

ILLINOIS STATE LABORATORY

OF

NATURAL HISTORY

The Natural History of Illinois:

BULLETIN No. 2.

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JUNE, 1878.

ERRATA.

BULLETIN No. 1.

- Page 33, line 5. after Report, read 1853 and '4.
Page 34, insert *Genus Poecilichthys*, Ag. between numbers 1 and 2.
Page 38, second line, for 2 1-6 read $2\frac{1}{6}$. Wherever, in this paper, two figures are separated by a hyphen, they should be written in the form of a common fraction.
- Page 40, line 11, for *Aphredodereus* read *Aphredoderus*; under No. 40, for *gruiniens* read *gruiniens*.
Page 44, No. 71, for *chrysochrous* read *chrysochloris*; for J. N. read J. W.
Page 45, No. 74, for E. L. read F. L.
Page 47, after 103 insert the following:—103 $\frac{1}{2}$. *C. analostona*, Grd., Silver-fin. Everywhere abundant through Central Illinois. Occurs less commonly further north.
- Page 52, Note 2, for der read den; for Archiev. read Archiv.
Note 3, for des read der; for Wein read Wien.
- Page 53, 8th line, for M. Bary read DeBary.
Note 7, for der (Brandpilze) read die.
- Page 54, for *Peronosporie* read *Peronosporee*.
Page 55, 8th line, for *hauptoria* read *haustoria*.
14th line, insert (12) after six, and add one to each of the three reference numerals following.
5th line from bottom. omit (15).
2d line from bottom, insert (16) after Common.
- Page 56, 10th line, 2d paragraph, instead of '75-6 read '74-5.
15th line from bottom, for pappillate read papillate.
11th line from bottom, for *Poltactis* read *Polyactis*.
- Page 57, 7th line, for *Peronosporie* read *Peronosporee*.
21st line from bottom, insert European before vine.
- Page 58, 8th line, for *Peronosporie* *Peronosporee*.
2d line, 2d paragraph, for 3 read 5.
7th and 8th lines, 2d paragraph, for one to three read twelve to fifteen.
4th line from bottom, for *bignouioides* read *bignonioides*.
- Page 68, No. 40, reduce *Acridium differentiale*, etc., to a synonym, and insert above it *C. differentialis*, Thos.
- Page 72, Plate II, fig. 1, for *Melanispora* read *Melampsora*.
Page 73, Plate III, fig. 3, for 3 read 5.
Plate III, fig. 5, for 5 read 3.
Plate III, fig. 7, for *Plycinidia* read *Pycnidia*.
Plate IV, fig. 12, for *fresii* read *friesii*.

BULLETIN No. 3.

In the preparation of the paper on The Food of Birds in this Bulletin, Uhler's "List of Hemiptera West of the Mississippi River" (1876) was followed with respect to the arrangement of the species mentioned; but through an unfortunate misunderstanding of the intention of the author of that list, the Pentatomidæ were all included under the Cydnidæ. For the latter name, the former should consequently be substituted, as follows:

Page 90, line 3 from bottom; page 92, line 11 from bottom; page 94, line 5, and line 5 from bottom; page 105, line 5 from bottom; page 108, line 13 from bottom; page 117, line 9 from bottom; page 126, line 14 from bottom; page 130, line 16; page 131, line 7 from bottom; page 132, line 13; page 138, lines 16 and 24; page 139, line 10; page 141, last line; page 143, line 2; page 145, line 5; page 148, line 12 from bottom.

BULLETIN No. 5.

Page 6. After description following Family PROTEIDÆ read:

Genus NECTURUS, Raf.

3. *N. lateralis*, (Say) Bd. Mud Puppy. Above brownish, with darker sub-circular spots; generally a dark stripe from snout back to eyes. A more or less distinct lateral band in young. Below dusky. Large, bushy, bright red gills, forming three tufts on each side of head. Head depressed; snout truncated; gular fold well developed; tail much compressed. $1\frac{1}{2}$ feet. Eastern region, except New England and Eastern Middle States, and from a few points in Australiparian.

4. *N. punctatus*, (Gibbes) Cope. Above nearly uniform dark olive, with numerous small orange or yellowish dots irregularly distributed over the whole surface, and large, dark, ill-defined spots at distant intervals. No lateral band. Beneath pale flesh color. Smaller and more slender than the preceding species. Eastern S. Carolina.

Page 18. Before FIRMISTERNIA and ARCIFERA, for ORDER read SUB-ORDER.

Page 22. Before RANIFORMIA, for ORDER read SUB-ORDER.

BULLETIN No. 6.

Page 6, line 12 from bottom; page 8, line 15; page 11, line 2; for *Cydnidæ* read *Pentatomidæ*.

Page 17, line 9, before *Vireo* omit *and*.

Page 23, above Arachnida, for *Cydnidæ* read *Pentatomidæ*.

Pages 25 and 27, above Orthoptera, for *Cydnidæ* read *Pentatomidæ*.

Page 28, lines 2 and 8, for *Graphorhinus vadosus* read *Epicærus imbricatus*.

Page 64, under Hemiptera, for *Siphonophora granarie* read *Aphis maidis*.

Page 69, line 5 from bottom, for *fresh-water* read *local*.

Page 78, line 1, after *all* insert *the*.

Page 82, line 7, for *character* read *characters*.

Page 91, line 5, for *consisted* read *consists*.

Page 92, line 2 from bottom, for *more* read *most*.

Page 97, line 11, for *forty-six* read *forty-six*.

Page 99, line 2, for *witu* read *with*.

Page 101, lines 12 and 13 from bottom, for *structure* read *structures*.

Page 105, line 23, for *aération* read *aëration*.

INTRODUCTION.

This is the second of a series of publications, issued by authority of the State Board of Education of Illinois, and designed especially to elucidate the natural history of this State. The first number was published in December, 1876, as Bulletin No. 1 of the Illinois Museum of Natural History; but a change in the title of the institution issuing them, necessitates a change in the title of the series.

S. A. FORBES,

Director Ill. State Lab. of Nat. Hist.

NORMAL, Ill., Dec. 12, 1877.

A List of the Species of the Tribe Aphidini, family
Aphidae, found in the United States, which
have been heretofore named, with
descriptions of some
New Species.

By CYRUS THOMAS, Ph. D.

Printed Dec. 13th, 1877.

A SYNOPTICAL TABLE OF THE SUB-FAMILIES OF APHIDAE, AS
GIVEN BY BUCKTON.

- I. Front wings with three discoidal veins, the third twice forked; hind wings with two discoidal veins. 1. *Aphidinae*.
- II. Front wings with three discoidal veins, third with one fork; hind wings with two discoidal veins. (One in *Colopha*.) 2. *Schizoneurinae*.
- III. Front wings with three discoidal veins, all simple; hind wings with one or two discoidal veins. 3. *Pemphiginae*.
- IV. Front wings with the third discoidal vein wanting; sometimes never acquiring wings. 4. *Chermesinae*.

The first sub-family, Aphidinae, is further divided by Buckton into two tribes as follows :

- | | |
|----------------------------|----------------------------|
| I. Antennae seven-jointed, | Tribe 1, <i>Aphidini</i> . |
| II. Antennae six-jointed, | Tribe 2, <i>Lachnini</i> . |

These characters, however, are calculated to deceive, as the sixth joint in many species of the second tribe consists of two parts, corresponding to the sixth and seventh joints in the first: in fact, the author speaks of these antennae as seven-jointed. The first of these tribes corresponds to Passerini's sub-family *Aphidinae*.

TRIBE 1. APHIDINI.

Genus SIPHONOPHORA, KOCH.

Antennae very long, on tubercles; honey tubes long, cylindrical.

1. *Siphonophora acerifoliae*, new sp.

Winged, viviparous female. General color light grey, varied with white and ash-brown. Antennae extending beyond the tip of the abdomen, nearly to the tips of the wings. The three ocelli distinct. Prothorax with depressed, expanded lateral margins. From the back of each of the first three or four abdominal segments, arise two distinct, slender, somewhat curved spines. Honey-tubes not extending beyond the tip of the abdomen. Most of the veins of the front wings, especially the fourth and the forks of the third, expand at the tips, forming dusky spaces; the subcostal vein is strictly parallel with the costa; stigma short and rather small.

Basal joints of the antennae dull yellowish, with a narrow darker ring at the apex of the third and fourth joints; more or less of the fifth of a transparent whitish color, forming an annulus; sixth and seventh dusky.

