

THE
DRAGONFLIES
OF
INDIANA.

BY
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BLUFFTON, IND.

LETTER OF TRANSMITTAL.

BLUFFTON, IND., December 15, 1899.

Mr. W. S. Blatchley, State Geologist, Indianapolis, Ind. :

DEAR SIR—I have the honor of sending you herewith a paper on the Odonata of Indiana, prepared at your request and according to your suggestions. Your wish was that this paper might include keys and descriptions of the species of dragonflies found in the State, thus furnishing students a means of identifying their specimens. While preparing the manuscript the compiler has tried to keep in mind the needs of those who may wish to know these beautiful and interesting insects by name.

Yours, very respectfully,

E. B. WILLIAMSON.

INTRODUCTION.

During the autumn of 1898, Mr. R. J. Weith and the writer prepared a list of the dragonflies known to occur in Indiana. This paper recorded 83 species for Indiana, giving for each the locality, date of capture, and collector's name. When this list was sent to Mr. Blatchley he requested that it be enlarged to include descriptions of the various species. Mr. Weith kindly gave me permission to use his notes and the present compilation has been prepared. I have attempted to give short descriptions of the species known to occur within the State, as well as of those which are most likely to be found in the future. The present list includes 84 species as positively recorded; one species of *Enallagma* is described as new. But little collecting has been done in the State, and the number is certain to exceed a hundred.

Thanks are due a number of persons for aid in the preparation of this paper. Dr. Calvert and Mr. Hine have given me help in the identification of material and in other ways. By Dr. Calvert's kindness I am privileged to use his key for nymphs as published in his Philadelphia Catalogue. Mr. Adams has furnished me a list of Illinois species as known to him. Mr. R. J. Weith, Elkhart, Mr. C. C. Dean, Bluffton, and Mr. Blatchley, have furnished many of the records. I have given these collectors credit under each species. The bulk of Mr. Weith's material was examined and a list of the species prepared by Dr. Calvert. Mr. J. B. Parker, instructor in English in the Ohio State University, has kindly prepared the etymology of the scientific names. Dr. Calvert also has helped with this work. The etymology of *Macromia*, as given, is according to his advice, the name probably referring to the equally long tarsal nails. Throughout the paper the writer, because of his inability in many cases, has not attempted to point out the application of the scientific names. To my late friend and instructor, Professor Kellcott, I owe all the interest and pleasure I have found in collecting and observing these insects. In the compilation of the paper free use has been made of the writings of different authors on the Odonata whenever it has seemed desirable to do so.

THE DRAGONFLIES OF INDIANA.

BY E. B. WILLIAMSON, BLUFFTON, IND.

* * * * *
To-day I saw the dragonfly
Come from the wells where he did lie.

“An inner impulse rent the veil
Of his old husk: from head to tail
Came out clear plates of sapphire mail.

“He dried his wings: like gauze they grew;
Thro' crofts and pastures wet with dew
A living flash of light he flew.”

—Tennyson.

The order *Odonata* (Gr. *odous*, a tooth, probably referring to the toothed mandibles), including the insects commonly called dragonflies, snake-feeders, snake-doctors, spindles, devil's darning needles, etc., may be briefly characterized as follows: Metamorphosis incomplete, that is, the young, from the hatching of the egg until the adult stage is reached, are active, the larval and pupal stages are not sharply defined, and at no time in its life history does the insect pass into a quiescent state corresponding to the pupa of a butterfly, bee, or other of the more highly specialized orders. Nymph aquatic. Imagoes mandibulate, that is, mouth parts adapted to biting. Wings four, membranous, netted-veined, the hind wings as large or larger than the front wings; all the wings usually provided with an opaque colored spot, the pterostigma, near the apex. Tarsi three-jointed. Antennae awl-shaped, inconspicuous.

Dragonflies are easily recognized and can hardly be mistaken for insects of any other order. One or more of the characters given above will serve to separate them from the Mayflies, the stoneflies, and some of the neuroptera to which they bear a slight resemblance.

The order *Odonata* is naturally divided into two suborders, three families and seven subfamilies.

ODONATA.

Suborder *Zygoptera*.Family *Agrionidae*.Subfamily *Calopteryginae*.Subfamily *Agrioninae*.Suborder *Anisoptera*.Family *Aeschnidae*.Subfamily *Gomphinae*.Subfamily *Cordulegasterinae*.Subfamily *Aeschninae*.Family *Libellulidae*.Subfamily *Cordulinae*.Subfamily *Libellulinae*.

These groups will be defined in the key to the genera. In the family *Agrionidae* belong our small slender species. The largest species occurring in the State belongs to the *Aeschnidae*, a family which includes some of the strongest fliers. The *Libellulidae* occurring in the State are mostly large species, though two or three are quite small, but the body is always robust and not slender and thread-like, as in most of the *Agrionidae*.

Life History.—The egg hatches in fresh or brackish water. From this time till the final change to the adult winged stage the insect is known as a nymph or larva. It leads an active predaceous existence, feeding on all forms of aquatic life which it can overpower. "The nymphs, as well as the adults, exhibit the malignant side of life that lived and sported about the marshes of the remote Tertiary period."—Kellicott. Some of the *Aeschnines* are known to be cannibalistic. Stefanelli has observed that nymphs of *Aeschna cyanea*, a European species, at night come out of the water and destroy the newly emerged imagoes of the same species.

Nymphs are known to feed on small fish. A European observer reports that 50,000 young fish were placed in a pond in the spring. In September only 54 remained, but there were immense quantities of dragonfly larvae. An *Agrionine* nymph was seen by the writer clinging to the abdomen of a dead catfish, upon the flesh of which it was evidently feeding. Within an hour a nymph of *Aeschna constricta* killed and partially consumed seven toad tadpoles, measuring about 13 mm. in length. Nymphs of larger species feed on nymphs of smaller species and all fall prey to fish, salamanders and crayfish.

The nymphs of the suborder *Zygoptera* propel themselves through the water by a serpentine motion. Those of the suborder *Anisoptera* expel water from the rectum and thus drive themselves forward.

The nymph undergoes successive moults, increasing in size and progressing in its development. Finally it crawls from the water upon

some object near at hand. After some time the skin splits across the top of the head and along the back and the adult or imago emerges, leaving the exuvia clinging to its support.

The imago for some time after its transformation is pale; the wings and body gradually expand to their full extent; and finally the bright colors of the mature insect appear. These pale, newly emerged individuals are known as teneral. The collector can recognize them as they fly by their shimmering wings and weak flight. The bodies and wings are soft and the colors are pale, obscure yellowish, bluish or brown. Individuals of some species, as they grow older, become covered with a whitish or bluish powder which may entirely obscure the earlier colors. This is especially true of the males. Such individuals are said to be pruinose.

With its advent into an aerial life our dragonfly becomes one of the most beautiful of insects. Strong, rapacious and daring, possessed of striking individualities, they offer the rarest sport to the collector who frequents their haunts, observing the many idiosyncrasies of these lords of insect creation. Here little *Perithemis domitia* goes quietly and politely about his business, flitting from lily-pad to sedge stem, making his observations on the beauty of the day and the large number of diptera which are abroad. *Plathemis lydia* comes along, rudely inquiring into everyone's affairs, for our *Plathemis* is either a restless busybody or an immaculate dandy who displays himself on some sunny log or rock. Then piratical *Anax junius* rushes up, makes a dash at *Plathemis*, glances at *Perithemis* and passes out of sight into the woods along the shore. And in the sedges all this time myriads of emerald and sapphire forms fight and make love in their different ways.

The food of the imagoes consists almost entirely of other insects, though some are known to occasionally eat the flesh of dead animals. Mr. F. S. Webster has observed *Libellula auripennis* feeding on fresh crocodile flesh. Of the insects eaten diptera are more preferred than any other order, though all soft bodied insects seem to fall prey to their ravenous appetites. Larger species eat their smaller relatives. Leaf-hoppers and other Hemiptera and Lepidoptera are consumed. *Mesothemis simplicicollis* may occasionally be seen to pick some resting moth from a weed or grass stem. Mr. J. L. Graf, Pittsburg, saw a dragonfly attack and overpower a large *Papilio*. The writer once took a female of *Cordulegaster obliquus* which was holding a large wasp in its mandibles.

The adult dragonfly has little to fear from other insects. A large robber fly has been observed carrying a teneral *Sympetrum rubicundulum* which it had doubtless killed. Birds, however, eat large numbers of Odonata. The skin of a female pigeon hawk collected in Cape May County, New York, now in the Carnegie Museum, bears this label: "Stomach full of dragonflies." The smaller hawks, shrikes, cuckoos and

flycatchers are the birds which most frequently feed upon Odonata, but none of these species at any time make them their exclusive article of diet. Fish occasionally dash at female Libellulines when they are ovipositing, but the writer has never seen the dragonfly injured by these attacks. Agrionines, which habitually descend beneath the water to oviposit, are no doubt frequently eaten by sunfish. Spiders occasionally entrap teneral dragonflies. Dr. Calvert records a young spider, *Dolomedes sexpunctatus*, feeding upon the soft parts of *Ischnura verticalis* and *Nehalennia posita*. In the webs of a large black and yellow spider, *Argiope*, the writer has found the remains of *Argia violacea*, *Libellula pulchella*, *Sympetrum rubicundulum* and *Mesothemis simplicicollis*. In the case of *Argia violacea* alone, the dragonflies were fully matured. The nymphs as well as the adults, from their feeding habits, are freely exposed to the entrance of intestinal parasites. Red mites, *Acarina*, are frequently found on the under surface of the thorax or abdomen of imagoes.

In pairing, the male dragonfly grasps the female by the prothorax (*Agrionidæ*) or by the occiput and rear of the head (*Aeschnidæ* and *Libellulidæ*) with his abdominal appendages. So held, the female curves her abdomen forward beneath her thorax till the vulva (vagina) at the ventral apex of the eighth abdominal segment is brought into contact with the accessory genital organs of the male, which are situated on the ventral surface of the second abdominal segment. Before copulation, the male, by curving his abdomen, transfers the sperm from the opening of the vas deferens on the ventral surface of 9 to the vesicle on the ventral surface of 2. The females usually proceed to ovipositing immediately after copulation. The *Agrionidæ*, the *Aeschninæ*, and probably the *Petaluroid Gomphinæ* and the *Cordulegasterinæ* place their eggs within the tissues of aquatic plants. Some of the *Agrionines* (*Lestes*, *Argia*, *Enallagma*) frequently descend beneath the water during oviposition, backing down a submerged stem or other support and placing the eggs successively at greater depths. At such times the male may or may not retain his hold of the prothorax of the female. The ovipositor is formed by the prolongation and modification of the vulvar lamina, the apex of the sternum of the eighth abdominal segment. In all the forms with an ovipositor, excepting the *Cordulegasterinæ*, two flaps which lie on either side of the ovipositor are developed from the sternum of the ninth abdominal segment. These are the genital valves. In the *Libellulidæ* and the *Gomphinæ*, excepting the *Petaluroids*, there is no ovipositor and the eggs are either dashed into the water or are attached by a gummy matter which surrounds them to submerged objects. Oviposition in plant tissues is known as endophytic; when the female dips her abdomen into the water and the eggs are left either floating or attached to some object, it is known as exophytic oviposition. In endophytic or exophytic oviposition the male may or may not retain his hold of the prothorax or head of the female.

Many species may be observed to pair more than once. This is true of *Libellula pulchella* in which copulation and oviposition follow in immediate succession for several times. On these occasions each act of copulation may take place with a different male. The possibility of range of individual variation of the offspring of each female is thus greatly increased.

The development of the egg and the hatching of the nymph require from six to twenty-one days, depending on the species.

Geological and Geographical Range. More than 100 species of fossil Odonata have been named. These belong to 27 genera. Thirteen of these genera are extinct, while the remaining number are represented by species living in the world to-day. All of the seven subfamilies are represented by extinct species. The oldest remains are those of the *Gomphinae*, *Aeschninae* and *Libellulinae* from the Lower Lias in England and Germany. The *Calopteryginae*, *Agrioninae* and *Cordulegasterinae* appear first in the Oolite, the lithographic slates, in Germany. The *Cordulinae* occur first in the Eocene in Italy.

Dragonflies are found all over the world within the limits of permanent human habitation. The northern and southern limits, as far as known, are 70° N. and 55° 30' S.

Kirby, in the preface to his Synonymic Catalogue, says: "Comparatively few recent species of the suborder Odonata are known at present—about 1,800, or rather more than half as many as those belonging to the least numerous classes of Vertebrata, such as Mammalia or Reptilia; and very much fewer than those of the larger families of such orders of insects as Coleoptera or Lepidoptera." Calvert, in his Philadelphia Catalogue, places the number of species at 1,922, distributed in 321 genera. The Neotropical species (Tropical Mexico, Central and South America, adjoining islands, the West Indies) number 570; Nearctic (America, north of Mexico) 258; Palæarctic (Europe, Asia, north of the Himalayas and west of the Indus, Arabia and Africa, north of the Tropic of Cancer, and the adjoining islands) 292; Ethiopian (Africa and Arabia south of the Tropic of Cancer, and adjacent islands) 217; Oriental (Asia, east of the Indus and south of the Himalayas, Ceylon, Sumatra, Java, Borneo and the Philippines) 436; Australian (Australia, Tasmania, New Zealand, New Guinea, Celebes and the intervening islands) 193; and Polynesian (the islands of the Pacific from the Australian Province to the Sandwich Islands, the Marquesas and the Low Archipelago) 42. These numbers, as given by Dr. Calvert, represent the total number of species recorded for each zoo-geographical area. A large number of species may occur in two or more of these areas. *Pantala flavescens*, for example, is found in Asia, Africa, America and islands of the Pacific.

Since Dr. Calvert made the above estimates, no less than 20 genera and 150 species have been described as new. The number of dragonflies now known to live in the world is about 2,100. The number recorded for Great Britain is 45, for France 70, and for all Europe 120. Professor Kellicott and his associates have taken 100 species in the State of Ohio. Even a larger number will doubtless be found to inhabit Indiana. The number of species of butterflies and of dragonflies to be found in the State is very nearly the same. That this number is decreasing for the Odonata, however, there can be little reasonable doubt. The draining of marshes and lakes, especially in the northern part of the State, and the pollution of many of the streams by sewage and the waste from oil wells and manufactories, will reduce the habitable areas, and thus tend to condense the species at more favorable locations. Perhaps this may explain the sudden appearance at some suitable locality of one or more species never before observed there. Under such conditions many species are certain to disappear. One man's lifetime is not sufficient to observe any appreciable decrease perhaps, but if collections are made and reliable notes kept, these will some day prove of great value and interest in showing to what extent man's occupation of the country has affected the natural conditions originally existing there. That small streams are disappearing, that marshes are becoming smaller and lakes shallower, that in the Upper Wabash the fish are dying and the Unionidæ have almost disappeared—these are well known facts, whatever may be the cause or causes, and surely the Odonatological fauna, depending so intimately upon the streams, marshes and lakes, must be most deleteriously affected.

Writings on Dragonflies.—Hagen's *Synopsis of the Neuroptera of North America*, Smithsonian Institution, 1861, contains descriptions of most of the species found in Indiana. This work can occasionally be purchased from second-hand book dealers, both at home and abroad. Calvert's *Catalogue of the Odonata of the Vicinity of Philadelphia, with an Introduction to the Study of this Group of Insects*,* contains a very full account of the anatomy, life histories and relationships of the Odonata, a bibliography, and descriptions, with keys to genera of imagoes and nymphs of the species known and presumed to occur within a radius of 20 miles from Philadelphia. Banks' *Synopsis, Catalogue and Bibliography of the Neuropteroid Insects of Temperate North America*,† gives keys to the genera, a list of the species and a bibliography to the literature of the subject. Kellicott's *Odonata of Ohio*‡ contains keys to the genera and species taken in Ohio, and full descriptions of the species. Most of the monographic work on the Odonata has been done by Baron de Selys-Longchamps, whose writings have been published in French. Bibliographies of his writings and

* Transactions American Ent. Soc., 1893.

† Transactions American Ent. Soc., 1892.

‡ Special papers of the Ohio Academy of Sciences, No. 2, 1899.

of those of other authors will be found in the works by Calvert and Banks mentioned above. Notes and descriptions appear from time to time in the entomological magazines of the country, especially the *Canadian Entomologist*, London, Ontario, Canada; the *Entomological News*, Philadelphia; and *Psyche*, Cambridge. Only three papers have been printed that deal directly with Indiana dragonflies. Thomas Say, in 1839, *Acad. Nat. Sci., Phila.*, Vol. VIII, pp. 9-46, published a paper entitled *Descriptions of New North American Neuropterous Insects, and Observations on Some Already Described*. Seventeen species are recorded for Indiana. Professor Kellicott, in the *Proc. Ind. Acad. Sci.*, 1895, under the title *The Odonata*, lists 14 species, represented in two collections sent him by Professor Eigenmann. The specimens were collected at Turkey Lake, Kosciusko County, during July and August, 1895. In the Annual Report, Department Geology and Natural Resources, Indiana, W. S. Blatchley, 1897, the writer printed a short list of 25 species collected at Shriner and Round lakes, Whitley County, on September 2-4, 1897.

COLLECTING AND PRESERVING.*

Nymphs.—Professor Needham, in the *Canadian Entomologist* for April, 1897, pp. 94-96, gives directions for collecting nymphs, which we may quote in part: "The nymphs, which are all aquatic, have an interesting distribution in depth. Those of the *Agrionidae* and of most *Aeschninae* cling to floating or submerged vegetation. These, at least, every aquatic collector has seen. Those of the *Libellulidae* sprawl upon the bottom amid fallen trash. Those of *Gomphinae* burrow shallowly along beneath the film of sediment that lies on the bottom, with the end of the abdomen turned up for respiration.

"It is very easy to collect them, especially in the spring. A garden rake with which to draw ashore the stuff to which they cling, and a pail of water in which to carry them home, is all the apparatus desirable at that season. Later, when a new growth of weeds is rooted fast to the bottom, the rake will have to be exchanged for a water-net. Withdrawn from the water, the nymphs render themselves evident by their active efforts to get back, and need only to be picked up. The places apt to yield the best collecting are small permanent pools, shallow inlets in the shores of lakes, and the places where the trash falls in the eddies of streams.

"They are quite as easily reared. I have found common wooden kits and pails half-filled with water, with screen or netting covers, entirely satisfactory. A number of nymphs, if near one size, may safely be kept

*See Bull. of the U. S. Nat. Mus., No. 39, Part O, "Directions for collecting and rearing dragonflies, stoneflies and Mayflies," by James G. Needham, Ph. D.

together (excepting only a few notoriously cannibalistic *Aeschninae*, e. g., *Anax junius*), and, if not grown, may be fed upon such small insects as a net will gather in any pond. (Small insects, which may be swept from grass and herbage with the beating net, will also serve them as food.) A good square meal once a week will keep them thriving. The water should be reasonably clean. Three things should be carefully observed: (1) there must be a surface up which they can climb to transform; if the sides of the kit are too smooth put in some sticks; (2) there must be room enough between the netting cover and the water for complete expansion of their wings; (3) they must remain out of doors where the sunshine will reach them. The last point especially is essential to success. But there is an easier way to do it, and one which, when a species is very common, will prove entirely satisfactory. If, when a species is becoming common, one will go to the edge of the water it frequents, at the time of its emergence, one may find nymphs crawling from the water, others transforming, imagoes drying their wings, and others ready to fly, and may thus obtain in a few minutes the material necessary for determining nymph and imago. The unfortunate thing about it is that many of the larger species transform very early in the morning, and to take such advantage of them one must be on the ground between daybreak and sunrise.

“Eggs also are easily obtained. If the ovipositing female be captured, held by the fore wings, leaving the hind wings free, and ‘dipped’ by hand to the surface of clean water in a vial or a tumbler, an abundance of eggs will usually be liberated. Eggs of those species which possess an ovipositor and which place them within the tissues of plants, may be obtained by collecting the stems in which they have been inserted. Eggs and nymphs should be dropped in boiling water for a minute and then preserved in alcohol.”

Imagoes.—During a favorable year in Indiana dragonflies may be found flying as early as the first of April, and as late as the first of November. The species are most numerous during the month of June. While certain species fly almost the entire season, others are to be found during only a short period. *Ischnura verticalis* and *Nehalennia posita*, two of the smallest species occurring in the State, and *Anax junius*, one of the largest, have the greatest seasonal range, appearing first, and being among the last to disappear. While most of the *Agrionidae* are easily captured, many species of the *Aeschnidae* and *Libellulidae* will be found to tax the skill and patience of the collector to the highest degree.

During the collecting season dragonflies may be found everywhere. Certain species will be found only in a certain environment, while others appear at home almost anywhere. *Heterina americana*, for example, never ranges far from the water’s edge, preferring the swift ripples of some stream, and being found but rarely about ponds or lakes. *Libellula*

pulchella, on the other hand, flies over every lake and puddle, explores every stream, from some twig or weed stem watches the traffic along a hot country road, and catches diptera in the open woodland. Small lakes with shores margined by rushes and sedges will prove the richest in the number of species, but the streams, fields and woods will yield others which seldom, if ever, visit the lakes. About Shriners and Round lakes, in Whitley County, 46 species have been observed. This is as large a number as has been recorded for Great Britain.

Males and females of the same species may differ greatly in their habits. The females of many of the *Libellulinae* and *Gomphinae*, especially, may conceal themselves among the rank herbage bordering some stream or lake, going only to the water to oviposit, while the active males of the same species constantly patrol the shore on the lookout for the females and for their insect prey. Immature males also of such species may frequent sheltered retreats. High winds drive species from their accustomed resorts, when they may seek shelter in deep woods, houses, etc. During the spring of 1899 Mr. J. L. Graf took four species which entered his home in Pittsburg—*Gomphaschna furcillata*, *Epiaschna heros*, *Tachopteryx thoreyi* and *Macromia illinoensis*. *Calopteryx maculata* and *Aeschna constricta* have been found in houses by the writer. *Epiaschna heros* is the only species, however, which seems to habitually seek protection from the weather in this way. Rarely great numbers of a species may appear. *Libellula quadrimaculata* frequently migrates in great flocks which darken the sky. Other species have also been observed in migratory swarms.

In the collecting and preserving of specimens the same general rules that apply to butterflies will hold here. It is impossible to repeat the carefully written and illustrated articles of several authors on this subject, and the student is referred to the following works: (1) *Directions for Collecting and Preserving Insects*, by C. V. Riley. Part F, Bull. U. S. Nat. Mus., No. 39, 1892; (2) *Taxidermy and Zoological Collecting*, by William T. Hornaday; Chas. Scribner's Sons, N. Y., contains a chapter by W. J. Holland on *Collecting and Preserving Insects*; (3) *The Butterfly Book*, by W. J. Holland, Doubleday & McClure Co., N. Y. This contains an illustrated chapter on collecting and preserving butterflies. In addition to the directions to be found in the above and other works, a few hints applicable especially to dragonflies may be given.

In the field, specimens may be carried in an ordinary cyanide bottle for two or three hours with safety. If they are left too long in the presence of the fumes of potassium cyanide, however, the colors are irrevocably ruined. During a day's trip the contents of the bottle may be placed from time to time between sheets of glazed cotton or in paper envelopes, in a cigar box. In this way a large number of specimens can be carried safely and conveniently.

When specimens are papered or placed in envelopes these should be of soft paper, and the specimens, after being dried, should be packed loosely to avoid crushing and breaking. If the envelopes are of stiff, heavy paper, there is danger of the eyes and other parts being pressed out of shape. Pinned specimens should have a bristle, pin or wire passed from the ventral surface of the thorax, between the pro- and mesothorax, or from the nasus, through the abdomen to its tip. The bristle should not pass beyond the abdomen, nor should it press the abdominal appendages from their natural position. The supporting wire or bristle prevents the otherwise almost certain breakage of pinned specimens. When expanding *Agrionidae*, in order to have a nicely proportioned specimen, the front wings and hind wings should be so placed that a line between them is at right angles to the body. In species of other families which have the base of the hind wings dilated, as in *Tramea* and *Pantala* for example, the hind wing should be drawn forward till the entire wing lies flat, and the front wings should then be placed just in advance of the hind wings. The abdomen should be straight, and the thorax and abdomen should lie in the same line, with the abdomen neither drooping nor upcurved.

The colors of dragonflies are likely to fade, and this is especially true of the bright blues and greens. The reds and yellows are most beautifully preserved in some species. Metallic coloration, as in the genus *Colopteryx*, is permanent. In larger species the colors may sometimes be retained with some degree of success by removing the thoracic and abdominal contents through a ventral longitudinal slit cut for the purpose, and by then replacing the parts removed with a small roll of paper in the abdomen and a small piece of cotton in the thorax. In performing this operation care must be exercised not to scrape or injure the body wall. Keeping specimens alive until the intestinal contents have been discharged has also been recommended. Specimens dropped into 95 per cent. alcohol as soon as they have been killed in the cyanide bottle; retain all their colors perfectly if not exposed to continuous light. Papered specimens, if the envelopes be of a loose porous paper like newspapers, may be dried very rapidly by placing them in the direct rays of the sun, if possible where there is a good draught of air. Smaller species, like the *Enallagmas*, may be almost perfectly preserved in this way. Under any circumstances, when the specimen is pinned or papered, rapid drying is most essential for the preservation of the colors. Pinned specimens should of course never be exposed to the direct rays of the sun.

Entomological supplies, pins, cork, insect cases, etc., may be purchased from a number of reputable dealers: M. Abbott Frazar, 93 Sudbury Street, Boston; Fred. Kaempfer, 88 State Street, Chicago; Queen & Co., 1010 Chestnut Street, Philadelphia; A. Smith & Sons, 269 Pearl Street, New York. The black, tempered steel pins made by

Kirby, Beard & Co., London, and for sale in this country by Dickerhoff, Raffloer & Co., Broadway, New York, are the best. Numbers 3 and 5 will be found the most convenient. In the study of specimens a small lens will be required. The No. 7 Doublet, made by Bausch & Lomb Optical Co., Rochester, N. Y., will answer for most purposes where a microscope is not required.

In the keys and descriptions which follow, the abdominal segments are represented by the Arabic numerals 1-10; the descriptions apply, unless otherwise stated, to maturely colored specimens; unless otherwise mentioned, the wings are hyaline; measurements are in millimeters; they are for average sized individuals, and may vary as much as one-sixth for particular specimens; 25 millimeters equal very nearly one inch; the length of abdomen includes the abdominal appendages; ab. and h.w. mean abdomen and hind wing respectively.

Great variations, especially in neuration, occur in some individuals, hence several specimens of a species are desirable; in identifying a species it is desirable, often necessary, to have both male and female specimens. The males are readily distinguished from the females by the stronger, more characteristically shaped abdominal appendages, and by the presence of the accessory genital organs of the ventral surface of 2. In those species which oviposit endophytically, the ovipositor is usually large and conspicuous. Many other differences exist in certain subfamilies and genera. So-called dimorphic females exist in some genera of *Libelluline* and *Agrioninae*. These are females which have the coloring or the neuration of the wings very different from the males or the ordinary females.

The following localities, mentioned throughout the paper, are found in the counties indicated:

Bluffton, Wells County.

Boot Lake, Elkhart County.

Chapman Lake, Kosciusko County.

Christina Creek, Elkhart County; tributary to the St. Joe River.

Eagle Lake, Kosciusko County.

Elkhart, Elkhart County.

Elkhart River, Elkhart County; tributary to the St. Joe River.

Frantz Fishpond, Wells County.

Goose Lake, Kosciusko County.

Indiana Lake, Elkhart County.

Round Lake, Whitley County.

Shriner Lake, Whitley County.

Simonton Lake, Elkhart County.

Turkey Lake, Kosciusko County.

Throughout the paper species have been designated by their scientific names. Any attempt to coin or establish common names for even the large and conspicuous forms will be more confusing than to simply use the specific names of the species. *Plathemis lydia* is sometimes spoken of as the "White-bodied snakefeeder." It will be as easy and more exact to refer to it as "lydia."

The belief in the harmfulness of "snakefeeders" is almost universal—their bite is poisonous, their sting fatal, they cause deafness by flying in people's faces, they sew up the ears of truants, and their best friends and most congenial associates are snakes—copperheads and rattlers preferred. As a matter of fact, they can inflict no injury on mankind, do not act as nurses or physicians to crawling creatures, and are not only harmless but, because of their destruction of mosquitoes, deerflies and other dipterous nuisances, are really beneficial. Many questions will be asked the collector of these insects by people whom he will meet in his search for specimens; and often his answers will lead his questioners to unjust conclusions concerning his mental capacity. The writer has been compelled to listen to the following: "Are you getting snakefeeders for fish-bait?"—"to eat?"—"to use their wings to make picture frames or ornaments?"—"or is there a bounty on them?"

SYSTEMATIC CHARACTERS OF NYMPHS.

This key is copied without change by permission of Dr. Calvert from his Philadelphia catalogue.

I. Three caudal tracheal-gills (*Zygoptera*).

Legion Calopteryx.—Basal joint of antennæ thick, more than twice as long as the other six together. Median lobe of labium bifid.

Front edge of median lobe of labium bifid to form a lozenge-shaped interval between which extends basally beyond the level of the attachment of the lateral lobes. Rear of head with a tooth each side. Median caudal gill flat, shorter than the other two.

CALOPTERYX.

Front margin of median lobe of labium bifid only as far basally as the level of the attachment of the lateral lobes. Abdominal segments with a lateral membrane whose margins are denticulated. Median caudal gill a little swollen at apex. HETERINA.

Subfamily Agrioninae.—Basal joint of antennæ hardly longer than thick, much shorter than the second or the third.

Lateral lobes of labium (excluding the terminal palp) deeply bilobed, median lobe barely bifid. *Legion Lestes*.

Lateral lobes of labium (excluding the terminal palp) not deeply bilobed, median lobe entire.

Legion Agrion.

The veins on the wing-covers will assist in determining between these two legions as in the imagoes.

II. No caudal tracheal-gills (Anisoptera).

Subfamily Gomphinae.—Antennæ 4-jointed, fourth joint rudimentary; first and second tarsi 2-jointed; labium flat, not covering the labrum or frons when closed.

First legs less distant from each other at base than are the second legs. Abdomen much less than twice as long as broad, very flat, almost circular when viewed from above. Third joint of antennæ large, flat, circular. HAGENIUS.

First legs as distant from each other at base as are the second legs. Abdomen at least twice as long as broad.

Middle third of front margin of median lobe of labium produced in a very short rounded lobe, with pavement teeth and a comb of flat scales. OPHIOGOMPHUS.

Middle third of the same straight or nearly so. GOMPHUS.

Subfamily Cordulegasterinae.—Antennæ 7-jointed; all tarsi 3-jointed; labium spoon-shaped, covering labrum and frons when closed, teeth on the opposed margin of the lateral lobes long, interlocking when closed so as to form a distinctly zigzag line of union. Abdomen two or three times as long as broad.

Characters of the subfamily. CORDULEGASTER.

Subfamily Aeschninae.—Antennæ 6-7-jointed; tarsi 3-jointed; labium flat, not covering labrum of frons when closed.

Antennæ 6-jointed.

Head broader than long; a lateral spine on 4-9, middle and inferior appendages of equal length. EPIÆSCHNA.

Antennæ 7-jointed; head broader than long.

Hind dorsal margin of 9 concave.

A lateral spine on 4-9, middle appendage sharply pointed. FONSCOLOMBIA. (BOYERIA.)

A lateral spine on 5-9, middle appendage bifid at tip.

GOMPHÆSCHNA.

Hind dorsal margin of 9 straight.

Eyes more prominent at the fore corner; labium at rest extending backward to the second legs; a lateral spine on 4, 5 or 6-9. Male projection conical. Female valves reaching apex of 9. ÆSCHNA.

Eyes more prominent in the middle; labium at rest extending backwards beyond second legs; a lateral spine on 7-9; middle appendage notched at tip, laterals half as long. Male projection cut at tip. Female valves shorter than 9.

ANAX.

Family Libellulide.—Antennæ 7-jointed; tarsi 3-jointed; labium spoon-shaped, covering labrum and frons when closed. Some Libelluline nymphs closely resemble those of the Cordulegasterinæ (*q. v.*), but may be distinguished by the teeth on the opposed margin of the lateral labial lobes being so short as to form an almost straight line of union when closed. Characters for separating Corduline from Libelluline nymphs are as yet unknown, as the latter subfamily has not been monographed.

Subfamily Cordulinæ:

An erect pyramidal horn on the front of the head.

No dorsal hook on 10; lateral spine on 9 reaching as far as level of tips of appendages. DIDYMOPS.

At least a small dorsal hook on 10; lateral spines on 9 much shorter than in *Didymops*. MACROMIA.

No erect pyramidal horn on the front of the head.

A tubercle on either side of the top of the head; 10 very short, a dorsal hook on 3-9, a sharp lateral spine on 8-9, those of 9 exceeding the appendages. EPICORDULIA.

No such tubercles.

Lateral spines of 8 very short, of 9 long, sharp, divergent, much longer than the appendages.

TETRAGONEURIA (group of *cynosura*).

Lateral spines of 8-9 flat, sharp, incurved; of 9 not longer than the appendages. SOMATOCHLORA (group of *libera*).

Subfamily Libellulinæ:

Middle (dorsal) terminal appendage a little longer than the inferiors (ventrals), all spinous. Teeth on opposed margin of lateral labial lobes flat, not interlocking, 8 and 9 with a long, sharp, incurved lateral spine. PANTALA.

Middle (dorsal) terminal appendages shorter than the inferiors, laterals without spines. Teeth on opposed margin of labial lobes much shorter than in *Pantala*, interlocking in a nearly straight line; otherwise as in *Pantala*. TRAMEA.

