

MISCELLANEOUS PUBLICATIONS
MUSEUM OF ZOOLOGY, UNIVERSITY OF MICHIGAN, NO. 104

Catalogue of the Odonata of Michigan

BY

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ANN ARBOR
MUSEUM OF ZOOLOGY, UNIVERSITY OF MICHIGAN
DECEMBER 17, 1958

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PRINTED IN THE UNITED STATES OF AMERICA

CONTENTS

	Page
INTRODUCTION	5
Regions of Michigan	5
Notes on Previous Accounts of Michigan Odonata	6
Species New to Michigan	9
Distribution of Michigan Odonata	10
Distribution	11
Sources and Arrangement of Data	12
Acknowledgments	13
LIST OF SPECIES	13
Suborder Zygoptera	13
Calopterygidae	13
<i>Calopteryx</i>	13
<i>Hetaerina</i>	14
Lestidae	14
<i>Lestes</i>	14
Coenagrionidae	17
<i>Amphiagrion</i>	17
<i>Argia</i>	17
<i>Chromagrion</i>	18
<i>Coenagrion</i>	18
<i>Enallagma</i>	18
<i>Ischnura</i>	21
<i>Nehalienia</i>	21
Suborder Anisoptera	22
Petaluridae	22
<i>Tachopteryx</i>	22
Cordulegasteridae	22
<i>Cordulegaster</i>	22
Gomphidae	23
<i>Dromogomphus</i>	23
<i>Gomphus</i>	23
<i>Hagenius</i>	26
<i>Lanthus</i>	26
<i>Ophiogomphus</i>	26
<i>Progomphus</i>	27
Aeshnidae	27
<i>Aeshna</i>	27
<i>Anax</i>	28
<i>Basiaeschna</i>	28
<i>Boyeria</i>	29
<i>Epiaeschna</i>	29
<i>Gomphaeschna</i>	29
<i>Nasiaeschna</i>	30
Corduliidae	30
Macrominae	30
<i>Didymops</i>	30
<i>Macromia</i>	30

	Page
LIST OF SPECIES (continued)	
Suborder Anisoptera (continued)	
Corduliidae (continued)	
Cordulinae	30
<i>Cordulia</i>	30
<i>Doracordulia</i>	31
<i>Epicordulia</i>	31
<i>Neurocordulia</i>	31
<i>Somatochlora</i>	31
<i>Tetragoneuria</i>	32
<i>Williamsonia</i>	33
Libellulidae	33
<i>Celithemis</i>	33
<i>Erythemis</i>	34
<i>Ladona</i>	34
<i>Leucorrhinia</i>	35
<i>Libellula</i>	36
<i>Nannothemis</i>	37
<i>Pachydiplax</i>	37
<i>Pantala</i>	37
<i>Perithemis</i>	37
<i>Plathemis</i>	37
<i>Sympetrum</i>	38
<i>Tramea</i>	40
SUMMARY	40
LITERATURE CITED.	40

MAP

Map

1. Michigan showing the three major physiographic and ecologic divisions . . . 7

CATALOGUE OF THE ODONATA OF MICHIGAN¹

INTRODUCTION

THE first studies on the dragonflies of Michigan were made over fifty years ago; between 1906 and 1957 there appeared twenty-nine papers by eighteen authors that deal specifically or incidentally with forms found in the state. Thirty-one years have elapsed, however, since Byers (1927) published his annotated list of the species known to occur in Michigan. In the interim there have been changes in nomenclature, many new state and county records have been added, and other records have been found in need of correction. The revised list of the Odonata of Michigan presented here is, therefore, timely. Published accounts of Michigan Odonata since Byers' list are: Andrews (1929), Bromley (1949), Byers (1939), Gloyd (1932, 1940, 1943), Kenk (1949), Leonard (1934, 1939a, 1939b, 1940a, 1940b), Needham and Westfall (1955), Walker (1933, 1951, 1952, 1953), Williamson (1933), and Wright (1946). In addition to these authors, significant contributions to our knowledge of the dragonflies of the state have been made, through collections and field observations, by Irving J. Cantrall, Frederick M. and Helen T. Gaige, Theodore H. Hubbell, Ada L. Olson, J. Speed Rogers, Curtis W. Sabrosky and George Steyskal.

Regions of Michigan

Physiographically and ecologically, Michigan may be divided into three natural regions (see Map 1). They are the Upper Peninsula (UP), Northern Lower Peninsula (NLP), and Southern Lower Peninsula (SLP). The division between the northern and southern parts of the Lower Peninsula roughly follows the course of the Grand Trunk River and extends west from the southern part of Saginaw Bay to Muskegon. All the Lower Peninsula north of this line and all of the Upper Peninsula lie in the Coniferous-Deciduous Forests Ecotone (Sub-Canadian Forest) of Pitelka (1941), which corresponds rather closely with the Canadian Biotic Province of Dice (1943). This is part of the Hemlock-White Pine-Northern Hardwoods Region of Braun (1950) and is characterized by a climax dominance of hemlock and northern hardwoods. The vegetation may consist of: (1) primary deciduous communities of sugar maple (*Acer saccharum*), beech (*Fagus grandifolia*), and basswood (*Tilia americana*), sugar maple and beech, or sugar maple and basswood; (2) primary mixed communities of either hemlock (*Tsuga canadensis*) or red spruce (*Picea rubens*) and northern hardwoods, with an admixture of white pine (*Pinus strobus*); (3) a prevalence of white pine, red pine (*Pinus resinosa*), or jack pine (*Pinus banksiana*), on sandy soils; or (4) in poorly drained areas, of black spruce (*Picea mariana*), northern white cedar (*Thuja occidentalis*), and tamarack (*Larix laricina*).

The southern part of the Lower Peninsula is in the Deciduous Forest

¹Accepted for publication January 6, 1958.

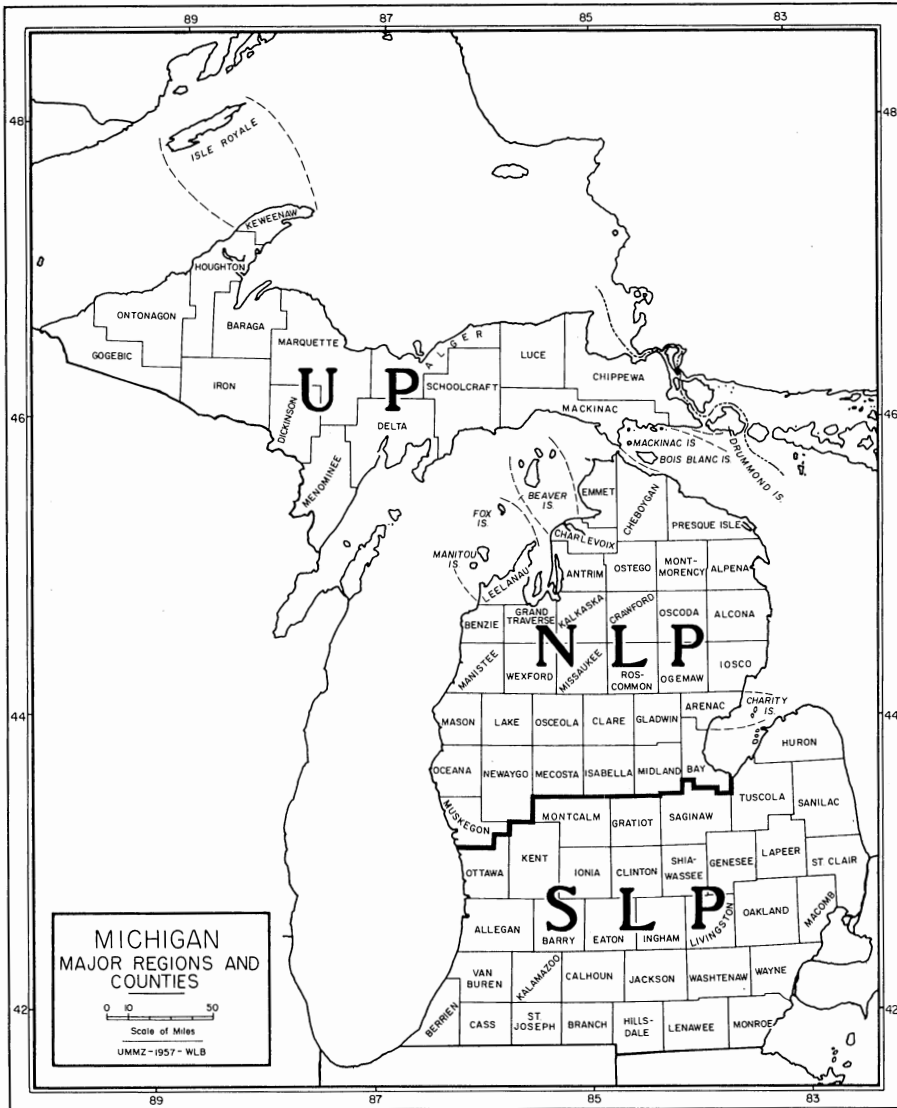
Biome of Pitelka, which is equivalent to Dice's Carolinian Biotic Province. Although it is part of the Beech-Maple Forest Region of Braun and characterized by a climax forest of sugar maple and beech, because of the youthful land surface, developmental stages of plant succession occupy large areas. In many places, as a result, there is a high frequency of other deciduous trees. The relatively recent retreat of the Wisconsin ice sheet accounts, therefore, for the communities of relics, such as bogs in poorly drained areas, oak-hickory forests on sandy or gravelly morainal ridges, and wet and dry prairie in the drier black oak-white oak forests. Most of the Lower Peninsula and most of the eastern half of the Upper Peninsula has a gently undulating surface and incomplete drainage. The western highlands of the Upper Peninsula present a more rugged topography, but drainage is, nevertheless, incomplete. In all three regions, but especially in the morainic districts, there are numerous lakes, ponds, swamps, and bogs, in addition to major and minor streams.

The mean annual temperature of the state is 45°F. and the mean annual precipitation is 31 inches (White, 1951). There is, however, a progressive increase in temperature and rainfall southward. According to United States Weather Bureau records for somewhat comparable periods, Luce County (Deer Park) in the Upper Peninsula had a mean annual temperature of 39.9°F. and a mean precipitation of 28.31 inches (1896-1920), whereas Washtenaw County (Ann Arbor) in the southeastern part of the Lower Peninsula, had a mean annual temperature of 47.4°F. and a mean annual precipitation of 31.35 inches (1880-1930). The Upper Peninsula and the northeastern part of the Lower Peninsula are characterized by a humid microthermal climate with a high percentage of potential evapotranspiration during the summer months, climatic type $B_2 rC'_2 b_1$; the remainder of the state by a less humid mesothermal climate with a lower percentage of potential evapotranspiration, climatic type $B_1 rB'_1 B_2$ (Thorntwaite 1931, 1948).

In all three divisions of the state the aquatic situations that serve Odonata are many and varied. The true habitat of these essentially aquatic insects is the one in which the larval stage lives. In the List of Species I indicate the habitat as I have ascertained it by observing oviposition or emergence. Oviposition is not always a reliable index, since the eggs may be deposited in unsuitable environments under duress. The habitats I distinguish are: (1) Rivers and Streams, including creeks, and the like; (2) Lakes, large or small; (3) Ponds, differentiated from lakes on the same basis of size used by Welch (1952); and (4) Bogs. The special aquatic situations associated with bogs I class as follows: (1) "Bog lakes," lakes which are dystrophic, poor in nutrients, and high in humic content and low in organic productivity. These can usually be recognized by the presence of a *Sphagnum-Carex* resilient floating mat or by ericaceous shrubs and/or tamarack and black spruce. (2) "Bog marshes," wet meadows characterized by graminoid plants and a peaty substrate which have been derived from bog lakes that, in ecological succession, omitted the ericoid-spruce-tamarack associations. (3) "Bog streams," streams which drain any of these bog situations, and (4) "Bog ponds," impoundments on such streams.

Notes on Previous Accounts of Michigan Odonata

Muttkowski, 1911. — Among the specimens upon which the description



Map 1. Michigan showing the three major physiographic and ecologic divisions of the state: Upper Peninsula (UP), Northern Lower Peninsula (NLP), and Southern Lower Peninsula (SLP).

of *Tetragoneuria morio* was based by Muttkowski is a female from Detroit, (Wayne County). This he designated as a paratype. I have shown that *morio* is a synonym of *T. cynosura* (Say); the female paratype, however, is in reality a specimen of *T. spinigera* (Selys).²

²Edward J. Kormondy, "Studies on the Life History, Morphology and Ecology of the Genus *Tetragoneuria* in Michigan (Odonata: Libellulidae)." Ph.D. Dissertation, University of Michigan, 1955, pp. 179-81. (In preparation for publication.)

Evans, 1914. — In his account of the dragonflies of the Douglas Lake region (Cheboygan County) Evans recorded a larva from the Maple River below Douglas Lake (probably Emmet County). This he identified as *Gomphus descriptus* Banks. In view of the known distribution of *descriptus* (Needham and Westfall, 1955), the inconclusive status of taxonomic discrimination of *Gomphus* larvae in 1914, and my failure to take the species in the Douglas Lake area, this record is dubious and has not been included in the present list (see p. 9 under Byers, 1927, for additional comments on this species).

Combs, 1917. — The Schoolcraft County records for several species in Combs' paper appear to be questionable. His field notes and collection are in the University of Michigan Museum of Zoology (UMMZ), and Williamson determined most of the material.

Nehallenia gracilis and *Nehallenia posita*. Combs listed these two forms as occurring together on July 13. In his field note Number 22 (July 13), is the entry "*Nehallenia posita*" and immediately underneath it and in the same handwriting "*Ischnura verticalis*." There is no mention of *N. gracilis*, nor does the name occur anywhere in the notes, and no specimen, either of *gracilis* or the closely allied *irene*, bearing these data is in the collection. According to the distribution given by Walker (1953), *gracilis* is the species to be expected in Michigan; there is a single record from the central part of the state and a series of twenty-two specimens from the southwestern part. Since *gracilis* has been reported in Ontario from only as far north as Parry Sound, in the Georgian Bay area, it is doubtful that the range in Michigan extends as far north as Schoolcraft County. I do not, therefore, believe this to be a reliable record; hence, have not included it. Combs' "*Nehallenia posita*" is probably *Ischnura verticalis* as suggested by the field catalogue entry. No authentic specimens of *posita* have been taken north of the Straits of Mackinac and the species is not common in the northern part of the Lower Peninsula. It is likely that the specimen(s) upon which Combs' record of "*posita*" was based was redetermined as *I. verticalis* after publication of his paper and the notation (referred to above) made in the field catalogue. If so the specimen(s) has later been destroyed.

Enallagma doubledayi. Combs listed this species as "recorded throughout the month [July]." The name does not appear anywhere in his field catalogue, in which, however, there are frequent references to *Enallagma carunculatum*, the genitalia of which are quite similar to, and rather easily confused with, those of *doubledayi*. Other than Combs' record, *doubledayi* is known only from central Ohio to Massachusetts and south to Florida. Combs' record of *doubledayi* is, therefore, presumed to have been based on specimens of *carunculatum*.

Enallagma piscinarium. This species is not listed in Combs' field catalogue on the date (July 23) indicated in his paper (nor on any other date); the only zygopteran given for that date in the field catalogue is "*Enallagma ebrium*," which *piscinarium* does not resemble at all. The UMMZ collection of *E. ebrium* contains no Schoolcraft specimen for this date, but (correctly identified as *E. antematatum*) there is one bearing Combs' label "*ebrium*," which was collected by him in Schoolcraft County on July 23. This is apparently the basis for the *piscinarium* record.

