1			L.E.M.
Villemontel	11-	VIII	-1983	A. Larochelle & M-C. Lariviere		1		L.E.M.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	O.	Collection:
Bonaventure Co.								
Bonaventure	09	VII	-1914	C. H. Young			1	C.N.C.
New-Richmond	25	VII	-1984	A. Larochelle & M-C. Lariviere		1		L.E.M.
Nouvelle	25	VII	-1984	A. Larochelle & M-C. Lariviere	1	1		L.E.M.
Paspebiac	26	VII	-1984	A. Larochelle & M-C. Lariviere		1		L.E.M.
Brome Co.								
Knowlton	04	VII	-1920	L. J. Milne	1			C.U.
	10	VII	-1927	G. S. Walley		1		C.N.C.
	23	VI	-1929	J. McDunnough	1			C.N.C.
	29	VI	-1929	G. S. Walley		1		C.N.C.
	01	VII	-1929	L. J. Milne	1			C.N.C.
	02	VII	-1929	L. J. Milne			1	C.N.C.
	18	VII	-1929	L. J. Milne		1		C.N.C.
	20	VII	-1929	L. J. Milne	1			C.N.C.
	29	VII	-1929	L. J. Milne	1			C.N.C.
	03	VIII	-1929	L. J. Milne	1			C.N.C.
	06	VIII	-1929	J. McDunnough		1		C.U.
	04	VII	-1930	L. J. Milne	1			C.N.C.
	04	VII	-1932	F. P. Ide		2		R.O.M
	19	VII	-1968	J. R. Vockeroth		1		C.N.C.
	23-25	VI	- 70	E. C. Becker	1			C.N.C.
Mont Sutton	19	VI	-1984	A. Larochelle & M-C. Lariviere	1	1		L.E.M.
Mont Owl Head	25	VI	-1984	A. Larochelle & M-C. Lariviere		1		L.E.M.
Orford Lake	10	VII	-1920	A. F. Winn	1			L.E.M.
Champlain Co.								
Orleans	13	VII	-1909	J. A. Hetoumeau		1		C.N.C.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	O.	Collection:
Charlevoix-Est Co.						
Lac-du-Port-au-Persil	19-VII -1981	A. Larochelle & M-C. Lariviere		1		L.E.M.
Port-au-Saumon	21-VII -1980	A. Larochelle & M-C. Lariviere		1		L.E.M.
	22-VII -1980	A. Larochelle & M-C. Lariviere	1			L.E.M.
Charlevoix-Ouest Co.						
St.-Hilarion	14-VIII-1982	A. Larochelle & M-C. Lariviere		1		L.E.M.
Chicoutimi Co.						
Lac Simoncouche	27-VII -1984	P. D. E___	1	1		U.Q.A.C.
Laterriere	15-VII -1981	A. Larochelle & M-C. Lariviere		1		L.E.M.
Le Gite-du-Berger	07-VIII-1947	E. G. Munroe	1			L.E.M.
Montmorency	21-VII -1980	R. Loiselle		1		U.Q.A.C.
Ste.-Rose-du-Nord	16-VII -1981	A. Larochelle & M-C. Lariviere		1		L.E.M.
Frontenac Co.						
Megantic	06-VII -1916	W. T. M. Forbes		1		CORNELL
	07-VII -1916	W. T. M. Forbes		1		CORNELL
Mont Megantic	29-VI -1984	A. Larochelle & M-C. Lariviere	3	6		L.E.M.
Gaspe-Est Co.						
Gaspe	06-VII -1939	J. Ouellet		1		U.D.M.
	25-VI -1954	G. P. Holland		2		C.N.C.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	O.	Collection:
Parc de Forillon						
	27-VII -1984	A. Larochelle & M-C. Lariviere	1			L.E.M.
Val d'Espoir	28-VII -1939	J. Ouellet		1		U.D.M.
	31-VII -1939	J. Ouellet		1		U.D.M.
Gaspe-Ouest Co.						
Lac York	29-VII -1984	A. Larochelle & M-C. Lariviere	1	3		L.E.M.
	31-VII -1981	A. Larochelle & M-C. Lariviere		1		L.E.M.
Marsoui	30-VII -1984	A. Larochelle & M-C. Lariviere	1	2		L.E.M.
Mont-Albert	15-VIII-1972	W. Boyle & G. Fontana		1		L.E.M.
	01-VIII-1984	A. Larochelle & M-C. Lariviere		1		L.E.M.
Perce	28-VII -1931	I. Sheppard		1		L.E.M.
Gatineau Co.						
Aylmer	30-VII -1931	L. J. Milne		1		C.N.C.
Chelsea	06-VII -1912	?	1			C.N.C.
Duncan Lake	16-VII -1971	J. F. McAlpine		1		C.N.C.
	08-VIII-1971	J. F. McAlpine	1			C.N.C.
	14-VIII-1971	J. F. McAlpine		1		C.N.C.
Gatineau Pk.	02-VIII-1974	J. Belwood	1			C.U.
Kazubazua	19-VII -1927	F. P. Ide		1		C.N.C.
	25-VII -1933	G. S. Walley		1		C.N.C.
Hull Co.						
Cascades	13-VI -1920	J. McDunnough		1		C.N.C.
Ile-de-Montreal Co.						
Montreal	16-VI -1918	A. F. Winn		1		L.E.M.
	24-VI -1934	G. A. Moore	1			L.E.M.
	10-VIII- ?	J. Ouellet		1		U.D.M.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	O.	Collection:
Sainte-Anne-de-Bellevue						
	08-VIII-1929	?		1		L.E.M.
	13-VIII-1929	?		1		L.E.M.
	29-VII -1940	?		1		L.E.M.
	13-VIII-1962	V. R. Vickery		1		L.E.M.
	22-VI -1967	W. Boyle		1		L.E.M.
	10-VIII-1973	R. L. Manuel	1	1		L.E.M.
Joliette Co.						
Lac Cloutier	19-22-VII-84	F. Genier		1		L.E.M.
Ste.-Emilie-de-L'energie						
	10-VI -1977	R. Pelletier	1		1	U.Q.A.M.
	30-VII -1977	E. Healy		1		U.Q.A.M.
	20-VII -1979	M. Rousseau		1		U.Q.A.M.
Kamouraska Co.						
Kamouraska	20-VIII-1982	A. Larochelle & M-C. Lariviere		1		L.E.M.
Park Reserve	09-VIII-1957	W. R. Mason	1			C.N.C.
	08-VII -1957	G. E. Shewell		1		C.N.C.
	09-VIII-1957	E. Mason		1		C.N.C.
Sully	12-VII -1936	J. Ouellet		1		U.D.M.
Labelle Co.						
Saint-Jean-sur-Lac						
	03-VII -1984	A. Larochelle & M-C. Lariviere		1		L.E.M.
Lac-Saint-Jean-East Co.						
Alma	12-VII -1981	A. Larochelle & M-C. Lariviere		2		L.E.M.
Lac-Saint-Jean-Ouest Co.						
Chibougamau	03-VII -1983	A. Larochelle & M-C. Lariviere	1			L.E.M.
Lac-Bouchette	14-VII -1981	A. Larochelle & M-C. Lariviere		1		L.E.M.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	O.	Collection:
Mistassini	30-	VI	-1944	A. Robert			2	U.D.M.
	07-	VII	-1944	A. Robert	1		1	U.D.M.
	22-	VII	-1944	A. Robert		1		U.D.M.
	23-	VII	-1944	A. Robert		2		U.D.M.
	27-	VI	-1956	J. R. McGillis		2		C.N.C.
	30-	VI	-1956	J. R. Lonsway		1		C.N.C.
	03-	VII	-1956	J. R. McGillis	1			C.N.C.
	04-	VII	-1956	J. R. Lonsway		1		C.N.C.
	05-	VII	-1956	J. R. Lonsway	2	2		C.N.C.
	13-	VII	-1956	J. R. Lonsway	5	1		C.N.C.
	14-	VII	-1956	J. R. Lonsway	2			C.N.C.
	18-	VII	-1956	J. R. Lonsway	2			C.N.C.
	19-	VII	-1956	J. R. Lonsway	1	1		C.N.C.
	24-	VII	-1956	J. R. McGillis	1	1		C.N.C.
	25-	VII	-1956	J. R. Lonsway	1	1		C.N.C.
	25-	VII	-1956	J. R. McGillis		3		C.N.C.
	03-	VIII	-1956	J. R. Lonsway	1			C.N.C.
	04-	VIII	-1956	J. R. Lonsway		1		C.N.C.
	16-	VII	-1978	A. T. Finnamore & L. M. Crozier		1		L.E.M.
Notre-Dame-de-la-Doré	08-	VII	-1981	A. Larochelle & M-C. Lariviere	2			L.E.M.
Normandin	10-	VII	-1981	A. Larochelle & M-C. Lariviere		2		L.E.M.
Peribonka	11-	VII	-1981	A. Larochelle & M-C. Lariviere		2		L.E.M.
St.-Felicien	09-	VII	-1981	A. Larochelle & M-C. Lariviere	1			L.E.M.
Lac-Saint-Jean-Ouest Co.								
Saint-Eugene	04-	VII	-1944	A. Robert	1	2		U.D.M.
	06-	VII	-1944	A. Robert		1		U.D.M.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	O.	Collection:
?	10-VII -1981	A. Larochelle & M-C. Lariviere	1	2		L.E.M.
Levis Co.						
Lauzon	? -VI -1939	J. Ouellet			2	U.D.M.
	01-VII -1939	J. Ouellet	5	2		U.D.M.
	03-VII -1939	J. Ouellet	2			U.D.M.
Levis	? [c.1900]	T. W. Fyles	1			L.E.M.
	? [c.1900]	T. W. Fyles		2		L.E.M.
L'Islet Co.						
Lac-Trois-Saumons						
	?	?	1			U.Q.A.C.
Lotbiniere Co.						
Laurier	02-VII -1984	A. Larochelle & M-C. Lariviere		1		L.E.M.
Matane Co.						
Lac Cascapedia						
	02-VIII-1981	A. Larochelle & M-C. Lariviere		1		L.E.M.
Matapedia Co.						
Amqui	09-VII -1979	R. Rochon		1		U.D.M.
	27-VII -1981	A. Larochelle & M-C. Lariviere		1		L.E.M.
La Verendrye Park						
	21-VIII-1965	D. M. Wood		1		C.N.C.
	05-VII -1976	F. Brodo			1	C.U.
Saint-Tharcisius						
	24-VII -1984	A. Larochelle & M-C. Lariviere		2		L.E.M.
Missisquoi Co.						
Frelighsburg	10-VII -1982	D. Di Ninni	1			U.Q.A.M.
?	05-VII -1929	G. S. Walley	1			C.N.C.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	O.	Collection:
Montcalm Co.						
Mont-Tremblant Prov. Park						
	21-VII -1932	A. Robert		1		U.D.M.
	03-VII -1954	A. Robert	1			U.D.M.
	30-VII -1954	A. Robert	1			U.D.M.
	02-VIII-1954	A. Robert		1		U.D.M.
	12-VIII-1954	A. Robert	1			U.D.M.
	15-VII -1955	A. Robert		1		U.D.M.
	21-VI -1959	A. Robert		1		U.D.M.
	11-VIII-1961	A. Robert		1		U.D.M.
	31-VII -1962	A. Robert		2		U.D.M.
	05-VIII-1962	A. Robert	1	1		U.D.M.
	20-VIII-1962	A. Robert		1		U.D.M.
	25-VIII-1962	A. Robert	1			U.D.M.
	26-VIII-1974	G. Eickwort	2			CORNELL
	29-VII -1978	D. Groulx			1	U.Q.A.M.
Rawdon	27-VII -1928	A. C. Sheppard	1			L.E.M.
Nicolet Co.						
Nicolet	21-VI -1980	A. Larochelle & M-C. Lariviere		1		L.E.M.
Pontiac Co.						
Chapeau	23-VIII-1968	M. J. Dadswell	2			C.U.
Norway-Bay	03-VII -1938	G. A. Hobbs		1		C.N.C.
	13-VII -1984	A. Larochelle & M-C. Lariviere		1		L.E.M.
Quebec Co.						
Cap Rouge	09-VII -1953	O. Peck			1	C.N.C.
Quebec	19-VI -1982	Y. Beaule	1			U.Q.A.C.
Riviere-du-Loup Co.						
Trois Pistoles						
	23-VIII-1983	A. Larochelle & M-C. Lariviere	1	1		L.E.M.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	O.	Collection:
Saguenay Co.								
Baie Comeau	22-	VII	-1981	A. Larochelle & M-C. Lariviere		1		L.E.M.
Baie Trinite	23-	VII	-1981	A. Larochelle & M-C. Lariviere		1		L.E.M.
Godbout	23-	VII	-1981	A. Larochelle & M-C. Lariviere	1			L.E.M.
Ilets Jeremie	16-	VIII	-1983	A. Larochelle & M-C. Lariviere	1			L.E.M.
Sault-au-Mouton	21-	VII	-1981	A. Larochelle & M-C. Lariviere		2		L.E.M.
Sherbrooke Co.								
Mont Orford	30-	VI	-1984	A. Larochelle & M-C. Lariviere		1		L.E.M.
Soulanges Co.								
Pte. Coulonge	09-	VII	-1917	J. I. Beaulne		1		C.N.C.
Temiscamingue Co.								
Laniel	20-	VII	-1930	H. S. Fleming		1		C.N.C.
	10-	VI	-1931	H. S. Fleming	1			C.N.C.
	25-	VIII	-1931	H. S. Fleming		1		C.N.C.
	13-	VIII	-1932	W. J. Brown		1		C.N.C.
	23-	VIII	-1932	W. J. Brown	1			C.N.C.
	10-	VI	-1944	A. R. Brooks		1		C.N.C.
McWatters	02-	VII	-1981	A. Larochelle & M-C. Lariviere	1			L.E.M.
Temiscouata Co.								
Notre-Dame-du-Lac	08-	VII	-1932	F. P. Ide		1		R.O.M.
Terrebonne Co.								
Lac Carre	19-23-	VIII	-68	W. Bovle & J. Lalonde		3		L.E.M.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	O.	Collection:
St-Hippolyte	01	VII	-1975	J. Thibault		1		U.D.M.
Sainte-Agathe-Sud								
	27	VI	-1978	R. Luiselle		1		U.Q.A.C.
Vaudreuil Co.								
Ile-Perrot	02	VIII	-1975	J. A. Garland	3	2		L.E.M.
Yamaska Co.								
Baieville	22	VI	-1983	S. Lavoie		1		U.Q.A.C.

Panorpa galerita Byers, 1962.

Panorpa subfurcata (*nec* Westwood, 1846); Hine, 1901:249, figs. 25, 30.

Panorpa subfurcata (*nec* Westwood, 1846); Esben-Petersen, 1921:66, fig. 70.

Panorpa subfurcata (*nec* Westwood, 1846); Carpenter, 1931a: 228, fig. 9.

Panorpa galerita Byers, 1962a:472, fig. 4. Holotype male (SNOW). Type-locality: UNITED STATES OF AMERICA: *Pennsylvania*, Lake Jean.

REDESCRIPTION

Head: reddish to brown. **Thorax:** reddish to dark brown. Wings (Fig. 61) with membrane clear, cross-veins without margins; bands and spots dark brown; apical band entire, occasionally including a few small clear spots; pterostigmal band entire, broad anteriorly, its apical branch usually broken; intermediate marginal spot anteriorly broad, posteriorly hook-shaped facing basal band; latter

usually interrupted near middle and extending to first basal spot; neither second basal nor marginal spots present. Legs yellowish to reddish. **Abdomen:** yellowish to brown. Male genitalia (Fig. 66) with ninth tergum (Fig. 85) oval, narrowed at three-quarters of distance from base; apex truncated and slightly emarginate; ninth sternum divergent apically, broader in middle than at base and apex, similar to those of *P. mirabilis* (pp. 107); dististyles with a broad dorsal lobe having two strong indentations on ventral aspect; ventral parameres unbranched, barbed, reaching second indentation of dististyles; dorsal parameres sub-triangular with rounded angles. Female genitalia with only distal plate present (Fig. 101), heart-shaped, decreasing in width towards base, apex emarginate; spermathecal apodemes diverging moderately, with free ends separated by a distance equal to width of distal plate; subgenital plate (Fig. 121) oval, narrowed at apex, latter either pointed or slightly notched, base with a less sclerotized region in-verted V; pleurites (Fig. 96) triangular, notched pos-teriorly, heavily sclerotized in middle, imparting a "hump-like" aspect to dorsum;

DISTRIBUTION

In Canada (Map 21), *Panorpa galerita* has been collected in Ontario, Quebec, New Brunswick, Prince Edward Island and Nova Scotia. In the United States, the species is known from New Hampshire, Vermont, New York to Pennsylvania and western Ohio. It is also known from Wisconsin, but not, so far, from intervenig Michigan (Carpenter, 1931a; Byers, 1962a; Webb *et al.*, 1975). The range is decidedly northern.

SEASONAL OCCURRENCE AND HABITAT

Adults from as early as May 18 until August 20. Its habitat is among ferns in beech (*Fagus* sp.), hemlock (*Tsuga* sp.) (Byers, 1962a; Webb *et al.*, 1975), and maple-birch (*Acer-Betula* spp.) forests. It has also been found in a scrub area of wild raspberry (*Rubus* sp.), sumac (*Rhus* spp.) jewelweed (*Impatiens* sp.) and milkweed (*Asclepias* spp.), as well as in an open field near an apple orchard in Oka, Quebec (Aranguren and Downes), a habitat much more exposed to sunlight than is usual for *Panorpa*.

REMARKS

This species usually possesses a hook-shaped, intermediate marginal wing spot which permits its accurate identification. Females also have a subgenital plate with an unsclerotized inverted "V" area at the base.

SPECIMENS EXAMINED

102 males, 111 females and 5 sex unknown.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
NEW BRUNSWICK.								
Charlotte Co.								
Saint Andrews	12	VI	-1978	S. A. Marshall	1			U.G.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
Kent Co.								
Kouchibouquac	07	VI	-1978	S. J. Miller	1			C.N.C.
	16	VI	-1978	S. J. Miller	1			C.N.C.
	19	VI	-1978	D. B. Lyons	1			C.N.C.
	20	VI	-1978	S. J. Miller		1		C.N.C.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M. F. U.	Collection:
	11-VII -1978	S. J. Miller	1	C.N.C.
	12-VII -1978	S. J. Miller	1 2	C.N.C.
Northumberland Co.				
Newcastle	16-VII -1932	F. P. Ide	1	R.O.M.
Princeville	07-VII -1971	B. V. Peterson	2	C.N.C.
Queens Co.				
Young Cove	29-VII -1973	K. G. Hamilton	1	C.N.C.
Westmorland Co.				
Shediac	04-VII -1939	W. J. Brown	1	C.N.C.
York Co.				
Fredericton	30-VI -1933	C. E. Atwood	1	R.O.M.
Long Creek	10-VII -1934	C. E. Atwood	1	R.O.M.
NOVA SCOTIA.				
Antigonish Co.				
Antigonish	08-VII -1968	B. Wright	1	N.S.M.
Colchester Co.				
Truro	08-VI -1919	W. E. Whitehead	1	L.E.M.
Halifax Co.				
?	19-VII -1977	Lay L.	1	N.S.M.
Victoria Co.				
Baddeck	22-VI -1936	T. N. Freeman	1	C.N.C.
Highland Road	4-5-VII-1983	B. Wright	1	N.S.M.
PRINCE EDWARD ISLAND.				
Kings Co.				
East Point	05-VII -1941	T. N. Freeman	1	C.N.C.
Queens Co.				
York	? -VI -1977	L. S. Thompson	1	C.N.C.
ONTARIO.				
Carleton Co.				

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
Manotick Station								
	14	VI	-1982	H. Walther		1		C.N.C.
Durham Co.								
Kendal	08	VI	-1980	J. Richardson		1		R.O.M.
Grenville Co.								
Spencerville	20	VI	-1939	G. H. Hammond		1		C.N.C.
Halton Co.								
Campbellville	24	V	-1978	W. A. Attwater	1			U.G.
	22	VI	-1978	C. Francis	1			U.G.
Halton Hills	26	VI	-1981	J. Cairns	2			U.G.
Kelso	26	V	-1982	C. Hare		3		U.G.
Hasting Co.								
Marmora	06	VII	-1951	J. F. McAlpine	1			C.N.C.
	14	VI	-1952	J. R. McGillis		1		C.N.C.
Muskoka Dist.								
Port Sydney	30	VI	-1919	N. K. Bigelow	1			R.O.M.
	08	VII	-1919	N. K. Bigelow		1		R.O.M.
Severn Bridge	11	VI	-1969	G. E. Scott	1			R.O.M.
Norfolk Co.								
Delhi	04	VI	-1941	D. A. Arnott	1			C.N.C.
Normandale	29	VI	-1925	G. S. Walley		4		C.N.C.
	09	VII	-1925	G. S. Walley	1			C.N.C.
Port Rowan	02	VI	-1975	I. M. Smith	1			C.N.C.
Simcoe	19	VI	-1939	G. S. Walley	1			C.N.C.
	23	VI	-1939	G. S. Walley	3			C.N.C.
Nipissing Dist.								
Algonquin Pk.	03	VI	-1961	Tran Van Quynh	1			U.G.
Peel Co.								
Belfountain	07	VI	-1975	D. J. McComb	1			U.G.
Peterborough Co.								
Nogies Creek	12	VI	-1975	F. Quan		1		R.O.M.
	16	VI	-1975	F. Quan	1			R.O.M.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
	17-	VI	-1975	F. Quan	1			R.O.M.
	26-	VI	-1975	F. Quan		1		R.O.M.
	10-	VII	-1975	F. Quan	1			R.O.M.
Prescott Co.								
Saint Eugene	15-	VII	-1978	E. Fuller & Jaagumagi	2			R.O.M.
Russell Co.								
Casselman	07-	VI	-1978	?		1		R.O.M.
Simcoe Co.								
Barrie	19-	VI	-1977	E. Fuller		1		R.O.M.
Severn	17-	VI	-1925	J. McDunnough		1		C.N.C.
Waterloo Co.								
Preston	11-	VI	-1971	J. A. Neary	1			U.G.
	14-	VI	-1971	B. K. Akey	1	1		U.G.
Wellington Co.								
Arkell	06-	VI	-1978	W. A. Attwater	1			U.G.
	06-	VI	-1978	D. Morris		1		U.G.
	08-	VI	-1977	K. Barber	1	1		U.G.
	09-	VI	-1978	D. Morris	1			U.G.
Belwood	17-	VI	-1966	D. H. Pengelly		2		U.G.
	10-	VI	-1968	D. H. Pengelly		1		U.G.
	05-	VII	-1972	D. H. Pengelly	1	1		U.G.
	17-	VI	-1976	E. A. Innes		1		U.G.
Erin	09-	VI	-1959	H. J. Teskey		1		C.N.C.
	09-	VI	-1979	J. Ernst		1		U.G.
Guelph	12-	VII	-1960	E. D. Douglas	1			U.G.
	20-	VII	-1960	E. D. Douglas	1			U.G.
	15-	VII	-1976	W. A. Attwater	1			U.G.
	16-	VI	-1977	K. M. Ralph		1		U.G.
	28-	V	-1979	K. L. Runciman		1		U.G.
	13-	VI	-1980	S. Beierl	1	1	1	U.G.
	08-	VI	-1981	J. Cairns		1		U.G.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
	30-	VI	-1981	C. Farivar		1		U.G.
Rockwood	13-	VII	-1981	J. Cairns	1			U.G.
Wentworth Co.								
Millgrove	? -	VII	-1949	H. Colhoon		2		U.G.
York Co.								
Brown Hills	16-	VI	-1976	?	1			U.G.
	23-	VI	-1976	?	1			U.G.
	27-	VI	-1977	?		1		U.G.
Newmarket	14-	VI	-1970	G. A. Surgeoner		1		U.G.
Vandorf	16-	VI	-1968	P. M. Catling	1			R.O.M.
QUEBEC.								
Argenteuil Co.								
Grenville	27-	VI	-1982	A. Larochelle & M-C. Lariviere	1			L.E.M.
Berthier Co.								
Berthierville	02-	VI	-1938	J. Ouellet	1			U.D.M.
	03-	VI	-1938	J. Ouellet	1			U.D.M.
Lanoraie	05-	VI	-1938	?			1	L.E.M.
	29-	V	-1975	R. Manuel	1	1		L.E.M.
	29-	V	-1975	J. A. Garland	1			L.E.M.
	26-	V	-1977	L. M. Crozier	1	2		L.E.M.
	26-	V	-1977	A. T. Finnamore	2			L.E.M.
	11-	VI	-1984	A. Larochelle & M-C. Lariviere	1			L.E.M.
Bonaventure Co.								
Pointe-a-la-Croix	24-	VII	-1984	A. Larochelle & M-C. Lariviere		1		L.E.M.
Brome Co.								
Knowlton	11-	VII	-1929	G. S. Walley		1		C.N.C.
Chateauguay Co.								

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
Cairnside	03-	VI	-1984	A. Larochelle & M-C. Lariviere	1			L.E.M.
Chicoutimi Co.								
Chicoutimi	15-	VIII	-1974	A. Francoeur		1		U.Q.A.C.
La Baie	? -	VII	-1981	M. Gagnon	1			U.Q.A.C.
Riviere du Moulin	26-	VI	-1984	P. D. E___	1	1		U.Q.A.C.
Saint-Felix-de-Otis	18-	VII	-1981	A. Larochelle & M-C. Lariviere	2	3		L.E.M.
Compton Co.								
Hereford	26-	VI	-1982	A. Larochelle & M-C. Lariviere		1		L.E.M.
Deux-Montagnes Co.								
La Trappe	11-	VI	-1937	J. Ouellet		1		U.D.M.
	18-	V	-1942	J. Ouellet		1		U.D.M.
	20-	V	-1942	J. Ouellet	2	2		U.D.M
Oka	31-	V	-1985	N. Ennis	2			L.E.M.
	07-	VI	-1985	A. Aranguren	2	2		L.E.M.
	19-	VI	-1985	A. Aranguren	2			L.E.M
	08-	VII	-1985	A. Aranguren	1			L.E.M.
Frontenac Co.								
Mont Megantic	29-	IV	-1984	A. Larochelle & M-C. Lariviere		2		L.E.M.
Gatineau Co.								
Gatineau Park	08-	VI	-1954	J. F. McAlpine	2			C.N.C.
Grand Remous	19-	IV	-1980	A. Larochelle M-C. Lariviere	1	1		L.E.M.
Harrington Lake	05-	VI	-1954	E. E. Sterns		1		C.N.C.
	11-	VI	-1954	J. E. H. Martin		2		C.N.C.

Locality:	Date:			Collector:	Sex:			Collection:
	D.	Mo.	Y.		M.	F.	U.	
	15	VI	-1954	H. J. Huckel	1			C.N.C.
	16	VI	-1954	E. E. Sterns		1		C.N.C.
Meach Lake	21	VI	-1916	A. Gibson	1			C.N.C.
	27	VI	-1969	M. J. Dadswell		2		C.U.
Wakefield	26	VI	-1946	G. S. Walley	1			C.N.C.
	28	VI	-1946	G. S. Walley	1	1		C.N.C.
Hull Co.								
Fairy Lake	15	VI	-1923	R. Ozburn		1		C.N.C.
	01	VI	-1927	G. S. Walley	1			C.N.C.
Hull	31	V	-1903	?	1			C.U.
Huntingdon Co.								
Covey Hill	23	VI	-1924	G. S. Walley		2		C.N.C.
Havelock	27	VI	-1980	A. Larochelle & M-C. Lariviere		1		L.E.M.
Hemmingford	15	VI	-1917	C. E. Petch		1		C.N.C.
Ile-de-Montreal Co.								
Montreal	19	VI	-1920	A. F. Winn			1	L.E.M.
	02	VI	-1932	?		1		U.D.M.
Sainte-Anne-de-Bellevue								
	05	VII	-1967	R. Lalonde		1		L.E.M.
	26	VI	-1975	A. C. Sheppard	1			L.E.M.
	27	V	-1976	P. W. Arntfield		1		L.E.M.
	08	VI	-1985	A. Aranguren		1		L.E.M.
Joliette Co.								
Sainte-Emilie-de-L'energie								
	03	VI	-1975	P. P. Harper		1		U.D.M.
	10	VI	-1977	R. Pelletier		1		U.Q.A.M.
Kamouraska Co.								
Reserve Park	17	VII	-1984	A. Larochelle & M-C. Lariviere		1		L.E.M.
St. Eleuthere	18	VII	-1984	A. Larochelle & M-C. Lariviere	3			L.E.M.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
Labelle Co.								
Lac-des-Ecorces								
	24-	VI	-1980	A. Larochelle & M-C. Lariviere		2		L.E.M.
Lac-Labelle	10-	VI	-1977	L. M. Crozier	1			L.E.M.
Lac Saguay	19-	VI	-1981	A. Larochelle & M-C. Lariviere	1	1		L.E.M.
Montigny	09-	VI	-1941	G. S. Walley	1	2		C.N.C.
Mont-Laurier	19-	VI	-1980	A.Larochelle & M-C. Lariviere	1	2		L.E.M.
Nomininque	07-	VII	-1967	A. Larochelle & M-C. Lariviere		1		L.E.M.
Lac-Saint-Jean-Ouest Co.								
St. Felicien	09-	VII	-1981	A. Larochelle & M-C. Lariviere	1			L.E.M.
L'assomption Co.								
L'assomption	19-	VI	-1982	A. Larochelle & M-C. Lariviere		1		L.E.M.
Montcalm Co.								
Mont Tremblant Prov. Park								
	17-	VI	-1952	A. Robert		1		U.D.M.
	21-	VI	-1952	A. Robert	2	1		U.D.M.
	04-	VII	-1952	A. Robert		1		U.D.M.
	06-	VII	-1952	A. Robert		1		U.D.M.
	13-	VI	-1954	A. Robert	1			U.D.M.
	17-	VI	-1954	A. Robert	1			U.D.M.
	09-	VII	-1954	A. Robert		1		U.D.M.
	19-	VI	-1955	A. Robert		1		U.D.M.
	20-	VI	-1956	A. Robert			1	U.D.M.

Locality:	Date:		Collector:	Sex:			Collection:
	D.	Mo. Y.		M.	F.	U.	
	16-	VI -1957	A. Robert			1	U.D.M.
	16-	VII -1957	A. Robert	1			U.D.M.
	15-	VII -1958	A. Robert		1		U.D.M.
	21-	VI -1959	A. Robert	1			U.D.M.
Rawdon	23-	VI -1983	A. Larochelle & M-C. Lariviere		1		L.E.M.
Nicolet Co.							
Nicolet	21-	VI -1980	A. Larochelle & M-C. Lariviere	1			L.E.M.
Papineau Co.							
Boilleau	27-	VI -1981	A. Larochelle & M-C. Lariviere		1		L.E.M.
Saint-Maurice Co.							
Trois-Rivieres							
	?	-VII -1918	F. Germain		1		L.E.M.
Temiscouata Co.							
Les Etrois	19-	VII -1984	A. Larochelle & M-C. Lariviere	1			L.E.M.
Degelis	20-	VIII-1984	A. Larochelle & M. C. Lariviere	1			L.E.M.
Packington	19-	VII -1984	A. Larochelle & M-C. Lariviere		1		L.E.M.
Terrebonne Co.							
Lac-Carre	30-	VI -1974	V. R. Vickery		1		L.E.M.
Sainte Sophie	26-	VI -1977	G. Malo		1		U.Q.A.M.
St.-Hippolyte	02-	VII -1974	P. P. Harper	1			U.D.M.
	10-	VII -1975	J. Thibault		1		U.D.M.
Sainte-Agathe-Sud							
	27-	VI -1978	R. Loiselle		1		U.Q.A.C.
Vaudreuil Co.							
Ile-Perrot	14-	VI -1975	J. A. Garland		1		L.E.M.
	13-	VI -1977	A. T. Finnamore	1			L.E.M.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M. F. U.	Collection:
Pte.-Fortune	23-V -1982	A. Larochelle & M-C. Lariviere	2 1	L.E.M.

Panorpa anomala Carpenter, 1931.

Panorpa anomala Carpenter, 1931a:245-246, fig. 29. Holotype male (M.C.Z.). Type-locality UNITED STATES OF AMERICA; *Kansas* Leavenworth Co.

Panorpa proximata Carpenter, 1931a:247, fig. 32. Holotype male (M.C.Z.). Type-locality UNITED STATES OF AMERICA: *Arkansas*, Washington Co. Synonymized by Byers (1974).

REDESCRIPTION

Head: yellow to brown. **Thorax:** brown to dark brown. Wings (Fig. 62) with membrane pale yellow and several basal margined cross-veins; marking variable; bands and spots brown to dark brown; apical band entire or presenting several clear spots to form a curved line; pterostigmal band broad anteriorly, apical and basal branches usually broken; intermediate marginal spot generally extending from C vein through C, Sc_1, R_1 and R_{2+3} cells to R_4 vein, sometimes reaching R Cell; basal band broken into two large spots; first and second marginal spots as well as first basal spot present. Legs yellow to brown. **Abdomen:** brown to dark brown. Male genitalia (Fig. 74) with ninth tergum (Fig. 86) rounded at base, apex moderately emarginated, forming two lateral projections; ninth sternum broad, ending before bases of dististyles; latter shorter than basistyles; ventral parameres barbed, elongate, divided towards apex

into two branches, the outer ones strongly curved inward, inner ones longer and more slender than outer ones and nearly straight; dorsal parameres oval, not reaching apex of dististyles. Female genitalia distal plate (Fig. 109) oval, covered laterally and basally by a membranous sheath or accessory plate (of Thornhill and Johnson, 1974), apex deeply emarginate, having two lateral lobes; spermathecal apodemes moderately diverging basally, divided into two overlapping layers, the inner ones being the longer; subgenital plate (Fig. 122) oval, narrowed at base, wider at a quarter of distance from base to apex, tip either pointed or notched, its internal lining presenting an elongate, sclerotized, triangular, thin membrane which is basally concave, deeply notched at tip; pleurites (Fig. 97) triangular, membranous, moderately sclerotized, posteriorly notched, dorsal aspect wider than ventral.

DISTRIBUTION

In Canada (Map 22), only one specimen of *P. anomala* has been collected from southern Ontario. In the United States, the species occurs from Kansas, Arkansas, Missouri, Alabama, South Carolina and North Carolina, north to Kentucky, Indiana and Michigan, continuing west to Wisconsin and Iowa (Carpenter, 1931a, 1936; Byers, 1954, 1974; Thornhill and Johnson, 1974; Webb *et al.*, 1975).

