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ARGIA, the quarterly news journal of the **DSA**, is devoted to non-technical papers and news items relating to nearly every aspect of the study of Odonata and the people who are interested in them. The editor especially welcomes reports of studies in progress, news of forthcoming meetings, commentaries on species, habitat conservation, noteworthy occurrences, personal news items, accounts of meetings and collecting trips, and reviews of technical and non-technical publications. Articles for publication in **ARGIA** should preferably be submitted and hard copy and (if over 500 words) also on floppy disk (3.5" or 5.25"). The editor prefers MS DOS based files, preferably written in WORD, WORD for WINDOWS, WordPerfect, or WordStar. Macintosh WORD disks can be handled. All files should be submitted **unformatted and without paragraph indents**. Each submission should be accompanied by a text (=ASCII) file. Other languages should be submitted only as text (=ASCII) files. Line drawings are acceptable as illustrations.

T. Donnelly (address above) is the interim editor of **ARGIA.**

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DISTRIBUTION RECORDS OF THE ODONATA OF MONTANA[1]

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ABSTRACT

Eighty-two species of Odonata are known from Montana, including sixteen species reported here for the first time. Fifteen previously reported species are discredited. Additionally, eleven species are predicted to occur in the state. County records, adult seasonal distributions, and notes on biology and natural history are presented for the eighty-two species. Important publications on Montana Odonata are reviewed. Some problems associated with early records of Montana Odonata are lack of good locality data, poor curatorial techniques and mislabelling. Montana Odonata display four distinct distributional patterns: eastern species in the prairie, boreal species in the mountains, western species in northwestern Montana and southern species in warm springs.

INTRODUCTION

Despite the fact that Odonata is among the best known groups of insects in North America (McCafferty et al. 1990), the Montana fauna has remained relatively poorly known. This is probably due to the region's few collectors compared to the eastern United States or the West Coast. Montana has great diversity of aquatic habitats from alpine lakes to prairie potholes and high-gradient mountain streams to sluggish prairie rivers. Also, the state lies in an area where several major habitat regions and dragonfly faunal elements meet. As a result, Montana has a diverse assemblage of odonate species.

Early publications dealing with Montana Odonata have led to many subsequent problems. Many of these records are based on damaged specimens or uncertain locality data. Even so, they have been perpetuated by later publications.

Hagen (1861) was the first to mention Odonata from what is now Montana. These records were attributed to the "upper Missouri" which, it seems likely, was the Missouri River above the confluence with the Yellowstone River, in present-day Montana. The specimens may have been collected on a railroad survey, but the paper does not specify. In this report, he described the first dragonfly from the state, ***Sympetrum madidum*** (as ***Diplax madida***), and listed ***Aeshna multicolor*** Hagen.

The first listing of species from the region was Hagen's (1873) treatment of the "Odonata from the Yellowstone." The 23 species he listed were based on specimens collected during the Hayden survey expeditions (1871 and 1872) to the Yellowstone National Park area (Hayden 1873; Haines 1977). These surveys were primarily explorations of the geography of the newly-established Yellowstone Park, but they also included other aspects of natural history observation including geology, botany and entomology (Haines 1977). Both of the expeditions began in Ogden, Utah, and proceeded to Fort Ellis near present-day Bozeman, Montana, and from there south into the Park (Haines 1977). In addition to Yellowstone, the surveys also explored several large regions in Montana, including areas north of present-day Bozeman (Hamilton 1964). Insect collecting began in Ogden and continued throughout the survey (Thomas 1873). Most of the odonates were apparently collected by C. Thomas on the first expedition (Hagen 1874), and it is not clear whether Odonata

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were collected in 1872, though Hagen (1874) attributes some specimens to that year. Thomas did not participate in the second expedition (Haines 1977).

Hagen's (1873) report of the Odonata collected on the survey is unreliable for a number of reasons, and the records have been questioned by later authors (e.g. Molnar and Lavigne 1979). The specimens were clearly poorly curated on the expedition since Hagen (1873, 1874) referred to many of them as "a fragment," "imperfect," and "specimens in bad condition." Some individual specimens were actually divided between two vials (Hagen 1874). Hagen had even lost some of the specimens by the time he wrote his next paper (Hagen 1874). Given these conditions, it's not improbable that specimens were mislabelled as well. Many of the questionable records are southern species which could have been collected south of Yellowstone in habitats that are more likely to contain them. Hagen was also inconsistent with some of his data. For example, he confused the two species, ***Erythemis collocata*** (Hagen) and ***E. simplicicollis*** (Hagen). He (1874) claimed to have named ***E. collocata*** from a specimen taken in the Yellowstone expedition, when, in fact, he originally described the species from the Pecos River, western Texas (Hagen 1861). It was actually ***E. simplicicollis*** that he reported from Yellowstone (Hagen 1873). These types of misidentifications and lapses support the view that many of his reported records are unreliable.

This early paper (Hagen 1873) and later repeated records (Hagen 1874, 1875), subsequently led to a great deal of confusion in the literature. Most of the problems stem from the fact that Hagen only referred to the specimens as being from "the Yellowstone." This has been often misinterpreted as meaning the Yellowstone River, which is primarily in Montana. It is more likely that it referred to the newly-established Yellowstone Park, which the Hayden Expedition was sent to survey, and which was, at that time, entirely in what is now Wyoming. Later authors, including Johnson (1973), Muttkowski (1910), Needham and Heywood (1929), Newell (1970) and Hagen (1875) himself accepted his (1873, 1874) records as being from Montana.

In spite of the ambiguous nature of these early records, we have included them in this account for the following reasons; 1) the surveys included areas of Montana, and the species could have been collected in the state, 2) most of the records have been supported by contemporary collecting, 3) any dragonfly that occurs in Yellowstone Park probably occurs in Montana, and 4) the records have been ascribed to Montana repeatedly by later authors, and their validity needs to be finally clarified.