Head pale brownish, with a narrow white median line; eyes red; prothorax same color as the head, with more or less distinct, very narrow, abbreviated, longitudinal white lines; abdomen marked with a few white dots somewhat regularly arranged, powdered with white behind the honey-tubes. The white lines and spots appear to be formed by a very fine white powdery substance. The spines on the abdomen black. Honey-tubes brown, white at the immediate tips.

Apterous individuals, (probably not fully grown.) Pale pea-green; eyes dark; apical portion of the antennae dusky; tibiae dusky at the base; honey-tubes pale green. The surface of the body smooth and shining.

Found on leaves of *Acer dasycarpum*, chiefly on the under side, somewhat sporadic and not aggregated in large colonies. Winged specimens very active and apparently capable of leaping. Slightly above medium size, but less than *S. rudbeckiae*.

It is possible that this *Aphis* should be placed in *Drepanosiphum*, or a new genus be formed for its reception.

2. *Siphonophora rudbeckiae*, FITCH. Senate 30, 66, 1851.

On *Rudbeckia laciniata*, *Ambrosia trifida*, and *Solidago serotina*.

3. *Siphonophora ambrosiae*, new sp.

Similar in size and appearance to *S. rudbeckiae*, but varying in color from a light brown to a dark seal brown.

Winged individuals. Discoidal veins of the front wings strongly curved. Antennae passing the tip of the abdomen, light brown, dark at the apex. Honey-tubes long, cylindrical, reaching beyond the tip

of the abdomen. Tail long and pointed. Body not tuberculate; antennae with alternate hairs, which, under a high power, appear to be capitate.

Apterous individuals. Body more or less covered with tubercles, out of which proceed hairs, which, in some specimens at least, are capitate. A similar characteristic has been noticed by Buckton in *Myzus ribis*, a species found on the Red Currant and the Gooseberry.

Honey-tubes dark, or the same color as the body, tail yellowish brown. Beak dark at the tip, reaching to the third coxae.

Found September 1st, at Sioux City, Iowa, on the leaves and flower-stems of *Ambrosia psilostachya*.

4. *Siphonophora rosae*, REAUM.

Aphis rosae, Reaum. Ins., iii, Pl. 21, Fig. 1-4.

Siphonophora rosae, Koch, Pflanz., 178.

On the tender shoots, leaf-stalks and flower-stalks of various cultivated and wild roses.

5. *Siphonophora avenae*, FAB.

Aphis avenae, Fab., Sp. Ins., ii, 386.

“ *granaria*, Kirby, Linn. Trans., iv, 238.

“ *hordei*, Kyber, Germ. Mag., Leit. ii.

“ *cerealis*, Kalt., Mon. Pflanz., I, 16, 6.

On Wheat, Oats and Barley leaves, stems and roots, according to the time of the year.

6. *Siphonophora viticola*, new sp.

Apterous female. Rather broadly ovate, wide behind, about .08 of an inch long. Dusky brown, somewhat paler in front. Antennae scarcely as long as the body. Honey-tubes very long, slightly curved and slightly enlarged at the base, cylindrical, and fully one-fourth the length of the body. Honey-tubes, legs and antennae black, except that there appears to be a broad pale annulus on the last near the base, and in many specimens several pale rings. Tail distinct.

Winged viviparous female. Similar to the wingless, somewhat more slender; front parts darker, the head and central parts of the thorax being dark brown.

The second discoidal vein more than usually distant from the third; stigma dusky or brown, elongate, with sides parallel, pointed at the tip.

In June and July, on the leaves near the tips of the branches, and also the tender twigs of cultivated grape vines.

Whether this is the *Aphis vitis* of Scopoli or not, I have no means at present of ascertaining.

7. *Siphonophora setariae*, new sp.

Winged viviparous female. Antennae about as long as the body or slightly longer; general color brown or brownish, usually with a slight

olive tint. Subcostal vein of the fore wings parallel with the costal; the three discoidal veins about equidistant at their bases; stigma fusiform, opaque, brown.

Apterous female. Honey-tubes extending slightly beyond the tip of the abdomen, black; tail white; legs yellow, except the joints, which are dusky; the femora are generally pale at the base. Antennae about as long as the body, marked as in the pupa, except that the light portions are clear white. Beak reaching nearly to the hind coxae.

Pupa. Oval, width about two-thirds the length; length about .05 inch. Antennae nearly as long as the body; first and second joints dusky, third and fourth bright yellow, apex dusky. Eyes black. Wing-pads greenish at the base.

Found on the heads of *Setaria glauca* and *Panicum crus-corvi*, Carbondale, Illinois, in August.

It is possible that those found on *Panicum* belong to a different species, as the wingless specimens are of a lighter color, and have a distinct tubercle on the sides of the neck, which I failed to observe in those on *Setaria*. If it should appear that these are specifically distinct, the species may be named *Siphonophora panicola*.

8. *Siphonophora euphorbiae*, new sp.

Notes in reference to color lost. If I remember rightly, it was green or greenish, similar in color to the following species, but distinct.

Antennae longer than the body, very slender; the third and seventh joints very long; a few regularly placed hairs on them. Honey-tubes long and slender, reaching beyond the tip of the abdomen, nearly one-third as long as the body, cylindrical. Tail very distinct, ensiform and slender, about half the length of the honey-tubes. Subcostal vein of the front wings diverging as it leaves the base, so as to leave the widest space between it and the costal vein opposite the insertion of the first discoidal vein, then approaching and joining it at the stigma.

Found at Sioux City, Iowa, September 1st, on *Euphorbia maculata*.

The specific name *euphorbiae* has already been used in *Aphis*, but this being in a different genus, it will not create confusion.

9. *Siphonophora euphorbicola*, new sp.

Winged viviparous female. Antennae longer than the body; general color pale pea-green; honey-tubes long, extending beyond the tip of the abdomen, equal in length to about one-fourth of the body. Head pale glaucous, the two lateral ocelli distinct; eyes dark; antennae dusky, except the basal joints and base of the third joint, which are pale. Thorax with a slight purplish tint; prothorax green; abdomen pale green; legs hyaline. Honey-tubes pale green at base, dusky at the tips; tail long, slender, sword-shaped, greenish. Veins of the wings slender and very straight, except the stigmatic, which is strongly curved. Beak reaches the hind coxae. Length to tip of abdomen .09 inch; to tips of wings .15 inch.

Apterous female. Pale green throughout, except the eyes, which are dark. Some specimens tuberculate.

Closely allied to *S. cyparissiae*, Koch, but that species has red eyes.

Found at Sioux City, Iowa, about the 1st of September, on *Euphorbia marginata*, on the leaves and leaf-stalks.

10. *Siphonophora asclepiadis*? FITCH. Senate, No. 30, 65, 1851.

On *Asclepias cornuti*. Referred with some doubt to this species.

Dark green with dusky shadings.

11. *Siphonophora erigeronensis*, new sp.

Winged viviparous female. Green, the antennae, eyes and honey-tubes black. Antennae as long as the body or rather longer; honey-tubes very long, passing the abdomen, nearly equal in length to one-third the body; cylindrical, deep black. Tail distinct, rather slender, and curved upwards. Legs long and slender, black, except the basal half of each femur, which is transparent green. Head and thorax deeper green than the abdomen.

Length to tip of abdomen, .08 inch; to tips of the wings, .13 inch.

The young are pale greenish-yellow. Fully grown wingless individuals, pale pea-green.

Found in August, at Carbondale, Illinois, upon the flower-stalks of *Erigeron canadensis*.

12. *Siphonophora coreopsidis*, new sp.

Winged individuals. Antennae about two-thirds the length of the body; joints proportioned as usual. Honey-tubes long and cylindrical, length equal to about twice the distance to the tip of the abdomen. Head and thorax black; abdomen greenish-yellow, with a grass-green spot on the back next the thorax, and three green spots along each side, one to a segment; antennae, legs and honey-tubes black; tail the color of the abdomen. The wings present a slightly smoky appearance; costal vein, stigma and discoidal veins, very dark, almost black; subcostal with a yellowish tint.

Apterous female. Head pale yellow; thorax yellowish-green; abdomen greenish-yellow, with a grass-green streak running from the thorax to the tip of the abdomen, also one running across near the thorax; the hind margin of the abdomen from the base of one honey-tube to the other is of a reddish tint. Eyes black. Wing-cases of the pupa black.

Found by Mr. Th. Pergande, in October, at St. Louis, Missouri, on *Coreopsis aristosa*, infesting the flower stalks.

13. *Siphonophora lactucae*, KALT., Mon. Pflanz.

On the garden lettuce.