SEASONAL OCCURRENCE AND HABITAT

Adults have been collected in Michigan (Thornhill and Johnson, 1974) from June 18 to July 19 in a dense growth of wood-stinging nettle (*Laportea* sp.), as well as in floodplain forests of maple-elm (*Acer-Ulmus* spp.) with an undergrowth vegetation of jewelweed (*Impatiens* spp.),

nettle (*Laportea canadensis*), goldenrod (*Solidago* spp.), poison ivy (*Toxicodendron radicans*) and coneflower (*Rudbeckia laciniata*).

REMARKS

Males of *P. anomala* are unique among Canadian species in having branched ventral parameres. The female has a genital plate similar to that of *P. debilis* in being covered laterally by a thin membrane, but differs from the latter by being covered basally as well.

SPECIMENS EXAMINED

1 male (the only specimen collected in Canada).
2 males and 2 females (specimens from Illinois, I.N.H.S.).

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
ONTARIO								
Kent Co.								
Chatham	13-	VI	-1936	G. M. Stirret	1			C.N.C.

Panorpa helena Byers, 1962.

Panorpa venosa (*nec* Westwood, 1846); Hine, 1901:250, figs. 4, 18, 23, 38; Esben-Petersen, 1921:66, figs. 71; Carpenter, 1931a: 234-235, figs 16, 51. Holotype female (B.M.N.H.). Type-locality: UNITED STATES OF AMERICA: *Georgia*.

Panorpa helena Byers, 1962a:474, fig. 6. Holotype male (SNOW). Type-locality: UNITED STATES OF AMERICA: *Pennsylvania*, Berks Co, Hopewell Lake, French Creek State Park.

REDESCRIPTION

Head: Yellow to brown. **Thorax:** Reddish to brown. Wings (Fig. 63) with membrane clear to pale yellow and with a few basal cross-veins with dark margins; bands and spots dark brown; apical band entire, broad, occasionally with small clear areas; pterostigmal band broad anteriorly, apical branch broken; intermediate marginal spot moderately large, generally extending from C vein through cells C, Sc and R_1 to R_{2+3} vein; small pale spot also present below and beyond Rs bifurcation on R cell; basal band either entire or broken into two large spots; only first basal spot present. Legs yellow to reddish brown. **Abdomen:** brown to dark brown. Male genitalia (Fig. 75) with ninth tergum (Fig. 87) rounded at base, constricted at three-fourths of distance from base, apex with an oval emargination forming two lateral projections; ninth sternum narrowed at base, tips reaching bases of dististyles; latter smaller than basistyles; ventral parameres narrow, elongate, barbed, unbranched, extending to bases of dististyles; dorsal parameres more or less outwardly-curved, apex folded in, extending to bases of dististyles. Female genitalia with distal plate (Fig. 110) oval, covered by a thin membrane from middle to basal portion, apex with either a rounded or a triangular emargination forming two lateral projections; spermathecal apodemes diverging widely, divided into two layers of about equal width and length; subgenital plate (Fig. 123) oval, wider in the middle, apex either pointed or slightly notched; pleurites (Fig. 98) triangular with a

moderately sclerotized, posterior pleural fold.

DISTRIBUTION

In Canada (Map 23), only a few specimens of *P. helena* have been collected in eastern Manitoba, western and southern Ontario, and in the Algoma District of the latter province. It is one of the species which seems able to penetrate the real boreal forest which is interesting because it is also able to exist rather far south. In the United States, the species is very widespread, occurring in New York, thence ranging throughout most of Midwest region, southward to Tennessee and Georgia, with isolated records from Maine and Utah (Banks, 1892; Hine, 1901; Sherman, 1908; Engelhardt, 1915; Esben-Petersen, 1921; Carpenter, 1931a, 1939; Gurney, 1937; Byers, 1954, 1958, 1962a, 1973a; Caron, 1967; Thornhill and Johnson, 1974; Webb *et al.*, 1975; Byers and Covell, 1981).

SEASONAL OCCURRENCE AND HABITAT

Adults have been collected from June 18 until August 5. The habitats of *P. helena* vary widely. They include lowland and upland, moist, shady forests with a leafy undergrowth of jewelweed (*Impatiens* spp.) and poison ivy (*Toxicodendron radicans*) (Byers, 1954, 1962a; Thornhill and Johnson, 1974; Webb *et al.*, 1975).

REMARKS

Males of *P. helena* can be separated from other Canadian panorpids by the shape of the dorsal parameres. Females possess pleurites having a small dorsally directed pleat or fold.

SPECIMENS EXAMINED

6 males, 14 females, 3 sex unknown.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
MANITOBA.								
Beaconia	03	VII	-1976	E. E. Adams		1		U.M.
Grand Beach	09	VII	-1925	A. J. Hunter	1		1	U.M.
	08	IX	-1925	A. J. Hunter		1		U.M.
	09	VII	-1979	B. Batulla	1			U.M.
	14	VII	-1979	B. Batulla		1		U.M.
Rathwell	16	VII	-1978	D. G. Delf		1		U.M.
Rennie	20	VI	-1950	W. G. H. Ives		1		U.M.
	26	VI	-1962	?			1	C.N.C.
Selkirk	30	VI	-1928	A. J. Hunter		1		U.M.
Traverse Bay	23	VII	-1983	T. W. Suzanski		1		U.M.
Victoria Beach								
	8-9	VII	-1928	N. E. Criddle		2		C.N.C.
ONTARIO.								
Algoma Dist.								
Icewater Creek								
	05	VIII	-1981	G. Aiudi	1			U.G.
Root River	18	VI	-1951	W. Y. Watson		1		R.O.M.
Wabos	07	VII	-1984	D. Poirier & C. Logan		1		U.G.
	29	VII	-1984	D. Poirier & C. Logan		1		U.G.
Rainy River Dist.								
Finland	04	VII	-1960	M. R. Mackay			1	C.N.C.
	04	VII	-1960	S. M. Clark	1	1		C.N.C.
	26	VII	-1960	S. M. Clark	1			C.N.C.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M. F. U.	Collection:
One sided Lake	25-VII -1960	S. M. Clark	1	C.N.C.
Waterloo Co.				
Elmira	14-VII -1959	J. A. Scott	1	U.M.

Panorpa debilis Westwood, 1846.

Panorpa debilis Westwood, 1846:191. Lectotype female. Type-locality UNITED STATES OF AMERICA: *New York*, Trenton Falls.

Panorpa canadensis Banks, 1895:191.

REDESCRIPTION

Head: reddish. **Thorax:** yellowish to reddish. Wings (Fig. 64) with membranes clear, a few basal cross-veins margined; wing bands dark brown; apical band with few small spots; pterostigmal band narrowed in middle, its apical branch reduced to a small spot; intermediate marginal spot broad anteriorly, generally extending from either C and/or Sc veins to R_4 vein, varying in shape; Legs yellowish to reddish. **Abdomen:** Reddish to dark brown. Male genitalia (Fig. 76) with ninth tergum (Fig. 88) broad basally, compressed three-quarters of distance from base, apex emarginate; ninth sternum V-shaped, tapered, rounded apically; dististyles with inner sides curved and without lobes; ventral parameres barbed, curved inward, extending beyond base of dististyles; dorsal parameres subtriangle, not reaching bases of dististyles Female genitalia with only distal plate (Fig. 111) present, basally constricted, apex emarginate and expanded laterally to form two

accesory plates; spermathecal apodemes shorter than distal plate, slightly divergent, divided into two overlapping layers, inner apodemes longer than outer ones; subgenital plate (Fig. 124) oval, rather straight at base; pleurites (Fig. 99) triangular, poorly sclerotized, more or less membranous, posterior edge deeply notched so that accessory plate of genital plate covers part of the latter.

DISTRIBUTION

In Canada (Map 24), *Panorpa debilis* is known to occur in rather southern localities of Ontario, Quebec and New Brunswick. In the United States, the species has been recorded from the eastern part, extending from Tennessee and North Carolina to New England, west to Wisconsin and thence south to Illinois and Kentucky (Banks, 1892; Carpenter, 1931a; Engelhardt, 1915; Byers, 1954; Caron, 1967; Thornhill and Johnson, 1974; Webb *et al.*, 1975). There is also a doubtful record for Colorado (Byers, 1973a).

SEASONAL OCCURRENCE AND HABITAT

Adults have been collected from June 2 until September 27, in patches of wild raspberry (*Rubus* spp.), jewelweed (*Impatiens* sp.) (Byers, 1954) and sumac (*Rhus* sp.), in maple-birch (*Acer-Betula* spp.) forests, as well as in a variety of moist habitats, including upland localities (Byers, 1954; Thornhill and Johnson, 1974).

REMARKS

P. debilis can be separated from other Canadian species by the narrow constriction of the pterostigmal wing-band near its mid-length. Males have a split lobe between the

have a split lobe between the two basistyles; female pleurites show that the genital plate is partially covered by its accessory plate.

SPECIMENS EXAMINED

100 males, 108 females and 9 sex unknown.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	U.	Collection:
NEW BRUNSWICK.						
Charlotte Co.						
Saint Andrews	25-VII -1978	A. A. Konecny	1			U.O.G.
ONTARIO.						
Bruce Co.						
Elsinore	02-VIII-1945	G. S. Walley	1	1		C.N.C.
	02-VIII-1945	G. S. Walley		1		C.U.
Lucknow	03-VII -1976	D. Levin		1		U.G.
Carleton Co.						
Blackburn	16-VI -1941	A. R. B.	1	1		C.N.C.
	27-VI -1956	J. F. McAlpine		2		C.N.C.
Constance Bay						
	21-VI -1933	G. S. Walley	2			C.N.C.
	10-VII -1933	G. S. Walley	1			C.N.C.
	08-VIII-1935	F. A. Urquhart	2			C.N.C.
Marshall Bay	04-VIII-1913	C. G. Hewitt		1		C.N.C.
Merivale	23-VII -1930	J. J. deGryse		1		C.N.C.
Munster	21-VII -1976	J. O'Hara	1			C.U.
Ottawa	12-VII -1918	?			1	R.O.M.
	27-VIII-1923	F. P. Ide		1		C.N.C.
	19-VII -1924	F. P. Ide	1			C.N.C.
	12-VII -1940	G. A. Hobbs		1		C.N.C.
	10-VII -1946	G. S. Walley	3	5		C.N.C.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	U.	Collection:
	28-VII -1946	A. R. Brooks	1	1		C.N.C.
	17-VI -1952	G. S. Walley	1			C.N.C.
	17-VI -1952	E. G. Munroe		1		C.N.C.
	19-VII -1953	L. K. Smith	1			I.N.H.S.
	08-VII -1962	B. S. Heming	1			U.G.
	21-VII -1963	E. C. Becker		1		C.N.C.
	21-VI -1970	R. H. Parry	1			C.U.
Stittsville	02-VII -1963	?	1			C.N.C.
Dufferin Co.						
Primrose	10-VI -1955	D. H. Pengelly		1		U.G.
	30-VI -1955	D. H. Pengelly	2	3		U.G.
Durham Co.						
Kendal	23-VIII-1963	J. D. Van Loon		1		U.G.
Leskard	24-VI -1955	G. B. Wiggins		1		R.O.M.
Shirley	20-VI -1977	J. A. Downes	1			L.E.M.
Elgin Co.						
Port Stanley	01-VIII-1922	?	2	1		U.G.
Saint Thomas	30-VII -1924	H. S. D___	1			C.N.C.
	05-VIII-1924	H. S. D___		1		C.N.C.
Glengarry Co.						
Glengarry Prov. Park						
	04-VII -1941	?		1		L.E.M.
Maxville	08-VIII-1938	J. M. Smith	1	1		U.G.
Grey Co.						
Durham	17-VI -1955	D. H. Pengelly		1		U.G.
Mount Forest	22-VII -1984	T. Lowery	1			U.G.
Haliburton Co.						
Algonquin Prov.Park						
	23-VI -1962	R. J. Pilfrey	1			U.G.
Halton Co.						

Locality:	Date:	Collector:	Sex:			Collection:
	D. Mo. Y.		M.	F.	U.	
Acton	08-VII -1955	D. H. Pengelly		1		U.G.
Halton Hills	26-VI -1981	J. Cairns	1			U.G.
Hastings Co.						
Chatterton	26-VII -1955	J. C. Martin	1			C.N.C.
Madoc	15-VII -1953	J. C. Martin	1			C.N.C.
Marmora	11-VII -1952	H. N. Smithe		1		C.N.C.
	27-VI -1952	C. Boyle	1	1		C.N.C.
	18-VIII-1952	J. F. McAlpine	1			C.N.C.
	24-VII -1952	J. R. Vockeroth	1			C.N.C.
	21-VII -1952	J. R. Vockeroth	1			C.N.C.
Maynooth	19-VI -1953	J. F. McAlpine	1			C.N.C.
Moira Lake	11-VII -1933	E. Thomas		1		C.N.C
Kent Co.						
Rondeau	21-VI -1923	A. W. Baker		1		U.G.
Lambton Co.						
Pinery Prov. Park						
	03-VII -1977	E. Oleksuik	1			R.O.M.
Lanark Co.						
Bells Corners	23-VII -1951	R. Lambert		1		C.N.C.
	24-VII -1951	R. Lambert	1			C.N.C.
Black Lake	? -1971	J. A. Downes	3		1	L.E.M.
	17-VI -1985	J. A. Downes	1			L.E.M.
	01-VII -1985	J. A. Downes	3			L.E.M.
Perth	01-VIII-1977	R. G. Bennett	1			U.G.
Stanleyville	01-VII -1985	J. A. Downes	1	2		L.E.M.
Leeds Co.						
Chaffeys Locks						
	04-VII -1971	J. C. E. Riotte	1			R.O.M.
Gananoque	09-VII -1941	G. S. Walley		1		C.N.C
	09-VII -1963	C. J. Edwards		1		U.G.
Lyn	10-VII -1926	F. P. Ide		1		C.N.C.
	26-VI -1929	F. P. Ide		1		R.O.M.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
St. Lawrence Is. Nat. Pk.								
	02-VI		-1975	E. Sigler		1		C.N.C.
	26-VI		-1975	H. J. Teskey		1		C.N.C.
	21-VII		-1975	J. H. Martin & Parks	1			C.N.C.
	31-VII		-1975	E. Sigler		1		C.N.C.
Lincoln Co.								
Vineland	21-VII		-1928	W. Putman		1		C.N.C.
	05-VII		-1929	W. L. Putman		1		C.N.C.
	28-VII		-1938	D. A. Ross		1		U.G.
Middlesex Co.								
London	?			W. Saunders		1		U.G.
Muskoka Dist.								
Port Sydney	02-VII		-1919	N. K. Bigelow	1	1		R.O.M.
Norfolk Co.								
Normandale	29-VI		-1925	G. S. Walley		1		C.N.C.
	30-VI		-1925	G. S. Walley	1			C.N.C.
	09-VII		-1925	G. S. Walley		1		C.N.C.
Simcoe	25-VI		-1939	G. E. Shewell	1	1		C.N.C.
Oxford Co.								
Ingersoll	25-VI		-1932	G. S. Walley		1		C.N.C.
Peel Co.								
Belfountain	01-VII		-1976	G. J. Umphrey	1			U.G.
Peterborough Co.								
Nogies (Lk.?)	26-VII		-1975	F. Quan	1	1		R.O.M.
Prince Edward Co.								
?	01-VII		-1896	Evans		1		R.O.M.
Russell Co.								
Casselman	18-VII		-1978	E. Fuller & Jaagumagi		1		R.O.M.
Mer bleue	19-VII		-1963	J. R. Vockeroth		3		C.N.C.
	25-VI		-1964	J. R. Vockeroth	4	2	1	C.N.C.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	U.	Collection:
Simcoe Co.						
De Grassi Point						
	22-VII -1934	A. W. A. Brown			1	R.O.M.
Ivy	? -VIII-1955	A. V. Skepasts		1		U.G.
Lake Simcoe	30-VII -1906	?			1	R.O.M.
Midland	30-VII -1956	J. G. Chillcot	1			C.N.C.
Orillia	26-VII -1924	H. L. Viereck	1			C.N.C.
Stormont Co.						
Finch	16-VI -1979	B. Termeer		1		U.G.
	08-VII -1979	B. Termeer	1			U.G.
Welland Co.						
Forks Creek	09-VI -1981	J. Cairns	1			U.G.
Wellington Co.						
Belwood	23-VI -1965	D. H. Pengelly	1			U.G.
	05-VII -1972	D. H. Pengelly	2	3		U.G.
	16-VII -1972	D. H. Pengelly		1		U.G.
	03-VII -1975	D. H. Pengelly	1			U.G.
	13-VII -1976	E. A. Innes	1			U.G.
Drayton	20-VIII-1949	H. Colhoun			1	U.G.
Eden Mills	25-VII -1977	A. A. Konecny		1		U.G.
Eramosa	04-VII -1959	R. E. Crawford	1			U.G.
	18-VII -1959	R. E. Crawford		1		U.G.
Erin	21-VI -1979	J. Ernest		1		U.G.
Guelph	27-VI -1981	L. Coote	1			U.G.
	20-31-VII-84	K. Gilbert		1		U.G.
	29-VI to:					
	07-VII -1984	K. Gilbert		1		U.G.
Wentworth Co.						
Ancaster	10-VII -1965	J. E. H. Martin		1		C.N.C
Millgrove	? -VII -1949	H. Colhoun		1		U.G.
?	06-IX -1938	J. M. Smith		1		U.G.
York Co.						

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	U.	Collection:
Toronto	26-VI -1891	?	1			R.O.M.
	05-VII -1891	W. Brodie Collection	1			R.O.M.
	? -1912	?		1		R.O.M.
	15-VI -1922	R. W. Hall		1		R.O.M.
	09-VIII-1924	?	1			R.O.M.
	18-VII -1925	?		1		R.O.M.
	20-VII -1933	F. A. V___	2	1		R.O.M.
	27-VII -1981	L. Coote		1		U.G.
QUEBEC.						
Argenteuil Co.						
Avoca	25-26-VII-63	D. K. Kevan		1		L.E.M.
Deux-Montagnes Co.						
Oka	08-VII -1985	A. Aranguren	1			L.E.M.
Berthier Co.						
Berthierville	07-VII -1938	J. Ouellet		2		U.D.M.
	05-VIII-1938	J. Ouellet	1			U.D.M.
	17-VII -1940	A. Robert		1		U.D.M.
	22-VIII-1949	A. Robert		1		U.D.M.
Lanoraie	02-VII -1975	J. A. Garland		1		L.E.M.
	25-VI -1980	A. T. Finnamore	1			L.E.M.
Brome Co.						
Bondville	01-VII -1927	?		1		L.E.M.
Dunkin	27-IX -1956	G. B. Wiggins	1			R.O.M.
Knowlton	09-VII -1927	G. S. Walley	1			C.N.C.
	18-VII -1929	L. J. Milne	1			C.N.C.
	22-VII -1929	L. J. Milne	1			C.U.
	22-VII -1929	L. J. Milne		2		C.N.C.
	28-VI -1929	L. J. Milne		2		C.N.C.
	10-VII -1930	L. J. Milne		1		C.N.C.
	19-VII -1968	J. R. Vockeroth	1			C.N.C

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
Orford Lake	11	VII	-1920	A. F. Winn		1		L.E.M.
Potton Springs	04	VII	-1928	J. A. Adams		1		C.N.C.
Sutton	02	VII	-1964	W. E. Richer		1		C.N.C.
?	02	VIII	-1917	A. F. Winn	1			L.E.M.
Dorchester Co.								
Lac-Etchemin	09	VIII	-1981	A. Larochelle & M-C. Lariviere		1		L.E.M.
Gatineau Co.								
Aylmer	09	VII	-1924	C. B. Hutchings	1			C.N.C.
Harrington Lake	03	VII	-1963	J. R. Vockeroth			1	C.N.C.
Kazabazua	28	VIII	-1928	J. A. Adams	1			C.N.C.
Kingsmere	19	VII	-1919	R. H. Chrystal		1		C.N.C.
Meach Lake	27	VI	-1969	M. J. Dadswell	1			C.U.
Hull Co.								
Fairy Lake	17	VII	-1928	J. A. Adams	1			C.N.C.
Hull	13	VIII	-1924	C. H. Curran		1		C.N.C.
Huntingdon Co.								
Havelock	30	VI	-1983	A. Larochelle & M-C. Lariviere	1	2		L.E.M.
Iberville Co.								
Sabrevois	02	VII	-1983	A. Larochelle M-C. Lariviere		1		L.E.M.
Ile-de-Montreal Co.								
Montreal	22	VII	-1934	G. A. Moore	1			L.E.M.
	?			J. Ouellet	1			U.D.M.
Sainte-Anne-de-Bellevue	?	VI	-1966	L. M. Crozier			1	L.E.M.
Kamouraska Co.								
La Pocaterie	07	VIII	-1981	A. Larochelle & M-C. Lariviere		1		L.E.M.

Locality:	Date: D. Mo. Y.	Collector:	Sex: M.	F.	U.	Collection:
Park Reserve	10-VII -1957	G. E. Shewell		1		C.N.C.
Labelle Co.						
Ferme Neuve	24-VI -1980	A. Larochelle & M-C. Lariviere		1		L.E.M.
Montcalm Co.						
Entres-Lacs	06-VIII-1981	F. Genier		1		L.E.M.
Papineau Co.						
Boilleau	27-VI -1981	A. Larochelle & M-C. Lariviere		1		L.E.M.
Pontiac Co.						
Norway Bay	05-VII -1938	G. A. Hobbs	1			C.N.C.
Otter Lake	24-VII -1958	L. A. Kelton	2	4		C.N.C.
Saint-Jean Co.						
Ste. Therese Island	04-VII -1916	W. Chagnon	1			L.E.M.
	17-VII -1916	W. Chagnon			1	L.E.M.
?	13-VIII-1917	W. Chagnon	1			L.E.M.
Shefford Co.						
Sainte-Cecile-de-Milton	? -VII -1978	R. Loiselle	1			U.Q.A.C.
Stanstead Co.						
Barnston	26-VIII-1984	A. Larochelle & M-C. Lariviere		1		L.E.M.
Temiscouata Co.						
Degelis	20-VII -1984	A. Larochelle & M-C. Lariviere	1			L.E.M.
Notre-Dame-du-Lac	07-VII -1932	F. P. Ide	2			R.O.M.
Terrebone Co.						
Lac Carre	23-VIII-1968	W. Boyle & J. Lalonde	1			L.E.M.
	05-VIII-1971	D. E. Johnstone		1		L.E.M.

Panorpa claripennis Hine, 1901.

Panorpa claripennis Hine, 1901:252, figs. 14, 36. Holotype male (M.C.Z.). Type-locality CANADA: *Quebec*, Sherbrooke.

REDESCRIPTION

Head: yellowish to brown. **Thorax** yellowish to reddish; Wings (Fig.) with membranes colourless, with several marginal cross-veins; bands and spots brown; apical band usually with one or two clear spots and/or broken posteriorly into two spots, occasionally very faint; pterostigmal band broad anteriorly, basal branch narrowed, apical branch occasionally broken into two spots; intermediate marginal spot usually forming a narrow stripe extending from C vein through Sc_1 and R_1 cells to R_{2+3} vein; basal band divided into two large spots; only first basal spot present. Legs yellowish to brown. **Abdomen:** yellowish to dark brown. Male genitalia (Fig. 77) with apex of ninth tergum (Fig. 89) moderately emarginate, forming two lateral projections, rounded at base, constricted at three-quarters of distance from base; nint sternum moderately broad, tapered apically, ending before bases of dististyles; latter having an inward ear-like structure at base, followed by a small notch in upper aspect; ventral parameres elongate, barbed, extending to ear-like structure of dististyles; dorsal parameres broad towards base, taper and round at apex, inner margins convexes, outer ones rather straight. Female genitalia comprising distal plate (Figs. 112, 125) only, rounded, apex

deeply emarginate forming two slender, lateral projections; spermathecal apodemes moderately bifurcated and divided into two layers, inner ones joined to a thin, concave membrane; subgenital plate (Fig. 125) oval, notched at tip, rounded at base, similar to that of *Panorpa latipennis* (p. 85); pleurites (Figs. 100, 125) triangular, membranous, a triangular pleural fold extending from anterior to posterior aspects, dorsal margin longer than ventral.

DISTRIBUTION

P. claripennis has been collected in southern Ontario and Québec (Map 25), extending to the Gaspé peninsula. The latter suggests that this species may be found in Maine and New Brunswick. In the United States, *P. claripennis* has been reported to have an northeastern distribution. It occurs in Wisconsin, Michigan, Ohio and, northeastward to New Hampshire. (Carpenter, 1931a, 1932; Byers, 1954; Thornhill and Johnson, 1974; Webb *et al.*, 1975). There is also an isolated record from western Florida (Byers, 1958).

SEASONAL OCCURRENCE AND HABITAT

Adults, in Canada, have been recorded as being found from May 15 until July 24. The habitat of *P. claripennis* is in swampy ground on jewelweed (*Impatiens* sp.), dogwood (*Cornus* spp.) and wayfaring-tree (*Viburnum* spp.) (Byers, 1954; Thornhill and Johnson, 1974; Webb *et al.*, 1975).

REMARKS

The wing markings of *P. claripennis* vary considerably. Nevertheless, this species can usually be separated from *P. latipennis* by its anteriorly broad pterostigmal wing band.

Males present sharper dististyles and thicker ventral parameres than those of the latter species; females have protruding pleurites when seen in ventral view.

SPECIMENS EXAMINED

63 males, 66 females and 1 sex unknown.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	E.	U.	Collection:
ONTARIO.								
Bruce Co.								
Hepworth	04	VII	-1979	D. Morris		1		U.G
Carleton Co.								
Ottawa	09	VI	-1920	J. McDunnough	1			C.N.C.
Dufferin Co.								
Horning's Mills	14	VI	-1928	F. P. Ide	1			U.G.
Durham Co.								
Brooklin	06	VII	-1979	D. Lewis		1		U.G.
Elgin Co.								
Aylmer	04	VI	-1941	H. B. Wressel		1		C.N.C.
Grey Co.								
Owen Sound	08	VI	-1975	J. M. Cumming	1	1		U.G.
Haldimand								
Dunnville	02	VI	-1961	J. C. Riotte	1			R.O.M.
	08	VI	-1975	N. Wilcox	1	1		U.G.
Halton Co.								
Campbellville	27	V	-1977	K. Barber	1			U.G.
	27	V	-1982	C. Hare		1		U.G.
Halton Hills	09	VI	-1978	J. Cappleman		1		U.G.
	26	VI	-1981	J. Cairns	3	1		U.G.
	26	VI	-1981	J. Kircher	1	1		U.G.
	02	VII	-1981	J. Cairns	1			U.G.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
Milton	27	V	-1974	N. Wilcox		1		U.G.
Middlesex Co.								
Coldstream	31	V	-1922	A. A. Wood	2	1		C.N.C.
	29	V	-1922	A. A. Wood		1		C.N.C.
	20	V	-1959	J. G. Chillcott	1			C.N.C.
London	11	VI	-1904	?	1			U.G.
Strathroy	14	VI	-1927	H. F. Hudson	1	1		C.N.C.
	08	VI	-1927	H. F. Hudson		1		C.N.C.
Norfolk Co.								
Simcoe	05	VI	-1939	T. N. Freeman	1	1		C.N.C.
	05	VI	-1939	G. E. Shewell	1			C.N.C.
Peel Co.								
Belfountain	26	VI	-1972	G. Sevean		1		U.G.
	23	V	-1975	J. M. Cumming	1			U.G.
	15	VI	-1976	J. M. Cumming	1			U.G.
	06	VI	-1982	R. Young		1		U.G.
Simcoe Co.								
Camp Borden	02	VI	-1975	S. Allan		1		U.G.
Lefroy	15	VI	-1982	R. Young		1		U.G.
	15	VI	-1982	A. John		2		U.G.
	26	VI	-1982	D. Morris		1		U.G.
Severn	16	VI	-1925	J. McDunnough	1			C.N.C.
Stormont Co.								
Cornwall	29	VI	-1925	F. P. Ide	1			C.N.C.
Welland Co.								
Forks Creek R.								
	29	V	-1981	J. Cairns		1		U.G.
	09	VI	-1981	J. Cairns	1			U.G.
	23	VI	-1981	J. Kircher	1			U.G.
	25	VI	-1981	J. Cairns		1		U.G.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
Wellington Co.								
Arkell	08-VI		-1977	K. Barber	1			U.G.
	06-VI		-1978	D. Morris	2			U.G.
	26-V		-1982	C. Hare		1		U.G.
Guelph	14-VI		-1971	J. A. Neary		1		U.G.
York Co.								
Stouffville	25-V		-1982	B. Brown		1		U.G.
QUEBEC.								
Berthier Co.								
Berthierville	10-VI		-1938	J. Ouellet		1		U.D.M.
	14-VI		-1938	J. Ouellet		1		U.D.M.
	06-VI		-1948	A. Robert	1			U.D.M.
	13-VI		-1948	A. Robert		1		U.D.M.
	20-VI		-1948	A. Robert	1	2		U.D.M.
	19-VI		-1949	A. Robert		1	1	U.D.M.
	22-VI		-1950	A. Robert	1			U.D.M.
	25-VI		-1950	A. Robert		1		U.D.M.
Lanoraie	26-V		-1977	L. Crozier	3			L.E.M.
Bonaventure Co.								
Cascapedia	21-VI		-1933	W. J. Brown	1			C.N.C.
Brome Co.								
Bondville	01-VII		-1927	?	1			L.E.M.
Knowlton	20-VI		-1927	G. S. Walley	2	1		C.N.C.
	14-VI		-1928	J. A. Adams	1			C.U.
	06-VI		-1930	G. S. Walley	1			C.N.C.
	13-VI		-1930	G. S. Walley		1		C.U.
	03-VII		-1932	F. P. Ide		1		R.O.M.
	04-VII		-1932	F. P. Ide		1		R.O.M.
	05-VI		-1963	J. R. Vockeroth	2	2		C.N.C.
	05-VI		-1963	J. G. Chillcott	1			C.N.C.

Locality:	Date:			Collector:	Sex:			Collection:
	D.	Mo.	Y.		M.	F.	U.	
Mont Owl Head	25	VI	-1984	A. Larochelle & M-C. Lariviere	3	4		L.E.M.
Sutton	19	VI	-1984	A. Larochelle & M-C. Lariviere	1	1		L.E.M.
Compton Co.								
Hereford	26	VI	-1982	A. Larochelle & M-C. Lariviere		1		L.E.M.
Frontenac Co.								
Megantic	15	VI	-1923	C. H. Curran	1			C.N.C.
Gatineau Co.								
Gatineau Park, Harrington Lake	09	VI	-1954	J. E. Martin		1		C.N.C.
Lytton	01	VII	-1981	A. Larochelle & M-C. Lariviere	1			L.E.M.
Huntingdon Co.								
Havelock	10	VI	-1984	A. Larochelle & M-C. Lariviere		1		L.E.M.
Ile-de-Montreal Co.								
Montreal	05	VI	-1931	A. Robert	1			U.D.M.
	07	VII	-1932	?	1			U.D.M.
Mont-Royal	20	VI	-1918	J. Ouellet		1		L.E.M.
Sainte-Anne-de-Bellevue	07	VI	-1954	?	1			L.E.M.
	20	VI	-1965	J. Lourity	1			L.E.M.
	21	VI	-1985	A. Aranguren		1		L.E.M.
Joliette Co.								
Lac Cloutier	24	VI	-1985	F. Genier & __ Bertrand		1		L.E.M.
Kazubazua	12	VI	-1935	T. N. Freeman	2	2		C.N.C.

Locality:	Date: D.	Mo.	Y.	Collector:	Sex: M.	F.	U.	Collection:
Sainte-Emilie-de-L'energie								
	10	VI	-1977	R. Pelletier		1		U.Q.A.M.
	06	VII	-1978	F. Oinet		1		U.Q.A.M.
Kamouraska Co.								
Saint-Eleuthere								
	18	VII	-1984	A. Larochelle & M-C. Lariviere	1			L.E.M.
Matapedia Co.								
Saint-Tharcisius								
	24	VII	-1984	A. Larochelle & M-C. Lariviere	1	1		L.E.M.
Missisquoi Co.								
Philipsburg	13	VI	-1982	A. Larochelle & M-C. Lariviere		2		L.E.M.
Rimouski Co.								
Trinite-des-Monts								
	21	VII	-1984	A. Larochelle & M-C. Lariviere		1		L.E.M.
Sherbrooke Co.								
Mont Orford	15	VI	-1963	J. R. Vockeroth	1			C.N.C.
Temiscouata Co.								
Degelis	25	VI	-1973	P. P. Harper	1			U.D.M.
Les-Etrois	19	VII	-1984	A. Larochelle & M-C. Lariviere		1		L.E.M.
Vaudreuil Co.								
Ile-Perrot	24	VI	-1980	J. A. Garland		1		L.E.M.
Pointe-Fortune								
	05	VI	-1982	A. Larochelle & M. C. Lariviere		3		L.E.M.
	23	VI	-1982	A. Larochelle & M-C. Lariviere	3	2		L.E.M.

Locality:	Date:			Collector:	Sex:			Collection:
	D.	Mo.	Y.		M.	F.	U.	
Rigaud	15	VI	-1981	A. Larochelle & M-C. Lariviere	1			L.E.M.

SUMMARY

The Canadian members of the Order Mecoptera are redescribed and their ranges mapped.

Bittacus stigmaterus, *Panorpa helena*, *P. banksii* and *P. mirabilis* are recorded for the first time for Canada; *Bittacus occidentis* and *Panorpa rufescens* have not yet been confirmed for Canada but they may well be found there.

The most important taxonomic characters used in order to recognize the species are in the wings and genital structures; the pronotum is of importance for *Boreus*. This study introduces new useful characters for the identification of the species: the intermediate marginal spot on the wing for *Panorpa*, in both sexes; the pleural fold for the females of *Panorpa*, and the shape and the pattern of sclerotization of the subgenital plate for females of *Bittacus*.

Since the wings of females *Boreus* are not distinctive characters for identification, and since the ovipositor tends to telescope, the use of scanning electron microscope could probably be of service in revealing the importance of the spines on the eighth abdominal sternum of the females.

Females of *Boreus elegans* and *B. nivoriundus* have a rather constant number of bristles on the meso- and/or metanotum, a character which does not assist in the identification of the females of other species since this character varies considerably or is absent.

Collection of adults and immature stages is needed, particularly in central and northern British Columbia where

additional members of the genus *Boreus* may occur. Nothing is known on the larvae of *Merope tuber*, discovery which could lead to a better understanding of the relationship of this genus with other genera of Mecoptera.

All four Canadian families of Mecoptera, Meropeidae, Panorpidae, Bittacidae and Boreidae, are found in eastern Canada, but only the last occurs in the west. There is no record of any species from Labrador. *Boreus* and *Panorpa* are the only two genera to have been found further north than the 50th parallel in the true boreal zone of the Nearctic Region.