In the Canadian Entomologist, July, 1897, pp. 167-168, Professor Needham gives a table for the genera of Gomphine nymphs.

KEY TO THE GENERA OF DRAGONFLIES (*imagoes*) KNOWN OR PRESUMED TO OCCUR IN INDIANA.

Wings similar in size and shape, folded in repose (in *Lestes* usually held half-opened); eyes far apart; males with two superior and two inferior abdominal appendages. Nymphs with three caudal tracheal-gills.

Suborder Zygoptera, p. 247

Wings dissimilar, hind wings usually wider, horizontally expanded in repose; eyes touching or not so widely separated as in the *Zygoptera*; males with two superior and one inferior abdominal appendage. Nymphs without caudal tracheal-gills.

Suborder Anisoptera, p. 247

Zygoptera. Family Agrionidae.

More than two antecubitals.
Two antecubitals.

Subfamily Calopteryginae. 1.

Subfamily Agrioninae. 2.

1. Basilar space free; males without pterostigma, females with or without. *Calopteryx*, p. 251

Basilar space cross-veined; males with the base of the wings bright colored. *Heterina*, p. 253

2. Median and subnodal sectors arising from the principal sector much nearer the arculus than the nodus. *Lestes*, p. 255

Median and subnodal sectors arising near the nodus. 3.

3. Bristles of the tibiae twice as long as the spaces between them.

Argia, p. 260

Bristles of the tibiae shorter, never twice as long as the spaces between them. 4.

4. No apical spine on the sternum of 8 in the female. Pterostigma similar on front and hind wings in both sexes. 5.

An apical spine on the sternum of 8 in the female. 6.

5. No postocular spots or narrow occipital line; size larger, length of abdomen about 28. *Erythromma*, p. 264

Postocular spots or narrow occipital line present; size smaller, abdomen about 20 (16-23). *Nehalennia*, p. 265

6. No postocular spots; colors red and dull black; pterostigma similar on front and hind wings. *Amphiagrion*, p. 267

Postocular spots present. 7.

7. Pterostigma of front and hind wings similar; nodal sector arising near fifth postcubital on front wings, and near the fourth on hind wings. *Enallagma*, p. 267

Pterostigma of front and hind wings dissimilar in coloration in the male; nodal sector arising near fourth postcubital on front wings and near the third on hind wings. 8.

8. Pterostigma of front wings of male normal in position, darker than of hind wings. *Ischnura*, p. 277

Pterostigma of front wings of male removed from the costa, lighter than of hind wings. *Anomalagrion*, p. 280

Anisoptera.

Antecubitals of the first and second series not corresponding (excepting the first one and one other); triangles of front and hind wings generally of similar shape. *Family Aeschnidae*, p. 248

Antecubitals of the first and second series mostly corresponding; triangle of front wings with its long axis at right angles to the wing, of hind wings with its long axis coinciding with that of the wing.

Family Libellulidæ, p. 249

Family Aeschnidæ.

Eyes separated or meeting at a single point dorsally; females without genital valves (excepting in the Petaluroid Gomphinæ). 1.

Eyes meeting dorsally for some distance; females with genital valves.

Subfamily Aeschninæ. 7.

1. Eyes separated by at least the width of the pterostigma, usually more. *Subfamily Gomphinæ.* 2.

Eyes meeting at a single point dorsally, or just separated. *Subfamily Cordulegasterinæ*, represented by a single genus in Indiana. *Cordulegaster*, p. 299

2. Median lobe of labium bifid; pterostigma narrow, not less than 8 long. *Tachopteryx*, p. 281

Median lobe of labium entire; pterostigma not so long. 3.

3. Triangles usually with cross-veins. 4.

Triangles and supratrangular spaces free. 5.

4. Legs long, apex of last femora reaching to the base of 3.

Hagenius, p. 282

Legs short, apex of last femora reaching only to base of 1.

Progomphus, p. 283

5. Inferior appendage of male bifid, the two branches divergent; dark markings of the thorax distinct, often confluent. 6.

Inferior appendage of male bifid; the branches contiguous; thorax bright green with faint darker markings.

Ophiogomphus, p. 298

6. Last femora long, the apex reaching the base of 3, with numerous small spines, and among them several conspicuously larger ones. *Dromogomphus*, p. 296

Last femora shorter, with numerous short spines only.

Gomphus, p. 283

7. Upper and lower sectors of the arculus arising about equally distant from the median and submedian veins respectively; thorax not uniform green. 8.

Upper sector of arculus arising much nearer the median vein than does the lower sector to the submedian; thorax uniform green.

Anax, p. 305

8. Subnodal sector not furcate. 9.

Subnodal sector furcate. 11.

9. Triangle more than once crossed. 10.

Triangle once crossed, basilar and supratrangular spaces free.

Gomphaeschna, p. 301

10. Wings broad, basilar and supratrangular spaces cross-veined.

Boyeria, p. 300

Wings narrow, basilar space free, supratrangular cross-veined.

Basiaeschna, p. 301

11. Supplementary sector between subnodal and median sectors separated from the subnodal by one or two cells; hind wing 55 or more in length. *Epiæschna*, p. 302
 Supplementary sector between subnodal and median sectors separated from the subnodal by three to seven cells; hind wing 50 or less in length. *Æschna*, p. 303

Family Libellulidæ.

Eyes tubercled behind; males with auricles on 2, and anal margin of hind wings excavated. *Subfamily Cordulinae.* 1.

Eyes not tubercled; males without auricles on 2, and anal margin of hind wings not excavated. *Subfamily Libellulinae.* 6.

1. Supratrangular space crossed, sectors of the arculus more or less united at their origin. 2.
 Supratrangular space free, sectors of the arculus separate at their origin. 3.

2. Eyes touching at hardly more than a point; triangles free; occiput larger than vertex; hind wing less than 40 in length. *Didymops*, p. 307

Eyes touching for a short distance; occiput much smaller than vertex; hind wing 40 or more. *Macromia*, p. 307

3. Wings with some dark markings, at least at the base of the hind wings. 4.

Wings without dark markings; triangle of front wings free or crossed, of hind wings crossed, rarely free; hind wings with or without an internal triangle; colors metallic. *Somatochlora*, p. 312

4. Triangle of hind wings usually free, of front wings crossed; hind wings without internal triangle; black markings on hind wings only, or small at base of front wings. *Tetragoneuria*, p. 310

Triangle of hind wings crossed; dark markings on both wings. 5.

5. Wings with dark at base and apex and usually at nodus; hind wings without internal triangle. *Epicordulia*, p. 310

Wings with dark spots at base and along the front margin. *Neurocordulia*, p. 312

6. Hind wings very wide at base; the triangle of the front wings placed as far beyond the level of the triangle of the hind wings as the latter triangle is long. 7.

Not as above; triangle of front wings on a level with the triangle of the hind wings or only a little beyond it. 8.

7. Segments 3 and 4 with two, and 5 with one additional transverse carina; base of hind wing transparent, the anal margin yellowish or the anal angle with a fuscous spot. *Pantala*, p. 314

Segments 3 and 4 with one additional transverse carina; base of hind wings broadly colored for its entire width. *Tramea*, p. 315

8. Hind lobe of prothorax large, bilobed; supratrangular veins normally absent in front wings; antecubitals of front wings 10 or less in number, or, in *Mesothemis* (which has two rows of 5 to 7 strong spines on the last tibiæ) 11 or 12. 9.
- Hind lobe of prothorax narrower than the other lobes, its hind margin entire; supratrangular veins usually present in front wings, when absent more than 13 or less than 8 antecubitals in front wings; antecubitals in front wings more than 10 in number, excepting in *Nannothemis* (which has the triangle of the front wings four-sided), where there are 6 or 7. 14.
9. Size small; abdomen robust; wings uniform yellow (male) or marked with fuscous (female); hind wing not more than 20 in length; triangle of front wing free; sectors of arculus distinct at their origin; sectors of the triangle of the hind wings arising from its hind angle; an additional carina on 4; hamule of male not bifid. *Perithemis*, p. 317
- Size larger; body slenderer; triangle of front wings crossed; hamule of male bifid. 10.
10. Wings with dark markings beyond the nodus; pterostigma at least four times as long as wide; sectors of the arculus separate at their origin or connected for only a short distance; sectors of the triangle of the hind wings arising from its hind angle. *Celithemis* p. 318
- Wings without dark markings beyond the nodus. 11.
11. Wings black at extreme base; pterostigma not more than twice as long as wide; sectors of arculus usually distinctly stalked; sectors of the triangle in the hind wings arising from its hind angle. *Leucorhinia*, p. 320
- Wings not black at the extreme base, or if so (*Pachydiplax*) the pterostigma at least three times as long as wide. 12.
12. General color of the body red or yellow; wings hyaline or with fuscous or pale yellow restricted to the extreme base or extending to the nodus; pterostigma variable; sectors of the arculus usually distinctly stalked; sectors of the triangle of the hind wings usually arising from its hind angle. *Sympetrum*, p. 321
- Colors of the body blue, green and brown. 13.
13. At least 10 antecubitals in the front wings, the last one not continuous; sectors of the arculus stalked; in the hind wings the lower sector of the triangle arises from its hind angle, the upper one from its outer side; last tibiæ with two rows of 5-7 strong spines. *Mesothemis*, p. 325
- Normally 6 antecubitals in the front wings, the last one continuous; sectors of arculus stalked; in the hind wing the lower sector of the triangle arises from its hind angle, the upper usually from its outer side; last tibiæ with two rows of 10 or more smaller spines. *Pachydiplax*, p. 326

14. Small, hind wing not more than 17 in length; triangle of front wings with the anterior side angulated forming a trapezium; less than 8 antecubitals. *Nannothemis*, p. 327
 Larger, triangle of ordinary form, not as above; more than 10 antecubitals in the front wings. 15.
15. Male without ventral hooks on 1; female with third tibiæ at least a little longer than third femora. *Libellula*, p. 327
 Male with a pair of ventral hooks on 1; female with third tibiæ as long as third femora. *Plathemis*, p. 333

CALOPTERYX Leach (*calos* Gr., beautiful; *pteryx* Gr., wing).

(*Calepteryx*) Leach, Edinb. Encycl. IX, p. 137, 1815.

A genus of about 18 species, found in North America, Europe, Asia, Japan and Northern Africa. The body color is beautifully metallic. The pterostigma is wanting in the males; present or not in the females.

Wings spatulate, the hind margin strongly rounded. 1.

Wings narrow, front and hind margins, nearly parallel. 2.

1. Wings uniformly black or brown. *maculata*.

Wings hyaline at base, apical third or fourth dark. *æquabilis*.

2. Wings of male apically dark; abdomen less than 40. *dimidiata* and *apicalis*.

Wings hyaline; abdomen more than 40. *angustipennis*.

C. MACULATA Beauvois (*maculatus* L., spotted).

Agrion maculata Beauvois, Ins. Afr. Amer., p. 85, 1805.

C. maculata Hagen, Syn. Neur. N. A., p. 57, 1861; Psyche V, p. 249, 1889.

A. maculata Kirby, Synonymic Cat., 1890.

Ab. male and female 38; h. w. male 28, female 31.

Male.—Metallic blue or green; under parts of head, thorax and abdominal segments 1–7 or 8 black; a humeral stripe, thoracic sutures and legs, black; venter of 8–10 usually whitish. Wings velvety black in the adult, paler and duller in immature individuals. Superior abdominal appendages forcipate, apical half widened, outer margin denticulated; inferiors one-fourth shorter.

Female.—Similar; duller; abdomen brassy brown; 8–10 with a pale mid-dorsal longitudinal line. Wings colored as in immature males, frequently darker apically and basally; pterostigma white, variable in size, reticulated.

Eastern United States; Quebec to Florida, west to Kansas and Texas; California, Iowa, Michigan, Ohio, Illinois, Indiana.

Turkey Lake (Kellicott); Elkhart, May 25, 1894; June 4–19, 1895 (Weith); Eagle Lake, July 6, 1898 (Deam); Crawford County, May

12, July 8 and 11, 1899 (Blatchley and Deam); Shriner Lake and Eel River, Whitley County, June 22 and 24, 1898, not common.

This species flies in Indiana from late spring till early fall. It prefers the smaller streams, seeking the cool, shady places where the vegetation is rankest. Rarely they are found in large numbers in woodland, even at a considerable distance from any stream. Their fluttering flight is very suggestive of the skippers among the butterflies. The metallic coloration and black wings make this very common species conspicuous.

C. *ÆQUABILIS* Say (*æquabilis* L., uniform).

C. æquabilis Say, Journ. Ac. Phila. VIII, p. 33, 1839; Hagen, Psyche V, p. 246, 1889.

Agrion æquabilis Kirby, Synonymic Cat., 1890.

Ab. male and female 40; h. w. male 32, female 33.

Male.—Metallic blue or green; head dark. Mid-dorsal thoracic carina, humeral line, more or less on thoracic sutures and legs and appendages, black. Wings yellowish hyaline, the anterior with the apical third or fourth and the posterior with the apical half or third dark. Appendages similar to *maculata*, but offering several differences.

Female.—Similar; brassy green, abdomen becoming brownish at tip, a light longitudinal median dorsal line on 8–10, and on the sides of 5–10; sides of thorax with some yellow. Wings apically lighter; pterostigma white, narrow and not reticulated.

Canada; Maine, Massachusetts, New York, Vermont, Ohio, Illinois (Adams).

Habits described as similar to *C. maculata*; taken in midsummer.

C. *DIMIDIATA* Burmeister (*dimidiatus* L., divided in the middle).

C. dimidiata Burmeister, Handb. Ent. II, p. 829, 1839; Hagen, Syn. Neur. N. A., p. 57, 1861; Psyche V, p. 246, 1889.

Agrion dimidiata Kirby, Synonymic Cat., 1890.

Ab. male 38, female 35; h. w. male 31, female 32.

Male.—Metallic green or blue; under part of head, thorax and abdomen, black; mid-dorsal thoracic carina, sutures, abdominal appendages and legs, black. Rear of head with a sharp tubercle on each side. Wings hyaline, with yellowish tinge, apically black. Appendages of usual shape, similar to *maculata*.

Female.—Similar; wings hyaline, yellowish, apex of hind wings brown, of front wings brownish, less defined; pterostigma white, large, reticulated.

Kentucky, Georgia, Florida,

C. DIMIDIATA APICALIS Burmeister (*apex* L., the extreme end).

C. apicalis Burmeister, Handb. Ent. II, p. 827, 1837; Hagen, Syn. Neur. N. A., p. 56, 1861.

C. dimidiata race *apicalis*, Hagen, Psyche V., p. 246, 1889.

Agrion apicalis Kirby, Synonymic Cat., 1890.

Ab. male 36, female 32; h. w. male 27, female 29.

Male.—Metallic blue or green; under part of head and abdomen, thoracic sutures, feet and abdominal appendages, black; thorax below yellowish. Rear of head with a sharp tubercle on each side. Wings hyaline, the apical sixth black. Appendages of usual form.

Female.—Similar; wings hyaline without pterostigma, or with a small white one of 1-3 cells.

Pennsylvania, Delaware, Massachusetts, New York, Michigan.

C. ANGUSTIPENNIS Selys (*angustus* L., narrow; *penna* L., a wing).

Sylphid angustipennis Selys. (male), Syn. Cal., p. 9, 1853.

S. elegans Selys (female), Syn. Cal., p. 9, 1853.

C. angustipennis Hagen, Syn. Neur. N. A., p. 56, 1861; Psyche V, p. 242, 1889.

Agrion elegans Kirby, Synonymic Cat., 1890.

Ab. male 46, female 43; h. w. male 36, female 38.

Male.—Brassy green, in old specimens the thorax becoming coppery; under part of head, thorax and abdomen, excepting 1, which is white, dark; thoracic sutures, feet and abdominal appendages, black. Rear of head with a tubercle on each side. Wings hyaline, larger veins, excepting the sub-costa, conspicuously green.

Female.—Similar; pectus dull yellowish; abdomen, towards its tip duller, a light, mid-dorsal longitudinal stripe on 8-10. Wings hyaline, tinged with yellowish, more apparent toward the base; pterostigma wanting.

Kentucky, Georgia, Ohio, Pennsylvania.

Early and midsummer; in western Pennsylvania common on June 18, rare, disappearing on July 2. In habits this species seems very similar to *Heterina americana*. It frequents the rapid ripples of the larger streams, spending much of the time on the wing over water. Its flight is more rapid than *maculata*, and it is captured with more difficulty.

HETERINA Hagen (*hetairos* Gr., a companion).

Hagen, Syn. Cal., p. 30, 1853.

A genus of about 40 species, confined to the western hemisphere. Two species occur in Indiana. They may be separated by the following characters;

Male.—Base of hind wings red ; tip of wings hyaline. Female, wings flavescent at base. *americana*.

Male.—Base of hind wings brown ; tip of wings dark. Female, wings flavescent throughout. *tricolor*.

H. AMERICANA Fabricius.

Agrion americana Fabricius, Ent. Syst. Supp., p. 287, 1798.

H. americana Hagen, Syn. Neur. N. A., p. 60, 1861 ; Kirby, Synonymic Cat., 1890.

Ab. male 36, female 31 ; h. w. male 28, female 30.

Male.—Head and thorax coppery red (adult), or metallic green (immature) ; humeral, two lateral lines and pectus, white or yellowish. Abdomen metallic green above, becoming dull with age, an indistinct median stripe ; 3-7 with yellow basal rings ; yellow on sides, excepting 9 ; beneath black, excepting at base and apex. Wings hyaline, basal fourth bright red, in the front wings reaching the anterior margin only at the extreme base ; the red brighter in the front wings, shaded with brown in hind wings ; pterostigma small, brown. In immature specimens the red is paler and duller and the pterostigma is yellow. Legs dark and pale. Superior appendages forcipate, outer margin denticulate at the middle, inner surface with two tubercles near the middle, apex obtuse ; lower appendages reaching to the first tubercle of the superiors, truncate.

Female.—Head, throat and abdomen metallic green, the last becoming dull with age ; humeral and lateral lines wider than in the male, not so noticeably bordered with black. Wings hyaline, basally and along the costa yellowish ; pterostigma white.

Maine to Maryland, west to Wisconsin and Missouri ; Iowa, Michigan, Illinois, Ohio, Indiana.

“*Lestes basalis*.—Inhabits Missouri, Indiana and Massachusetts” (Say) ; Turkey Lake (Kellicott) ; Christiana Creek, July 8, 1895, common (Weith) ; Lake County, June 23, 1899 ; Montgomery County, May 26, 1899 (Blatchley) ; Shriner and Round Lakes, August 1, 1896, September 2, 1897, rare ; Wabash River, Wells County, August 20, 1896, June 22, 1898, abundant.

This common species flies as late as the middle of October. It is rarely taken far from its preferred environment—the banks of larger streams, especially near shallow rocky ripples grown up with water-willow (*Dianthera*), where it may often be found in great numbers. “Another notable habit is that of congregating, sometimes in companies of hundreds. These assemblies commence in the afternoon and do not disperse until the warmth of the following day awakens them to activity. Both sexes take part in these assemblies, and they rest so compactly that a single sweep of the net may capture scores of them.”—Kellicott. The bright red at

the base of all the wings of adult males distinguish them at once as they flit from some boulder in mid-stream to the swaying stem of a water-willow.

Heterina scelerata Walsh, described from Illinois, is a "pterostigmatous variation of *americana* Fabr."—Calvert, *The Odonata of Baja California*, p. 474.

H. TRICOLOR Burmeister (*tri* L., three; *color* L.).

Calopteryx tricolor Burmeister, Handb. Ent. II, p. 827, 1839.

H. tricolor Hagen, Syn. Neur. N. A., p. 61, 1861; Kirby, Synonymic Cat, 1890.

Ab. male 41, female 36; h. w. male and female 30.

Male.—Blackish brown; humeral, two lateral stripes, and pectus yellow. Abdomen of almost uniform coloration; narrow interrupted basal rings on 2-6. Wings hyaline, tipped with brown; the front ones basally red, the red not reaching the costa, and the hind ones basally brown, the brown produced along the costa and not reaching the hind margin; pterostigma very small, black. Legs dark throughout. Superior appendages slenderer than in *americana*, inner surface with a tubercle and a median dilation; inferiors half as long as superiors.

Female.—Bronze-green and buff; throat green, mid-dorsal carina black, buff on either side uniting with the humeral line; sides buff and green. Abdomen green and pale. Wings flavescent throughout, pterostigma white. Legs pale and green.

Pennsylvania, Illinois, Georgia, Texas, Ohio, Indiana.

Wabash River, Wells County, August 20, 1898, a single male.

This species frequents the willow-covered banks of larger streams, especially about rapids. It is taken with more difficulty than *H. americana*.

LESTES Leach (*lestes* Gr., a plunderer).

Leach, Edinb. Encycl. IX, p. 137, 1815.

A genus of about 60 species, distributed over most of the world—America, the West Indies, Europe, Africa, Madagascar, Asia, Japan, Malay Archipelago, Australia, New Guinea, New Zealand, and the Sandwich Islands. Five fossil species have been referred to this genus. Nine species will doubtless be found in Indiana, though only seven have been recorded as yet. Their usual haunts are ponds, marshes and lakes, where they flit from stem to stem among the low herbage, usually resting with the wings half expanded. Some species are frequently met with in woodland.

Male inferior abdominal appendages less than half as long as the superiors. *eurinus* and *congener*.

Male inferior abdominal appendages more than half as long as the superiors. 1.

1. Male with inferior appendages shorter than the superiors; rear of head in both sexes blackish. 2.

Male with inferior appendages longer than the superiors, incurved; rear of head in both sexes yellow. *inequalis*.

2. Male inferior appendages sigmoid; female with a yellow band across the rear of head. *unguiculatus*.

Otherwise, male inferior appendages nearly straight, dilated or not at the apex. 3.

3. Thorax metallic green; mid-dorsal thoracic carina and humeral stripe, if yellow, very narrowly so. 4.

Thorax not metallic green, brownish. 5.

4. Abdomen less than 34 in length. *uncatus*.

Abdomen more than 34 in length. *vigilax*.

5. Abdomen of male pale, very long, about 40, and slender. *rectangularis*.

Abdomen of male shorter, of brighter coloration than the thorax. *disjunctus* and *forcipatus*.

L. EURINUS Say (*eurinus* Gr, with a good nose, keen scented).

L. eurina Say, Journ. Ac. Phila. VIII, p. 36, 1839; Hagen, Syn. Neur. N. A., p. 70, 1861; Scudder, Psyche VI, p. 66, 1891.

L. eurinus Kirby, Synonymic Cat., 1890.

Ab. male 38, female 34; h. w. male 27, female 28.

Male.—Dark metallic green; lips pale. Mid-dorsal carina and humeral suture black, second lateral suture more or less so. Abdomen with narrow yellowish basal rings on 2-7. Wings yellowish. Legs dark and pale. Superior appendages with an acute basal tooth and a truncate, denticulated median one on the inner side; inferior appendages one-third as long.

Female.—Similar; mid-dorsal thoracic carina yellow.

Illinois, New York, Maine, Massachusetts.

This species and the following are the two of the nine species regional for Indiana, that have not yet been recorded. They are distinguished from the others by the short inferior appendages of the male. *Eurinus* has been taken in New York during July.

L. CONGENER Hagen (*congener* L., of like race).

L. congener Hagen, Syn. Neur. N. A., p. 67, 1861; Selys, Bull. Ac. Belg. (2) XIII, p. 316, 1862; Kirby, Synonymic Cat., 1890.

Ab. male 29, female 27; h. w. male 20, female 21.

Male.—Blackish brown; lips, mid-dorsal carina, narrow humeral stripe, sides of thorax, and head and thorax below, pale yellow; second lateral suture black. Abdomen with yellowish interrupted rings on 2-7; a trace of a white longitudinal mid-dorsal line. Rear of head, pectus and segments 9-10 primrose in mature males. Legs black and pale yellow. Superior appendages black, lighter at base, longer than 10, on the inner surface is an acute basal tooth, followed by a median denticulate dilation; inferiors reaching to the middle of this dilation, curved inwards and upwards.

Female.—Similar; humeral stripe wider, and the pale, longitudinal dorsal line of the abdomen more evident.

New York, Delaware, Missouri, Colorado, Nevada, Yellowstone, Ohio.

Congener has been taken in Ohio in the fall, flying well into October.

L. UNGUICULATUS Hagen (*unguiculus* L., a finger-nail). Pl. VII, fig. 1.

L. unguiculata Hagen, Syn. Neur. N. A., p. 70, 1861.

L. unguiculatus Kirby, Synonymic Cat., 1890.

Ab. male 28, female 27, h. w. male 19, female 21.

Male.—Blackish brown; mid dorsal carina, humeral suture, and face and under parts of head and thorax, yellow. Abdomen above metallic green or brown; narrow interrupted basal rings on 2-7, passing into the yellow on the sides of 1-7. Mature specimens of both sexes more or less pruinose. Pterostigma brown, whitish at either end. Legs black and pale.

Female.—Similar; humeral stripe wider; rear of the head with a yellow band from eye to eye, obscure in older individuals.

Quebec, Nova Scotia; New Jersey, Massachusetts, Missouri, Maine, New York, Illinois, Pennsylvania, California, Iowa, Wyoming, Michigan, Ohio, Indiana.

Boat Lake, July 4, 1897, common; Simonton Lake, July 13, 1899 (Weith); Chapman Lake, July 6, 1898; Eagle Lake, July 9, 10 and 12, 1898 (Deam); Shriner and Round lakes, September 2, 1897, July 21, 1898; Wabash River, Wells County, July 3, 1898.

A common species flying from June till October.

L. UNCATUS Kirby (*uncus* L., a barb). Pl. VII, fig. 2.

L. uncatus Kirby, Synonymic Cat., p. 160, 1890.

L. forcipata Hagen, Syn. Neur. N. A., p. 71, 1861.

L. hamata Selys, Bull. Ac. Belg. (2) XIII, p. 300, 1862.

Ab. male 29, female 26; h. w. male 21, female 23.

Male.—Metallic green; face, under side of head and thorax, sides below and a much reduced humeral line (often wanting), yellowish. Abdomen above metallic green, last two or three segments black; 3-7

with narrow yellow basal rings; sides of 1-7 yellow. Pterostigma with a white vein at either end. Legs black lined with pale.

Female.—Similar; mid-dorsal thoracic carina yellow; humeral stripe narrow; basal rings of segments 3-7 interrupted; basal half of 1 yellow.

Canada, Nova Scotia; District of Columbia, Illinois, Missouri, New York, Maine, Massachusetts, New Hampshire, Georgia, Wisconsin, South Dakota, California, Wyoming, Michigan, Ohio, Indiana.

Wabash River, Wells County, June 19, 1898, June 11, 1899; Frantz Fishpond, June 5, 1899 (Deam *et al.*).

A beautiful and common species, flying until late in the summer, and often taken at a considerable distance from water.

L. DISJUNCTUS Selys (*disjunctus* L., disconnected).

L. disjuncta Selys, Bull. Ac. Belg. (2) XIII, p. 302, 1862.

L. disjunctus Kirby, Synonymic Cat., 1890.

Ab. male 29, female 27; h. w. male 19, female 21.

Male.—Blackish brown; face, under part of head and thorax, sides of throax below, humeral stripe, and usually mid-dorsal carina, yellow; second lateral suture with more or less black. Abdomen metallic green or bronze, last three segments duller; 3-7 with pale interrupted narrow basal rings; sides of 1-7 yellow. Both sexes with head, thorax, and base and apex of abdomen more or less primrose in older individuals. Legs dark lined with pale.

Female.—Similar; humeral stripe wider than in the male, as in both sexes wider below.

Nova Scotia; District of Columbia, Maine, Illinois, New Hampshire, New York, Colorado, Wyoming, Yellowstone, Michigan, Ohio, Indiana.

Simonton Lake, apparently rare, July 11, 1899; Elkhart, July 17, 1899 (Weith).

This species may be looked for during July and August.

L. FORCIPATUS Rambur (*forceps* L., a pair of pincers). Pl. VII, fig. 3.

L. forcipata Rambur, Ins. Nevr., p. 246, 1842.

L. hamata Hagen, Syn. Neur. N. A., p. 70, 1861.

L. forcipatus Kirby, Synonymic Cat., 1890.

Ab. male 33, female 31; h. w. male 22, female 24.

Male and female.—Very similar to *disjunctus*; larger, humeral stripes wider, equal in both sexes (in *disjunctus* wider in the female than in the male); sides of thorax (metepisternum and metepimeron) usually with less black; pterostigma black (brown in *disjunctus*). The superior appendages of the male differ as follows: in *disjunctus* the basal tooth is about equal to the apical one, in *forcipatus* it is larger; the apical tooth

is noticeably more acute in *disjunctus* than in *forcipatus*. The inferior appendages are apically more widened in *forcipatus* than in *disjunctus*.

New Jersey, Georgia, Illinois, Massachusetts, Florida, Wisconsin, Texas, Colorado, Pennsylvania, New York, Iowa, Ohio, Indiana.

Wabash River, Wells County, May 25, 1899, three males (Deam).

The first of its genus on the wing in Indiana in the spring. It has been taken in Ohio and western Pennsylvania as early as April; flies until August.

L. RECTANGULARIS Say (*rectus* L., straight; *angulus* L., an angle).

Pl. VIII, fig. 5.

L. rectangularis Say, Journ. Ac. Phila. VIII, p. 34, 1839; Hagen, Syn. Neur., p. 66, 1861; Kirby, Synonymic Cat., 1890.

Ab. male 40, female 32; h. w. male 21, female 23.

Male.—Blackish brown; face, under part of head and thorax, sides of thorax below, humeral stripe (wider below) and mid-dorsal carina, yellow or greenish. Abdomen pale brown basally, becoming black posteriorly; pale segments have their apices dark; 1-7 with pale narrow basal rings. Legs pale, lined with dark.

Female.—Similar; abdomen sometimes greenish bronze; always darker than in the male, the sides yellowish. Legs darker.

Massachusetts, Maryland, New York, District of Columbia, Illinois, Indiana, Georgia, Maine, Pennsylvania, Minnesota, Michigan, Ohio.

“Inhabits Indiana and Massachusetts” (Say); Elkhart, June 15, in grove, June 23, in woods, June 25, 1897, in marsh, nowhere common; Boot Lake, July 4, 1897; Simonton Lake, July 11, 1899; Elkhart, city limits, July 14, 19 and 30, 1899, common (Weith); Eagle Lake, July 6 and 12, 1898 (Deam); Wabash River, Wells County, June 22, 1898, June 11 and September 10, 1899 (Deam *et al.*); Lake, Jackson Township, Wells County, May 29, 1899 (Deam); Round and Shriner lakes, September 2, 1897, June 8, 1898; woodland, near Wabash River, Adams County, June 19, 1898, very abundant.

June to September. This species is often taken in deep woodland, usually near some swampy area, but often it is found in high woods and at a distance from water. Of the *Lestes* found in the State this species is most often met with. It seems at home anywhere. The long slender abdomen of the male distinguish it at once from other species.

L. VIGILAX Hagen (*vigilax* L., watchful). Pl. VII, fig. 4.

L. vigilax Bull. Ac. Belg. (2) XIII, p. 306, 1862; Kirby, Synonymic Cat., 1890; Kellicott, Journ. Cin. Soc. Nat. Hist., p. 200, 1895.

Ab. male 37, female 35; h. w. male 24, female 26.

Male.—Metallic green; lips, under part of head and thorax, sides of thorax below, narrow humeral stripe and mid-dorsal carina, yellow or greenish. Abdomen metallic green, obscure and black at the tip, the basal segments each with a pale narrow basal ring. Legs dark, lined with pale. Head, thorax and base and apex of abdomen more or less primrose in older individuals.

Female.—Similar; the humeral stripe wider; 9 and 10 pale, largely yellow.

New Jersey, Florida, Massachusetts, Pennsylvania, Michigan, Ohio, Illinois (Adams), Indiana.

Chapman Lake, July 7, 1898; Goose Lake, July 11, 1899 (Deam); Shriner and Round lakes, September 2, 1897, June 7 and July 21, 1898, abundant, pairing in September and July.

This is a species of the lakes, where, among the *Scirpus* and *Typha*, from July to September it may sometimes be found very abundantly. It is a slender, graceful and beautiful species.

L. INEQUALIS Walsh (*in L.*, not; *æqualis* L., equal). Pl. VII, fig. 6.

L. inequalis Walsh, Proc. Ac. Phila., p. 385, 1862; Kirby, Synonymic Cat., 1890.

Ab. male 39, female 37; h. w. male 26, female 27.

Male.—Metallic green; face, under parts of head and thorax and sides of thorax below, yellow or pale; mid-dorsal carina and a humeral line black or very narrowly pale. Abdomen metallic green, coppery or duller at apex, the last segments blackish; sides yellow; pale narrow basal rings on 3-6 or 7. Legs light, lined with dark. Head, prothorax and 9 and 10 more or less primrose in older individuals.

Female.—Similar; the mid-dorsal carina and humeral stripes yellow, wider than in the males.

Maine, Illinois, New Hampshire, New Jersey, Pennsylvania, New York, Michigan, Ohio, Indiana.

Round Lake, July 22, 1898, a pair taken at rest on a spatterdock leaf. In form, color and habits this species much resembles *vigilax*; it is larger and more robust.

ARGIA Rambur (*argia* Gr., idleness).

Rambur. Ins. Névr., p. 254, 1842.