Buckton appears to think this distinct from *Aphis lactucae*, Linn., or *S. lactucae*, Koch.

14. *Siphonophora polygoni*, WALK.

Aphis polygoni, Walk., Zool., vi, 2249.

On *Polygonum persicariae*.

15. *Siphonophora salicicola*, new sp.

I have not seen this species living, hence cannot give the colors; and I have some doubt as to its generic position, the antennal tubercles not being very distinct, and the plant on which it was found not the kind on which the species of this genus usually reside.

Winged individual. Antennae seven-jointed, of the usual form in this genus; apparently on tubercles; all the joints transversely wrinkled. Beak of medium length. Tail distinct, curved upwards, expanding in the middle, and about half the length of the honey-tubes. Honey-tubes long, reaching beyond the tip of the abdomen, cylindrical. Wings with the neuration as usual in this genus, the second fork of the third discoidal vein very near the tip, the distance to the tip not more than one-sixth the distance to the junction of the first fork with third vein.

Specimens in glycerine. Found in June, by Miss Emma A. Smith, at Peoria, Illinois, on willow.

It is evidently not the *Aphis salicicola*, Uhler, (*A. salicti*, Harr.) which is a *Lachnus*.

16. *Siphonophora verbenae*, new sp.

Wingless female. Of a bright pea-green color throughout, (some specimens yellowish-green;) with two or three deeper green, longitudinal stripes on the abdomen. Eyes black. Antennae about as long as the body, pale and colorless, except at the tips, where they are dusky.

Honey-tubes reaching to or slightly beyond the tip of the abdomen, cylindrical, pale. Tail rather short, whitish. Body regularly ovate, somewhat elongated; medium size.

Found at Carbondale, Illinois, November, on the leaves of *Verbena*.

The following species are mentioned as probably found in the United States, introduced from Europe.

17. *Siphonophora rubi*, KALT.

Shining green and slightly pilose. On the Blackberry.

18. *Siphonophora pisi*, KALT.

Various shades of green. On the Pea.

19. *Siphonophora tanacetii*, LINN.

Brown, with lighter shades. On the common Tansy.

20. *Siphonophora fragariae*, KOCH.

Green. On the Strawberry.

Genus PHORODON.

Similar to *Siphonophora* in some respects, and to *Aphis* (restricted) in others. Chief distinguishing character, the spine-like prolongation of the inner side of the antennal tubercle, and of the first joint of the antennae.

21. *Phorodon humuli*, SCHRANK.

Aphis humuli, Schrank, Faun. Boic., II, 110, 1199.

pruni, Mahaleb, Fonscol., Ann. Soc. Ent. Fr., X, 175.

Phorodon humuli, Passerini.

The well known and injurious *Aphis* of the Hop-vine; the cause of the "Blight." Green.

Genus MYZUS.

Too closely allied to *Phorodon*, the chief difference being that the frontal tubercles are not porrected in the female, and that the first antennal joint is only gibbous.

22. *Myzus cerasi*, FAB.

Aphis cerasi, Fab., Syst. Ent., 734, 4.

Myzus cerasi, Pass.

Shining black. On cherry leaves.

23. *Myzus*? *cerasicolens*, FITCH.

Aphis cerasicolens, Fitch, Senate, No. 30, 65, 1851.

Pale greenish yellow. On *Cerasus serotina*.

24. *Myzus*? *cerasifoliae*, FITCH.

Aphis cerasifoliae, Fitch.

Black, abdomen green. On leaves of *Cerasus virginiana*.

25. *Myzus persicae*, SULZ.

Aphis persica, Sulz., Hist. Ins., 105, Pl. II, Fig. 4, 5.

institia, Koch, Pflanz., 58, Fig. 74, 75.

persicaecola, Boisd.

persicophila, Rondani.

Myzus persicae, Pass.

Red and brown On the Peach and Nectarine.

26. *Myzus ribis*, LINN.

Aphis ribis, Linn., Syst. Nat., II, 733.

Rhopalosiphum ribis, Koch, Pflanz., 39, Fig. 50, 51.

Myzus ribis, Pass.

Green to yellow. On leaves of Red Currant.

Genus CHAITOPHORUS.

Similar to *Aphis* (restricted) in form and antennae; honey-tubes very short; legs, antennae, and usually the body, hairy (hirsute).

27. *Chaitophorus negundinis*, new sp.

Winged individual (in glycerine).—Wings very thin and delicate, and veins very slender; the costal vein bends outward from the base to the insertion of the second discoidal vein; the stigmatic vein starts from the stigma far back near the middle, curves slightly and gradually for a short distance and is then almost straight to the apex of the wing; stigma very long and slender; veins and stigma pale yellowish. Antennae nearly as long as the body, sparsely covered with long stiff hairs. Honey-tubes short. Apparently greenish.

Found at Peoria, Illinois, in June, by Miss Smith, on *Negundo aceroides*.

28. *Chaitophorus populicola*, new sp.

Winged specimens. Antennae not very long, somewhat hairy. Wings transparent, but along each discoidal vein there is a broad smoky border; stigma dark; when examined by a strong power the wings appear to be covered with scales; when examined by an ordinary pocket lens they present a very pretty appearance, as though marked by dark cross bands. Head and thorax shining black; neck dull yellowish; abdomen yellowish, with some irregular dusky patches toward the tip. Antennae, which reach about the middle of the abdomen, dusky, the basal half paler; legs dark, the bases of the femora pale; beak short, reaching only to the middle coxae.

Apterous female. Reddish-brown, or tortoise-shell color; a large, yellowish, triangular or Y-shaped spot, (the forks pointing backwards) on the middle part of the abdomen; honey-tubes reduced to simple tubercles, yellow. There is often a palish stripe along the middle of the head and thorax. Antennae pale yellowish at the base. Length about .05 of an inch.

Body more or less hairy; and although my notes, made at the time, fail to mention the fact, I think that some, at least, of the apterous specimens were covered with tubercles.

Found in July, at Carbondale, Illinois, and the first part of September, at Dubuque, Iowa, on the under sides of the leaves of young sprouts of *Populus angulata*.

The remaining species of the tribe are placed in the genus *Aphis*. Those which are new and those heretofore described which I have been able to examine, appear to belong to the genus as restricted; the others require further examination.

29. *Aphis vernoniae*, new sp.

Winged individuals.—Rather small, .06 to .08 of an inch in length to the tip of the abdomen; .12 inch to the tips of the wings. General

eral color bright lemon yellow ; thorax yellow, except the lobes, which are brown or blackish ; eyes black ; antennae pale or dusky ; abdomen yellow ; honey-tubes yellow or ochreous ; tail yellowish ; legs pale.

In some specimens the thorax is dark ; the abdomen greenish-yellow.

Antennae seven-jointed, nearly as long as the body. In some specimens (probably males) they appear to be on tubercles, which are prolonged on the interior margin ; seventh joint about as long as the fifth and sixth united. Honey-tubes slender, cylindrical, and reaching about to the tip of the abdomen. Tail short and blunt. In some (wingless) specimens there is a distinct tubercle on each side of the prothorax, and another on each side just above the posterior coxae, but these were not observed on the winged individuals.

Wingless individuals.—Color almost uniform greenish-yellow ; eyes black ; honey-tubes yellowish ; tail whitish ; legs pale.

Found in June, at Carbondale, Illinois, on the under side of the leaves and stems of *Vernonia fasciculata* ; also about the first of September, at Ft. Dodge, Iowa, on the flower stalks of the same plant. The latter presented some slight differences from the former. Is closely allied to *A. beccabungae*, Koch, and possibly identical with it.

30. *Aphis mali*, Fabr., Syst. Ent., 737.

Aphis pyri, Reaum., Ins., III, 281,350.

On the leaves and tender twigs of the Apple.

31. *Aphis malifoliae*, Fitch, Fourth Rep. N. Y. S. Cab., 49.

Probably a variety of the preceding. On apple leaves.

32. *Aphis cephalanthi*, new sp.

Wingless female.—Of a nearly uniform purplish color, the young quite pale, the older and mature individuals darker, but more or less translucent, with a slightly pruinose cast or covering ; head and tip of the abdomen dusky ; a slightly impressed line along each side of the abdomen near the margin. Honey-tubes cylindrical, reaching about to the tip of the abdomen ; tail distinct. Beak reaches rather beyond the middle coxae. Length about .05 inch.

They give a reddish or dull orange color when crushed.