Hagen (1874) repeated his earlier records and clarified some of them. He also described two new species, ***Diplax atripes*** (=***Sympetrum costiferum*** (Hagen)) and ***Diplax decisa*** (=***Sympetrum rubicundulum*** (Say)), using specimens from the Hayden surveys in the descriptions. In addition, he added ***Sympetrum illotum*** (Hagen) (as ***Mesothemis illota*** Hagen) and an unspecified ***Argia*** to the state list.

After Hagen's contributions, other authors added species to Montana's list. Selys (1878) described ***Herpetogomphus montanus*** (=***Ophiogomphus severus montanus*** Hagen) from Montana. Williamson (1900) mentioned ***Amphiagrion abbreviatum*** (Selys) from the state. Calvert (1907) reported ***Libellula comanche*** from Montana and Yellowstone in the species description. Martin (1907) described ***Somatochlora ensigera*** from a single female from Montana. Muttkowski (1910) listed Montana species in his catalogue, though these were probably taken from previous publications not examined in this study. Needham and Heywood (1929) listed a total of 12 species from the state. Needham and Westfall (1955) listed 12 Anisoptera from Montana and Yellowstone. Kormondy (1960) listed 9 new species from Montana. Newell (1970) added 22 species to the list (despite his claim of 31) and listed all the species reported from the state at that time. Bick and Hornuff (1974) added 17 previously unreported species and several subspecies. Roemhild (1975) was the first to present a thorough treatment of the Zygoptera of the state. This work included keys in addition to distributions and added two species to the state list. Bick (1990) added ***Epitheca spinigera*** Selys to the list. Miller and Ivie (1995) described the damselfly ***Enallagma optimolocus*** from Montana specimens. No recent publications provide a comprehensive list of Montana Odonata.

DISTRIBUTIONAL PATTERNS OF MONTANA ODONATA

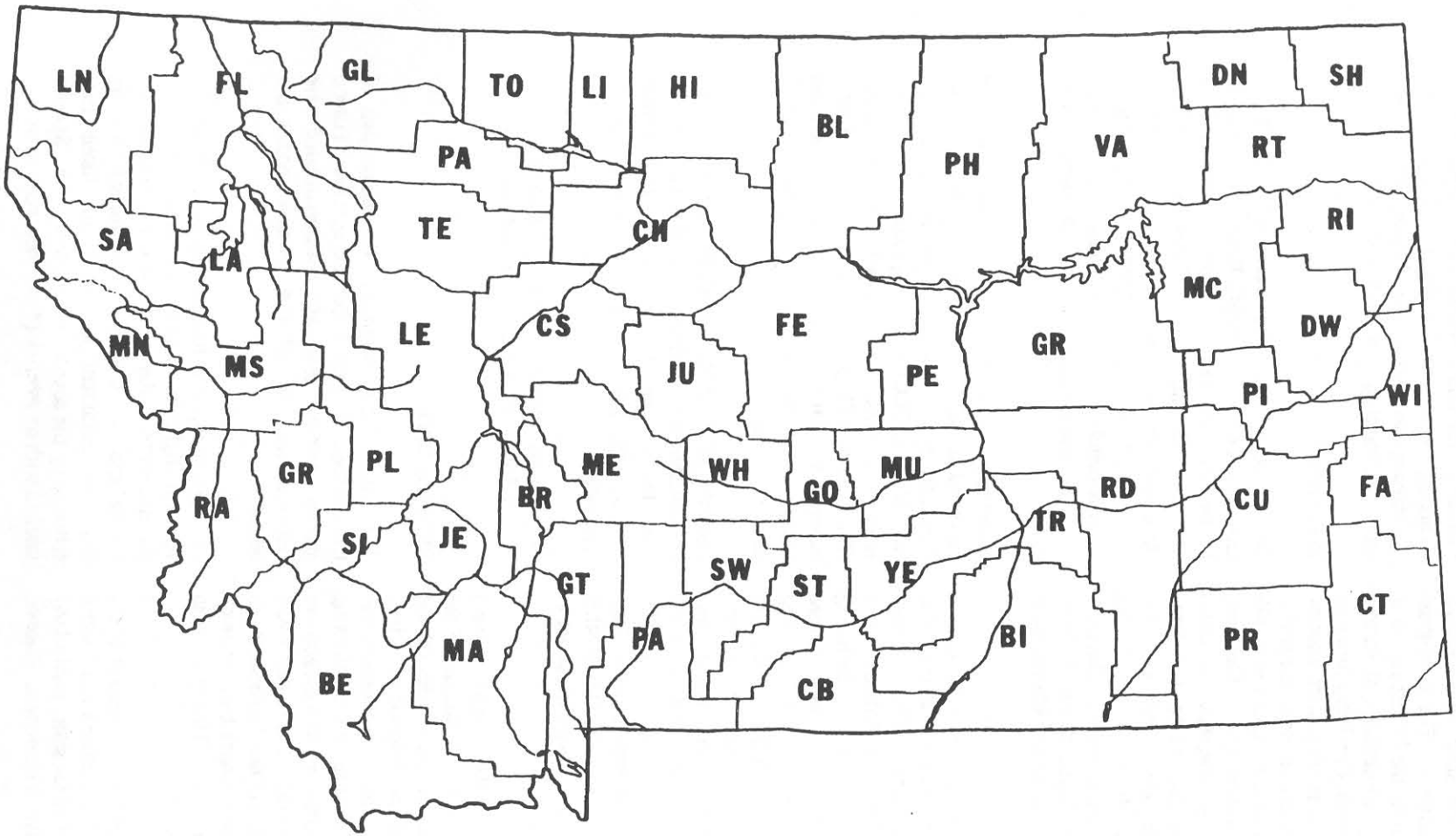

Figure 1, Montana Counties.