A genus of about 50 species, confined almost entirely to America—one species known from the Kurile Islands, another from the Mollucas and a third from the Cape of Good Hope. Five species have already been taken in the State and a sixth species will probably be found in the southern part along the Ohio. In their choice of environment they differ very decidedly from the *Lestes*, *Enallagmas* and other smaller

agrionines, preferring the glaring sun as it shines on some bare beach or boulder, rather than the rank grasses and sedges of some stream or swale.

Pterostigma surmounting more than one cell, *i. e.*, the pterostigma longer than the cell just behind it. *putrida*.

Pterostigma surmounting only one cell, *i. e.*, not longer than the cell just behind it. 1.

1. Wings entirely dark brown. *fumipennis*.
Wings hyaline or slightly tinged or tipped with brownish. 2.
2. Males with last two segments blue, segments 1-7 of abdomen black, with no blue or violet. *tibialis*.
Males with last three segments blue. 3.
3. Males violet and black, the violet predominating on 1-7. *violacea*.
Males blue and black, the black predominating on 1-7. 4.
4. Males with the thorax deep blue with wide black stripes on the mid-dorsum and the humeral suture. *sedula*.
Males with the thorax light blue, not heavily marked with black. *apicalis*.

Rear of head black, or blackish—*putrida* and *tibialis*.

Rear of head yellowish—*violacea*, *sedula* and *apicalis*.

A. *PUTRIDA* Hagen (*putridus* L., polluted). Pl. IV, fig. 2; Pl. VII, fig. 7.

Agrion putridum Hagen, Syn. Neur. N. A., p. 96, 1861.

Argia putrida Kirby, Synonymic Cat., 1890.

Ab. male 34, female 32; h. w. male 24, female 25.

Male.—Gray or light brown; vertex, mid-dorsum of the thorax and a stripe on either side, black. Abdomen black, the basal segments sometimes pale above, 3-7 with pale narrow basal rings. Older individuals are largely primrose. Wings with the upper sector of the triangle ending on the margin beyond the origin of the ultranodal and almost on a level with the pterostigma. Legs pale lined with dark. Apex of 10 excised, the sides produced; appendages short.

Female.—Younger specimens are brown, much like the males, with the abdomen mostly brown. Fully matured females have the head and thorax pale blue, with the mid-dorsal thoracic carina and very narrow lines on the sutures black. The abdomen is brown above, bounded on either side with an interrupted black stripe; below the black, pale blue or greenish.

Quebec; Maine, New York, Maryland, Virginia, Wisconsin, Illinois, Texas, Pennsylvania, Florida, Michigan, Ohio, Indiana.

Elkhart, July 30, 1899, common (Weith); Crawford County, July, 11, 1899 (Deam); Whitley County, August 1, 1896, September 2, 1897;

St. Mary's River, Ft. Wayne, June 26, 1898, abundant; Eel River, Allen County, June 23, 1898; Wabash River, Wells County, July and August, 1896, June 10 and 22, and July 3, 1898.

An abundant species to be found during most of the Odonatological season. *Putrida*, *tibialis* and *apicalis* are much alike in habits, frequenting sunny exposed localities, where they rest on the ground, on boards, or on rocks or boulders. *Violacea* and *sedula* prefer the sedge and rush-margined banks of some stream or lake, where they live much after the manner of the *Enallagmas* and many others of the *Agrioninae*. The *Argias* are hardy species and are apparently holding their own along the Wabash River, where the delicate *Enallagmas* and *Nehalennias* seem to be disappearing as a result of the pollution of the stream. On June 22, 1898, they comprised the great bulk of the Odonate fauna along the banks of this river in Wells County. *Putrida* was most abundant, and many pairs were observed ovipositing. In one case several pairs were observed on the same support—a small board fastened in the mud at the bottom of the river, one end above the surface of the water—and in the filth-laden algæ which covered this board the females were ovipositing their eggs. In some cases both male and female were submerged. Occasionally as the female descends into the water, the male will struggle, apparently trying to free himself, but, unable to do this, he straightens his abdomen, avoiding the water as long as he may, and so is gradually drawn beneath the surface.

A. FUMIPENNIS Burmeister (*fumus* L., smoke; *penna* L., a wing).

Agrion fumipenne Burmeister, Handb. Ent. II, p. 819, 1839;
Hagen, Syn. Neur. N. A., p. 97, 1861.

Argia fumipennis Kirby, Synonymic Cat., 1890.

Ab. male 26, female 28; h. w. male 19, female 21.

This species may be known from the other *Argias* by its darkly colored wings. It has been recorded from Florida, Georgia and Kentucky.

A. VIOLACEA Hagen (*violaceus* L., violet colored).

Agrion violaceum Hagen, Syn. Neur. N. A., p. 90, 1861.
Argia violacea Kirby, Synonymic Cat., 1890.

Ab. male 26, female 25; h. w. male 20, female 21.

Male.—Violet; thorax with mid-dorsal stripe, humeral stripe and narrow lines on the lateral sutures black. Abdomen violet, with the following black: interrupted apical rings on 2-4, apical rings on 5 and 6, all of 7 excepting a basal ring; 8-10 blue. Legs pale, lined with dark. Superior abdominal appendages are short and obtuse; the inferiors are longer than the superiors and are bifid.

Female — Brown or dull violet, with mid-dorsal and humeral stripes. Abdomen as in *A. putrida*.

District of Columbia, New York, Maine, Maryland, Virginia, Illinois, Texas, Pennsylvania, Michigan, Ohio, Indiana.

Elkhart, edge of pond, June 11 and 17, 1895; Christiana Creek, July 8, 1895; Indiana Lake, June 25, 1899, common (Weith); Goose Lake, July 11, 1898; Eagle Lake, July 6 and 8, 1898; Marion County, June 22, 1899 (Deam); Round and Shriner lakes, August 1, 1896, September 2, 1897, June 7 and 24, and July 21, 1898, observed pairing on all dates excepting June 7, when only teneral were observed; Eel River, Whitley County, June 23, 1898; Wabash River, Wells County, June 22, 1898.

A common species, on the wing in Indiana from June till September. The violet color of the males distinguish them at once from all other species with which they associate.

A. *SEDULA* Hagen (*sedulus* L., persistent).

Agrion sedulum Hagen, Syn. Neur. N. A., p. 94, 1861.

Argia sedula Kirby, Synonymic Cat., 1890; Kellicott, Journ. Cin. Soc. Nat. Hist., p. 203, Jan., 1895.

Ab. male 26, female 25; h. w. male 18, female 20.

Male.—Deep blue; vertex, mid-dorsal thoracic and humeral stripes and line on second suture, black. Abdomen black, blue as follows: 1, base and sides of 2, basal rings on 3-7, all of 8-10. The basal rings on 3-7 are wider and more conspicuous than in any other species. Feet pale and dark. The superior abdominal appendages are short and rounded; inferiors are bifid, the lower lobe larger than the upper.

Female.—Obscure brownish; mid-dorsal thoracic carina and humeral suture black. Wings slightly flavescent.

Virginia, Texas, Ohio, Indiana.

Elkhart, July 8, 1895, city limits, July 30, 1899, common (Weith); Wabash River, Wells County, July, 1896, rare.

Sedula flies as late as September. With *violacea* this species prefers a life among the rank vegetation along ditches, streams and lakes.

A. *TIBIALIS* Rambur (*tibia* L., the leg). Pl. VII, fig. 8.

Platynemis tibialis Rambur, Ins. Névr., p. 241, 1842.

Agrion fontium Hagen, Syn. Neur. N. A., p. 91, 1861.

Argia tibialis Kirby, Synonymic Cat., 1890.

Ab. male and female 27; h. w. male 21, female 22.

Male.—Dark lilac or blue; vertex, wide mid-dorsal and humeral stripes and line on second suture, black; sides of thorax pale, yellowish. Abdo-

men black, pale narrow basal rings on 2-7; 9 and 10 blue. Legs dark with but little pale.

Female.—Similar to the male; 9 black, 10 yellow.

Virginia, Georgia, Florida, Illinois, New Jersey, Pennsylvania, Texas, Michigan, Ohio, Indiana.

Crawford County, July 11, 1899 (Deam); Wabash River, Wells County, June 22, 1898, common.

June and July. On June 22 this species was associated with *putrida* and *apicalis* along the Wabash River near Bluffton. The habits of the three were very similar, though, perhaps, *tibialis* frequented the vegetation more than the other two. Its dark color distinguishes it in the field.

A. APICALIS Say (*apex* L., the extreme end). Pl. VII, fig. 9.

Agrion apicalis Say, Journ. Ac. Phila., VIII, p. 40, 1839.

A. apicale Hagen, Syn. Neur. N. A., p. 91, 1861.

Argia apicalis Kirby, Synonymic Cat. 1890.

Ab. male 29, female 28; h. w. male 21, female 23.

Male.—Pale blue or drab; vertex, mid-dorsal thoracic carina and a spot on the humeral suture above and below, black. Abdomen dark brown or black, the segments darker apically; 3-7 with pale narrow basal rings; 8-10 blue. Legs dark and light.

Female.—When young are light brown; when fully adult, pale blue, like the males. The humeral spots are small or wanting, and the abdomen is darker; dorsum black, with the apical half of 9 and all of 10 yellow.

Maine, New York, District of Columbia, Virginia, Louisiana, Missouri, Pennsylvania, Illinois, Texas, Iowa, Michigan, Ohio, Indiana.

Wabash River, Wells County, June 22, 1898, common, pairing; June 5, 1899 (Dean *et al.*); Elkhart, city limits, July 30, 1899, rare (Weith); Shriner Lake, July 21, 1898, one male; St. Mary's River, Allen County, June 26, 1898, common; Frantz Fishpond, July 4, 1898.

Similar in color and habits to *putrida*; adults are distinguished as they fly by the brighter and clearer color of the thorax. The species may be looked for from June to September.

ERYTHROMMA Charpentier (*erythros* Gr., red; *omma* Gr., eye).

Charpentier, Lib. Eur., p. 20, 1840.

A genus represented in Europe, Asia and North America. Seven species are known, but three of these are questionably referred to the genus. It is doubtful if the single North American species, *Erythromma conditum* Hagen, is congeneric with the type of the genus, *E. najas* Hausmann, of Europe.

E. CONDITUM Hagen (*conditus* L., hidden).

E. (?) conditum Hagen, Bull. Ac. Belg. (2) XLI, p. 1305, 1876;
Kirby, Synonymic Cat., 1890.

Ab. male and female 28; h. w. male 21, female 23.

Male.—Blue; vertex, a mid-dorsal thoracic stripe, widened at the middle and above, and a spot under each wing, black; metepimeron bright yellow. Abdomen black, blue as follows: sides and apical rings on 1 and 2, interrupted basal rings on 3–7, and all of 8 and 9. Legs dark and pale. Superior appendages as long as 10, the apex dilated incurved; the inferiors are shorter, wedge-shaped in profile.

Female.—Darker and duller, younger individuals with light brown instead of blue; the yellow on the metepimeron wanting or darker than in the male. Abdomen with 2–10 black above, excepting interrupted basal rings on 3–7.

Maine, New York, Maryland, District of Columbia, Ohio, Western Pennsylvania (Graf, Atkinson).

May and June. This species frequents cool, shaded, swampy spots, where the vegetation is rank, along some stream or marsh. In such a place they may sometimes be found in large numbers, often associated with *Calopteryx maculata*.

NEHALENNIA Selys (*Nehalennia* L., name of a river goddess of the Rhine).

Selys, Rev. Od. d'Eur., p. 172, 1850.

A genus represented in Asia, Europe, and North and South America. Eight species are known. Three species occur in the United States, and two of these have been taken in Indiana. They prefer sheltered sedgy spots, where they may sometimes be found in great numbers.

Metallic green and blue; thorax above uniform in color. *irene*.

Bronze-black and yellow; thorax above with antehumeral stripes.
posita.

N. IRENE Hagen (a proper name).

Agrion irene Hagen, Syn. Neur. N. A., p. 74, 1861.

N. irene Kirby, Synonymic Cat., 1890.

Ab. male and female 21; h. w. male 13, female 14.

Male.—Metallic green; face, sides of thorax and below pale yellowish; a narrow occipital line. Abdomen metallic green, duller posteriorly; pale basal rings on 1–2; pale interrupted basal rings on 3–6; apex of 8 and most of 9 and 10 blue. Legs pale lined with dark, the tarsi ringed. Superior abdominal appendages short bifid, the inferiors longer.

Female.—Similar, the yellow on the thorax darker. The basal rings on the abdominal segments are narrower and the blue at the tip is confined to an apical spot on 9 and the greater part of 10.

Maine, New York, Massachusetts, New Jersey, Florida, Illinois, Wisconsin, South Dakota, Iowa, Ohio, Indiana.

Elkhart, margin of pond, June 11, 18 and 19, 1895, pairing June 19; city limits, July 14, 1899 (Weith); Marshall County, May 18, 1899 (Blatchley); Shriner Lake, June 24, 1898, one male, five females.

This small and beautiful species is distinguished at once by its bright green color. It is found from May till July in damp grassy places along some stream or near still water. It is easily overlooked by the collector, especially if the vegetation which it frequents is being moved by the wind.

N. POSITA Hagen (*positus* L., placed).

Agrion positum Hagen, Syn. Neur. N. A., p. 77, 1861.

N. posita Kirby, Synonymic Cat., 1890.

Ab. male and female 20; h. w. male 12, female 14.

Male.—Bronze black; face, sides of thorax and beneath yellow or yellowish; postocular spots round; a narrow occipital line; a yellow antehumeral stripe interrupted above to form a ! mark; second lateral suture with a black line. Abdomen bronze black, darker posteriorly; apical ring on 1, and basal rings on 3-7 yellow. Legs pale, lined with dark, tarsi ringed. Appendages yellow, short, the superiors a little larger than the inferiors.

Female.—Paler than the male; the antehumeral stripe sometimes not interrupted.

Quebec; Massachusetts, Pennsylvania, New York, District of Columbia, Georgia, New Jersey, Florida, Michigan, Ohio, Illinois (Adams), Indiana.

Elkhart, June 14, 1895, marsh, common; May 18 and 25, 1897, pond; city limits, July 14, 1899; Christiana Creek, May 21, 1897 (Weith); Lake, Jackson Township, Wells County, September 14, 1899 (Deam); Round and Shriner lakes, July 21, 1898, common; Eel River, Allen County, June 23, 1898, common; Wabash River, Wells County, July, 1896, rare.

A common species, flying from May till October. In life the male usually has the thorax bright colored, tinged with green. The divided antehumeral will usually distinguish the species. The length of abdomen may vary in different individuals as much as seven mm. or eight mm.

AMPHIAGRION Selys (*amphi* Gr., about; *Agrion*, a genus of Odonata; *agrion*, Gr., a wild animal).

Selys, Bull. Ac. Belg. (2) XLI, p. 284, 1876.

Four species have been described in this genus, which is confined to North America.

A. SAUCIUM Burmeister (*saucius* L., enfeebled).

Agrion discolor and *Agrion saucium* Burmeister, Handb. Ent. II, p. 819, 1839; Hagen, Syn. Neur. N. A. pp. 79 and 85, 1861.

Amphiagrion discolor Kirby, Synonymic Cat., 1890.

Agrion saucium Calvert, Burmeister's Types of Od., Trans. Am. Ent. Soc., Vol. XXV, p. 39, 1898.

Ab. male 20, female 21; h. w. male 14, female 15.

Male.—Dark brown or black; sides of thorax and under parts of head and thorax, pale reddish. Abdomen with 1-6 red, 6 usually with an apical black spot; 7 red basally; the rest of the segment and all of 8-10 blackish, usually with a narrow longitudinal red mid-dorsal stripe. The coloration of 7-10 is subject to considerable variation. Legs pale reddish, without or with but little dark. Superior abdominal appendages short; the inferiors longer, prolonged, slender and incurved.

Female.—Similar, paler; thorax dull reddish or yellowish. Abdomen with more black than usual in the males; 10 largely reddish.

Quebec; Maine, New York, Massachusetts, Pennsylvania, District of Columbia, Maryland, Illinois, South Carolina, South Dakota, Colorado, Ohio, Indiana.

Christiana Creek, May 21 and 25, 1897, and May 21, 1899; Elkhart, margin of pond, May 25, 1897; Indiana Lake, June 25, 1899 (Weith).

May to July. This species frequents the grassy banks of small streams. In such places, during the latter part of May they may sometimes be found in great numbers, often in couple, when a single sweep of the net may gather half a dozen pairs. In the field this red and brown species can be mistaken for no other, unless it is the orange female of *Ischnura verticalis*, from which it is distinguished by the greater amount of red on the abdomen.

ENALLAGMA Charpentier (*enallatto* Gr., to exchange, to differ from).

Charpentier, Lib. Eur., p. 21, 1840.

A genus of more than 40 known species, occurring in the Americas and the West Indies, Europe, Asia and Africa, Japan and the Malay Archipelago. The greater number are American, and more than a fourth of all the species are found within the State. To this genus belong the

most of our smaller dragonflies whose bright blue colors render them conspicuous about lakes and rivers during June and July. Representatives of this genus may be found from early May until late in September. The abdominal appendages of the males are beautifully characteristic of the species. The females are more difficult of determination, and often positive identifications are possible only by taking them in association with males.

The bright colors are very apt to fade, the entire insect becoming an ugly dull brown. Rapid drying usually preserves the colors fairly well. Specimens may be beautifully preserved in small vials of 95 per cent. alcohol. A large number of individuals may be dropped as soon as collected, into a large vial or jar of alcohol. After a few days they may be transferred to small vials, filled with fresh alcohol.

The following key, based on colors, applies only to males.

Dorsum of segment 2 blue with an apical black spot; rarely this spot extends forward to the base of the segment, but it is always narrowed anteriorly. 1.

Dorsum of segment 2 black. 6.

1. Dorsum of segments 3-5 at least one-third blue. 2.

Dorsum of segments 3-5 largely black. 3.

2. Segment 5 more than half blue. *doubledayi*, *hageni*, *ebrium* and *civile*.

Segment 5 with the blue and black about equal. *carunculatum*.

3. A distinct black spot on the side of segment 2. *geminatum*.

No distinct black spot on the side of segment 2. 4.

4. Segment 8 blue with a black spot at base. *traviatum*.

Segment 8 entirely blue. 5.

5. Segment 7 with apical half or three-quarters blue. *aspersum*.

Segment 7 black. *piscinarium*.

6. Dorsum of 8 and 9 blue. *divagans*.

Dorsum of 8 black, 9 blue or yellow. 7.

7. Face green or blue. *exsulans*.

Face yellow or yellowish. 8.

8. Thorax largely green or blue and black, tinged with pale yellow below. *antennatum*.

Thorax orange or yellow and black. 9.

9. Segment 9 yellow or orange. *signatum*.

Segment 9 pale blue. *pollutum*.

E. DOUBLEDAYI Selys (named for Edward Doubleday).

Agrion doubledayi Selys, Rev. Od., p. 209, 1850; Hagen, Syn. Neur. N. A., p. 89, 1861.

Enallagma doubledayi Kirby, Synonymic Cat., 1890.

Ab. male 25, female 24; h. w. male 17, female 18.

Male.—Similar to *E. hageni*. The abdominal appendages are short, the superiors have the upper branch rectangular in profile, shorter than the lower obtuse branch; the inferiors are as long as the upper branch of the superiors and are turned upwards; the superiors bear a pale tubercle which projects beyond the darker part of the appendages.

Female.—Head and thorax yellowish where the male is blue. Dorsum of the abdomen dark green.

Florida, Massachusetts, Ohio.

This species has been taken in Ohio in May. *Doubledayi*, *hageni*, *ebrium*, *civile* and *carunculatum* are black and light blue—*bleu vif*—in coloration. On the wing the blue is most conspicuous, and the insects appears to be largely of this color. *Aspersum*, *traviatum*, *geminatum*, *piscinarium*, *divagans* and *exsulans* are black and darker blue—*bleu de ciel*—the black predominating when they are seen flying. *Antennatum*, *signatum* and *pollutum* are black and blue, green, yellow or orange.

E. HAGENI Walsh (named for Hermann August Hagen). Plate V, figs. 1 and 2.

Agrion hageni Walsh, Proc. Ent. Soc. Phila., II, p. 234, 1863.

E. hageni Kirby, Synonymic Cat., 1890.

Ab. male 23, female 22; h. w. male 16, female 17.

Male.—Blue; vertex black; postocular spots blue, large, usually connected. Thorax with mid-dorsal and humeral stripes black. Abdomen blue, black as follows: basal spot on 1, apical spot on 2, apical third or fourth of 3-5, apical half of 6, all of 7 but an interrupted basal ring, and dorsum of 10. Legs dark and pale.

Female.—Green; duller and paler. Dorsum of 2-10 black, 3-7 with pale basal rings.

Canada; Maine, New York, Massachusetts, Maryland, Missouri, Illinois, New Hampshire, Delaware, South Dakota, Wisconsin, Iowa, Ohio, Indiana.

Turkey Lake (Kellicott); Elkhart, June 11, 1895 (Weith); Crawford County, July 8, 1899 (Blatchley); Eagle Lake, July 5, 6, 9 and 12, 1898 (Deam); Round and Shriner lakes, June 7 and 24 and July 21, 1898, abundant, pairing on first two dates.

May, June and July. A species of the smaller lakes, usually abundant where found. On June 7 it was the most abundant *Enallagma* about Shriner and Round lakes, especially frequenting the strips of *Scirpus americanus* which grow on the shore and in the shallow water along the eastern part of Shriner.

E. EBRIUM Hagen (*ebrius* L., drunken). Pl. V, figs. 3 and 4.

Agrion ebrium Hagen, Syn. Neur. N. A., p. 89, 1861.

E. ebrium Kirby, Synonymic Cat., 1890.

Ab. male 25, female 24; h. w. male 17, female 18.

Male.—Blue with black markings similar to *E. hageni*, from which it may be at once distinguished by the abdominal appendages. Blue post-ocular spots large, connected.

Female.—The color is yellowish green where the male is blue and the dorsum of the abdomen is entirely dark green excepting basal rings on 2-7.

Nova Scotia; Maine, New York, Illinois, Missouri, Iowa, New Hampshire, Michigan, Ohio, Indiana.

Elkhart, June 11, 1895 (Weith).

E. CIVILE Hagen (*civilis* L., of citizens, civil). Pl. I; Pl. V, figs. 5 and 6.

Agrion civile Hagen, Syn. Neur. N. A., p. 88, 1861.

E. civile Kirby, Synonymic Cat., 1890.

Ab. male 25, female 27; h. w. male 18, female 20.

Male.—Blue and black, similar to the preceding species. The black on the apex of abdominal segment 6 usually occupies about two-thirds of the dorsum. The postocular spots are usually connected.

Female.—The blue of the male replaced by duller blue, or yellowish green. Dorsum of abdomen black, 3-7 with pale interrupted basal rings.

Canada, Mexico, West Indies; Maine, New York, Pennsylvania, Maryland, Virginia, District of Columbia, Missouri, Texas, South Dakota, New Mexico, California, Massachusetts, Michigan, Ohio, Illinois, (Adams) Indiana.

Frantz Fishpond, July 4, 1898, June 5, 1899, abundant, pairing on the former date (Deam *et al.*); Wabash River, Wells County, July, 1896.

May to September. Apparently this species is less common in Indiana than *carunculatum*, which it very much resembles in habits and appearance. Doubtless some of the State records as given for this species belong rather to *carunculatum*. Often old individuals of *civile* and *carunculatum*, and possibly of other species, have the wings slightly milky or gray and the pterostigma bluish or pruinose.

E. CARUNCULATUM Morse (*caruncula* L., a bit of flesh). Pl. V, figs. 7 and 8.

E. carunculatum Morse, Psyche, Vol. 7, p. 208, March, 1895.

Ab. male 25, female 26; h. w. male 19, female 20.

Male.—Blue; head and thorax with black markings similar to the preceding species; postocular spots connected. Abdomen blue, black as follows: basal spot on 1, apical spot on 2, apical third of 3, about apical half of two-thirds of 4 and 5, apical two-thirds or three-fourths of 6, all of 7 but a narrow basal ring, and all of 10. Legs dark and pale.

Female.—Indistinguishable from *E. civile*. In both species there is a great variation in size.

Nevada, Ohio, Illinois (Adams), Indiana.

Simonton Lake, July 9 and 14, 1899, common (Weith); Frantz Fishpond, July 4, 1898, June 5, 1899, rare (Deam *et al.*); Eagle Lake, July 5, 9 and 10, 1898 (Deam); Round and Shriner Lakes, September 2, 1897, and June 24 and July 21, 1898; Wabash River, Wells County, July, 1896.

June to September. The males of this species are most easily separated from *civile* structurally by the superior abdominal appendages, as seen in dorsal view. In profile the appendages of these two species sometimes appear obscure and indistinct.

E. ASPERSUM Hagen (*aspersus* L., spotted).

Agrion aspersum Hagen, Syn. Neur. N. A., p. 97, 1861.

E. aspersum Kirby, Synonymic Cat., 1890.

Ab. male 25, female 24; h. w. male and female 18.

Male.—Blue; vertex black; postocular spots blue, connected. Throat with mid-dorsal and humeral stripes black. Abdomen blue, black as follows: a basal spot on 1, an apical spot on 2, apical two-thirds of 3, all of 4–6 excepting narrow interrupted basal rings, basal half of 7, and 10. Legs dark and pale. The abdominal appendages are very similar to *E. traviatum*. In profile they may be distinguished as follows: *aspersum* has the lower lobe of the superiors more prominent than *traviatum*, so that in *aspersum* the inferior appendages just reach the tip of this lobe, in *traviatum* they extend far beyond it, almost equaling the upper lobe of the superiors.

Female.—Lighter than the male. Dorsum of 1–10 with a longitudinal black band, reduced to a narrow stripe on the greater part of 7 and 8; interrupted basal rings on 3–6.

New York, New Jersey, Illinois, New Hampshire, Pennsylvania, Virginia, Massachusetts, Ohio.

E. TRAVIATUM Selys (*traviatus* L., from *travio*, to go through). Pl. V, figs. 9 and 10.

E. traviatum Selys, Bull. Ac. Belg. (2) XLI, p. 519, 1876; Kirby, Synonymic Cat., 1890.

Ab. male 25, female 24; h. w. male 17, female 18.

Male.—Blue; vertex blue or green bounded with black lines; postocular spots connected. Thorax with the black mid-dorsal and humeral stripes narrow. Abdomen blue, black as follows: a basal spot on 1, an apical spot on 2, all of 3-7, excepting rather broad interrupted basal rings, a basal patch on 8, and all of 10. Legs dark and pale.

Female.—Similar to the male, paler. Mid-dorsal thoracic and humeral stripes largely reddish yellow with narrow black lines. Dorsum of abdomen black, blue as follows: interrupted basal rings on 3-7, 8 and 9 excepting basal spots, and all of 10.

New York, Massachusetts, Ohio, Indiana.

Round and Shriner lakes, June 24, 1898, abundant, pairing, females were common in adjoining woodland.

This delicate species has probably a very short seasonal range. Like several others of the genus—*hageni*, *aspersum*, *divigans*, *pollutum*—*traviatum* seems to confine itself pretty closely to the lakes and ponds.

E. GEMINATUM Kellicott (*geminus* L., twin). Pl. V, figs. 11 and 12.

E. geminata Kellicott, Ent. News, Vol. VI, p. 239, September, 1895.

Ab. male 20, female 19; h. w. male 14, female 15.

Male.—Blue; vertex black, postocular spots not connected. Thorax with wide mid-dorsal and humeral stripes, and a line on the second suture black. Abdomen blue, black as follows: a basal spot on 1, an apical spot on 2, the anterior point of this sometimes reaching the base of the segment, 3-6 excepting basal interrupted rings, all of 7 and 10. Legs pale and dark.

Female.—Similar, usually paler. Dorsum of abdomen black, an apical ring on 1, and widely interrupted basal rings on 3-7; 8 has a blue spot on either side—these spots are of variable size, sometimes meeting dorsally, making the basal half or three-fourths of the segment blue.

New York, Ohio, Michigan, Illinois (Adams), Indiana.

Elkhart, May 31, June 10, September 18, 1895, July 18, 1899 (Weith); Lake, Jackson Township, Wells County, September 14, 1899, common, pairing (Deam); Round and Shriner lakes, June 8 and 24, 1898, abundant on both dates; Eel River, Allen County, June 23, 1898; Frantz Fishpond, July 4, 1898.

May to September. The smallest and possibly the most active representative of the genus in the State. They are found near streams and ponds or lakes, but seem to prefer the still water, over which, during the middle of the day, they fly restlessly back and forth, usually several feet or more from the shore.

E. piscinarium n. sp. (*piscinarius* L., one fond of fishponds). Pl. V, figs. 13 and 14.

Ab. male, 22; h. w. male 15.

Male.—Head blue, beneath pale; the following black: vertex, antennæ, excepting the first joint, and the clypeus; post-ocular spots rounded cuneiform, narrowly connected. Prothorax black, posterior lobe narrowly margined with blue; thorax blue, a mid-dorsal and humeral stripe and a spot on the first and second sutures just under the wing bases, black. Abdomen blue, black as follows: a basal spot and narrow apical ring on 1, a cordate apical spot connected with a narrow apical ring on 2, very narrowly interrupted basal rings on 3–6 (these rings are widest anteriorly, becoming narrower successively), all of 7 and 10; sides of 1 and 2 blue, posteriorly the black of the dorsum extending more onto the sides. Legs pale; femora above, tibia anteriorly, and tarsi entirely, dark, successively paler from the first pair to the third. Superior abdominal appendages black, inferiors pale, tipped with dark; very similar to *E. geminatum*. The superiors, like *geminatum*, have a small acute tooth on the lower inner surface of the lower lobe; the upper lobe is shaped very much as in *geminatum*, while the lower lobe is more developed than in that species, turning upward and lying outside of the upper lobe. Seen from above and from the side the superior appendages on the inner surface resembled a mittened hand, the upper lobe corresponding to the thumb, which lies half within the partly closed palm, represented by the lower lobe. The inferior appendages, viewed in profile, are more upturned than in *geminatum*, the upper edge is more concave, and they are relatively shorter.

Described from a single male. Franz Fishpond, Wells County, Indiana, July 4, 1898, L. A. Williamson. The specimen has been examined by Dr. Calvert and Mr. Hine. It is deposited in the Museum of Comparative Zoölogy, Cambridge, Mass.

The species is most nearly related to *E. geminatum* Kellicott. From that species it offers the following differences in coloration: Postocular spots connected in *piscinarium*, not connected in *geminatum*; a spot on the second lateral suture above in *piscinarium*, a well defined line in *geminatum*; abdominal segment 2 without a lateral spot in *piscinarium*, 2 with a large irregular rectangular spot in *geminatum*; and the basal rings on 3–6 slightly wider and less interrupted in *piscinarium* than in *geminatum*.

E. divagans Selys (*divagans* L., wandering). Pl. V, figs. 15 and 16.

E. divagans Selys, Bull. Ac. Belg. (2) XLI, p. 519, 1876; Kirby, Synonymic Cat., 1890.

Ab. male 23, female 24; h. w. male 16, female 18.

Male.—Blue; vertex black, blue postocular spots connected. Thorax with mid-dorsal and humeral stripes and a spot on the first and second sutures above, black. Dorsum of abdomen black, an apical ring on 1, narrow interrupted basal rings on 3–7, and all of 8 and 9, blue. Legs dark and pale.

Female.—Similar, paler; humeral stripe with reddish yellow on the suture. Dorsum of abdomen black, a large basal spot on 9 and all of 10 blue.

Massachusetts, Pennsylvania, New York, Ohio, Indiana.

Round and Shriners lakes, June 24, 1898, two males.

E. EXSULANS Hagen (*exsulans* L., being a stranger). Pl. V, figs. 17 and 18.

Agrion exsulans Hagen, Syn. Neur. N. A., p. 82, 1861.

E. exsulans Kirby, Synonymic Cat., 1890.

Ab. male 27, female 26; h. w. male 18, female 19.

Male.—Blue; vertex black, postocular spots connected. Thorax with mid-dorsal and humeral stripes and spots above the sutures, black. Dorsum of abdomen black, a narrow apical ring on 1, narrow interrupted basal rings on 3–6, the apical part of 8 and all of 9 blue. Legs pale and dark.

Female.—Similar, paler; the thorax has the mid-dorsal and humeral stripes bright dark green, each humeral enclosing a reddish yellow stripe which covers the suture; mid-dorsal carina yellow. Abdomen with the dorsum dark green, interrupted basal rings on 3–6, apex or not of 9 and usually all of 10 blue.

Maine, New York, Pennsylvania, Virginia, Maryland, District of Columbia, Illinois, Missouri, Texas, Michigan, Ohio, Indiana.

Elkhart, June 13, July 8, 1895, July 18, 1899 (Weith); Eagle Lake, July 6, 1898; Marion County, June 26, 1899 (Deam); Wabash River, Wells County, July, 1896, June 22, 1898, June 5, 1899 (Deam *et al.*); Round and Shriners lakes, June 24 and July 21, 1898, rare; Eel River, Allen County, June 23, 1898, abundant, pairing.

June to September. This very common species seems to prefer the herbage along streams, though it may be expected about every pond and lake. The male abdominal appendages seem to offer greater individual variations than are found in the same parts in any other species occurring in the State.

E. ANTENNATUM Say (*antenna*, L., a sail-yard). Pl. V, figs. 19 and 20.

Agrion antennata Say, Journ. Ac. Phila., VIII, p. 39, 1839.

Protoneura antennata Hagen, Syn. Neur. N. A., p. 73, 1861.

E. fischeri Kellicott, Journ. Cin. Soc. Nat. Hist., p. 206, January, 1895.

Ab. male and female 24; h. w. male 17, female 18.