Winged individual.—Head and thorax black, abdomen pale purplish, marked along the margin with pruinose spots. Two pruinose spots on the abdomen immediately behind the thorax ; tip of the abdomen dusky ; about four of the pruinose spots on each side anterior to the honey-tubes and two behind them. Antennae very slender, dusky, reaching about to the middle of the abdomen. Legs pale, except the joints and tarsi, which are dusky. Wings transparent, but with a slightly smoky shade when seen erect in the living insect ; veins dark, except the subcostal or midrib, which is pale.

Length to tip of abdomen about .05 ; to tip of the wings about .12 inch.

Found in July, at Carbondale, Illinois, on the new growth of the twigs or stems of young plants of *C-phalanthus occidentalis* ; occasionally on the midrib of the leaf near the base.

It is possible that this should be placed in *Callipterus*, but the honey-tubes are rather long, and the antennae do not agree with characters as given by Koch, which, in fact, appear to be contradictory.

33. *Aphis viburni* ? Fabr., Syst. Ent., 737, 18.

On the tender twigs of *Viburnum opulus*.

Our species appears to be identical with the European.

General color lilac-brown ; antennae shorter than the body ; the honey-tubes short ; legs usually pale honey yellow. Illinois, June.

34. *Aphis maidis*, FITCH.

On the tassel, ear-stalks and roots of Indian corn. Green throughout in apterous individuals ; winged with head and thorax shining black.

35. *Aphis brassicae*, LINN., Syst. Nat., II, 734.

Aphis floris-rapeae, Curt., Journ. Roy. Agr. Soc., III, 55.

Pale greenish-yellow. On Cabbage.

36. *Aphis impatientis*, new sp.

Winged individual.—Antennae extending about to the base of the honey-tubes, pale and dusky alternately ; head black ; prothorax pale brown, rest of the thorax shining black ; abdomen pale brownish ; honey-tubes not reaching the tip of the abdomen, black ; tail dull yellowish ; veins of the wings and stigma brown ; wings iridescent ; legs dusky, tibiae pale yellow. Length to tip of abdomen about .10 inch, to tip of wings .18 inch.

Apterous specimens.—Olive or purplish-brown.

Found in August, at Carbondale, Illinois, on *Impatiens fulva*.

Is an *Aphis* in the restricted sense.

37. *Aphis symphoricarpi*, new sp.

Apterous individuals—(No winged specimens observed).

There appear to be two varieties, but evidently belonging to the same colonies.

One is pale, transparent green or yellowish green ; eyes black ; antennae pale, with a black ring a little beyond the middle, tips dusky ; honey-tubes and a small space around the base ochre yellow ; tarsi and tip of the beak black ; legs pale, transparent greenish. Bodies rather

broadly ovoid, and very convex ; abdomen very distinctly acuminate at the apex, but no tail apparent.

The other variety is rather less convex, and the dorsal surface is more or less shaded with brown ; in the darker specimens this color sometimes occupies most of the back ; there is usually a median line or stripe of green on the posterior half of the abdomen, which can often be indistinctly traced to the thorax ; the thorax generally more or less shaded with pale brown ; tip of the abdomen usually pale or greenish, and not acuminate as in the other variety ; tail distinct but short, whitish ; honey-tubes dark at the tips ; remainder, and a space around the base, yellowish-brown.

Legs rather short. Antennae reaching to the honey-tubes or nearly to the tip of the abdomen ; honey-tubes very short, almost reduced to tubercles, length about twice their diameter.

Found at Ft. Dodge, Iowa, about the first of September, on the leaves of *Symphoricarpos vulgaris* ; on the under side of the leaves near the ends of the branches.

38. *Aphis pruni*, KOCH, Pflanz., 63, Figs. 88-90.

Aphis prunifoliae, FITCH.

Green, with more or less black. On the leaves of native and cultivated plums.

39. *Aphis rumicis*, LINN., Syst. Nat., II, 734.

For the numerous synonyms given by Walker, See Walker, List, Homop. Brit. Mus., 981. Also Trans., Ill. St. Hort. Soc., 1876, 163. Some of these synonyms are erroneous.

Black. On the Bean, Dock, &c.

40. *Aphis cornifoliae*, FITCH. Senate, No. 30, 65, 1851.

Black. On the leaves of *Cornus paniculata*.

41. *Aphis circaezandis*, FITCH.

Head and thorax black. On leaves of *Galium circaezans*.

42. *Aphis crataegifoliae*, FITCH. Senate, No. 30, 66, 1851.

Black, abdomen green. On the leaves of *Crataegus punctata*.

43. *Aphis betulaecolens*, FITCH. Ibid.

Sulphur-yellow. On the Beech. Probably belongs to *Callipterus*.

44. *Aphis sambucifoliae*, FITCH. Ibid.

Black (probably greenish-black ?). On Elder leaves. It is quite probable this is *A. sambuci*, Linn.

45. *Aphis pinicolens*, FITCH. *Ibid.*
Straw-yellow. On the Pine.
46. *Aphis populifoliae*, FITCH. *Ibid.*
Chestnut-brown, pruinose. On leaves of *Populus grandidentata*. Probably belongs to *Chaitophorus*, and may be identical with the one one I have named *Ch. populicola*; but Dr. Fitch's description is too short and unsatisfactory to decide this point.
47. *Aphis candicans*, FITCH.
On the leaves of *Populus candicans*. Probably belongs to *Chaitophorus*.
48. *Aphis gossypii*, --? Pat. O.F. Rep., 1855.
Green or yellow, thorax striped with black. On the leaves of cotton.
49. *Aphis?* *caryella*, FITCH.
50. *punctatella*, FITCH.
51. *maculella*, FITCH.
52. *fumi pennella*, FITCH.
53. *marginella*, FITCH.

These species, according to Dr. Fitch, are found on the Hickory. It is more than probable that they are varieties of one species. They most likely belong to Passerini's genus *Pterocallis*; at any rate they belong to the tribe under consideration.

54. *Aphis aceris*, LINN., Syst. Nat., II, 736.

Occurs, according to Dr. Fitch, on *Acer pennsylvanicum*. If he is correct in his determination, it will belong to the genus *Chaitophorus*. The winged specimens black, the apterous yellowish and very hairy; honey-tubes very short.

Genus RHOPALOSIPHUM.

Similar to *Siphonophora*, but differs in having the honey-tubes enlarged in the middle.

55. *Rhopalosiphum berberidis?* KALT., *Mon. Pflanz.*, 95.

Aphis berberidis, Fitch, Senate, No. 30, 65, 1851.

Black, abdomen yellow. On the leaves of *Berberis vulgaris*.

I doubt the identity of Fitch's and Kaltenbach's species, although infesting the same plant; the difference in color is too great.

I also give descriptions of some new species belonging to other tribes, with notes on a few species heretofore described.

Lachnus quercifoliae ? FITCH.

The following is a description of what I presume to be Dr. Fitch's *L. quercifoliae*.

Apterous individuals.—(apparently hardly full-grown).

Antennae longer than the body; third joint longest, the second about four-fifths the length of the third, thence decreasing regularly to the sixth, which is divided into two parts differing in diameter, or there is a seventh which is not more than half of the length of the sixth; sparsely covered with hairs placed alternately. Honey tubes very short, the diameter exceeding the length, snowy white; tail short, semi-circular; body slightly hairy. General color brown; head paler and yellowish; first two pairs of legs transparent white; hind legs brown, except the tarsi, which are pale. Beak whitish, and reaching slightly beyond the third coxae. The young are yellowish white, with pale-brown patches; as they increase in age, they grow darker, assuming a tortoise-shell appearance; the middle of the back and a spot each side of the abdomen at the shoulders pale. The older specimens show a distinct ridge along each side of the abdomen. Segments of the abdomen very distinctly marked. Nearly oval in form; length less than one-tenth of an inch. Tibiae hairy.

Found on the upper surface of the leaves of the White Oak, at Carbondale, Illinois, in August.

I have some doubt in reference to the position assigned this species by Dr. Fitch, if indeed it be his species.

Rhizobius eleusinis, new sp.

The body very broadly ovate and very convex, almost globular; the abdomen abruptly rounded behind, the last segment small and conical, appearing in the older or completely grown specimens as a short tail; tapering regularly from the middle of the abdomen forward to the head, the thorax and thoracic segments distinguished only by the deeper sutures and position. Eyes very minute, almost obsolete. Antennae very short, not reaching beyond the thorax, six-jointed, first and second thickest, rest cylindrical, of equal thickness; third longest, sixth next, fourth and fifth equal in length; slightly hairy (under strong magnifier) especially the sixth joint. Beak reaching fully to the hind coxae. General and almost entire color a milky white; apical half of the antennae and tip of the beak dusky or black; the older specimens have two or three transverse fuscous bands on the thorax and posterior part of the abdomen. The under side often presents, on the lateral margins, abbreviated, transverse, brownish stripes, but the middle part is smooth and white. The legs are dirty white, more or less touched with pale brown.