LIST OF ABBREVIATIONS

ab	Apical branch
Acv	Anal cross-vein
Ae	Aedeagus
AH	Anal horn
Al	Accessory lobe
Ap	Accessory plate
Awb	Apical wing band
bb	Basal branch
Bp	Basal plate
Bs	Basistyle
Bwb	Basal wind band
C	Costa
Ce	Cercus
Ci	Cerci
Cu	Cubitus
Dp	Distal plate
Dpm	Dorsal paramere
Ds	Dististyle
Gp	Genital plate
Hd	Hood
Ims	Intermediate marginal spot
Ish	Internal sheath
Lp	Lateral projection
M	Media
MsN	Mesonotum
MtN	Metanotum
Pcv	Pterostigmal cross-vein
Pf	Pleural fold
Pl	Pleurite
pm	Paramere
PN	Pronotum
Pwb	Pterostigmal wing band
R	Radius
Rs	Radial sector
S	Segment
Sa	Spermathecal apodeme
Sap	Subanal plate
Sc	Subcosta
Sd	Spermathecal duct
Sgp	Subgenital plate
St	Sternum
T	Tergum
Vpm	Ventral paramere
W	Wing
1bs	First basal spot
2bs	Second basal spot
1ms	First marginal spot
2ms	Second marginal spot
1-3A	Anal

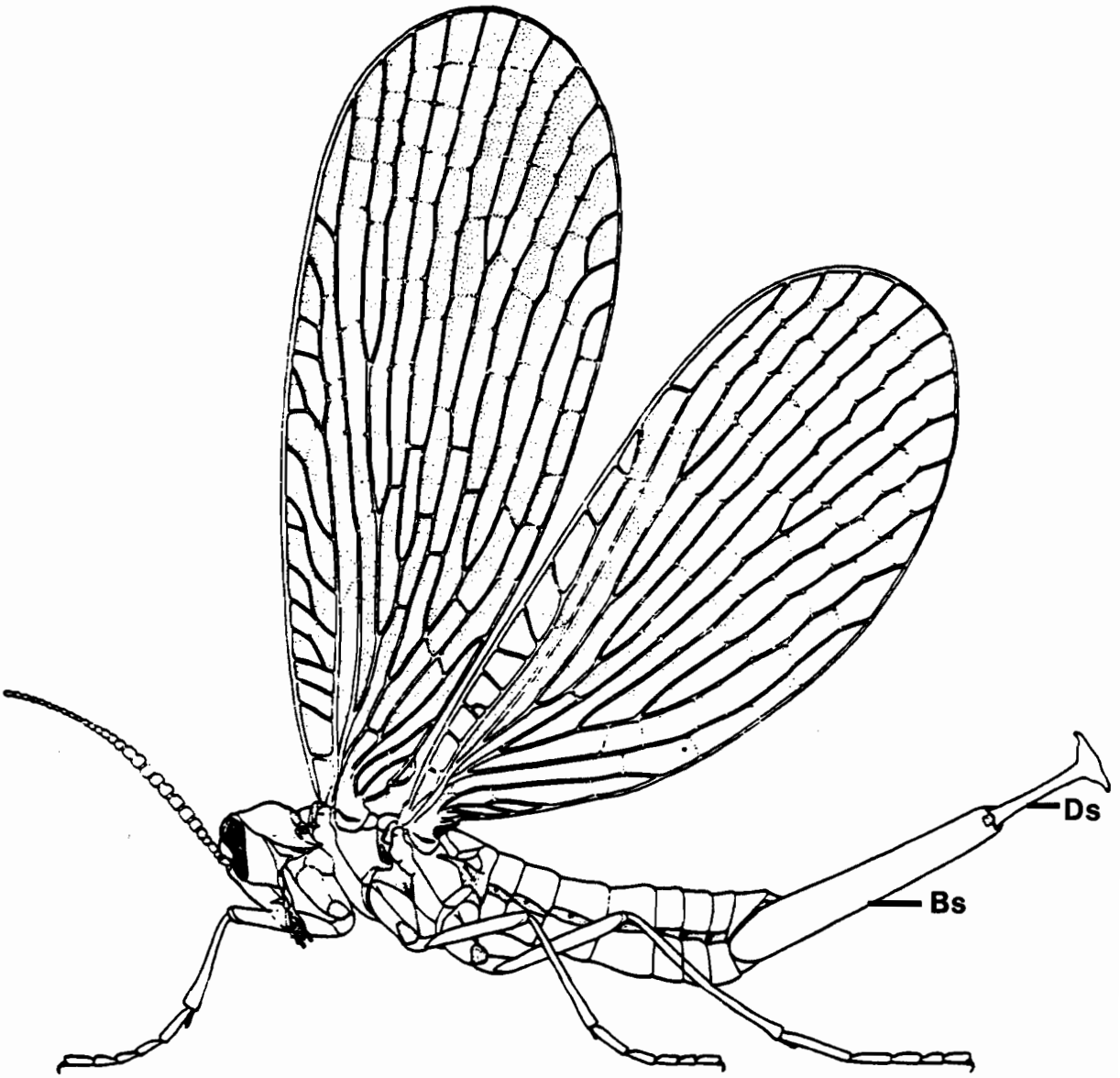
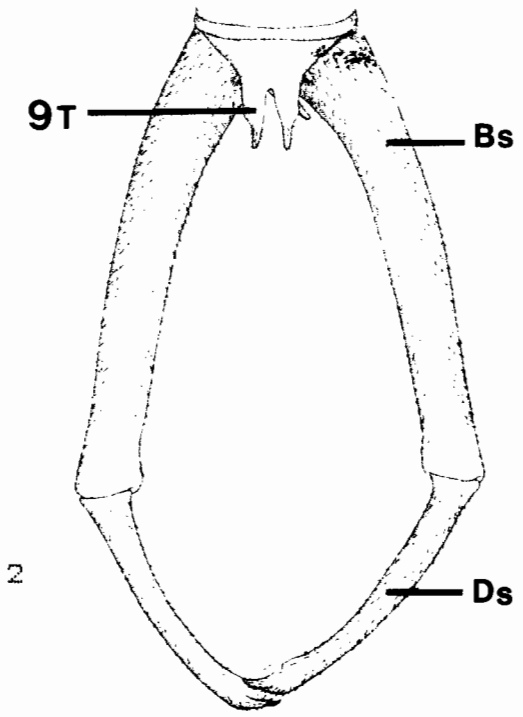


Fig. 1. Lateral view of *Merope tuber* Newman, male (After Mickoleit, 1967; notation added).



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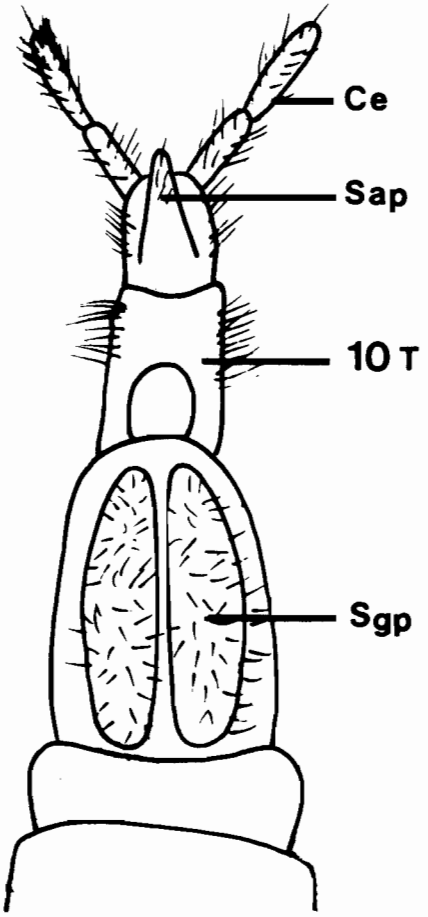

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Fig. 2. Dorsal view of terminalia of male *Merope tuber* Newman (After Willmann, 1979; notation added and deleted).

Fig. 3. Ventral view of terminalia of female *Merope tuber* Newman (50X).

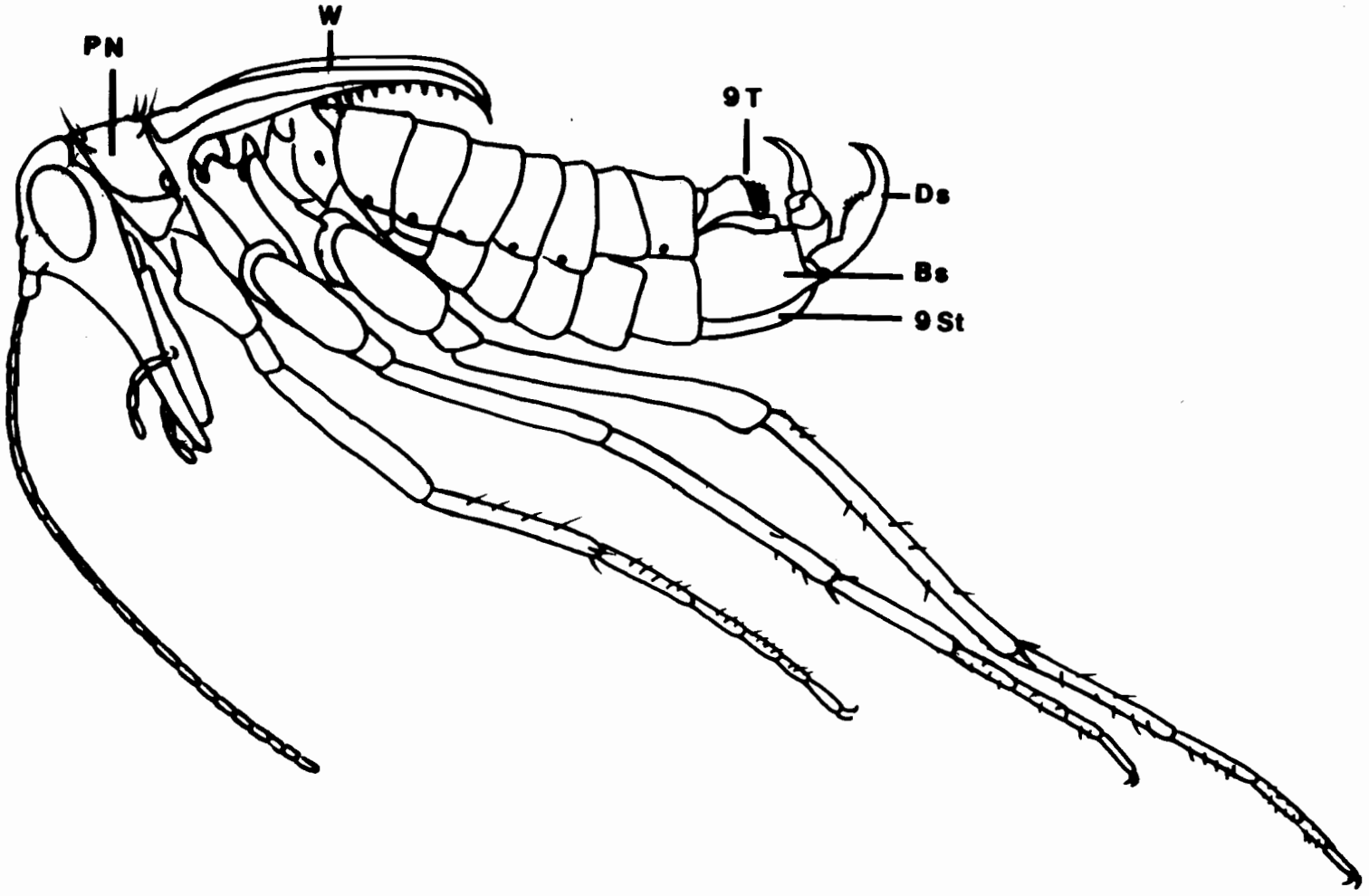


Fig. 4. Lateral view of *Boreus elegans* Carpenter, male: right legs and antenna omitted (23X).

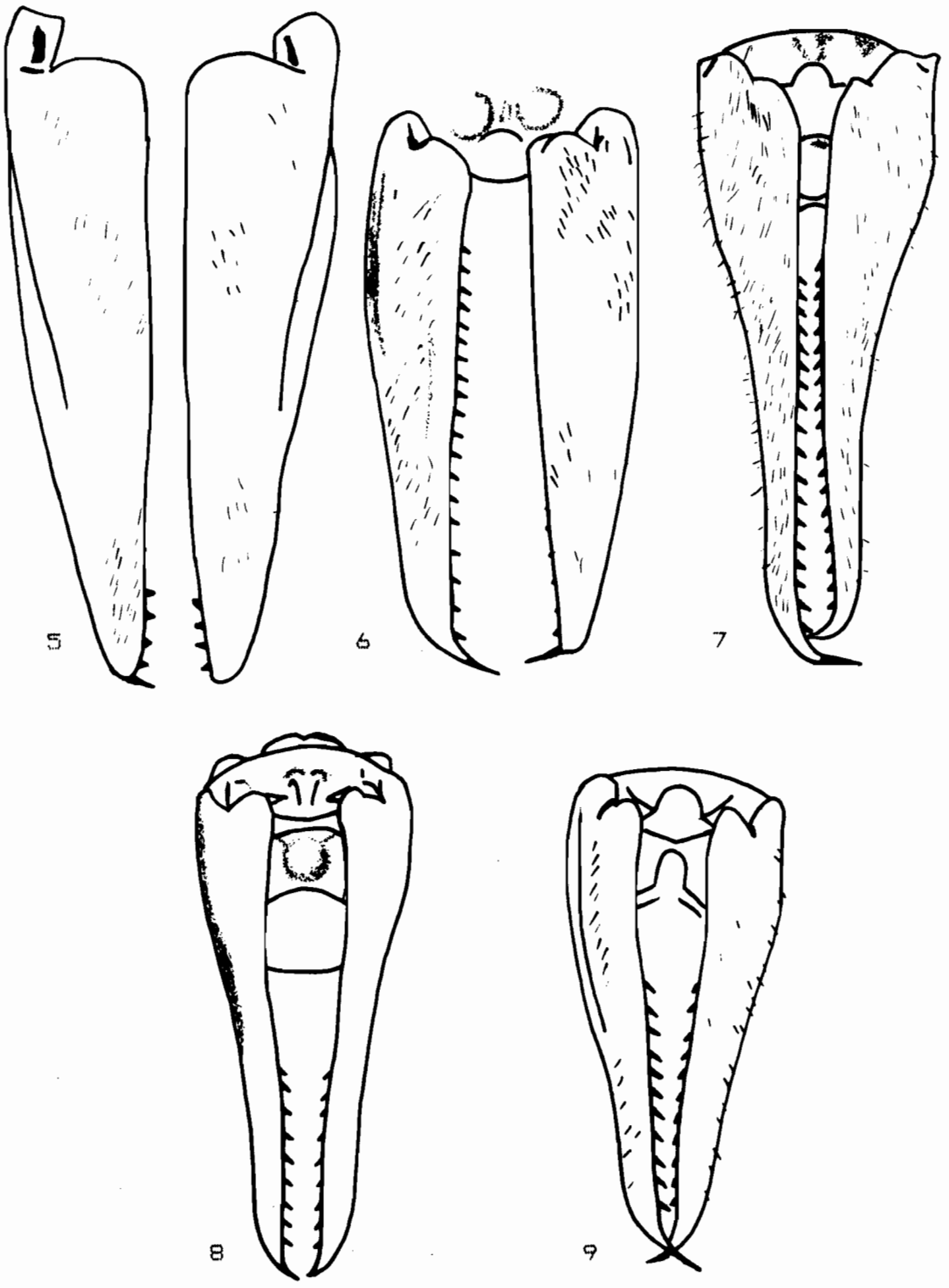
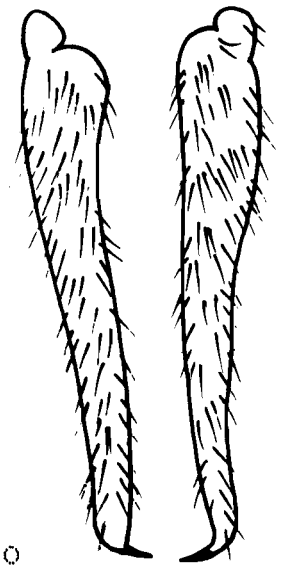


Fig. 5-9. Dorsal view of fore wings of male *Boreus* spp. (100X). 5. *Boreus elegans* Carpenter; 6. *Boreus nivoriundus* Fitch; 7. *Boreus pilosus* Carpenter; 8. *Boreus brumalis* Fitch; 9. *Boreus nix* Carpenter.



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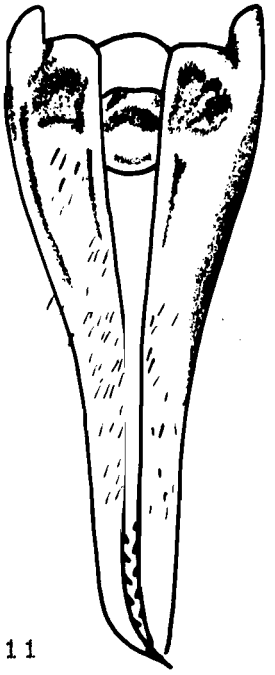

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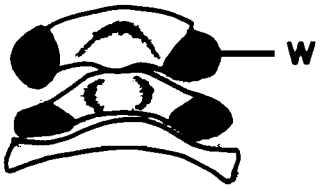

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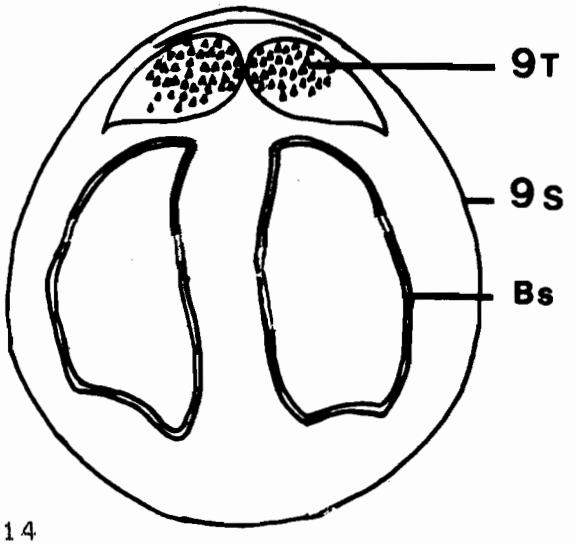
Figs. 10-11. Dorsal view of fore wings of male *Boreus* spp. (100X). 10. *Boreus reductus* Carpenter; 11. *Boreus californicus* Packard.

Fig. 12. Lateral view of hind wing of male *Boreus elegans* Carpenter (100X).

Fig. 13. Dorsal view of wings of female *Boreus reductus* (100X). (see Fig. 36)



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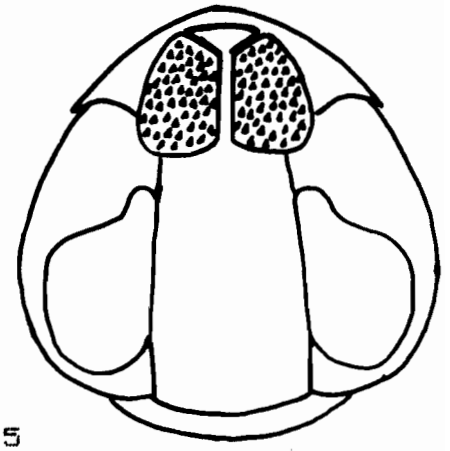

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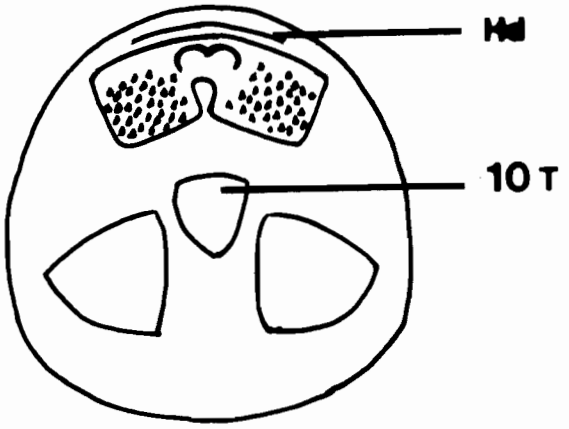

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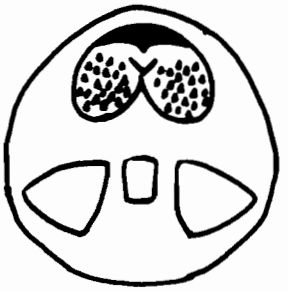
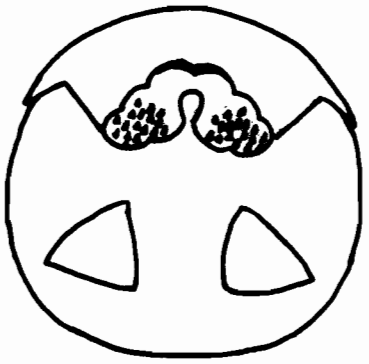


17

Figs. 14-17. Dorsal view of ninth terga of male *Boreus* spp. (127X). 14. *Boreus elegans* Carpenter; 15. *Boreus nivoriundus* Fitch; 16. *Boreus pilosus* Carpenter; 17. *Boreus brumalis* Fitch. (dististyles removed)



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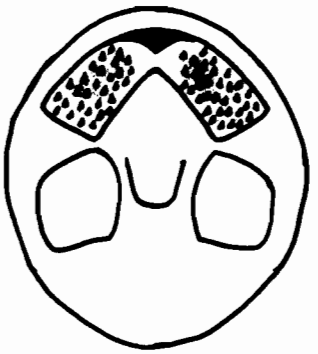

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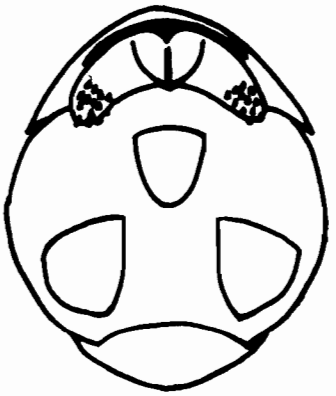

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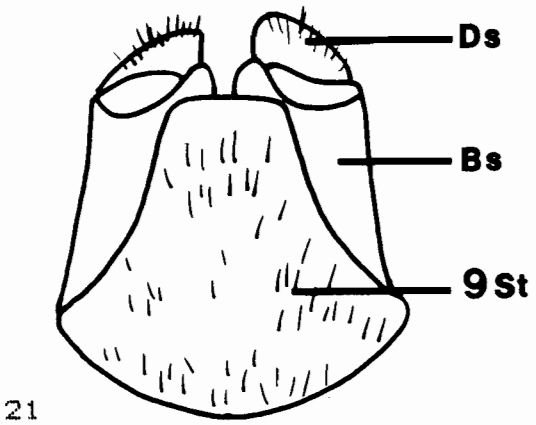
Figs. 18-20. Dorsal view of ninth terga of male *Boreus* spp. (127X). 18. *Boreus nix* Carpenter; 19. *Boreus reductus* Carpenter; 20. *Boreus californicus* Packard. (dististyles removed)



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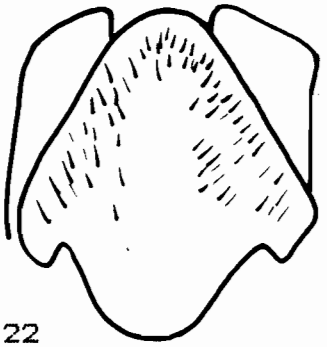

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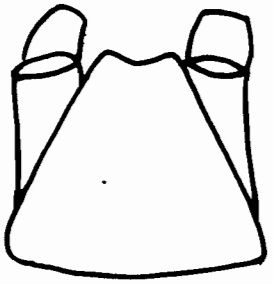

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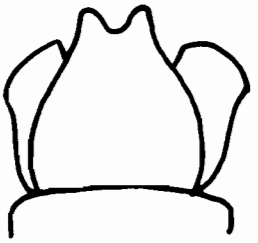

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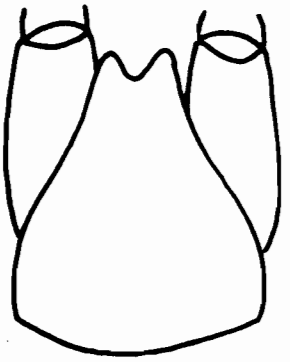

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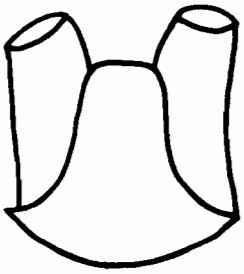

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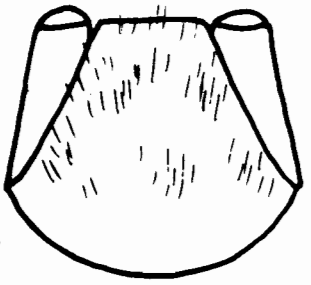
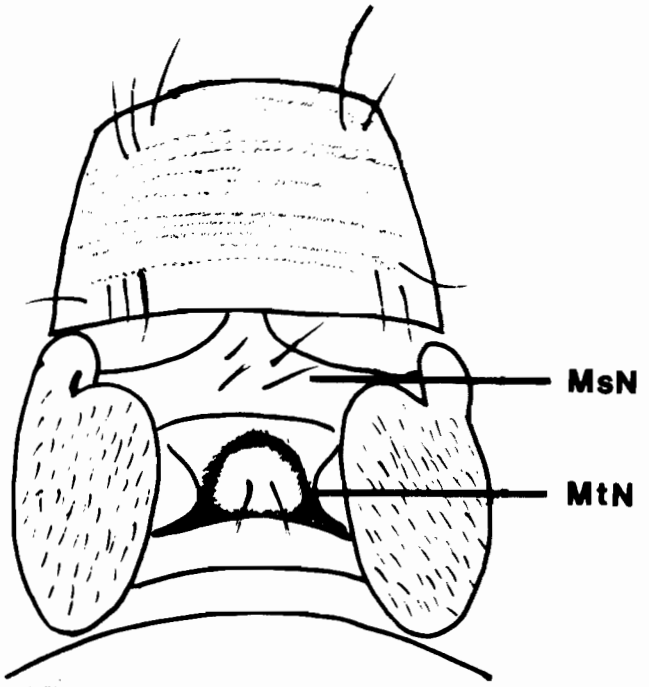


27

Figs. 21–27. Ninth sterna of male *Boreus* spp. (100X). 21. *Boreus elegans* Carpenter; 22. *Boreus nivoriundus* Fitch; 23. *Boreus pilosus* Carpenter; 24. *Boreus brumalis* Fitch; 25. *Boreus nix* Carpenter; 26. *Boreus reductus* Carpenter; 27. *Boreus californicus* Packard. (pilosity partially or completely omitted)



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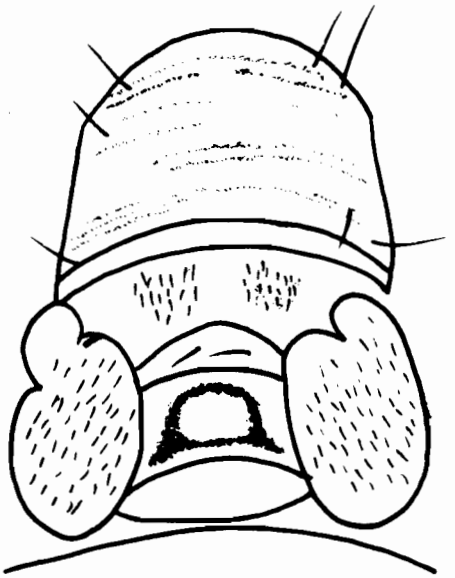

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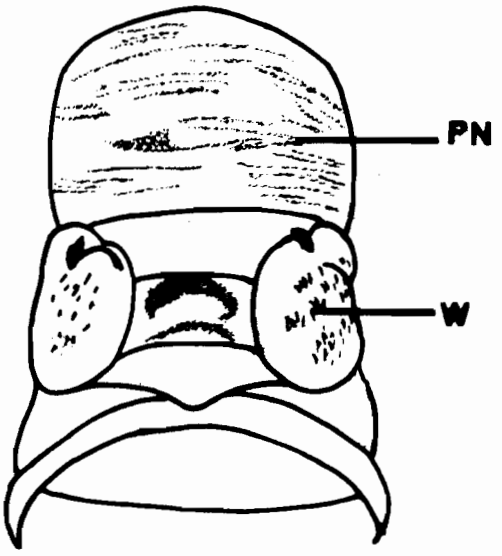

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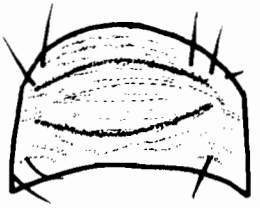
Figs. 28-30. Dorsal view of thorax of female *Boreus* spp. (100X). 28. *Boreus elegans* Carpenter; 29. *Boreus nivoriundus* Fitch; 30. *Boreus californicus* Packard.

31



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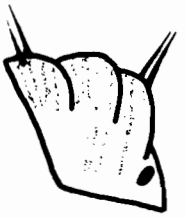
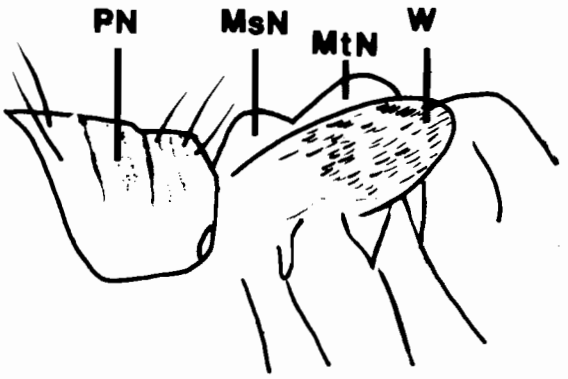


34

Figs. 31-33. Dorsal view of pronotum of *Boreus* spp. (100X). 31. *Boreus pilosus* Carpenter; 32. *Boreus brumalis* Fitch; 33. *Boreus nix* Carpenter.

Fig. 34. Lateral view of pronotum of *Boreus brumalis* Fitch (100X).



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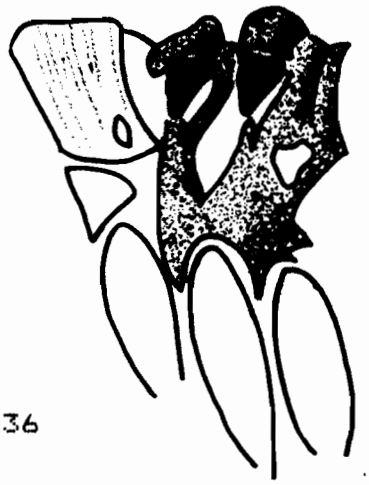

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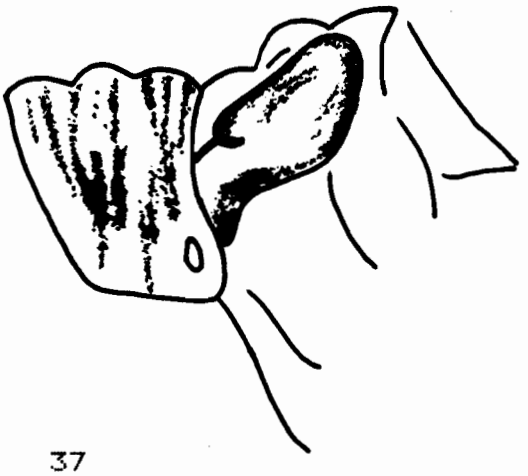
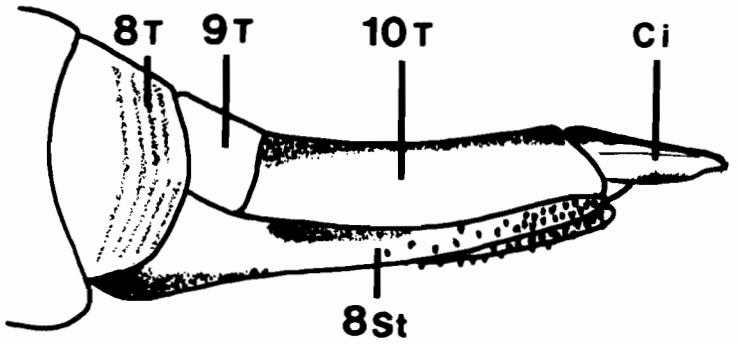


37

Figs. 35-37. Lateral view of thorax of female *Boreus* spp. (100X). 35. *Boreus nix* Carpenter; 36. *Boreus reductus* Carpenter; 37. *Boreus californicus* Packard.



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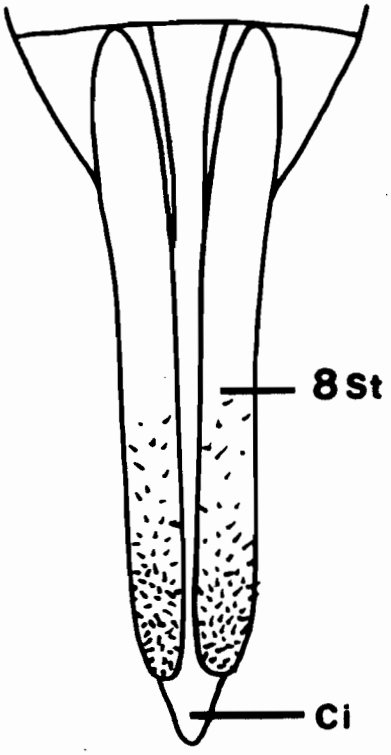

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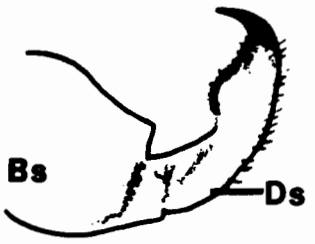


40

Fig. 38. Lateral view of terminalia of female *Boreus pilosus* Carpenter (100X).

Fig. 39. Ventral view of eighth sternum of female *Boreus elegans* Carpenter (100X).

Fig. 40. Lateral view of dististyle and basistyle of male *Boreus pilosus* Carpenter (100X).