Gomphus graslinellus. Two females so labeled were taken on July 14. They were later redetermined by Williamson as *G. lividus* and are included in the List of Species under that name. In Combs' field catalogue under this date the name *graslinellus* has been erased but is still distinguishable under the penciled-in "*sordidus*" (= *lividus*).

Byers, 1927. — References to six papers published prior to 1927 are not in Byers list. They are: Pettit (1901) in which three species are listed from Alger County; Adams (1909) in which thirteen species are reported from Isle Royale in addition to those given by Needham (1909); Williamson (1909) in which *Macromia illinoiensis* is reported from Emmet County; Muttkowski (1911) in which the paratype female of *Tetragoneuria morio* (= *T. spinigera*) is listed from Detroit (Wayne County); Calvert (1919) in which the Walnut Lake (Oakland County) specimens referred by Needham (1908) to *Enallagma pollutum* were included in the type series of *E. vesperum* Calvert; and Calvert (1921) in which a paratype of *Gomphus lineatifrons* is listed from Ingham County. Since Byers included only those data which constituted state records, thus omitting about one hundred published records, even though the papers containing them were cited in his bibliography, his list was, in consequence, not only incomplete but misleading with regard to the distribution of a number of species.

The catalogue forms on which Byers recorded the data for his paper are in the UMMZ. Discrepancies between his notes and published list were found in only three cases; and these are discussed below under the species concerned. Some of the county records given by Byers and stated to be based upon material in the UMMZ collection could not be verified by specimens; but examination of Byers' notes showed that, in most instances, these rested upon larvae which are in Byers' personal collection.

Byers listed 130 dragonflies as occurring in Michigan (his numerical sequence runs to 131 but 82 is omitted). Of these, four have been reidentified: *Gomphus descriptus*, as *G. fraternus* by Williamson; *G. externus*, as *G. vastus* by Gloyd; *Calopteryx dimidiata apicalis*, as *C. aequabilis* by Kormondy; and *Neurocordulia obsoleta*, as *N. yamaskanensis* by Williamson. Two other names are placed in synonymy: *Sympetrum assimilatulum* is made a synonym of *S. rubicundulum* and *Tetragoneuria simulans* (Muttkowski's *forma simulans*) of *T. cynosura*. Since *Neurocordulia yamaskanensis* is the only name in this group which did not appear in Byers' list, and is substituted for *N. obsoleta*, these changes constitute a net reduction of five species, that is, to 125.

Species New to Michigan

The following seven species have been reported in Michigan since 1927: *Gomphus graslinellus* and *Cordulegaster erroneus* (Andrews, 1929); *Williamsonia fletcheri* (Gloyd, 1932); *Ophiogomphus aspersus* (Walker, 1933); *Sympetrum internum* (as *S. decisum*, Williamson, 1933); *Lanthus albistylus* (Leonard, 1940a); and *Enallagma vernale* (Gloyd, 1943). In addition, I include in this catalogue eighteen species and one subspecies new to the state for a total of 151 taxa. They are *Lestes disjunctus australis* Walker,

Amphiagrion n. sp., *Coenagrion interrogatum* (Hagen), *Enallagma aspersum* (Hagen), *E. traviatum* (Selys), *Nehalonia gracilis* Morse, *Cordulegaster diastatops* (Selys), *Gomphus (Stylurus) laurae* (Williamson), *G. viridifrons* Hine, *Ophiogomphus carolus* Needham, *Boyeria grafiana* Williamson, *Nasiaeschna pentacantha* (Rambur), *Macromia taeniolata* Rambur, *Somatochlora cingulata* (Selys), *S. linearis* (Hagen), *S. tenebrosa* (Say), *Pantala flavescens* (Fabricius), *P. hymenea* (Say), and *Sympetrum ambiguum* (Rambur).

Distribution of Michigan Odonata

The odonate fauna of Michigan includes representatives of six families of Anisoptera and the three families of Zygoptera recognized in North America, north of Mexico. The 46 genera represented constitute 55 percent of the North American genera and the 150 species (151 taxa) 35 percent of those recognized in the United States and Canada.

Slightly more than half of the Odonata occurring in Michigan are distributed widely throughout the state. Distribution of the remainder more or less correlated with three natural regions of the state. The taxa may be apportioned geographically as follows:

Upper Peninsula	12 (8%)
Upper Peninsula and Northern Lower Peninsula	15 (10%)
Northern Lower Peninsula	4 (3%)
Northern and Southern Lower Peninsula	18 (12%)
Southern Lower Peninsula	20 (13%)
Distributed statewide	80 (53%)
Distribution unknown	2 (1%)

The Merriam Life Zones have been utilized by a number of odonatists (Whitehouse, 1948, and Walker, 1941, among others) to describe the ranges of species. Considering the distribution of the species known to occur in Michigan, it appears doubtful whether the range of more than half of them can be described in terms of life zones. Few if any are confined to a given zone, although they may find near optimal conditions and be more abundant in one zone than in others. Because of their familiarity, I have, nevertheless, used life zones in treating distribution. On this basis 23 of the Michigan taxa are strictly boreal, 99 are austral, and 28 occur abundantly in both boreal and austral regions. (The undescribed species of *Amphiagrion* mentioned below is not included in this analysis nor in the one on geographical regions which follows.)

In the List of Species the following abbreviations are used to indicate the life zones. Zones in which the species is most abundant and generally distributed are capitalized.

arc - Arctic	t - Transition
h - Hudsonian	a - Upper Austral
c - Canadian	l - Lower Austral

Distribution

Michigan Odonata may be grouped according to general geographic range. I have established three regional divisions and certain subdivisions within them. The group into which the species fits is indicated in the List of Species by the symbols given below.

I. EASTERN GROUP (occurring for the most part east of the 100th meridian, 90 species and 1 subspecies)

- E-1 - Widespread: more or less widely distributed east of the 100th meridian, north to central Quebec and south to the Gulf Coast. (39 species; ex., *Hagenius brevistylus*)
- E-2 - Northeastern: northern and western limit as in E-1, most, however, only west to Iowa; southern limit about Tennessee. (32 species; ex., *Sympetrum semicinctum*)
- E-3 - Southeastern: western and southern limits as in E-1; northern limit in southernmost Michigan. (13 species and 1 subspecies; ex., *Somatochlora linearis*)
- E-4 - Central: western and southern limit as in E-1, eastern limit in western North Carolina, northern limit in northern lower Michigan. (3 species; ex., *Gomphus lineatifrons*)
- E-5 - Northern: southern limit in northern lower Michigan, east to Nova Scotia, northern limit central Quebec and thence northwest to Kewatin and northeastern Saskatchewan. (3 species; ex., *Coenagrion interrogatum*)

II. TRANSCONTINENTAL GROUP (58 species):

- T - Transcontinental, Wide: north to central Canada, south to Gulf Coast and Mexico, and from Atlantic to Pacific. (8 species; ex., *Anax junius*)
- NT - Transcontinental in north only: west to Rocky Mts. and thence northwest to coast, some extending south into California. (42 species)
 - NT-1 - Southern limit on the Gulf Coast. (2 species; ex., *Aeshna umbrosa*)
 - NT-2 - Southern limit in Tennessee. (16 species; ex., *Aeshna canadensis*)
 - NT-3 - Southern limit in southern Michigan. (24 species; ex., *Tetragnenia spinigera*)
- ST - Transcontinental in the south only: north to Kansas, Iowa, central Michigan and New York, south to Gulf, and west through Arizona and California. Some extend into Mexico. (7 species; ex., *Hetaerina americana*)
- CT - Transcontinental, central oblique: New Brunswick to North Carolina and west to 100th meridian, continuing to California in south. (1 species; ex., *Sympetrum rubicundulum*)

III. NORTHWESTERN GROUP (1 species):

- NW - Northwestern: British Columbia, and east of the Rockies to Michigan, Indiana, and Oklahoma. (1 species; ex., *Gomphus graslinellus*)

Sources and Arrangement of Data

The present catalogue is based chiefly on adult specimens in the Williamson-Kennedy Odonata collection of the University of Michigan Museum of Zoology (UMMZ). Their collection contains about 20,000 determined Michigan specimens, some 5,000 of which were identified by me for this list. Determinations by E. B. Williamson, L. K. Gloyd, P. P. Calvert, and E. M. Walker were accepted without re-examination, unless some special importance was attributed to them. The next major source of data was the collections and Michigan list of Dr. R. R. Dreisbach, of Midland, Michigan. Dreisbach's list is based on identifications of material in his personal collection, made by Mrs. Gloyd, Dr. J. G. Needham, and myself. The Odonata collection at Michigan State University, around 2,000 specimens, was made available by Dr. R. L. Fischer, and the small one at Alma College by Mr. Arlan Edgar. My own collection, some 2,000 specimens, was made during a four-year study on the systematics of *Tetragoneuria*. It has been deposited in the UMMZ.

Previously published records are included only for those counties for which no other data are available. The species are arranged alphabetically in each genus and the genera alphabetically under each family. Following the binomen the regional distribution is given in the following regional blocks: UP, Upper Peninsula; NLP, Northern Lower Peninsula; SLP, Southern Lower Peninsula. Under each region the counties are listed alphabetically and the earliest and latest dates of capture indicated. Isle Royale, although politically part of Keweenaw County, is listed separately because of its biotic distinctness. Species known from the Edwin S. George Reserve are indicated by an asterisk (*) following Livingston County. Specimens without indication of ownership or indicated by "M" are in the UMMZ. Other sources of data (museum specimens or literature references) are indicated by the following abbreviations:

A	- Alma College Collection	Kn	- Kenk, 1949
Ad	- Adams, 1909	Mu	- Muttkowski, 1910
An	- Andrews, 1929	N08	- Needham, 1908
B	- Byers, 1927	N09	- Needham, 1909
Br	- Bromley, 1949	O	- O'Brien, 1911
C	- Combs, 1917	P	- Pettit, 1901
D	- Dreisbach Collection	R	- Ruthven, 1906
E	- Evans, 1914	S	- Michigan State University Collection
H	- Hebard, 1910	Sn	- Snow Entomological Museum Collection
Ha75	- Hagen, 1875	W12	- Walker, 1912
Ha85	- Hagen, 1885	W25	- Walker, 1925
Hw	- Harwood Collection	W33	- Walker, 1933
K	- Kellicott, 1894	W52	- Walker, 1952

Acknowledgments

I wish to acknowledge the help of a number of persons in the preparation of this catalogue: Dr. Theodore H. Hubbell, Director of the University of Michigan Museum of Zoology; Dr. George W. Byers, of the University of Kansas, who loaned Douglas Lake material in the collections of the Snow Museum; Dr. J. G. Needham, who forwarded several hundred undetermined Zygoptera from the Dreisbach collection; Leonora K. Gloyd, who sent records of *Amphiagrion saucium* and of *Amphiagrion* n. sp. (which she is describing) and offered valuable suggestions; Dr. Paul D. Harwood, of Ashland, Ohio, who sent specimens for determination, some of which have been deposited in the University of Michigan Museum of Zoology. Especial acknowledgment is owing to Dr. R. R. Dreisbach of Midland, Michigan, for permission to make use of the records in his large collection, and to Dr. R. L. Fischer of Michigan State University for giving access to the Odonata collection of that institution. Many colleagues and associates including Dr. Francis C. Evans, Dr. Philip S. Humphrey and his family, Dr. Neil W. Beach, Dr. Rodger D. Mitchell, and Mr. David C. L. Gosling contributed specimens. Miss Elsa Hertz, of the University Museums, typed the manuscript. Field studies during 1955 were supported, in part, by a grant from the National Science Foundation through the University of Michigan Biological Station.

LIST OF SPECIES

Suborder Zygoptera

Calopterygidae

Calopteryx

Calopteryx aequabilis Say. UP: Alger, Baraga, Delta, Dickinson, Gogebic (Hw,M), Houghton, Iron, Keweenaw, Isle Royale (S), Marquette, Ontonagon, Schoolcraft; vi.7-viii.15. NLP: Alpena, Arenac, Cheboygan (M,Sn), Clare, Crawford (D,S), Emmet, Gladwin, Isabella (D,M), Lake, Midland, Missaukee (D,S), Oscoda, Otsego (D,M), Presque Isle, Roscommon, Wexford; v.30-viii.15. SLP: Berrien, Gratiot (D,M), Huron, Ingham (S), Jackson, Kalamazoo (S), Livingston*, Oakland, Shiawassee (K), Washtenaw; vi.12-viii.24. Life Zone: Cta. Dist.: E-3. Ref.: Walker, 1953: Pl. 8. Habitat: Small to medium streams with rocky and silty bottoms, usually fairly rapid.

Kellicott's Shiawassee County record (1894) of *Calopteryx dimidiata apicalis* (Burm.) is probably referable to *C. aequabilis*. Leonora K. Gloyd suggested this and said that Borrer was unable to locate the specimen in the Ohio State University collections. Neither the southern *C. d. dimidiata* nor the more northern *C. d. apicalis* have been reported from either Ohio or Canada. Frequently individuals of *aequabilis* show considerable variation in the extent of wing marking, so that a misidentification by Kellicott is likely.

Calopteryx maculata (Beauvois). UP: Alger, Dickinson, Gogebic (D,Hw), Houghton, Keweenaw (D,M), Mackinac, Marquette, Menominee, Ontonagon, Schoolcraft (D,M); vi.7-viii.15. NLP: Alcona (D,M), Alpena, Arenac (D,M), Benzie (B), Cheboygan (M,S,Sn), Clare (D), Crawford (D,M), Emmet, Gladwin (D,M), Grand Traverse (D), Iosco, Isabella (D,M), Kalkaska (D,S), Lake, Manistee, Mason (B), Mecosta (B), Midland (D,M,S), Missaukee (D,S), Montmorency (M,S), Muskegon, Newago (B), Oceana, Ogemaw (D,M), Osceola (D,M), Oscoda, Otsego (M,S), Presque Isle, Roscommon (D,M), Wexford (D,M); v.26-viii.22. SLP: Allegan (D,M), Barry (B), Berrien, Branch (B), Gratiot (A,D,M), Huron, Ingham (S), Ionia (D), Jackson, Kalamazoo (S), Kent (S), Lapeer (M,S), Lenawee (B), Livingston*, Macomb, Monroe (D), Montcalm (D,M), Oakland (D,M), Shiawassee (D), St. Clair (D), St. Joseph (D,M), Tuscola (D), Van Buren (S), Washtenaw, Wayne (D,M); v.14-ix.11. Life Zone: cTAL. Dist.: E-1. Ref.: Walker, 1953: Pl. 8. Habitat: Similar to that of *C. aequabilis* but the streams it frequents are generally smaller and more shaded. While the two species occur together, *C. aequabilis* emerges a few days earlier.

Although Byers (1927) listed September 19 as the latest date for this species in the state, this is undoubtedly in error; the latest date appearing in the notes upon which his paper was based is September 11, the same as the latest date reported above. Both records are based on the same Livingston County specimen, collected by I. B. Guthe.

Hetaerina

Hetaerina americana (Fabricius). NLP: Arenac, Cheboygan (E), Midland (D,M,S); vii.9-ix.11. SLP: Calhoun (S), Ingham (S), Kalamazoo (S), Lapeer, Lenawee, Livingston, Macomb, Monroe, Oakland, Shiawassee (S), St. Clair, Washtenaw, Wayne (B); vi.12-ix.30. Life Zone: TAL. Dist.: ST. Ref.: Walker, 1953: Pl. 8.

The adult specimens reported from Cheboygan County (Evans, 1914) undoubtedly were strays.

Hetaerina titia (Drury). SLP: Oakland (B); vii.15. Life Zone: AL. Dist.: E-2. Ref.: Garman, 1917: Pl. 52.

Byers (1927) recorded this species from two males and one female, none of them now in the UMMZ. The species is probably an occasional adventive in Michigan.