Length about .05 to .07 of an inch. The species of this genus, as far as known, never acquire wings.

Found during September, at Carbondale, Illinois, on the roots of *Eleusine indica*.

Tychea panici, new sp.*

Antennae very short, in the specimens examined, which appear to be scarcely fully grown; not reaching beyond the prothorax, apparently five-jointed; joints nearly equal to each other, sub-moniliform. Body ovate, very convex. Apparently without eyes, at least I failed to find them with a pretty high power, yet Mr. Pergande appears to have found specimens in which they were minutely represented, as shown in the figure drawn by him. Beak very short, reaching but little beyond the first coxae. Legs unusually short, the hind pair being scarcely longer than the others. Without honey-tubes or anything representing them. Divisions between the segments not well marked. Uniform orange red or reddish-yellow; beak tipped with fuscous. Length not more than about .04 of an inch.

Found during October, by Mr. Th. Pergande, at St. Louis, Mo., on the roots of *Panicum glabrum*.

This is probably a species of *Tychea*, which has, according to Koch, six-jointed antennae, but according to Passerini, only five.

*The winged form of this species has probably been discovered by Mr. Pergande since the above description was printed. It apparently belongs to the genus *Schizoneura*.

A NEW SPECIES OF APHIS, OF THE GENUS COLOPHA.

By MISS NETTIE MIDDLETON, ASST. ST. ENT., ILL.

Printed March 20th, 1878.

Colopha eragrostidis, new sp.

Winged individual.—General color reddish-brown; head black; prothorax yellowish, rest of the thorax and abdomen reddish brown; veins of the wings dark; stigma pale brown.

Wings, when first seen horizontal, but becoming erect, formed and veined as usual; the third vein in the anterior pair with only one fork and obsolete nearly half way to the base of the fork; the first and second veins approximate very closely at the base. Posterior pair with but one discoidal vein.

Antennae six jointed, with the sutures between the third and fourth and between fifth and sixth transparent; first and second joints short; third about equal to the fourth, fifth and sixth united; the fourth and fifth nearly equal in length; sixth very short, but little exceeding the first and second united. The antennae as compared with the body are very short, scarcely reaching to the base of the front wings; not tapering.

Wingless individual.—Body covered with a cottony substance; beak short, not extending to the base of the second pair of legs. No honey-tubes. Length of the body .06 of an inch; to tip of wings .10 of an inch.

This species was found September 1st, 1877, on the upper leaves and fruit stems of a species of grass (*Eragrostis poaeoides* var. *megastachya*), the blades of the grass folding over the insects.

It is also found on some species of *Panicum*.

This evidently belongs to Mr. J. Monell's new genus *Colopha*, as the third vein of the front wing is but once forked, the hind wings have but one discoidal vein, and the antennae are six-jointed.

A LIST OF THE MOSSES, LIVERWORTS AND LICHENS OF ILLINOIS.

By JOHN WOLF and ELIHU HALL.

The specimens upon which the following list is based were nearly all collected by the writers; those from Menard county by Mr. Hall, those from Fulton county by Mr. Wolf. Those from Southern Illinois were mostly obtained by Mr. Wolf, as botanical collector of a party from the State Laboratory which visited the counties of Union, Johnson and Jackson, during July and August, 1877.

We are under great obligation to Prof. Leo Lesquereux, Thomas P. James, Esq., Coe F. Austin, Esq., and Henry Willey, Esq., for the determination of species, and for many other favors.

MUSCI.

ARCHIDIUM, *Brid.*

A. ohioense, *Schimp.*, Menard.

EPHEMERUM, *Hampe.*

E. crassinervium, *Schwægr.*, Fulton, Menard.

ACAULON, *Mull.*

A. triquetrum, *Spruce.*, Menard.

A. muticum, *Schreb.*, Fulton.

A. schimperianum, *Sull.*, Menard.

A. wolfii, *James*, Fulton.

PHASCUM, *L.*

P. cuspidatum, *Schreb.*, Fulton, Menard.

PLEURIDIUM, *Brid.*

P. alternifolium, *Brid.*, Fulton, Menard.

ASTOMUM, *Hampe*.

A. crispum, <i>Hedw.</i> ,	Fulton.
A. sullivanti, <i>Schimp.</i> ,	Menard.
A. nitidulum <i>Schimp.</i> ,	Fulton, Menard.

BRUCHIA, *Schwægr.*

B. flexuosa, <i>Schwægr.</i> ,	Fulton.
B. beyrichiana, <i>Hampe.</i> ,	Ill.

WEISIA, *Hedw.*

W. viridula, <i>Brid.</i> ,	Fulton, Menard.
W. mucronata, <i>Br. & Schf.</i> ,	Fulton.

CAMPYLOPUS, *Brid.*

C. leanus, <i>Sulliv.</i> ,	Fulton, Menard.
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TREMATODON, *Rich.*

T. longicollis, <i>Rich.</i> ,	Union, Johnson.
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DICRANUM, *Hedw.*

D. varium, <i>Hedw.</i> ,	Fulton, Menard.
D. rufescens, <i>Turner.</i> ,	“ “
D. heteromallum, <i>Hedw.</i> ,	“ “
D. flagellare, <i>Hedw.</i> ,	Fulton, Menard, Johnson.
D. scoparium, <i>L.</i> ,	Fulton, Menard.
D. palustre, <i>Brid.</i> ,	Ill.
D. undulatum, <i>Turner.</i> ,	Menard.
D. spurium, <i>Hedw.</i> , var. condensatum,	Menard.

CERATODON, *Brid.*

C. purpureus, <i>Brid.</i> ,	Fulton, Menard, Lee
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LEUCOBRYUM, *Hampe.*

L. glaucum, <i>Hampe.</i> ,	Fulton, Menard.
L. minus, <i>Hampe.</i> ,	Johnson.

FISSIDENS, *Hedw.*

F. obtusifolius, <i>Wils.</i> ,	Fulton.
F. minutulus, <i>Sulliv.</i> ,	Fulton, Menard.
F. bryoides, <i>Hedw.</i> ,	Fulton, Menard, McHenry.
F. subbasilaris, <i>Hedw.</i> ,	Fulton, Menard.
F. taxifolius, <i>Hedw.</i> ,	“ “
F. adiantoides, <i>Hedw.</i> ,	Fulton, Kane, Menard.

CONOMITRIUM, *Montagne.*

C. julianum, <i>Mont.</i> ,	Fulton, Menard.
C. hallianum, <i>Sulliv. & Lesq.</i> ,	Menard.

TRICHOSTOMUM, *Br. & Sch.*

T. tortile, <i>Schrad.</i> ,	Fulton, Menard.
T. pallidum, <i>Hedw.</i> ,	Fulton, Menard, Union, Johnson.
T. tophaceum, <i>Brid.</i> ,	Ill.
T. rigidulum, <i>Smith</i> ,	Ill.

BARBULA, *Hedw.*

B. unguiculata, <i>Hedw.</i> ,	Menard.
B. caespitosa, <i>Schwægr.</i> ,	Fulton, Menard, S. Ill.
B. papillosa, <i>Wils.</i> ,	Menard.
B. rigida, <i>Schultz</i> ,	"
B. fallax, <i>Hedw.</i> ,	Fulton.
B. vinealis, <i>Brid.</i> ,	Menard.
B. subulata, <i>Brid.</i> ,	Ill.

DESMATODON, *Brid.*

D. flavicans, <i>Br. & Schimp.</i>	Peoria Co.
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DIDYMODON, *Br. & Sch.*

D. rubellus, <i>Br. & Sch.</i> ,	Fulton.
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POTTIA, *Ehrh.*

P. subsessilis, <i>Br. & Sch.</i> ,	Menard.
P. exigua, <i>Aust.</i> ,	"

TETRAPHIS, *Hedw.*

T. pellucida, <i>Hedw.</i> ,	Menard.
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ENCALYPTA, *Schreber.*

E. ciliata, <i>Hedw.</i> ,	Ogle.
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DRUMMONDIA, *Hook.*

D. clavellata, <i>Hook.</i> ,	Fulton, Menard.
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ORTHOTRICHUM, *Hedw.*

O. strangulatum, <i>Beauv.</i> ,	Fulton, Menard.
O. canadense, <i>Br. & Sch.</i> ,	Fulton.
O. crispulum, <i>Hornschn.</i> ,	Fulton, Menard.