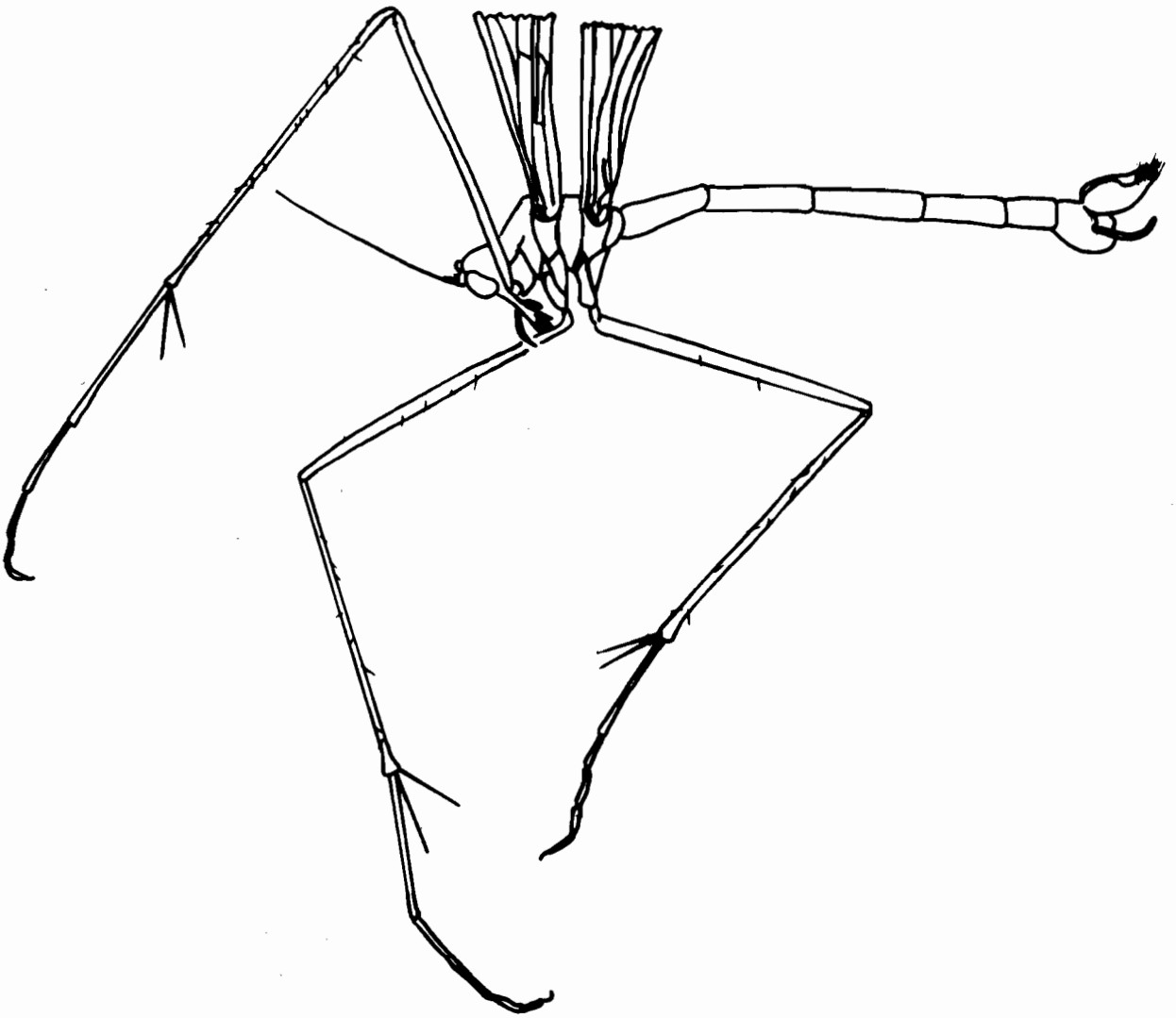
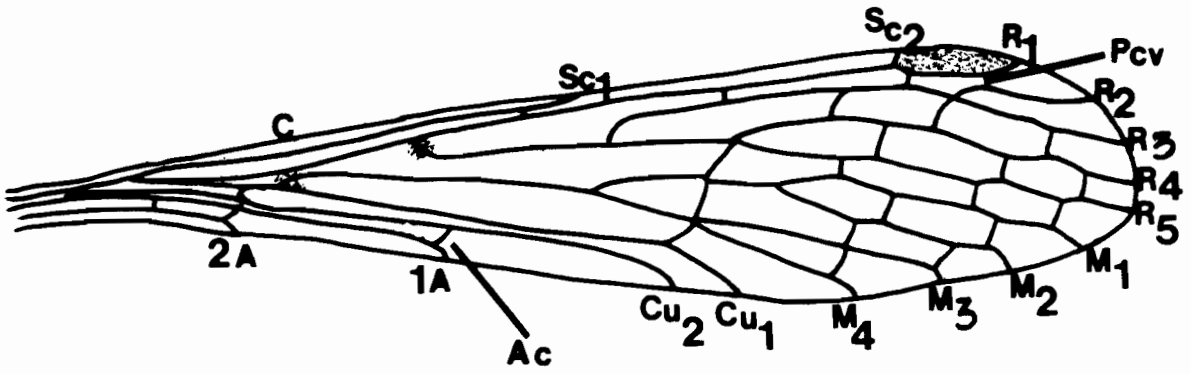


Fig. 41. Lateral view of *Bittacus strigosus* Hagen, male; wings cut off and right legs omitted (4.5X).

42



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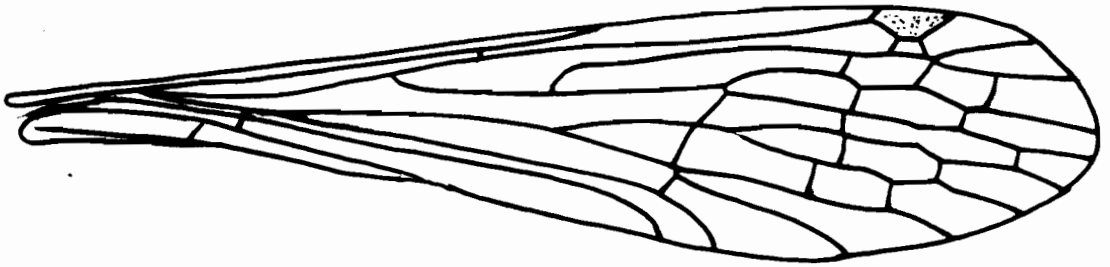

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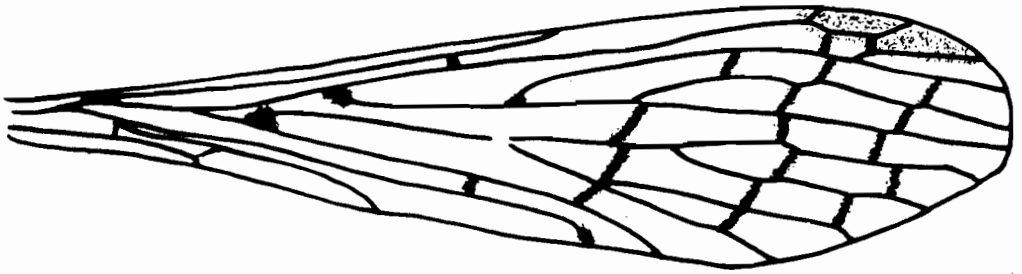
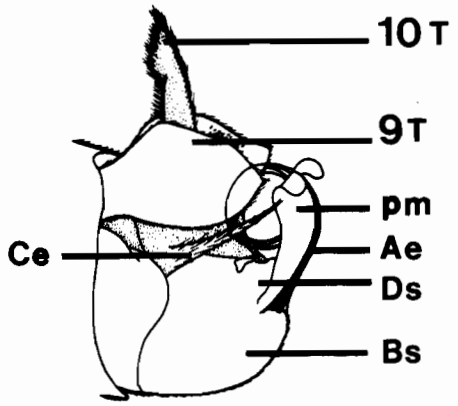
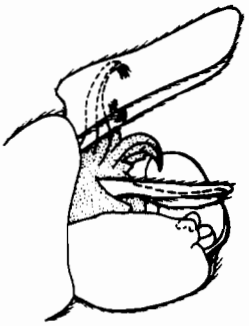


Figs. 42-44. Right fore wings of *Bittacus* spp. (6X). 42. *Bittacus pilicornis* Westwood (vein notation modified after Borror *et al.*, 1981); 43. *Bittacus Stigmaterus* Say; 44. *Bittacus strigosus* Hagen.



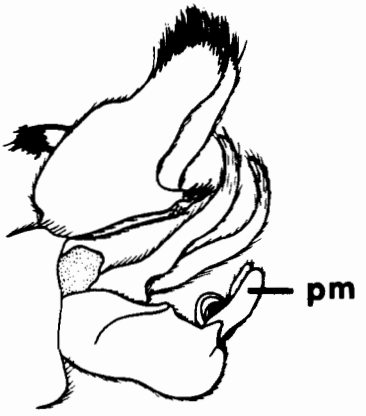
45 A

B

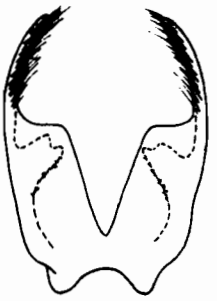


46 A

B

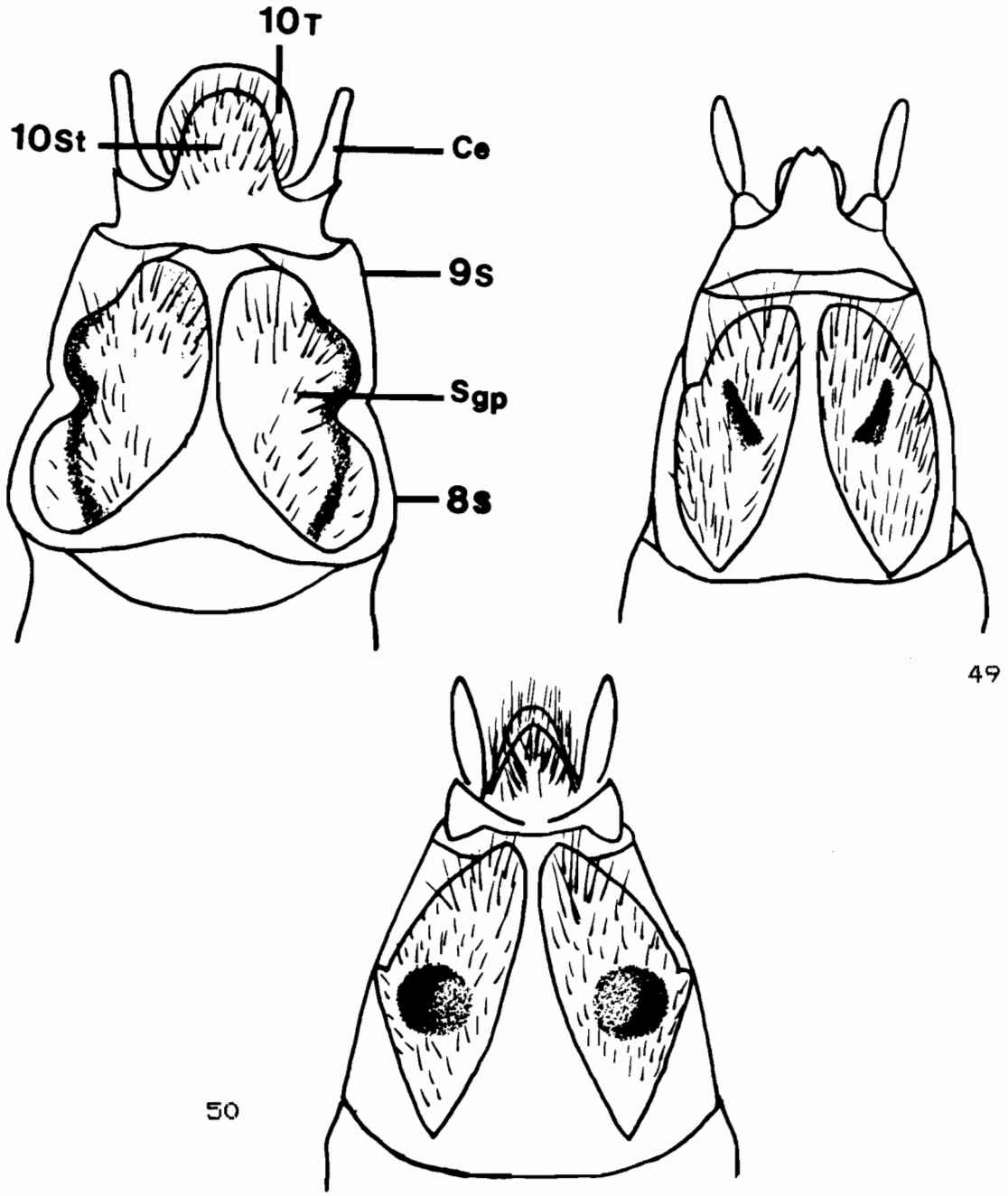


47 A



B

Figs. 45–47. Terminalia of male *Bittacus* spp., A. lateral view; B. dorsal view. 45. *Bittacus pilicornis* Westwood; 46. *Bittacus stigmaterus* Say; 47. *Bittacus strigosus* Hagen (After Webb *et al.*, 1975; notation added; Fig. 47–A slightly modified).



Figs. 48-50. Ventral view of ninth terminalia of female *Bittacus* spp. illustrating subgenital plates (32X). 48. *Bittacus pilicornis* Westwood; 49. *Bittacus stigmaterus* Say; 50. *Bittacus strigosus* Hagen.

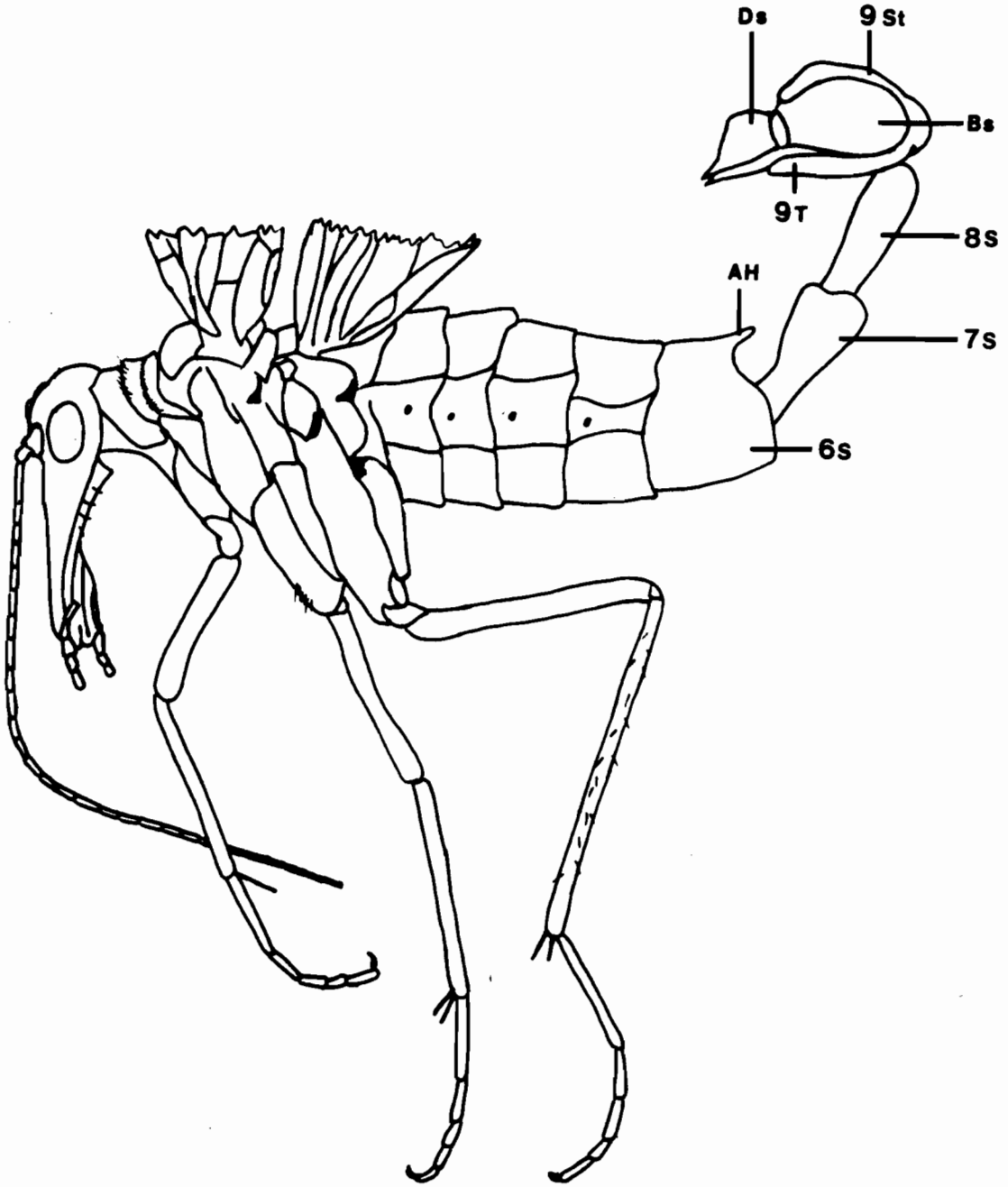


Fig. 51. Lateral view of *Panorpa galerita* Byers, male; wings cut off and right legs omitted (8.8X).

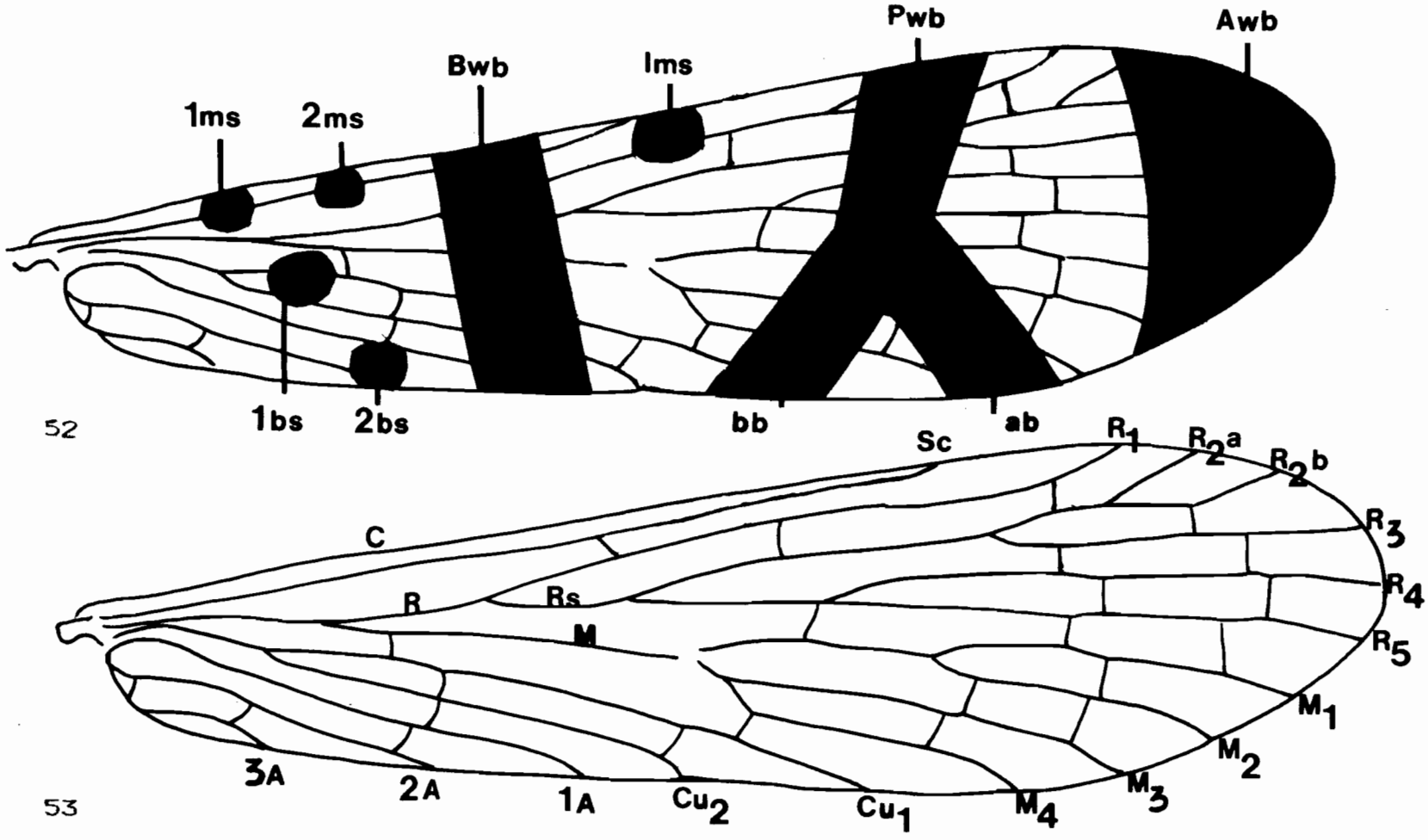
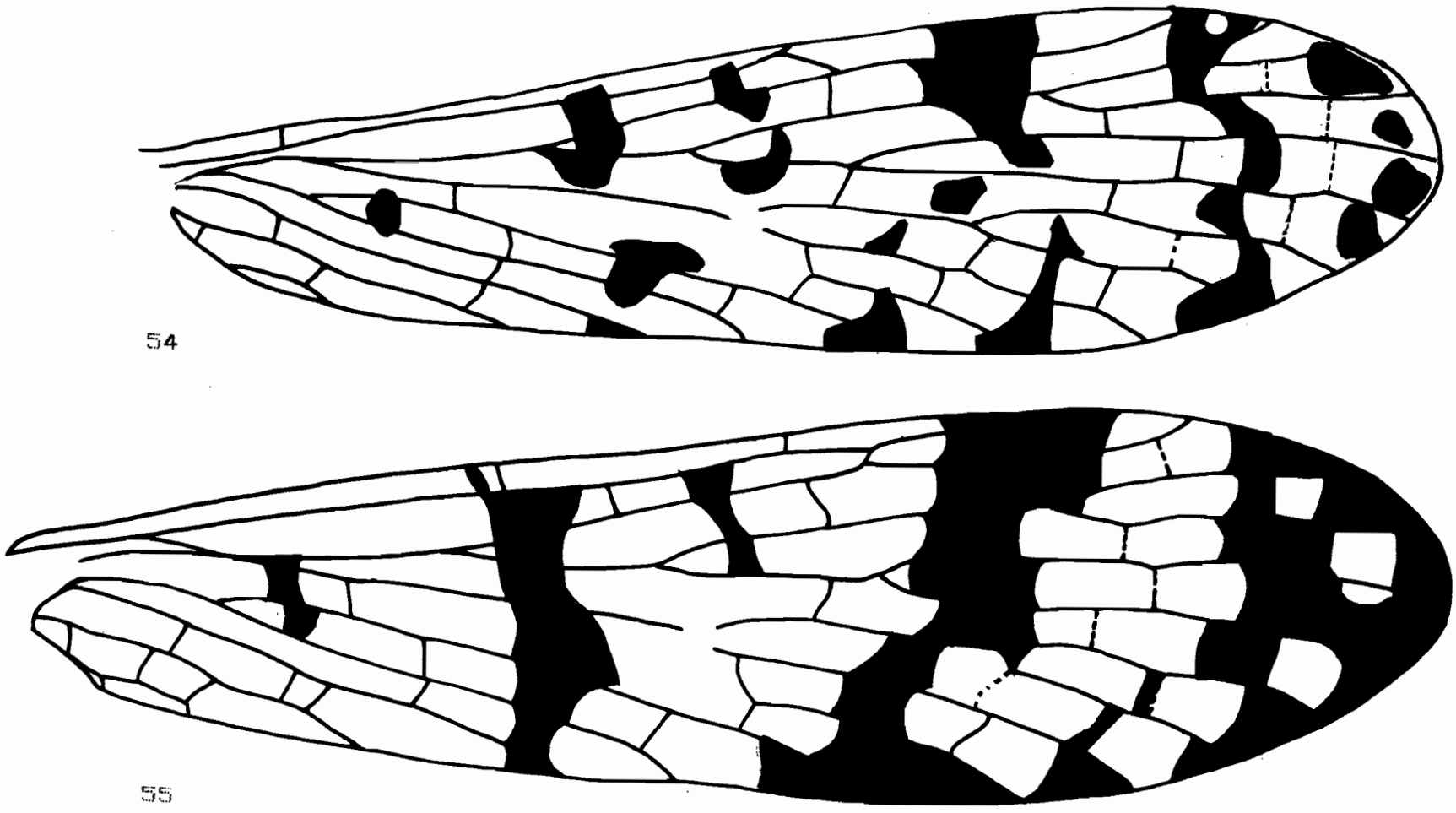
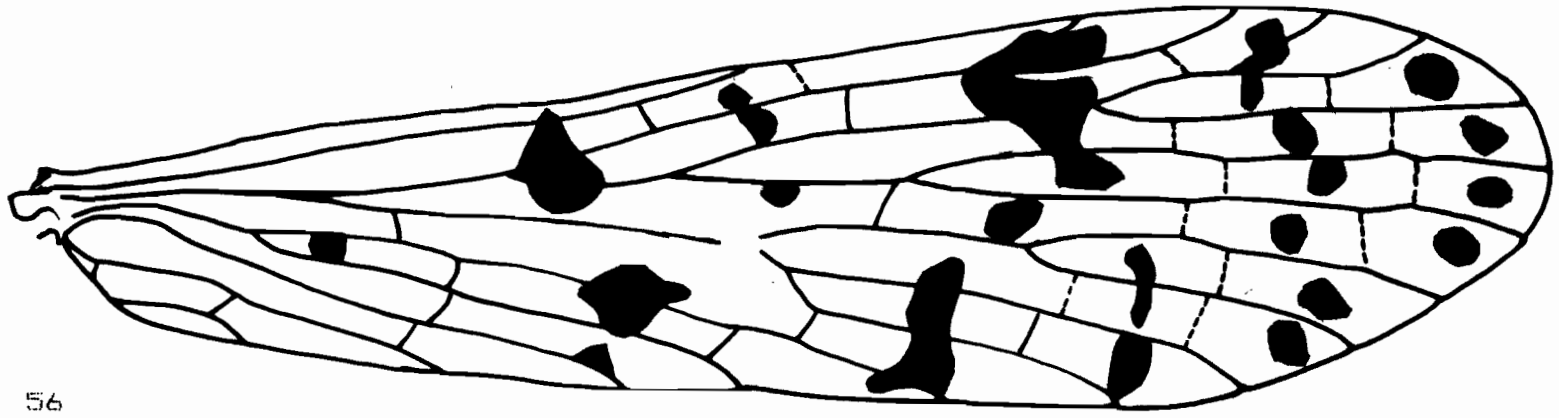


Fig. 52. Right fore wing of *Panorpa* modified from Carpenter (1931a) and Thornhill and Johnson (1974) illustrating a hypothetical wing marking.

Fig. 53. Right fore wing of *Panorpa* sp. illustrating wing-vein notation (12X) (vein notation after Grassé, 1951).



Figs. 54-55. Right fore wings of *Panorpa* spp. (12X). 54. *Panorpa submaculosa* Carpenter; 55. *Panorpa latipennis* Hine.



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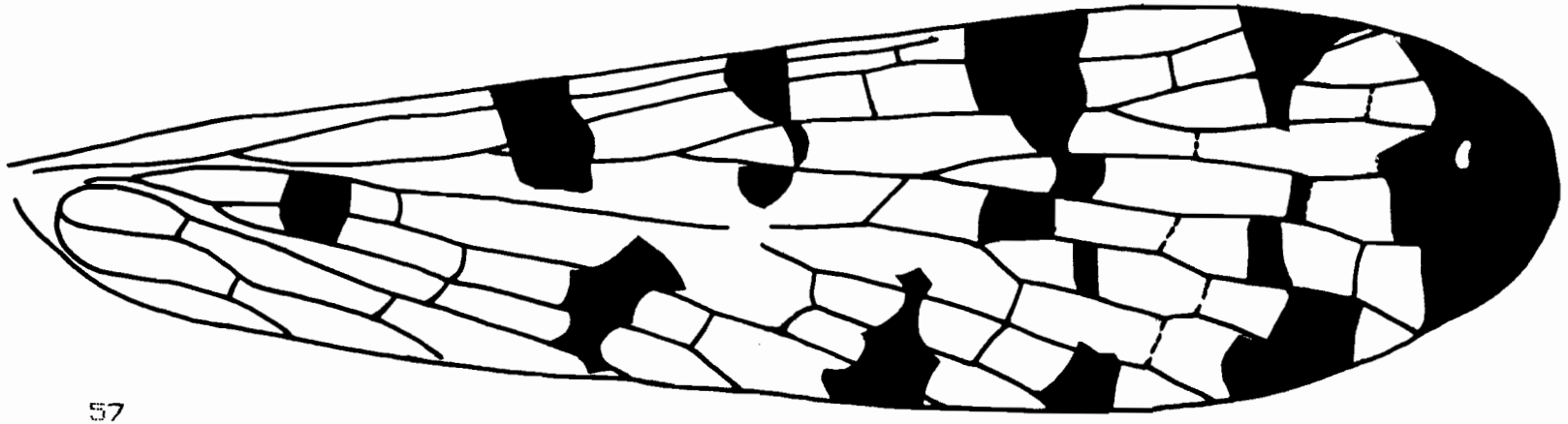

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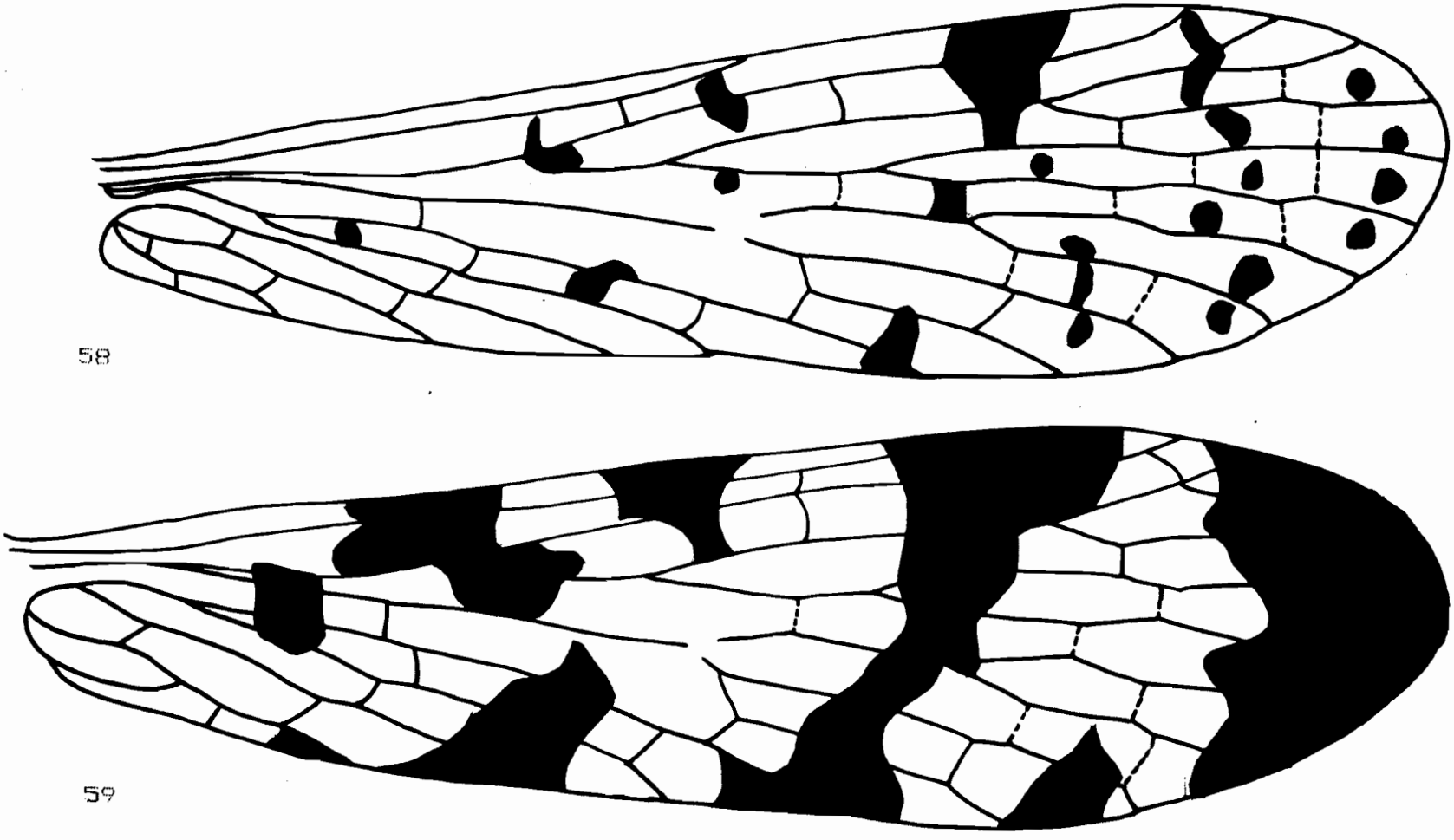
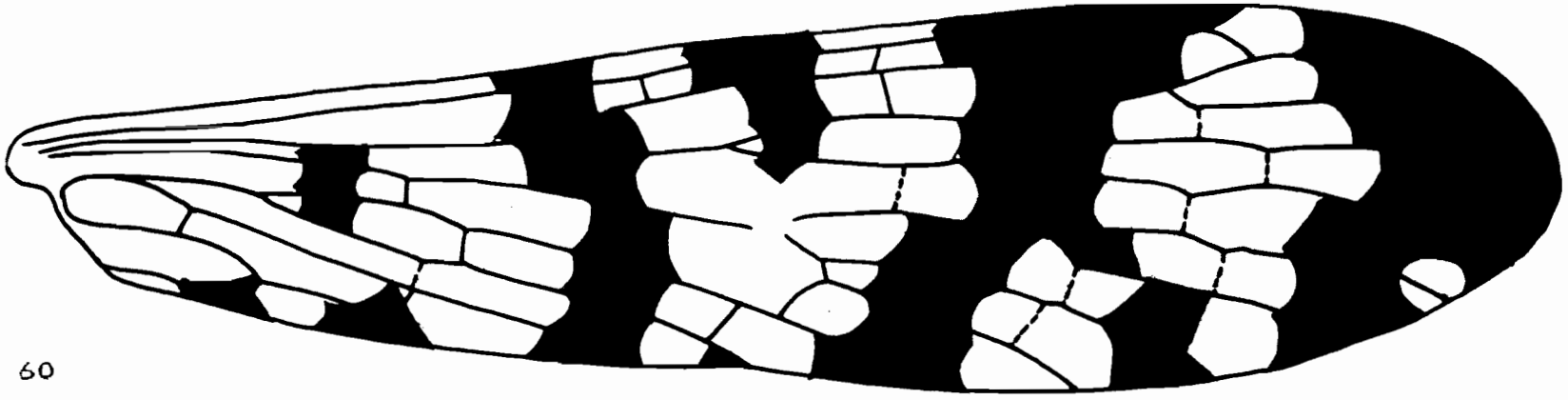
Figs. 56–57. Right fore wings of *Panorpa* spp. (12X).
56. *Panorpa nebulosa* Westwood; 57. *Panorpa banksii* Hine.