Lestidae

Lestes

Lestes congener Hagen. UP: Chippewa, Isle Royale (S), Keweenaw (D); vii.29-viii.8. NLP: Alcona (D), Charlevoix, Cheboygan (B), Clare (D), Emmet, Gladwin (D), Grand Traverse (S), Manistee (D), Midland (D), Osceola (D,M), Otsego (D), Presque Isle; vii.22-ix.14. SLP: Barry (D), Branch, Gratiot (D), Ingham (S), Jackson (D,M), Kalamazoo (S),

Livingston*, Montcalm, Saginaw (D), Shiawassee, Van Buren (D), Washtenaw; vi.24-ix.16. Life Zone: CTA. Dist.: NT-2. Ref.: Walker, 1953: ♂, Pl. 22; ♀, Pl. 13. Habitat: Bog lakes and marshes.

Lestes disjunctus australis Walker. SLP: Livingston*, Washtenaw, Wayne; v.10-vi.19. Life Zone: tAl. Dist.: E-3. Ref.: Walker, 1953: ♂, Pl. 22; ♀, Pl. 12.

FIRST STATE RECORDS. Walker (1953) did not suggest that the range of this subspecies would include southern Michigan, although it is recorded from southernmost Essex and Kent counties in Ontario. Specimens from Livingston County (E. S. George Reserve, near Pinckney) are the northernmost records. Walker's statement (1953) that the season of *L. d. australis* is earlier than that of *L. d. disjunctus* is corroborated by our records.

Lestes disjunctus disjunctus Selys. UP: Chippewa, Delta, Dickinson, Gogebic, Houghton (D), Keweenaw (D,M), Isle Royale (D,M,S), Luce, Mackinac (D,M,S), Marquette, Menominee, Schoolcraft; vii.2-viii.27. NLP: Alcona (D), Alpena, Bay, Charlevoix, Cheboygan, Emmet, Iosco (D,M), Lake, Leelenau, Manistee (D), Mason (D,M), Midland (D,M), Missaukee (M,S), Muskegon (D), Oceana, Osceola (D,M), Oscoda, Otsego (D,M), Presque Isle; vi.6-ix.5. SLP: Allegan (W52), Huron, Ingham (S), Kalamazoo (S), Oakland, Shiawassee (K), Van Buren (S), Washtenaw; vi.26-viii.7. Life Zone: hCTa. Dist.: NT-3. Ref.: Walker, 1953: ♂, Pl. 22; ♀, Pl. 14. Habitat: Bog lakes and marshes; sand-marl-bottom lakes; marshy zones of sand-bottom lakes.

The Luce County records for *L. d. disjunctus* include a male (viii.11) which Walker determined as intermediate between *L. d. disjunctus* and *L. d. australis*. The distributions of *L. disjunctus* and of *L. forcipatus* (see below) given here is based on re-examination of all specimens listed in the light of the distinctions drawn by Walker (1952) and supersedes that of Byers (1927).

Lestes dryas Kirby. UP: Baraga (H), Chippewa, Delta (D), Dickinson, Gogebic, Iron (D,M), Keweenaw (D,M), Isle Royale (D,S), Luce, Mackinac (D,M), Marquette (D,M), Menominee (D,M), Ontonagon (D,M), Schoolcraft (D,M); v.23-viii.22. NLP: Alcona (D,M), Antrim (D), Arenac (D), Bay (D,M), Charlevoix, Cheboygan (D,M), Clare (D,M), Emmet, Gladwin (D,M), Iosco (D,M), Kalkaska (D), Manistee (D), Mecosta (D,M), Midland (D,M,S), Missaukee (D), Montmorency, Newago (D), Oceana, Ogemaw (D,M), Osceola (D,M), Oscoda (D,M), Otsego (D), Presque Isle (D), Wexford (D); vi.5-ix.9. SLP: Allegan (S), Berrien, Clinton (S), Gratiot (D), Huron (D,M), Ingham (S), Jackson, Lapeer, Livingston*, Monroe, Oakland, Shiawassee (K), Washtenaw, Wayne; v.7-viii.31. Life Zone: hCTA. Dist.: NT-2. Ref.: Walker, 1953: ♂, Pl. 22; ♀, Pl. 13. Habitat: This circumboreal species inhabits bog lakes and marshes and marshy zones of sand-muck-bottom lakes.

Lestes eurinus Say. UP: Menominee, Schoolcraft; vii.2-vii.22. NLP: Cheboygan, Lake, Montmorency (S), Oscoda, Otsego (D,M); vi.24-vii.25. SLP: Huron, Ingham (M,S), Livingston*, Oakland, St. Joseph (D); v.30-vi.29. Life Zone: cTA. Dist.: E-3. Ref.: Walker, 1953: ♂, Pl. 22; ♀, Pl. 13. Habitat: Bog lakes; muck-bottom marshes or flooded plains; sand-marl-bottom lakes.

Lestes forcipatus Rambur. UP: Chippewa, Keweenaw (M), Isle Royale (D), Mackinac, Ontonagon (D,M); vi.14-viii.11. NLP: Charlevoix, Cheboygan, Emmet, Isabella (D), Lake, Mecosta (D), Midland (D,M), Osceola (D,M), Oscoda, Presque Isle (D,M), Roscommon (S); vi.21-viii.22. SLP: Barry (S), Berrien, Gratiot (D), Huron, Ingham (S), Kalamazoo (S), Kent (S), Lapeer, Livingston*(D,M), Washtenaw; v.10-viii.31. Life Zone: cTA. Dist.: E-3. Ref.: Walker, 1953: ♂, Pl. 22; ♀, Pl. 14. Habitat: Bog marshes; typha-lined ponds.

See note above under *L. disjunctus*.

Lestes inaequalis Walsh. NLP: Isabella (D), Roscommon; vi.10-vi.28. SLP: Allegan (S), Livingston, Oakland, Shiawassee (K), Washtenaw; vi.20-vii.28. Life Zone: tA. Dist.: E-3. Ref.: Walker, 1953: ♂, Pl. 22; ♀, Pl. 13. Habitat: Marsh zones of muck or sand-bottom lakes.

Lestes rectangularis Say. UP: Chippewa (B), Gogebic, Luce, Mackinac, Marquette (B), Schoolcraft; vi.11-viii.26. NLP: Alcona (D,M), Antrim (D), Arenac (D), Bay (D,M), Cheboygan, Clare (D,M), Emmet, Gladwin (D), Iosco, Isabella (D,M), Lake, Mecosta (D), Midland (D,M), Missaukee (D,S), Muskegon, Newago (D), Oceana, Presque Isle (D,M), Roscommon, Wexford (D); vi.20-ix.11. SLP: Allegan (S), Berrien, Branch, Clinton (D,S), Genesee (D,M), Gratiot (D), Huron (D,M), Ingham (A,S), Jackson, Kalamazoo (S), Lapeer, Livingston*, Macomb, Monroe (B), Montcalm (D), Oakland, Ottawa (D), Saginaw (D), Shiawassee, Tuscola (D), Van Buren (D), Washtenaw, Wayne (D,M); v.23-x.3. Life Zone: cTAL. Dist.: E-1. Ref.: Walker, 1953: ♂, Pl. 22; ♀, Pl. 14. Habitat: Bog lakes; marsh zones of sand-silt-bottom lakes.

Lestes unguiculatus Hagen. UP: Baraga (H), Chippewa, Gogebic (D), Houghton (B), Keweenaw (M,S), Isle Royale (D,S), Mackinac (D,M), Marquette (D,M), Menominee (D,M), Ontonagon (D,M,S), Schoolcraft; vi.22-viii.22. NLP: Antrim, Arenac, Bay (D,M,S), Charlevoix, Cheboygan, Clare (D,M), Emmet, Gladwin (D), Grand Traverse, Iosco (D,M), Isabella (D), Kalkaska (D,M), Lake, Manistee (D,M), Mason (D,M), Mecosta (D,M), Midland (D,M), Missaukee (D,M), Montmorency, Muskegon (D,M), Newago, Oceana, Osceola (D,M), Oscoda (D,M), Otsego (D), Roscommon (D), Wexford (D); vi.3-ix.10. SLP: Barry (D,S), Berrien (M,S), Branch, Calhoun (S), Clinton (S), Genesee (D,M), Hillsdale, Huron, Ingham (S), Jackson, Kalamazoo (S), Lapeer, Livingston*, Macomb, Monroe (D,M), Montcalm (D), Oakland, Ottawa (D), Shiawassee (K), Van Buren (S), Washtenaw (M,S), Wayne; v.12-ix.24. Life Zone: cTA. Dist.: NT-2. Ref.: Walker, 1953: ♂, Pl. 22; ♀, Pl. 13. Habitat: Marshy beach pools along Great Lakes; marshy zones of sand-silt-bottom ponds and lakes.

Lestes vigilax Hagen. UP: Menominee, Schoolcraft; vi.30-viii.10. NLP: Antrim, Cheboygan, Clare (D,M,S), Iosco, Kalkaska, Lake, Newago (D), Presque Isle; vi.13-viii.2. SLP: Barry (S), Jackson, Kalamazoo (S), Lenawee, Livingston*, Montcalm, Oakland (N08), Shiawassee (K), Van Buren (D), Washtenaw; vi.11-viii.14. Life Zone: cTAL. Dist.: E-1. Ref.: Walker, 1953: ♂, Pl. 22; ♀, Pl. 13. Habitat: Bog lakes; marshy zones of sand-silt-bottom lakes.

This species is probably an occasional adventive in the Upper Peninsula.

Coenagrionidae

Amphiagrion

Amphiagrion saucium (Burmeister). UP: Alger (D), Dickinson (D), Mackinac (D,M), Schoolcraft; vi.18-viii.2. NLP: Alcona, Antrim, Benzie (D), Charlevoix, Cheboygan, Clare (D), Crawford (D,S), Emmet, Gladwin (D,M), Grand Traverse (D,M), Iosco (D), Isabella (D), Lake (D,M), Mason, Mecosta (D,M), Midland (D,M), Missaukee (S), Muskegon (D), Oceana (D), Oscoda, Otsego, Wexford (D); v.18-vii.27. SLP: Berrien, Cass (S), Kalamazoo (M,S), Livingston, Montcalm (D), Oakland, St. Joseph, Washtenaw; v.15-vii.28. Life Zone: cTA. Dist.: E-3. Ref.: Walker, 1953: ♂, Pl. 25; ♀, Pl. 30. Habitat: Marsh ponds; beach pools along Lake Michigan.

Amphiagrion n. sp. UP: Isle Royale, Mackinac; vii.4-viii.9.

FIRST STATE RECORDS. Leonora K. Gloyd, who is engaged on a revision of this genus, has permitted inclusion of the known Michigan distribution of this as yet unnamed species.

Argia

Argia apicalis (Say). NLP: Midland (D); vii.2-vii.21. SLP: Calhoun (S), Ingham (S), Saginaw (D), Shiawassee (K), Washtenaw; vii.1-vii.22. Life Zone: tAL. Dist.: E-1. Ref.: Walker, 1953: ♂, Pl. 23; ♀, Pl. 27.

Argia moesta (Hagen). UP: Iron, Ontonagon; vii.3-viii.20. NLP: Emmet, Midland (D,M,S), Montmorency (S), Newago (D); vi.6-viii.11. SLP: Branch, Livingston, Monroe (S), Oakland, Shiawassee (D), St. Clair (D), St. Joseph (D), Washtenaw (M,S); v.24-ix.25. Life Zone: cTAL. Dist.: ST. Ref.: Walker, 1953: ♂, Pl. 23; ♀, Pl. 27. Habitat: Rocky bottom, rapid streams.

The distribution of this species in the Upper Peninsula indicates a probable extension of its known range northward from Wisconsin.

Argia sedula (Hagen). SLP: Jackson, Livingston, Oakland, Washtenaw; vii.9-ix.29. Life Zone: AL. Dist.: ST. Ref.: Walker, 1953: ♂, Pl. 23; ♀, Pl. 27.

Argia tibialis (Rambur). NLP: Midland (D,M); vi.10-vii.2. SLP: Berrien, Ingham (S), Lapeer, Shiawassee (K), Washtenaw; vi.13-viii.4. Life Zone: tAL. Dist.: E-2. Ref.: Walker, 1953: ♂, Pl. 23; ♀, Pl. 27.

Argia violacea (Hagen). UP: Alger, Gogebic, Marquette, Menominee; vii.8-viii.10. NLP: Alcona (D,M), Antrim, Arenac (D,M), Cheboygan (D,M), Clare (D,M), Emmet, Gladwin (D,M), Isabella (D,M), Lake (D,M), Mecosta (D), Midland (D,M), Montmorency (M,S), Newago (D), Oceana, Presque Isle; vi.15-ix.4. SLP: Barry (S), Berrien (B), Branch, Gratiot (D,M), Huron, Ingham (S), Jackson, Kalamazoo (S), Kent (D), Livingston*, Montcalm, Oakland (D,M,S), Saginaw (D), Shiawassee (K), Van Buren (S), Washtenaw; vi.8-ix.12. Life Zone: cTAL. Dist.: ST. Ref.: Walker, 1953: ♂, Pl. 23; ♀, Pl. 27. Habitat: Marshy zones of sand-bottom lakes and stream impoundments; transition cedar-spruce bog lakes; sluggish streams.

Chromagrion

Chromagrion conditum (Hagen). UP: Houghton, Keweenaw, Luce, Schoolcraft; vi.16-vii.30. NLP: Antrim, Cheboygan, Crawford (D,S), Emmet, Gladwin, Mecosta (D), Midland (D,M), Missaukee (D), Oscoda, Presque Isle (D), Wexford (D); v.29-vii.28. SLP: Gratiot (D), Jackson, Livingston*, Montcalm (D), Saginaw (D), Shiawassee (D), Washtenaw; v.23-viii.2. Life Zone: CTA. Dist.: E-3. Ref.: Walker, 1953: ♂, Pl. 25; ♀, Pl. 30. Habitat: Bog-stream impoundments; slow bog streams; marshy zones of sand-bottom lakes.

Coenagrion

Coenagrion interrogatum (Hagen). UP: Isle Royale (M,S); vii.2-vii.12. Life Zone: HC. Dist.: E-5. Ref.: Walker, 1953: ♂, Pl. 26; ♀, Pl. 29.

FIRST STATE RECORDS. This species, recently reported for the first time in the United States from Maine (Borror, 1951), was first taken in Michigan on Isle Royale, vii.12.1938, by G. Steyskal.

Coenagrion resolutum (Hagen). UP: Alger, Gogebic (Hw,M), Houghton, Mackinac, Schoolcraft; vi.3-vii.1. NLP: Arenac (D), Charlevoix, Cheboygan, Emmet, Midland, Oscoda, Roscommon (D,S); v.21-vi.22. SLP: Livingston*, Tuscola (D); v.28-vi.16. Life Zone: Hct. Dist.: NT-3. Ref.: Walker, 1953: ♂, Pl. 23; ♀, Pl. 29. Habitat: Marshy zones of sand-marl-bottom lakes; bog lakes and ponds.

Enallagma

Enallagma antennatum (Say). UP: Schoolcraft; vii.23. NLP: Arenac, Bay (D,M), Clare (D,M), Gladwin (D), Iosco (D), Manistee (D), Mecosta (D), Midland (D,M,S); vi.7-vii.22. SLP: Genesee, Gratiot, Huron, Jackson, Kalamazoo (S), Lapeer, Livingston, Monroe (D,M), Oakland (B), Van Buren (S), Washtenaw, Wayne; v.20-viii.3. Life Zone: ctA. Dist.: E-3. Ref.: Walker, 1953: ♂, Pl. 25; ♀, Pl. 29.

The Schoolcraft County record is considered in the discussion of Combs' paper (p. 8); the species is probably an occasional adventive in the Upper Peninsula.