PTYCHOMITRIUM, *Br. & Sch.*

P. drummondi, <i>Hook. & Wils.</i> ,	S. Ill.
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GRIMMIA, *Ehrh.*

G. apocarpum, <i>Br. & Sch.</i> ,	Menard.
G. confertum, <i>Br. & Sch.</i> ,	Fulton, Menard.
G. ovata, <i>V. & M.</i> ,	S. Ill.

HEDWIGIA, *Ehrh.*

H. ciliata, *Ehrh.*, Fulton, Menard.

ATRICHIMUM, *Beauv.*

A. undulatum, *Beauv.*, Fulton, Menard.
A. angustatum, *Beauv.*, Fulton, Menard, Johnson.

POGONATUM, *Beauv.*

P. brevicaule, *Brid.*, Fulton, Menard.

POLYTRICHUM, *Brid.*

P. commune, *Lin.*, Fulton, Menard.
P. formosum, *Hedw.*, Menard, Union.
P. juniperinum, *Hedw.*, Fulton, Menard.

TIMMIA, *Hedw.*

T. megapolitana, *Hedw.*, Fulton, Menard.

AULACOMNION, *Schwægr.*

A. heterostichum, *Br. & Sch.*, Fulton, Menard.

BRYUM, *Br. & Sch.*

B. pyriforme, *Hedw.*, Fulton, Menard.
B. nutans, *Schreb.*, " "
B. roseum, *Schreb.*, Fulton, Kane, Menard.
B. albicans, *Wahl.*, Fulton, Menard.
B. argenteum, *Lin.*, " "
B. cernuum, *Hedw.*, " "
B. bimum, *Schreb.*, " "
B. intermedium, *Brid.*, " "
B. caespiticium, *L.*, " "
B. atropurpureum, *Web. & Mohr.*, " "
B. obconicum, *Hsch.*, Menard.
B. uliginosum, *Br. & Sch.*, Fulton

MNIUM, *Br. & Sch.*

M. affine, *Bland.*, Fulton, Menard.
M. punctatum, *Hedw.*, Menard.
M. serratum, *Brid.*, "
M. stellare, *Hedw.*, "
M. cuspidatum, *Hedw.*, Fulton, Menard.

BARTRAMIA, *Hedw.*

B. pomiformis, *Hedw.*, Fulton, Menard.
B. fontana, *Brid.*, Menard.
B. marchica, *Brid.*, Fulton.
B. radicalis, *Beauv.*, Menard.

FUNARIA, *Schreb.*

- F. hygrometrica, *Hedw.*, Fulton, Menard, N. Ill.
 F. flavicans, *Michx.*, Menard.
 F. microstoma, *Br. & Sch.*, “

DISCELIUM, *Brid.*

- D. nudum, *Brid.*, Fulton.

PHYSCOMITRIUM, *Brid.*

- P. pyriforme, *Br. & Sch.*, Fulton, Menard.
 P. immersum, *Sull.*, Ill.

APHANORRHEGMA, *Sulliv.*

- A. serratum, *Sulliv.*, Fulton, Menard.

FONTINALIS, *Dill.*

- F. biformis, *Sulliv.*, Fulton.
 F. filiformis, *S. & L.*, Fulton, Mason.
 F. dalecarlica, *Bryol. Europ.*, Fulton.

DICHELYMA, *Myrin.*

- D. capillaceum, *Bryol. Europ.*, Fulton.

LEUCODON, *Schwægr.*

- L. julaceus, *Sulliv.*, Fulton, Menard, S. Ill.

LEPTODON, *Mohr.*

- L. trichomitrium, *Web.*,
 var. immersum, *S. & L.*, Menard, S. Ill.
 L. ohioense, *Sulliv.*, Pulaski.

ANOMODON, *Hook. & Tayl.*

- A. obtusifolius, *Br. & Sch.*, Fulton, Menard.
 A. attenuatus, *Hub.*, “ “
 A. tristis, *Cesati*, “ “
 A. rostratus, *Hedw.*, Fulton, Menard, S. Ill.

LESKEA, *Hedw. ; Bryol. Europ.*

- L. polycarpa, *Hedw.*, Fulton, Menard, S. Ill.
 L. obscura, *Hedw.*, Fulton.
 L. denticulata, *Sulliv.*, Ill.
 L. austini, *Sulliv.*, Fulton, Menard.

CLASMATODON, *Hook. & Wils.*

- C. parvulus, *Hampe*, Fulton.

THELIA, *Sulliv.*

T. hirtella, <i>Hedw.</i> ,	Menard.
T. asprella, <i>Schimp.</i> ,	Fulton, Menard.
T. lescurii, <i>Sulliv.</i> ,	Fulton.

FABRONIA, *Raddi.*

F. gymnostoma, <i>Sulliv. & Lesqx.</i> ,	Fulton, Menard.
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ANACAMPTODON, *Brid.*

A. splachnoides, <i>Brid.</i> ,	Fulton, Menard, S. Ill.
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PYLAISAEA, *Bryol. Europ.*

P. subdenticulata, <i>W. P. Sch.</i> ,	Fulton, Menard.
P. intricata, <i>Bryol. Europ.</i> ,	“ “
P. polyantha, <i>Schreb.</i> ,	Fulton.

HOMALOTHECIUM, *Bryol. Europ.*

H. subcapillatum, <i>Bryol. Europ.</i> ,	Fulton, Menard.
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PLATYGYRIUM, *Bryol. Europ.*

P. repens, <i>Bryol. Europ.</i> ,	Fulton, Menard.
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CYLINDROTHERCIUM, *Bryol. Europ.*

C. cladorrhizans, <i>Bryol. Europ.</i> ,	Fulton, Menard.
C. seductrix, <i>Bryol. Europ.</i> ,	“ “
C. compressum, <i>Bryol. Europ.</i> ,	“ “
C. brevisetum, <i>Bryol. Europ.</i> ,	Menard.

CLIMACIUM, *Web. & Mohr.*

C. americanum, <i>Brid.</i> ,	Fulton, Menard.
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HYPNUM, *Dill.*

H. delicatulum, <i>Hedw.</i> ,	Fulton, Menard.
H. minutulum, <i>Hedw.</i> ,	“ “
H. scitum, <i>Beauv.</i> ,	“ “
H. gracile, <i>Br. & Sch.</i> ,	Fulton, Kane, Menard.
H. triquetrum, <i>L.</i> ,	Fulton, Menard.
H. alleghaniense, <i>C. Mull.</i> ,	S. Ill.
H. hians, <i>Hedw.</i> ,	Fulton, Menard.
H. novaeangliae, <i>S. & L.</i>	Ill.
H. sullivanti, <i>Spruce</i> ,	Fulton, Menard.
H. diversifolium, <i>Schimp.</i> ,	Menard.
H. strigosum, <i>Hoffm.</i> ,	Marion, Menard.
H. bosci, <i>Schwaegr.</i> ,	Menard.
H. serrulatum, <i>Hedw.</i> ,	Fulton, Menard.
H. deplanatum, <i>W. P. Sch.</i> ,	“ “

<i>H. microcarpum</i> , <i>C. Mull.</i> ,	Menard.
<i>H. micans</i> , <i>Schwartz</i> ,	
var. <i>album</i> , (<i>C. M.</i>) <i>Aust.</i> ,	Fulton, Menard.
<i>H. cylindrocarpum</i> , <i>C. Mull.</i> ,	Menard.
<i>H. schreberi</i> , <i>Willd.</i> ,	Fulton, Menard.
<i>H. aduncum</i> , <i>Hedw.</i> ,	“ “
<i>H. crista-castrensis</i> , <i>L.</i> ,	“ “
<i>H. imponens</i> , <i>Hedw.</i> ,	“ “
<i>H. curvifolium</i> , <i>Hedw.</i> ,	“ “
<i>H. haldanianum</i> , <i>Grev.</i> ,	“ “
<i>H. collinum</i> , <i>Br. & Schf.</i> ,	III.
<i>H. salebrosum</i> , <i>Hoff.</i> ,	Fulton, Menard.
<i>H. laetum</i> , <i>Brid.</i> ,	Fulton, Menard.
<i>H. acutum</i> , <i>Mitten</i> ,	Menard, Fulton.
<i>H. acuminatum</i> , <i>Beauv.</i> ,	Fulton, Menard.
<i>H. rivulare</i> , <i>Bryol. Europ.</i> ,	“ “
<i>H. chrysophyllum</i> , <i>Brid.</i> ,	“ “
<i>H. hispidulum</i> , <i>Brid.</i> ,	Fulton, Menard, S. III.
<i>H. sommerfeldtii</i> , <i>Myrim</i> ,	Fulton.
<i>H. dimorphum</i> , <i>Brid.</i> ,	“
<i>H. adnatum</i> , <i>Hedw.</i> ,	Fulton, Menard.
<i>H. serpens</i> , <i>Hedw.</i> ,	“ “
var. <i>radicale</i> , <i>Brid.</i> ,	“ “
var. <i>orthoeladon</i> , <i>Beauv.</i> ,	“ “
<i>H. riparium</i> , <i>Hedw.</i> ,	“ “
var. <i>cariosum</i> , <i>Sull.</i> ,	III

HEPATICAE.