Figs. 58-59. Right fore wings of *Panorpa* spp. (12X).
58. *Panorpa acuta* Carpenter; 59. *Panorpa mirabilis* Carpenter.



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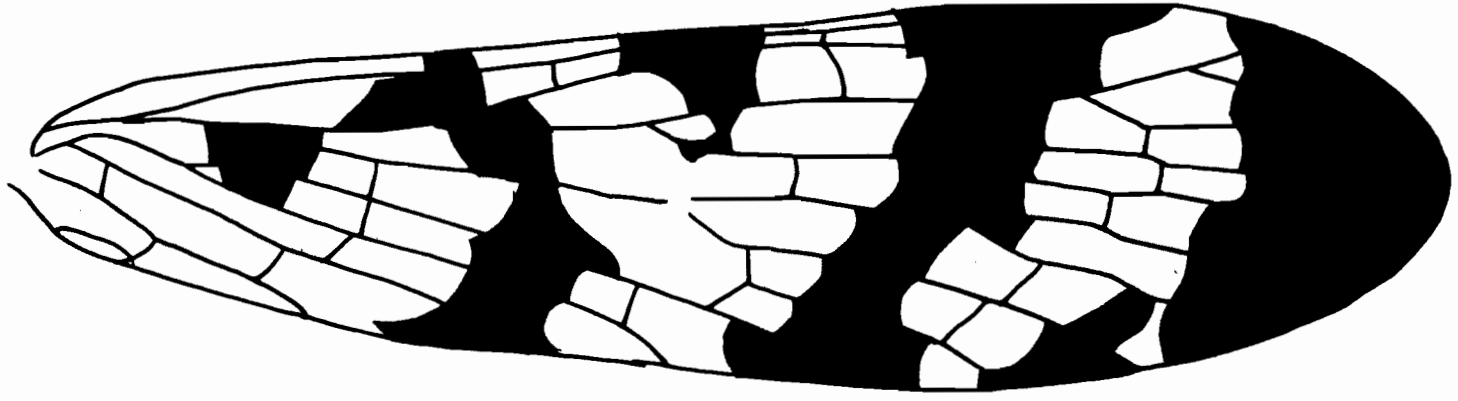
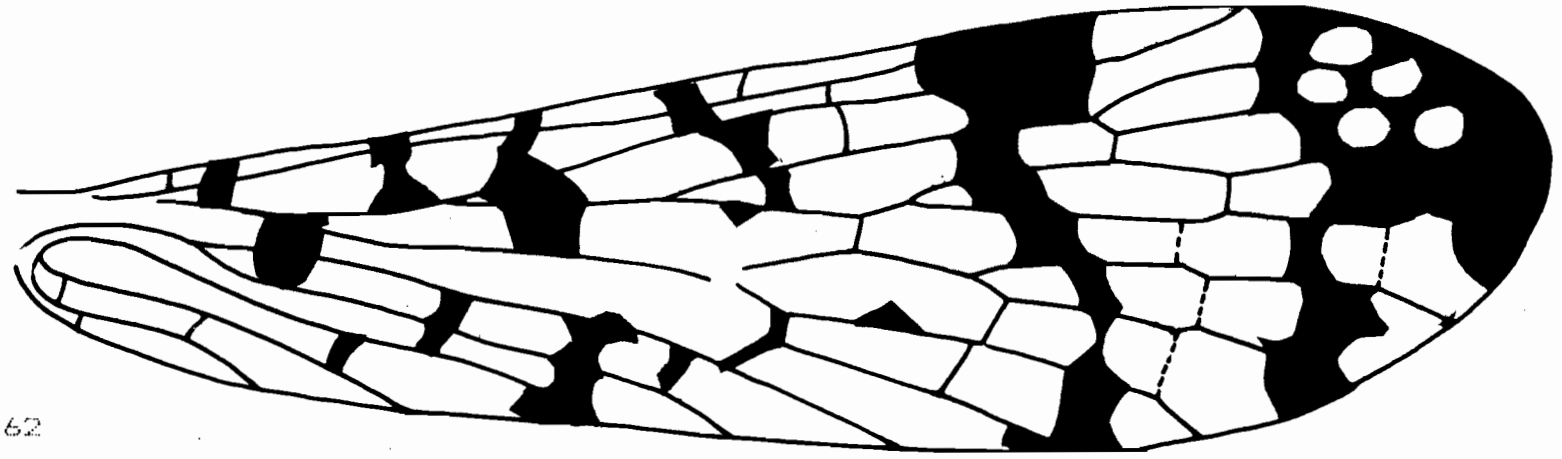


61

Figs. 60-61. Right fore wings of *Panorpa* spp. (12X). 60. *Panorpa subfurcata* Westwood; 61. *Panorpa galerita* Byers.



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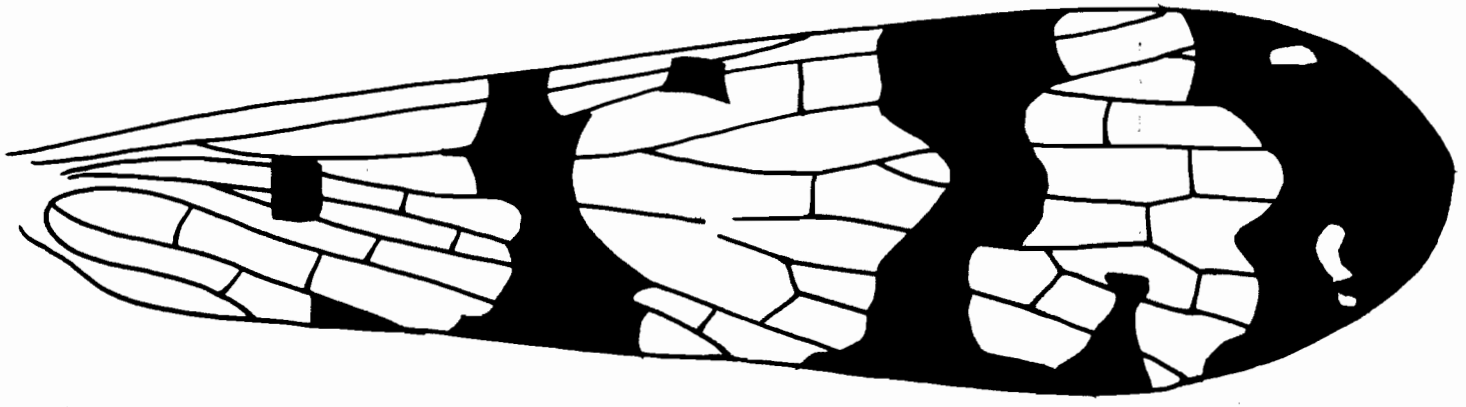

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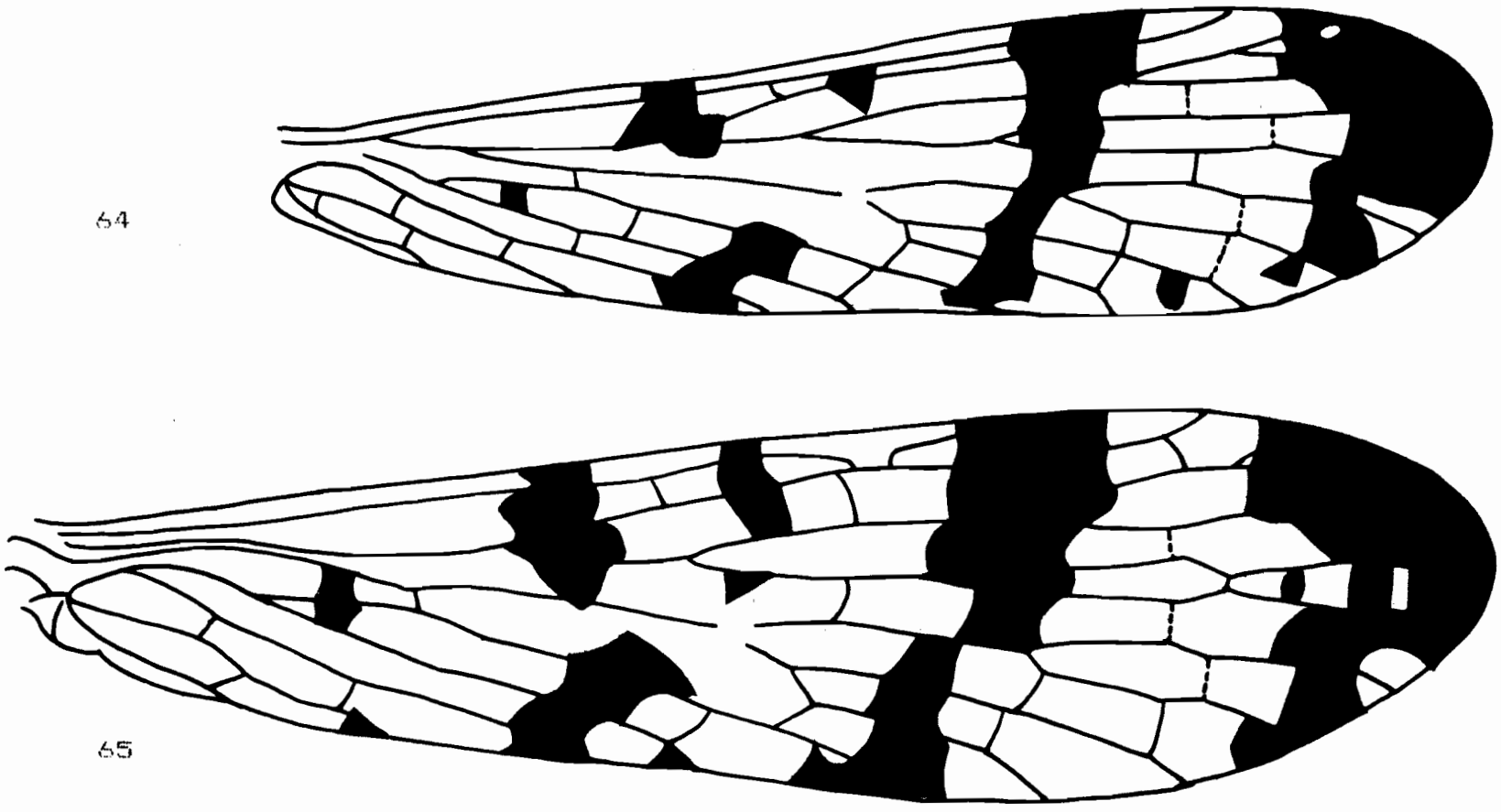
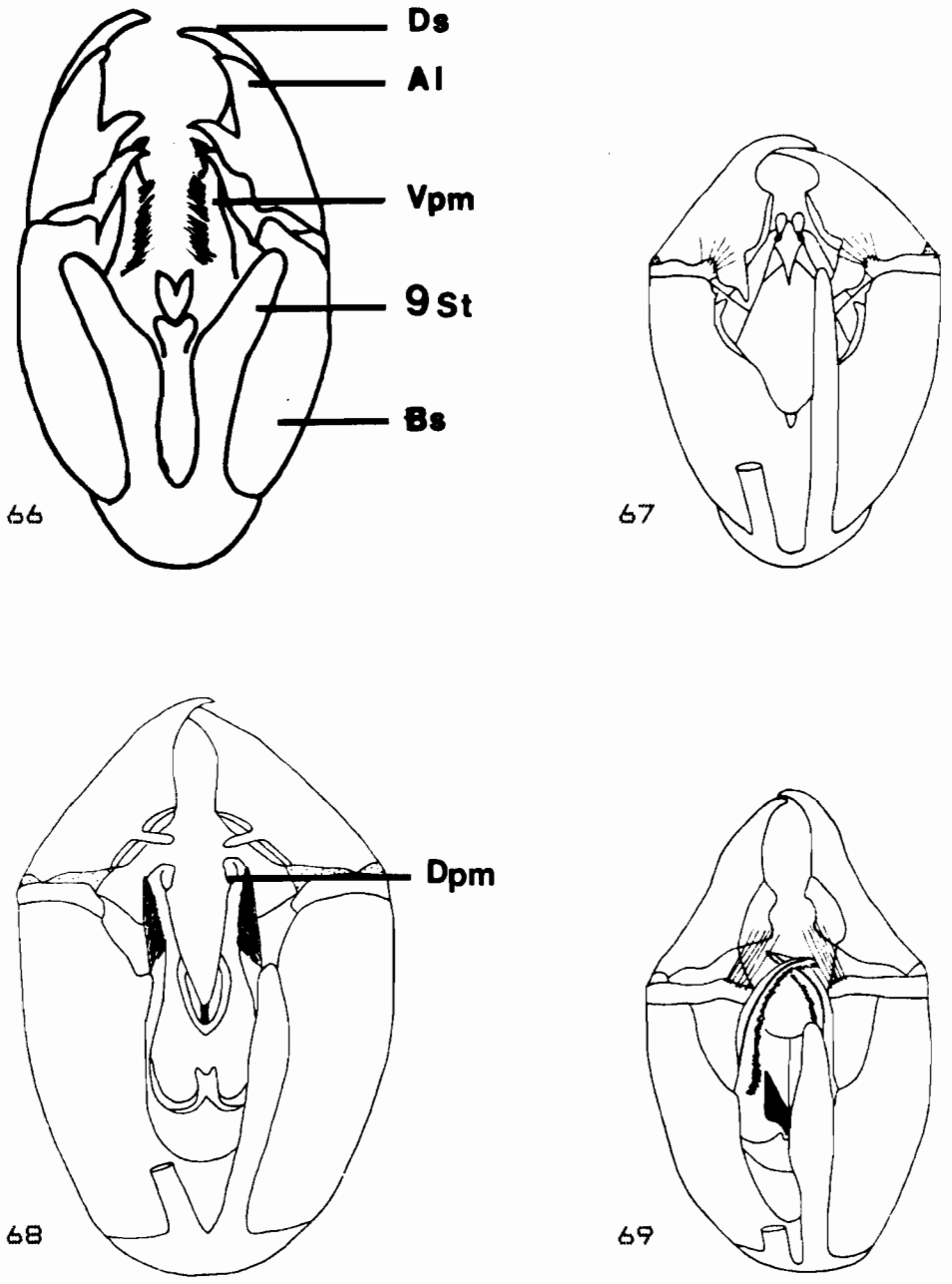
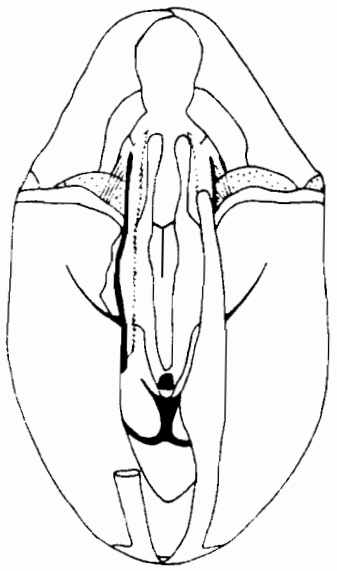
Figs. 62-63. Right fore wings of *Panorpa* spp. (12X). 62. *Panorpa anomala* Carpenter; 63. *Panorpa helena* Byers.



Figs. 64–65. Right fore wings of *Panorpa* spp. (12X). 64. *Panorpa debilis* Westwood; 65. *Panorpa claripennis* Hine.



Figs. 66-69. Ventral view of ninth segments of male *Panorpa* spp. 66. *Panorpa galerita* Byers (20X); 67*. *Panorpa submaculosa* Carpenter; 68*. *Panorpa latipennis* Hine; 69*. *Panorpa nebulosa* Westwood. (* After Thornhill and Johnson, 1974)



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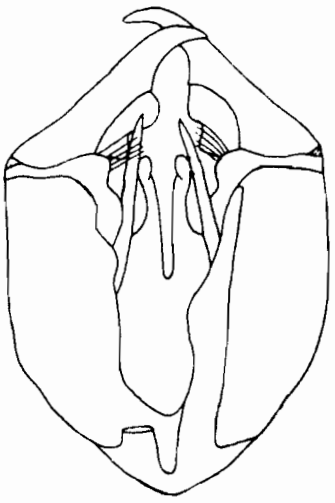

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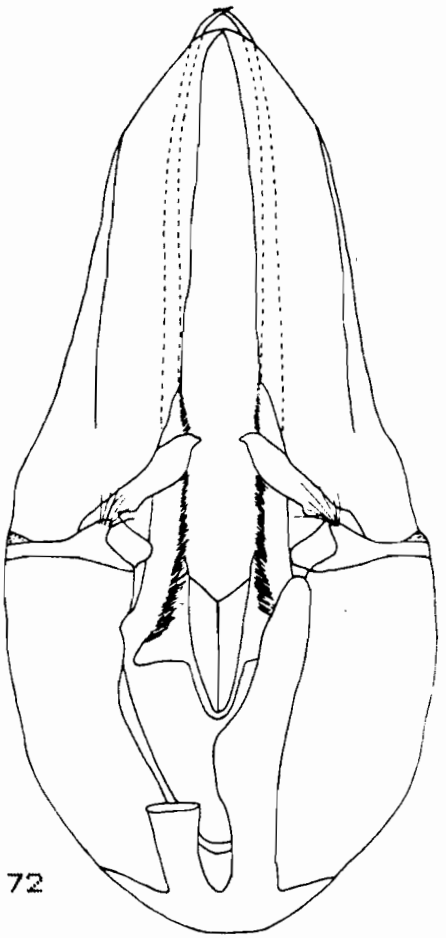

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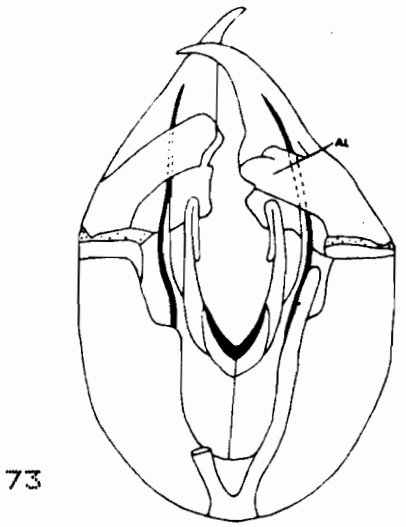
Figs. 70–72. Ventral view of ninth segments of male *Panorpa* spp. 70. *Panorpa banksii* Hine; 71. *Panorpa acuta* Carpenter; 72. *Panorpa mirabilis* Carpenter. (After Thornhill and Johnson, 1974; notation deleted).



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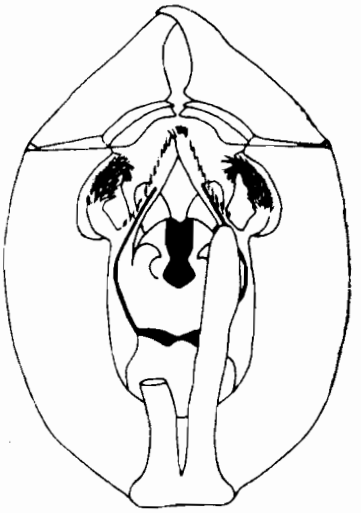

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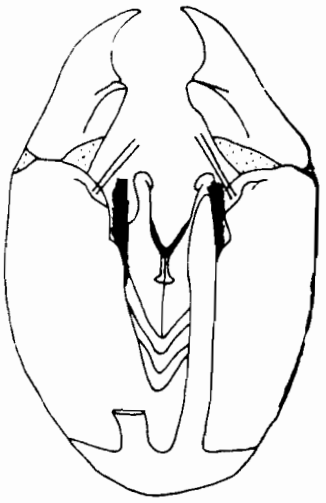

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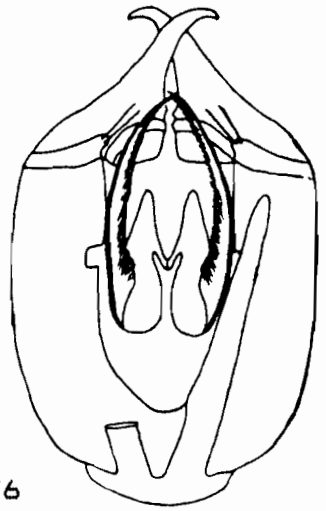

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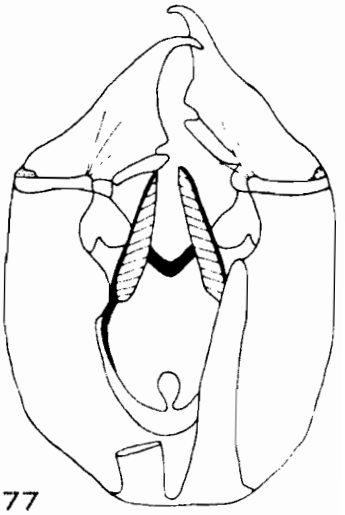
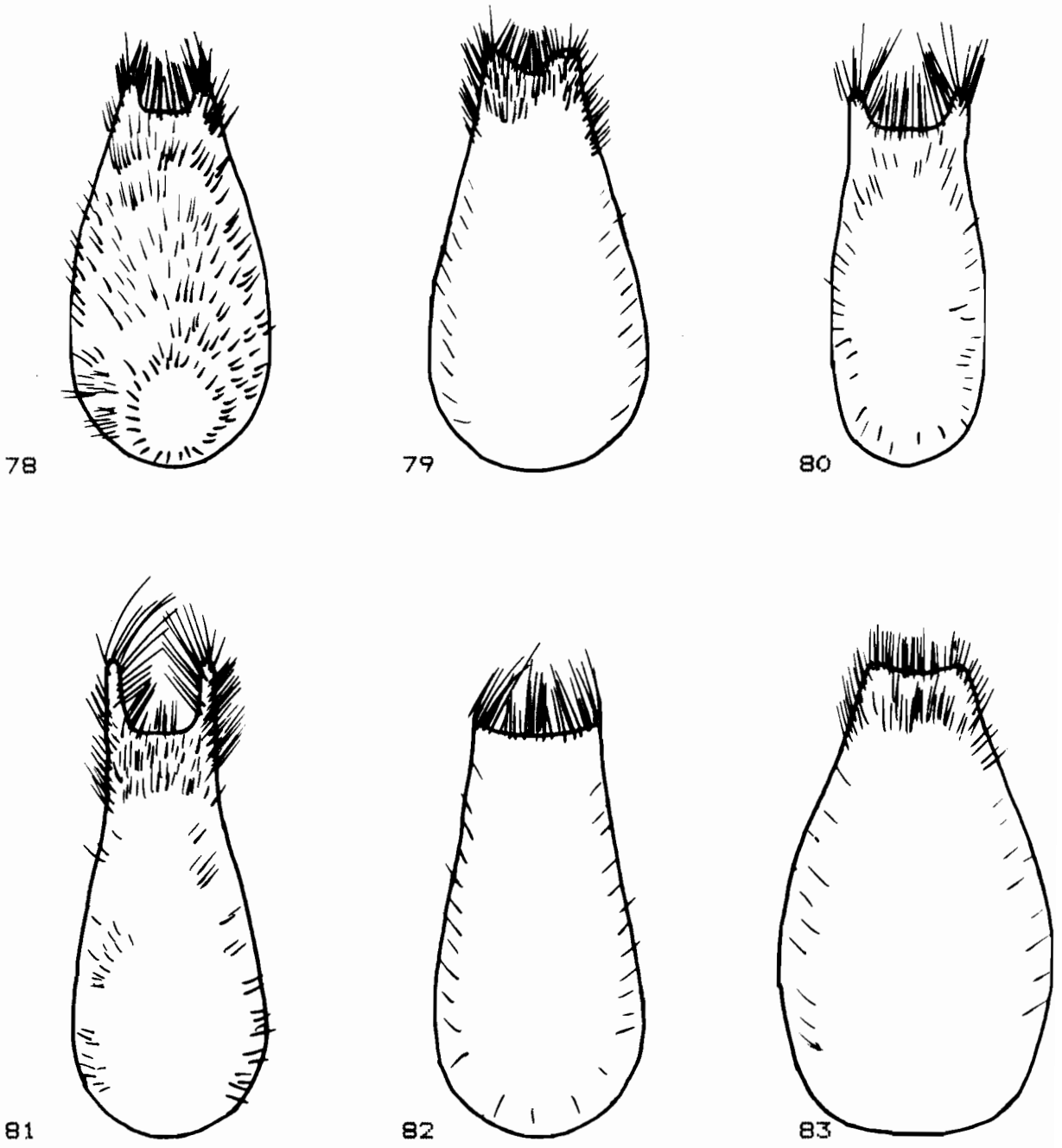
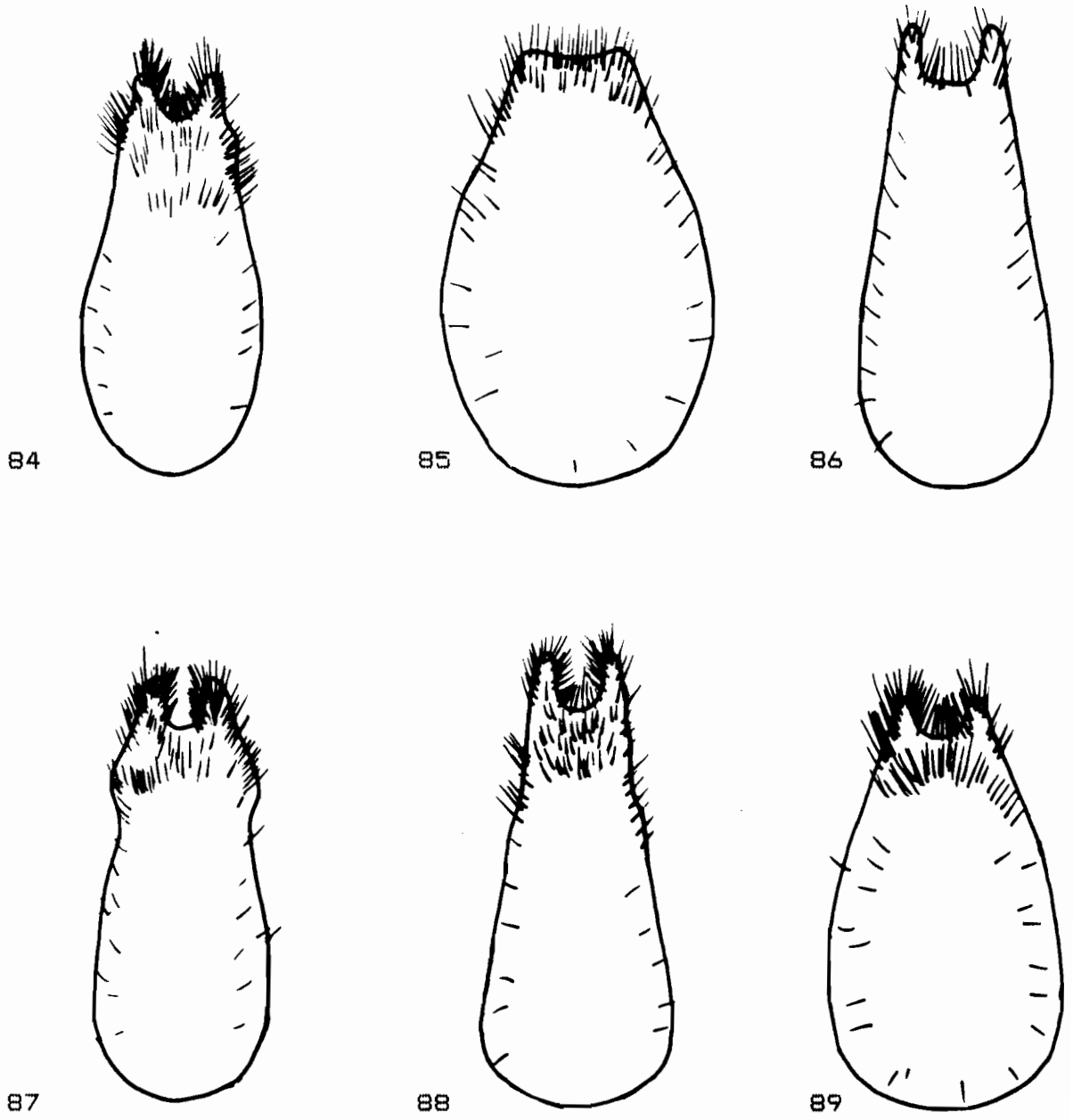


77

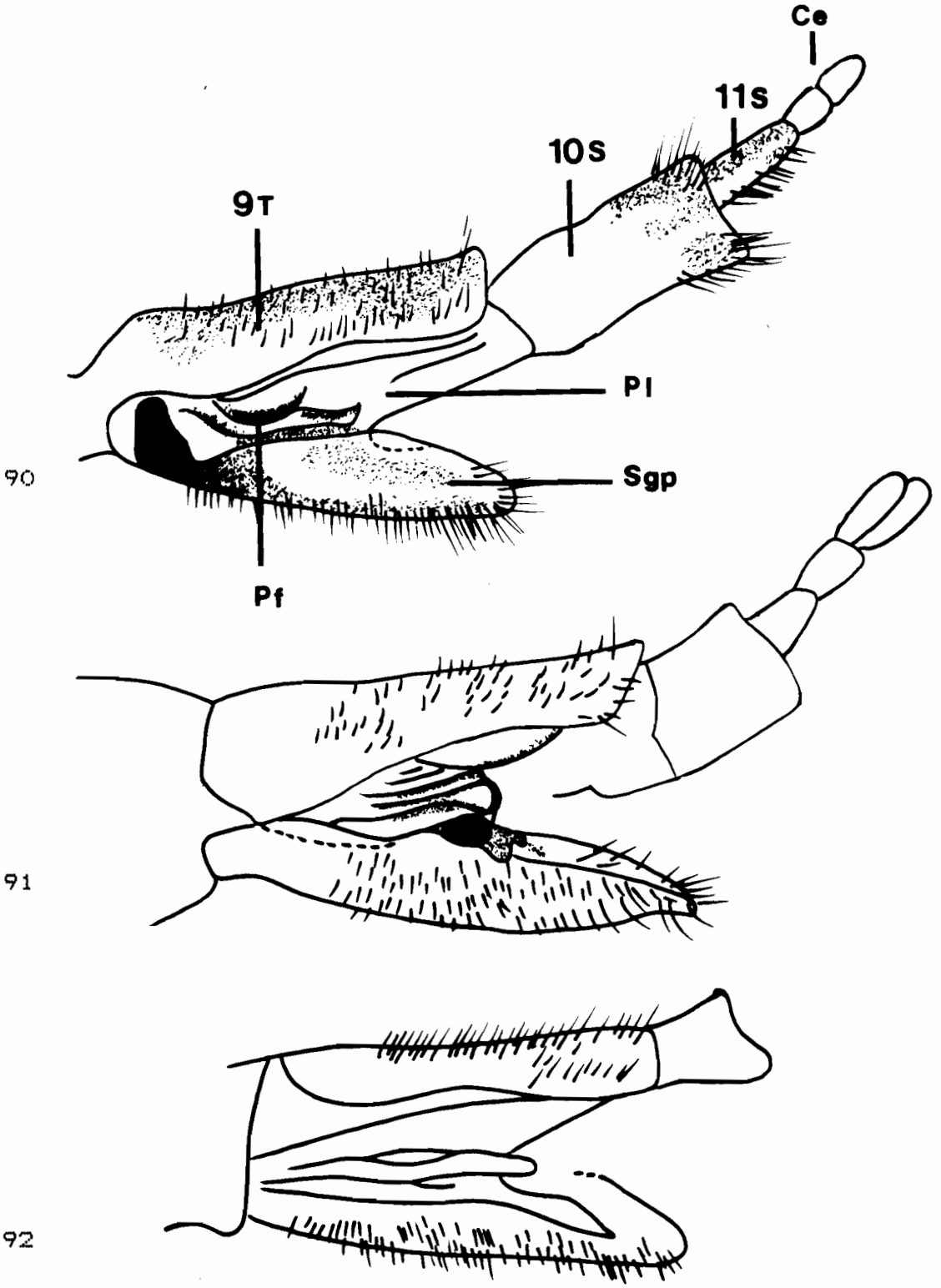
Figs. 73-77. Ventral view of ninth segments of male *Panorpa* spp. 73. *Panorpa subfurcata* Westwood; 74. *Panorpa anomala* Carpenter; 75. *Panorpa helena* Byers; 76. *Panorpa debilis* Westwood; 77. *Panorpa claripennis* Hine (After Thornhill and Johnson, 1974.)



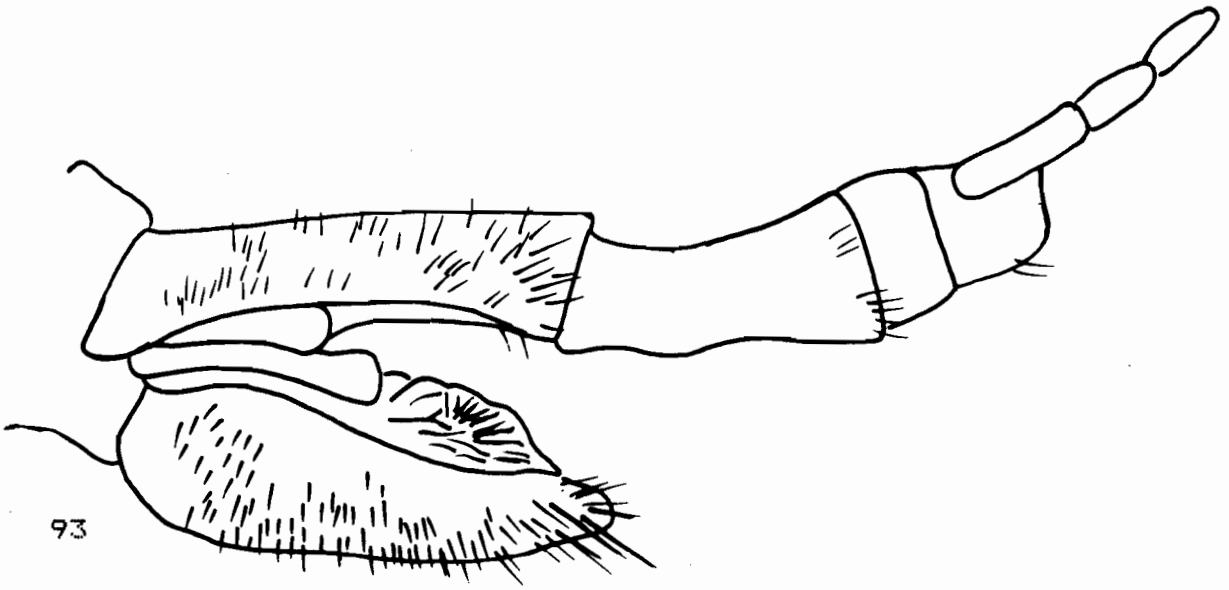
Figs. 78–83. Ninth terga of male *Panorpa* spp. (25X). 78. *Panorpa submaculosa* Carpenter; 79. *Panorpa latipennis* Hine; 80. *Panorpa nebulosa* Westwood; 81. *Panorpa banksii* Hine; 82. *Panorpa acuta* Carpenter; 83. *Panorpa mirabilis* Carpenter (pilosity partially omitted).