Male.—Black, orange, blue and green; vertex black, face orange, blue postocular spots connected. Thorax black, a glaucous or yellow antehumeral stripe and the sides blue or greenish, excepting a black spot above on each of the sutures; beneath faintly tinged with yellowish. Abdomen with the dorsum black, the following blue: a narrow apical ring on 1, narrow interrupted basal rings on 3-6, and all of 9. Pterostigma small, square, a decided reddish brown. Legs yellow, lined with dark, the last pair the palest.

Female.—Similar, paler; the mid-dorsal thoracic carina yellow (sometimes so in the male also). Abdomen with dorsum bronze black, interrupted basal rings on 3-6 and most of 10 blue or pale. Pterostigma paler.

Ohio, New York, Iowa, Illinois (Adams), Indiana.

"Inhabits Indiana" (Say); Indiana Lake, June 25, 1899 (Weith); Eagle Lake, July 6, 1898 (Deam); Wabash River, Wells County, July and August, 1896, June 22, 1898, June 5, 1899; Frantz Fishpond, July 4, 1898, June 5, 1899 (Deam *et al.*); Eel River, Allen County, June 23, 1898, abundant; Round and Shriner lakes, June 7 and 24, 1898, common, pairing on both dates.

May to September. This common and beautiful species frequents the herbage near streams, lakes and ponds, where it may sometimes be found in great numbers. It is distinguished from all the other Agrionines as it flies by the orange or yellowish on the head and ventral part of the thorax as distinct from the black and blue or green of the remainder of the thorax. During the middle of August, 1896, it was by far the most abundant Odonate about a deserted gravel pit near the Wabash River in Wells County.

E. signatum Hagen (*signatus* L., marked). Pl. V, figs. 21 and 22.

Agrion signatum Hagen, Syn. Neur. N. A., p. 84, 1861.

E. signatum Kirby, Synonymic Cat., 1890.

Ab. male 28, female 27; h. w. male 17, female 18.

Male.—Orange; vertex black, orange occipital spots connected. Thorax with a mid-dorsal and humeral stripes and a line on the second suture bronze black or dark green, the humeral stripe sometimes has a lilac or greenish stripe of equal width lying just below it. Dorsum of abdomen black, the following orange or pale yellow: a narrow apical ring on 1, basal interrupted rings on 3-7, all of 9, and the sides of 10, sometimes reducing the black on the dorsum of 10 to a line. Pterostigma paler than in *antennatum*, longer than wide. Legs pale yellow with little or no dark.

Female.—Similar, usually more blueish than yellow. Dorsum of abdomen bronze black, 3-7 with yellowish, interrupted basal rings, 9 with the yellow on the sides reaching the mid-dorsum apically, and 10 entirely yellow. Legs with more dark than in the male.

Maine, New York, Maryland, Georgia, Louisiana, Illinois, Missouri, Pennsylvania, Massachusetts, Iowa, Michigan, Ohio, Indiana.

Turkey Lake (Kellicott); Elkhart, June 10, 1895, July 27, 1899 (Weith); Chapman Lake, July 7, 1898; Lake, Jackson Township Wells County, September 14, 1899, pairing (Deam); Wabash River Wells County, July, 1896, October 2, 1898 (Deam *et al.*); Round and Shriner lakes, August 1, 1896, September 2, 1897, June 7 and 24, and July 21, 1898, pairing on all dates but June 7; Eel River, Allen County, June 23, 1898, abundant.

June to September. A common species, graceful and active, preferring slow flowing or still water. At Shriner and Round lakes they were abundant on the dates given above; the females when not pairing or ovipositing were always found among the vegetation near shore; the brightest colored males are oftenest seen about the lily pads at a considerable distance from land. As in *pollutum*, teneral individuals are dull pale blue, where the adults are orange or yellow in color.

E. POLLUTUM Hagen (*pollutus* L., polluted). Pl. V, figs. 23 and 24.

Agrion pollutum Hagen, Syn. Neur. N. A., p. 36, 1861.

E. pollutum Kirby, Synonymic Cat., 1890.

Ab. male 28, female 27; h. w. male 17, female 18.

Male.—Bright yellow, pale; vertex black, postocular spots blue, connected; thorax with a narrow mid dorsal stripe, a humeral spot above and below, joined with faint reddish, and a spot above on the second suture, bronze or green black; as in *signatum*, the humeral stripe has a pale indistinct bluish stripe below it. Dorsum of the abdomen greenish black or brown, segments usually darker apically, especially on the anterior segments, posterior segments darker, blue or pale, as follows: basal rings on 3-7, all of 9, and the sides of 10, extending well onto the dorsum. Legs pale yellow without dark lines or with the merest trace of such.

Female.—Similar, paler. Dorsum of abdomen bronze black, 3-7 with basal yellowish or pale rings, apex of 9 and all of 10 yellowish or bluish. Legs with more dark than in the male.

Maine, Florida, Ohio, Indiana.

Simonton Lake, July 13, 1899 (Weith); Round and Shriner lakes, September 2, 1897, June 7 and 24 and July 21, 1898, abundant at a few points around the lakes.

June to September. Color of tenerals pale blue, changing to yellow with age. The females of *signatum* and *pollutum* are distinguished by the

reduction of the thoracic mid-dorsal and humeral stripes in *pollutum*. *Pollutum* is the most slender and delicate of the *Enallagmas* found in Indiana. Along the shores of Shriner Lake the species occurs abundantly at a few places. During the middle of the day they will be found congregated in some cool, shady spot near the water's edge in such numbers that a single sweep of the net may capture half a dozen individuals. Like *signatum*, they are on the wing after sunset, often at a considerable distance from shore.

ISCHNURA Charpentier (*ischnos* Gr., lean; *oura* Gr., tail).

Charpentier, Lib. Eur., p. 20, 1840.

A widely distributed genus of about 30 known species. It is represented in North and South America, Europe, Asia, Africa, Australia and islands of the South Pacific. Two species are found in the State. *I. kellicotti*, so far as observed, confines itself to certain localities and surroundings, but *I. verticalis* is found everywhere, the males distinguished at once from the *Enallagmas* and other smaller species with which they commonly associate by the green and black thorax and the bright blue on abdominal segments 8 and 9.

The name *Ischnurus* was used in 1837 for a genus in *Arachnida*. The name *Ischnura* has been used, however, by all authors on Odonata during the past 50 years, and there seems no advantage to be gained by dropping it. If "all generic names are different unless originally spelled alike" (Jordan and Evermann, Fishes of North and Middle America, Part I, p. v, 1896), and if *Scaphirhynchus* and *Scaphorhynchus* can both exist, there seems no logical reason why *Ischnura* in Odonata may not be retained with *Ischnurus* in *Arachnida*. In his Synonymic Catalogue Kirby proposes the name *Micronympha* to take the place of *Ischnura*.

The females of species in this genus are dimorphic. That is, at the time of imagination two distinct color types of females appear. In *verticalis*, for example, the females may be greenish and brown or black, or the thorax and basal abdominal segments may be conspicuously reddish yellow. Later both forms become pruinose and the original colors are almost, if not completely, obscured. Such dimorphism is said to exist in other Agrionine genera, among them *Anomalagrion*, which is found in Indiana.

Male and black female.—Dorsum of 1 and 2 black; pterostigma on front wings of male usually black above.
verticalis.

Dorsum of 1 and 2 with more or less blue; pterostigma on front wings of male usually largely blue above. *kellicotti*.

Orange female.—Abdominal segments 2 and 3 largely orange. *verticalis*.
Abdominal segments 2 and 3 largely black. *kellicotti*.

I VERTICALIS Say (*vertex* L., the highest point). Pl. IV, figs. 6, 7 and 9.

Agrion verticalis Say, Journ. Ac. Phila. VIII, p. 37, 1839.

Agrion verticale and *Agrion ramburii* Hagen, Syn. Neur. N. A., p. 82 and p. 76, 1861.

Micronympha verticalis Kirby, Synonymic Cat., 1890.

Ab. male 20, black female 21; orange female 22; h. w. male 13, black female 14, orange female 15.

Male.—Green; vertex black, small round, postocular spots and a short occipital line, blue. Thorax with wide mid-dorsal and humeral stripes, a spot above on the first suture, and a narrow line on the second suture, black, rarely the green stripe included between the mid-dorsal and humeral stripes is interrupted to form an ! mark, as in *Nehalennia posita*. Dorsum of abdomen black, a narrow apical ring on 1 and narrow interrupted basal rings on 3-7 pale, 8 and 9 bright blue with a black stripe on either side. Pterostigma on front wings black, on hind wings pale brown. Legs pale and dark. The apical dorsal edge of 10 is produced as an upturned bifid process. The appendages are short, the superiors lamellate, triangular in profile; the inferiors a little longer, produced from the lower outer side, the upper lobe short and erect.

Black female.—Similar to the male, postocular spots connected or not; the humeral stripe is indistinct, usually black above and below, connected by reddish brown, sometimes represented by only a spot above; first and second sutures each with a spot above. Dorsum of abdomen uniform black or dark brown, sides paler, greenish. Pterostigma on all the wings pale brown. Usually smaller and slenderer, the head and thorax appreciably less robust, and the entire insect usually becoming less pruinose than the orange female. This description is made from alcoholic specimens. In life they are colored as follows: Bluish or grayish, pruinose; mid-dorsal thoracic and humeral stripes black; abdominal segments 1-7 with their apices darker, usually black, and 8-10 black.

Orange female.—Colors orange and bronze black; vertex black, postocular spots orange, connected; thorax with black as in the male, stripes narrower, and only a spot or short line on the second suture. Abdomen with 1-3 largely orange, apical half or third of 3 bronze black; dorsum of 4-10 bronze black, sometimes 8-10 are slightly marked with pale. This form becomes entirely pruinose, the orange entirely disappearing but remaining longest on the basal abdominal segments. In this coloration the postocular spots disappear or become dark brown; the black humeral stripe is bordered above (antehumeral stripe) and below by dark brown stripes; and the entire abdominal dorsum is black or dark brown; the sides of thorax and abdomen greenish. These markings

appear when the pruinose insect is dropped into alcohol. In the localities where the writer has observed this species the pruinose orange females in the spring have always been far more numerous than either the black females or the brightly colored orange females; in the autumn the black females seem to be most numerous.

Quebec to Georgia, west to Missouri and Louisiana, Iowa, Michigan, Ohio, Illinois, Indiana.

"Inhabits Indiana" (Say); Elkhart and vicinity; St. Joe River, Christiana Creek, Simonton Lake, June 10 and 11 and September 2, 1895, May 10 and 25, 1897, May 14, 19 and 21 and July 13, 14, 19, 27 and 30, 1899 (Weith); Crawford County, May 9, 1899 (Blatchley); Goose Lake, July 11, 1898; Eagle Lake, July 9, 1898; Lake, Jackson Township, Wells County, September 14, 1899 (Deam); Wabash River, Wells County, July and August, 1896, June 22, July 31 and September 4 and 10, 1898 (Deam *et al.*); Round and Shriner lakes, August 1, 1896, September 2, 1897, June 7 and 24 and July 21, 1898, observed pairing on all dates but June 7; Eel River, Allen County, June 23, 1898; Frantz Fishpond, July 4, 1898.

May to October; found everywhere. Their flight is so weak that wind storms often carry them far from their birthplace, and solitary individuals may be found perhaps resting on some dry paved thoroughfare. The pterostigma on all four wings in young males is brown; it is only in fully matured males that the pterostigma on the front wings is different in color from the pterostigma on the hind wings. This applies as well to *kellicotti*.

I. KELLICOTTI Williamson (named for David S. Kellicott).

I. kellicotti Williamson, Ent. News, Vol. IX, p. 209, November 1898; Calvert, l. c. p. 211.

Ab. male 21, female 22; h. w. male 15, female 16.

Male.—Blue; vertex black, postoculars blue, large, round and not connected. Thorax with wide, mid-dorsal and humeral stripes, a spot above on the first suture and a narrow stripe on the second, black. Abdomen above bronze black, the following blue: apex of 1, usually much of 2, the black on the sides extending across the segment apically and basally and near the middle, an apical spot on 7, and all of 8 and 9; pale interrupted basal rings on 3-7. Pterostigma of front wings mostly bright blue above in fully matured individuals, pale brown in hind wings. Legs pale and dark. Appendages black, longer and slenderer than in *I. verticalis*.

Black female.—Similar; postoculars continued onto rear of head. Dorsum of abdominal segments 8 and 9 usually largely blue, 8 some-

times blue only basally and apically, 10 blue. Pterostigma pale brown, the same on all four wings.

Orange female.—Similar to the black female but with orange or yellow replacing the blue.

New Jersey, Block Island off Rhode Island coast (Calvert), Indiana.

Round and Shriner lakes, September 2, 1897, June 7 and 24, and July 21, 1898.

Altogether 30 males and five females of this species has been taken in the State. Of the number, all but two males were taken in a small bay in the southwestern part of Round Lake. The two males were taken at the western end of Shriner Lake. They have been found only about the beds of white waterlilies, resting on the floating leaves. Their flight is usually short and direct, without the fluttering and hesitancy before alighting which makes the flight of other Agrionine species found associated with them. This species, and often *Enallagma geminatum* and *Enallagma signatum*, as well as others, is most easily captured by striking down with the insect net directly on the specimen and sinking the net with the captured dragonfly beneath the surface of the water. As the net is swept through the water and brought to the surface the dragonfly is found uninjured, clinging to the bag. *Kellicotti* may often be observed catching Diptera; in fact, unless disturbed, this seems to be its only reason for flying from one leaf to another, excepting when it suddenly darts at some trespassing *Enallagma*, usually *signatum*.

ANOMALAGRION Selys (*anomalos* Gr., irregular; *Agrion*, a genus of Odonata, *agrion* Gr., a wild animal).

Selys, Sagra's Hist. Cuba, Ins., p. 469, 1857.

A genus represented by a single species, reported from North America, Cuba and Venezuela.

A. HASTATUM Say (*hastatus* L., armed with a spear). Pl. IV, fig. 8.

Agrion hastata Say, Journ. Ac. Phila. VIII, p. 38, 1839.

A. hastatum Hagen, Syn. Neur. N. A., p. 77, 1861.

Anomalagrion hastatum Kirby, Synonymic Cat., 1890.

Ab. male 18, female 19; h. w. male 11, female 13.

Male.—Orange or yellow; vertex black, postocular spots small, not connected. Wide mid-dorsal thoracic and humeral stripes and spot above on the second suture, bronze black. Abdomen yellow or orange, bronze black on dorsum as follows: all of 1 and 2, much of 3, the basal and apical spots on 3 usually meeting on the mid-line, basal and apical spots, variable in size, on 4 and 6, and 7 basally. Pterostigma on front wings removed from the costa, ovate, reddish; on hind wings normal in

position, black. Legs pale, dark lined. Posterior dorsal edge of 10 bears a slender bifid spine. Superior abdominal appendages half as long as 10, bifid; inferiors a little longer than the superiors.

Black female.—Similar to the male; dorsum of abdomen black, pale interrupted basal rings on 3-6. Pterostigma brown, similar on all the wings.

Orange female.—Similar to the male; postocular spots continuous with orange on rear of head; thoracic humeral stripe reduced to a line or wanting. Abdomen with spot on the middle of 1, at base of 2, apical rings on 2-4 and all of 5 or 6-8 or 9 bronze black.

Venezuela, West Indies; Maine, Pennsylvania, New Jersey, New York, Maryland, Florida, Louisiana, Texas, Iowa, Ohio, Illinois (Adams), Indiana.

"Inhabits Indiana" (Say); Lake, Jackson Township, Wells County, June 21, 1899 (Deam); Elkhart, St. Joe River, July, 1899 (Weith).

May to September. A common species, to be looked for in marshes and swamps bordering streams or still water.

TACHOPTERYX Uhler (*tachys* Gr., swift; *pteryx* Gr., wing).

Uhler, Bull. Ac. Belg. (2) VII, p. 551, 1859.

A genus of three known species. Two occur in North America, the third in Japan. *Tachopteryx* is one of the four genera which constitute the Legion *Petalura* of Selys. They differ from all other genera in the subfamily *Gomphinae* by having the median lobe of the labium bifid and by the females having an ovipositor.

T. THOREYI Hagen (named for M. Thorey).

Uropetala thoreyi Hagen, Mon. Gomph., p. 373, 1857.

Petalura thoreyi Hagen, Syn. Neur. N. A., p. 117, 1861.

Tachopteryx thoreyi Selys, Bull. Ac. Belg. XLVI, p. 696, 1878;

Kirby Synonymic Cat., 1890.

Ab. male 56, female 54; h. w. male 51, female 52.

Male.—Gray, plumbeous or yellowish; head above dark, face yellowish with black, occiput yellowish, bordered with black. Thoracic sutures black, a wide, rather indefinite stripe on the humeral and another on the second lateral suture. Abdomen with black as follows: four spots on the dorsum of 1, the apical two the smaller, and a narrow interrupted transverse median ring, apical half and basal spot connecting on 3-7, and most of 8-10. Pterostigma very long and narrow; front wings with about 15 antecubitals and 9 postcubitals; triangle of front wings usually twice crossed and of hind wings once. Superior abdominal appendages flattened, apical portion triangular; the inferior shorter, near its base with two superior recurved teeth.

Female.—Similar; basal spots on 3–7 less distinct.

Massachusetts, New York, North Carolina, Maryland, Kentucky, Texas, Florida, Pennsylvania (J. L. Graf, H. D. Merrick).

T. thoreyi has been taken by the writer in western Pennsylvania. It was usually observed resting in sunny situations on fences or trees, at the edges of woodland. A small stream and a small marshy area were near. While resting they are very easily approached, and the net may be brought within an inch of them without disturbing them. In fact, they may be touched with the rim of the net and still remain at rest. Once aroused, their flight is swift and strong. Mr. Graf has observed the species in Allegheny County, Pa., from June 1 until July 16.

HAGENIUS Selys (named for Hermann August Hagen).

Selys, Bull. Ac. Belg. XXI (2), p. 82, 1854.

The type of the genus is *H. brevistylus*, found in North America and Colombia. A species from India has been provisionally referred to *Hagenius*. These are the only species of the genus known.

H. BREVI-STYLUS Selys (*brevis* L., short; *stylus* L., a style).

H. brevistylus Selys, Bull. Ac. Belg. XXI (2), p. 82, 1854; Hagen, Syn. Neur. N. A., p. 114, 1861; Kirby, Synonymic Cat., 1890.

Ab. male 55, female 60; h. w. male 48, female 52.

Male.—Black, marked with greenish yellow; face yellow. Mid-dorsal thoracic carina a short curved line on either side, a transverse line in front, a narrow antehumeral stripe, usually interrupted, and two broad stripes on the sides and a line between them, yellow. Abdomen black, the following yellow: a median longitudinal stripe running nearly the length of the abdomen and ending on the base of 8, sides of 8 and 9, sides anteriorly, and beneath the entire length. Wings slightly tinged with brown; pterostigma long; front wings with about 20 antecubitals and 15 postcubitals. Abdominal appendages shorter than 10; superiors curved downwards at the apex, forming a hook, anterior to which there are two downwardly projecting processes; inferior about equal to superiors, wide, apex broadly bifid, upturned.

Female.—Similar; occiput small, hind border with a small posterior tubercle on each side. Vulvar lamina covering about a fourth of 9, apical margin excavated.

Colombia, Canada; Maine, New York, Massachusetts, Maryland, Wisconsin, Kansas, Texas, Florida, Kentucky, Michigan, Pennsylvania, Ohio, Illinois (Adams), Indiana.

Elkhart, July 5, 1893, one female; September 4, 1895, three nymphs; June 20, 1897, one male at edge of thick woods; June 1, 1899, one male in woods (Weith).

June, July and August. Apparently preferring the larger and more swiftly flowing streams, resting on the twig or branch of some near by shrub or tree, or hunting along the shore near the surface of the water, revisiting the same spot time and again.

PROGOMPHUS Selys (*pro* Gr., before; *Gomphus*, a genus of Odonata, *gomphos* Gr., a wedge-shaped bolt).

Selys, Bull. Ac. Belg. XXI (2), p. 69, 1854.

A genus confined to the Americas. Eleven species are known. One of these occurs north of Mexico and the West Indies.

P. OBSCURUS Rambur (*obscurus* L., dusky). Pl. IV, figs. 3 and 4.

Diastomma obscurum Rambur, Ins. Névr., p. 170, 1842.

Progomphus obscurus Hagen, Syn. Neur. N. A., p. 110, 1861;

Selys, Bull. Ac. Belg. XLVI (2), p. 658, 1878; Kirby, Synonymic Cat., 1890.

Ab. male and female 43; h. w. male 32, female 33.

Male.—Brown, marked with greenish yellow; face and occiput greenish, occiput nearly straight, two yellow spots behind each eye. Thorax with the following markings: each side above with an oblique line which meets a transverse line anteriorly, and a narrow interrupted antehumeral stripe; sides indefinitely brown and green. Abdomen above with the apices of 2-7 brown, widest on 5 and 6, 7 with a brown spot on either side near the middle, 8-10 uniform brown. Wings with a small brown basal spot; in front wings about 15 antecubitals and 8 postcubitals. Legs small, yellowish brown, pale beneath. Superior abdominal appendages pale yellow, about twice as long as 10; inferior a third shorter than the superiors, brown, a dorsally directed process before the apex.

Female.—Similar; the abdomen darker, the greenish yellow reduced to basal spots, or anteriorly appearing as an interrupted longitudinal mid-dorsal stripe.

Mexico; Massachusetts, Pennsylvania, Georgia, Texas, Oregon, California, Ohio, Illinois (Adams), Indiana.

Elkhart, July 4, 1895, over marsh; Simonton Lake, July 8, 1895, and July 9, 1899 (Weith); St. Mary's River, Ft. Wayne, June 26, 1898, not rare at the ripples, a pair taken resting on a boulder in mid-stream.

GOMPHUS Leach (*gomphos* Gr., a wedged shaped bolt or nail).

Leach, Edinb. Encyc. IX, p. 137, 1815.

As used by Selys, the genus *Gomphus* includes more than 50 known species. About 20 of these are found in Europe, Asia or Africa and the

remainder occur in North America. No less than 15, and possibly a greater number of species will eventually be found in the State. Selys. Bull. Ac. Belg. XXI (2), 1854, divides the genus into 7 groups with the following types:

I. *G. occipitalis* from India, since made the type of another genus.

The species referred to this group of the genus *Gomphus* in 1854 have been transferred to two other genera.

II. *G. dilatatus* from the United States.

III. *G. vulgatissimus* from Europe.

IV. *G. pallidus* from the United States.

V. *G. parvulus* from the United States.

VI. *G. plagiatus* from the United States.

VII. *G. notatus* from the United States.

Species representing groups II-VII, excepting V, will doubtless be found in the State. Needham, Canadian Entomologist, July, 1897, after studying the nymphs or a number of species, groups the N. A. species of the genus *Gomphus* under four genera, as follows:

I. *Lanthus*, type *G. parvulus*, =Group V.

II. *Arigomphus* (*Orcus*), type *G. pallidus*, =Group IV.

III. *Stylurus*, type *G. plagiatus*. This genus includes Groups VI and VII of Selys.

IV. The name *Gomphus* is retained for Groups II and III of Selys.

In the present paper it is deemed advisable to use the name *Gomphus* in its wider sense. Kirby, in his Synonymic Catalogue, uses the name *Aeshna* of Fabricius for this genus. As has been pointed out (Selys., Needham) the name *Gomphus* should be retained.

The *Gomphi* are strong fliers and some of them are among our most wary dragonflies. As imagoes the males are much oftener taken than the females. Many species prefer the rocky, rapid ripples of some stream, flying back and forth near the water's surface, and taking long rests on some sunny boulder. Others frequent the shores of lakes and ponds. Some species are frequently met with in open fields and along sunny roads. The females are more retiring than the males. Of the material collected in the State, in every species excepting *G. exilis*, the males have greatly exceeded the females in numbers. Excepting *spiniceps*, which flies from July till September, the various species may be looked for from May till July. June is the Odonate month as far as the *Agrioininae* and *Gomphinae* are concerned. Later summer brings the *Aeschninae* and the *Libellulinae*, but it is during June, that in Indiana the maximum number of species is on the wing.

Coloration usually offers specific characters. Structurally the abdominal appendages and genitalia of the male, and the occiput and vulvar lamina of the female are distinctive.

Groups of Selys. in which the species known or likely to occur in Indiana fall:

- II. *Dilatatus, vastus, ventricosus, crassus.*
- III. *Quadricolor, fraternus, externus, grashinellus.*
- IV. *Pallidus, villosipes, furcifer, sordidus, spicatus, descriptus, exilis.*
- VI and VII. *Notatus, amnicola, spiniceps, plagiatus, segregans.*

Abdominal segment 9 not longer than 8; thorax colored much as in figs. 2 or 3, Pl. VII; males with 7-9 conspicuously dilated, superior abdominal appendages black. 1.

Abdominal segment 9 usually equal to or longer than 8; thorax colored much as in figs. 1 or 4, pl. VII; males with 7-9 less expanded, superior abdominal appendages yellow or brown, rarely black. 9.

1. Segments 7-9 greatly dilated. 2.
Segments 7-9 moderately dilated. 5.
2. Abdomen more than 40 in length. 3.
Abdomen less than 40 in length. 4.
3. Abdomen more than 45 in length. *dilatatus.*
Abdomen less than 45 in length. *crassus.*
4. Humeral and antehumeral black stripes not meeting. *vastus.*
Humeral and antehumeral black stripes joined for some distance. *ventricosus.*
5. Dorsum of 9 black. 6.
Dorsum of 9 with some yellow. 7.
6. Abdomen about 32 in length. *quadricolor.*
Abdomen about 40 in length. *externus.*
7. Superior surface of all the tibiae not yellow or green. 8.
Superior surface of all the tibiae yellow or green. *grashinellus.*
8. Posterior edge of the inferior abdominal appendage of the male, seen from above, straight; occiput of the female with a median spine. *fraternus.*
Posterior edge of the inferior abdominal appendage of the male seen from above, concave; occiput of the female without a spine. *externus.*
9. Thorax pale with dark markings, the pale area on the dorsum of the thorax on either side of the mid-dorsal dark area continuous with the pale anterior edge of the meso-thorax (fig. 1, pl. VII). 10.
Thorax dark with pale markings, the pale stripe or bar on the dorsum of the thorax on either side of the mid-dorsal dark area not meeting the pale mesothoracic half-collar (fig. 4, pl. VII). 16.

10. Thorax with the brown markings pale and obsolete, sides with little or no brown. *pallidus*.
Thorax darker, humeral and antehumeral not widely separated.
11.
11. Abdomen about 34 or more in length. 12.
Abdomen about 31 in length. *exilis*.
12. *Villosipes, furcifer, sordidus, spicatus, descriptus*: the males may be separated by their abdominal appendages (pl. VII); the females may be distinguished as follows:
Occiput with a spine or prominence in the middle. 13.
Occiput without median spine or prominence. 14.
13. Colors dark brown or black and olive. *villosipes*.
Colors obscure dull brown and olive. *spicatus*.
14. Abdominal segment 9 with a yellow mid-dorsal stripe; colors dull brown and olive. *sordidus*.
Abdominal segment 9 above brown or black. 15.
15. Apices of the vulvar lamina rounded. *furcifer*.
Apices of the vulvar lamina pointed, divaricate. *descriptus*.
16. Abdomen less than 38 in length. *annicola*.
Abdomen about 40 or more in length. 17.
17. Segment 7 and 9 about equal in length. *spiniceps*.
Segment 7 much longer than 9. 18.
18. Black, marked with yellow and green; stripes or bars on thorax above usually separated from meso-thorax half-collar by more than their own width; antehumeral narrowed or interrupted above. *notatus*.
Fuscous, marked with yellow and green; stripes on thorax above longer, more nearly reaching the meso-thoracic half-collar; antehumeral of uniform width. *plagiatus*.

G. DILATATUS Rambur (*dilatatus* L., broadened). Pl. VI, fig. 6.

G. dilatatus Rambur, Ins. Névr., p. 155, 1842; Hagen, Syn. Neur. N. A. p. 103, 1861.

Aeshna dilatata Kirby, Synonymic Cat., 1890.

Ab. male 52, female 47; h. w. male and female 40.

Male.—Yellow marked with black; head yellow, borders of labrum, a transverse line between clypeus and frons, and vertex black. Thorax with the following black: a stripe on either side of the mid-dorsal carina not reaching the front margin, a humeral and antehumeral stripe, and lines on the first and second sutures. Abdomen black above, a mid-dorsal yellow stripe on 1-4, and long yellow apical spots on 5-7; sides of 1 and 2 and spots on the sides of 8 and 9, yellow. Pterostigma yellow;

costa yellow. Legs black, the femora of the first pair yellow beneath. Abdominal segments 7-9 greatly dilated.

Female.—Similar to the male. Abdominal segments 7-9 less dilated. Vulvar lamina elongate, bifid, the apices separating.

Michigan, Georgia, Florida, Ohio.

G. VASTUS Walsh (*vastus* L., large). Pl. VI, figs. 3, 5 and 28.

G. vastus Walsh, Proc. Ac. Phila., p. 391, 1862.

Aeshna vasta Kirby, Synonymic Cat., 1890.

Ab. male and female 38; h. w. male 30, female 32.

Male.—Black, marked with greenish yellow; head with the following green: occiput, median part of frons, post-clypeus below, and labrum on either side above. Thorax black with diverging stripes above, which meet the interrupted mesothoracic semicollar below and join above with a narrow antehumeral stripe, and sides, excepting the distinct lines on the first and second sutures, greenish yellow. Abdomen black; 1 and 2 above greenish yellow; an indistinct interrupted longitudinal yellow stripe on 3-7, ending on the base of 7; sides of 1 and 2 greenish, 7 shaded with yellowish, 8 with a basal spot, and 9 largely, bright yellow. Costa green on its anterior edge. Legs black, femora of the first pair green beneath. Segment 7-9 greatly dilated.

Female.—Similar. Segments 7-9 less dilated. Vulvar lamina with its two points turned inwards and upwards.

Quebec; New York, Massachusetts, Maryland, District of Columbia, Illinois, Pennsylvania, Iowa, Michigan, Ohio, Indiana.

Elkhart, May 17, 1896, at edge of grove, five males, three females (Weith).

This common species may be expected along the Ohio River or, in fact, any of the larger rivers or lakes of the State. The males are oftener found near the water's edge, the females in some field or along some country road.

G. VENTRICOSUS Walsh (*venter* L., the abdomen).

G. ventricosus Walsh, Proc. Ent. Soc. Phila., II, p. 248, 1863;

Selys, Bull. Ac. Belg. XLVI (2), p. 453, 1878.

Aeshna ventricosa Kirby, Synonymic Cat., 1890.

Ab. male 33, female 35; h. w. male 28, female 30.

Male.—Differs from *G. vastus* in the following points: face without black; median thoracic black area with the sides parallel, not wider below; humeral and antehumeral black stripes confluent for some distance; that is, the antehumeral yellow stripe reduced (in *vastus* not at all); and one pleural stripe. There are other differences, but these will

separate *ventricosus* from *vastus* and other nearly related species. Abdominal segments 8-10 are black above, and the appendages are distinct.

Female.—Similar to the male. Abdomen more robust. Vulvar lamina similar to *vastus*, the pointed tips more divaricate.

Massachusetts, Virginia, Michigan, Illinois.

G. CRASSUS Hagen (*crassus* L., thick).

G. crassus Hagen, Bull. Ac. Belg. XLVI (2), p. 453, 1878.

Aeshna crassa Kirby, Synonymic Cat., 1890.

Ab. female 43; h. w. female 36.

Male.—Not known.

Female.—Described as much resembling *externus*, with the following as some of the differences: a conical brown spine between the lateral ocellus and the eye (in *externus* a yellow spine *behind* the ocellus); the line on the first lateral suture of the thorax is narrow and interrupted, on the second suture the line is wider; abdomen very robust; the dorsal stripe on 2 is not trilobed; and the vulvar lamina constricted near its base, then enlarging in two flattened pointed diverging lobes (in *externus* the lamina is not constricted and the two lobes are contiguous to near their apices, when they widely diverge).

Kentucky.

The above description is taken from Hagen's original description. The vulvar lamina as here described for *crassus* agrees with the vulvar lamina of the form called *externus* by Kellicott in *The Odonata of Ohio*. The description given above of the vulvar lamina of *externus* agrees with the form called *fraternus* in the *Odonata of Ohio*. Possibly the *externus* of the *Odonata of Ohio* should be *crassus*, though the Kentucky specimen is larger than Ohio and Indiana specimens.

G. QUADRICOLOR Walsh (*quattuor* L., four; *color* L.). Pl. VI, figs. 7 and 29.

G. quadricolor Walsh, Proc. Ent. Soc. Phila. II, p. 248, 1863.

Aeshna quadricolor Kirby, Synonymic Cat., 1890.

Ab. male and female 32; h. w. male 26, female 27.

Male.—Bluish green, marked with black; face olive. Thorax with the following black: a mid dorsal stripe, wider below and not reaching the anterior edge, a humeral and antehumeral stripe, equal in width, connected above and below, and the first and second sutures and most of the space between them. Abdomen black above, a longitudinal mid-dorsal stripe on 1-3, very narrow on 3, and small basal spots on 4-8, yellow or green; sides of 1 and 2 largely greenish, and 8 and 9 largely

bright yellow. Costa yellowish, pterostigma light brown. Legs black. Abdominal segments 7-9 moderately expanded.

Female.—Similar, more robust. Abdominal segments 7-9 less expanded, the yellow duller. Vulvar lamina short, emarginate.

Massachusetts, Michigan, Illinois, Ohio, Indiana.