Beaverhead BE
Big Horn BI
Blaine BL
Broadwater BR
Carbon CB
Carter CT
Cascade CS
Chouteau CH
Custer CU
Daniels DN
Dawson DW
Deer Lodge DE
Fallon FA
Fergus FE
Flathead FL
Gallatin GT
Garfield GR
Glacier GL
Golden Valley GO
Granite GN
Hill HI
Jefferson JE
Judith Basin JU
Lake LA
Lewis & Clark LE
Liberty LB
Lincoln LN
Madison MA
McCone MC
Meagher ME
Mineral MN
Missoula MS
Musselshell MU
Park PA
Petroleum PE
Phillips PH
Pondera PN
Powder River PR
Powell PL
Prairie PI
Ravalli RA
Richland RI
Roosevelt RT
Rosebud RD
Sanders SA
Sheridan SH
Silver Bow SI
Stillwater ST
Sweet Grass SW
Teton TE
Toole TO
Treasure TR
Valley VA
Wheatland WH
Wibaux WI
Yellowstone YE

Although many species, such as ***Libellula quadrimaculata*** Linnaeus, and ***Enallagma boreale*** Selys, occur throughout the state, other species display several distinct patterns. The short-grass prairie of Montana comprises the largest region in the state and has a large assemblage of eastern species. The Rocky Mountain Cordillera forms an effective western barrier to many eastern species, and several reach their western limits in the prairie region. Some of these include ***Ischnura verticalis*** (Say), ***Enallagma antennatum*** (Say), ***Gomphus externus*** Hagen and ***Arigomphus cornutus*** (Tough). This region is drained by two large rivers, the Missouri in the north and the Yellowstone in the south. A small, but ecologically significant, portion of the southeastern counties is drained by the Little Missouri River. This is the only drainage in which ***Macromia*** is known to occur.

The mountains that form a barrier to eastern species also provide a corridor for boreal species to extend their ranges southward. The mountain lakes, ponds and bogs provide habitat for a characteristic odonate fauna including ***Leucorrhinia glacialis*** Hagen, ***Aeshna juncea*** (Linnaeus), ***Aeshna subarctica*** Walker and ***Somatochlora hudsonica*** (Selys). The high gradient mountain streams contain few species. The continental divide bisects this region, and many of the peaks rise to over 3000 meters. In the northeastern portion of the mountains is the St. Mary River which drains north into Hudson's Bay. While this river is ecologically significant for other organisms (such as fish), no odonate is known to be restricted to this drainage.

The northwestern counties of the state also have a rich fauna of northern species, and, because of the mild, wet climate, western nearctic species inhabit the area as well. Some of the dragonflies include ***Cordulegaster dorsalis*** and ***Ophiogomphus occidentis***. This region requires more collecting since it seems likely that other western dragonflies may extend inland in this area. The largest rivers in the state, the Clark Fork and the Kootenai, drain this region even though the drainage basin is much smaller than others in the state. This testifies to the region's higher precipitation.

The final significant pattern of distribution is the warm spring fauna. Montana contains many warm springs in the western part of the state, particularly near the tectonically active Yellowstone Plateau. These springs provide habitat for many dragonflies including several southern species. Some species, including ***Libellula saturata*** Uhler, ***Argia alberta*** Kennedy, ***Erythemis collocata*** (Hagen) and ***Erpetogomphus designatus*** Hagen, are known only from warm springs in Montana.

METHODS

Several collections were examined: the D. L. Gustafson Collection (DLGC, Bozeman), the K. B. Miller Collection (KBMC, Fort Collins), and the Montana Entomological Collection (MTEC, Bozeman). Records were also obtained from the T. W. Donnelly Collection (TWDC, Binghamton). Approximately 4000 specimens (adults and nymphs) were examined during the course of this study.

Voucher specimens for adults of these species are deposited in MTEC except ***Somatochlora walshi*** (Scudder) and ***Pantala flavescens*** (Fabricius) (KBMC and DLGC), ***Ophiogomphus occidentis*** Hagen (KBMC), ***Somatochlora albicincta*** (Burmeister) (TWDC and DLGC), and ***Lestes forcipatus*** Rambur, ***Somatochlora ensigera*** Martin and ***Libellula composita*** (Hagen) which are literature records.

Hagen's (1873, 1874) records for which there are no contemporary specimens available are removed from the permanent state list except Libellula composita (Hagen) for which Montana may be the type locality.

Only county records are listed for each species. County locations and abbreviations are shown in Fig. 1.

SPECIES LIST

The current list of Montana Odonata consists of ten families, 26 genera and 82 species. Fifteen species records that are unsubstantiated are removed from the list and 16 new species are added.

The species name is followed immediately by the seasonal flight distribution, the author first citing the species from the state, and the county records for the species. County records for which there were no specimens examined are listed first followed by the source of the information. Species marked with an asterisk (*) are new state records.

ZYGOPTERA

Calopterygidae

Calopteryx aequabilis Say, 17 Jun-7 Aug, Newell 1970, FL GT MS. Known only from western Montana, associated with slower, clear streams.

Hetaerina americana (Fabricius), 8 Jun-18 Aug, Hagen 1873 (as ***H. californica*** Hagen), VA (Roemhild 1975) BI CT CS FA FE MU PE PH PR RD YE. Although Johnson (1973) doubted Hagen's (1873, 1874) records, its presence was later verified by Roemhild (1975). It is found throughout eastern Montana around small streams, and also at warm springs in the Little Rocky Mountains (Blaine and Phillips Counties).

Lestidae

Lestes congener Hagen, 18 Jul-11 Oct, Hagen 1873, BE BI BL BR CB CT CS CH CU DE FA FE FL GT GR HI JU MA MC MS PA PN PR PI RA RI RT RD SH ST SW TE TO YE. Common throughout the state at many habitats.

Lestes d. disjunctus Selys, 11 Jun-8 Nov, Hagen 1873, BE BR CS CU DE FE FL GT JU LA LE MA MS PA PL RA SH SW TE WH YE. Common in western Montana, more rare farther east. It is occasionally associated with warm springs.

Lestes dryas Kirby, 2 Jun-21 Aug, Newell 1970, FE (Donnelly, in litt.) BE CT CS DE FL GT JU LA LE LN MA MC MS PA RA RT RD SW. Common throughout the state. It is generally associated with ponds surrounded by *Typha* sp.