Enallagma aspersum (Hagen). NLP: Oscoda; vi.24. SLP: Lapeer, Livingston*; vi.19-vii.20. Life Zone: TA. Dist.: E-3. Ref.: Walker, 1953: ♂, Pl. 25; ♀, Pl. 29.

FIRST STATE RECORDS.

Enallagma boreale Selys. UP: Alger (Hw,S), Chippewa, Gogebic (D), Isle Royale (S), Keweenaw (D,M), Mackinac, Schoolcraft (D,M); v.30-vii.10. NLP: Bay (D), Charlevoix, Cheboygan, Clare, Emmet, Grand Traverse, Mason (D), Midland (D,M), Missaukee (S), Oscoda, Presque Isle (D,M), Roscommon (M,S); v.21-viii.6. SLP: Clinton (S), Genesee (D), Gratiot (D), Huron, Ingham (S), Jackson (D), Kent (D), Lapeer, Livingston*, Monroe (D), Oakland (D,M), Washtenaw; v.12-viii.11. Life Zone: hCt. Dist.: NT-3. Ref.: Walker, 1953: ♂, Pl. 24; ♀, Pl. 28. Habitat: Bog lakes and marshes; sand-bottom lakes.

Enallagma carunculatum Morse. UP: Chippewa (B), Delta (D), Dickinson (D), Gogebic, Houghton (B), Iron (D,M), Isle Royale (M,S), Keweenaw (S), Mackinac, Marquette, Menominee, Ontonagon (R), Schoolcraft; vi.21-viii.27. NLP: Alcona (D), Antrim (D,M), Arenac (D), Bay (M,S), Benzie (D,M), Cheboygan (D,M), Clare, Emmet (D,M), Gladwin (D), Grand Traverse, Iosco (D,M), Lake (D,M), Leelenau, Manistee (D), Mason (D,M), Missaukee (D), Muskegon (D,M), Newago (D), Oceana (D,M), Oscoda, Presque Isle, Roscommon; vi.19-ix.6. SLP: Branch, Huron, Jackson, Lenawee, Livingston* (D,M), Montcalm (D), Van Buren, Washtenaw, Wayne; vi.21-ix.24. Life Zone: cTAL. Dist.: NT-3. Ref.: Walker, 1953: ♂, Pl. 24; ♀, Pl. 28. Habitat: Bogs; sand-marl-bottom lakes; sand-bottom streams.

Enallagma civile (Hagen). UP: Keweenaw (S), Mackinac, Schoolcraft (C); vii.10-vii.12. NLP: Midland; ix.5-ix.7. SLP: Gratiot, Huron, Jackson, Oakland (N08), Shiawassee (K), Washtenaw; vi.6-vii.10. Life Zone: cTAL. Dist.: ST. Ref.: Walker, 1953: ♂, Pl. 24; ♀, Pl. 28.

Enallagma cyathigerum (Charpentier). NLP: Montmorency; vii.13. SLP: St. Joseph, Washtenaw (B); v.15-vi.2. Life Zone: hCTa. Dist.: NT-3 (and circumboreal). Ref.: Walker, 1953: ♂, Pl. 24; ♀, Pl. 28.

Enallagma divagans Selys. SLP: Livingston*, Oakland, Shiawassee (K), Washtenaw; vi.6-vii.15. Life Zone: tAl. Dist.: E-1. Ref.: Garman, 1927: ♂, Pl. 10; Garman, 1917: ♀, Pl. 72. Habitat: Bog lakes and ponds.

Enallagma ebrium (Hagen). UP: Alger (D), Chippewa, Dickinson (D), Gogebic (Hw,M), Mackinac (D,M), Schoolcraft; vi.8-viii.11. NLP: Arenac (D), Charlevoix (D,M), Cheboygan, Clare, Emmet, Gladwin (D,M), Grand Traverse (D,M), Iosco, Kalkaska, Lake, Leelenau, Mecosta (D), Midland (D,M), Missaukee (D,M,S), Montmorency, Muskegon (D,M), Newago (D), Oceana (D), Osceola, Oscoda, Otsego, Presque Isle (D,M), Roscommon (D,M), Wexford (D); v.28-viii.11. SLP: Huron, Ingham (M,S), Jackson, Kalamazoo (S), Lapeer, Livingston* (D,M), Monroe (D), Montcalm (D), Oakland, Saginaw (D), Shiawassee (K), Washtenaw (Hw,M), Wayne; v.19-vii.29. Life Zone: CTA. Dist.: NT-2. Ref.: Walker, 1953: ♂, Pl. 24; ♀, Pl. 28. Habitat: Bog lakes and ponds; marshy zones of sand-muck-bottom lakes.

Enallagma exsulans (Hagen). UP: Houghton (B), Isle Royale (Ad); viii.20. NLP: Arenac (D,M), Benzie, Cheboygan, Clare, Emmet, Gladwin (D,M), Grand Traverse (D), Iosco (D), Isabella (D,M), Kalkaska, Midland (D,M,S), Newago (D,M), Oceana, Presque Isle; vi.12-viii.14. SLP: Allegan (S), Branch, Eaton (S), Gratiot (D,M), Huron, Ingham (S), Ionia (D), Jackson, Kalamazoo (M,S), Lapeer, Livingston, Macomb, Monroe (M,S), Oakland, Shiawassee (D,S), Washtenaw, Wayne; vi.7-ix.1. Life Zone: CTAL. Dist.: E-1. Ref.: Walker, 1953: ♂, Pl. 25; ♀, Pl. 29. Habitat: Marshy zones of sand-bottom lakes; rocky streams.

Enallagma geminatum Kellicott. UP: Menominee; viii.27. NLP: Clare (D,M), Grand Traverse, Iosco, Mecosta (D), Muskegon, Presque Isle; vi.25-viii.5. SLP: Barry (S), Branch (B), Jackson, Kalamazoo (S), Lapeer, Livingston* (D,M), Montcalm, Oakland (M,S), Van Buren, Washtenaw (Hw,M); vi.4-viii.18. Life Zone: ctAL. Dist.: E-1. Ref.: Walker, 1953: ♂, Pl. 24; ♀, Pl. 28. Habitat: Bog lakes; marshy zones of sand-muck-bottom lakes.

This species has undoubtedly entered the Upper Peninsula from neighboring Wisconsin; whether or not it is established in Menominee County is uncertain.

Enallagma hageni (Walsh). UP: Alger (D,Hw,M,S), Baraga (M,S), Chippewa, Delta (D,M,S), Dickinson (D,M), Gogebic (D,M), Houghton (D,M), Iron (D,M,S), Keweenaw (D,M,S), Isle Royale (D,S), Luce (M,S), Mackinac (D,M,S), Marquette, Menominee (D,Hw,M), Ontonagon (D,M), Schoolcraft (D,M); vi.3-viii.22. NLP: Antrim, Arenac (D), Bay (D,M), Benzie, Charlevoix, Cheboygan (D,M), Clare (D,Hw,M,S), Crawford (D,M), Emmet, Gladwin (D,M), Grand Traverse (D,M), Iosco (D,M), Isabella (D), Kalkaska, Lake (D,M), Leelenau (D,M), Manistee (D), Mason (D,M), Midland (D,M), Missaukee, Newago (D,M), Oceana, Ogemaw (D), Oscoda, Otsego (D,M), Presque Isle (D,M), Roscommon (D,M,S), Wexford (D); vi.4-viii.14. SLP: Berrien, Branch, Huron (D,M), Ingham (M,S), Jackson, Kalamazoo (S), Livingston*, Monroe, Oakland, Ottawa (D), Saginaw (D,M), Van Buren (S), Washtenaw, Wayne; iv.21-ix.3. Life Zone: cTa. Dist.: E-3. Ref.: Walker, 1953: ♂, Pl. 24; ♀, Pl. 28. Habitat: Bog lakes and ponds; sand- and sand-marl-bottom lakes; slow streams.

This species is the most abundant and most frequently encountered *Enallagma* in Michigan and one of the most common of the Zygoptera in the state.

Enallagma signatum (Hagen). UP: Chippewa; vii.27. NLP: Alpena (D), Antrim (D), Cheboygan, Clare, Emmet, Gladwin (D), Iosco (D,M,S), Isabella (D,M), Lake, Manistee (S), Midland, Muskegon (D), Oceana, Oscoda; vi.20-viii.20. SLP: Branch (B), Genesee, Jackson, Livingston, Oakland, Shiawassee (K), Washtenaw, Wayne; v.1-viii.29. Life Zone: cTAL. Dist.: E-1. Ref.: Walker, 1953: ♂, Pl. 25; ♀, Pl. 29. Habitat: Marshy zones of sand-muck-or sand-marl-bottom lakes; bog lakes.

This species is probably an occasional adventive in the Upper Peninsula.

Enallagma traviatum (Selys). SLP: Livingston*, Montcalm, Oakland (D,M), Washtenaw; vi.7-vii.15. Life Zone: tAl. Dist.: E-2. Ref.: Gorman, 1927: ♂, Pl. 10; ♀, Pl. 11. Habitat: Bog lakes.

FIRST STATE RECORDS. These are the westernmost records for this species.

Enallagma vernale Gloyd. UP: Keweenaw (S), Mackinac, Schoolcraft; vi.1-vi.18. NLP: Cheboygan, Emmet, Presque Isle, Roscommon (D); v.29-v.30. SLP: Livingston*, Washtenaw; v.11-vi.20. Life Zone: cTa. Dist.: E-5. Ref.: Walker, 1953: ♂, Pl. 24; ♀, Pl. 28. Habitat: Bog lakes and marshes.

Enallagma vesperum Calvert. UP: Mackinac; vii.9-viii.9. NLP: Iosco, Lake, Mecosta (D), Missaukee (D), Oceana, Presque Isle, Roscommon; vi.25-viii.12. SLP: Barry (D,S), Branch, Ingham (S), Ionia (D), Jackson, Livingston, Oakland (D,M), Van Buren (S), Washtenaw; v.1-viii.13. Life Zone: cTAL. Dist.: E-1. Ref.: Walker, 1953: ♂, Pl. 25; ♀, Pl. 29. Habitat: Marshy zones of sand-muck-bottom lakes.

Byers' (1927) *E. pollutum* is included in the Oakland County records. This species is probably an occasional adventive in the Upper Peninsula.

Ischnura

Ischnura kellicotti Williamson. SLP: Branch; vii.30. Life Zone: cTa. Dist.: E-3. Ref.: Garman, 1917: ♂, Pl. 72.

This species is probably an occasional adventive in Michigan.

Ischnura posita (Hagen). NLP: Cheboygan, Emmet, Isabella (D), Manistee (D), Midland (D), Missaukee (D), Muskegon (D,S), Oscoda, Presque Isle; vi.2-viii.17. SLP: Clinton, Genesee (D), Ionia (D), Jackson, Kalamazoo (S), Kent (D), Oakland, Shiawassee, St. Joseph, Washtenaw, Wayne; v.15-ix.25. Life Zone: ctAL. Dist.: E-1. Ref.: Walker, 1953: ♂, Pl. 26; ♀, Pl. 30. Habitat: Bog lakes and ponds; marshy zones of sand or sand-marl-bottom lakes; sand-silt-bottom streams.

Combs' (1917) Schoolcraft County record is included under *I. verticalis* (see p. 8).

Ischnura verticalis (Say). UP: Alger (M,S), Baraga (M,S), Chippewa, Dickinson (D,M), Gogebic (D,Hw,M,S), Houghton (D,M), Iron (D,M,S), Keweenaw (M,S), Isle Royale, Luce, Mackinac, Marquette (D,M), Menominee (D,M), Ontonagon (R), Schoolcraft (C); vi.3-ix.2. NLP: Alcona (D,M), Antrim (D,M), Arenac (D), Bay (D,M,S), Charlevoix (D,M), Cheboygan (M,S), Clare (D,M,S), Crawford (D), Emmet, Gladwin (D,M), Grand Traverse (D), Iosco (D,M,S), Isabella (D,M), Kalkaska, Lake (D,M), Leelenau, Manistee (S), Mason (D,M), Mecosta (D), Midland (D,M,S), Missaukee (D,S), Muskegon (D,M), Newago (D,M), Oceana (D,M), Ogemaw (D), Osceola (D,M), Oscoda (D,M), Otsego (D,M), Presque Isle, Roscommon (D,M,S), Wexford (D); v.21-ix.17. SLP: Barry (D,S), Berrien, Branch, Eaton (D), Calhoun (S), Clinton (S), Genesee (D,M), Gratiot (D,M), Huron, Ingham (M,S), Ionia (D,S), Jackson (D,M), Kalamazoo (S), Kent (D), Lapeer (D,M), Lenawee, Livingston*, Macomb, Monroe, Montcalm (D), Oakland (D,M,S), Ottawa (D), Saginaw (D), Shiawassee (D,S), St. Joseph (D,M), Tuscola (D), Van Buren (D,S), Washtenaw, Wayne (D,M,S); v.7-ix.24. Life Zone: cTAL. Dist.: E-1. Ref.: Walker, 1953: ♂, Pl. 26; ♀, Pl. 30. Habitat: Bog lakes and ponds; sand-bottom lakes; streams.

Combs' (1917) Schoolcraft County record of *I. posita* is included here (see p. 8). Along with *Enallagma hageni* and *Nehallemia irene*, *Ischnura verticalis* is one of the most common damselflies in Michigan.

Nehallemia

Nehallemia gracilis Morse. NLP: Iosco; vii.10. SLP: Barry (S); vii.18. Life Zone: cTa. Dist.: E-3. Ref.: Walker, 1953: ♂, Pl. 25; ♀, Pl. 29.

FIRST STATE RECORDS. See discussion (p. 8) of Combs' (1917) record.

Nehallemia irene (Hagen). UP: Baraga (H), Chippewa, Gogebic (D,Hw,M,S), Houghton (B), Iron (D), Keweenaw (M,S), Isle Royale (D,S), Luce, Mackinac (M,S), Marquette (D,S), Menominee (Hw,M), Ontonagon (D), Schoolcraft (D,M); vi.11-viii.13. NLP: Alcona (D), Antrim (D), Bay (D,M,S), Benzie (D), Charlevoix, Cheboygan (D,M), Clare (Hw,M), Crawford

(D), Emmet, Gladwin (D,M), Grand Traverse (D,M), Iosco (D,M), Isabella (D), Kalkaska (D,M), Lake (D,M), Leelenau, Manistee (D), Mecosta (D), Midland (D), Missaukee (D,M,S), Montmorency (M,S), Muskegon (D), Newago (D,M), Oceana (D,M), Ogemaw (D), Osceola (D,M), Oscoda, Otsego (D,M), Presque Isle (D,M), Roscommon (D,M), Wexford (D); v.29-viii.25. SLP: Allegan, Barry (S), Berrien, Branch, Eaton (D), Genesee (D,M), Gratiot (D,M), Huron (D,M), Jackson, Livingston* (D,M), Monroe (D,M), Oakland (D,M), Shiawassee (D), Washtenaw, Wayne (D,M); v.11-ix.1. Life Zone: cTa. Dist.: NT-3. Ref.: Walker, 1953: ♂, Pl. 25; ♀, Pl. 29. Habitat: Marshy zones of sand-or sand-muck-bottom lakes; bog lakes.

Suborder Anisoptera

Petaluridae

Tachopteryx

Tachopteryx thoreyi (Hagen). SLP: Berrien; vi.20. Life Zone: tAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: Fig. 37.

This species is probably an occasional adventive in Michigan.

Cordulegasteridae

Cordulegaster

Cordulegaster diastatops (Selys). UP: Keweenaw (D); vi.27. NLP: Antrim (D), Crawford; vii.10. SLP: Berrien, Cass, Washtenaw; v.29-vii.4. Life Zone: cTAL. Dist.: E-1. Ref.: Garman, 1927: Fig. 13.