Elkhart, May 5 1896, a male, probably *quadricolor*, in a road (Weith); St. Mary's River, Ft. Wayne, June 26, 1898, one male, taken at a rapid stony ripple, others seen.

G. FRATERNUS Say (*fraternus*, L., brotherly). Pl. VI, figs. 8, 9 and 30.

Aeshna fraterna Say, Journ. Ac. Phila. VIII, p. 16, 1839.

Gomphus fraternus Hagen, Syn. Neur. N. A., p. 104, 1861.

Aeshna fraterna Kirby, Synonymic Cat., 1890.

Ab. male 37, female 38; h. w. male 30, female 32.

Male.—Yellowish green or olive, marked with dark brown; face greenish, without black. Thorax with the following brown: a mid-dorsal stripe, not reaching the anterior edge, an antehumeral equal in width to the mid-dorsal stripe, a slightly narrower humeral, a line on each of the lateral sutures and a short line or spot between them below. Abdomen black above, with a longitudinal mid-dorsal stripe, olive anteriorly where it is widest, and yellow posteriorly, ending as yellow basal spots on 7-8 or 9; sides of 1 and 2 and part of 3 greenish; lateral basal spots on 7 and 8, and all of the side of 9, yellow. Pterostigma brown, costa yellow. Legs mostly black. Segments 7-9 laterally expanded.

Female.—Similar, usually more yellowish. Humeral and antehumeral stripes connected above. Abdomen more robust; 7-9 less dilated. Vulvar lamina reaching the middle of 9, bifid, the apices diverging.

New York, New Hampshire, Texas, Illinois, Michigan, Ohio, Indiana.

"Common in June on the banks of the Wabash" (Say); St. Mary's River, Ft. Wayne, June 26, 1898, common about stony ripples.

G. EXTERNUS Hagen (*externus* L., strange, external). Pl. VI, figs. 2, 10 and 31.

G. externus Hagen, Mon. Gomph., p. 411, 1857; Syn. Neur. N. A., p. 104, 1861.

Aeshna externa Kirby, Synonymic Cat., 1890.

Ab. male 40, female 41; h. w. male 32, female 33.

Male and female.—Very similar to *fraternus*, slightly larger, and body color usually more greenish or olive than in that species. In *fraternus* abdominal segment 9 is usually black above in both sexes; in *externus* it has a yellowish longitudinal stripe or basal spot. In *externus* the males

have the abdominal appendages slenderer than in *fraternus*; viewed from above, the posterior edge of the inferior between its two branches is concave in a continuous curve with these branches; in *fraternus* the posterior edge is straight. The females may be distinguished by the shape of the occiput. (See pl. VI.)

Nebraska, Illinois, New Mexico, Texas, Ohio, Indiana.

Wabash River, Wells County, June 22, 1898, about stony ripples, many seen, several males taken.

This species, as determined by Professor Kellicott, is not *externus*, according to Dr. Calvert and Mr. Adams, as is shown by specimens in the M. C. Z. The true *externus* has the abdominal appendages distinctly different from either *fraternus* or *externus* as determined by Kellicott. Probably two species have been confused under the name of *fraternus*, so that either the *fraternus* or *externus* of the *Odonata of Ohio* and of the present paper possibly represents an undescribed species. (See *G. crassus*.) The vulvar lamina of the two species designated in this paper may be distinguished as follows: *externus*—constricted near the middle, bifid just beyond the constriction, the lobes gradually tapering, divaricate, acute (from a drawing by Mr. Hine); *fraternus*—bifid, lobes slightly tapering, contiguous till just at their tip where they turn outward at right angles, apex obtuse.

G. GRASLINELLUS Walsh (diminutive of *G. graslini*, named for A. D. de Graslin). Pl. VI., figs. 11, 12 and 32.

G. graslinellus Walsh, Proc. Ac. Phila., p. 394, 1862.

Aeshna graslinella Kirby, Synonymic Cat., 1890.

Ab. male 36, female 37; h. w. male 31, female 32.

Male and female.—Similar to *fraternus*, color more yellowish. Humeral and antehumeral stripes often connected for their entire length in the female; both sexes with the stripes on the first and second lateral sutures wider than in *fraternus* or *externus*. Abdomen above with more yellow. Dorsum of 9 and 10 conspicuously yellow; sides of 8–10 with more yellow. Tibiæ of all the legs with a green stripe on the upper side.

Illinois, Ohio, Indiana.

Marshall County, May 18, 1899 (Blatchley); Frantz Fishpond, July 4, 1898, one male and one female, the female taken while ovipositing among the algæ much after the manner of *Libellulas*.

Graslinellus is apparently very common at certain times and places. It is often taken along larger streams.

G. PALLIDUS Rambur (*pallidus* L., pale). Pl. VI, fig. 13.

- G. pallidus* Rambur, Ins. Névr., p. 163, 1842; Hagen, Syn. Neur. N. A., p. 105, 1861.
G. pilipes Hagen, Syn. Neur. N. A., p. 106, 1861.
Aeshna pallida Kirby, Synonymic Cat., 1890.

Ab. male 39, female 37; h. w. male 32, female 33.

Male.—Olive, with pale brown markings; occiput and face greenish. Thorax with the median brown area pale, obsolete; the humeral and antehumeral separate; little or no brown on the sides. Abdomen brown, with an interrupted yellow dorsal band on 1-7. Costa, yellow. Femora beneath and tibiæ above, greenish.

Female.—Similar. Occiput slightly concave. Vulvar lamina bifid at its extremity.

Georgia, Louisiana, Illinois (Adams), Indiana.

Christiana Creek, May 26, 1897, one female (Weith).

G. VILLOSIPES Selys (*villosus* L., hairy; *pes* L., foot). Pl. VI, figs. 1, 14 and 33.

- G. villosipes* Selys, Bull. Ac. Belg. XXI (2), p. 53, 1854; Hagen, Syn. Neur. N. A., p. 105, 1861.
Aeshna villosipes Kirby, Synonymic Cat., 1890.

Ab. male 38, female 39; h. w. male 33, female 34.

Male.—Olive, marked with dark brown; face and occiput greenish, the latter with a median spine. Thorax with the following brown: a short narrow stripe on either side of the mid-dorsal carina, a short antehumeral stripe, a humeral of equal width, and indistinct lines on the first and second sutures. Abdomen black, an interrupted yellowish green longitudinal mid-dorsal stripe indistinct or wanting on 8 and 9, 10 and the superior appendages entirely yellow; sides greenish or yellow, reduced to linear spots on 4-6. Pterostigma light brown; costa yellow. Legs black; the first femora beneath and all the tibiæ above green.

Female.—Similar; stouter; abdomen with more yellow on the sides. The occipital spine is simple or several pointed. Vulvar lamina short, bifid, the apices contiguous.

Massachusetts, Michigan, Pennsylvania, New York, Ohio.

The writer has taken this species in western Pennsylvania near Pittsburgh in a marsh with a small area of open water. The few specimens observed were resting on railroad ties which were floating in the water.

G. **FURCIFER** Hagen (*furca* L., a two-pronged fork; *fero* L., to carry).
Pl. VI, figs. 15 and 16.

G. furcifer Hagen, Bull. Ac. Belg. XLVI (2), p. 458, 1878.
Aeshna furcifer Kirby, Synonymic Cat., 1890.

Ab. male 35, female 36; h. w. male 28, female 30.

Male and female.—Similar to *villosipes*. The humeral and antehumeral stripes sometimes united above. Distinguished from *villosipes* in both sexes by the absence of the occipital spine; the abdominal appendages of the male are distinctive.

Massachusetts, Michigan, Ohio.

Furcifer is said to frequent still or sluggish bodies of water.

G. **SORDIDUS** Hagen (*sordidus* L., dirty, sordid). Pl. VI, figs. 17 and 34.

G. sordidus Hagen, Bull. Ac. Belg. XXI (2), p. 54, 1854; Syn.
Neur. N. A., p. 106, 1861.

G. minutus (excepting male) Calvert, Phila. Cat., p. 244, 1893.

G. lividus Kellicott, Od. Ohio, p. 66, 1899.

G. umbratus Needham, Can. Ent., p. 184, July, 1897.

For the above synonymy I am indebted to Dr. Calvert.

Ab. male 35, female 36; h. w. male 30, female 32.

Male.—Olive, marked with brown; face and occiput greenish. Thorax with the extent of the brown markings very variable, usually as follows: a brown stripe on either side of the mid-dorsal carina, not reaching the anterior edge, an antehumeral and humeral stripe, joined above and below, and first and second sutures and much of the sides indistinctly. Abdomen brown, a maculate longitudinal mid-dorsal yellow stripe; 9 above entirely yellow; 10 and the appendages brown; sides greenish or yellow, reduced to basal spots on 3-7. Pterostigma light brown; costa yellow. Femora brown; tibiae black, green above.

Female.—Similar. Vulvar lamina short, bifid.

South Carolina, Pennsylvania, Georgia, Ohio, Indiana.

Christiana Creek, May 25, 1897, one female; June 1, 1897, two males (Weith).

This species seems to live along the smaller rivers and streams.

G. **SPICATUS** Hagen. (*spica* L., a point, a spike). Pl. VI, figs. 18 and 35.

G. spicatus Hagen, Bull. Ac. Belg. XXI (2), p. 54, 1854; Syn.
Neur. N. A., p. 107, 1861.

Aeshna spicata Kirby, Synonymic Cat., 1890.

Ab. male and female 36; h. w. male 29, female 30.

Male and female.—Very similar to *sordidus*. Abdomen above and on the sides with more greenish and yellow. Female with the vulvar lamina short, deeply and broadly bifid. From *sordidus* this species may be distinguished by the abdominal appendages of the males and the occipita or the females.

Canada; Massachusetts, Maine, New York, Ohio, Indiana.

Shriner Lake, June 8, 1898, many males, one female taken, common, flying over the water near the shores of the lake.

“*Spicatus* frequents the borders of wave-beaten shores or rushing rivers.”—Kellicott.

G. DESCRIPTUS Banks (*descriptus* L., described). Pl. VI, fig. 19.

G. descriptus Banks, Journ. N. Y. Ent. Soc. IV, p. 194, 1896.

Ab. male and female 35; h. w. male 30, female 31.

Male and female.—Similar to *sordidus*. In the male abdominal segments 9 and 10 above and the appendages are black; in the female the abdomen is more yellow, and 10 has a mid-dorsal longitudinal stripe. Occiput of female slightly concave in the middle. Vulvar lamina one-third as long as 9, the apical half bifid, the tips acute and divaricate.

New York, Illinois (Adams).

G. EXILIS Selys (*exilis* L., small). Pl. VI, figs 20, 21 and 36.

G. exilis Selys, Bull. Ac. Belg. XXI (2), p. 55, 1854; Hagen, Syn. Neur. N. A., p. 108, 1861.

Aeshna exilis Kirby, Synonymic Cat., 1890.

Ab. male 31, female 32; h. w. male 25, female 26.

Male.—Greenish yellow, marked with dark brown; face and occiput green. Thorax with the following brown: a mid-dorsal stripe slightly wider below, not reaching the anterior edge, above narrowly joined to the antehumeral, an antehumeral and humeral stripe, and the first and second sutures and much of the space between them. Abdomen dark brown, segments 1–8 with a narrow yellow mid-dorsal stripe; sides of 1 and 2 greenish; sides of 8 and 10, and nearly all of 9, yellow. Costa yellowish green.

Female.—Similar. Abdomen with the sides yellower, and 9 and 10 yellow above. Legs paler than in the male. Vulvar lamina short, triangular, the apex bifid, the ends rounded.

Quebec; Maine, New York, Massachusetts, Maryland, New Jersey, Pennsylvania, Florida, Michigan, Ohio, Indiana.

Christiana Creek, May 25, 1897, one female; Simonton Lake, July 1, one female, July 8, 1897, one male, not common; Indiana Lake, June 25, 1899 (Weith); Goose Lake, July 8, 1897, one female (Deam).

G. sp. Collected by Prof. R. C. Osburn, Loudonville, Ohio, June 10, 1899. Pl. VI, fig. 22.

Ab. male 35; h. w. male 28.

Male.—“Abdominal appendages and genitalia like *brevis*, and head of *abbreviatus*”—Calvert.

Thorax bright olive, dark brown as follows: on either side of the mid-dorsal carina, not extending to the anterior edge, an antehumeral and humeral, equal in width and joined above and below, and short lines below on the lateral sutures. Abdomen black, yellow triangular basal spots on 1-7. Occiput high, rounded. Legs black, first femora green below. Segments 7-9 moderately expanded.

New York (Calvert) and Ohio (Osburn).

G. NOTATUS Rambur (*notatus* L., marked). Pl. VI, fig. 23.

G. notatus Rambur, Ins. Névr., p. 162, 1842; Hagen, Syn. Neur. N. A., p. 110, 1861.

G. fluvialis Walsh, Proc. Ac. Phila., p. 394, 1862.

Aeshna notata Kirby, Synonymic Cat., 1890.

Ab. male 40, female 41; h. w. male 32, female 34.

Male.—Greenish yellow and black; vertex and occiput black, frons black with a transverse yellow line (interrupted in the middle) above, clypeus with black on either side of the center, labrum with the lower half, edges, and broad-median stripe, black. Thorax black, the following greenish yellow: interrupted mesothoracic semicollar, dorsum each side with a short oblique bar, a narrow, sometimes interrupted, antehumeral stripe, and all of the sides, excepting broad lines on the sutures. Abdomen black, the following greenish or yellow: mid-dorsal line on 1 and 2, indistinct dorsal basal spot on 3 and 8, sometimes appearing also on the other segments, the extreme posterior edge of 8 and 9, sides of 1 and 2 and 8-10. Legs black, anterior femora green beneath.

Female.—Similar, throughout with less black; thoracic antehumeral stripe wider. Abdominal segments 3-8 with small yellow basal spots above. Occiput similar to *plagiatus*. Vulvar lamina short, terminating in two conical, divaricating branches.

Canada; Michigan, Illinois, Ohio.

This species may be looked for along the Ohio and Wabash, and perhaps other larger rivers.

G. AMNICOLA Walsh (*amnicola* L., that grows near a river).

G. amnicola Walsh, Proc. Ac. Phila., p. 396, 1862.

Aeshna amnicola Kirby, Synonymic Cat., 1890.

Ab. male and female 36; h. w. male and female 33.

Male and female.—Similar to *notatus*. Described as brighter yellow; the oblique stripes on the thorax above shorter; the antehumeral line interrupted; and an incomplete line on the first lateral suture, and none on the second. Superior abdominal appendages of the male less divaricate; vulvar lamina of the female ending in two contiguous branches.

Illinois, Iowa.

G. SPINICEPS Walsh (*spina* L., a thorn; *caput* L., the head). Pl. VI, figs. 24 and 25.

Macrogomphus (?) *spiniceps* Walsh, Proc. Ac. Phila., p. 389, 1862.

G. spiniceps Selys, Bull. Ac. Belg. XXV (2), p. 750, 1873.

Aeshna spiniceps Kirby, Synonymic Cat., 1890.

Ab. male 46, female 47; h. w. male 37, female 39.

Male and female.—Black, marked with olive and yellow; similar to *notatus*; face without distinct black markings, obscured with brown; oblique bands on dorsum of thorax longer; first and second lateral sutures and the space between them brown; basal yellow spots on 3-7 more conspicuous; occiput of the male almost straight, little elevated; female with a small median notch, similar to *plagiatus*; vertex of the female with a yellow acute spine behind each lateral ocellus; first hamular branch long, exposed part equal to twice the distance from it to the base of the segment, curved; in *notatus* about equal to this distance, and straight; vulvar lamina very short, rounded.

Massachusetts, Illinois, Pennsylvania, Ohio.

On July 4, 1899, large numbers of this species were transforming along the Allegheny River just above Pittsburg in western Pennsylvania. It was impossible to capture the fully matured individuals which occasionally flew up from the grass or from the willow shrubs. The teneral were more often found among the willows than elsewhere.

G. PLAGIATUS Selys (*plagios* Gr., sloping). Pl. VI, figs. 26, 27 and 37.

G. plagiatus Selys, Bull. Ac. Belg. XXI (2), p. 57, 1854; Hagen, Syn. Neur. N. A., p. 109, 1861.

Aeshna plagiata Kirby, Synonymic Cat., 1890.

Ab. male 43, female 45; h. w. male 35, female 37.

Male and female.—Brown or fuscous, marked with yellow or green, duller than the preceding related species, similar. Teneral have the abdomen almost entirely yellow, obscured with pale brown; fully colored individuals have the abdomen brown, with a yellow, mid-dorsal stripe, more conspicuous than in *notatus*, and segments 9 and 10 pale brown. Humeral stripes longer than in *notatus*; antehumeral stripe wider than in *notatus* or *spiniceps*, not interrupted or narrowed above.

Maryland, South Carolina, Pennsylvania, Tennessee, Florida, Texas, Ohio, Illinois (Adams).

This species is common in the great marshes about Sandusky, Ohio. It is easily taken. A male, collected by R. C. Osborn, July 9, 1899, shows a peculiar thoracic color pattern, due to the reduction of the dark markings. The pale oblique bars on each side of the thorax above are widest in front, where they are continuous with the mesothoracic half-collar; the dark humeral and antehumeral stripes are separated by the width of the former; first and second sutures with brown, interrupted on the first, wider on the second. The coloration of other parts of this specimen is as usual.

G. *SEGREGANS* Needham (*segregans* L., living apart).

Stylurus segregans Needham, Can. Ent. XXIX (8), p. 185, 1897.

Ab. male 44; h. w. male 35.

Described from a single male, reared at Havana, Ill. Similar to the preceding species. The appendages are described as follows: "Male superior appendages yellowish brown, much longer than 10, divaricate at almost a right angle, slightly incurved toward the tip and cut obliquely to form an obtuse external angle at two-thirds their length, and a supero-internal point. The bevelled portion is minutely denticulate opposite the apices of the inferior appendage. No teeth or spines. The inferior appendage is bifid half its length with branches strongly divergent and strongly upcurved, their apices resting outside the bevelled portion of the superiors."

DROMOGOMPHUS Selys. (*dromos* Gr., flight; *Gomphus*, a genus of Odonata, *gomphos* Gr., a wedge-shaped bolt).

Selys, Bull. Ac. Belg. XXI (2), p. 58, 1854.

A genus of three known species, confined to North America.

Femora of last pair of legs entirely black. *spinus*.

Femora of last pair of legs with much yellowish. *spoliatus*.

D. *SPINOSUS* Selys. (*spinus* L., thorny). Pl. II.

D. spinosus Selys, Bull. Ac. Belg. XXI (2), p. 59, 1854.

Gomphus spinosus Hagen, Syn. Neur. N. A., p. 102.

D. spinosus Kirby, Synonymic Cat., 1890.

Ab. male 41, female 43; h. w. male 34, female 36.

Male.—Black or brown, marked with yellowish green; face and occiput yellowish, the occiput convex. Thorax above yellowish, this pale area about equaling in width the wide brown humeral stripe, which is divided by a pale, sinuate, narrow, antehumeral stripe; anteriorly the brown

humeral stripe gives off a narrow brown stripe which passes to near the mid-dorsal carina and then backward, disappearing above; sides light colored. Abdomen largely black, with an interrupted longitudinal mid-dorsal stripe, widest anteriorly; 7-9 dilated. Legs black, first femora green beneath. Abdominal appendages black, divaricate, pointed; the inferior shorter than the superiors.

Female.—Similar; the line turning inward and upward from the humeral stripe along the mid-dorsal carina is wider than in the male, so the female seems to have a mesothoracic collar, joined by a mid-dorsal stripe, and short oblique bars on either side of and near the mid-dorsal stripe, yellow. An acute spine behind each lateral ocellus. Occiput with a median acute spine.

Maine, Georgia, Kentucky, West Virginia, Illinois, Texas, New York, Pennsylvania, Massachusetts, New Jersey, Florida, Michigan, Ohio, Indiana.

Elkhart, June 9, 1895; June 10, 1897; June 5, 1899, in woods, rare; Elkhart River, July 4, 1897; Indiana Lake, June 25, 1899, common (Weith); Wabash River, June 22, 1898; St. Mary's River, Ft. Wayne, June 26, 1898, flying over ripples.

“The female has been observed often ovipositing in a manner similar to *Macromia illinoiensis*, that is, by skimming the water and every few feet touching it with the abdominal tip, scarcely checking her speed; at other times I have seen them drop from an overhanging tree and repeatedly tap the water, remaining in one place, after the manner of *Libellula*. Pairs were noticed to fly up into tree tops and remain in union for a considerable time.”—(Odonata of Ohio.)

D. *SPOLIATUS* Hagen (*spoliatus* L., impoverished).

Gomphus spoliatus Hagen, Mon. Gomph., p. 409, 1857; Syn. Neur. N. A., p. 103, 1861.

D. spoliatus Kirby, Synonymic Cat., 1890.

Male.—Yellow or greenish yellow, marked with brown; face and occiput greenish. Thorax above brown, a mesothoracic collar, mid-dorsal carina, an oblique bar on either side and a narrow antehumeral stripe, sometimes interrupted, yellow; sides greenish yellow, a brown stripe on each suture. Abdomen with 1-6 above black or dark brown, an irregular, interrupted longitudinal mid-dorsal stripe and sides, yellow; 7-9 greatly dilated, yellow, clouded and shaded more or less with brown; 10 entirely yellow. Pterostigma light brown; costa greenish. Abdominal appendages yellow, in profile straighter than in *D. spinosus*, less curved, and the superiors with the inferior carina less strongly developed.

Female.—Similar. Occiput with an obtuse prominence at the middle. Texas, Ohio.

June and July. This species has been taken along the Maumee River, in northwestern Ohio. It may certainly be expected along the rivers or canal at Ft. Wayne.

OPHIOGOMPHUS Selys. (*ophis* Gr., a serpent; *Gomphus*, a genus of Odonata, *gomphos* Gr., a wedge-shaped bolt).

Selys, Bull. Ac. Belg. XXI (2), p. 39, 1854.

A genus including a dozen species. Two occur in Asia, a third in Europe and the remaining nine are confined to North America. For a discussion of the genus, and figures of the N. A. species, see Needham, Can. Ent. XXXI (9), September 1899, p. 233.

O. RUPINSULENSIS Walsh (*rupes* L., a rock; *insula* L., an island: Rock Island, Illinois).

(*H*) *erpetogomphus* ? *rupinsulensis* Walsh, Proc. Ac. Phila., p. 388, 1862.

O. rupinsulensis Selys, Bull. Ac. Belg. XLVI (2), p. 434, 1878.
Diastatomma rupinsulense Kirby, Synonymic Cat., 1890.

Ab. male 39, female 38; h. w. male 31, female 32.

Male.—Bright green or yellowish green, marked with brown; face, occiput and parts of vertex, green. Thorax with indistinct brown as follows: a humeral line wider above, an antehumeral of equal width, and the upper part of the second lateral suture. Abdomen brown with elongated basal spots, pointed posteriorly, on 1-9, sides of 1 and 2 and 7-9, and most of 10, greenish yellow. Pterostigma brown; costa green or yellow. Legs pale proximally, darker distally. Abdomen slender, 7-9 expanded. Appendages yellow or greenish; superiors obtuse, curved inwards; inferior shorter, its branches not divaricate, before the apex a stout process, pointing upward and outward.

Female.—Similar; brown thoracic marks fainter. Abdomen duller, more robust, 8 and 9 somewhat expanded. Vulvar lamina almost as long as 9, bifid, the branches divergent only at the apex.

Canada; Maine, New York, Illinois, Wisconsin, New Jersey, Pennsylvania, Ohio, Indiana.

Elkhart, May 30, 1895, over marsh; June 17, 1897, and May 11 and 23, 1899, not common, in woods (Weith); Wabash River, June 10, 1898, one male.

May and June, frequenting the ripples of larger streams, flying back and forth over the water or resting on the ground near the water's edge. The size and bright color at once distinguish this species.

CORDULEGASTER Leach (*cordyle* Gr., a club; *gaster* Gr., the abdomen).

Leach, Edinb. Encyc. IX, p. 136, 1815.

A genus of 15 known species, distributed over North and Central America, Europe, Asia and Africa. Three fossil species have been referred to this genus. Two species may be expected in the State. They are rare, apparently frequenting ravines and the edge of woods.

Mr. J. S. Hine has kindly furnished me with the following note: "Professor Kellicott took *C. erroneus*, female, at Sugar Grove, Ohio, resting on a branch above a cold spring on a hill-side. I found *C. obliquus* June 12, 1899, at Medina, Ohio. Between two hills in a pasture the water had formed a small gutter, similar to a furrow, rather crooked. A small amount of water stood in this gutter at intervals. The *Cordulegasters* followed the bends of the gutter very closely, flew leisurely, and did not seem at all molested by my presence. If I had held my net quiet I believe they would have flown in. I never before saw so large a species taken so easily. I took them about ten o'clock in the morning. The strip between the two hills mentioned above was perhaps ten rods wide. The hills on either side were thinly wooded. J. B. Parker took the same species in the ravine north of the township line near Columbus last spring. He said the species seemed to be common and flew rather leisurely. I visited the place a few days later but was unable to procure or even see a single specimen."

Abdominal segments 2-7 with yellow sub-median transverse rings, very narrowly interrupted above on 3-7. *erroneus*.

Abdominal segments 2-8 maculate above with spear-shaped yellow spots. *obliquus*.

C. ERRONEUS Hagen (*erroneus* L., wandering about).

C. erroneus Hagen, Bull. Ac. Belg. XLVI (2), p. 688, 1878; Kirby, Synonymic Cat., 1890.

Ab. male 54, female 55; h. w. male 44, female 50.

Male and female.—Black or brown, marked with yellow; face yellow and black. Thorax with the following yellow; diverging stripes on the dorsum and two broad stripes on either side. Abdomen yellow as follows: a narrow median transverse ring on 2 (in the female this widens on either side, passing forward onto the sides of 1; in the male much of 2 may be yellow, the black confined to a large mid-dorsal spot), wider sub-median transverse rings on 3-7, 8 with two spots on either side, the posterior two indistinct in the female. Male superior abdominal appendages shorter than 10, the apices turned outward, in profile a conspicuous sub-median ventral process; inferiors slightly shorter, broadly bifid at apex. Anterior row of spines on second and third tibiae replaced

by knobs. In the female the vulvar lamina long, projecting, about three times as long as 9.

North Carolina, Kentucky, Pennsylvania, West Virginia, Ohio.

C. OBLIQUUS Say (*obliquus* L., slanting).

Aeshna obliqua Say, Journ. Ac. Phila. VIII, p. 15, 1839.

C. obliquus Hagen, Syn. Neur. N. A., p. 116, 1861.

Tenigaster obliqua Kirby, Synonymic Cat., 1890.

Ab. male 50, female 54; h. w. male 42, female 47.

Male and female.—Similar to the preceding; dorsal thoracic stripes wider and shorter. Abdomen with segments 2-8 (female) or 3-9 (male) each with a mid-dorsal spot, long on 2 and 3, shorter and basal on the remaining segments. In the male the superior abdominal appendages are shorter than 10, apices not turned outwards, in profile with the lower edge straight, without ventral processes; inferior shorter, scarcely bifid.

Canada; Maine, Massachusetts, Illinois, West Virginia, Ohio, Indiana.

“Inhabits Indiana” (Say).

BOYERIA MacLachlan (named for Boyer de Fonscolombe).

MacLachlan, Ann. Mag. Nat. Hist. XVII (6), p. 424, 1896.

New name for *Fonscolombia* Selys.

A genus of three species, found in Europe, Japan and North America.

B. VINOSA Say (*vinosus* L., full of wine).

Aeshna vinosa Say, Journ. Ac. Phila. VIII, p. 13, 1839.

Aeschna quadriguttata Hagen, Syn. Neur. N. A., p. 130, 1861.

Fonscolombia vinosa Kirby, Synonymic Cat., 1890.

Ab. male and female 50; h. w. male 42, female 44.

Male.—Color dark brown, marked with green and yellow; face obscure greenish. Thorax with a dorsal green stripe on either side above and two bright yellow spots on each side below. Abdomen spotted with yellow. Pterostigma yellowish brown; wings brown at base and sometimes faintly at apex. Abdomen constricted at 3, a longitudinal mid-dorsal stripe on 3-8; superior appendages almost as long as 9+10, widest beyond the middle, apex hardly acute, a small ventral tooth near the base; inferior two-fifths as long as superiors, triangular, the apex notched.

Female.—Similar, the green dorsal thoracic stripes obscure. Hind wings with the anal angle rounded, not acute as in the male.

Canada; Maine, New York, Massachusetts, Pennsylvania, Maryland, District of Columbia, Carolina, Georgia, Kentucky, Tennessee, Arkansas, Michigan, Ohio, Illinois (Adams), Indiana.

Elkhart, June 20, 1899, rare, flying in the woods (Weith).

June to September, usually along streams with wooded banks.

BASIESCHNA Selys (*basis* Gr., base; *Aeschna*, a genus of dragonflies, probably *aischros* Gr., ugly).

Selys, Bull. Ac. Belg. V (3), p. 735, 1883.

A genus of a single species.

B. JANATA Say (*Janus* L., a Latin deity).

Aeshna janata Say, Journ. Ac. Phila. VIII, p. 13, 1839.

Aeschna janata Hagen, Syn. Neur. N. A., p. 125, 1861.

B. janata Kirby, Synonymic Cat., 1890.

Ab. male and female 43; h. w. male and female, 36.

Male.—Brown, marked with green and yellow; face greenish, frons with a black T mark above. Thorax with an obscure dorsal green stripe on either side above, and sides each with two yellow stripes, narrowly bordered with black. Abdomen spotted and banded with greenish, fading in dry specimens. Wings yellowish brown at base; anal angle of the hind wings acute. Abdomen constricted at 3. Superior appendages about equal to 9+10, basal three-fifths extending downwards and backwards, apical two-fifths extending directly backwards, expanded, the interior edge straight; inferior equal to one-half the superiors in length, triangular, pointed.

Female.—Similar. Anal angle of hind wings rounded. Appendages simple, straight.

Maine, Massachusetts, New York, New Hampshire, New Jersey, Ohio, Indiana.

Elkhart, May 7, 1896, in the roads; May 4, 1898, April 30, May 4 and 11, 1899, in woods, rare; Christiana Creek, May 5, 1899 (Weith).

April, May and June. This species may often be found flying back and forth over some small stream or pond much after the manner of the *Aeschnas* which appear later in the season.

GOMPHÆSCHNA Selys (*Gomphus*, a genus of Odonata, p. 283; *Aeschna*, a genus of Odonata, p. 303.)

Selys, Trans. Ent. Soc. Lond., p. 413, 1871.

A genus represented by a single species from the United States. (Calvert—*Cat. Od. Phila.*, 1893, p. 248.)

G. FURCILLATA Say (*furcilla* L., little fork).

Aeshna furcillata Say, Journ. Ac. Phila. VIII, p. 15, 1839.

Aeshna furcillata Hagen, Syn. Neur. N. A., p. 131, 1861.

A. antilope Hagen, Proc. Bost. Soc. Nat. Hist. XVI, p. 354, 1874.

Gomphæschna furcillata and *G. antilope* Kirby, Synonymic Cat., 1890.

Ab. male 43, female 40; h. w. male 35, female 36.

Male.—Brown, marked with blue or green and black; face brown, frons above with a black T spot. Dorsum of the thorax with an obscure green stripe on either side; humeral suture above, first lateral suture below, and second lateral suture for its entire length, narrowly black. Abdomen black or dark brown with yellow or green (brown in dried specimens) markings. Pterostigma brown; costa yellowish. Superior abdominal appendages as long as 9+10, straight, widened for the apical half, apex rounded, an inferior basal tooth; inferior two-fifths as long, bifid at apex, divaricate.

Female.—Similar, front wings with a faint brown spot, sometimes wanting, at the nodus. Appendages as long as 10, straight, simple.

Massachusetts, Vermont, Maryland, Georgia, Michigan, New Jersey, Virginia, Ohio, Pennsylvania (Graf).

May and June. A specimen, a female, given me by Mr. Graf, flew into his home in Pittsburg. The single specimen taken in Ohio, also a female, was found one morning clinging to a screen door in Columbus.

EPLÆSCHNA Selys (*epi* Gr., near; *Aeshna*, a genus of Odonata, p. 303).

Selys, Proc. Bost. Soc. Nat. Hist. XVIII, p. 36, 1875.

A genus including two known species, one from North America, the other from South America. "This horrible creature had no mouth that we could perceive; but, as if to make up for that deficiency, it was provided with at least four score of eyes, that protruded from their sockets like those of the green dragonfly."—*The Thousand and Second Tale*, E. A. Poe.

E. HEROS Fabricius (*heros* Gr., a warrior).

Aeshna heros Fabricius, Ent. Syst. Suppl., p. 185, 1798.

Aeshna heros Hagen, Syn. Neur. N. A., p. 128, 1861.

E. heros Kirby, Synonymic Cat., 1890.

Ab. male 66, female 68; h. w. male 56, female 60.

Male.—Brown, marked with green; face brown and green; frons above with a T spot. Thorax with the following green: a dorsal stripe, wider

above, on either side, and two broad green stripes on each side. Abdomen marked with green rings and spots. The colors fade till the abdomen becomes entirely brown; in life the colors are most beautiful, the eyes deep blue above, shading below into green. Wings usually tinged more or less with yellowish; the apices sometimes brown; pterostigma reddish brown. Abdominal segment 10 with a median dorsal spine. Superior appendages long, apical two-thirds expanded; inferior one-half as long, apex notched.

Female.—Similar. Occiput on either side produced backward in an obtuse angle. Abdominal segment 10 with a ventral denticulate projection. Appendages as long as 9+10, leaf-like, simple.