Lestes unguiculatus Hagen, 25 Jun-31 Aug, Newell 1970, BI BL CB CT CS CH CU DN DW FA FE FL GT GR HI JU LA LN MA MC MS PH PN PI RI RT RD SA ST SW TE TO TR VA. Our most common ***Lestes***. It is found throughout the state along streams and springs.

Lestes forcipatus Rambur, DW (Bick and Hornuff (1974), who only recorded the county) Known only from a male and female. Further collecting is required to determine its status in the state.

Coenagrionidae

Amphiagrion abbreviatum (Selys), 25 May-24 Sep, Williamson 1900. BE CB CT CS CU FE FL GT GN LA LE LN MA MC MS PA PH PN RA RD SA SW WH. It has a broad range in Montana, at slow streams, warm springs and seeps.

Argia alberta Kennedy, 24 May-1 Oct, Newell 1970, BL GN MA PH SA. Only known from warm springs in western and central areas of the state. It is often associated with ***A. vivida*** Hagen.

Argia emma Kennedy, 14 Jun-8 Aug, Newell 1970, CT FL GT LN ME PN RD YE. Our only ***Argia*** abundant in cooler streams. It has not been collected from warm springs.

Argia fumipennis violacea (Hagen) 29 Apr, 8 Jun-9 Aug, Roemhild 1975, BL CT MC PH. The least common ***Argia*** in the state. It is found only in far eastern Montana in slow streams. It is also found in warm springs in the Little Rocky Mountains (Blaine and Phillips Counties) in great abundance. The April record is from a dead, teneral female found on the shoreline of Landusky Plunge Warm Spring (Blaine Co.).

Argia vivida Hagen, 5 Jun-1 Oct, Muttkowski 1910, CB CT FE GT GN MA PH RA RD SA. Nymphs and adults are common at western Montana warm springs. Also occurs in some eastern prairie streams.

Coenagrion angulatum (Walker), 19 May, Roemhild 1975, HI WI. The first record of this species by Roemhild (1975), from one collection in Hill County (MTEC), was the only state record until Miller found specimens in 1994 at a roadside pool near Baker. It is common in North Dakota (Bick et al. 1977) and is probably more common in Montana than collections indicate.

****Coenagrion interrogatum*** (Hagen), 31 May-3 Jul, FL. Collected at two sites in the county, Spencer Lake near Whitefish and Howe Lake in Glacier National Park, both of which are boggy lakes in coniferous forest.

Coenagrion resolutum (Hagen), 23 May-13 Aug, Newell 1970, BE CB CT DE FL GT GL GN LA LE LN MA MS PA PI PL PN RI SW WH. Very common, locally abundant species at a variey of habitats.

Enallagma anna Williamson, 23 May-1 Oct, Newell 1970, ME MS (Donnelly in litt.) BI CB CT FA FE FL GT GL GN LA LE MA MU PA PH PN PR RD SW VA WH. Common stream species.

Enallagma antennatum (Say), 10 Jun-29 Jul, Bick and Hornuff 1974, DW (Bick and Hornuff 1974) CT GR MC PR RT VA. Relatively common in far eastern Montana.

Enallagma boreale Selys, 16 May-8 Sep, Newell 1970, MS (Donnelly in litt.) BE BI BL CB CT CH DN FA FE FL GT GL GN HI JU LA LE LN MA MC MU PA PH PL PN RA RI RT SA SH SW TE WH YE. Very common throughout the summer at a variety of habitats.

Enallagma carunculatum Morse, 5 Jun-1 Oct, Newell 1970, BI BR CB CT CH FA FL GT GN LA MA MC MS MU RI RD WI YE. Common stream and pond species.

Enallagma civile (Hagen), 29 May-29 Aug, Newell 1970, CT CU FA GT PH RI RD WI. Relatively uncommon in the state. It has not been found west of Continental Divide in Montana. Roemhild's (1975) record from Lake County is a misidentified specimen of ***E. carunculatum*** (Miller and Ivie 1995).

****Enallagma clausum*** Morse, 3 Jul-18 Aug, BE BL BR FE GT MC PH TE. Uncommon in Montana. Adults have been found at reservoirs, streams and ponds.

Enallagma cyathigerum (Charpentier), 20 May-8 Sep, Newell 1970, BE BI BL BR CB CT CH DN DE FA FE FL GT GN HI LA LE LN MA MC MN MS PA PH PI PN RI RT RD SA SH SW TE WH WI. One of our most common odonates. Found in all habitat types.

Enallagma ebrium (Hagen), 10 Jun-24 Aug, Newell 1970, GN MS (Donnelly in litt.) BI BL CB CT CU DN FA FL LA LN MA MC PH RI RT RD SA WI. Common and locally abundant species at ponds with emergent vegetation.

Enallagma hageni (Walsh), 10 Jun-18 Aug, Bick and Hornuff 1974, DW YE (Bick and Hornuff 1974) BL CT CH CU FA FE HI MC PH PN RI RT RD WI. Occurs east of the mountains at streams and ponds.

Enallagma praevarum (Hagen), 13 Jun-26 Aug, Bick and Hornuff 1974, BI BL CT CH FE GR MC MU PH PR RD. Found east of the mountains, usually along streams. It occurs at warm springs in the Little Rocky Mountains (Phillips and Blaine Counties).

Enallagma optimolocus Miller and Ivie, 24 Jun-25 Aug, Miller and Ivie 1995, FL LE MA. Found along slow, clear streams.

Ischnura cervula Selys, 26 May-1 Oct, Newell 1970, BL CT CS CH CU DN FE FL GT GR LA LN MA MC ME MS PH PN RD SA ST SW TE YE. Very common species around emergent vegetation.

Ischnura perparva Selys, 25 May-20 Sep, Muttkowski 1910, GN (Donnelly in litt.) BI BL CB CT CS CU DW FE FL GT GR LA LE LN MA MC ME MS PH PA PR PL PN RT RD SW TE WH YE. Very common species, widespread in Montana.