RICCIACEAE.

RICCIA, *Mich.*

<i>R. sorocarpa</i> , <i>Bisch.</i> ,	Fulton, Menard.
<i>R. lescuriana</i> , <i>Aust.</i> ,	“ “
<i>R. natans</i> , <i>L.</i> ,	“ “
<i>R. lutescens</i> , <i>Schwein.</i> ,	“ “
<i>R. fluitans</i> , <i>L.</i> ,	Fulton.
var. <i>canaliculata</i> , <i>Hoffm.</i> ,	“
var. <i>sullivanti</i> , <i>Aust.</i> ,	Menard.
<i>R. frostii</i> , <i>Aust.</i> ,	Fulton.

ANTHOCEROTEAE.

ANTHOCEROS, *Mich.*

<i>A. punctatus</i> , <i>L.</i> ,	Fulton, Menard.
<i>A. laevis</i> , <i>L.</i> ,	Fulton, Menard, Union.
var. <i>major</i> ,	Fulton.
<i>A. orbicularis</i> , <i>Schwein.</i> ,	"

MARCHANTIACEAE.

MARCHANTIA, *L.*

<i>M. polymorpha</i> , <i>L.</i> ,	Fulton, Menard.
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CONOCEPHALUS, *Hill.*

<i>C. conicus</i> , <i>L.</i> ,	Fulton, Menard, Union.
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ASTERELLA, *Beauv.*

<i>A. hemisphaerica</i> , <i>L.</i> ,	Fulton, Menard, Union.
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DUVALIA, *Nees.*

<i>D. barbifrons</i> , <i>Bissh.</i> ,	Fulton, Menard.
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FIMBRIARIA, *Nees.*

<i>F. tenella</i> , <i>Nees</i> ,	Fulton, Menard.
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JUNGERMANNIACEAE.

ANEURA, *Dumort.*

<i>A. pinguis</i> , <i>L.</i> ,	Fulton.
<i>A. sessilis</i> , <i>Spreng.</i> ,	Menard, Johnson.
<i>A. multifida</i> , <i>L.</i> ,	Fulton.
<i>A. latifrons</i> ,	Menard.

CHILOSCYPHUS, *Corda.*

<i>C. ascendens</i> , <i>Sull.</i> ,	Fulton, Menard, Johnson
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LOPHOCOLEA, *Nees.*

<i>L. bidentata</i> , <i>L.</i> ,	Fulton.
<i>L. heterophylla</i> , <i>L.</i> ,	"
<i>L. macouni</i> , <i>Aust.</i> ,	Fulton, Johnson.
<i>L. minor</i> , <i>Nees</i> ,	Menard, Fulton.

BLEPHAROSTOMA, *Dumort.*

B. trichophyllum, *L.*, Fulton.

CEPHALOZIA.

C. sullivantiae, *Aust.*, Johnson.
 C. divaricata, *Engl. Bot.*, Fulton.
 C. bicuspidata, *L.*, "
 C. curvifolia, *Dicks.*, Fulton, Menard, Union, Johnson.
 C. connivens, *Dicks.*, Ill.
 C. albescens, *Hook.*, "

HARPANTHUS, *Nees.*

H. scutatus, *Mitt.*, Union, Johnson

JUNGERMANNIA, *L.*

J. schraderi, *Mart.*, Fulton, Menard, Union, Johnson.
 J. hyalina, *Lyell*, Fulton.

LEPTOSCYPHUS.

L. taylori, *Hook.*, Fulton.

SCAPHANIA, *Lindenberg.*

S. nemorosa, *L.*, Johnson.

FRULLANIA, *Raddi.*

F. grayana, *Mont.*, Menard.
 F. squarrosa, *Nees*, S. Ill.
 F. aeolotis, *Nees*, Fulton, Menard.
 F. virginica, *Gottsche*, "
 F. eboracensis, *Gottsche*, "

MADOTHECA, *Dumort.*

M. thuja, *Dicks.*, Fulton, Menard.
 M. porella, *Dicks.*, "

RADULA, *Nees.*

R. complanata, *L.*, Menard.

BLEPHAROZIA.

B. ciliaris, *L.*, Fulton, Menard.

CALYPOGEIA, *Raddi.*

C. trichomanis, *Dicks.*, Menard.

LICHENES.

USNEEI.

RAMALINA, *Ach.*

- R. calicaris*, *Fr.*, Fulton, Menard, S. Ill.
 var. *fraxinea*, *Fr.*, Fulton, Menard.

CETRARIA, *Ach.*, *Fr.*

- C. ciliaris*, *Ach.*, Fulton, Menard.

USNEA, *Ach.*

- U. barbata*, (*L.*) *Fr.*, Fulton, Menard, S. Ill.
 var. *florida*, *Fr.*, Menard.
 var. *strigosa*, *Ach.*, Fulton.
 var. *rubiginosa*, *Mich.*, Menard.

ALECTORIA, (*Ach.*) *Nyl.*

- A. jubata*, (*L.*) *Fr.*, var. *chalybeiformis*, *Ach.*, Fulton.

PARMELIEI.

THELOSCHISTES, *Norm.*, *Tuck.*

- T. parietinus*, (*L.*) *Norm.*, Menard.
T. concolor, (*Dicks.*) Fulton, Menard.

PARMELIA, (*Ach.*) *D. N.*

- P. perforata*, *Ach.*, Fulton, Menard.
 var. *erinita*, (*Ach.*) *Tuck.*, " "
P. perlata, (*L.*) *Ach.*, " "
 var. *olivetorum*, *Ach.*, " "
P. tiliacea, (*Hoffm.*) *Flk.*, " "
P. borreri, *Turn.*, " "
 var. *rudecta*, *Tuck.*, Menard.
P. saxatilis, (*L.*) *Fr.*, Fulton, Menard, Johnson.
 var. *rosaeformis*, *Ach.*, Menard.
P. laevigata, *Ach.*, "
P. aurulenta, *Tuck.*, "
P. colpodes, *Ach.*, "

<i>P. caperata</i> , (<i>L.</i>) <i>Ach.</i> ,	Fulton, Menard, S. Ill.
<i>P. conspersa</i> , (<i>Ehrh.</i>) <i>Ach.</i> , var. <i>stenophylla</i> , <i>Ach.</i> ,	Menard.
<i>P. olivacea</i> , (<i>L.</i>) <i>Ach.</i>	Fulton, “
var. <i>aspidota</i> , <i>Ach.</i>	“

PHYSICIA, (*Fr.*) *Th. Fr.*

<i>P. aquila</i> , (<i>Ach.</i>) <i>Nyl.</i> var. <i>detonsa</i> , <i>Tuck.</i> ,	Union.
<i>P. pulverulenta</i> , (<i>Schreb.</i>) <i>Nyl.</i> ,	Fulton, Menard, S. Ill.
<i>P. speciosa</i> , (<i>Wulf. Er.</i>) <i>Nyl.</i> ,	“ “ “
var. <i>hypoleuca</i> , <i>Ach.</i> ,	Fulton, Menard.
<i>P. stellaris</i> , (<i>L.</i>) <i>Nyl.</i> ,	“ “
var. <i>tribacia</i> , <i>Fr.</i> ,	“ “
<i>P. cæsia</i> , (<i>Hoffm.</i>) <i>Nyl.</i> ,	Fulton.
var. <i>stellata</i> , <i>Fr.</i> ,	Fulton, Menard.
<i>P. obscura</i> , (<i>Ehrh.</i>) <i>Nyl.</i> ,	“ “
var. <i>ciliata</i> , <i>Schaer.</i> ,	“ “
var. <i>agglutinata</i> , <i>Schaer.</i> ,	“ “

PYXINE, *Fr.*

<i>P. cocoes</i> , (<i>Sw.</i>) <i>Nyl.</i> ,	Fulton.
var. <i>sorediata</i> , <i>Tuck.</i> ,	Fulton, Menard.