FIRST STATE RECORDS.

Cordulegaster erroneus Hagen. UP: Marquette (A);(no dates). NLP: Oceana; vii.26. Life Zone: tA. Dist.: E-3. Ref.: Garman, 1927: Fig. 13.

Cordulegaster maculatus Selys. UP: Baraga, Chippewa (S), Dickinson (D), Gogebic (D), Houghton, Isle Royale (S), Luce, Marquette, Schoolcraft; vi.16-vii.27. NLP: Alcona, Alpena (B), Benzie (B), Charlevoix (B), Cheboygan (B), Crawford (B), Emmet, Gladwin, Grand Traverse, Iosco (B), Lake (B), Mason (B), Mecosta (B), Montmorency, Ogemaw (B), Oscoda, Otsego, Roscommon, Wexford (B); vi.23-vii.22. SLP: Barry (B), Berrien (B), Branch (B), Cass (B), Jackson (B), Kent (B), Livingston; vi.8. Life Zone: cTAL. Dist.: E-1. Ref.: Garman, 1927: Fig. 13; Needham and Westfall, 1955: Fig. 39.

Cordulegaster obliquus (Say). NLP: Midland (D); v.30. SLP: Berrien, Oakland, Wayne; v.30-vii.28. Life Zone: tAL. Dist.: E-3. Ref.: Garman, 1927: Fig. 13.

Williamson questioned whether the female from Berrien County was *obliquus* or *fasciatus*; it appears to me to be *obliquus*.

Gomphidae

Dromogomphus

Dromogomphus spinosus Selys. UP: Alger (M,S), Iron (D,M), Keweenaw, Isle Royale (D), Mackinac, Marquette, Ontonagon; vi.26-viii.16. NLP: Benzie, Cheboygan, Crawford (D), Emmet (D,M), Grand Traverse, Lake, Midland (D,M), Presque Isle, Roscommon (D); vi.5-viii.17. SLP: Jackson (B), Kalamazoo, Livingston*, Oakland, Shiawassee (D), St. Joseph (D), Washtenaw; v.30-viii.20. Life Zone: cTAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: Fig. 78. Habitat: Sand-marl-bottom lakes.

Gomphus

Gomphus (Stylurus) amnicola Walsh. UP: Schoolcraft; vii.16-vii.29. Life Zone: TAL. Dist.: E-2. Ref.: Needham and Westfall, 1955: ♂, Figs. 144, 147; ♀, Fig. 89.

This species is probably an occasional adventive in Michigan.

Gomphus brevis Hagen. UP: Chippewa, Gogebic, Iron, Mackinac (B), Schoolcraft; vii.3-vii.26. NLP: Alpena (D), Cheboygan, Grand Traverse, Presque Isle (D), Roscommon (D,M); vi.2-vii.28. Life Zone: CT. Dist.: E-3. Ref.: Needham and Westfall, 1955: ♂, Figs. 137, 139; ♀, Fig. 89. Habitat: Rocky bottom, rapid streams.

Gomphus cornutus Tough. UP: Chippewa, Gogebic, Schoolcraft; vi.21-vii.25. Life Zone: cT. Dist.: NT-2. Ref.: Needham and Westfall, 1955: ♂, Figs. 92, 94; ♀, Fig. 89.

Gomphus exilis Selys. UP: Alger, Iron, Isle Royale (S), Luce, Mackinac (B), Marquette, Menominee, Schoolcraft (B); vi.26-viii.22. NLP: Cheboygan, Clare (D,M), Emmet, Grand Traverse, Lake (M,S), Mason, Missaukee (S), Montmorency (S), Newago (D), Otsego, Presque Isle; v.30-vii.30. SLP: Huron, Ingham (S), Jackson, Kalamazoo (M,S), Livingston* (M,S), Montcalm, Oakland (M,S), Washtenaw; v.14-vii.15 (viii.) Life Zone: CTAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: ♂, Figs. 123, 127; ♀, Fig. 89. Habitat: Sand-and sand-marl-bottom lakes.

I captured a male of this species "in tandem" with a female *G. spicatus*.

Gomphus fraternus (Say). UP: Chippewa, Delta (D), Mackinac (M,S), Schoolcraft; vi.21-vii.9. NLP: Alpena, Bay, Cheboygan, Emmet, Gladwin (D), Iosco, Midland (D,M,S), Presque Isle (D); v.28-viii.11. SLP: Berrien, Huron, (D,M), Ingham (S), Ionia (D), Monroe, Oakland, Washtenaw, Wayne; v.29-viii.27. Life Zone: cTAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: ♂, Figs. 107, 109; ♀, Fig. 89. Habitat: Bog marshes; large sand-bottom lakes.

Byers' (1927) Washtenaw County record of *G. descriptus* is included here.

Gomphus furcifer Hagen. UP: Chippewa, Marquette; vii.8-viii.1. NLP: Iosco (D,M), Oscoda; vi.27-vii.10. SLP: Jackson, Livingston*, Oakland, St. Joseph, Washtenaw, Wayne (Ha85); v.15-vii.2. Life Zone:

TA. Dist.: E-3. Ref.: Needham and Westfall, 1955: ♂, Figs. 93, 94; ♀, Fig. 89. Habitat: Small bog lakes.

The Michigan State University collections contain a reared specimen labeled "No.77, 5/13/42," which is either from Ingham or Kalamazoo County.

Gomphus graslinellus Walsh. UP: Marquette (An); (no dates.) NLP: Cheboygan; vii.4. SLP: Washtenaw; vi.21-vii.4. Life Zone: cTAL. Dist.: NW. Ref.: Needham and Westfall, 1955: ♂, Figs. 124, 127; ♀, Fig. 89.

The Schoolcraft County specimens listed by Combs (1917) were redetermined as *G. lividus* (see p. 9). Although it has not been possible to verify Andrews' Marquette County record, it is probable that the species does occur in the Upper Peninsula.

Gomphus (Stylurus) laurae (Williamson). SLP: Kalamazoo (S), Washtenaw; vii.15-viii. Life Zone: aL. Dist.: E-2. Ref.: Needham and Westfall, 1955: ♂, Figs. 147, 148; Williamson, 1932: ♀, Pl. 1.

FIRST STATE RECORDS. These Michigan records are the northernmost for this essentially austral species; the previous northern record was Indiana.

Gomphus lineatifrons Calvert. NLP: Midland (D,M,S); v.31-vi.27. SLP: Gratiot (D,M), Ingham (S), Oakland, Washtenaw; v.18-vii.4. Life Zone: tAL. Dist.: E-4. Ref.: Needham and Westfall, 1955: ♂, Figs. 111, 113; ♀, Fig. 89.

One Oakland County specimen reported by Byers (1927) as *G. vastus* was redetermined as *G. lineatifrons* by E. B. Williamson.

Gomphus lividus Selys. UP: Alger (Hw), Iron, Gogebic (Hw), Mackinac, Schoolcraft; vi.7-vii.19. NLP: Alpena, Charlevoix, Cheboygan (M,Sn), Emmet, Grand Traverse, Midland (D,M), Montmorency (S), Ogemaw (D,M), Presque Isle (D,M), Roscommon (D,S); v.21-ii.28. SLP: Barry (S), Calhoun (D), Gratiot (D), Ingham (S), Ionia (D), Jackson, Lapeer (D,M), Livingston* (D), Oakland, St. Joseph (D), Washtenaw; v.14-vii.11. Life Zone: cTAL. Dist.: E-2. Ref.: Needham and Westfall, 1955: ♂, Figs. 127, 128; ♀, Fig. 89. Habitat: Sand-bottom lakes; rocky bottom, swift streams.

Combs' Schoolcraft County records (1917) for *G. graslinellus* are included here (see P. 9).

Gomphus (Stylurus) notatus Rambur. SLP: Wayne (Ha75). Life Zone: cTAL. Dist.: E-2. Ref.: Needham and Westfall, 1955: ♂, Figs. 147, 149; ♀, Fig. 89.

This species is undoubtedly a rare adventive in Michigan.

Gomphus (Stylurus) plagiatus Selys. "Michigan" (Mu). Life Zone: tAL. Dist.: E-2. Ref.: Needham and Westfall, 1955: ♂, Figs. 151, 153; ♀, Fig. 89.

This species is undoubtedly a rare adventive in Michigan.

Gomphus quadricolor Walsh. NLP: Midland (M,S); v.26-vi.2. SLP: St. Clair; v.29. Life Zone: TAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: ♂, Figs. 132, 133; ♀, Fig. 89.

The specimens from Charlevoix, Mackinac, and Wayne counties, recorded as this species by Byers (1927), were redetermined by E. B. Williamson as *G. spicatus* (which see).

Gomphus (Stylurus) scudderi Selys. UP: Gogebic, Mackinac, Schoolcraft; vii.17-vii.29. NLP: Cheboygan (O), Crawford; vii.25-viii.13. Life Zone: cTA. Dist.: E-1. Ref.: Needham and Westfall, 1955: ♂, Figs. 153, 154; ♀, Fig. 89.

Gomphus spicatus Hagen. UP: Alger (Hw) Chippewa, Dickinson, Gogebic (Hw), Houghton, Iron, Keweenaw (D,S), Isle Royale, Luce, Mackinac (D,M), Marquette, Menominee, Ontonagon, Schoolcraft; v.29-viii.5. NLP: Antrim, Charlevoix, Cheboygan (M,S), Clare (D,Hw,M), Crawford, Emmet, Gladwin, Grand Traverse, Iosco (D,M), Kalkaska (M,S), Lake (M,S), Mason (D,M), Mecosta (D), Midland (D), Missaukee (S), Montmorency (S), Muskegon, Newago (D), Ogemaw (D), Otsego, Presque Isle, Roscommon (D,M); v.16-vii.28. SLP: Ingham (S), Jackson, Livingston* (D,M), Oakland, St. Joseph (D), Washtenaw, Wayne; v.5-vii.1. Life Zone: CTA. Dist.: E-3. Ref.: Needham and Westfall, 1955: ♂, Figs. 132, 134; ♀, Fig. 89. Habitat: Virtually ubiquitous in a wide variety of lakes, ponds, and marshes.

The most common gomphine in the state. See *Gomphus quadricolor*, above.

Gomphus (Stylurus) spiniceps (Walsh). "Michigan" (Mu). Life Zone: TA. Dist.: E-3. Ref.: Needham and Westfall, 1955: ♂, Figs. 153, 155; ♀, Fig. 89.

This species is undoubtedly a rare adventive in Michigan.

Gomphus submedianus Williamson. SLP: Wayne (Ha85, as *G. pallidus*). Life Zone: TA. Dist.: E-4. Ref.: Needham and Westfall, 1955: ♂, Figs. 98, 99; Williamson, 1914: ♀, Pl. 5.

This species is undoubtedly a rare adventive in Michigan.

Gomphus vastus Walsh. UP: Schoolcraft; vi.17. NLP: Cheboygan (E); (no dates.) SLP: Berrien, Huron, Monroe, Oakland; v.29-vii.14. Life Zone: tAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: ♂, Figs. 113, 114; ♀, Fig. 89.

The Monroe County specimen was reported by Byers (1927) as *G. externus*. One of the two females he reported from Oakland County was re-determined as *G. lineatifrons* by L. K. Gloyd.

Gomphus ventricosus Walsh. NLP: Alpena (D), Cheboygan, Crawford (D), Midland (D,M,S), Roscommon (B); v.30-viii.9. SLP: Jackson, Oakland (B), Shiawassee (D), Washtenaw; v.17-vii.21. Life Zone: cTA. Dist.: E-3. Ref.: Needham and Westfall, 1955: ♂, Figs. 113, 115; ♀, Fig. 89. Habitat: Sand-or sand-marl-bottom lakes.

Gomphus villosipes Selys. SLP: Washtenaw, Wayne (Ha75); vi.21. Life Zone: TA. Dist.: E-3. Ref.: Needham and Westfall, 1955: ♂, Figs. 98, 100; ♀, Fig. 89.

Gomphus viridifrons Hine. NLP: Midland; v.26. 1935 (R. R. Dreisbach, coll.) Life Zone: tA. Dist.: E-4. Ref.: Needham and Westfall, 1955: ♂, Figs. 139, 140; ♀, Fig. 89.

FIRST STATE RECORDS. It is not unlikely that this specimen was a stray.

Hagenius

Hagenius brevistylus Selys. UP: Alger, Gogebic (Hw,M), Isle Royale (S), Keweenaw (S), Luce (B), Mackinac, Ontonagon; vi.28-viii.15. NLP: Alpena (B), Cheboygan (M,S,Sn), Crawford (B), Emmet, Grand Traverse, Iosco (B), Kalkaska, Lake, Otsego (B), Presque Isle (M,S); vi.3-viii.10. SLP: Berrien, Ingham (S), Jackson, Kalamazoo (S), Livingston, Shiawassee (M,S), St. Joseph, Washtenaw; vi.5-viii.23. Life Zone: CTAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: Fig. 52. Habitat: Sand-or sand-marl-bottom lakes.

Lanthus

Lanthus albistylus Selys. NLP: Lake; vii.27. Life Zone: cTAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: ♂, Figs. 82, 83; Needham and Heywood, 1929: ♀, p. 120.

Ophiogomphus

Ophiogomphus aspersus Morse. UP: Gogebic; vii.29. SLP: Oakland (W33). Life Zone: CTa. Dist.: E-3. Ref.: Needham and Westfall, 1955: ♂, Figs. 56, 59; ♀, Fig. 62.

Ophiogomphus carolus Needham. UP: Alger; vii.8. 1949 (J. W. and F. A. Leonard, coll.). NLP: Cheboygan (E); (no dates,) Life Zone: Ct. Dist.: E-3. Ref.: Needham and Westfall, 1955: ♂, Figs. 58, 59; ♀, Fig. 62.

FIRST STATE RECORD. Although Evans (1914) reported *O. carolus* from Cheboygan County, his specific determination of the unavailable larva is in doubt. The species was previously reported for the United States only from New York and Maine.

Ophiogomphus colubrinus Selys. UP: Gogebic (Hw,M), Houghton, Keweenaw, Isle Royale (S), Mackinac, Ontonagon (D,M), Schoolcraft; v.9-ix.9. NLP: Cheboygan, Crawford, Emmet, Lake, Midland (D), Montmorency, Otsego, Wexford; vi.4-viii.14. Life Zone: HC. Dist.: NT-3. Ref.: Needham and Westfall, 1955: ♂, Figs. 59, 60; ♀, Fig. 62. Habitat: Rocky bottom, moderately swift streams.

Ophiogomphus rupinsulensis (Walsh). UP: Gogebic (B), Houghton (B), Luce, Ontonagon (D); vii.7-viii.26. NLP: Alpena (B), Arenac (D,M), Charlevoix, Crawford (D), Emmet, Iosco (B), Midland (D,M), Montmorency (B), Newago (D), Presque Isle; v.29-viii.7. SLP: Calhoun (D), Gratiot, Huron (B), Kalamazoo (S), St. Joseph (D,M), Washtenaw; v.28-vii.4. Life Zone: CTA. Dist.: E-3. Ref.: Needham and Westfall, 1955: ♂, Figs. 68, 69; ♀, Fig. 62. Habitat: Rocky bottom, moderately swift streams.

Progomphus

Progomphus obscurus (Rambur). NLP: Cheboygan, Emmet (E), Lake, Midland (D,M); v.31-viii.20. SLP: Ingham (S), Livingston, Washtenaw; vi.15-vii.14. Life Zone: cTAL. Dist.: ST. Ref.: Needham and Westfall, 1955: Figs. 41, 42. Habitat: Sand-bottom lakes.