Ischnura verticalis (Say), 19 May-26 Aug, Bick and Hornuff 1974, BI CT CU DN DW FA HI MC RI RT VA WI. Common species of eastern Montana ponds and streams.

Nehalennia irene (Hagen), 31 May-24 Aug, Bick and Hornuff 1974, FL LA LN MS. Nymphs and adults are common and often very abundant in northwestern and west-central Montana in bogs and lake margins with emergent vegetation.

ANISOPTERA

Aeshnidae

Aeshna californica Calvert, 4 Jun-17 Jul, Bick and Hornuff 1974, LA (Bick and Hornuff 1974), CT FL GR LN MC PL SA. Most commonly collected in western Montana at lakes and ponds. Our earliest ***Aeshna***.

Aeshna canadensis Walker, 8 Jul-10 Sep, Bick and Hornuff 1974, LA (Bick and Hornuff 1974) FL LN MS. At boreal bogs, streams and lake margins with emergent vegetation.

Aeshna constricta Say, 29 Sep, Hagen 1873, RD. The only recent record of this species from the state is from Far West Pond. Since it is widespread in North Dakota (Bick et al. 1977) it may be more common in Montana than collections indicate. Hagen (1873) reported it as common from the "upper Missouri".

Aeshna eremita Scudder, 18 Jul-10 Sep, Kormondy 1960, BE FL LA LE MS. Our largest

Aeshna. Nymphs and adults are found at boreal lakes in western Montana.

Aeshna interrupta Walker, 27 Jun-10 Oct, Kormondy 1960, MS (Donnelly in litt.) BL MC (Bick and Hornuff 1974) BE BR CB CT CU FL GT GN HI LA MS PA PH RI RD TE. One of our most common ***Aeshna***. Found at many habitats, including warm springs. The three subspecies, ***A. i. lineata*** Walker, ***A. i. interrupta*** and ***A. i. interna*** Walker were reported from the state by Bick and Hornuff (1974), Newell (1970) and Kormondy (1960), respectively. No consistent distributional patterns of the subspecies were noted during this study. Bick and Hornuff (1974) found ***A. i. lineata*** in Blaine, Flathead and McCone Counties. Kormondy (1960) reported ***A. i. interna*** from Flathead County.

Aeshna juncea (Linnaeus), 4 Jul-16 Sep, Bick and Hornuff 1974, BE FL GN LN MS. Occurs in the mountains at boggy ponds and lake margins. It is probably more common, but these habitats are poorly collected.

Aeshna multicolor Hagen, 12 Jun-1 Oct, Hagen 1861, CT FA FL GT GN HI LA PH RD SA. Uncommon in the state. Nymphs and adults are found in lowland ponds and in warm springs.

Aeshna palmata Hagen, 1 Jul-10 Oct, Kormondy 1960, BE BI CB CT FA FL GT GR JU LA LE LN MA MS PA PH PR RA ST SW. Our most common ***Aeshna***. It is found in most habitats including warm springs. It is often encountered far from water.

Aeshna sitchensis Hagen, 8 Jul-16 Sep, Bick and Hornuff 1974, GN LA LE. Our smallest aeshnid. Collected from wet meadows in the Swan River Valley (Lake County), Skalkaho Pass (Granite County) and near Indian Meadows (Lewis and Clark County).

****Aeshna subarctica*** Walker, 16 Sep, GN. Four males of this species were collected at Mud Lake, near Skalkaho Pass by M. Hooten and Gustafson. This northern Nearctic species probably occurs in other boreal areas of western Montana.

****Aeshna tuberculifera*** Walker, 26 Jul-16 Sep, FL GN MS. This species was believed to have an eastern distribution with a disjunct Vancouver Island population until Paulson and Garrison (1977) reported it from eastern Washington. These Montana records support their hypothesis that the species is more widespread in the West than thought. In Montana, we have collected males more rarely than females at oviposition sites, which are lakes and ponds with emergent vegetation. All females examined were homeochromatic.

Aeshna umbrosa Walker, 8 Jul-24 Sep, Newell 1970, FL GN LA MA MS RA. Relatively common in western Montana. Found along streams or wave-swept lake shores where it seems to replace ***A. palmata***. Both ***A. u. occidentalis*** and ***A. u. umbrosa*** have been listed from Montana by Bick and Hornuff (1974) and Newell (1970), respectively. ***A. u. occidentalis*** is the most common in the state. No consistent distributional patterns were noted for the two subspecies in the state.

Anax junius (Drury), 23 May-27 Aug, Bick and Hornuff 1974, LA (Bick and Hornuff 1972) BR CT CU FA FL GT MC PI RD WI. Relatively common in Montana. There are early- and late-season populations. The early individuals may be migrants from farther south. The later adults are ones that develop from eggs in Montana. Many nymphs have been collected from ponds in the state, but final-instar nymphs have only been collected in mid-summer.

Gomphidae

****Arigomphus cornutus*** (Tough), 9 Jun-5 Jul, CT FA. Collected from man-made reservoirs only, such as Rush Hall Lake, north of Baker (Fallon County), and MacNab Pond, near Ekalaka (Carter County), in southeastern Montana. At these sites, nymphs are also common.

****Erpetogomphus designatus*** Hagen, 1 Jul-20 Jul, BL PH. This record represents a significant range extension northward from the next closest record in South Dakota and is the northernmost record for the genus (Garrison 1994). It has only been collected at the large warm springs in the Little Rocky Mountains.

Gomphus externus Hagen, 8 Jun-15 Aug, Bick and Hornuff 1974, BI (Bick and Hornuff 1974) CT FA RI RD VA. Generally uncommonly found in larger rivers in eastern Montana. Also found in smaller plains streams and (as nymphs) in Rush Hall Lake (Fallon County), a man-made reservoir.