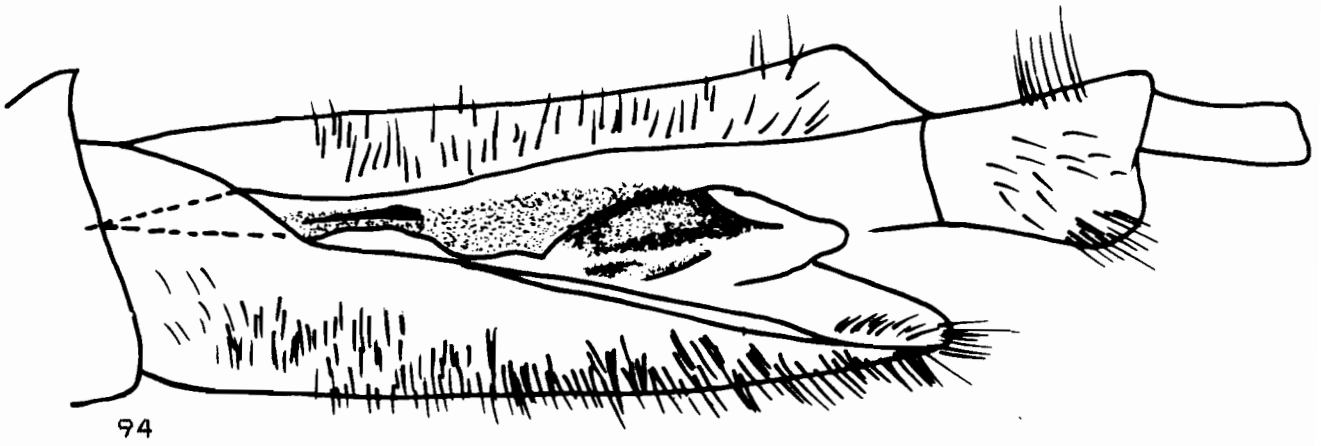


Figs. 84–89. Ninth terga of male *Panorpa* spp. (25X). 84. *Panorpa subfurcata* Westwood; 85. *Panorpa galerita* Byers; 86. *Panorpa anomala* Carpenter; 87. *Panorpa helena* Byers; 88. *Panorpa debilis* Westwood; 89. *Panorpa claripennis* Hine.

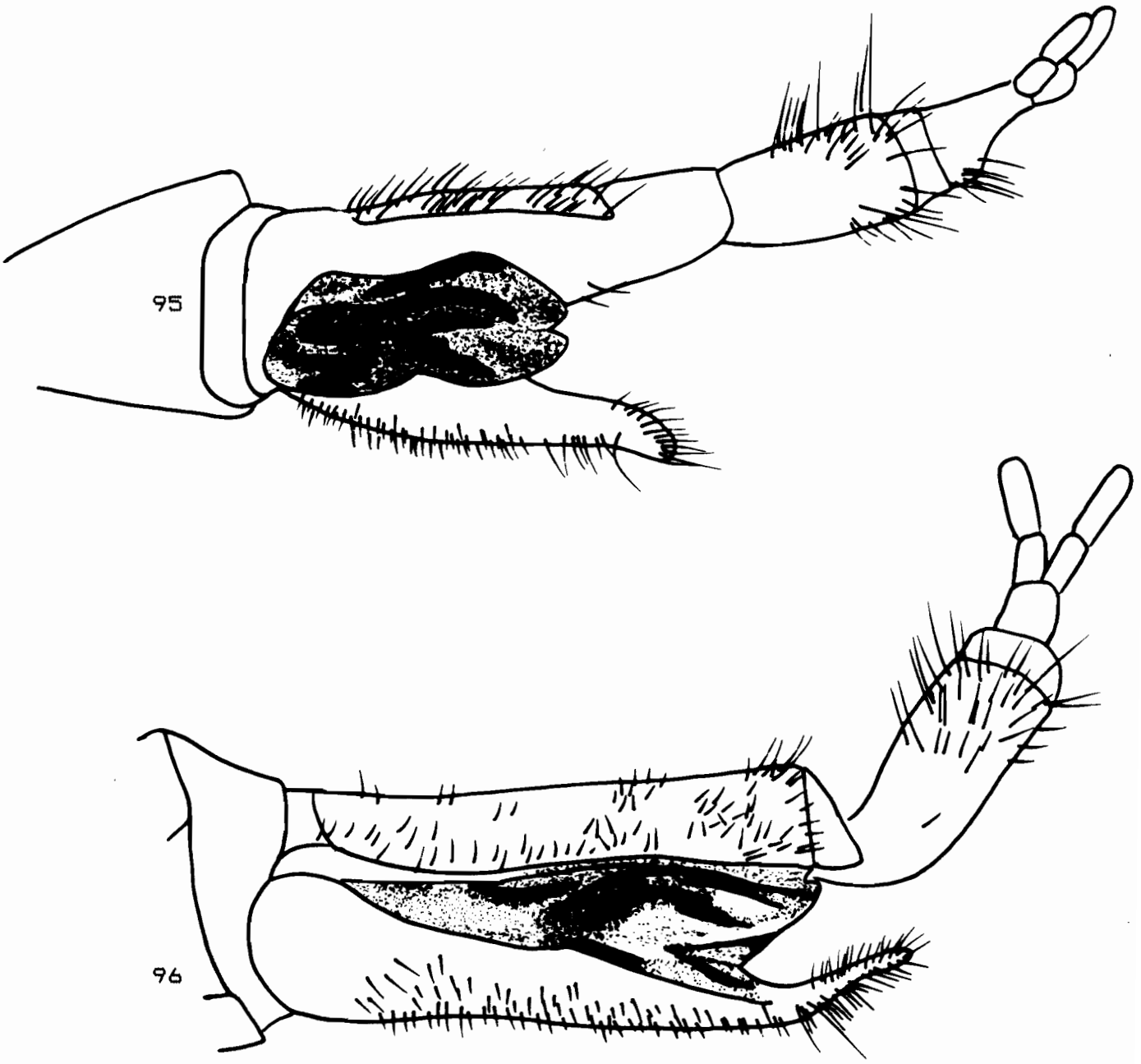


Figs. 90-92. Lateral view of ninth to eleventh segments of female *Panorpa* spp. (50X). 90. *Panorpa submaculosa* Carpenter; 91. *Panorpa latipennis* Hine; 92. *Panorpa nebulosa* Westwood (eleventh segment omitted).

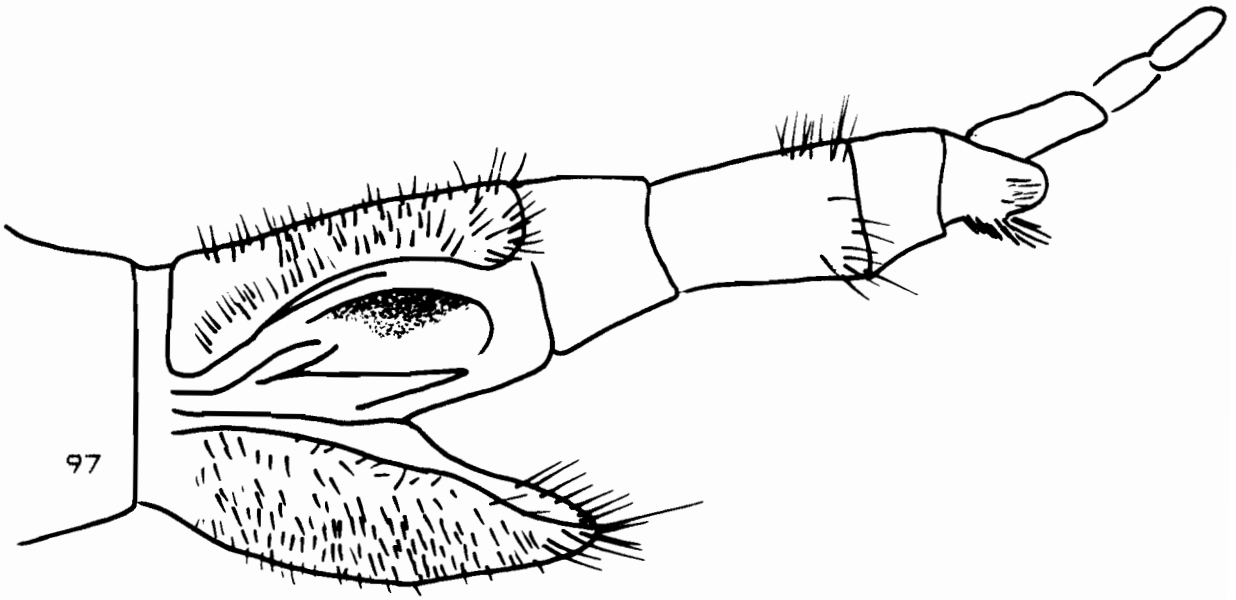


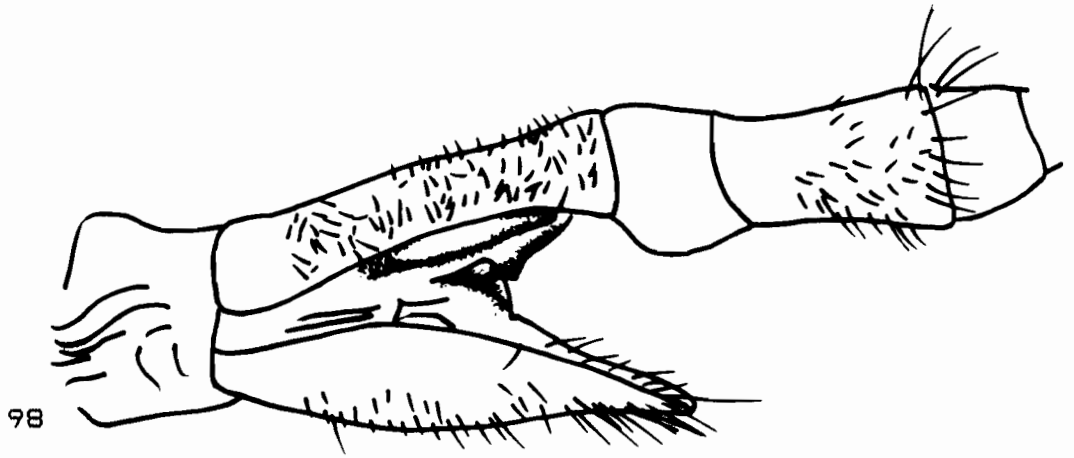


Figs. 93-94. Lateral view of ninth to eleventh segments of female *Panorpa* spp. (50X). 93. *Panorpa acuta* Carpenter; 94. *Panorpa mirabilis* Carpenter.

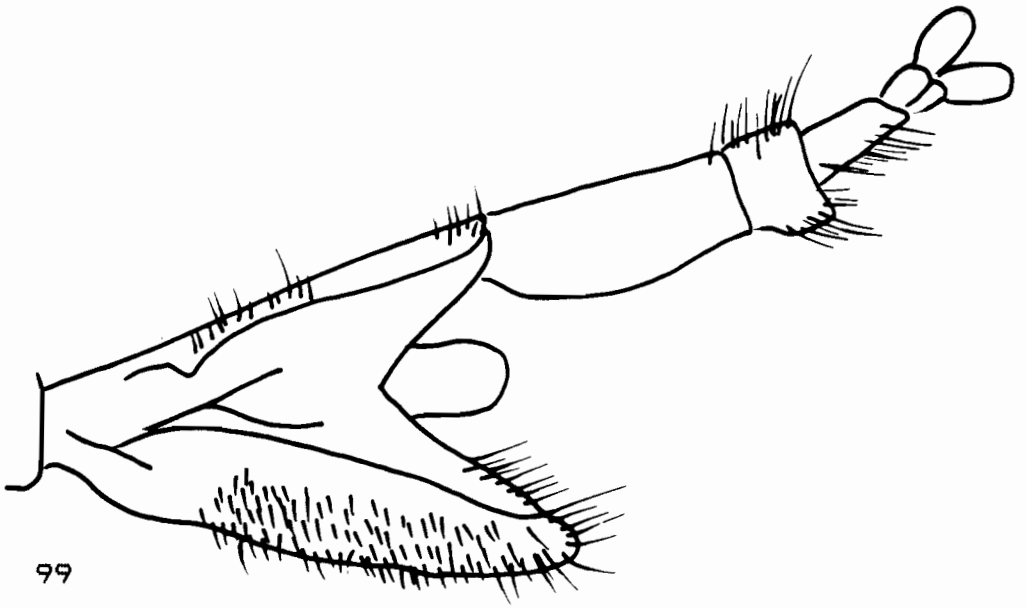


Figs. 95–96. Lateral view of ninth to eleventh segments of female *Panorpa* spp. (50X). 95. *Panorpa subfurcata* Westwood; 96. *Panorpa galerita* Byers.





Figs. 97-98. Lateral view of ninth to eleventh segments of female *Panorpa* spp. (50X). 97. *Panorpa anomala* Carpenter; 98. *Panorpa helena* Byers.



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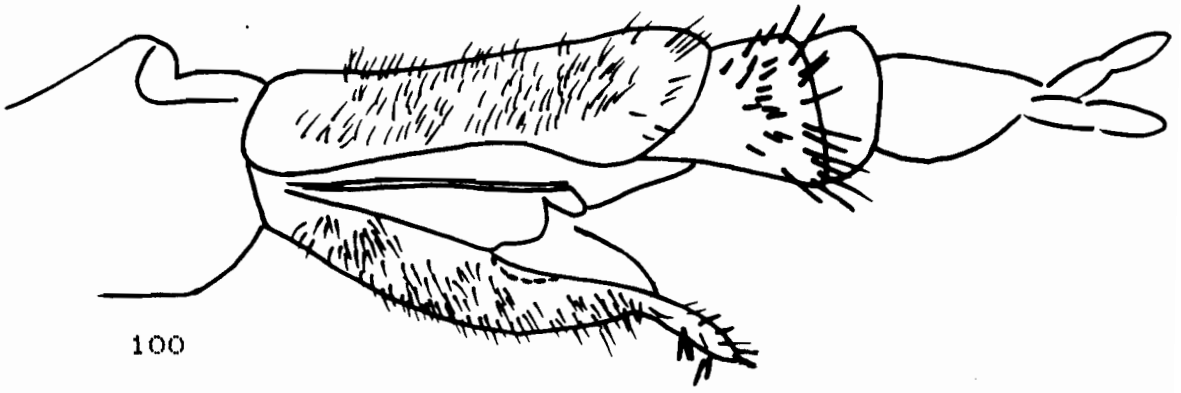

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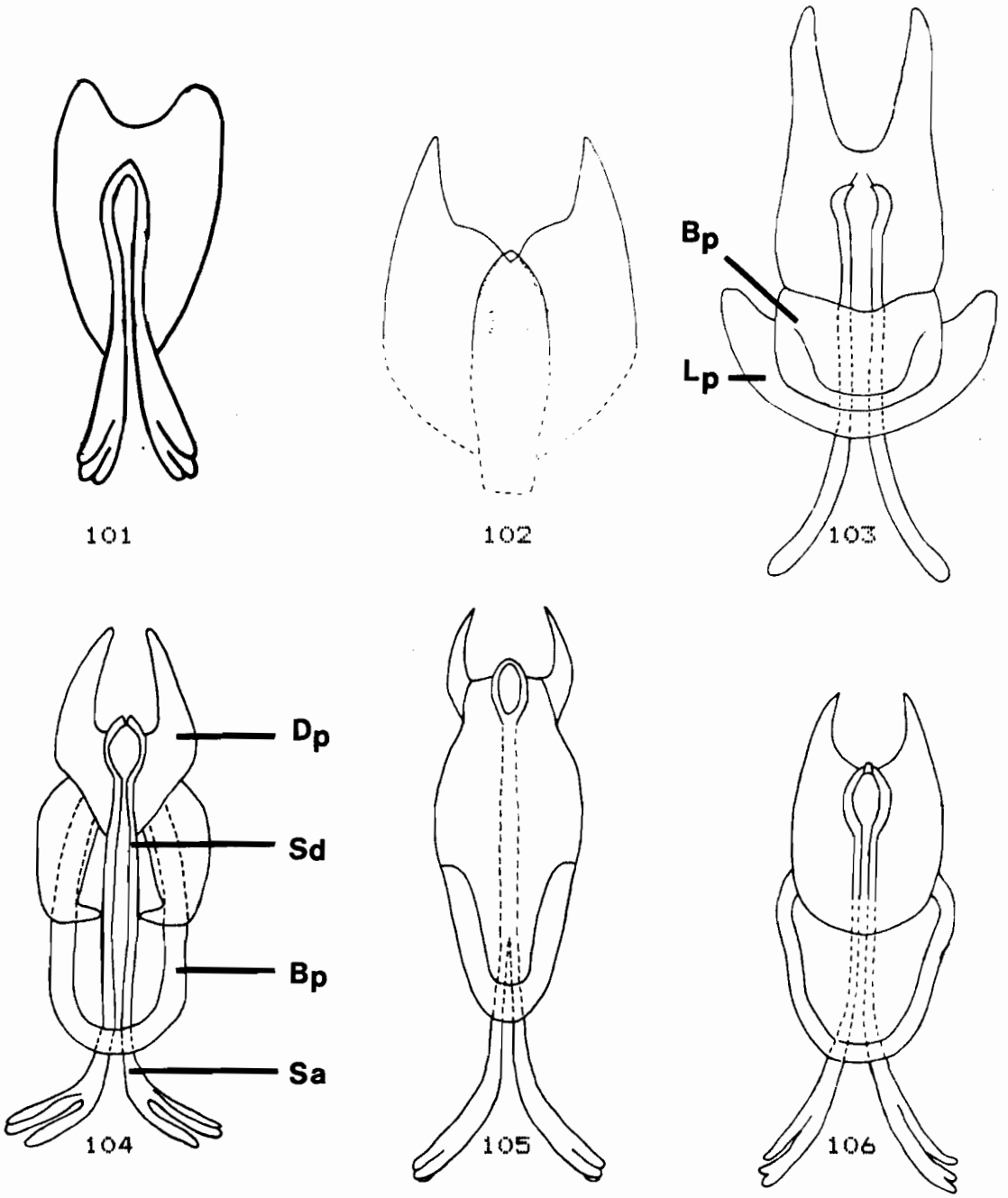
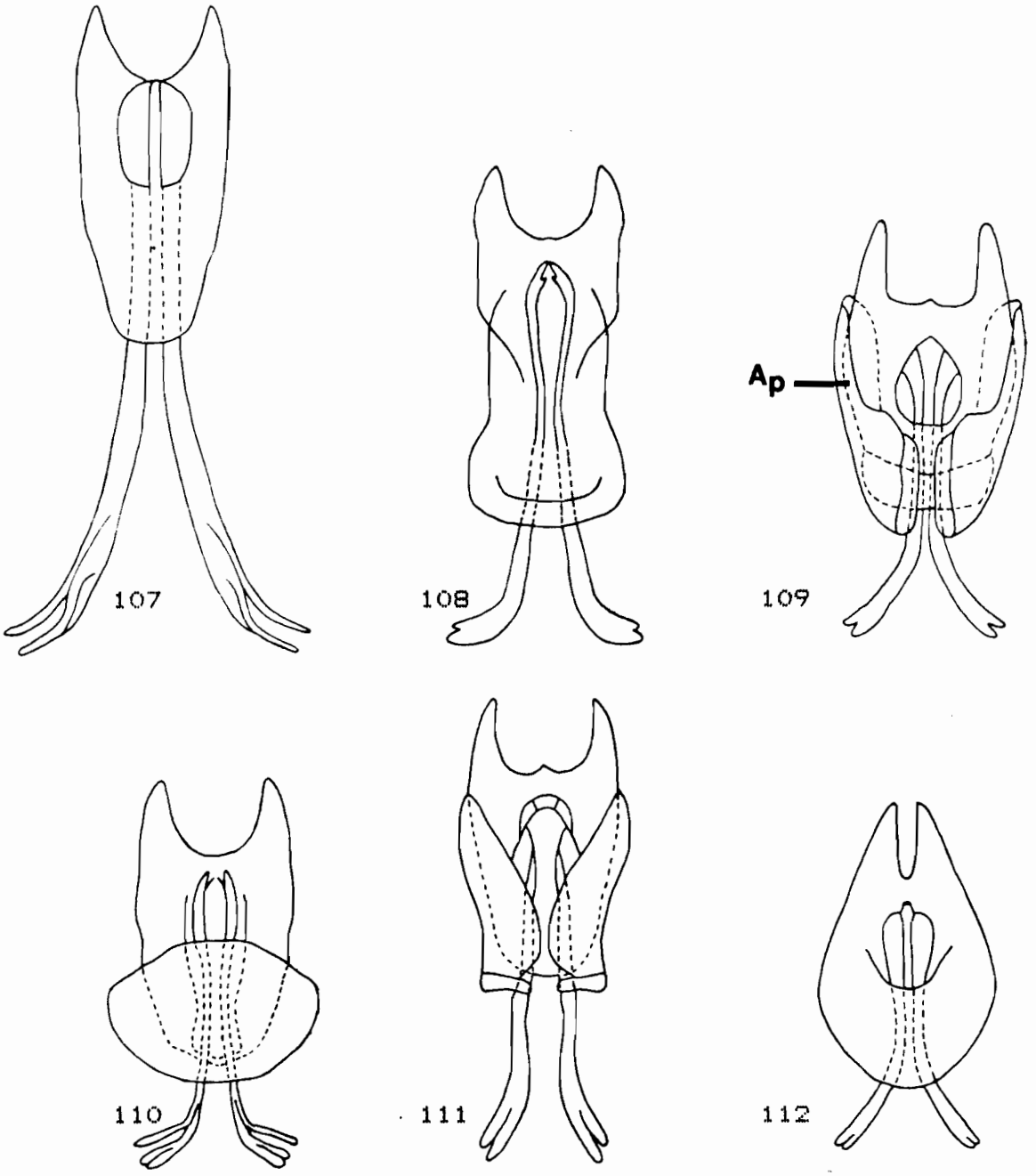
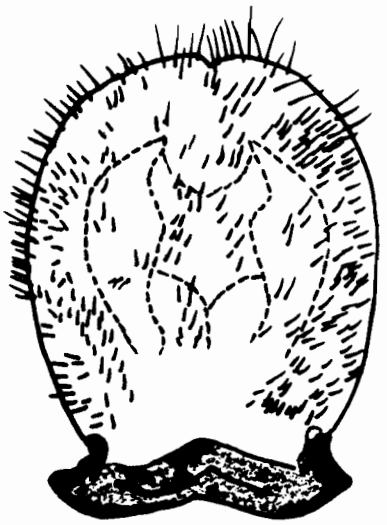
Figs. 99–100. Lateral view of ninth to eleventh segments of female *Panorpa* spp. (50X). 99. *Panorpa debilis* Westwood; 100. *Panorpa claripennis* Hine.



Figs. 101-106. Genital plates of female *Panorpa* spp. 101. *Panorpa galerita* Byers (50X); 102*. *Panorpa submaculosa* Carpenter; 103*. *Panorpa latipennis* Hine; 104*. *Panorpa nebulosa* Westwood; 105*. *Panorpa banksii* Hine; 106*. *Panorpa acuta* Carpenter. (* After Thornhill and Johnson, 1974; notation added and deleted)



Figs. 107-112. Genital plates of female *Panorpa* spp. 107. *Panorpa mirabilis* Carpenter; 108. *Panorpa subfurcata* Westwood; 109. *Panorpa anomala* Carpenter; 110. *Panorpa helena* Byers; 111. *Panorpa debilis* Westwood; 112. *Panorpa claripennis* Hine. (After Thornhill and Johnson, 1974)



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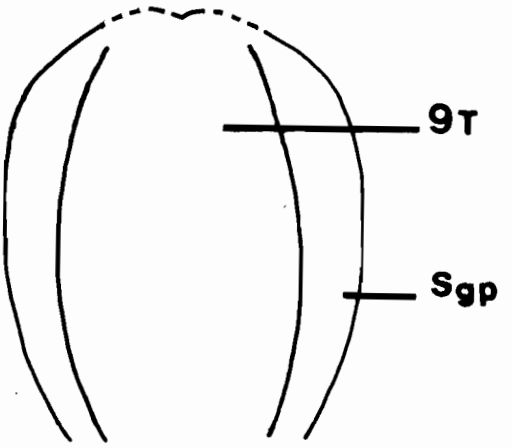

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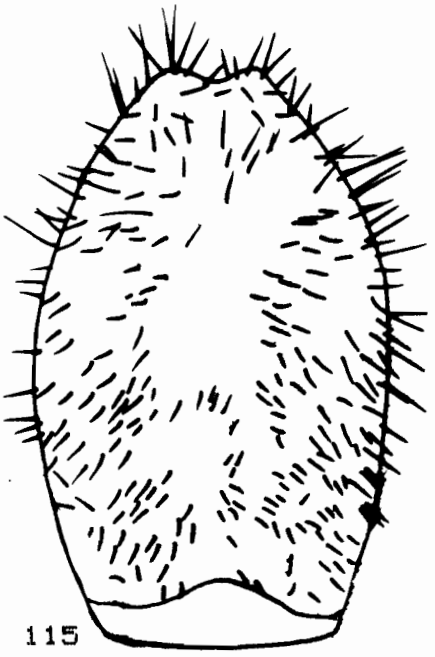

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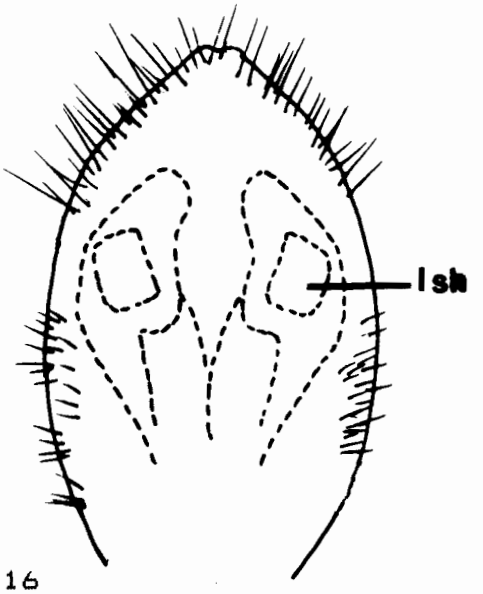
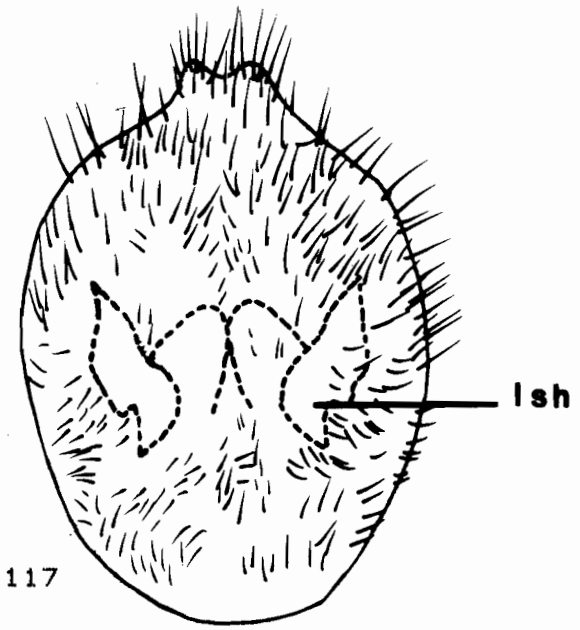


116

Figs. 113-116. Ventral view of subgenital plates of female *Panorpa* spp. (50X). 113-114*. *Panorpa submaculosa* Carpenter; 115. *Panorpa latipennis* Hine; 116. *Panorpa nebulosa* Westwood. (* dorsal view)



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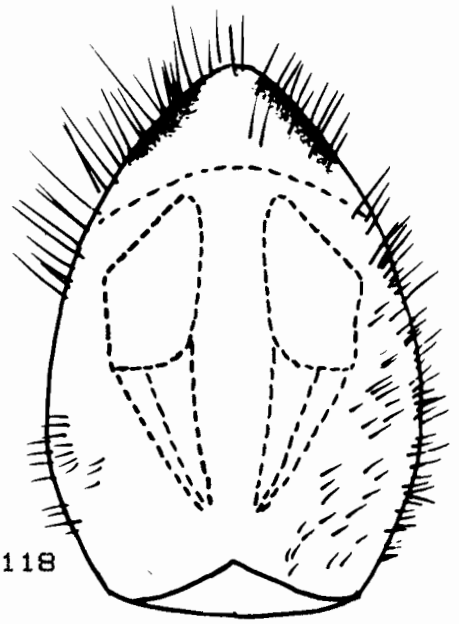

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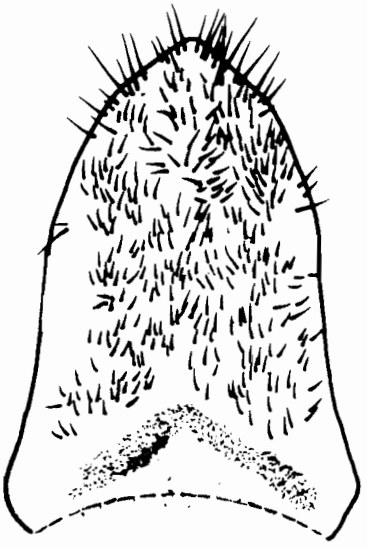

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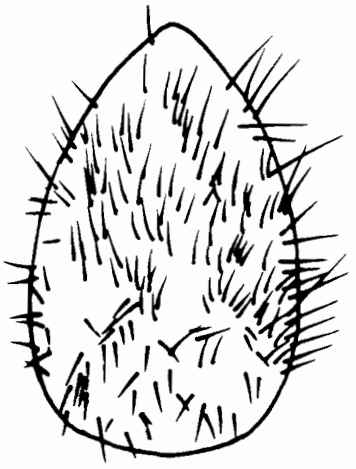
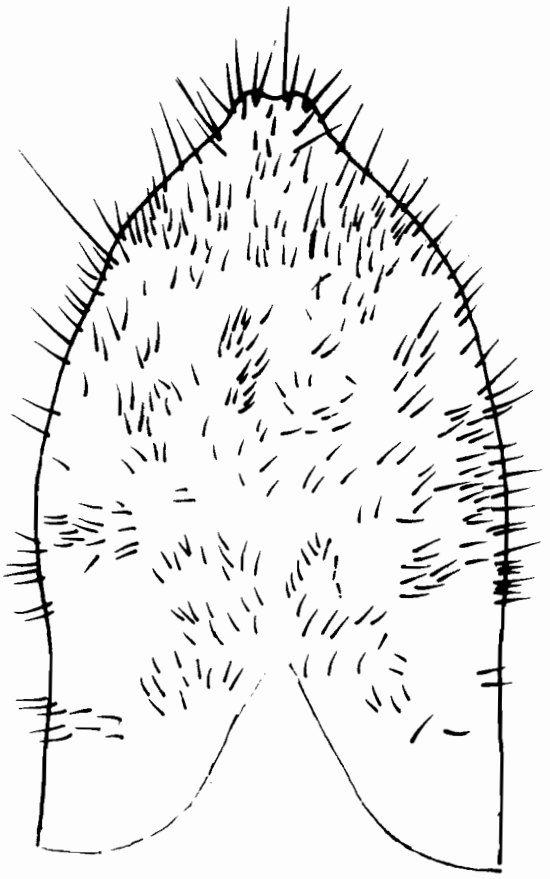


120

Figs. 117-120. Ventral view of subgenital plates of female *Panorpa* spp. (50X*). 117. *Panorpa banksii* Hine; 118. *Panorpa acuta* Carpenter; 119. *Panorpa mirabilis* Carpenter; 120. *Panorpa subfurcata* Westwood. (* Fig. 119, 25X)



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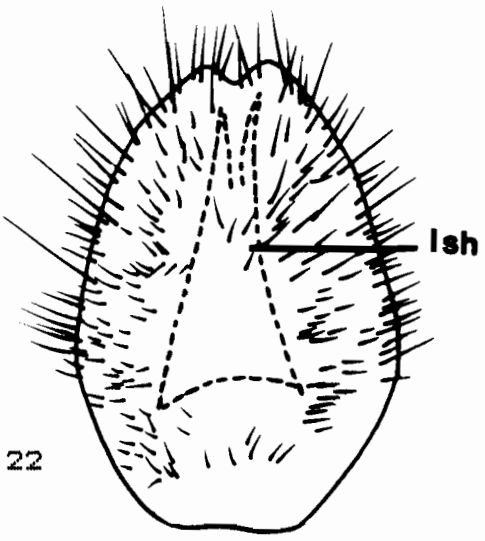

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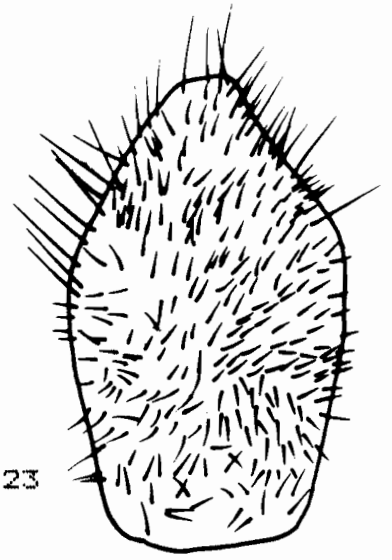
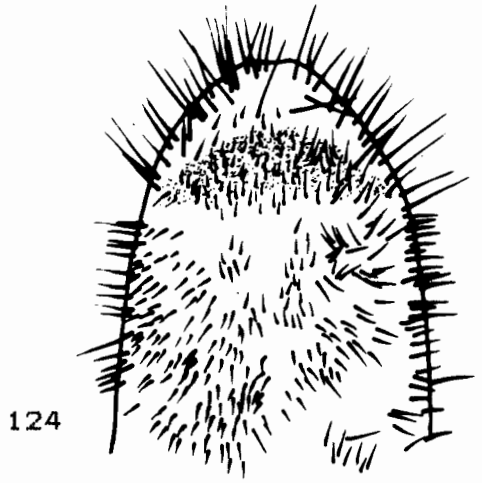


123

Figs. 121-123. Ventral view of subgenital plates of female *Panorpa* spp. (50X). 121. *Panorpa galerita* Byers; 122. *Panorpa anomala* Carpenter; 123. *Panorpa helena* Byers.