Quebec to Mexico, west to the Mississippi; Michigan, Ohio, Illinois, Indiana.

"*Aeshna multicolor*.—Inhabits Indiana" (Say); Elkhart, May 24, 1896, one female caught in the house; June 23, 1897, one male (Weith); Bluffton, July, 1896, one female caught in the house by Miss Henrietta Arnold.

Before storms this species often enters houses. It flies from May till September, but is commonest during May and early summer, when it may be expected along country roads, in open woods, over fields or water—any place where it may hunt flying insects.

ÆSCHNA Fabricius ("A name introduced by former writers," probably *aeschros* Gr., ugly).

(*Aeshna*) Fabricius, Syst. Ent., p. 424, 1775.

A genus of about 50 species, represented in North and South America, Europe, Asia, Africa and Australia. Eleven fossil species have been referred to this genus. Three species have been taken in Indiana and a fourth may be expected. The three known to occur in the State are very similar in habits. They frequent the edges of woods, especially where there are pools of water or some small stream, from the last of July until late in the fall. During the middle of the day they spend much of the time resting on twigs of bushes and trees. Late in the afternoon they are most active, flying about over fields, and hovering over stretches of water. They constantly return to some sheltered nook among the bushes or sedges to catch the insects there. As darkness comes on, they are seen to take long rests in clumps of weeds and grass or in trees, and finally they cease flying altogether.

Frons above with a black T spot. 1.

Frons above without a black T spot. *pentacantha*.

1. Male.—Anal triangle of hind wings of 2 cells; 10 with three dorsal basal spines, the median one the largest. 2.

Male.—Anal triangle of hind wings of 3 cells; 10 without dorsal spines. *constricta*.

2. Superior longitudinal carina of the superior appendages not denticulate. *verticalis*.

Superior longitudinal carina of the superior appendages with 4–9 denticles. *clepsydra*.

- A. VERTICALIS Hagen (*vertex* L., the highest point). Pl. VII, figs. 10 and 11.

A. verticalis Hagen, Syn. Neur. N. A., p. 122, 1861; Kirby, Synonymic Cat., 1890.

Ab. male 52, female 53; h. w. male 45, female 46.

Male.—Reddish brown; marked with green and blue. Thorax with a green stripe, wider above, on either side above; sometimes a short green antehumeral stripe, and two stripes on either side, the anterior one most distinct, green or blue. Abdomen with spots and rings of green and blue. Abdomen slenderer than in *constricta*; constricted at 3. Superior appendages as long as 9+10.

Female.—Similar. Hine states that this species may be recognized from *constricta* by the length of the vulvular process, 2 mm. in *constricta*, 1 mm. in *verticalis*. The appendages are also only about half as wide as in that species.

Nova Scotia to the District of Columbia; Illinois, California, Ohio, Indiana.

Elkhart, September 9, 1895, one female, probably this species, taken in a grove (Weith).

- A. CLEPSYDRA Say (*clepsydra* Gr., a water-clock). Pl. VII, figs. 12 and 13.

Aeshna clepsydra Say, Journ. Ac. Phila. VIII, p. 12, 1839.

Aeshna clepsydra Hagen, Syn. Neur. N. A., p. 122, 1861; Kirby, Synonymic Cat., 1890.

Ab. male 54, female 52; h. w. male 46, female 44.

Male and female.—Coloration similar to the preceding. Male distinguished by the denticles on the superior carina of the superior abdominal appendages; female not separable.

Finland, Siberia, Canada; Labrador to Massachusetts; New York, Maryland, Michigan, Wisconsin, Illinois, Dakota, Ohio, Indiana.

Turkey Lake, two males and one female (Kellicott).

A. *CONRICTA* Say (*constrictus* L., constricted). Pl. IV, fig. 10; pl. VII, figs. 14 and 15.

Aeshna constricta Say, Journ. Ac. Phila. VIII, p. 11, 1839.

Aeshna constricta Hagen, Syn. Neur. N. A., p. 123, 1861; Kirby, Synonymic Cat., 1890.

Ab. male 55, female 54; h. w. male and female 45.

Male.—Reddish brown, marked with bright green; face green or brown. Thorax with a broad green stripe on either side above, a short green antehumeral stripe, and two stripes on either side green or blue. Abdomen marked with green and blue spots and rings, constricted at 3. Superior appendages slightly longer than 9+10.

Female.—Similar. Wings often tinged with yellowish. Appendages simple.

Siberia; Labrador to Maryland, west to Colorado; British Columbia to Lower California; Ohio, Illinois, Indiana.

“Inhabits Indiana” (Say); Lake, Jackson Township, Wells County, September 14, 1899, common (Deam); Elkhart, October 12, 1899 (Weith); Round Lake, September 2, 1897, numerous about the outlet of the lake, pairing at rest on weeds and low shrubs.

This and *Anax junius* are the common representatives of the subfamily in the State. The males of *constricta* have the abdomen marked with blue, with little or no green, while the females have but little blue or none at all. This is true also of *verticalis* and *clepsydra*.

A. *PENTACANTHA* Rambur (*pente* Gr., five; *acantha* Gr., a thorn).

A. pentacantha Rambur, Ins. Névr., p. 208, 1842; Hagen, Syn. Neur. N. A., p. 129, 1861; Kirby, Synonymic Cat., 1890.

Ab. male and female 56; h. w. male and female 48.

Male and female.—Distinguished from the preceding by the absence of a T spot on the frons above. Superior abdominal appendages of the male short, dilated beneath before the apex, obliquely truncated; the inferior a little shorter, obtuse. Female appendages small.

Illinois, Louisiana, Texas.

ANAX Leach (*anax* Gr., a king, a lord.)

Leach, Edinb. Encyc. IX, p. 137, 1815.

A genus of 25 living species, represented in North and South America, Europe, Asia, Africa, and the Hawaiian Islands. One fossil species is known.

Frons above with a black or brown spot. *junius*.

Frons above without markings. *longipes*.

A. JUNIUS Drury (*Junius* L., a proper name).

Libellula junia Drury, Ill. Exot. Ent. I, p. 112, 1770.

A. junius Hagen, Syn. Neur. N. A., p. 118, 1861; Kirby Synonymic Cat., 1890.

Ab. male 55, female 54; h. w. male 51, female 52.

Male.—Green, marked with blue and brown; face green; frons above with a dark spot, surrounded by yellow, the latter surrounded by a blue ring. Thorax green. Abdomen with 1 and base of 2 green; 3–10 bright blue with a longitudinal interrupted mid-dorsal brown band. Wings more or less tinged with yellowish. Abdomen constricted at 3. Superior appendages as long as 9+10, with a lateral and posterior sub-apical spine; inferior shorter, quadrangular.

Female.—Similar. Abdomen with the blue of the male replaced by purplish brown. Occiput emarginate. Abdomen less constricted at 3. Appendages leaf-like.

China, Siberia; Quebec to Florida and the West Indies, west to the Pacific; Alaska to Costa Rica; Sandwich Islands; Michigan, Ohio, Illinois, Indiana.

Turkey Lake (Kellicott); Elkhart, over marsh, August 30 and September 3, 1895; September 15 and 18, 1896; April 22, 1898 (Weith); Lake, Jackson Township, Wells County, September 14, 1899 (Deam); Round and Shriner Lakes, August 1, 1896; September 2, 1897; June 7 and 24 and July 21, 1898; Wells County, July and August, 1896; June 22, 1898.

March to November. Occasionally this species will appear in large compact flocks which pass back and forth in pursuit of insects, very much after the manner of night hawks. Like this bird, too, as twilight comes on they fly nearer and nearer the ground as the flocks of small diptera settle to the earth. During the latter part of July, 1896, several such flocks were seen near Bluff ton. Some of these flocks numbered at least several hundred individuals. *Junius* is oftenest found during May and June, when they may be found pairing and ovipositing about every weedy pond. They fly about in couple, then drop down on some bit of floating stuff, where they rest a moment or so, the female with her abdomen submerged as she deposits her eggs; then the pair rise and fly back and forth along the shores or over the water, coming to rest again near or at a distance from their former resting place.

A. LONGIPES Hagen (*longus* L., long; *pes* L., foot).

A. longipes Hagen, Syn. Neur. N. A., p. 118, 1861; Kirby, Synonymic Cat., 1890.

Ab. male 56, female 57; h. w. male 52, female 54.

Male.—Head, thorax and base of abdomen, green. Abdomen brick red.

Female.—Abdomen, from the third segment, brown.

Brazil, Mexico, West Indies; New York, Massachusetts, New Jersey, Maryland, Georgia, Florida, Ohio (?).

DIDYMOPS Rambur (*didymos* Gr., double; *ops* Gr., eye).

Rambur, Ins. Névr., p. 142, 1842.

A genus of one species, confined to the United States. The single representative may be found from April till in June patrolling the sunny edges of woods, the shores of lakes, and the banks of rivers.

D. TRANSVERSA Say (*transversus* L., transverse). Pl. IV, fig. 5.

Libellula transversa Say, Journ. Ac. Phila. VIII, p. 19, 1839.

D. transversa Hagen, Syn. Neur. N. A., p. 135, 1861; Kirby, Synonymic Cat., 1890.

Ab. male 37, female 39; h. w. male 34, female 38.

Male.—Gray or brown marked with pale yellow; face brown with a greenish transverse stripe; frons with a black T spot. Thorax with the sides each with a yellow band, bordered in front and behind with black, between the wings. Abdomen above with yellow basal spots; 10 almost entirely yellow. Wings brownish at base. Legs long, slender. Abdomen with 7-9 enlarged. Appendages yellow, longer than 10; superiors incurved, minutely denticulate below; inferior of equal length, triangular.

Female.—Similar. Wings with more brown at the base. Occiput inflated. Abdomen of uniform size throughout. Appendages shorter, straight, simple.

Quebec; Maine, New York, Massachusetts, Vermont, Pennsylvania, District of Columbia, South Carolina, Georgia, Kentucky, Michigan, New Jersey, Texas, Ohio, Indiana.

Shriner Lake, June 7, 1898, one male flying in company with *Gomphus spicatus* and one female taken in an orchard near the lake.

MACROMIA Rambur (*macros* Gr., great; long; *omos* Gr., equally).

Rambur, Ins. Névr., p. 137, 1842.

As defined by Selys, a genus of about 15 species, represented in North America, Europe and Africa. The genus *Epophthalmia* Burmeister, as used by Selys, contains eight or nine species, two of which (*teniolata* and *georgina*) are North American, and, as pointed out by Calvert, are congeneric with *Macromia illinoiensis*. *Macromia* Rambur (*pars*) and *Epophthalmia* Burmeister (*pars*) were separated (Selys, 1871) by the following points:

Macromia.—Triangle and internal triangle usually free (the triangle of all the wings and the internal triangle of the front wings sometimes crossed); the exterior side of the triangle of the hind wings straight.

Epopthalmia.—Triangle of all the wings and internal triangle of the front wings crossed; the exterior side of the triangle of the hind wings concave. This genus (minus the first group (*E. tæniolata*) of Selys) contains seven species, found in Asia and the Malay Archipelago.

Thorax above with a yellow stripe on each side; frons above not steel blue. 1.

Thorax above without a yellow stripe on each side; frons above steel blue. *illinoensis*.

1. Abdomen about 60 in length; yellow antehumeral stripe short. *tæniolata*.

Size smaller. 2.

2. Abdomen about 52. *annulata*.

Abdomen about 46. *pacifica*.

M. ILLINOIENSIS Walsh.

M. illinoensis Walsh, Proc. Ac. Phila., p. 397, 1862; Kirby, Synonymic Cat., 1890.

Ab. male 48, female 50; h. w. male 44, female 46.

Male.—Brown and metallic green, marked with pale yellow; face brown, a transverse obscure yellowish band. Sides of the thorax, between the wings, with a yellow stripe. Abdomen black, more or less spotted with yellow, a conspicuous basal spot on 7. Wings very slightly brownish at base, apex often brown. Superior abdominal appendages a little longer than 10, lyre-shaped when seen from above; inferior equal in length to the superiors, triangular, curved upwards.

Female.—Similar; more brown at base of wings and abdomen with more yellow.

Canada; New Hampshire, Massachusetts, Pennsylvania, Tennessee, Illinois, Georgia, Michigan, Ohio, Indiana.

Elkhart, June 11, one male, July 4, one female, 1896; June 15, 1898, one female caught in the house (Weith).

June and July. This species frequents rapid rivers. As it flies along, skirting the banks of the streams, it may be recognized by the basal yellow spot on abdominal segment 7 and by the bright blue and metallic green of the eyes and thorax. R. C. Osborn says that at Sandusky, Ohio, this species may often be found congregated in great numbers in quiet nooks among the bushes near the marshes. They rest on the under side of twigs with the abdomen hanging down, and several individuals may occupy the same twig.

M. TÆNIOLATA Rambur (*tæniola* L., a little band, a ribbon).

M. tæniolata Rambur, Ins. Névr., p. 139, 1842; Hagen, Syn. Neur. N. A., p. 132, 1861.

Epophthalmia tæniolata, Kirby, Synonymic Cat., 1890.

Ab. male 60, female 62; h. w. male 54, female 58.

Male.—Brown and metallic green, marked with yellow; face brown, a transverse yellow nasal band. Thorax with a short yellow stripe on the dorsum near the anterior edge and a broad yellow stripe entirely encircling the thorax between the front and hind wings. Abdomen with an interrupted transverse ring on 2, and a divided spot on the dorsum of 2-8, larger and usually united on 7, yellow. Wings sometimes more or less tinged with yellowish. Abdominal appendages much as in *M. illinoensis*.

Female.—Similar; often lacking the yellow spots on abdominal segment 8. Wings more yellowish.

Pennsylvania, Maryland, Georgia, Florida, Ohio, Illinois (Adams), Indiana.

Elkhart, May 31, 1896, one female, in thick woods (Weith).

This species is said to resemble *M. illinoensis* in its habits.

M. ANNULATA Hagen (*annulatus* L., with a ring).

M. annulata Hagen, Syn. Neur. N. A., p. 133, 1861; Kirby, Synonymic Cat., 1890.

Ab. male and female 52; h. w. male 45, female 47.

Similar to the following.

Illinois, Texas.

M. PACIFICA Hagen (*pacificus* L., pacific—Pacific Ocean).

M. pacifica Hagen, Syn. Neur. N. A., p. 134, 1861; Kirby, Synonymic Cat., 1890.

Ab. male 47, female 45; h. w. male 40, female 45.

Male.—Steel blue, marked with yellow; the dorsal thoracic stripes reaching above almost to the yellow stripe on the antealar sinus. Superior appendages a little larger than 10, an external median tooth; the inferior of about equal length, triangular.

Female.—Appendages shorter than 10.

This species is distinguished from *annulata* by its smaller size, labrum narrowly bordered with fuscous, and the frons in front brown.

Texas, California, Illinois (Adams).

EPICORDULIA Selys (*epi* Gr., near to; *Cordulia*, a genus of dragonflies, *cordyle* Gr., a club).

Selys, Bull. Ac. Belg. XXX (2), p. 259, 1871.

A genus confined to the United States, represented by two species.

E. PRINCEPS Hagen (*princeps* L., a chief).

Epitheca princeps Hagen, Syn. Neur. N. A., p. 134, 1861.

Epicordulia princeps Kirby, Synonymic Cat., 1890.

Ab. male 43, female 46; h. w. male 41, female 44.

Male.—Olive or yellowish brown, obscurely marked with yellow. Thorax clothed with gray pile; markings obscure. Abdomen with yellow on the sides. Wings with a basal, a nodal (this sometimes wanting) and an apical spot, all variable in size, brown. Superior abdominal appendages almost as long as 9+10, apical two-thirds expanded; inferior less than one-third shorter, long, triangular, the apex with two upturned points.

Female.—Similar. Appendages as long as 9+10. Vulvar lamina almost as long as 9, bifid for its entire length, forcipate.

Canada; Connecticut, New York, Pennsylvania, Maryland, Georgia, Michigan, Illinois, Texas, Ohio, Indiana.

Round and Shruener Lakes, June 7 and 24, and July 21, 1898, common, patrolling the margins of the lakes, difficult to capture; Frantz fish-pond, July 4, 1898, common.

May and June. A strong, restless species frequenting bodies of still water. The wing spots vary greatly in size in different individuals, but they will always distinguish the species in the field.

TETRAGONEURIA Hagen (*tetragonus* Gr., with four equal angles; *neuron* Gr., a nerve).

Hagen, Syn. Neur. N. A., p. 140, 1861.

A genus of eight or nine species, confined to North America. Concerning *T. semiaquea* Burmeister, Calvert (Phila. Cat.) says: "Probably only a variety of *cygnosura*." Morse (Psyche, March, 1895) says, after describing the wing markings of *cygnosura* and *semiaquea*, "These two forms are doubtless one species, no structural differences being perceptible. There is another species found in the southern States having the fuscous of a more reddish hue, and even wider in extent, which presents differences in the abdominal appendages. This is perhaps the true *semiaquea*." I have males taken in Whitley County, which are *semiaquea*; males taken in Westmoreland County, Pa., which are *cygnosura*; and males taken in Fairfield County, Ohio, which are intermediate in the

PLATES FOR PAPER
ON
DRAGONFLIES OF INDIANA.

PLATE I.

FRONT WING OF A SPECIES OF AGRIONIDÆ, *Enallagma civile*.

1. Costa.
2. Subcosta.
3. Median vein.
4. Submedian vein.
5. Postcosta.
6. Principal sector.
7. Ultra-nodal sector.
8. Nodal sector.
9. Subnodal sector.
10. Median sector.
11. Short sector.
12. Upper sector of the triangle.
13. Lower sector of the triangle.
14. Arculus.
15. Antecubitals, two, the first and second, numbering from the base of the wing towards the apex.
16. Postcubitals, ten in number. The ante- and postcubitals in the row of cells just posterior to the costa are known as the ante- and postcubitals of the first series; and those in the second row of cells from the costa are known as the ante- and postcubitals of the second series.
17. Nodus.
18. Basal postcostal vein.
 - A. Pterostigma.
 - B. Basilar space.
 - C. Quadrilateral.
 - G. Antenodal cells.

The points to be especially noticed are the origin of the subnodal and median sectors nearer the nodus than the arculus, and the origin of the nodal sector at the fifth postcubital.

For a fuller account of this subject see *The Wings of Insects*, by Professors Comstock and Needham, in the *American Naturalist*, 1898, especially for the months of January, February, April, October and December.

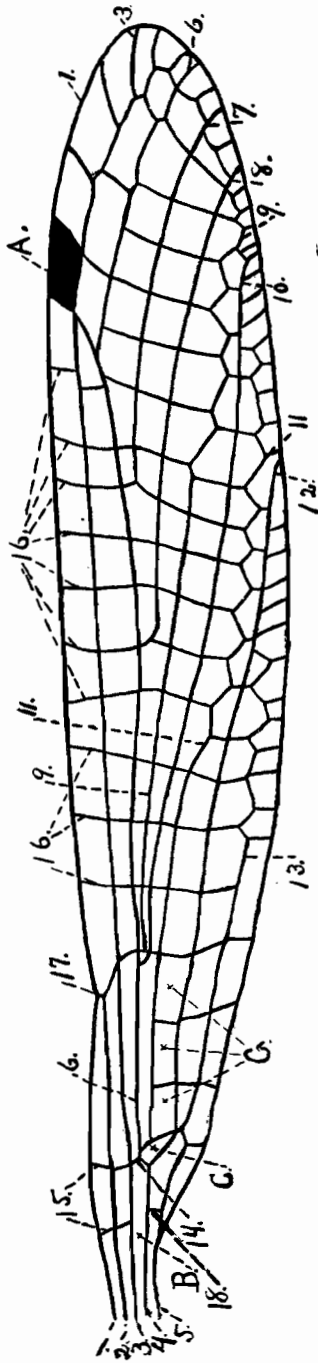


PLATE II.

FRONT WING OF A SPECIES OF AESCHNIDÆ, *Dromogomphus spinosus*.

1. Costa.
2. Subcosta.
3. Median vein.
4. Submedian vein.
5. Postcosta.
6. Principal sector.
8. Nodal sector.
9. Subnodal sector.
10. Median sector.
11. Short sector.
12. Upper sector of the triangle.
13. Lower sector of the triangle.
14. Arculus.
15. Antecubitals, fifteen in the first series, fourteen in the second, the first and fourth of the first series coincident with the first and fourth of the second series.
16. Postcubitals, eleven in both first and second series.
17. Nodus.
 - A. Pterostigma.
 - B. Basilar space.
 - C. Supra-triangular space.
 - D. Median space.
 - E. Internal triangle.
 - F. Triangle.
 - G. Post-triangular cells, three, followed by two rows increasing.

The points to be noticed are the antecubitals of the first and second series not corresponding; the sectors of the arculus (the two veins arising from the apical side of the arculus) separate at their origin; basilar and supra-triangular spaces free (without cross-veins); triangle free; and the presence of an internal triangle.

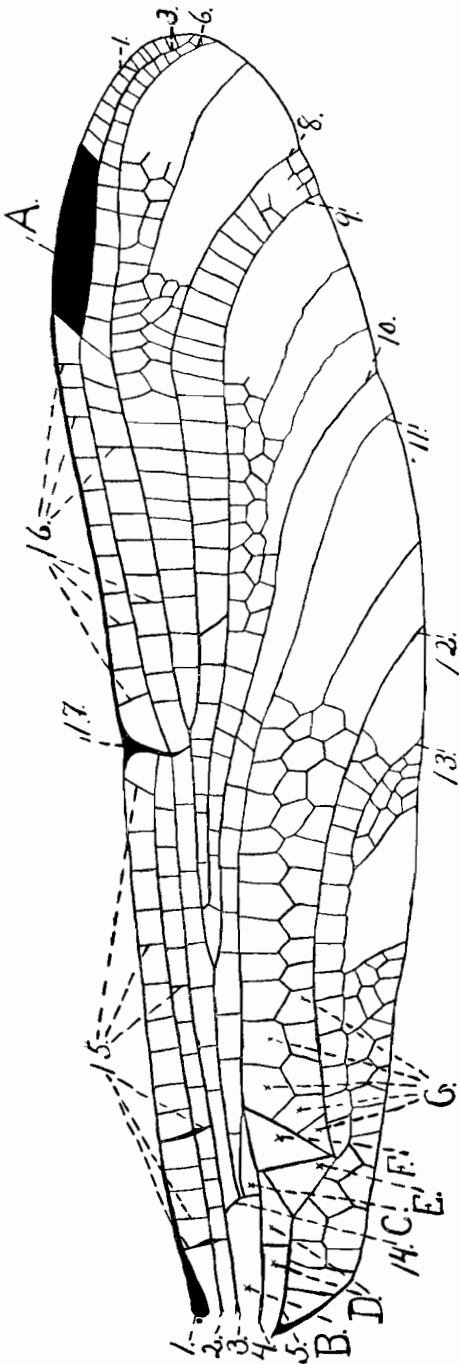


PLATE III.

FRONT WING OF A SPECIES OF LIBELLULIDÆ, *Libellula incesta*.

1. Costa.
2. Subcosta.
3. Median vein.
4. Submedian vein.
5. Postcosta.
6. Principal sector.
8. Nodal sector.
9. Subnodal sector.
- 9a. Supplementary sector between the subnodal and medial sectors.
10. Median sector.
11. Short sector.
12. Upper sector of the triangle.
13. Lower sector of the triangle.
14. Arculus.
15. Antecubitals, sixteen in number, those of the first series coincident with those of the second series, excepting the two nearest the nodus.
16. Postcubitals, twelve in the first series, eight in the second.
17. Nodus.
 - A. Pterostigma.
 - B. Basilar space.
 - C. Supra-triangular space.
 - D. Median space.
 - E. Internal triangle.
 - F. Triangle.
 - G. Post-triangular cells, four, followed by three rows increasing.

In this wing the antecubitals of the first and second series correspond; sectors of the arculus joined at their origin; basilar space free; supra-triangular space with a cross-vein; and triangle once crossed.

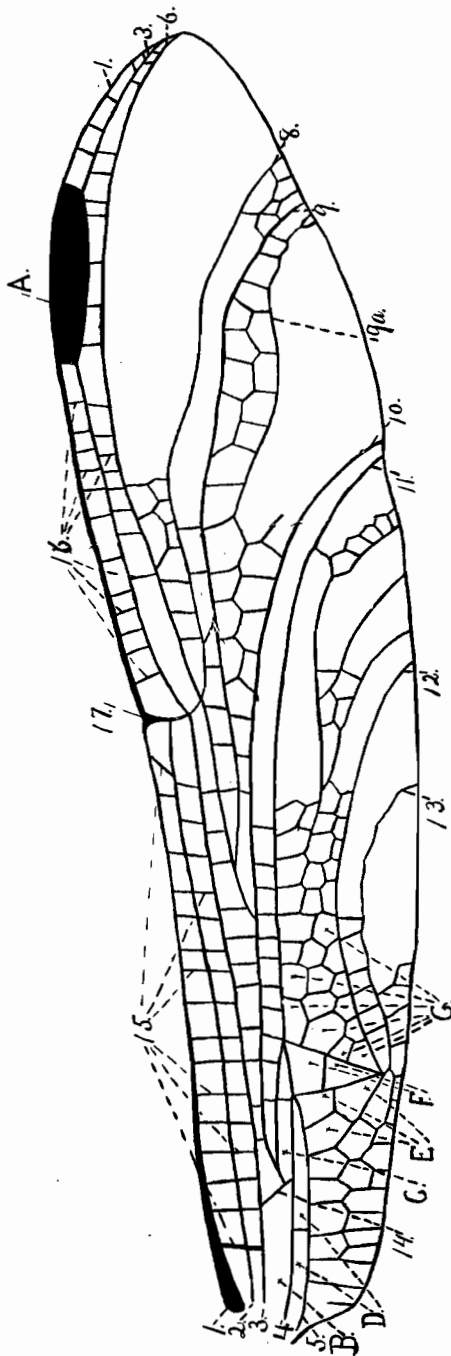


PLATE IV.

Fig. 1. *Libellula incesta*. a. Head. b. Thorax. c. Abdomen, composed of ten segments, I-X. d. Frontal vesicle. e. Antenna. f, ff and fff. First, second and third legs. g and gg. Front and hind wings. h. Membranule. i. Superior appendages.

Fig. 2. Anterior face of the left front leg of *Argia putrida*. a. Coxa. b. Trochanter. c. Femur. d. Tibia. e. Tarsus, three jointed, showing toothed tarsal claws.

Fig. 3. Anterior view of the head of *Progomphus obscurus*, male. a. Eye. b. occiput. c. Vertex or frontal vesicle. d. Frons, bent to form a vertical and a horizontal surface. e and f. Clypeus or epistoma; e, post-clypeus or nasus; f, anteclypeus or rhinarium. g. Labrum. h. Mandible. i. Gena. j. Ocelli. k. Antenna.

Fig. 4. Ventral view of the head of *Progomphus obscurus*, male. a. Eye. b. Rear of head. c. First maxilla. d. Middle lobe of labium or second maxilla. dd. Lateral lobe of labium. e. Post-clypeus. f. Ante-clypeus. g. Labrum. h. Mandible. i. Gena.

Fig. 5. Lateral view of the head of *Didymops transversa*, to show the tubercled eye. a. Eye. b. Tubercle. c. Vertex. d. Frons. e. Clypeus. f. Labrum. g. Labium.

Fig. 6. Lateral view of the thorax of *Ischnura verticalis*, showing the three segments which compose the thorax—the prothorax, the mesothorax and the metathorax. a. First coxa, borne by the prothorax. aa. Second coxa, borne by the mesothorax. aaa. Third coxa, borne by the metathorax. b. Base of front wing, borne by the mesothorax. bb. Base of hind wing, borne by the metathorax. c. Pronotum, with its three lobes, the anterior, the middle, and the posterior. d. Propleuron. e. Articulating surface for the head. f. Mid-dorsal carina. g. Mesepisternum. h. Mesepimeron. i. Mesinfraepisternum. j. Humeral suture. k. First lateral suture. l. Metepisternum. m. Metepimeron. n. Metinfraepisternum. o. Second lateral suture. p. Metasternum. I and II. First and second abdominal segments.

Fig. 7. Lateral view of abdominal segments 8, 9 and 10 of *Ischnura verticalis*, female. a. Ventral apical spine on 8. b. Genital valve.

Fig. 8. Tip of left front wing of *Anomalagrion hastatum*, male, showing the unusual position of the pterostigma, a.

Fig. 9. Nymph of *Ischnura verticalis*, typical of the suborder *Zygoptera*.

Fig. 10. Nymph of *Aeschna constricta*, typical of the suborder *Anisoptera*.

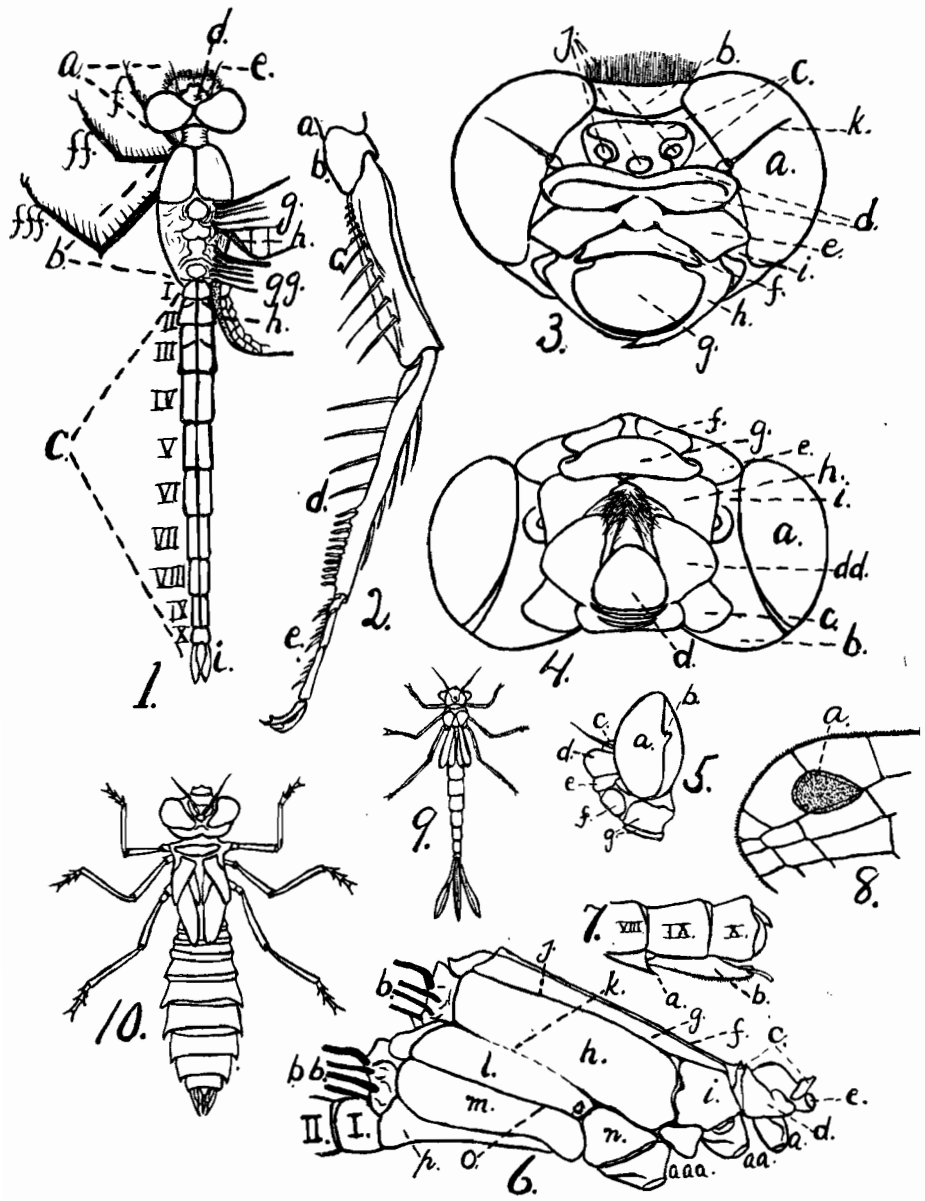


PLATE V.

LATERAL AND DORSAL VIEWS OF THE MALE ABDOMINAL APPENDAGES OF THE
SPECIES OF *Enallagma* TAKEN IN INDIANA.

1, 2.	<i>E. hageni</i> .	13, 14.	<i>E. piscinarium</i> .
3, 4.	<i>E. ebrium</i> .	15, 16.	<i>E. diyagens</i> .
5, 6.	<i>E. civile</i> .	17, 18.	<i>E. exsulans</i> .
7, 8.	<i>E. carunculatum</i> .	19, 20.	<i>E. antennatum</i> .
9, 10.	<i>E. traviatum</i> .	21, 22.	<i>E. signatum</i> .
11, 12.	<i>E. geminatum</i> .	23, 24.	<i>E. pollutum</i> .