Gomphus graslinellus Walsh, 6 Jun-2 Jul, CT GR LN MC. Absent from mountains. It is uncommon in smaller, far-eastern plains streams. It is also found in northwestern Montana, which is predictable since it is found in British Columbia (Cannings and Stuart 1977).

Ophiogomphus severus Hagen, 9 Jun-25 Aug, Hagen 1874, BE CB FL GL GN MA MS PH PL RD YE. Our most common gomphid. Found in mountain streams, some plains streams and warm springs. ***O. s. severus*** and ***O. s. montanus*** (Selys) were reported by Hagen (1873) (as ***O. colubrinus*** Selys) and Selys (1878), respectively. ***O. s. montanus*** occurs mainly in northwestern Montana.

Ophiogomphus occidentis Hagen, 26 Jun, FL SA. This species has been collected from Clark Fork and Whitefish Rivers in the Columbia River drainage of western Montana. Most of the records are of nymphs. These records are the easternmost for the species.

Petaluridae

Tanypteryx hageni (Selys), 10 Jul, GT. The one record from Montana (MTEC) is a female labeled Bozeman, 1932. Unfortunately, no other label information is available (such as collector or specific locality). The specimen was apparently originally pinned, since it retains a hole dorsally and ventrally in the thorax. It is now in a clear envelope, and the original label has been lost. While this record is questionable because of the possibility of mislabelling of the specimen and the fact that no other specimens of this rare species have been found this far east, we have chosen to include it in the current treatment for several reasons. First, slow, trickling springs in boggy areas, the habitat of the species (Svihla 1959), are common in the state. Second, the record is not inconsistent with other distributional patterns of western flora and fauna which extend their ranges eastward into Montana (e.g. ***Ophiogomphus occidentis***). In addition, the collection of Odonata at MTEC contains virtually no specimens from the states where ***T. hageni*** has been found, and, therefore, there is no support for the conclusion that the MTEC specimen was collected from within the known range of the species. An awareness of the possible presence of this unique species in Montana may stimulate focused collecting in the species' habitat, which is probably the most poorly collected in Montana. This record should be considered provisional until additional specimens are found.

Cordulegastridae

Cordulegaster dorsalis Hagen, 24 Jul-17 Sep, Bick and Hornuff 1974, FL (Bick and Hornuff 1974) LA RA. Our largest odonate. It is uncommon, but its habitat type is poorly collected. We collected it at clear, boreal streams in the Swan River Valley (Lake County) and Blue Joint Warm Spring (Ravalli County).

Corduliidae

Macromia illinoiensis Walsh, CT. Known only from several nymphs from the Little Missouri River drainage in southeastern Montana. Despite the fact that ***Macromia*** nymphs are difficult to identify, these are assigned to ***M. illinoiensis*** because of their morphology, the known distribution of the species and the fact that the species is the most common in the genus (Needham and Westfall 1955). This species record should be considered provisional until adults are collected for positive identification.

Cordulia shurtleffi Scudder, 27 May-1 Aug, Newell 1970, BE CB FL GN LN MS PL SA. Widespread and locally abundant in western Montana.

Epitheca spinigera (Selys) (=***Tetragoneuria spinigera***), 4 Jun-13 Jul, Bick 1990, FL LN SA. Common spring species in northwestern Montana. Newell's (1970) report of ***E. cynosura*** may be this species (see below).

Somatochlora albicincta (Burmeister), 29 Jul-16 Sep, GN. Rarely collected and only from Mud Lake, near Skalkaho Pass. It should be present at other boreal lentic sites in Montana.

Somatochlora ensigera Martin, Martin 1907. Montana is the type locality for this species (Walker 1925). No specimens from Montana were available for this study, but it should occur at streams in the eastern part of the state.

Somatochlora hudsonica (Selys), 3 Jul-4 Aug, BE FL. Adults fly along grassy margins of mountain lakes and ponds.

Somatochlora minor Calvert, 31 Jul-16 Sep, Bick and Hornuff 1974, BE GN LA. Uncommonly

collected in Montana. Found along clear mountain streams.

Somatochlora semicircularis (Selys), 3 Jun-16 Sep, Newell 1970, BE FL DE GT GN LE LN MS PL SA. Common in boreal, marshy areas in western Montana.

****Somatochlora walshi*** Scudder, 25 Jun-24 Aug, FL LN. Known only from two specimens collected from Loon Lake (Lincoln County) and a boggy stream near West Glacier (Flathead County).

Libellulidae

Erythemis collocata (Hagen), 17 Sep, Hagen 1861 (as ***Mesothemis simplicicollis*** (Say)), MA. Paulson (1970) states that Montana ***Erythemis*** are this species, not ***E. simplicicollis*** (Say). ***E. collocata*** has only been found at Potosi Warm Spring in the Tobacco Root Mountains.

****Leucorrhinia glacialis*** Hagen, 11 Jun-28 Jul, FL LN MS. Found in northwestern Montana at mountain lakes and ponds with emergent vegetation. A male of this species was found in tandem with a teneral male of ***L. proxima.***

****Leucorrhinia borealis*** Hagen, 12 Jul, JU. Collected only once in Montana from a pond in the Little Belt Mountains.

Leucorrhinia hudsonica (Selys), 31 May-26 Aug, Kormondy 1960, BE FL GN LA LN MA SA. Relatively common in western Montana at boreal ponds with emergent vegetation.

Leucorrhinia intacta (Hagen), 20 Jun-3 Aug, Newell 1970, MS LA (Donnelly in litt.) BI CT FL GN LN PA RT SA WI. Very common and widespread in a variety of habitats.

Leucorrhinia proxima Calvert, 26 May-7 Aug, Bick and Hornuff 1974, CB FL LA LE MS SA. A western Montana species occurring in boreal ponds, bogs and lake margins with emergent vegetation. It is often extremely abundant. Several male-male-female "tandems" have been collected or seen. Males are red on the thorax and base of abdomen (western form) while females may be marked as in the male or with yellow.