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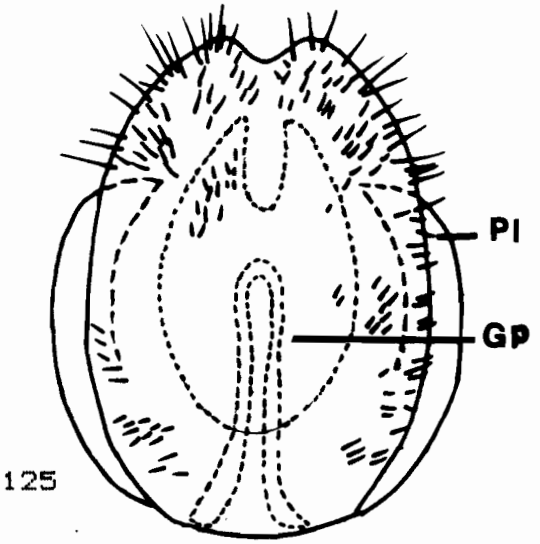
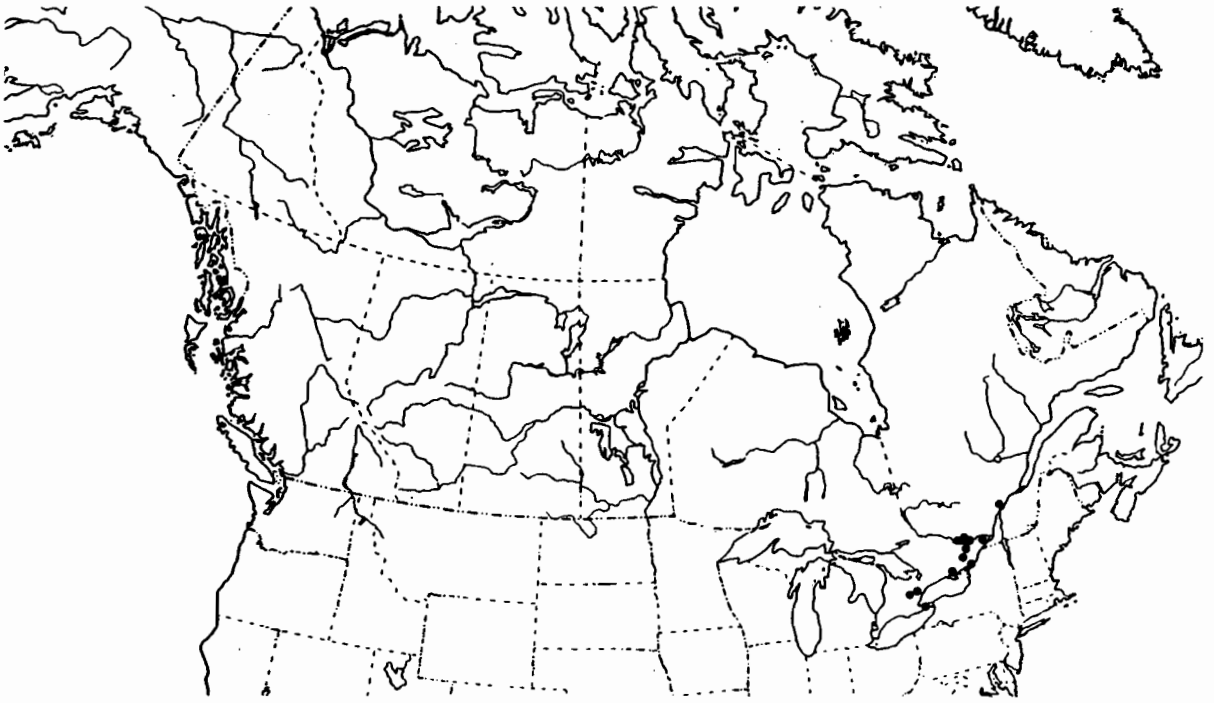


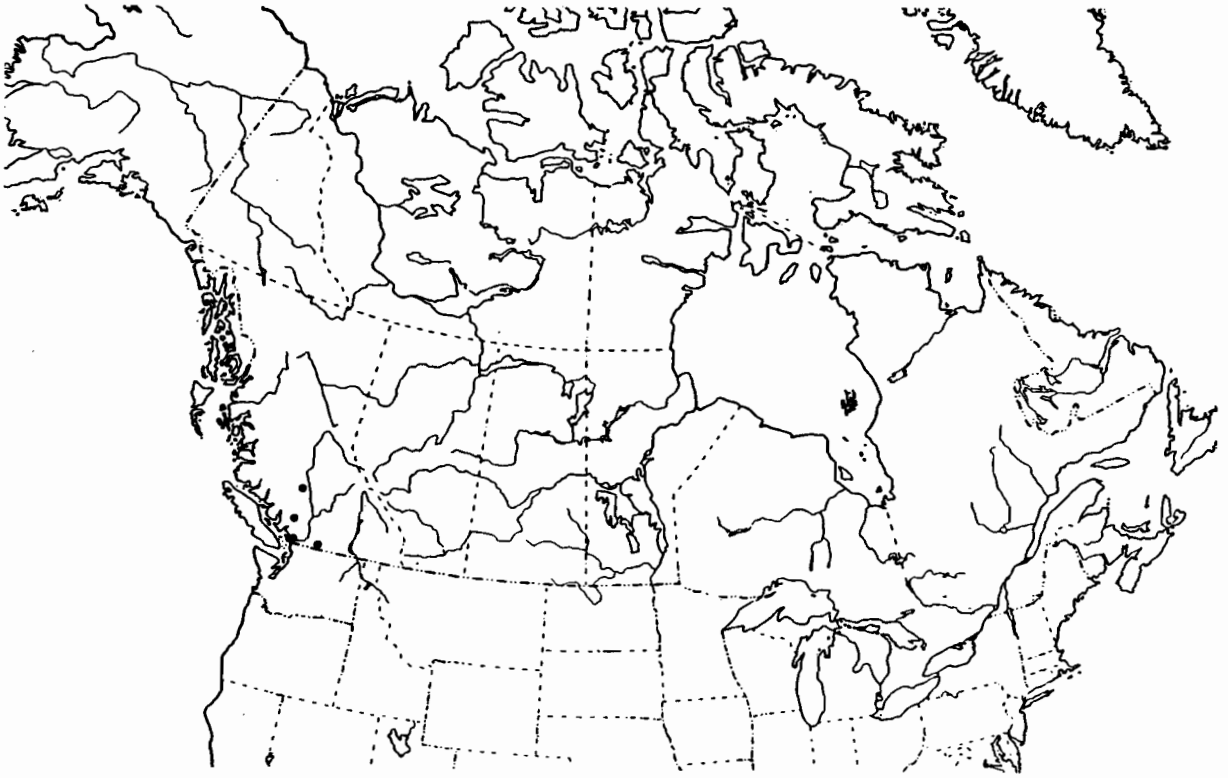
125

Figs. 124-125. Ventral view of subgenital plates of female *Panorpa* spp. (50X). 124. *Panorpa debilis* Westwood; 125. *Panorpa claripennis* Hine.

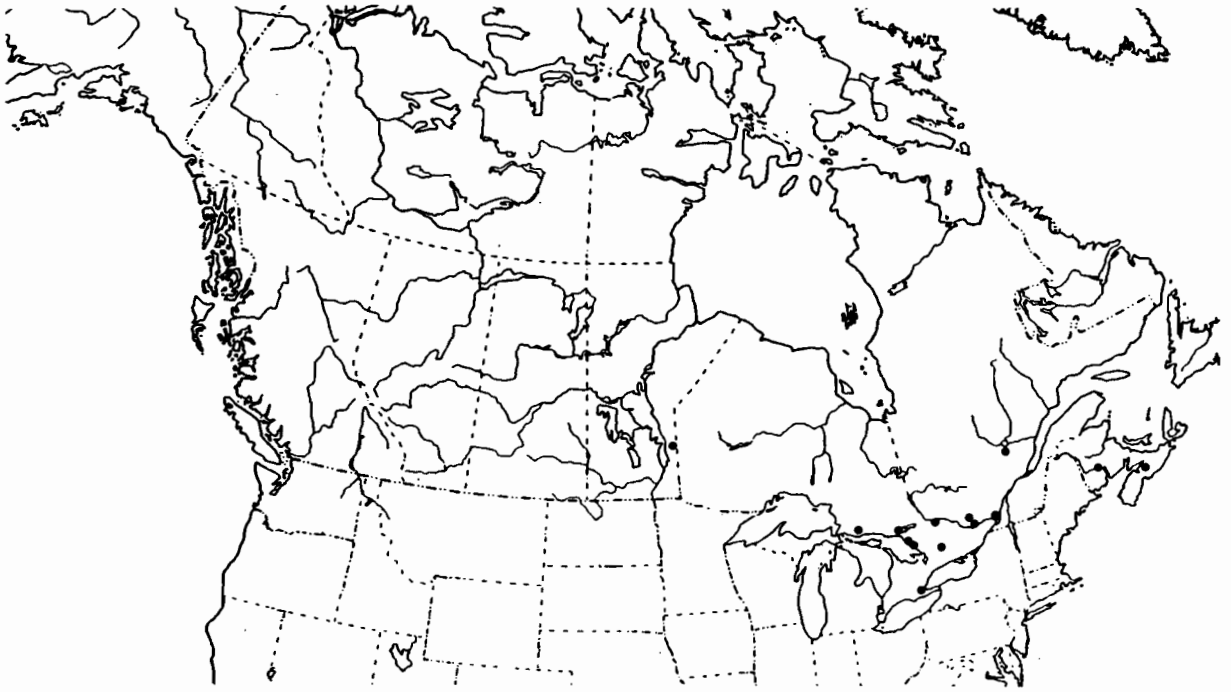
Map 1. General distribution of Mecoptera in North America. (modified from Webb *et al.*, 1975).



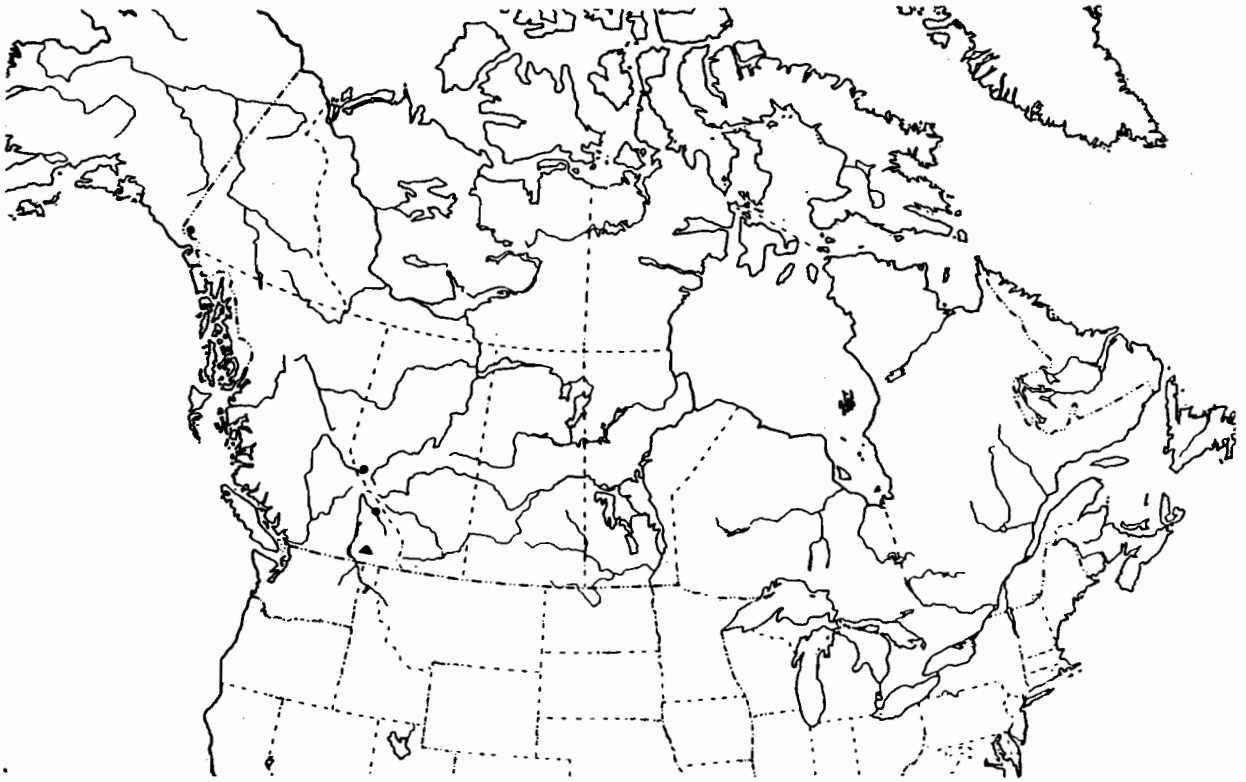
Map 2. Distribution of *Merope tuber* Newman in Canada.



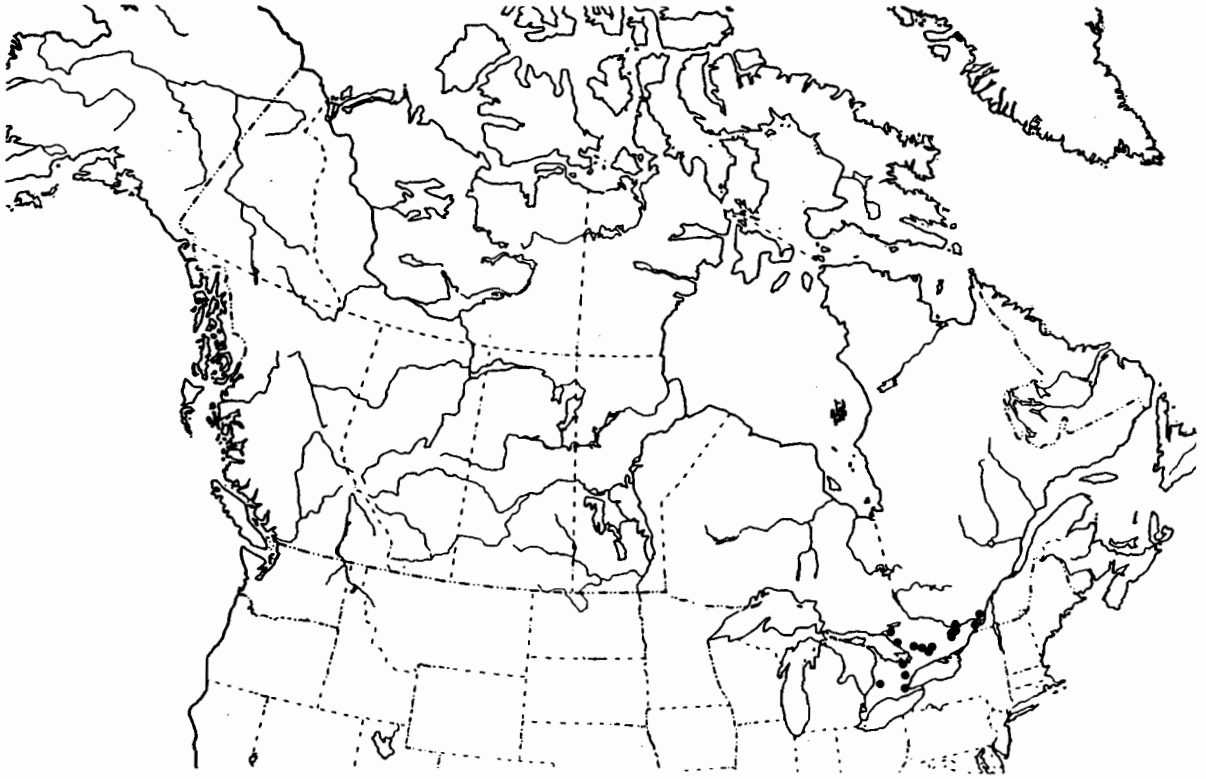
Map 3. Distribution of *Boreus elegans* Carpenter in Canada.



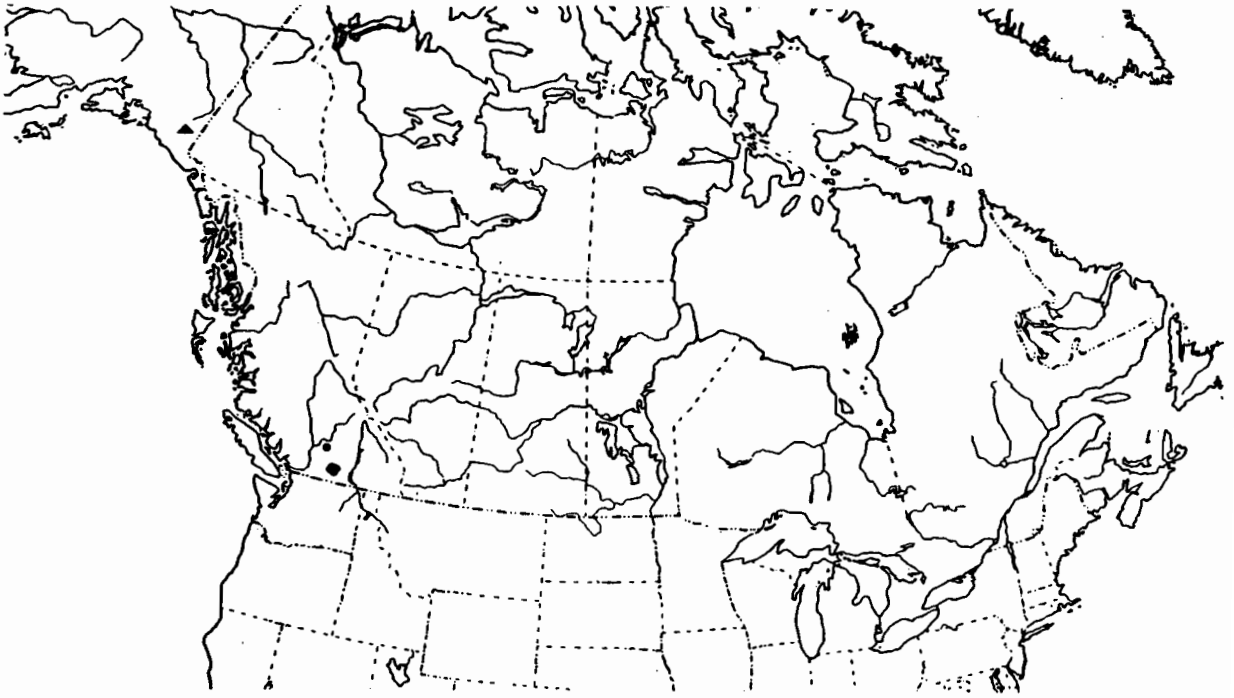
Map 4. Distribution of *Boreus nivoriundus* Fitch in Canada.



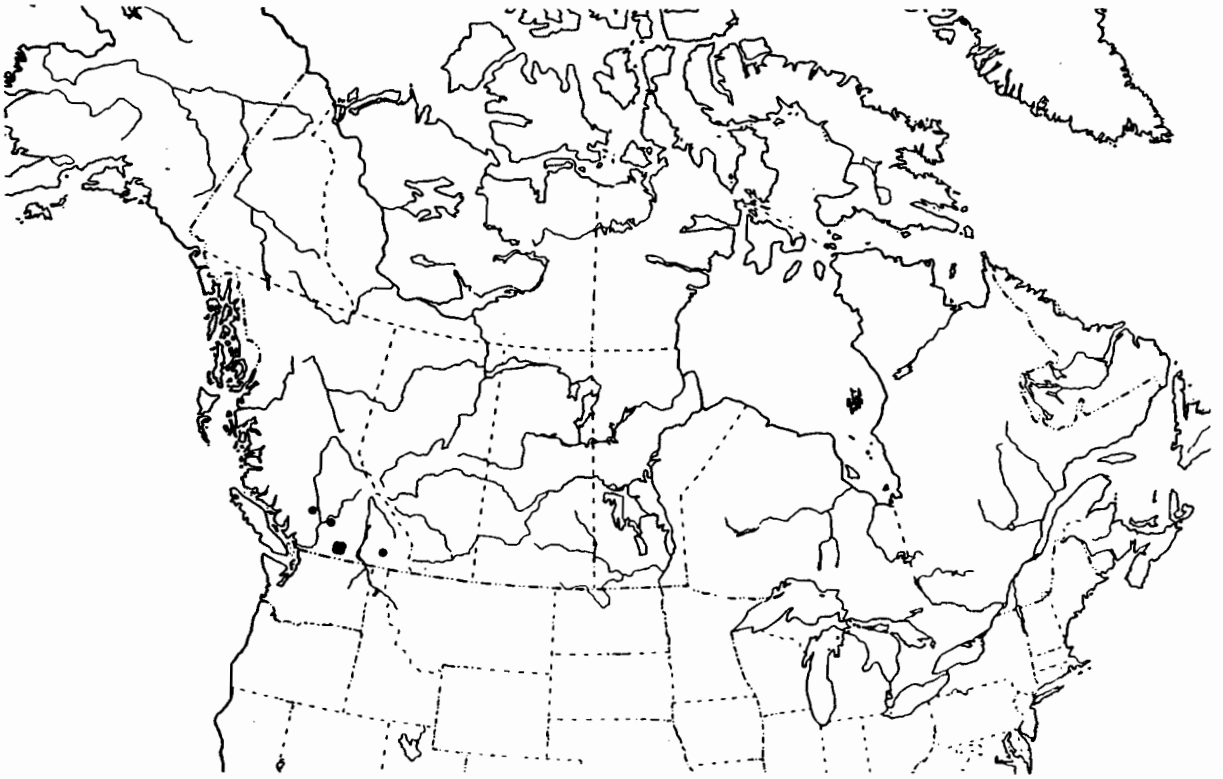
Map 5. Distribution of *Boreus pilosus* Carpenter in Canada (▲ record taken from Penny, 1977).



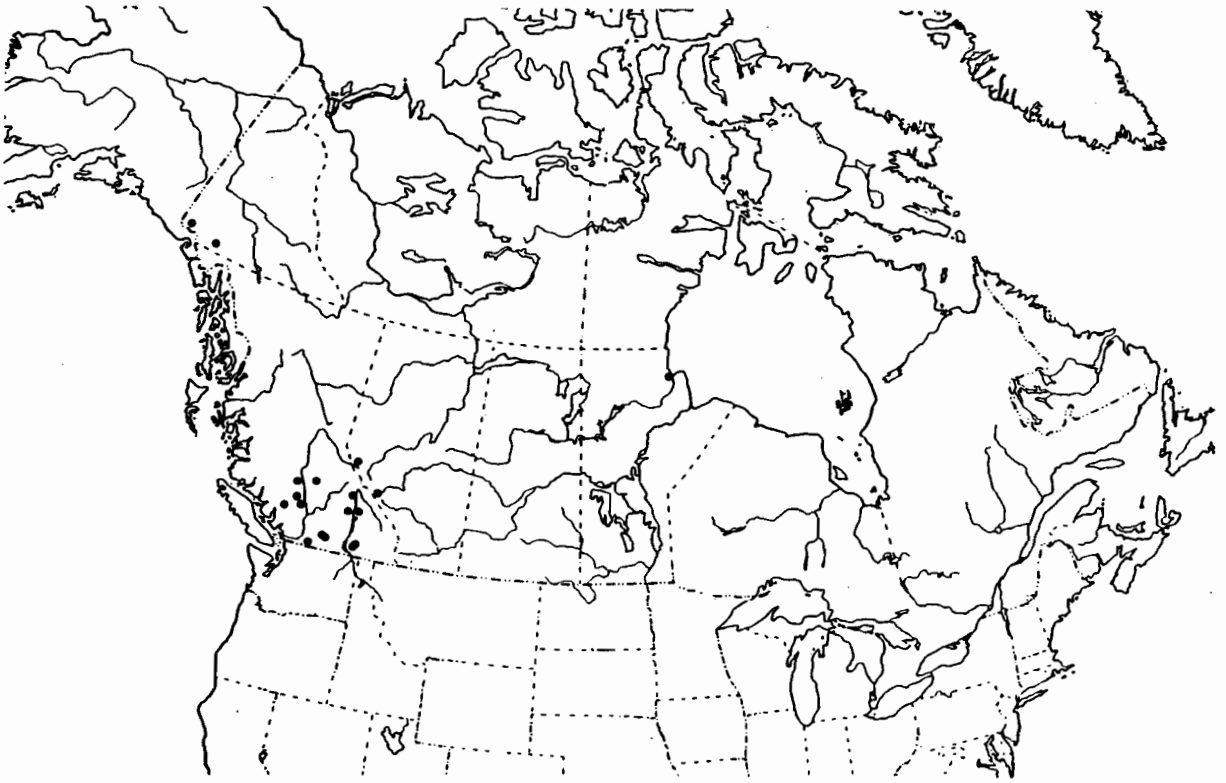
Map 6. Distribution of *Boreus brumalis* Fitch in Canada.



Map 7. Distribution of *Boreus nix* Carpenter in Canada and Alaska (▲ record taken from Penny, 1977).

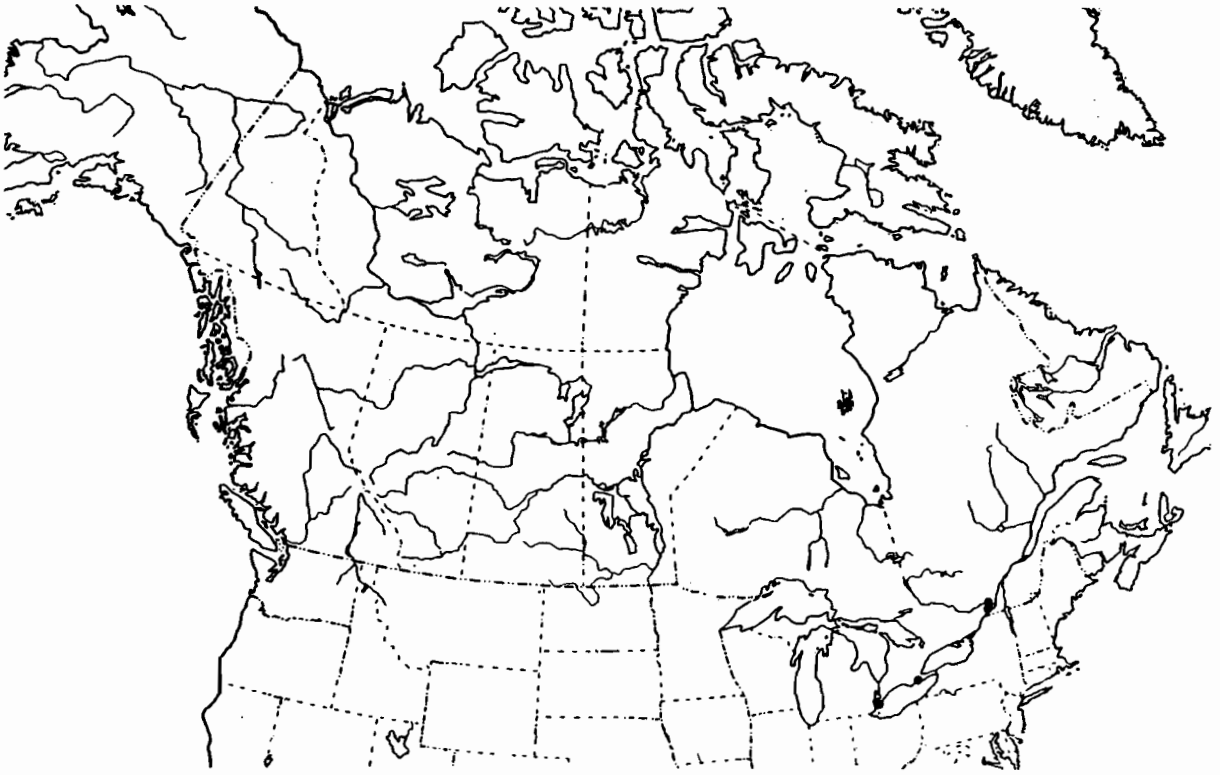


Map 8. Distribution of *Boreus reductus* Carpenter in Canada.

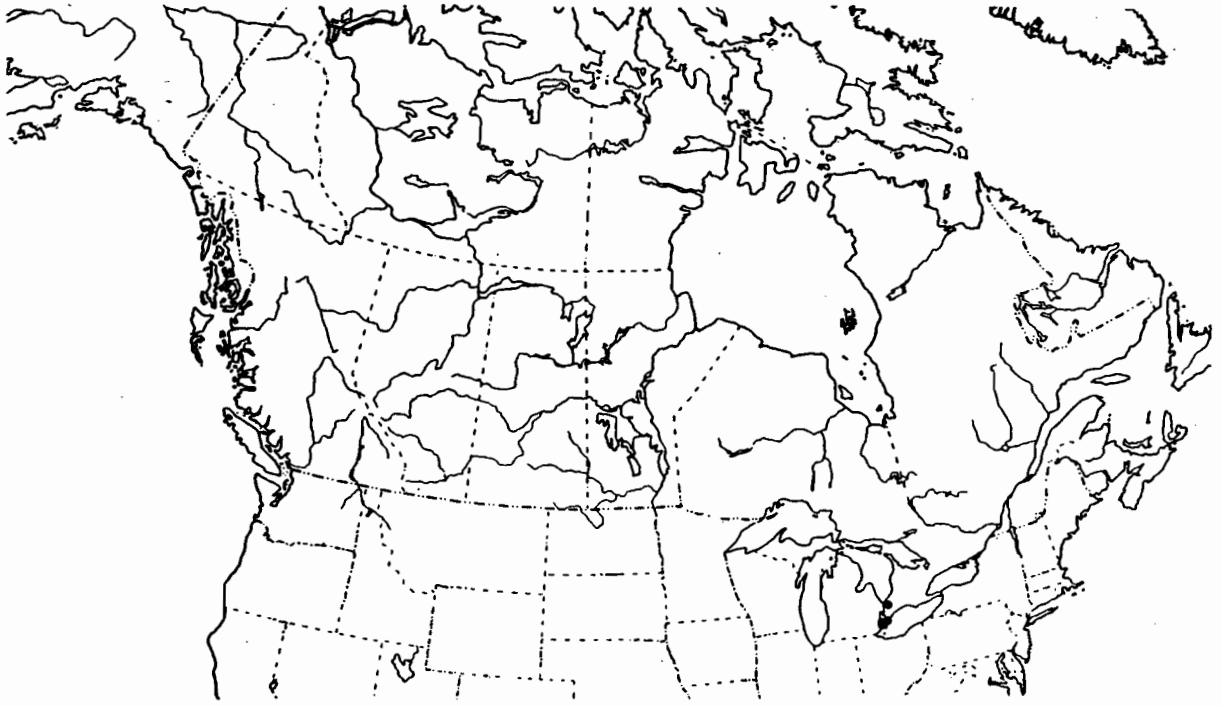


Map 9. Distribution of *Boreus californicus* Packard in Canada.

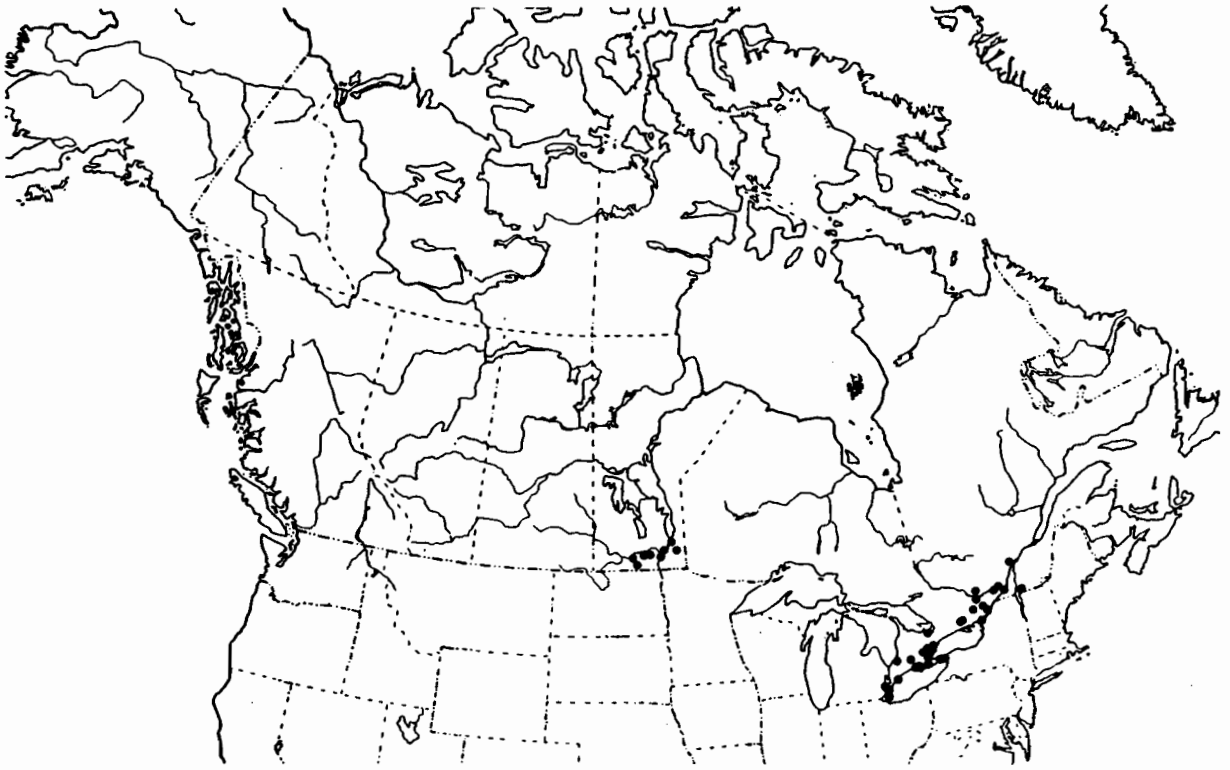
Map 10. Distribution of *Boreus borealis* Banks (●) and *B. intermedius* Lloyd (▲) in Alaska.