Aeshnidae

Aeshna

Aeshna canadensis Walker. UP: Alger, Baraga, Chippewa, Dickinson, Gogebic (Hw,M), Houghton (B), Iron (Hw,M), Keweenaw (D,M,S), Isle Royale (D,S), Luce, Mackinac (D,M), Marquette, Menominee (S), Ontonagon, Schoolcraft; vi.12-ix.21. NLP: Antrim, Charlevoix, Cheboygan (D,M), Clare (D), Emmet, Grand Traverse (S), Iosco, Kalkaska, Lake, Midland (D), Missaukee (S), Montmorency (S), Presque Isle, Roscommon (D,M); vi.11-ix.16. SLP: Huron, Jackson, Kalamazoo (M,S), Livingston, Oakland, Washtenaw, Wayne (W12); vii.3-viii.20. Life Zone: CTA. Dist.: NT-2. Ref.: Needham and Westfall, 1955: ♂, Fig. 181; Walker, 1912: ♀, Pl. 19. Habitat: Bog lakes, ponds, and marshes.

Aeshna clepsydra Say. UP: Baraga (H), Keweenaw, Ontonagon (R); vii.6-viii.8. NLP: Cheboygan (D,M); viii.3-viii.17. SLP: Huron, Livingston*, Oakland (N08), Shiawassee (K), Washtenaw, Wayne (W12); vii.16-ix.11. Life Zone: tA. Dist.: E-3. Ref.: Needham and Westfall, 1955: ♂, Fig. 182; Walker, 1912: ♀, Pl. 19.

Aeshna constricta Say. UP: Chippewa, Dickinson, Houghton, Mackinac (B), Marquette (An), Schoolcraft; vii.11-viii.12. NLP: Bay (D), Charlevoix, Emmet, Midland (D,M); vii.15-ix.14. SLP: Clinton (S), Huron, Ingham (S), Livingston* (D,M), Macomb (S), Oakland, Shiawassee (K), Washtenaw, Wayne; vii.4-ix.18. Life Zone: cTA. Dist.: NT-2. Ref.: Needham and Westfall, 1955: ♂, Fig. 183; Walker, 1912: ♀, Pl. 21.

Byers (1927) gave May 30 as the earliest date of capture of this species in the state, but the earliest date in his notes is July 24. In view of the midsummer season of this species, it is doubtful that the May date is reliable.

Aeshna eremita Scudder. UP: Chippewa, Houghton (B), Keweenaw, Isle Royale (D,S), Luce, Marquette, Schoolcraft; vii.5-ix.10. NLP: Emmet, Iosco; vii.5-ix.14. Life Zone: archCt. Dist.: NT-3. Ref.: Needham and Westfall, 1955: ♂, Fig. 185; Walker, 1912: ♀, Pl. 19. Habitat: Bog ponds and marshes.

Aeshna interrupta Walker. UP: Chippewa (M,S), Houghton (B), Iron (Hw), Keweenaw (D,M), Isle Royale (D,S), Luce, Mackinac, Marquette, Ontonagon (D), Schoolcraft (C); vii.3-ix.12. NLP: Alcona (B), Alpena (B), Charlevoix, Cheboygan (D), Crawford (B), Emmet, Iosco (B), Lake (B), Mason (B), Midland (D), Muskegon (B), Oscoda, Roscommon (B); vii.22-viii.26. SLP: Allegan (B), Berrien (B), Kent (B); (no dates.) Life Zone: hCt. Dist.: E-3. Ref.: Walker, 1912: ♂, Pl. 15; ♀, Pl. 20.

Aeshna mutata Hagen. SLP: Livingston*, St. Joseph (D,M), Washtenaw; v.17-vi.9. Life Zone: A. Dist.: E-3. Ref.: Needham and Westfall, 1955: ♂, Fig. 189; Walker, 1912: ♀, Pl. 21.

Aeshna sitchensis Hagen. UP: Alger, Baraga (H), Chippewa, Houghton (B), Keweenaw, Isle Royale (Ad), Schoolcraft; vi.13-viii.21. NLP: Charlevoix; viii.1. Life Zone: HC. Dist.: NT-3. Ref.: Walker, 1912: ♂, Pl. 15; ♀, Pl. 18.

Aeshna subarctica Walker. UP: Chippewa, Gogebic (B), Houghton (B), Keweenaw, Isle Royale; vii.31-viii.16. Life Zone: HC. Dist.: NT-3. Ref.: Walker, 1912: ♂, Pl. 15; ♀, Pl. 18.

Aeshna tuberculifera Walker. UP: Chippewa, Marquette; vii.24-ix.10. NLP: Cheboygan, Emmet; vii.16-viii.22. SLP: Huron, Ingham (Br), Kalamazoo (S), St. Joseph; vii.24-viii.3. Life Zone: cTa. Dist.: NT-2. Ref.: Needham and Westfall, 1955: ♂, Fig. 193; Walker, 1912: ♀, Pl. 20. Habitat: Bog lakes and ponds.

Aeshna umbrosa Walker. UP: Alger, Chippewa, Gogebic, Houghton (B), Keweenaw, Isle Royale (D,S), Luce, Mackinac, Marquette, Menominee, Schoolcraft; vi.18-ix.12. NLP: Alcona (B), Alpena (B), Charlevoix, Cheboygan (D,M), Clare, Crawford, Emmet, Gladwin, Grand Traverse (B), Iosco, Lake (B), Midland (D,M), Missaukee (S), Montmorency, Newago, Otsego, Presque Isle, Roscommon; vi.30-ix.25. SLP: Huron (D,M), Livingston*, Oakland, Shiawassee (S), Washtenaw; vi.8-ix.23. Life Zone: CTAL. Dist.: NT-1. Ref.: Needham and Westfall, 1955: ♂, Fig. 194; Walker, 1912: ♀, Pl. 20. Habitat: Bog lakes, ponds, and creeks.

Aeshna verticalis Hagen. UP: Alger (P), Chippewa, Schoolcraft (B); vi.25-viii.22. NLP: Charlevoix, Cheboygan (B), Emmet, Iosco, Lake; vii.20-ix.4. SLP: Huron, Livingston*, Wayne (W12); vii.17-viii.26. Life Zone: cTA. Dist.: E-3. Ref.: Needham and Westfall, 1955: ♂, Fig. 195; Walker, 1912: ♀, Pl. 19.

Anax

Anax junius (Drury). UP: Baraga (H), Chippewa, Keweenaw, Isle Royale (N09), Luce (B), Mackinac (D), Marquette (An), Ontonagon, Schoolcraft; v.16-ix.9. NLP: Alcona (B), Alpena (B), Arenac (D,M), Bay, Charlevoix, Cheboygan, Crawford, Emmet, Iosco, Lake, Mecosta (B), Midland (D,M,S), Missaukee (S), Montmorency (S), Oscoda, Otsego, Presque Isle, Roscommon; v.4-ix.10. SLP: Barry (S), Berrien, Clinton (S), Gratiot, Huron, Ingham (M,S), Jackson (D,M), Kalamazoo (S), Livingston*, Montcalm, Monroe, Oakland, Shiawassee (S), St. Clair, St. Joseph (D), Van Buren (S), Washtenaw, Wayne; iv.12-x.7. Life Zone: ctAL. Dist.: T. Ref.: Needham and Westfall, 1955: Fig. 164. Habitat: Virtually ubiquitous in a wide variety of aquatic habitats.

Basiaeschna

Basiaeschna janata (Say). UP: Alger (Hw), Chippewa, Dickinson, Luce (B), Mackinac, Marquette, Ontonagon; vi.7-vii.6. NLP: Alpena,

Cheboygan, Clare (D), Emmet, Gladwin, Grand Traverse (B), Iosco, Kalkaska, Midland (D), Presque Isle, Roscommon (M,S); v.8-viii.17. SLP: Ingham,(S), Jackson, Kalamazoo (S), Livingston*, Montcalm (B), Oakland, Van Buren (B), Washtenaw; iv.30-vi.21. Life Zone: cTAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: Fig. 160. Habitat: Sand-or sand-marl-bottom lakes; bog lakes; moderately swift streams.

Byers (1927) listed April 18 as the earliest date of capture in the state, twelve days earlier than that reported above. According to his notes he collected two larvae on April 18, 1925, which "emerged in laboratory"; the date of emergence is not indicated but, in any event, the larval collection does not represent adult seasonal data. The next earliest date in Byers' notes is May 2.

Boyeria

Boyeria grafiana Williamson. UP: Isle Royale (S); viii.3-7.1936 (C. W. Sabrosky, coll.). Life Zone: cTA. Dist.: E-3. Ref.: none.

FIRST STATE RECORD. This single male specimen was probably a stray, occurring near the known northwestern range of the species.

Boyeria vinosa (Say). UP: Alger, Chippewa, Gogebic (Hw,M), Houghton, Mackinac, Marquette; vii.23-ix.10. NLP: Alcona (B), Alpena (B), Benzie (B), Cheboygan, Crawford, Emmet, Iosco, Lake, Manistee, Mason (B), Midland (D,M), Montmorency, Newago, Presque Isle; vii.3-x.10. SLP: Barry (B), Berrien (B), Ingham (S), Jackson, Kalamazoo (S), Livingston, Monroe (B), Oakland, Shiawassee (K), Washtenaw, Wayne; vi.30-ix.10. Life Zone: cTAL. Dist.: E-1. Ref.: Needham and Westfall, 1955; Fig. 162. Habitat: Rock bottom, moderately swift streams.

The species was observed ovipositing in exposed roots of alder (*Alnus* sp.) just above waterline.

Epiaeschna

Epiaeschna heros (Fabricius). NLP: Cheboygan (E), Midland; vi.12. SLP: Berrien, Huron, Shiawassee (K), Washtenaw (B), Wayne; vi.3-vii.29. Life Zone: hCTAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: Fig. 172.

Gomphaeschna

Gomphaeschna furcillata (Hagen). SLP: Wayne (Ha75); (no dates.) Life Zone: ctAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: Fig. 158.

This species is probably a rare adventive in Michigan.

Nasiaeschna

Nasiaeschna pentacantha (Rambur). SLP: Ingham (S); vi.27.1940 (coll. unknown). Life Zone: tAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: Fig. 170.

FIRST STATE RECORDS.

Corduliidae

Macrominae

Didymops

Didymops transversa (Say). UP: Chippewa (B), Keweenaw (D,S), Mackinac, Menominee, Ontonagon (D); vi.6-vii.27. NLP: Cheboygan, Lake (D), Montmorency (S), Presque Isle; vi.10-viii.1. SLP: Ingham (S), Jackson, Kalamazoo (S), Livingston* (D,M), Oakland, Washtenaw; v.11-vi.21. Life Zone: cTAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: Fig. 202. Habitat: Sand-and sand-marl-bottom lakes; bog lakes.

Macromia

Macromia illinoiensis Walsh. UP: Alger, Chippewa, Gogebic, Luce (B), Mackinac; vi.9-viii.12. NLP: Alpena (B), Charlevoix, Cheboygan, Clare, Emmet, Iosco (B), Lake, Midland, Montmorency (B), Otsego (B), Roscommon (D,M); vi.9-viii.3. SLP: Huron, Ingham (S), Lenawee (B), Montcalm (B), Oakland (N08), Shiawassee (K), Washtenaw; vi.1-vii.14 [August, no date.] Life Zone: cTAL. Dist.: E-1. Ref.: Garman, 1927: Pl. 11; Needham and Westfall, 1955: Fig. 206.

Macromia taeniolata Rambur. SLP: Ingham, St. Joseph; viii.3-viii.12. Life Zone: tAL. Dist.: E-2. Ref.: Needham and Westfall, 1955: Fig. 201.

FIRST STATE RECORDS. These are the northernmost records of this species.

Cordulinae

Cordulia

Cordulia shurtleffi Scudder. UP: Alger (Hw,M), Baraga (H), Chippewa, Gogebic (D,Hw,M), Houghton, Iron, Keweenaw (M,S), Isle Royale (S), Mackinac, Marquette (M,S), Ontonagon, Schoolcraft; vi.8-vii.29. NLP: Cheboygan (B), Clare (D), Crawford, Iosco (D), Montmorency (B), Oscoda, Otsego, Presque Isle; v.30-vii.3. SLP: Ingham (S), Oakland, Washtenaw (B); v.15-vi.17. Life Zone: hCt. Dist.: NT-3. Ref.: Needham and Westfall, 1955: Figs. 262, 264. Habitat: Bog lakes; sand-and sand-muck-bottom lakes and ponds.

Doracordulia

Doracordulia libera (Selys). UP: Alger (Hw), Baraga, Chippewa (S), Delta, Dickinson, Gogebic (D,Hw), Iron (D,M), Isle Royale (S), Keweenaw, Mackinac, Schoolcraft; vi.9-viii.11. NLP: Alpena (B), Cheboygan, Clare (D), Crawford, Grand Traverse, Iosco, Lake, Midland (D,M), Missaukee (S), Osceola (D), Presque Isle, Roscommon, Wexford (D); vi.3-vii.25. SLP: Berrien, Jackson, Kalamazoo (S), Livingston* (D,M), Oakland, Saginaw (D), St. Joseph, Washtenaw; v.17-vii.19. Life Zone: CTa. Dist.: E-3. Ref.: Needham and Westfall, 1955: Figs. 265, 268. Habitat: Bog lakes and creeks; sand-, sand-marl-, sand-muck-bottom lakes.

Epicordulia

Epicordulia princeps (Hagen). UP: Chippewa; viii.1-viii.14. NLP: Charlevoix, Cheboygan (B), Clare, Grand Traverse, Iosco, Kalkaska, Lake (D,M), Mason, Montmorency (B), Oceana, Presque Isle; vi.13-vi.27. SLP: Ingham (S), Jackson, Livingston*, Oakland, Shiawassee (K), Washtenaw; vi.9-vii.26. Life Zone: cTAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: Fig. 217. Habitat: Bog lakes and marshes; sand-or sand-marl-bottom lakes.

Neurocordulia

Neurocordulia yamaskanensis (Provancher). NLP: Cheboygan; vi.26. Life Zone: CTa. Dist.: E-3. Ref.: Needham and Westfall, 1955: ♂, Fig. 216; Howe, 1917-19-23: ♀, Fig. 53.

Recorded by Byers (1927) as *N. obsoleta* (see p. 9).

Somatochlora

Somatochlora cingulata (Selys). UP: Marquette; vii.8-vii.12. Life Zone: hC. Dist.: NT-3. Ref.: Needham and Westfall, 1955: ♂, Fig. 237; Walker, 1925: ♀, Pl. 7.

FIRST STATE RECORDS. It has not been determined whether this species is other than adventive in Michigan; its only other reported occurrence in the United States is in New Hampshire.

Somatochlora elongata (Scudder). UP: Alger, Chippewa, Keweenaw (D,M), Luce; vi.26-viii.13. NLP: Alpena (B); (no dates.) Life Zone: CT. Dist.: E-3. Ref.: Needham and Westfall, 1955: ♂, Fig. 238; ♀, Fig. 239. Habitat: Slow-moving bog streams.

Byers' records from Schoolcraft County (1927) were based on specimens that were redetermined by L. K. Gloyd as *S. williamsoni*.

Somatochlora forcipata (Scudder). UP: Dickinson, Marquette (B), Schoolcraft; vii.23-vii.26. Life Zone: HCt. Dist.: NT-3. Ref.: Walker, 1925: ♂, Pl. 2; Needham and Westfall, 1955: ♀, Fig. 242.

Somatochlora franklini (Selys). UP: Alger, Baraga (H), Chippewa, Isle Royale (D,M), Luce, Mackinac, Marquette, Schoolcraft; vi.15-viii.7. Life Zone: HC. Dist.: NT-3. Ref.: Needham and Westfall, 1955: ♂, Fig. 243; ♀, Fig. 242. Habitat: Sand-and sand-marl-bottom lakes.