Libellula composita (Hagen), Hagen 1873. Originally described from Montana by Hagen (1873), as ***Mesothemis composita***. This southern species has not been collected subsequently in the state. Hagen's specimens may have been collected in more arid areas farther south of Montana and mislabelled. The species is included here because Montana may be the type locality, but the record should be considered provisional until more specimens are collected.

Libellula forensis Hagen, 17 Jun-27 Aug, Hagen 1873, CT CU GT LA PR SW YE. Adults are often encountered at lowland ponds and slow streams.

Libellula julia Uhler (=***Ladona julia***), 3 Jun-30 Jul, Bick and Hornuff 1974, LA (Bick and Hornuff 1974) FL LN MS. Very abundant at boreal ponds, bogs and lake margins in northwestern Montana.

Libellula lydia Drury (=***Plathemis lydia***), 8 Jun-6 Aug, Newell 1970, CT CUGT JU LA LN PH RA. Relatively rare in Montana except in the northwestern counties. It is found at ponds.

Libellula pulchella Drury, 11 Jun-7 Aug, Newell 1970, CT FA GT JU LA MC RI RT SA WI YE. Uncommon, occuring primarily in ponds in plains region, but also occurs in warm springs.

Libellula quadrimaculata Linnaeus, 20 May-26 Aug, Kormondy 1960, BE BI CT FA FL GT GN LA LN MA MS PH RA SA SW WH. Extremely common in Montana. It occurs at nearly all habitats including warm springs.

Libellula saturata Uhler, 5 Jun-17 Sep, Hagen 1873, BL BT GN MA PH RA SA. Known only from warm springs in Montana. It is often very abundant.

****Pantala flavescens*** (Fabricius), 6 Aug, RD. Collected only at Far West Pond, near Rosebud, flying above a dirt road. These specimens may be vagrants from farther south.

Sympetrum corruptum (Hagen), 20 May-12 Oct, Hagen 1873 (as ***Mesothemis corruptum***), BE CB CT FA FE FL GT HI LA MA MC PH PN PR PI RA RD SA YE. Very common. Distinct early and late emergences have been observed in the state. A large migration of recently emerged adults was observed in Bozeman during August 1993 flying from the southeast to the northwest just above the ground. Another unidirectional mass movement was seen by Miller in the southern Big Horn Mountains in Washakie County, Wyoming in late

August, 1995. These movements were similar to those observed by Opler (1971) and Turner (1965).

Sympetrum costiferum (Hagen), 16 Jul-13 Oct, Hagen 1874 (as ***Diplax atripes*** Hagen), CT FL GT GN JU LN MA RD TE YE. Relatively common species at shallow ponds and lakes.

Sympetrum danae (Sulzer), 2 Jul-8 Nov, Hagen 1873 (as ***Diplax scotica*** Donovan), LA (Donnelly in litt.) BE BL FL GT JU LN MA MS PA SW. Common in western Montana. Hagen (1874) was unable to locate the Hayden Expedition specimens of ***D. scotica***. Kormondy (1960) verified the species from Montana.

Sympetrum internum Montgomery, 20 Jun-29 Sep, Kormondy 1960, BE CT CH CU DE DN FA FL GT GL HI LA MA MC PH RA RI RD SH. Very common in Montana. Occurs in many habitats. It has often been confused with ***S. rubicundulum*** (Say).

Sympetrum madidum (Hagen), 25 Jul-20 Aug, Hagen 1861, CT MA PH SW. Rarely collected in Montana. Hagen (1861) described the species from a single, damaged specimen from the "upper Missouri."

Sympetrum obtrusum (Hagen), 23 Jun-28 Sep, Hagen 1874 (as ***Diplax decisa*** Hagen), BE CT FA FE FL GT GN LA LN MA MS RA RD SW WI YE. Very common in the state. It occurs at many habitats, generally with emergent vegetation. Hagen (1873) reported ***D. assimilata*** as well as an undescribed species from the Hayden Expedition, both of which he later (1874) determined to be ***D. decisa***. ***D. decisa*** was synonymized, by Montgomery (1943), with ***S. obtrusum***. ***Sympetrum obtrusum*** was reported under this name for the first time from Montana by Kormondy (1960).

Sympetrum occidentale Bartenev, 8 Jul-10 Oct, Bick and Hornuff 1974, LA PA (Bick and Hornuff 1974) BI BL CB CT DW FL GT JU PA PH RI RD SW TE YE. Relatively common at lowland ponds. ***Symeptrum occidentale occidentale*** and ***S. o. fasciatum*** Walker were both reported from Montana by Bick and Hornuff (1974). The first occurs in northwestern Montana while the second occurs throughout the rest of the state.

Sympetrum pallipes (Hagen), 29 Jun-29 Aug, Newell 1970, BI CT FE GT GN JU MA MS PA. Very abundant and widespread in habitats with emergent vegetation. A dark form occurs in western Montana and a pale form occurs in the rest of the state.

DISCREDITED SPECIES

The following species have been reported from Montana, but either identifications were later changed, or the species are unlikely to occur in the state, and no specimens were observed during this study. The species name is followed by the author who reported the species and the reason for its removal.

Aeshna propinqua Scudder (=***A. verticalis*** or ***A. juncea*** Hagen), Hagen 1873. Hagen was unsure of his first identification of this species but later (1874) asserted its validity. The name has been considered a synonym of either of two species (Walker, 1912), one of which ***(A. juncea***) occurs within the state. Hagen's record could also apply to ***A. canadensis***, which was subsequently split from ***A. verticalis*** and which is common in the state.

Argia aquasable Newell, Newell 1970. This name, attributed to Hagen by Newell, is a *nomen nudum*.

Calopteryx maculata Beauvois, Newell 1970. This species was reported by Newell (1970) from a badly damaged female specimen from Flathead County (Johnson 1974). This record probably refers to ***C. aequabilis*** which is common in Flathead County, and not ***to C. maculata*** which is mainly an eastern species (Johnson 1974) and has an extremely small probability of occuring in northwestern Montana. In addition, extensive collecting in the Flathead Valley over several years has failed to produce any more specimens of ***C. maculata***. Therefore, based on Newell's (1970) record, the species is removed from the state list. However, see below under Possible Montana Species.