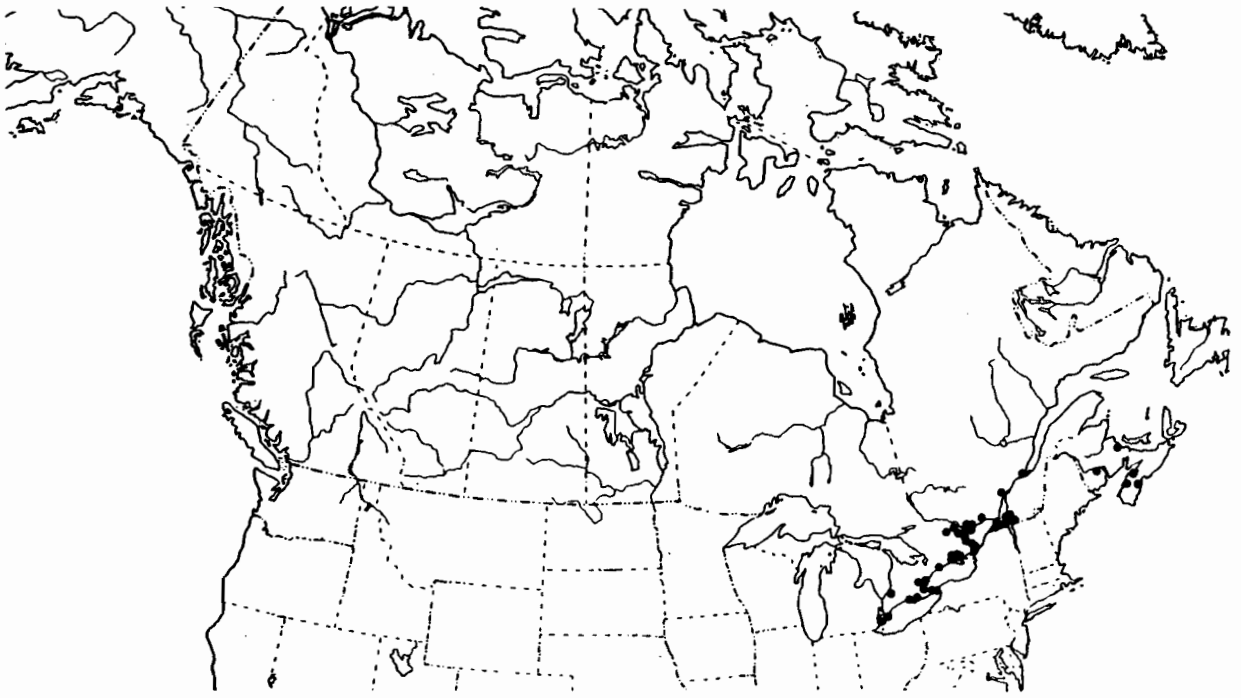
Map 11. Distribution of *Bittacus pilicornis* Westwood in Canada.



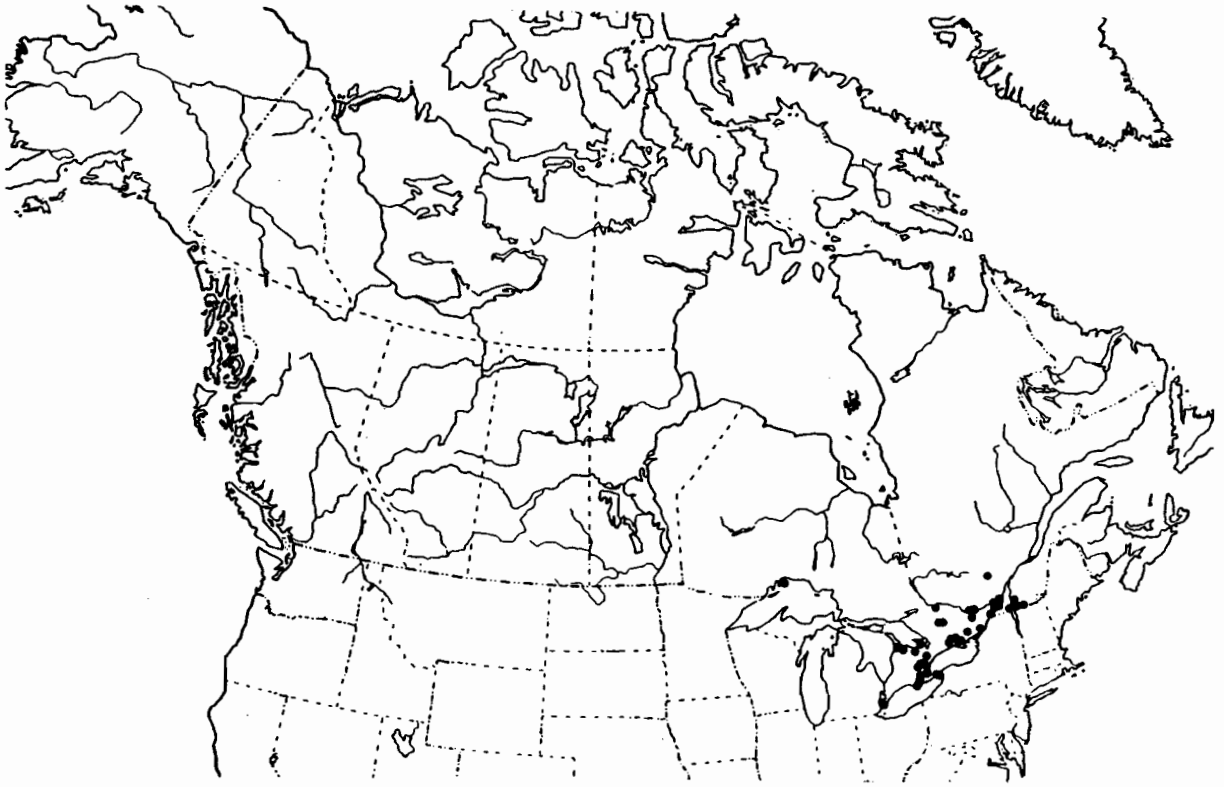
Map 12. Distribution of *Bittacus stigmaterus* Say in Canada.



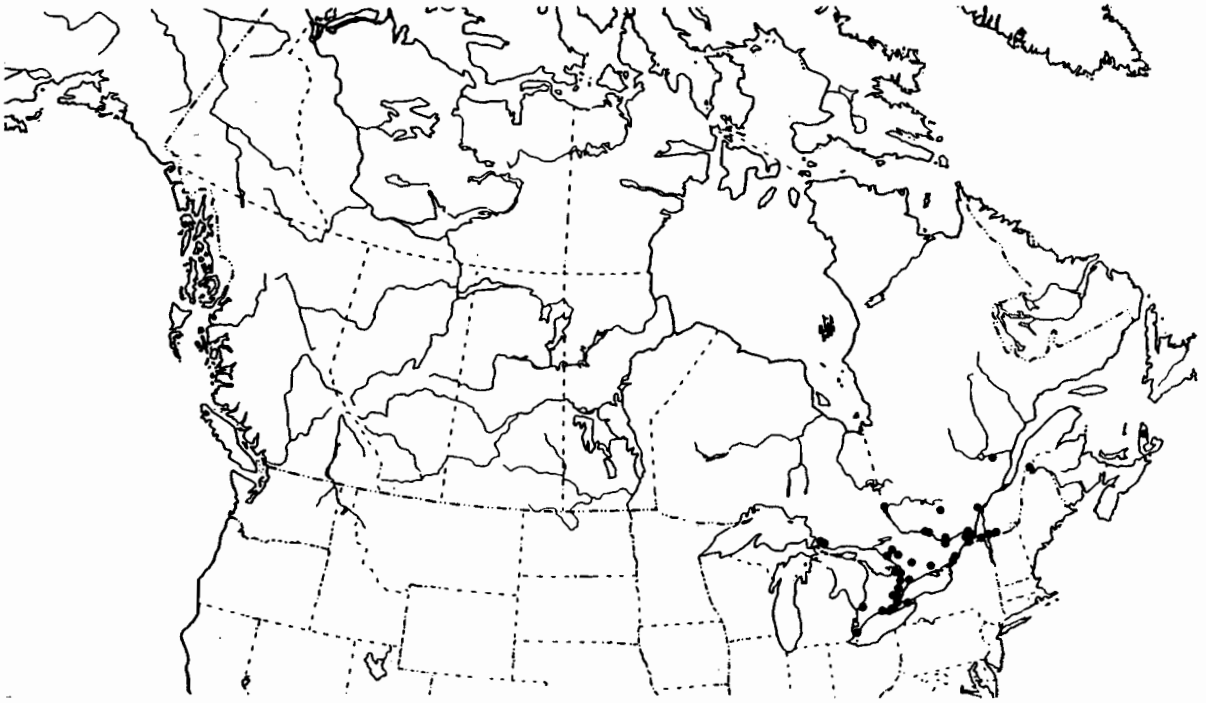
Map 13. Distribution of *Bittacus strigosus* Hagen in Canada.



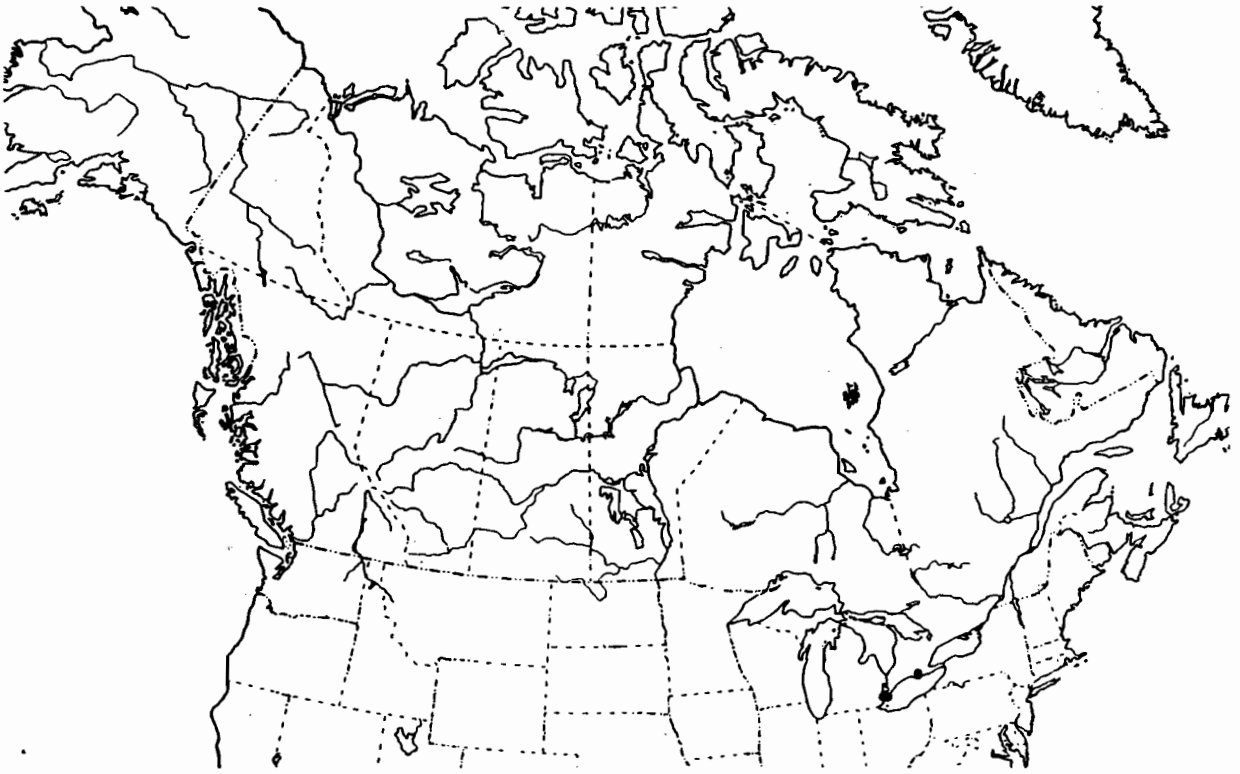
Map 14. Distribution of *Panorpa submaculosa* Carpenter in Canada.



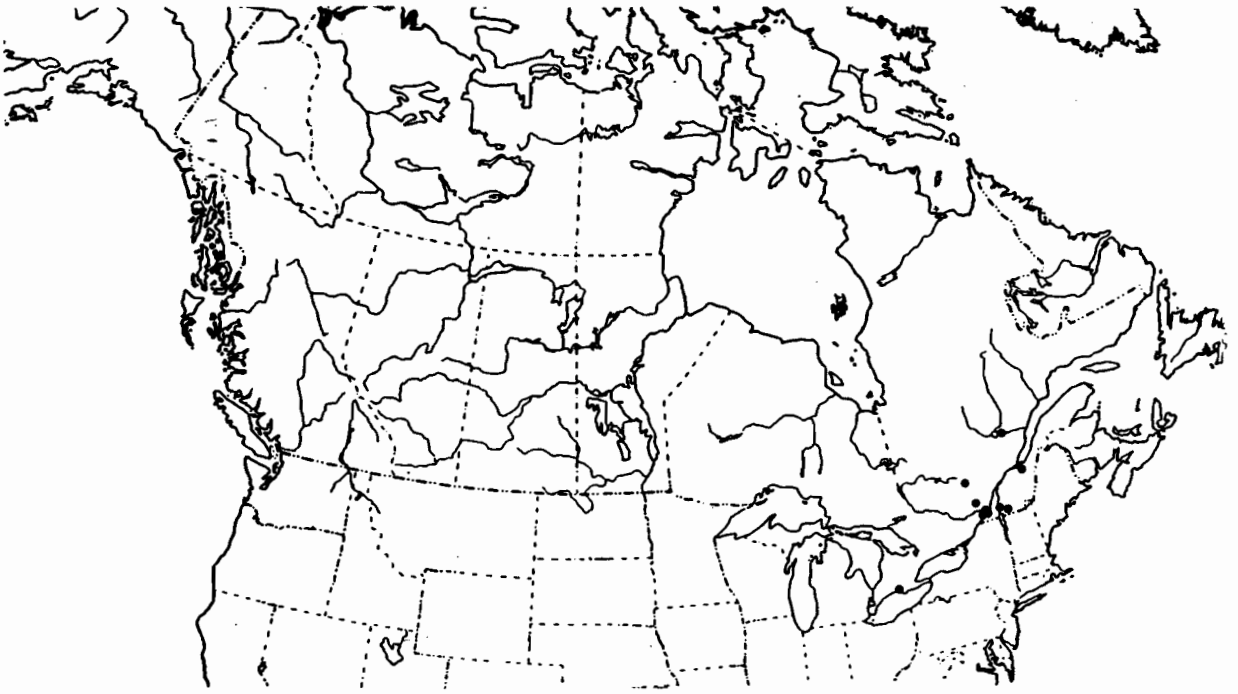
Map 15. Distribution of *Panorpa latipennis* Hine in Canada.



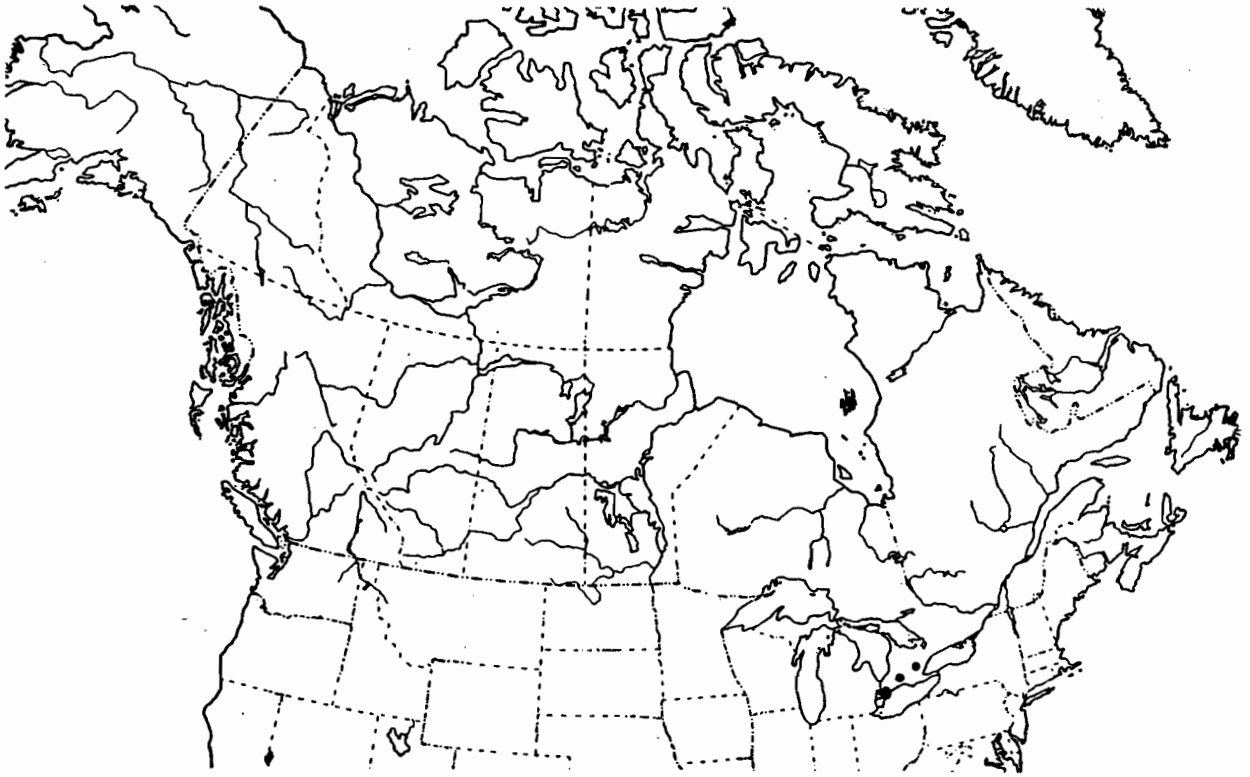
Map 16. Distribution of *Panorpa nebulosa* Westwood in Canada.



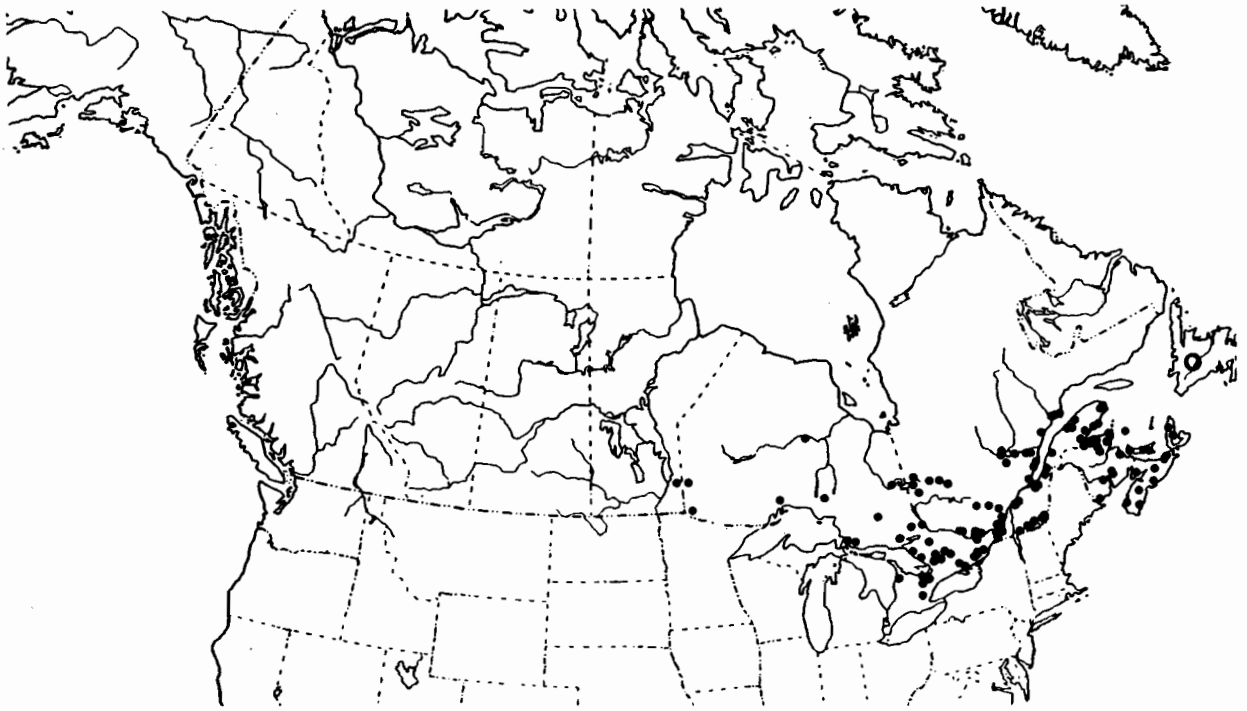
Map 17. Distribution of *Panorpa banksii* Hine in Canada.



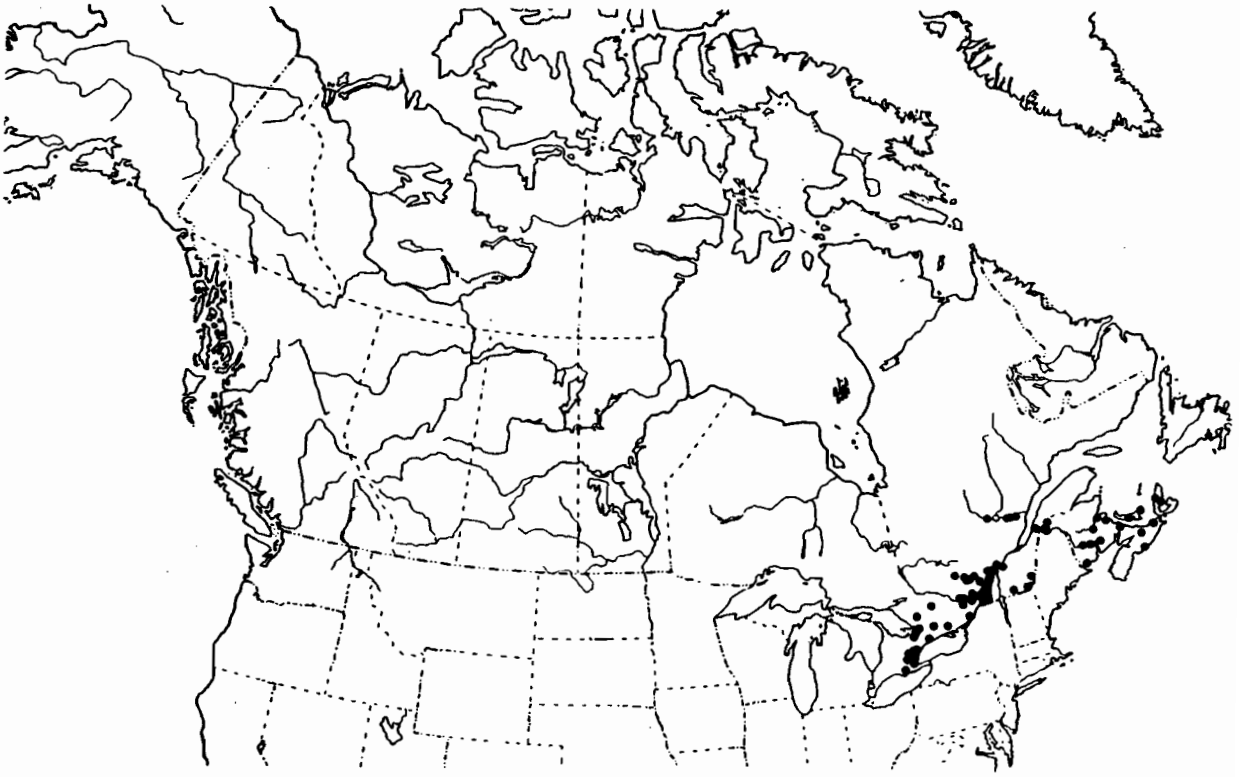
Map 18. Distribution of *Panorpa acuta* Carpenter in Canada.



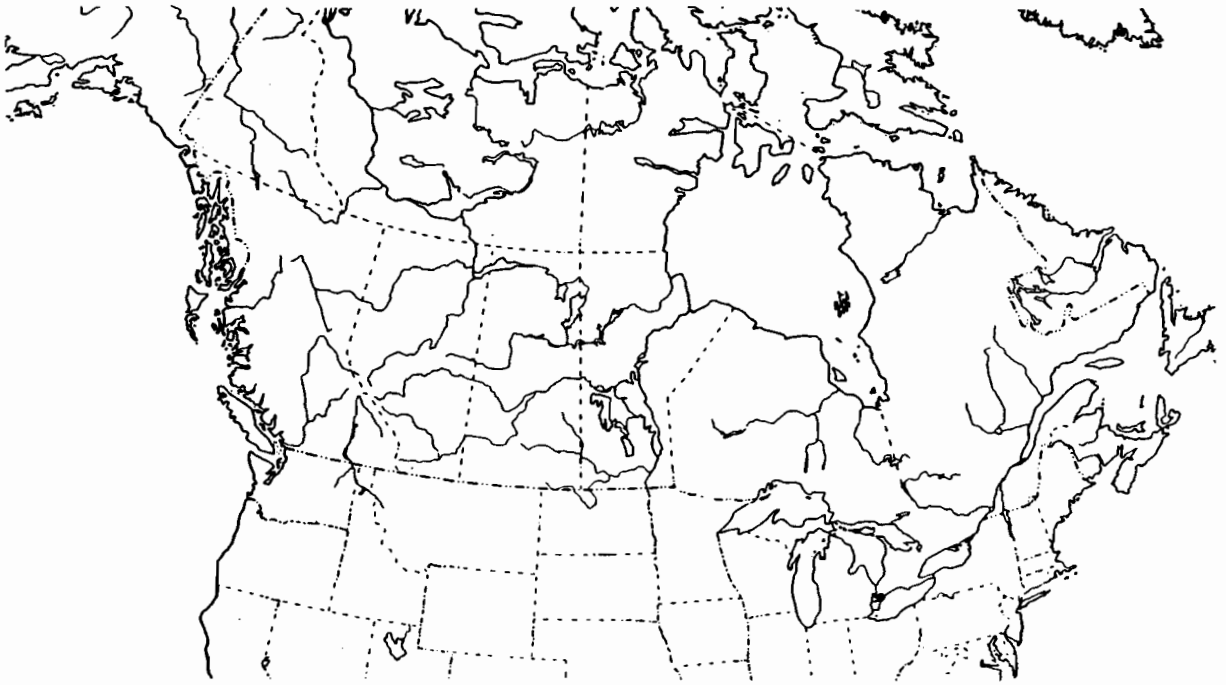
Map 19. Distribution of *Panorpa mirabilis* Carpenter in Canada.



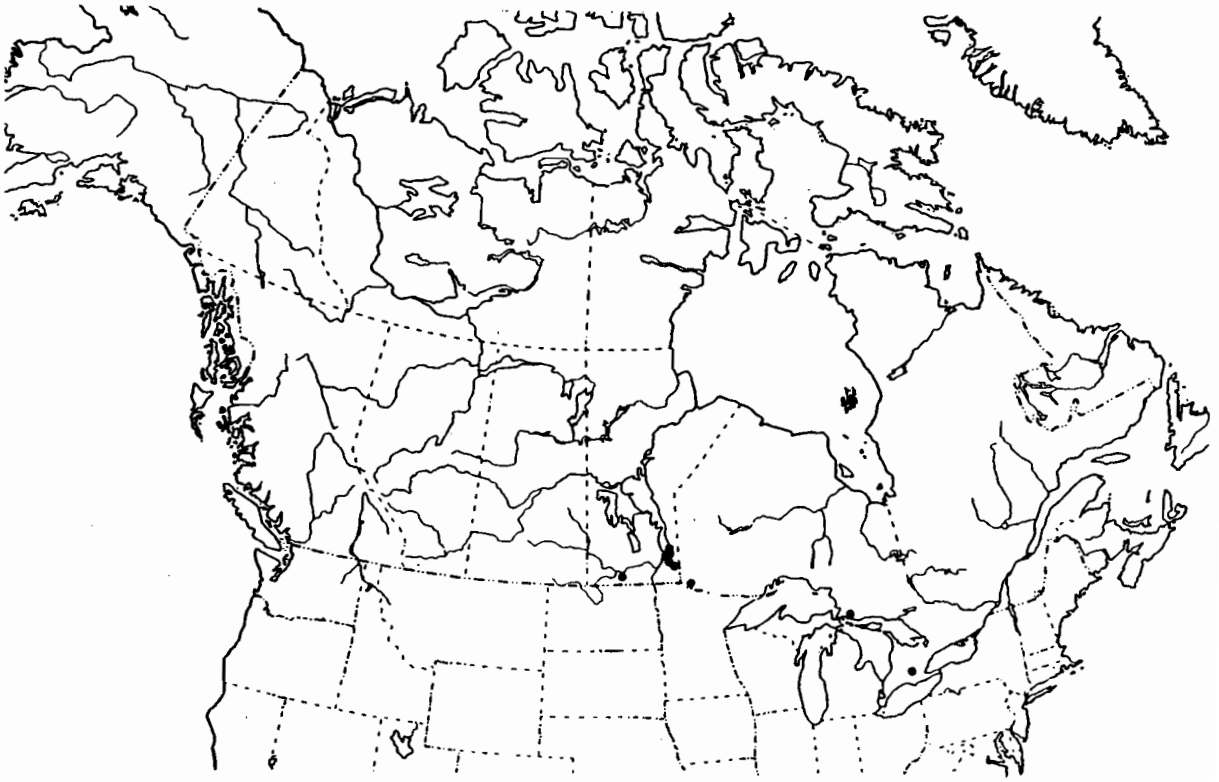
Map 20. Distribution of *Panorpa subfurcata* Westwood in Canada. (**o** record taken from Byers, 1969)



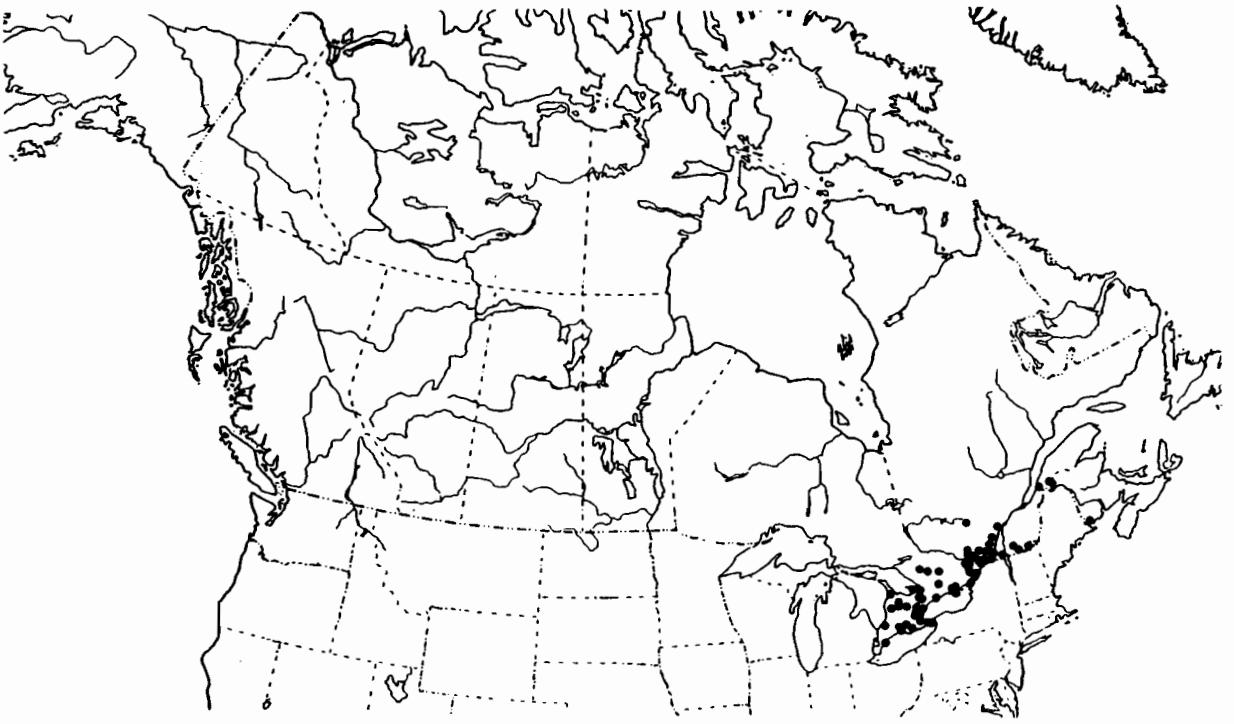
Map 21. Distribution of *Panorpa galerita* Byers in Canada.



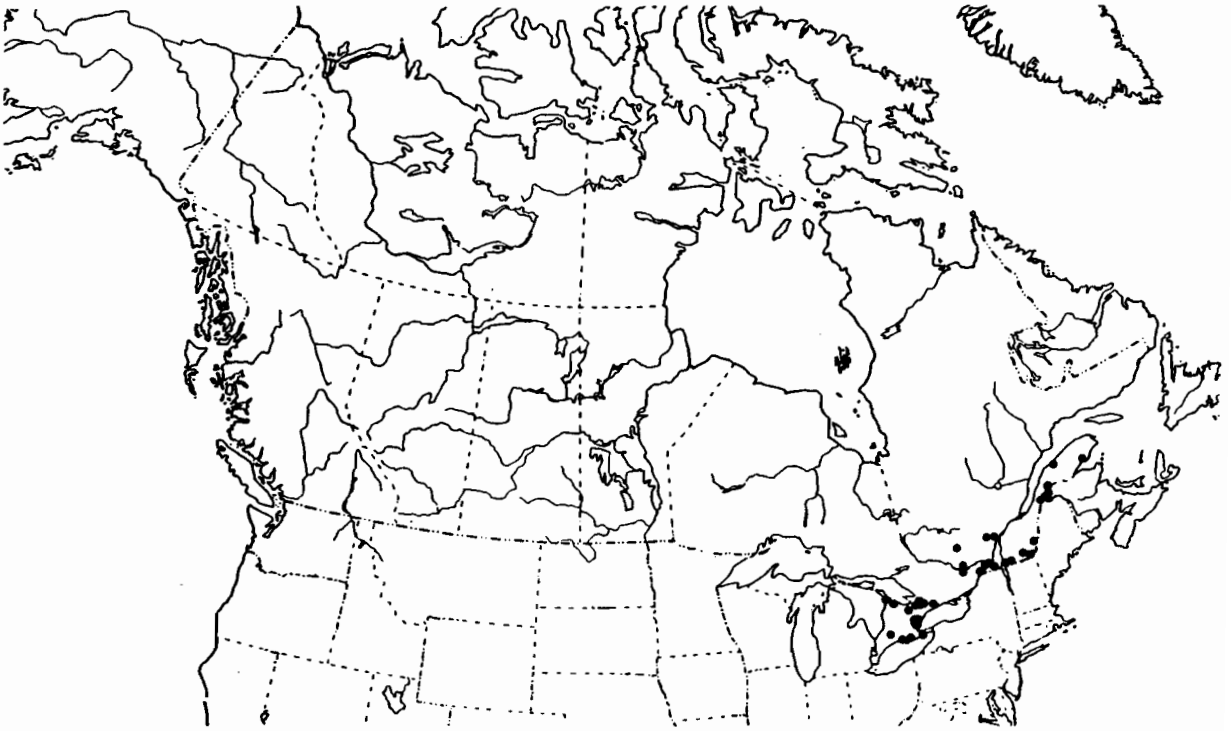
Map 22. Distribution of *Panorpa anomala* Carpenter in Canada.



Map 23. Distribution of *Panorpa helena* Byers in Canada.



Map 24. Distribution of *Panorpa debilis* Westwood in Canada.



Map. 25. Distribution of *Panorpa claripennis* Hine in Canada.

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