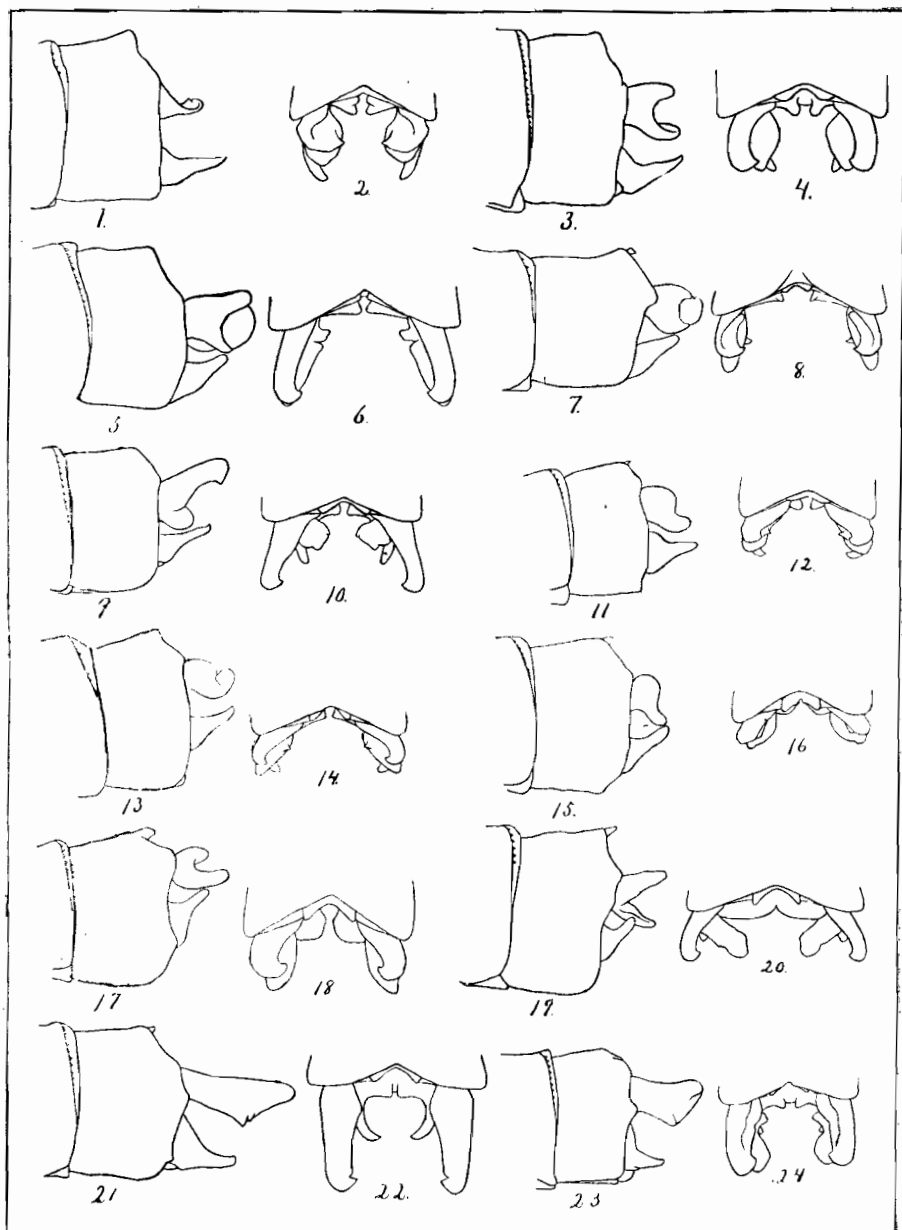


PLATE VI.

GOMPHUS.

- 1, 2, 3, 4. Outlines to show the thoracic markings in the genus.
- | | |
|---------------------------|-----------------------------|
| 1. <i>G. villosipes</i> . | a. Median dorsal stripes. |
| 2. <i>G. externus</i> . | b. Antehumeral stripe. |
| 3. <i>G. vastus</i> . | c. Humeral stripe. |
| 4. <i>G. spiniceps</i> . | d. Lateral stripes. |
| | e. Mesothoracic halfcollar. |

Male abdominal appendages:

- | | |
|--|---|
| 5. Profile of <i>G. vastus</i> . | 17. Profile of <i>G. sordidus</i> . |
| 6. Profile of <i>G. dilatatus</i> . | 18. Profile of <i>G. spicatus</i> . |
| 7. Profile of <i>G. quadricolor</i> . | 19. Profile of <i>G. descriptus</i> . |
| 8, 9. Profile and dorsal of <i>G. fraternus</i> . | 20, 21. Profile and dorsal of <i>G. exilis</i> . |
| 10. Profile of <i>G. externus</i> . | 22. Profile of <i>G. sp.</i> , collected by R. C. Osburn in Ohio. |
| 11, 12. Profile and dorsal of <i>G. graslinellus</i> . | 23. Profile of <i>G. notatus</i> . |
| 13. Profile of <i>G. pallidus</i> . | 24, 25. Profile and dorsal of <i>G. spiniceps</i> . |
| 14. Profile of <i>G. villosipes</i> . | 26, 27. Profile and dorsal of <i>G. plagiatus</i> . |
| 15, 16. Profile and dorsal of <i>G. furcifer</i> . | |

Occipita of females.

- | | |
|------------------------------|----------------------------|
| 28. <i>G. vastus</i> . | 33. <i>G. villosipes</i> . |
| 29. <i>G. quadricolor</i> . | 34. <i>G. sordidus</i> . |
| 30. <i>G. fraternus</i> . | 35. <i>G. spicatus</i> . |
| 31. <i>G. externus</i> . | 36. <i>G. exilis</i> . |
| 32. <i>G. graslinellus</i> . | 37. <i>G. plagiatus</i> . |

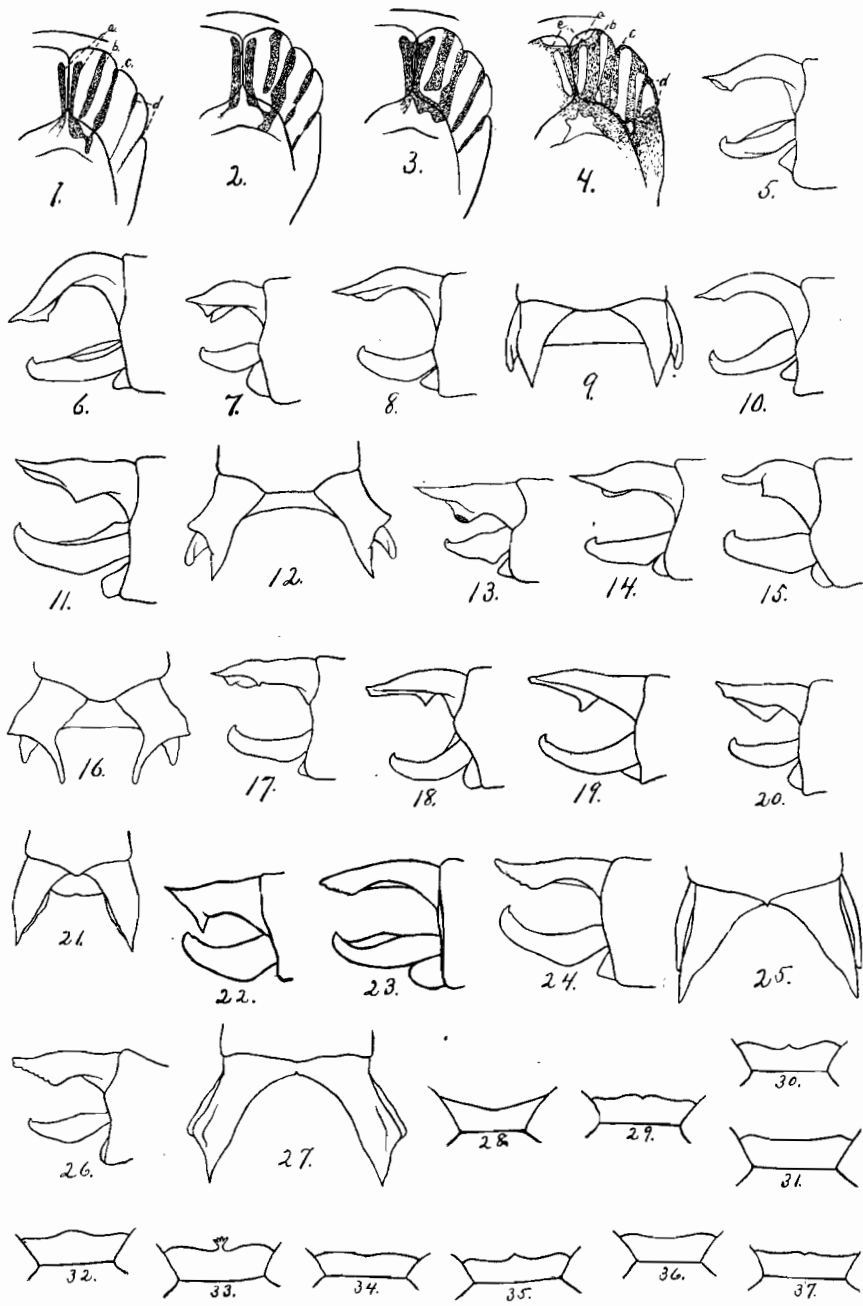


PLATE VII.

Dorsal view of the male abdominal appendages of:

- | | |
|---------------------------------|----------------------------------|
| 1. <i>Lestes unguiculatus</i> . | 4. <i>Lestes vigilax</i> . |
| 2. <i>Lestes uncatus</i> . | 5. <i>Lestes rectangularis</i> . |
| 3. <i>Lestes forcipatus</i> . | 6. <i>Lestes inequalis</i> . |

Lateral view of the male abdominal appendages of:

- | | |
|----------------------------|----------------------------|
| 7. <i>Argia putrida</i> . | 9. <i>Argia apicalis</i> . |
| 8. <i>Argia tibialis</i> . | |

Lateral and dorsal views of the male abdominal appendages of:

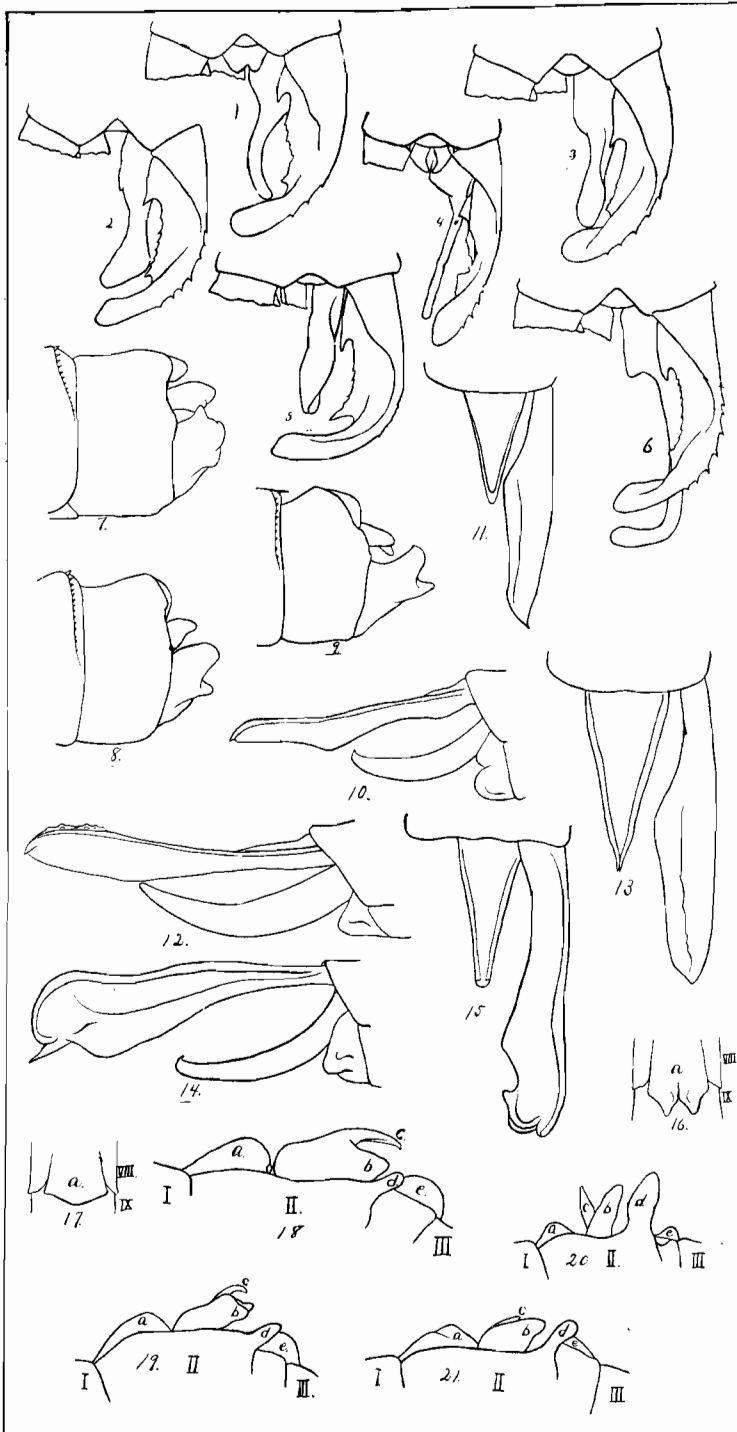
- | | |
|-------------------------------------|-------------------------------------|
| 10, 11. <i>Aeschna verticalis</i> . | 14, 15. <i>Aeschna constricta</i> . |
| 12, 13. <i>Aeschna clepsydra</i> . | |

Vulvar lamina (a) of:

- | | |
|-------------------------------------|--------------------------------|
| 16. <i>Sympetrum rubicundulum</i> . | 17. <i>Sympetrum vicinum</i> . |
|-------------------------------------|--------------------------------|

External male genital organs on the ventral surface of 2. I, II, III, the first three abdominal segments. a. Anterior lamina. b. External hamular branch. c. Internal hamular branch. d. Genital lobe. e. Vesicle.

- | | |
|-------------------------------------|----------------------------------|
| 18. <i>Sympetrum rubicundulum</i> . | 20. <i>Sympetrum vicinum</i> . |
| 19. <i>Sympetrum obtrusum</i> . | 21. <i>Sympetrum corruptum</i> . |



extent of wing coloring. Mr. Adams reports *cynosura* for Illinois. Kellicott and Hine record both *cynosura* and *semiaquea* for Ohio.

A small brown area at base of front wings between the sub-costal and median; male superior appendages with a distinct ventral spine. *spinigera*.

Front wings without the brown area; male superior appendages with a distinct ventral angle only. *cynosura*.

T. SPINIGERA Selys (*spinus* L., a thorn; *gero* L., to bear).

Cordulia spinigera Selys, Bull. Ac. Belg. XXXI (2), p. 269, 1871.

Tetragoneuria spinigera Kirby, Synonymic Cat., 1890.

Ab. male 31, female 32; h. w. male 31, female 33.

Male and female.—Differs from the next species as indicated. Frons above with a black T spot, indistinct in the female.

Canada, Vancouver; Michigan, Georgia.

T. CYNOSURA Say (*cyon* Gr., dog; *oura* Gr., tail).

Libellula cynosura Say, Journ. Ac. Phila. VIII, p. 30, 1839.

Cordulia lateralis and *T. cynosura* Hagen, Syn. Neur. N. A., pp. 139 and 140, 1861.

T. cynosura Kirby, Synonymic Cat., 1890.

Ab. male 28, female 27; h. w. male 28, female 29.

Male.—Brown, markings obscure, yellowish; frons above usually without a black T spot. Thorax covered with long gray pile. Abdomen with a yellow spot on either side of 2-9. Hind wings with black or brown at base, variable in extent; there may be a small basal and a small anal spot, not connected (*cynosura*), or these may be joined and extend on the wing beyond the triangle or to and beyond the nodus (*semiaquea*). Superior abdominal appendages as long as 9+10, seen from above evenly curved, meeting at the middle, apical two-thirds thickened.

Female.—Similar. Appendages shorter than 9+10. Vulvar lamina longer than 9, bifid for almost its entire length.

Nova Scotia, Quebec; Maine, Massachusetts, New York, Pennsylvania, District of Columbia, South Carolina, Georgia, Florida, Louisiana, Michigan, Ohio, Illinois, Indiana.

Christiana Creek, May 26, 1897; Simonton Lake, June 9, 1897; Elkhart, May 11, 1899, one male, flying in the woods (Weith); Marshall County, May 18, 1899; Crawford County, July 8, 1899 (Blatchley); Round and Shriner lakes, June 7, 1898, abundant, almost in flocks along the shores of the lakes; observed also in woodland and along roads in open country.

May, June and July. Apparently this species is of short seasonal range in any locality. On June 11, 1898, while riding on a bicycle along the northern side of the Grand Reservoir in Ohio, about twilight I passed through a small flock of this species of dragonfly. Three struck me in the face and several struck my body and the bicycle.

NEUROCORDULIA Selys (*neuron* Gr., a nerve; *Cordulia*, a genus of dragonflies, *cordyle* Gr., a club).

Selys, Bull. Ac. Belg. XXXI (2), p. 278, 1871.

A genus of four species, confined to North America.

N. OBSOLETA Say (*obsoletus* L., worn out).

Libellula obsoleta Say, Journ. Ac. Phila. VIII, p. 28, 1839.

Didymops obsoleta Hagen, Syn. Neur. N. A., p. 136, 1861.

N. obsoleta Kirby, Synonymic Cat., 1890.

Ab. male 30, female 34; h. w. male 30, female 34.

Male.—Dull brown, obscurely marked; thorax above with a short transverse line on each side anteriorly, and sides with a spot, yellow. Wings with a yellowish spot on each antecubital and near the arculus, and triangle of hind wings with a yellow spot. Superior appendages with the apical half thickened, no abrupt angle on the lower surface.

Female.—Similar. Wings with larger spots; a spot at nodus, at base of front wings, and on anal part of hind wings.

Massachusetts, Pennsylvania, Illinois, Louisiana, Ohio, Indiana.

“Inhabits Indiana and Massachusetts” (Say.)

Mr. Hine writes me that Dr. Dury took this species at Walnut Hills, Cincinnati, during the last part of May and the first part of June, 1899.

SOMATOCHLORA Selys (*soma* Gr., body; *chloros* Gr., green).

Selys, Bull. Ac. Belg. XXXI (2), p. 279, 1871.

A genus of 36 named species, represented in North and South America, Europe, Asia, Australia and adjoining islands. As species have been identified, four may be expected in the State. Say described his *Libellula tenebrosa* from Indiana, and this is our only positive record. The species are all largely metallic green in coloration. They are difficult of identification, the abdominal appendages of the male and the vulvar lamina of the female offering almost the only characters.

The writer has seen only one species of the genus in life. Individuals of this species were flying back and forth along a small stream, occasionally hovering for several seconds in one spot, then moving swiftly to another location or flying away to return again in a few minutes. Their

flight was very swift and strong, and none were seen at rest. Our species may be expected in the southern and more mountainous parts of the State.

Hind wings with an internal triangle. 1.

Hind wings without an internal triangle. Superior appendages of the male a little longer than 10, constricted at the base, where they bear an inferior tooth, then thickened and curved inwards; inferior a little shorter, subtriangular, apex obtuse. Vulvar lamina short.
libera.

1. Superior appendages of the male longer than 9+10, abruptly bent at the middle, the apical halves almost at right angles to the basal halves and directed toward each other; the truncate point of the inferiors lying just in front of the approximated points of the superiors, suddenly upcurved at apex. Vulvar lamina longer than 9, forming a compressed trough at right angles to the abdomen. *tenebrosa.*

Superior appendages of the male not as in *tenebrosa*; inferior not truncate. 2.

2. Superiors of the male not as long as 9+10, curved at base, with two external teeth; apex bifid, the external branch bent downwards; inferior a little shorter. Vulvar lamina longer than 9, at right angles to the abdomen. *linearis.*

Superiors of the male longer than 9+10, no external teeth, terminating in a small hook turned downwards and inwards; inferior more than half as long. Vulvar lamina forming a recurved trough, reaching to the tip of the abdomen. *filosa.*

S. LINEARIS Hagen (*linearis* L., with lines).

Cordulia linearis Hagen, Syn. Neur. N. A., p. 137, 1861.

S. linearis Kirby, Synonymic Cat., 1890.

Ab. male 46, female 47; h. w. male 43, female 45.

Male and female.—Metallic or brassy green; lips and face below yellowish and brownish; frons above and vertex brassy green. Thorax obscure brassy green. Abdomen brownish black, 2-8 with a round basal spot on each side. Wings sometimes tinged with brown.

Pennsylvania, Georgia, Illinois, Missouri.

S. FILOSA Hagen (*filum* L., a thread).

Cordulia filosa Hagen, Syn. Neur. N. A., p. 136, 1861.

S. filosa Kirby, Synonymic Cat., 1890.

Ab. male 41, female 48; h. w. male 38, female 43.

Male and female.—Similar to *linearis*, more metallic. Thorax each side with two yellow stripes, one under each wing. Abdomen with pale on the sides of 1-3.

Maryland, Georgia, New Jersey, Illinois (Adams).

S. TENEBROSA Say (*tenebrosus* L., dark, gloomy).

Libellula tenebrosa Say, Journ. Ac. Phila. VIII, p. 19, 1839.

Cordulia tenebrosa Hagen, Syn. Neur. N. A., p. 137, 1861.

S. tenebrosa Kirby, Synonymic Cat., 1890.

Ab. male 38, female 39; h. w. male 38, female 37.

Male and female.—Brown or obscure green; lips and face yellowish and brown; frons above metallic; vertex and occiput brown. Thorax on the sides with a posthumeral and median green stripe, each followed by a short or rounded yellow stripe. Abdomen bronze black, 1-3 with pale on the sides. Hind wings sometimes yellowish brown along the anal border.

Nova Scotia; Maryland, New Hampshire, New York, New Jersey, Illinois, Indiana.

"Inhabits Indiana" (Say).

S. LIBERA Selys (*liber* L., free).

Cordulia libera Selys, Bull. Ac. Belg. XXXI (2), p. 263, 1871.

S. libera Kirby, Synonymic Cat., 1890.

Ab. male and female 29; h. w. male 29, female 31.

Male and female.—Obscure metallic green; lips yellow, face and frons brown. Thorax obscurely brown and metallic green. Abdominal segments 2 and 3 marked with brown. Wings with yellowish brown, especially on the hind wings, confined to the extreme base.

Canada; Michigan, New York, Maine.

PANTALA Hagen (*pan* Gr., all; *ala* L., wing).

Hagen, Syn. Neur. N. A., p. 141, 1861.

A genus of two species. One is confined to North America, the other is cosmopolitan. One species has been taken in the State and the other is sure to be found. They fly during July and August, and are very difficult to capture, moving swiftly, sometimes at a considerable height from the ground, and apparently never alighting. They are to be found rarely in almost any environment.

Anal angle with no distinct fuscous spot. *flavescens*.

Anal angle with a distinct fuscous spot. *hymenæa*.

P. FLAVESCENS Fabricius (*flavescens* L., turning light yellow).

Libellula flavescens Fabricius, Ent. Syst. Suppl., p. 285, 1798.

Pantala flavescens Hagen, Syn. Neur. N. A., p. 142, 1861; Kirby, Synonymic Cat., 1890.

Ab. male 32, female 33; h. w. male 41, female 40.

Male and female.—Yellowish. Abdomen with a maculate mid-dorsal stripe, absent on some of the segments, and sides below of 1-8, black. Hind wings with anal margin yellowish; apices sometimes tinged.

Asia, Africa and America; New York, Massachusetts, Pennsylvania, Maryland, Virginia, Georgia, Florida, Wisconsin, Illinois, Missouri, Ohio.

P. HYMENÆA Say (*Hymenæus* L., god of marriage).

Libellula hymenæa Say, Journ. Ac. Phila. VIII, p. 18, 1839.

Pantala hymenæa Hagen, Syn. Neur. N. A., p. 142, 1861; Kirby, Synonymic Cat., 1890.

Ab. male 30, female 31; h. w. male 41, female 42.

Male and female.—Colors reddish brown, marked with dark brown. Abdomen more or less banded and ringed. Hind wings with the anal angle yellowish and with a round, dark yellowish brown spot; and apices sometimes tinged.

Mexico, Cuba; Pennsylvania, Illinois, South Dakota, Texas, New Mexico, Kansas, Ohio, Indiana.

“Inhabits Indiana” (Say).

TRAMEA Hagen (*trama* L., a woof, a spider's web).

Hagen, Syn. Neur. N. A., p. 143, 1861.

A genus of about 32 species, represented in North and South America, India, Africa, Australia, and islands of the Indian and Pacific oceans. Three species have been taken in Indiana. In flight any of these three can be distinguished from all our other Odonata by the colored bases of the hind wings. They may be met with about lakes and ponds, over fields and along roads. *T. lacerata* is the commonest species. All are swift fliers and difficult to catch. They may be expected from May till September.

Adults with basal part of hind wings reddish or yellowish brown. 1.

Adults with basal part of hind wings black, scarcely reaching the costa, not hyaline between the median and the upper sector of the arculus on a level with the triangle. *lacerata*.

1. Brown reaching the costa, and extending to the fourth antecubital; basilar space hyaline in part, colored on the apical side of the arculus. *carolina*.

Brown usually not reaching the costa, extending only to the second antecubital; basilar and space outside of it between the median and the upper sector of the arculus hyaline, thus separating the colored area into a small anterior and a large posterior spot. *onusta*.

T. CAROLINA Linné.

Libellula carolina Linné, Cent. Ins., p. 28, 1763.

T. carolina Hagen, Syn. Neur. N. A., p. 143, 1861; Kirby, Synonymic Cat., 1890.

Ab. male and female 32; h. w. male and female 42.

Male and female.—Reddish brown. Abdominal segments 8–10 black above. Front wings slightly yellowish at base; hind wings with the colored area more evenly edged along the exterior than in *onusta* or *lacerata*, the hyaline anal spot relatively smaller; from this spot across the colored area in its narrowest part is about seven mm.; the corresponding part in *onusta* and *lacerata* measures about four mm. Male superior appendages a little longer than 9+10. Hamule little if any longer than genital lobe. Vulvar lamina of the female not quite as long as 9.

Massachusetts, Pennsylvania, New York, New Jersey, Florida, Ohio, Indiana.

Lake, Jackson Township, Wells County, May 7, 1899, common (Deam).

T. ONUSTA Hagen (*onustus* L., burdened).

T. onusta Hagen, Syn. Neur. N. A., p. 144, 1861; Kirby, Synonymic Cat., 1890.

Ab. male 31, female 33; h. w. male 40, female 42.

Male and female.—Reddish brown. Front wings tinged at base; hind wings with a reddish brown basal area. Male superior abdominal appendages a little longer than 9–10. Hamule much longer than the genital lobe. Vulvar lamina of the female as long as 9, bilobed.

Mexico, Panama, West Indies; Missouri, Florida, Texas, Ohio, Illinois (Adams), Indiana.

Frantz Fishpond, July 4, 1898, common, pairing and ovipositing; the female oviposits in the same manner as the *Libellulas*, the male usually remaining near.

T. LACERATA Hagen (*laceratus* L., torn).

T. lacerata Hagen, Syn. Neur. N. A., p. 145, 1861; Kirby, Synonymic Cat., 1890.

Ab. male 36, female 35; h. w. male 43, female 44.

Male and female.—Brownish black. Dorsum of abdomen with white or greenish spots, 7 usually conspicuously light colored, especially in the female. Front wings with a little brown at base; hind wings with black; in teneral this is reddish or yellowish brown. Male superior abdominal appendages as long as 8+9+10. Hamule shorter than the genital lobe. Vulvar lamina of the female half as long as 9, bilobed.

Mexico, Sandwich Islands; New York, Pennsylvania, Maryland, Michigan, Illinois, Missouri, Texas, Ohio, Indiana.

Turkey Lake (Kellicott), Round and Shriner lakes, September 2, 1897, June 7 and 24, 1898, only teneral individuals observed on September 2; Frantz Fishpond, July 4, 1898, common, pairing and ovipositing.

PERTHEMIS Hagen (*peri* Gr., around; *Themis* Gr., the goddess of justice).

Hagen, Syn. Neur. N. A., p. 185, 1861.

A genus including seven or eight species, represented in North and South America and the West Indies. A single species occurs in Indiana.

P. DOMITIA Drury (a Latin proper name).

Libellula domitia Drury, Ill. Ex. Ent. II, p. 83, 1773.

L. tenera Say, Journ. Ac. Phila. VIII, p. 31, 1839.

P. domitia Hagen, Syn. Neur. N. A., p. 185, 1861; Kirby, Synonymic Cat., 1890.

Tenera, *tenuicincta* and *iris*, regarded by Hagen and Calvert as varieties of *domitia*, are given specific rank by Kirby in his *Catalogue*.

Ab. male 14, female 13; h. w. male 18, female 19.

Male.—Yellowish brown. Markings obscure, thorax sometimes with two lateral pale stripes, and abdomen with some yellow marks. Wings uniform tawny yellow, or sometimes with a brown spot near the triangle and a basal brown streak on the hind wings.

Female.—Wings hyaline; front wings yellowish along the costa, an area near the triangle and another and larger area at the nodus, yellowish brown bordered with yellow; hind wings similar, the inner colored area covering the triangle and extending backward toward the anal angle. These markings vary greatly. Mr. James Tough, Chicago, showed me a male with the wings colored very much as in the female.

South America, West Indies; United States east of the Mississippi, Texas, Ohio, Illinois, Indiana.

“Inhabits Indiana, Pennsylvania and Massachusetts” (Say); Elkhart, July 2, 1894; marsh near Boot Lake, July 25, 1897, rare (Weith); Eagle Lake, July 10, 1898; Goose Lake, July 11, 1898 (Deam); pond

near Wabash River, Wells County, June 22, 1898; Frantz Fishpond, July 4, 1898, numerous, pairing and ovipositing; June 5, 1899; Lake, Jackson Township, Wells County, September 14, 1899, common (Deam *et al.*); Round and Shriner lakes, August 1, 1896, September 2, 1897, and June 24 and July 21, 1898, usually common.

June to September. A pretty and interesting little species; socially it is a perfect opposite of *Celithemis elisa*. As in other related species (*Celithemis* and *Sympetrum*), the male retains his hold of the head of the female as she flies along near the surface of the water, occasionally striking the water with her abdomen to release the eggs.

CELETHEMIS Hagen (*celis* Gr., a stain, a spot; *Themis* Gr., the goddess of justice).

Hagen, Syn. Neur. N. A., p. 147, 1861.

A genus of four species, represented in North America and Cuba. Three species have been taken in Indiana. The habits of all are very similar. They prefer lakes and are rarely if ever taken along streams. Occasionally they are found far from water but winds have probably carried them from more congenial surroundings. They are usually found along reedy shores, resting on the tips of sedges and grasses growing in or near the water. They pair at rest, the male clinging to any convenient support. During oviposition the male retains his hold of the female's head.

Wing markings yellowish or reddish brown; pterostigma red or yellow. 1.

Wing markings dull brown or black, pterostigma the same color. *fasciata*.

1. Wings yellowish marked with yellowish brown; nodal spot extending almost the full width of the wing. *eponina*.

Wings hyaline marked with yellowish or reddish brown; nodal spot small and rounded, beyond the nodus. *elisa*.

C. EPONINA Drury (*Epona* L., the goddess of horses).

Libellula eponina Drury, Ill. Ex. Ent. II, p. 86, 1773.

C. eponina Hagen, Syn. Neur. N. A., p. 147, 1861; Kirby, Synonymic Cat., 1890.

Ab. male 26, female 24; h. w. male 33, female 32.

Male and female.—Reddish brown and yellow. Thorax with a mid-dorsal and two lateral stripes, blackish. Abdomen black, with yellow spots. Front wings with a spot covering much of the triangle and lying above and internal to it, a nodal band running from the costa almost to

the posterior margin, and a band of similar width and length just inside the pterostigma; hind wings similarly marked, a spot extending from the base to and covering the triangle, and a rounded spot behind this; nodal band constricted at the middle, sometimes divided to form two spots. The extent of the markings is subject to considerable variation.

Cuba; United States east of the Rocky Mountains; Ohio, Michigan, Illinois, Indiana.

"Inhabits Pennsylvania and Indiana" (Say); Turkey Lake (Kellicott); Elkhart, June 12, 1895, margin of pond, rare; Boot Lake, July 4, 1897, usually common; Simonton Lake, July 5, 8 and 9, and August 1, 1897, usually common (Weith); Chapman Lake, July 7, 1898; Goose Lake, July 11, 1898; Lake, Jackson Township, Wells County, June 25, 1899 (Deam); Round and Shriner lakes, August 1, 1896; September 2, 1897; and June 24 and July 21, 1898, common, observed pairing on all dates.

C. ELISA Hagen (a proper name).

Diplax elisa Hagen, Syn. Neur. N. A., p, 182, 1861.

C. elisa Kirby, Synonymic Cat., 1890.

Ab. male 21, female 19; h. w. male 26, female 25.

Male and female.—Yellow or red, marked with deep brown or black. Thorax with mid-dorsal carina, humeral and two lateral sutures more or less black. Abdomen black with dorsum of 3-7 and sides of 1-3 largely red or yellow. Front wings with the ante- and postcubitals and some other cross-veins edged with brown; a small spot above the triangle (often wanting), a rounded spot near the costa between the nodus and the pterostigma, and apex from the pterostigma, brown, the extreme apex hyaline in the female; hind wings similar, a large brown basal area, bounded by the submedian and upper sector of the arculus in front, extending beyond the triangle, and running backward almost to the posterior and anal margin; this brown area enclosing a paler tawny area.

Canada; Maine, New York, Massachusetts, Georgia, Michigan, Illinois, Ohio, Indiana.

Christiana Creek, July 8, 1895, scarce; Boot Lake, July 5 and 9, 1895, and July 4, 1897 (Weith); Chapman Lake, July 7, 1898; Goose Lake, July 11, 1898 (Deam); Frantz Fishpond, July 4, 1898, and June 5, 1899, rare (Deam *et al.*); Round and Shriner lakes, August 1, 1896, September 2, 1897, and June 7 and 24 and July 21, 1898, usually common, observed pairing on all dates but June 7.