Sympetrum rubicundulum (Say) (***Diplax assimilata*** Hagen), Hagen 1873. Hagen reported this species but later (1874) changed the identification to ***Diplax decisa*** Hagen (=***Sympetrum obtrusum*** (Hagen)).

Epitheca cynosura (Say) (=*Tetragoneuria cynosura*), Newell 1970. Bick (1990) reported *E. spinigera* (collected by Newell in 1967 and Newell, Haick and Potter in 1970) in the Florida State Collection of Arthropods. Newell probably misidentified these specimens as *E. cynosura*, which is not known from the western United States.

Erpetogomphus viperinus Selys, Hagen 1873 . Hagen (1874) changed this identification to *E. compositus* Hagen (see below).

Erpetogomphus compositus Hagen, Hagen 1873 (as *E. viperinus* Hagen not Selys). This mainly southwestern species (Garrison 1994) has not been found again in Montana or Yellowstone. Hagen (1874) reported the species with trepidation since the teneral female specimen was a "fragment" (Hagen 1873) and in "very bad condition" (Hagen 1874). Garrison (1994) believes the citation may refer to a locality outside the Park, but doesn't indicate which state. It may have been collected south of Yellowstone and mislabelled. The possibility remains that the species might extend its range north in warm springs, as with *E. designatus* Hagen.

Ischnura demorsa (Hagen), Muttkowski 1910. It is possible, but unlikely, that this southwestern species occurs in the state, perhaps in warm springs.

Libellula comanche Calvert, Hagen 1873 (as *L. flavida* Hagen). The description included specimens from Montana and Yellowstone. See *L. flavida* Hagen, below.

Libellula flavida Hagen, Hagen 1873. Reported from only a "fragment" (Hagen 1873). Calvert (1907) may have used this information in his description of *L. comanche*. However, Hagen (1874) questioned his own record of the species from the Hayden Expedition since he no longer had the specimen. No additional material is available from Montana.

Libellula nodisticta Hagen, Hagen 1873. This southern species may occur in warm springs in the state, however, specimens have not been found since Hagen's record. His specimens from the Hayden Expedition may have been collected farther south and mislabelled.

Ophiogomphus colubrinus Selys, Hagen 1873. Hagen (1874) changed this determination to *O. severus* Hagen.

Pachydiplax longipennis (Burmeister), Hagen 1873 (as *Mesothemis longipennis* Hagen). No specimens have recently been found. See discussion below under Possible Montana Species.

Sympetrum illotum (Hagen), Hagen 1874. Reported from a headless female specimen. It has not been found since in Yellowstone or Montana.

Sympetrum vicinum (Hagen), Hagen 1873. Hagen (1874) was unable to subsequently locate these specimens. No individuals have since been collected in Montana or Yellowstone. See discussion below under Possible Montana Species.

POSSIBLE MONTANA SPECIES

The following species have been found from neighboring states and further collecting may establish their occurrence in Montana:

Archilestes californica McLachlan. Found in Latah County, northern Idaho (Logan 1967) in "pond and pond-like habitats." It may occur in northwestern Montana.

Archilestes grandis (Rambur). Reported from Teton County, Wyoming (Molnar and Lavigne 1979).

Calopteryx maculata Beauvois. This species is removed from the Montana list based on Newell's (1970) record from Flathead County (see above). However, *C. maculata* is found in South Dakota (Bick et al. 1977) and may occur in southwestern Montana.

Ischnura damula Calvert. Found in Wyoming (Bick and Hornuff 1972; Molnar and Lavigne 1979), the Dakotas (Bick et al. 1977), and British Columbia (Cannings and Stuart 1977). It probably occurs in Montana.

Libellula luctuosa Burmeister. Found in Butte and Meade Counties, South Dakota (Bick et al. 1977). It may be found in southeastern Montana.

Macromia magnifica McLachlan. Occurs in large rivers in southcentral British Columbia (Cannings and Stuart 1977) and Washington (Paulson and

Garrison 1977). It may occur in the Kootenai or Clark's Fork drainages in Montana.

Pachydiplax longipennis (Burmeister). Occurs in Kootenai County, Idaho (Logan 1967). It may occur in northwestern Montana.

Somatochlora cingulata (Selys). Occurs in southern British Columbia and Alberta (Cannings and Stuart 1977) and Wyoming (Molnar and Lavigne 1979). It may occur in western mountains of Montana.

Somatochlora franklini Selys. Reported from Banff, Alberta and Field, British Columbia (Cannings and Stuart 1977). It may occur in Montana's northern mountains.

Sympetrum rubicundulum (Say). Carle (1993) indicates that the range of this species may extend into Montana. However, no specimens have yet been found which can verify the species in the state.

Sympetrum vicinum (Hagen). Occurs in North Dakota (Bick et al. 1977) and Idaho (Logan 1967). It may be found in Montana.

FUTURE INVESTIGATIVE POSSIBILITIES

Much work remains to be done on Montana Odonata distribution. As discussed, several species are predicted to occur in the state and, as yet, have not been found, and many species are known from very limited collecting data. Future work should concentrate on habitat-specific collecting in those areas which are undercollected for Odonata. The areas greatly in need of collecting include 1) warm springs, where other southern species may occur, 2) boreal bogs and ponds where the northern Nearctic fauna is still somewhat unknown, 3) the northwest, particularly in bogs and larger rivers, where western species may be collected and 4) streams and springs in the southeast where other eastern species may be found. General collecting throughout the state will continue to be valuable since the known distribution of many species is still limited, and new state records are always a possibility. Updates on Montana Odonata research, and Montana aquatic invertebrates in general, can be located at the World Wide Web site: **http://rivers.oscs.montana.edu/dlg/aim.html**, "**Aquatic Invertebrates of Montana**."

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