Somatochlora incurvata Walker. UP: Alger (D), Chippewa, Keweenaw (S); vii.8-viii.27. Life Zone: C. Dist.: E-5. Ref.: Needham and Westfall, 1955: ♂, Fig. 245; ♀, Fig. 246.

Somatochlora kennedyi Walker. UP: Alger (D,M), Chippewa, Gogebic (Hw,M), Isle Royale (S), Luce, Mackinac, Ontonagon, Schoolcraft (C); vi.1-vii.26. NLP: Charlevoix, Cheboygan, Midland (D,M); vi.4-vi.23. SLP: Livingston*; v.19. Life Zone: hCt. Dist.: NT-3. Ref.: Needham and Westfall, 1955: ♂, Fig. 247; ♀, Fig. 246. Habitat: Bog marshes; sand-marl-bottom lakes.

Francis C. Evans captured two females on the Edwin S. George Reserve, Livingston County, May 19, 1949. Their teneral condition indicates the extension of the distribution of the species into southern Michigan.

Somatochlora linearis (Hagen). NLP: Midland; vi.21-viii.13. Life Zone: tAl. Dist.: E-2. Ref.: Needham and Westfall, 1955: ♂, Fig. 248; ♀, Fig. 249.

FIRST STATE RECORDS.

Somatochlora minor Calvert. UP: Houghton (B), Keweenaw, Isle Royale (D,M,S), Luce (B), Schoolcraft; vii.17-viii.7. NLP: Alcona (B), Alpena (B), Cheboygan, Montmorency, Oscoda, Otsego; vi.23-vii.9. Life Zone: hCt. Dist.: NT-3. Ref.: Needham and Westfall, 1955: ♂, Fig. 250; Walker, 1925: ♀, Pl. 4.

Somatochlora tenebrosa (Say). SLP: ?Ingham [no date]. Life Zone: cTAl. Dist.: E-1. Ref.: Needham and Westfall, 1955: ♂, Fig. 256; ♀, Fig. 254.

FIRST STATE RECORD: A male bearing the data, "Ag. Coll. Mich." Dr. R. L. Fischer assures me that the label used indicates that the specimen was collected in Ingham County.

Somatochlora walshii (Scudder). UP: Alger (D), Gogebic (Hw), Luce, Mackinac, Marquette, Schoolcraft; vi.18-vii.27. NLP: Charlevoix, Emmet, Iosco, Osceola, Otsego; vii.8-viii.23. Life Zone: hCt. Dist.: NT-3. Ref.: Needham and Westfall, 1955: ♂, Fig. 257; ♀, Fig. 258. Habitat: Bog lakes, floodwoods.

Somatochlora williamsoni Walker. UP: Alger, Chippewa, Delta, Gogebic, Keweenaw, Isle Royale (D,S), Luce (B), Mackinac, Marquette, Schoolcraft; vi.21-viii.10. NLP: Charlevoix, Cheboygan (D,M), Emmet, Iosco, Midland (D), Oscoda; vi.22-viii.21. SLP: Wayne (W25); (no dates). Life Zone: CT. Dist.: NT-2. Ref.: Needham and Westfall, 1955: ♂, Fig. 260; ♀, Fig. 261. Habitat: Bog ponds; sand-marl-bottom lakes; marshy ponds.

Tetragoneuria

Tetragoneuria canis MacLachlan. UP: Alger, Baraga, Chippewa, Dickinson, Gogebic (Hw,M), Houghton, Keweenaw (S), Mackinac, Marquette, Ontonagon, Schoolcraft; vi.3-vii.23. NLP: Cheboygan, Missaukee (D,S), Otsego, Presque Isle, Roscommon; v.30-vii.10. Life Zone: CTa. Dist.: NT-3. Ref.: Needham and Westfall, 1955: Fig. 221. Habitat: Bog ponds, lakes, and creeks.

Tetragoneuria cynosura (Say). UP: Chippewa, Dickinson, Gogebic, Houghton, Iron, Luce, Mackinac, Marquette, Ontonagon (D,M), Schoolcraft; vi.8-vii.28. NLP: Alcona (B), Alpena (B), Benzie, Cheboygan, Clare (D), Emmet, Gladwin (D,M,S), Grand Traverse, Iosco, Lake, Mason, Midland (D), Montmorency (B), Newago, Oceana, Ogemaw, Oscoda, Otsego, Presque Isle, Roscommon; vi.3-vii.13. SLP: Berrien, Clinton (S,M), Genesee (D,M), Ingham (S), Jackson, Kalamazoo (S), Kent, Lapeer, Livingston*, Montcalm (B), Oakland (M,S), Shiawassee, St. Joseph, Van Buren (S), Washtenaw (M), Wayne (M); iv.30-vii.17. Life Zone: CTAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: ♂, Fig. 222; Muttkowski, 1911: ♀, Fig. 3. Habitat: Sand-marl-bottom lakes; semi-bog lakes.

The Kent County record is in the Milwaukee Public Museum. Additional records from Alpena and Washtenaw counties are in the Academy of Natural Sciences of Philadelphia. Records from Wayne County are in the U. S. National Museum and Museum of Comparative Zoology, Harvard College.³

Tetragoneuria spinigera Selys. UP: Alger, Baraga, Chippewa, Delta, Dickinson, Gogebic (Hw,M), Iron (M,S), Keweenaw (M,S), Isle Royale (M,S), Luce, Mackinac, Marquette, Menominee, Ontonagon, Schoolcraft; v.29-vii.23. NLP: Benzie, Charlevoix, Cheboygan, Clare (HwM), Crawford, Gladwin, Grand Traverse, Iosco, Kalkaska (S), Missaukee (D,S), Montmorency (M,S), Ogemaw, Oscoda, Otsego, Presque Isle, Roscommon (D,M,S); v.16-vii.28. SLP: Ingham (S), Livingston, Oakland, Washtenaw, Wayne; v.8-vi.27. Life Zone: CTa. Dist.: NT-3. Ref.: Needham and Westfall, 1955: ♂, Fig. 226; Muttkowski, 1911: ♀, Fig. 6. Habitat: Bog lakes.

The Wayne County record is in the U. S. National Museum.⁴

Williamsonia

Williamsonia fletcheri Williamson. UP: Schoolcraft; vi.5. Life Zone: C. Dist.: NT-3. Ref.: Needham and Westfall, 1955: Fig. 269.

Libellulidae

Celithemis

Celithemis elisa (Hagen). NLP: Antrim, Charlevoix, Cheboygan, Clare (D,M,S), Gladwin (D,M), Grand Traverse (D,M,S), Iosco, Kalkaska, Lake (D,M), Leelenau, Mason, Mecosta (D), Missaukee (M,S), Montmorency (M,S), Muskegon, Newago (D), Oceana, Ogemaw (D,M,S), Osceola (D,M), Oscoda, Otsego (D,M), Presque Isle; vi.13-viii.13. SLP: Allegan (M,S), Barry (S), Berrien, Clinton (S), Genesee (M,S), Huron, Ingham (S), Jackson, Kalamazoo (S), Kent (S), Livingston* (D,M), Montcalm, Monroe (D,M),

³Kormondy, *op. cit.*, pp. 219-24, see note 2.

⁴Kormondy, *op. cit.*, pp. 226-28, see note 2.

Oakland (D,M), Shiawassee (S), St. Clair, St. Joseph, Washtenaw; vi.1-viii.20. Life Zone: cTAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: Fig. 283. Habitat: Bog lakes, ponds, and marshes; sand-marl-bottom lakes.

Celithemis eponina (Drury). UP: Isle Royale (N09), Luce (B); (no dates). NLP: Cheboygan (E), Grand Traverse (B), Iosco, Lake (B), Mecosta (D), Montmorency (B), Oscoda (D,M), Otsego (B); vii.21-viii.15. SLP: Allegan (S), Barry (S), Berrien, Branch, Clinton (S), Genesee (S), Ingham (S), Ionia (D), Jackson, Kalamazoo (S), Kent (M,S), Lenawee, Livingston* (D,M), Montcalm (B), Oakland (D,M), Shiawassee (K), Van Buren (M,S), Washtenaw; vi.17-viii.19. Life Zone: ctAL. Dist.: E-2. Ref.: Needham and Westfall, 1955: Fig. 283. Habitat: Bog lakes.

Celithemis monomelaena Williamson. SLP: Barry (S), Jackson, Kalamazoo (S), Livingston*, Oakland, Washtenaw (M,S); vi.6-vii.25. Life Zone: tA. Dist.: E-3. Ref.: Needham and Westfall, 1955: Fig. 283. Habitat: Boglike ponds and lakes.

Erythemis

Erythemis simplicicollis (Say). UP: Chippewa, Menominee; vii.2-vii.27. NLP: Bay, Charlevoix, Clare (D,M,S), Grand Traverse (S), Isabella (D,M), Lake, Midland (D,M), Muskegon, Oceana, Oscoda; vi.23-viii.20. SLP: Allegan (M,S), Barry (S), Clinton (S), Eaton (D), Genesee (S), Huron, Ingham (S), Jackson, Kalamazoo (S), Lenawee, Livingston* (D,M), Montcalm (D), Oakland, Shiawassee (K), St. Joseph (D), Washtenaw; v.18-ix.1. Life Zone: ctAL. Dist.: T. Ref.: Needham and Westfall, 1955: Fig. 312. Habitat: Boglike lakes and marshes; sand-muck-bottom lakes.

It is not unlikely that this species is occasionally adventive in the Upper Peninsula.

Ladona

Ladona julia (Uhler). UP: Alger (Hw,M), Baraga, Chippewa, Dickinson, Gogebic (D,M), Houghton, Keweenaw (M,S), Isle Royale (M,S), Luce, Mackinac, Marquette, Menominee, Schoolcraft; v.29-vii.30. NLP: Charlevoix, Cheboygan (D,M,S), Clare (D,M), Emmet, Gladwin (D,M,S), Grand Traverse (D), Iosco (D,M), Lake, Mason (D,M), Midland, Missaukee (S), Montmorency (M,S), Muskegon (D,M), Newago (D), Ogemaw (D,M), Osceola (D), Oscoda, Otsego (M,S), Presque Isle (D,M), Roscommon (D,M), Wexford (D); v.16-vii.28. SLP: Barry (S), Clinton (S), Genesee (S), Ingham (S), Kalamazoo (S), Kent (D), Livingston* (D,M), Oakland, Shiawassee (S), St. Joseph, Washtenaw; v.10-viii.16. Life Zone: CTa. Dist.: NT-2. Ref.: Needham and Westfall, 1955: ♂, Fig. 294: Garman, 1927: ♀, Fig. 63. Habitat: Virtually ubiquitous in a wide variety of aquatic habitats.

Leucorrhinia

Leucorrhinia frigida (Hagen). UP: Baraga (H), Chippewa, Delta (D), Dickinson, Houghton (D,M), Iron, Isle Royale (S), Keweenaw, Luce, Mackinac (S), Schoolcraft (D,M); vi.14-viii.13. NLP: Cheboygan, Emmet, Iosco (D,M), Lake, Missaukee (S), Muskegon, Osceola (D), Otsego, Presque Isle, Wexford (D); vi.5-viii.5. SLP: Barry (S), Berrien, Kalamazoo (S), St. Joseph; v.28-vii.18. Life Zone: CTa. Dist.: NT-2. Ref.: Hagen, 1890: Pl. 10. Habitat: Bog lakes; sand-and sand-marl-bottom lakes.

All specimens from Michigan in this genus which were available for study have been re-examined; the present list supersedes the distributional data given by Byers (1927).

Leucorrhinia glacialis Hagen. UP: Alger, Baraga (H), Chippewa, Dickinson (D,M), Gogebic, Iron, Luce, Mackinac, Marquette (M,S), Schoolcraft; vi.8-vii.25. NLP: Cheboygan, Lake, Missaukee (S), Oscoda, Otsego (D,M,S), Presque Isle; v.24-vii.26. Life Zone: Ct. Dist.: NT-3. Ref.: Hagen, 1890: Pl. 10; Needham, 1901: Pl. 10. Habitat: Bog lakes and marshes.

Leucorrhinia hudsonica (Selys). UP: Alger, Baraga (H), Chippewa, Gogebic (D,M), Houghton, Iron, Keweenaw (M,S), Isle Royale, Luce, Mackinac, Marquette (S), Menominee, Schoolcraft; vi.5-viii.8. NLP: Charlevoix, Cheboygan, Oscoda, Otsego; vi.1-vii.28. Life Zone: Hct. Dist.: NT-3. Ref.: Walker, 1940: ♂, Figs. 14, 16; Walker, 1942; ♀, Fig. 6. Habitat: Bog ponds; sand-bottom lakes.

Leucorrhinia intacta (Hagen). UP: Alger (Hw), Chippewa, Dickinson, Gogebic, Houghton, Isle Royale (N09), Mackinac (D,M), Menominee (Hw,M), Schoolcraft; v.30-vii.22. NLP: Antrim, Bay (D,M,S), Charlevoix, Cheboygan (D,M,Sn), Clare (M,S), Crawford, Emmet, Gladwin (D,M,) Grand Traverse (D,M,S), Iosco (D,M), Lake, Leelenau (D,M), Mason (D), Midland, Missaukee (D,M,S), Montmorency, Muskegon (D,M), Osceola (D), Oscoda, Otsego (D,M), Presque Isle, Roscommon (M,S), Wexford (D); v.16-viii.2. SLP: Barry (S), Berrien, Clinton (S), Eaton (D), Genesee, Gratiot (D), Huron (D,M), Ingham (S), Jackson (D), Kalamazoo (S), Kent (D), Livingston* (D,M), Montcalm, Oakland, Saginaw (D), Shiawassee (D,S), St. Clair, St. Joseph (D,M), Van Buren (S), Washtenaw, Wayne; v.1-viii.2. Life Zone: cTA. Dist.: NT-2. Ref.: Hagen, 1890: Pl. 10. Habitat: Bog ponds and lakes; sand-marl-bottom lakes.

Leucorrhinia proxima Calvert. UP: Alger (Hw,M), Baraga, Chippewa, Delta, Dickinson, Gogebic (D,Hw,M,S), Iron, Keweenaw (M,S), Isle Royale (D,S), Luce, Mackinac, Marquette (M,S), Menominee (Hw), Ontonagon, Schoolcraft; vi.4-viii.7. NLP: Antrim, Charlevoix, Cheboygan, Emmet, Grand Traverse (D), Iosco, Mason (D,M), Osceola (D), Oscoda, Otsego, Presque Isle, Roscommon; vi.4-vii.28. Life Zone: hCt. Dist.: NT-3. Ref.: Hagen, 1890: Pl. 10. Habitat: Bog lakes, ponds and marshes; sand-muck-bottom lakes.

Libellula

Libellula cyanea Fabricius. UP: Chippewa; viii.1. NLP: Emmet (E); (no dates). SLP: Berrien (S), Clinton (S), Genesee (S), Jackson, Kalamazoo (S), Livingston*, Oakland (A,M), St. Joseph, Washtenaw; v.31-viii.27. Life Zone: tAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: Fig. 297. Habitat: Boglike lakes; sand-muck-bottom lakes.

This species is probably only an occasional adventive north of the Southern Lower Peninsula.

Libellula incesta Hagen. UP: Chippewa; viii.1. NLP: Grand Traverse (S), Mason (D,M); vii.19-vii.25. SLP: Clinton (S), Jackson, Kalamazoo (S), Kent (D), Livingston*, Montcalm, Oakland, Shiawassee (K), Washtenaw, Wayne (B); v.17-viii.27. Life Zone: ctAL. Dist.: E-1. Ref.: Kennedy, 1922: ♂, Pl. 2. Habitat: Bog lakes.