This species may often be found resting on the inflorescence of some of the rushes, preferably of the bulrush, *Scirpus lacustris*, growing in the shallow waters of our lakes. So perched on a swinging rush, they have a wide view of what is going on about them and at the same time are inconspicuous, harmonizing well with the dingy brown of the over-ripe

flowers to which they cling. From this vantage ground they make sudden dashes at passing diptera and smaller dragonflies, often returning to the identical sedge time and again. Each is proprietor of a particular locality. When one encroaches on the hunting territory of another he is quickly hustled away by the rightful and irate owner. Quarrelsome among themselves, they are moreover "the butt of Odonate society, for *Anax*, *Libellula* and *Celithemis eponina* are sure to pay it their disrespect whenever they spy it in passing."—Kellicott. The females are more retired, and, are usually found among the sedges back from the water's edge.

C. FASCIATA Kirby (*fascia* L., a band, a stripe).

C. fasciata Kirby, Trans. Zoöl. Soc. Lond. XII, p. 326, 1889;
Synonymic Cat., 1890; Hine, Ent. News X, p. 1, 1899.

Ab. male 22, female 21; h. w. male 28, female 27.

Male and female.—Blackish, with yellow markings, showing more distinctly in younger specimens. Antehumeral stripe and much of the sides yellow. Abdomen with a maculate dorsal stripe and spots on sides of segments, yellow. Front wings black at nodus and from there toward the base of the wing, usually as two branches, one between the subcostal and the median, the other between the submedian and the postcosta; the antecubitals of the second series are more or less surrounded with black; a spot between the nodus and the pterostigma, sometimes divided to form two spots, one behind the other; apex black (male), or with a black stripe just before the tip (female); hind wings similar; the spot from base to nodus sometimes with its outer lower part curved backward and inward toward the anal angle; a round anal spot.

Canada; Georgia, Florida, Ohio, Indiana.

Goose Lake, July 11, 1898 (Deam); Round and Shriners lakes, August 1, 1896, September 2, 1897, and June 24 and July 21, 1898, usually rare, several pairs taken on June 24; Frantz Fishpond, July 4, 1898, one male.

LEUCORHINIA Brittinger (*leucos* Gr., white; *rhis* Gr., the nose).

Brittinger, Sitzb. Ak. Wiss. Wien IV, p. 333, 1850.

A genus of 10 species, represented in North America, Europe and Japan. One species has been taken in Indiana. *Proxima*, *glacialis* and *frigida* have been taken east and west of Indiana, but farther north. None of them have been taken in northern Ohio, northern Illinois, or Michigan, and to find any of them in northern Indiana would be a surprise.

L. INTACTA Hagen (*intactus* L., untouched).

Diplex intacta Hagen, Syn. Neur. N. A., p. 179, 1861.

L. intacta Kirby, Synonymic Cat., 1890.

Ab. male 22, female 21; h. w. male 25, female 26.

Male.—Black; face and frons above ivory-white. Sides of abdomen dark brown, obscurely marked with black. Abdominal segment 7 with a yellow dorsal basal spot. Front wings with a little black at base between the subcosta and median and the submedian and postcosta; hind wings with a basal streak, and behind it a triangular basal spot. Superior appendages with a ventral subapical process; inferior deeply and broadly bifid, apices pointed.

Female and younger male.—Similar; face obscured with yellowish. Thorax with obscure yellowish markings above and on the sides. Abdominal segments 2-7 each with a dorsal yellow spot. Wings tinged with yellowish about the black basal areas. Vulvar lamina consisting of two short, slender, separated lobes.

Nova Scotia, Canada to Pennsylvania; South Dakota, Nevada, Washington, Michigan, Ohio, Illinois, Indiana.

Elkhart, June 10 to 25, 1895; and June 10, 1897, not common (Weith); Marshall County, May 18, 1899 (Blatchley); Round and Shriner lakes, June 7 and 24, 1898, teneral and adults were abundant on both dates.

May, June and July. A common and odd-little species, distinguished at once, as it hovers about the collector carefully studying his intentions, by its dark color with the clear ivory-white on its head.

SYMPETRUM Newman (*sympiedgo* Gr., to press together; *etron* Gr., the abdomen).

Newman, Ent. Mag. I, p. 511, 1833.

A genus, as defined by Kirby, of about 46 species, represented in North and South America, Europe, Asia and Africa. Four species have been taken in Indiana and at least one more is sure to be found. The habits of all are very similar. They are common about lakes and ponds during July, August and September, and even later. *Vicina* flies until in November. Sometimes specimens are found in great numbers in dry meadows; and every bit of low swampy ground is sure to swarm with them during August. *Corruptum* is more swift and wary than the others. All are conspicuous by their yellow (young) or bright red (adult) colors.

Triangle of front wing usually free; sectors of triangle of hind wings separate at their origin (*Diplacodes* Kirby). *minusculum*.

Triangle of front wing usually crossed; sectors of triangle of hind wings joined or but little separated at their origin (*Sympetrum*). 1.

1. Abdominal segment 4 with a median transverse carina; hind wing about 30 in length. *corruptum*.
Abdominal segment of 4 without a median transverse carina. 2.
2. Superior appendages of the male with a prominent median ventral tooth; vulvar lamina of the female bifid or incised. 3.
Superior appendages of the male denticulate beneath, no prominent median tooth; vulvar lamina of the female entire. 4.
3. Internal branch of hamules as long or longer than the external. *Rubicundulum* and *albifrons*.
Internal branch of hamules small, shorter than the external. *obtrusum*.
4. Hind wings with yellow extending more or less distinctly to the nodus. *semicinctum*.
Hind wings with yellow confined to the base. *vicinum*.

S. RUBICUNDULUM Say (*rubicundulus* L., somewhat ruddy). Pl. VII, figs. 16 and 18.

Libellula rubicundula Say, Journ. Ac. Phila. VIII, p. 26, 1839.

Diplax rubicundula Hagen, Syn. Neur. N. A., p. 176, 1861.

S. rubicundulum Kirby, Synonymic Cat., 1890.

Ab. male 25, female 24; h. w. male 26, female 25.

Male.—Yellow to red. Abdomen with lateral black markings. Wings yellow at base or with yellow extending to the nodus (var. *assimilata* Uhler). Superior abdominal appendages scarcely as long as 9, slightly upturned at apex, acute; the inferior median tooth is denticulate on its anterior side. Var. *assimilata* has been taken in Whitley and Wells counties. The yellow on the wings is usually distinct, but specimens scarcely distinguishable from the typical *rubicundulum* have been taken pairing with well marked specimens of the variety.

Female.—Similar; brown. Vulvar lamina bifid, the lobes approximate.

Nova Scotia to Maryland; Wyoming, Illinois, South Dakota, Nebraska, Michigan, Ohio, Indiana.

“Inhabits Indiana and Massachusetts” (Say); Elkhart, June 17 to September 11, 1897, in woods and over marshes, usually not common; one male (*assimilatum*) July 2, 1894 (Weith); Eagle Lake, July 9, 1898 (both forms); Goose Lake, July 11, 1898; Wells County, July 31 and September 4 (both forms), 1898; June 5, 1899, a teneral male, in woods; August 6, 1899 (Deam); Round and Shriner lakes, September 2, 1897 (both forms); and June 24, 1898, rare; Eel River, Allen County, June 23, 1898, tenerals.

S. OBTUSUM Hagen (*obtrusus* L., obtruded). Pl. VII, fig. 19.

Diplax obtrusa Hagen, Stet. Ent. Zeit. XXVIII, p. 95, 1867.

Note after *D. rubicundula*, Syn. Neur. N. A., p. 177, 1861.

S. obtrusum Kirby, Synonymic Cat., 1890.

Ab. male and female 23; h. w. male and female 23.

Male and female.—Very similar to the preceding. In adult specimens the face is more nearly white than in *rubicundulum*, in which species it is yellowish or reddish. Males are distinguished by the hamules. The females are distinguished with more difficulty: *obtrusum* has the vulvar lamina bifid, the conical lobes contiguous to the acute apex; *rubicundulum* has the lobes more inflated, less tapering, less acute, and divergent at the extreme apex. The females of *obtrusum* are olive brown in color with perhaps a reddish tinge. I have never seen *rubicundula* of this color. Both sexes of *obtrusum* are smaller than *rubicundulum*.

Nova Scotia to Pennsylvania; Massachusetts, Wisconsin, Colorado, Washington, Michigan, Ohio, Illinois (Adams), Indiana.

Elkhart, June 14, 1897, over marsh; October 11, 1899 (Weith); Goose Lake, July 11, 1898; Lake, Jackson Township, Wells County, September 4 and 10, 1898, and September 14, 1899, very numerous, pairing (Deam); Round and Shriner lakes, September 2, 1897, and June 24, 1898, common; Blue River, Whitley County, June 23, 1898.

S. ALBIFRONS Charpentier (*albus* L., white; *frons* L., front).

Libellula albifrons Charpentier, Lib. Eur., p. 81, 1840.

Diplax albifrons Hagen, Syn. Neur. N. A., p. 177, 1861.

S. albifrons Kirby, Synonymic Cat., 1890.

Ab. male and female 24; h. w. male and female, 25.

Male and female.—Reddish yellow. Abdomen red (adult) or yellow (young) spotted with black. Wings with the extreme base yellow. Hamules long, bifid, the external branch small, truncated, internal branch longer, narrow. Vulvar lamina short, rounded, the apex incised.

Massachusetts, Georgia, Missouri, Texas, Illinois (Adams).

S. VICINUM Hagen (*vicinus* L., neighborly). Pl. VII, figs. 17 and 20.

Diplax vicina Hagen, Syn. Neur. N. A., p. 175, 1861.

S. vicinum Kirby, Synonymic Cat., 1890.

Ab. male 21, female 22; h. w. male 24, female 23.

Male and female.—Colors similar to *rubicundulum*. Wings with the base only yellow.

Canada; Maine, New York, New Hampshire, Massachusetts, New Jersey, Pennsylvania, Maryland, District of Columbia, Virginia, Illinois, Michigan, Ohio, Indiana.

Turkey Lake (Kellicott); Elkhart, September 18 and 23, 1895, over marsh, common (Weith); Eagle Lake, July 11, 1898; Goose Lake, July 12, 1898; Wells County, September 4, 1898, and July 20, 1899 (Deam); Round and Shriner lakes, September 2, 1897, June 24 and July 21, 1898, very abundant, pairing on September 2, on June 24 only teneral were observed.

S. SEMICINCTUM Say (*semi* L., half; *cinctus* L., encircled).

Libellula semicincta Say, Journ. Ac. Phila VIII, p. 27, 1839.
Diplax semicincta Hagen, Syn. Neur. N. A., p. 176, 1861.
S. semicinctum Kirby, Synonymic Cat., 1890.

Ab. male and female 20; h. w. male and female 23.

Male and female.—Coloration as in other species, yellow to red, sides of abdomen spotted with black. Front wings yellowish brown from the base to the triangle or nodus; hind wings yellowish brown from the base to the nodus, usually lighter at base. Genitalia of the male much resembling *vicinum*. Vulvar lamina of the female very short, margin entire.

Maine, New York, New Hampshire, Massachusetts, Maryland, Pennsylvania, Colorado, New Mexico, Nevada, California, Michigan, Ohio, Illinois (Adams), Indiana.

“Inhabits Indiana and Massachusetts” (Say); Shriner Lake, July 21, 1898, one male.

S. CORRUPTUM Hagen (*corruptus* L., marred, spoiled). Pl. VII, fig. 21.

Mesothemis corrupta Hagen, Syn. Neur. N. A., p. 171, 1861.
S. corruptum Kirby, Synonymic Cat., 1890.

Ab. male 27, female 28; h. w. male 29, female 30.

Male and female.—Varying greatly in coloration at different ages. Young: thorax yellowish, an antehumeral, narrow humeral, and two lateral stripes terminated below by a bright yellow spot, grayish; later all these markings disappear excepting the lateral yellow spots. Abdomen yellowish, some black on the sides and above on 8 and 9. The fully adult insect is red. Veins and pterostigma yellowish and brown, or red. Legs black, sharply lined with yellow. Male superior appendages thickened apically, with inferior denticles. Vulvar lamina of the female not projecting, apex emarginate.

Asia, Mexico; Pennsylvania, Illinois, Kansas, California, Wyoming, Montana, Colorado, Texas, Louisiana, Ohio.

S. MINUSCULUM Rambur (*minusculus* L., rather small).

Libellula minuscula Rambur, Ins. Névr, p. 115, 1842.

Diplax minuscula Hagen, Syn. Neur. N. A., p. 183, 1861.

Diplacodes minuscula Kirby, Synonymic Cat., 1890.

Ab. male and female 18; h. w. male and female 19.

Male and female.—Yellow, marked with fuscous and black. Abdomen yellow, dorsum with three maculate black stripes and the apex black. Extreme base of hind wings yellow.

Georgia, Florida, Kentucky.

MESOTHEMIS Hagen (*mesos* Gr., middle, between; *Themis* Gr., the goddess of justice).

Hagen, Syn. Neur. N. A., p. 170, 1861.

A genus confined to America; two species are known.

M. SIMPLICICOLLIS Say (*simplex* L., simple; *collum* L., neck).

Libellula simplicicollis Say, Journ. Ac. Phila. VIII, p. 28, 1839.

M. simplicicollis Hagen, Syn. Neur. N. A., p. 170, 1861; Kirby, Synonymic Cat., 1890.

Ab. male 30, female 29; h. w. male and female 31.

Male.—Green and black; face green. Thorax green, sometimes the sutures with black. Abdomen mostly green basally, apical half mostly black. In older males the thorax and abdomen becomes entirely pruinose, grayish blue in color. Superior appendages whitish, denticulate underneath.

Female.—Green and dark brown, similar to the young male. Vulvar lamina elevated, triangular, entire.

Mexico, West Indies, Bahamas; United States east of the Rocky Mountains; Texas, Montana, Utah, Michigan, Ohio, Illinois, Indiana.

“Inhabits Indiana and Massachusetts” (Say); Turkey Lake (Kellcott); Elkhart, July 2, 1894, June 10 to September 17, 1895, June 28, 1899 (Weith); Eagle Lake, July 6, 1898; Chapman Lake, July 7, 1898 (Deam); Wabash River, Wells County, August, 1896, July 31, 1898; Frantz Fishpond, July 4, 1898, June 5, 1899; Lake, Jackson Township, Wells County, June 25, 1899 (Deam *et al.*); Round and Shriner lakes, August 1, 1896, September 2, 1897, and June 7 and 24, and July 21, 1898, usually abundant, pairing and ovipositing in July and September.

Of the dragonflies common about our swamps, marshes and lakes, none is more interesting, perhaps, than this species. The female because of her bright green color and energetic and peculiar method of hunting, is at least as conspicuous as the more soberly colored old males. Diptera

form the bulk of their food, many *Chrysops* justly perishing in this way. They have also been observed to kill and eat butterflies (*Pamphila*), moths, and dragonflies (*Lestes vigilax* and *Argia violacea*). On several occasions and at different localities males have been seen going through maneuverings which are hinted at frequently by some of the *Libellulas*, but which seem to have been perfected only by this species. Two males are necessary for the performance. They flutter motionless, one a few inches in front of the other, when suddenly the rear one will rise and pass over the other, which at the same time moves in a curve downwards, backwards and then upwards, so that the former position of the two is just reversed. These motions kept up with rapidity and regularity give the observer the impression of two intersecting circles which roll along near the surface of the water.

PACHYDIPLAX Brauer (*pachys* Gr., thick; *Diplax* (= *Sympetrum*), a genus of Odonata; *diplox*, a double folded mantle).

Brauer, Verh. zool.-bot. Gesell. Wien XVIII, pp. 368, 722, 1868.

A genus with a single species, found in North America and Mexico.

P. LONGIPENNIS Burmeister (*longus* L., long; *penna* L., a wing).

Libellula longipennis Burmeister, Handb. Ent. II, p. 850, 1839.

Mesothemis longipennis Hagen, Syn. Neur. N. A., p. 176, 1861.

P. longipennis Kirby, Synonymic Cat., 1890.

Ab. male 24, female 22; h. w. male 29, female 28.

Male.—Young: face whitish or greenish, frons above and vertex metallic blue. Thorax dark brown, the following yellowish or greenish: antecular sinus, mid-dorsal carina, antehumeral stripe; humeral stripe, and three broad stripes on the sides. Abdomen black or brown, an interrupted greenish stripe on either side of the dorsum of 2-7, below this on either side a similar interrupted stripe, not continued so far posteriorly. In older males the thorax and abdomen become pruinose and the markings are obscured. Wings hyaline, sometimes tinged with brown, especially between the nodus and pterostigma; dull yellow at base; hind wings sometimes with a short black streak between the subcosta and median, and another between the submedian and postcosta.

Female.—Similar to young male; occasionally pruinose in old individuals.

Mexico, Bahamas, Vancouver's Island; New York, Massachusetts to Florida, west to the Mississippi; Texas, Montana, California, Michigan, Ohio, Illinois, Indiana.

Turkey Lake (Kellicott); Elkhart, June 10 to July 11, 1895; Boot Lake and over marsh, June 27 to July 22, 1897, not common; May 26,

1899, one female in woods (Weith); Eagle Lake, July 5, 1898; Chapman Lake, July 7, 1898 (Deam); Wabash River, Wells County, August, 1896; June 5, 1899; Frantz Fishpond, June 5, 1899; Lake, Jackson Township, Wells County, May 29, 1899 (Deam *et al.*); Round and Shriner lakes, August 1, 1896; June 24 and July 21, 1898, common.

This species (and more rarely others) will frequently rest on some twig or stem with the wings drooping and the abdomen pointing straight up. The object to be gained by such a position is not evident, for the abdomen makes a favorite mark for passing *Libellulas* to nip at.

NANNOTHEMIS Brauer (*nanos* Gr., a dwarf; *Themis* Gr., the goddess of justice).

Brauer, Verh. zool.-bot. Gesell. Wien XVIII, pp. 369, 726, 1868.

A genus of three known species, represented in North and South America.

N. BELLA Uhler (*bellus* L., pretty, neat).

Nannophya bella Uhler, Proc. Ac. Phila., p. 87, 1857; Hagen, Syn. Neur. N. A., p. 186, 1861.

Nannothemis bella Kirby, Synonymic Cat., 1890.

Ab. male and female 12; h. w. male and female 15.

Male.—Black; face and frons pale, a median black spot connected with the black labrum; vertex metallic green or blue. Thorax and abdomen black. Pruinose in older individuals.

Female.—Similar. Thorax above dark brown, a yellow antehumeral line, and sides yellow with two black lines. Abdomen with following yellow: transverse basal band on 2-4, basal spot on 5-7, and entire dorsum of 10. Wings yellowish on basal third.

Ontario to Georgia; Maine, Massachusetts, New York, Connecticut, New Jersey, Pennsylvania, Maryland, Georgia, Indiana.

Elkhart, June 12, 1895, margin of pond; June 25, 1899, Indiana Lake, over marsh, common, most active towards evening, in the morning taken at rest on the stems of spatterdock leaves (Weith).

LIBELLULA Linné (*libella* L., a water-level).

Linné, Syst. Nat. I, p. 543, 1758.

As used by Hagen and Bauer this genus includes more than 30 species, represented in North and South America, Europe and Asia. Kirby in his *Revision of the Subfamily Libellulinae*, Trans. Zool. Soc. Lond. XII, 1889, separates the genus into five genera—*Libellula*, *Leptetrum*, *Plathemis* (?), *Belonia* and *Holotania*. *Libellula exusta* Say is placed in *Leptetrum*. In

the Can. Ent. XXIX, p. 146, Needham, after a study of both nymph and imago, proposes a new genus, *Ladona*, for *L. exusta*. In this paper it is more convenient to use *Libellula* in its wider sense.

About the lakes and marshes of northern Indiana three Odonatological seasons may be recognized—the *Enallagma* season, during which the Gomphines and Cordulines are also abroad; the *Libellula* season, when representatives of almost all the subfamilies may be found but when, as on June 24, I wrote in my note book, “it is the day of *Libellulas*,” and the *Sympetrum* season, when, to be sure, there are many *Lestes*, but they are weak, half-awake people who seem well content to let the hordes of red *Sympettra* rule the regions of hazy air above the dense sedge growths where they rest with listless wings neither closed nor spread. During this season the powerful *Aeschnas* wing their way about the lake, but they are too few in numbers to exercise much control. It is during the *Libellula* season that the shores are well guarded and patrolled. No visitor comes then but is challenged; nothing moves on water or land or through the air that is not noted and questioned. And the collector, followed and watched by many flashing forms, will find himself becoming so unscientific, perhaps, as to credit the members of his escort with psychological processes not unlike his own, but better fitted to the restless bodies that, if only for a short season, know unbounded freedom.

Base of hind wings, to beyond the triangle at least, black for the entire width. *basalis*.

Base of hind wings hyaline, or with the colored area not reaching the posterior edge of the wing. 1.

1. Base of hind wings hyaline, or with colored area not extending to and covering the triangle. 2.

Hind wings with colored area extending from the base to and covering the triangle. 6.

2. Wings hyaline at base, without basal streaks. 3.
- Wings with basal streaks. 4.
3. Yellowish or reddish species, pterostigma yellowish. *auripennis*.
Dark species, pterostigma black. *incesta*.
4. A small nodal spot and extreme apex black. *vibrans*.
No nodal or apical markings. 5.
5. Wings each with a basal streak, sometimes two on hind wings; pterostigma bicolored. *cyanea*.

Front wings with two basal streaks, hind wings with a basal streak and a triangular spot back of it; pterostigma unicolored. *exusta*.

6. Nodal spot small, wings hyaline beyond it. *quadrinaculata*.
Nodal spot larger, another spot at pterostigma or apex, or the area between nodus and pterostigma, from costa to hind margin of wings, black. 7.

7. Wing spots yellowish; basal spot on hind wing behind the submedian. *semifasciata*.
Wing spots black or dark brown; basal spot on hind wings almost reaching the costa. 8.
8. Each wing with three spots. 9.
Each wing with a basal spot and the entire area between nodus and pterostigma black. (*Plathemis lydia* male, see p. 333.)
9. Triangle of front wings more or less brown or black. *pulchella*.
Triangle of front wings entirely hyaline. (*Plathemis lydia* female, see p. 333.)

L. BASALIS Say (*basis* Gr., base).

L. basalis Say, Journ. Ac. Phila. VIII, p. 23, 1839.

L. luctuosa Hagen, Syn. Neur. N. A., p. 152, 1861.

Belonia luctuosa Kirby, Synonymic Cat., 1890.

Ab. male 31, female 27; h. w. male 40, female 38.

Male.—Blackish brown. Abdomen yellow on either side, this obscure in older individuals. Wings with basal third to half dark brown or black, on the front wings darkest beyond the base; in older individuals chalky white beyond the black almost to the pterostigma.

Female.—Wings with less black, sometimes only a dark tinge extending to the triangle on the front wings; no chalky white beyond the black area; apices usually dark.

Canada; New York, New Jersey, Pennsylvania, Maryland, District of Columbia, Michigan, Illinois, Kansas, South Dakota, Texas, Iowa, Ohio, Indiana.

Elkhart, May 31 to July 12, 1895, common; Boot Lake, July 4, 1897, common (Weith); Eagle Lake, July 5, 1898; Chapman Lake, July 7, 1898 (Deam); Wells County, July 31, 1898; pond near the Wabash, Wells County, June 22, 1898; Frantz Fishpond, July 4, 1898, abundant, ovipositing; June 5, 1899 (Deam *et al.*); Round and Shriner lakes, August 1, 1896, September 2, 1897, June 7 and 24, and July 21, 1898, very abundant, only tenerals observed on June 7, ovipositing on June 24, July 21 and September 2; Eel River, Allen County, June 23, 1898.

L. AURIPENNIS Burmeister (*aureus* L., golden; *penna* L., a wing).

L. auripennis Burmeister, Handb. Ent. II, p. 861, 1839; Hagen, Syn. Neur. N. A., p. 155, 1861.

Holotania auripennis Kirby, Synonymic Cat., 1890.

Ab. male 38, female 36; h. w. male 40, female 39.

Male and female.—Yellow or reddish brown. A yellow mid-dorsal thoracic stripe on young individuals. Abdomen with a mid-dorsal black

stripe. Wings yellowish or reddish, especially along the front margin; apices sometimes brown.

Cuba, Isle of Pines; Atlantic and Gulf States south of New York; Ohio.

L. INCESTA Hagen (*incestus* L., impure, polluted). Pl. III; Plate IV, fig. 1.

L. incesta Hagen, Syn. Neur. N. A., p. 155, 1861; Calvert, Trans. Am. Ent. Soc. XVII, p. 34, 1890.

Holotania incesta Kirby, Synonymic Cat., 1890.

Ab. male 35, female 33; h. w. male 39, female 33.

Male and female.—Yellowish and reddish brown, similar to the preceding. Older males dark pruinose blue. Wings hyaline, nodus sometimes edged with dark, and apex sometimes dark.

Canada to Florida; Maine, New Hampshire, Massachusetts, Carolina, Texas, Michigan, Ohio, Illinois (Adams), Indiana.

Round and Shiner lakes, August 1, 1896, September 2, 1897, and June 24 and July 21, 1898, abundant at certain points, especially the northern shores of Round Lake, ovipositing September 2 and June 24.

L. VIBRANS Fabricius (*vibrans* L., fluttering).

L. vibrans Fabricius, Ent. Syst. II, p. 330, 1793.

L. lydia Hagen, Syn. Neur. N. A., p. 155, 1861.

Holotania vibrans Kirby, Synonymic Cat., 1890.

Ab. male 40, female 38; h. w. male 48, female 47.

Male and female.—Yellow and reddish brown. Mid-dorsal thoracic stripe and sides, yellow, with slight black markings. Abdomen with sides yellow. Older males pruinose, the markings obscure. Wings with a long basal streak between the subcosta and median, a dot at the nodus, and the apex, more so in the female, black.

New York, Pennsylvania and New Jersey to Texas; Ohio, Illinois (Adams).

L. CYANEA Fabricius (*cyaneos* Gr., dark blue).

L. cyanea Fabricius, Syst. Ent., p. 424, 1775

L. quadrupla Hagen, Syn. Neur. N. A., p. 157, 1861.

Leptetrum cyaneum Kirby, Synonymic Cat., 1890.

Ab. male 29, female 27; h. w. male 35, female 34.

Male and female.—Yellow and chocolate brown. Thorax with a mid-dorsal stripe and sides largely yellow. Abdomen with a mid-dorsal brown stripe. Older males become entirely blue pruinose. Front wings

with a basal streak between the subcosta and median; hind wings with a basal streak between the subcosta and the median, and usually a shorter one between the submedian and postcosta; apices of all the wings sometimes brown; yellowish tinges at either end of the bicolored pterostigma.

New York, Massachusetts to Virginia; Pennsylvania, Ohio, Indiana.

Elkhart, generally common about marshes and ponds, taken from June 10 to July 4, 1897; one female in woods, June 14, 1897; Boot Lake, July 4, 1897, common (Weith); Goose Lake, July 11, 1898; Lake, Jackson Township, Wells County, July 31, 1898 (Deam); Shriner Lake June 7 and July 21, 1898, rare.

L. EXUSTA Say (*exustus* L., burned up, consumed).

L. exusta Say, Journ. Ac. Phila. VIII, p. 29, 1839.

L. deplanata Hagen, Syn. Neur. N. A., p. 154, 1861.

Leptetrum exustum Kirby, Synonymic Cat., 1890.

Ab. male 25, female 23; h. w. male 30, female 29.

Male and female.—Dark reddish brown. An antehumeral pale stripe. Abdomen with a mid-dorsal black stripe. Thorax above and abdomen white pruinose in old males. Bases of wings yellowish; front wings with two basal streaks; hind wings with a superior basal streak, behind it a triangular spot.

Canada, Vancouver's Island; Maine, Massachusetts, New York, Pennsylvania, New Jersey, North Carolina, Florida, Georgia, Wisconsin, Washington, Ohio, Illinois (Adams).

L. QUADRIMACULATA Linné (*quattuor* L., four; *maculatus* L., spotted).

L. quadrimaculata Linné, Syst. Nat. I, p. 543, 1758; Hagen, Syn. Neur. N. A., p. 150, 1861.

Leptetrum quadrimaculatum Kirby, Synonymic Cat., 1890.

Ab. male and female 30; h. w. male and female 35.

Male and female.—Olive or yellowish, marked with black. Humeral and second lateral suture black. Abdomen largely yellow, 6 or 7-10 black above. Wings with more or less yellowish at base and along the costa; a small nodal spot; hind wings with a yellowish black, triangular basal spot.

Europe and Asia; Canada, Nova Scotia; Maine, Massachusetts, New York, New Jersey, Michigan, Illinois, Wisconsin, Idaho, Wyoming, Utah, Washington, Iowa, Ohio, Indiana.

Common at Elkhart about 1890, not seen since then (Weith).

L. SEMIFASCIATA Burmeister (*semi* L., half; *fascia* L., a band, a stripe).

L. *semifasciata* Burmeister, Handb. Ent. II, p. 862, 1839; Hagen, Syn. Neur. N. A., p. 151, 1861.

Leptetrum semifasciatum Kirby, Synonymic Cat., 1890.

Ab. male 27, female 26; h. w. male and female 36.

Male and female.—Reddish or yellowish. Sides of thorax with two pale stripes, more or less distinct. Abdomen yellow, last 4 or 5 segments largely black above. Wings yellowish tinged at base as far as the triangle; veins conspicuously red or yellow; yellowish or reddish brown spots as follows: a nodal spot, a pterostigmal band, sometimes the apex, and usually an anal spot in the hind wings; the following yellowish black: in front wings the apical half of the median space, and the space between the sectors as far as the apex of the triangle; in hind wings a streak from the base, between the submedian and the postcosta, to and covering the triangle, the supratrangular space, and the space between the sectors of the arculus as far as the apex of the triangle.

Maine, New York, Massachusetts, Pennsylvania, New Jersey, Maryland, District of Columbia, Carolina, Florida, Texas, Michigan, Illinois, Ohio, Indiana.

Elkhart, June 13, 1897, one male in a road; June 17 and July 6, 1897, in woods; Boot Lake, July 4, 1897 (Weith); Eagle Lake, July 12, 1898 (Deam).

L. PULCHELLA Drury (*pulchellus* L., beautiful).

L. *pulchella* Drury, Ill. Exot. Ent. I, p. 115, 1770; Hagen, Syn. Neur. N. A., p. 153, 1861.

Plathemis (?) *pulchella* Kirby, Synonymic Cat., 1890.

Ab. male 34, female 32; h. w. male and female 42.

Male and female.—Blackish brown. Sides of thorax with two wide yellowish stripes. Abdomen with a stripe on each side yellow; pruinose in old males; wing spots black or dark brown; a basal spot between the costa or subcosta and the postcosta, to or slightly beyond the triangle, coloring the triangle completely in the hind wings, more or less in the front wings; a large nodal and an apical spot; male usually with anal portion of hind wings and spots alternating with black spots on all the wings, chalky white.

Quebec to Georgia, west to Utah and Texas; Michigan, Ohio, Illinois, Indiana.

Turkey Lake (Kellicott); Elkhart, June 10 and 12, 1895, very common (Weith); Eagle Lake, July 8, 1898 (Deam); Marion County, May 23, 1899, Crawford County, July 8, 1899 (Blatchley); Round and

Shriner lakes, August 1, 1896, June 7 and 24, and July 21, 1898; Eel River, Allen County, June 23, 1898; Wabash River, Wells County, June 19 and 22, 1898; Frantz Fishpond, July 4, 1898.

PLATHEMIS Hagen (*platos* Gr., broad; *Themis* Gr., the goddess of justice).

Hagen, Syn. Neur N. A., p. 149, 1861.

A North American genus including two species. *Libellula pulchella* is placed in this genus provisionally by Kirby, "though this species *pulchella* has some resemblance to *Holotania*."

P. LYDIA Drury (a proper name).

Libellula lydia Drury, Ill. Exot. Ent. I. p. 112, 1770.

P. trimaculata Hagen, Syn. Neur. N. A., p. 149, 1861.

P. lydia Kirby, Synonymic Cat., 1890.

Ab. male 28, female 24; h. w. male and female 33.

Male and female.—Brown. Thorax each side with two yellowish stripes. A yellow spot on each side of 2-9. Older males with the thorax largely and the abdomen entirely white pruinose. Male with wings marked with dark brown or black as follows: a basal spot, between the costa or subcosta and the postcosta, extending to the triangle in the front wings, and to and covering the triangle in the hind wings; basilar space more or less hyaline; and a wide band, between the nodus and pterostigma, for the entire width of the wing; a chalky white spot behind each basal spot, sometimes wanting on the front wings. Female with wing markings much like *Libellula pulchella*, triangle of front wings entirely hyaline.

Quebec to Florida, west to Colorado; Washington to southern California, Michigan, Ohio, Illinois, Indiana.

Turkey Lake (Kellicott); Elkhart, June 16, 19 and 26, 1895, very common; July, 1896; May 23, 1897, one female in thick woods on high ground; Christiana Creek, May 25, 1897; Boot Lake, July 4, 1897, common (Weith); Eagle Lake, July 9, 1898 (Deam); Crawford County, July 8, 1899 (Blatchley); Wabash River, Wells County, June 22, 1898, ovipositing; July 12, 1899 (Deam *et al.*); Frantz Fishpond, July 4, 1898, numerous; Round and Shriner lakes, August 1, 1896, June 7 and 24, and July 21, 1898, common; Eel River, Allen County, June 23, 1898.