Libellula luctuosa Burmeister. UP: Chippewa, Dickinson (D), Menominee; viii.1-viii.22. NLP: Antrim (D,M), Bay (D,M,S), Cheboygan, Clare (M,S), Gladwin (D), Grand Traverse (S), Iosco (D,M), Isabella (D), Lake, Mecosta (D), Midland (D,M), Missaukee (S); vi.4-viii.15. SLP: Allegan (S), Barry (S), Berrien, Branch (B), Clinton (S), Genesee (S), Gratiot (A), Huron, Ingham (S), Ionia (D), Jackson, Kalamazoo (S), Kent (D,M,S), Lapeer, Livingston*, Monroe (D,M), Montcalm (D,M), Oakland (A,D,M,S), Ottawa (S), Shiawassee (D,S), St. Clair, Van Buren (S), Washtenaw, Wayne; v.21-viii.22. Life Zone: ctAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: Fig. 297. Habitat: Bog lakes, ponds, and marshes.

Libellula pulchella Drury. UP: Alger, Baraga (H), Chippewa (B), Delta, Dickinson, Gogebic (Hw,M), Houghton, Iron, Luce, Mackinac, Ontonagon, Schoolcraft; vi.14-vii.30 [viii. ?]. NLP: Bay (D,M), Charlevoix, Cheboygan (M,S), Crawford, Emmet, Gladwin, Grand Traverse, Iosco (D,M), Lake, Manistee (B), Midland (D,M), Missaukee (S), Montmorency, Muskegon (D,M), Oceana (D,M), Oscoda, Otsego, Presque Isle, Roscommon (D,M); v.25-viii.20. SLP: Barry (S), Berrien, Clinton (S), Genesee (S), Gratiot (A,M), Huron (D,M), Ingham (A,M,S), Jackson, Kalamazoo (S), Kent (S), Lapeer, Livingston* (M,S), Macomb, Oakland (A,M), Shiawassee (S), St. Clair, St. Joseph (D,M), Van Buren (S), Washtenaw, Wayne; v.14-viii.20. Life Zone: cTAL. Dist.: T. Ref.: Needham and Westfall, 1955: Fig. 297. Habitat: Marsh zones of bog lakes and ponds; marshy zones of sand-, sand-marl-, sand-detritus-bottom lakes.

Libellula quadrimaculata Linnaeus. UP: Alger, Baraga, Chippewa, Delta (D,M), Dickinson, Gogebic (D,Hw,M,S), Houghton, Iron, Keweenaw, Isle Royale (D,S), Luce (M,S), Mackinac (D,M), Marquette (D,M), Menominee (Hw), Schoolcraft; v.29-viii.10. NLP: Alpena, Arenac (D), Bay (D,M,S), Charlevoix, Cheboygan (M,S,Sn), Crawford (S), Clare (D,M), Emmet, Gladwin (D,M), Iosco, Lake, Midland (D,M), Missaukee (S), Montmorency, Ogemaw (D,M), Oscoda, Otsego (D,M,S), Presque Isle, Roscommon (D,M,S); v.16-vii.28. SLP: Barry (S), Clinton (S), Huron, Ingham (S), Kalamazoo (S), Livingston*, Oakland, Shiawassee (K), St. Joseph, Washtenaw, Wayne; v.4-viii.15. Life Zone: hCTa. Dist.: NT-2. Ref.: Needham and Westfall, 1955: Fig. 297. Habitat: Bog lakes, ponds, and marshes; sand-, sand-marl-, sand-detritus-bottom lakes and ponds.

Libellula semifasciata Burmeister. SLP: Huron, Ingham (S), Kalamazoo (S), Oakland, Shiawassee (K), Washtenaw; v.20-vi.27. Life Zone: tAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: Fig. 297.

Nannothemis

Nannothemis bella (Uhler). UP: Baraga (H); vii.8. NLP: Cheboygan (M,Sn), Emmet, Grand Traverse (D), Lake, Oceana (D), Oscoda; vi.18-viii.3. SLP: Barry (S), Kalamazoo (S), Livingston*, Oakland, Washtenaw; vi.11-vii.18. Life Zone: ctAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: Fig. 274. Habitat: Only in bog lakes in northern Michigan; in marshy zones of sand-detritus-bottom lakes in southern Michigan.

Pachydiplax

Pachydiplax longipennis (Burmeister). NLP: Emmet (E), Muskegon, Otsego (S); vi.26-vii.4. SLP: Allegan (S), Barry (S), Berrien, Branch, Huron, Jackson, Kalamazoo (S), Livingston*, Montcalm (D), Oakland, Shiawassee (K), St. Joseph, Washtenaw, Wayne; v.31-viii.19. Life Zone: ctAL. Dist.: T. Ref.: Needham and Westfall, 1955: Fig. 320. Habitat: Bog lakes and marshes; marsh ponds.

Pantala

Pantala flavescens (Fabricius). NLP: Grand Traverse; vi.27. SLP: Huron, Washtenaw; vii.23-vii.29. Life Zone: ctAL. Dist.: T. Ref.: Needham and Westfall, 1955: Fig. 340. Habitat: Sand-bottom lakes.

FIRST STATE RECORDS.

Pantala hymenea (Say). UP: Dickinson, Iron; vi.17.1954 (E. J. Kormondy, coll.). Life Zone: ctAL. Dist.: T. Ref.: none. Habitat: Bog lakes.

Perithemis

Perithemis tenera (Say). UP: Chippewa; vii.23. SLP: Branch (B), Clinton (S), Ingham (S), Kalamazoo (S), Livingston*, Oakland (M,S), Shiawassee (K), Washtenaw; vi.16-ix.1. Life Zone: tAL. Dist.: E-2. Ref.: Garman, 1927: Pl. 13. Habitat: Boglike lakes.

The specimen from Chippewa County was undoubtedly a stray.

Plathemis

Plathemis lydia (Drury). UP: Alger, Baraga, Chippewa, Dickinson, Houghton, Isle Royale (S), Keweenaw (S), Luce, Mackinac, Marquette, Menominee (S), Ontonagon (R); vi.16-viii.3. NLP: Alpena (B), Arenac,

Benzie (B), Cheboygan (M,S), Crawford (M,S), Emmet, Gladwin, Iosco, Lake, Mecosta (B), Midland (D,M,S), Missaukee (S), Montmorency (S), Muskegon, Oceana, Oscoda, Otsego, Roscommon (D,M); vi.2-viii.6. SLP: Berrien (M,S), Clinton (S), Eaton (D), Genesee (S), Gratiot (D), Huron (D), Ingham (A,S), Jackson (B), Kalamazoo (S), Lapeer (D,M), Livingston* (D,M), Montcalm (B), Oakland, Saginaw, Shiawassee (K), St. Joseph, Van Buren (S), Washtenaw, Wayne; v.7-viii.21. Life Zone: cTAL. Dist.: T. Ref.: Garman, 1927: Fig. 63. Habitat: Bog lakes, ponds and marshes; sand-muck- and sand-marl-bottom lakes.

Sympetrum

Sympetrum ambiguum (Rambur). SLP: Washtenaw; vii.28.1919 (E. McCormick, coll.). Life Zone: tAL. Dist.: E-1. Ref.: Needham and Westfall, 1955: ♂, Figs. 308, 309; Needham, 1901: ♀, Fig. 30.

FIRST STATE RECORD. The species is most probably an occasional adventive in Michigan; the single male specimen represents the northernmost record west of the Alleghanies.

Sympetrum [= *Tarnetrum* Needham] *corruptum* (Hagen). UP: Isle Royale; vii.7. NLP: Bay, Charlevoix, Cheboygan, Oceana; vi.25-ix.6. SLP: Huron, St. Clair, Washtenaw, Wayne; iv.18-ix.19. Life Zone: cTAL. Dist.: T. Ref.: Needham and Westfall, 1955: Fig. 310.

The April 18 record is a female collected in Detroit, Wayne County, in 1931 by W. C. Stinson; this is unusually early for this essentially late-summer species; the next earliest record in the Southern Lower Peninsula is June 25.

Sympetrum costiferum (Hagen). UP: Alger, Chippewa, Delta, Dickinson, Gogebic (D,Hw,M), Houghton (D), Keweenaw, Luce, Mackinac (D,M), Marquette, Ontonagon; vii.25-ix.11. NLP: Bay (D), Benzie (B), Charlevoix, Cheboygan, Emmet, Grand Traverse (S), Iosco, Lake, Leelenau, Missaukee (S), Otsego; vii.7-ix.15. SLP: Huron, Tuscola (D); vii.20-viii.21. Life Zone: CTa. Dist.: NT-2. Ref.: Needham and Westfall, 1955: ♂, Figs. 308, 309; Needham, 1901: ♀, Fig. 30. Habitat: Bog lakes; sand-muck- and sand-marl-bottom lakes.

Sympetrum danae (Sulzer). UP: Chippewa, Dickinson, Keweenaw, Luce, Marquette (B), Schoolcraft (B); vii.17-ix.10. NLP: Charlevoix, Cheboygan (O); viii.5-viii.11. Life Zone: hCt. Dist.: NT-3. Ref.: Needham and Westfall, 1955: ♂, Figs. 308, 309; Needham and Heywood, 1929: ♀, Fig. 240.

Sympetrum internum Montgomery. UP: Chippewa, Dickinson (D,M), Gogebic (D,Hw,M), Houghton, Iron (D,M), Keweenaw, Isle Royale (S), Luce, Mackinac (D,M), Marquette, Menominee (D,M), Ontonagon (D), Schoolcraft; vi.23-ix.5. NLP: Alcona (D,M), Arenac (D), Benzie, Charlevoix, Cheboygan (D,M,S,Sn), Clare (D,M,S), Emmet, Gladwin (D,M), Iosco (D), Isabella (D), Manistee (D), Mason (D,M), Mecosta (D,M), Midland, Missaukee (S), Montmorency (M,S), Ogemaw (D), Osceola (D,M), Oscoda (D,M), Otsego (D), Presque Isle, Roscommon, Wexford (D); vi.24-ix.14. SLP: Barry (S), Gratiot (A), Ingham (S), Montcalm, Oakland; vii.5-viii.26. Life Zone:

hCTa. Dist.: NT-2. Ref.: Needham and Westfall, 1955: ♂, Figs. 308, 309; Williamson, 1933: ♀, Pl. 1. Habitat: Bog marshes and creeks; sand- and sand-marl-bottom lakes and ponds.

The earlier confusion of *Sympetrum internum*, *S. obtrusum*, and *S. rubicundulum* (see Williamson, 1933, and Montgomery, 1943) necessitated a re-examination of all specimens of these species from Michigan which were available for study. Many specimens listed by Byers (1927) as *obtrusum* or *rubicundulum* are *internum*.

Sympetrum obtrusum (Hagen). UP: Alger, Baraga (H), Chippewa, Delta, Dickinson, Gogebic (D,Hw,M), Houghton (D,M), Iron (D,M), Keweenaw (D,M), Isle Royale (D,M,S), Luce, Mackinac, Marquette, Ontonagon (D,M,S), Schoolcraft (D,M); vi.28-ix.12. NLP: Antrim, Arenac (D,M), Bay (D,M), Charlevoix, Cheboygan (D,M,Sn), Clare (M,S), Emmet, Gladwin, Iosco, Isabella (D), Kalkaska, Lake, Leelenau, Mecosta, Midland (D,M), Missaukee (D,S), Montmorency (M,S), Newago, Oceana, Osceola (D,M), Otsego (D,M), Presque Isle (D,M), Roscommon (M,S), Wexford (D); vi.20-ix.26. SLP: Barry (S), Berrien, Clinton (S), Gratiot (A), Huron (D,M), Ingham (S), Jackson, Kalamazoo (S), Kent (S), Lapeer, Livingston*, Montcalm, Oakland (M,S), Ottawa (D), Saginaw (D,M), Shiawassee (S), Tuscola (D), Washtenaw, Wayne; vi.8-ix.21. Life Zone: CTA. Dist.: NT-2. Ref.: Needham and Westfall, 1955: ♂, Figs. 308, 309; Needham, 1901: ♀, Fig. 30. Habitat: Bog lakes and marshes; sand- and sand-marl-bottom lakes.

Sympetrum rubicundulum (Say). UP: Alger (P), Baraga (H), Houghton, Keweenaw, Marquette; vii.2-viii.28. NLP: Bay (D,M), Cheboygan, Clare, Grand Traverse (S), Iosco, Isabella (D,M), Lake, Mecosta (D), Midland (D,M), Missaukee (S), Ogemaw (D,M); vi.19-ix.16. SLP: Barry (D,S), Berrien, Branch, Calhoun (M,S), Clinton (D,S), Genesee (D), Huron, Ingham (M,S), Ionia (D,S), Jackson, Kalamazoo (S), Kent (D,S), Lapeer, Livingston*, Montcalm, Oakland (M,S), Shiawassee (S), St. Clair, Van Buren (S), Washtenaw (M,S), Wayne (D,M); vi.1-ix.10. Life Zone: tA. Dist.: CT. Ref.: Needham and Westfall, 1955: ♂, Figs. 308, 309; Williamson, 1933: ♀, Pl. 1. Habitat: Bog lakes.

Sympetrum semicinatum (Say). UP: Marquette; viii.16. NLP: Missaukee (S); ix.8. SLP: Barry (S), Jackson, Kalamazoo (S), Livingston*, Oakland, Shiawassee (K), St. Joseph; vi.24-viii.20. Life Zone: cTA. Dist.: E-3. Ref.: Needham and Westfall, 1955: ♂, Figs. 308, 309; Needham, 1901: ♀, Fig. 30.

Sympetrum vicinum (Hagen). UP: Alger, Chippewa, Delta (D), Dickinson (D,M), Gogebic, Iron (D), Luce, Marquette, Schoolcraft (B); vii.16-ix.3. NLP: Charlevoix, Cheboygan, Clare (S), Emmet, Gladwin, Grand Traverse (S), Iosco, Lake, Mason (D,M), Midland (D), Missaukee (S), Oceana, Otsego, Presque Isle, Roscommon (M,S); vii.7-ix.21. SLP: Barry (D,S), Clinton (S), Genesee (D), Gratiot (A), Huron, Ingham (S), Kalamazoo (S), Kent (M,S), Lapeer, Livingston*, Oakland, Shiawassee (K), Tuscola, Van Buren (D), Washtenaw, Wayne; vi.23-x.24. Life Zone: cTA. Dist.: NT-1. Ref.: Needham and Westfall, 1955: Figs. 308, 309. Habitat: Bog lakes; sand-, sand-marl-, sand-muck-bottom lakes.

Tramea

Tramea carolina (Linnaeus). SLP: Washtenaw; v.20. Life Zone: tAL. Dist.: E-2. Ref.: Garman, 1927: Fig. 63.

This species is probably an occasional adventive in Michigan.

Tramea lacerata Hagen. NLP: Charlevoix, Cheboygan (E); vi.20. SLP: Huron, Oakland, St. Clair, Washtenaw; vii.23-ix.19. Life Zone: ctAL. Dist.: ST. Ref.: Needham and Heywood, 1929: p. 253.

SUMMARY

One hundred and fifty species and one subspecies, representing the Odonata that occur in Michigan, are listed. Of these nineteen taxa are recorded for the state for the first time. For each taxon distribution, season, and habitat, in whichever of the three principal regions of the state (Upper Peninsula, Northern Lower Peninsula, and Southern Lower Peninsula) it occurs, is given. Physiographical and ecological characteristics of these state divisions are discussed. I have proposed the three zoogeographical categories, Eastern, Transcontinental, and Western, and have analyzed the Michigan odonate fauna according to this system. In the Introduction aspects of the history of odonatology in Michigan are reviewed and several papers dealing with the Michigan dragonflies are discussed.

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