PELTIGEREI.

STICTA, (*Schreb.*) *Del.*

<i>S. herbacea</i> , <i>Ach.</i> , (?)	Menard.
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NEPHROMA, *Ach.*

<i>N. laevigatum</i> , <i>Ach.</i> ,	Union, Johnson.
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PEITIGERA, (*Hoffm.*) *Fee.*

<i>P. canina</i> , (<i>L.</i>) <i>Hoffm.</i> ,	Fulton, Menard.
<i>P. polydactyla</i> , (<i>Neck.</i>) <i>Hoffm.</i> ,	“

PANNARIEI.

HEPPIA, *Naeg.*

<i>H. despreauxii</i> , <i>Mont.</i> ,	Fulton, Menard.
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PANNARIA, (*Del.*) *Tuck.*

<i>P. microphylla</i> , (<i>Sw.</i>) <i>Del.</i> ,	Union, Johnson
<i>P. leucosticta</i> , <i>Tuck.</i> ,	“ “

- P. crossophylla, *Tuck.*, S. Ill.
 P. molybdæa, *Pers.*, var. *cronia*, *Tuck.* Fulton, Johnson.
 (*Southern specimens in fruit*)
 P. nigra, (*Huds.*) *Nyl.* Fulton, Menard, S. Ill.
 P. byssina, (*Hoffm.*) *Tuck.*, Fulton, Menard.

COLLEMEI.

EPHEBE, (*Fr.*) *Tuck.*

- E. pubescens, *Fr.*, Menard.

SYNALISSA, *Fr.*

- S. schaereri, *Mass.*, Fulton, Menard, S. Ill.
 S. phaeococca, *Tuck.*, Fulton.

COLLEMA, (*Hoffm.*) *Fr.*

- C. pycnocarpum, *Nyl.*, Fulton, Menard.
 C. cyrtaspis, *Tuck.*, " "
 C. microphyllum, *Ach.*, Menard, Union
 C. verruciforme, *Ach.*, Menard.
 C. leptaleum, *Tuck.*, "
 C. flaccidum, *Ach.*, Fulton, Johnson.
 C. nigrescens, (*Huds.*) *Ach.*, Fulton, Menard.
 C. pulposum, (*Bernh.*) Fulton, Menard, Johnson.
 var. *tenax*, *Ach.*, Ill.
 C. limosum, *Ach.*, Fulton, Menard.
 C. arenosum, (*Wulf.*) *Schaer.*, Menard.
 C. pustulatum, *Ach.*, Johnson.

LEPTOGIUM, *Fr.*

- L. subtile, *Nyl.*, Fulton, Menard, Union.
 L. minutissimum, *Flk.*, Menard.
 L. lacerum, (*Sw.*) *Fr.*, Fulton, "
 var. *bolacinum*, *Schaer.*, "
 L. pulchellum, (*Ach.*) *Nyl.*, Fulton, Menard, Johnson.
 L. tremelloides, *Fr.*, Fulton, Menard.
 L. cæsiellum, *Tuck.*, *ined. n. sp.*, " "
 L. chloromelum, (*Sw.*) *Nyl.*, " "
 L. myochroum, (*Ehrh.*) *Schaer.*, S. Ill.
 var. *saturninum*, (*Dicks.*) *Tuck.*, Johnson.
 L. daetylinum, *Tuck.*, Fulton.

LECANOREI.

PLACODIUM, (DC.,) Naeg. & Hepp.

<i>P. sideritis</i> , <i>Tuck.</i> ,	Fulton.
<i>P. vitellinum</i> , (<i>Ehrh.</i>) <i>Hepp.</i> ,	Fulton, Menard.
<i>P. cerinum</i> , (<i>Hedw.</i>) <i>Naeg.</i> ,	Fulton, Menard, S. Ill.
<i>P. aurantiacum</i> , (<i>Light.</i>) <i>Naeg.</i> ,	Fulton, Menard, Johnson.
<i>P. ferrugineum</i> , (<i>Huds.</i>) <i>Hepp.</i> ,	Fulton, Menard, S. Ill.
var. <i>nigricans</i> , <i>Tuck.</i> ,	Fulton.
<i>P. campitidium</i> , <i>Tuck.</i>	Fulton, Menard.

LECANORA, *Ach.*, *Tuck.*

<i>L. muralis</i> , (<i>Schreb.</i>) <i>Schaer.</i> ,	S. Ill.
<i>L. tartarea</i> , (<i>L.</i>) <i>Ach.</i> ,	"
<i>L. subfusca</i> , (<i>L.</i>) <i>Ach.</i> ,	Fulton, Menard, Union, Johnson.
var. <i>discolor</i> , <i>Fr.</i> ,	Fulton.
<i>L. varia</i> , (<i>Ehrh.</i>) <i>Fr.</i> ,	Fulton, Menard.
var. <i>aitema</i> , <i>Ach.</i> ,	Fulton.
var. <i>sarcopis</i> , <i>Wahl.</i> ,	"
<i>L. elatina</i> , <i>Ach.</i> , var. <i>ochrophaea</i> , <i>Tuck.</i> ,	"
<i>L. cinerea</i> , <i>L.</i>	S. Ill.
<i>L. cervina</i> , <i>Pers.</i> , var. <i>eucarpa</i> , <i>Nyl.</i> ,	"
var. <i>pruinosa</i> , <i>Ach.</i> ,	Fulton.

RINODINA, *Mass.*

<i>R. sophodes</i> , (<i>Ach.</i>) <i>Mass.</i> ,	Fulton, Menard.
var. <i>confragosa</i> , <i>Nyl.</i> ,	Fulton, Johnson.
<i>R. ascociscana</i> , <i>Tuck.</i> ,	Fulton, Menard.
<i>R. albo-atra</i> , <i>Fl.</i> ,	Ill.
<i>R. constans</i> , (<i>Nyl.</i>) <i>Tuck.</i> ,	Fulton.

PERTUSARIA, *D. C.*

<i>P. pertusa</i> , (<i>L.</i>) <i>Ach.</i> ,	Menard, Johnson.
<i>P. leioplaca</i> , (<i>Ach.</i>) <i>Schaer.</i> ,	Fulton, Menard.
<i>P. velata</i> , (<i>Turn.</i>) <i>Nyl.</i> ,	" "
<i>P. pustulata</i> , (<i>Ach.</i>) <i>Nyl.</i> ,	" "
<i>P. wulfenii</i> , <i>DC.</i> ,	" "
<i>P. globularis</i> , <i>Ach.</i> ,	S. Ill.

CONOTREMA, *Tuck.*

<i>C. urceolatum</i> , (<i>Ach.</i>) <i>Tuck.</i> ,	Fulton, Menard.
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GYALECTA, *Ach.*

<i>G. pineti</i> , (<i>Schrad.</i>) <i>Fr.</i> ,	Fulton, Menard.
<i>G. trivialis</i> , <i>Willey</i> , <i>ined. n. sp.</i> ,	Fulton.

CLADONIEI.

CLADONIA, *Hoffm.*

<i>C. alciornis</i> , <i>Fr.</i> ,	Johnson.
<i>C. pyxidata</i> , <i>Fr.</i> ,	Fulton, Menard.
var. <i>symphyearpa</i> , <i>Fr.</i> ,	Menard.
<i>C. cariosa</i> , (<i>Ach.</i>) <i>Spreng.</i> ,	Fulton.
<i>C. fimbriata</i> , (<i>L.</i>) <i>Fr.</i> ,	Fulton, Menard.
var. <i>tubaeformis</i> , <i>Hoffm.</i> ,	Fulton.
var. <i>adpersa</i> , <i>Tuck.</i> ,	Fulton, Menard.
<i>C. gracilis</i> , (<i>L.</i>) <i>Fr.</i> ,	" "
var. <i>verticillata</i> , <i>Fr.</i> ,	" "
<i>C. mitrula</i> , <i>Tuck.</i> ,	" "
<i>C. turgida</i> , (<i>Ehrh.</i>) <i>Hoffm.</i> ,	" "
<i>C. furcata</i> , (<i>Huds.</i>) <i>Fr.</i>	Fulton, Menard, Johnson, Union.
var. <i>crispata</i> , <i>Flk.</i> ,	Fulton, Menard.
var. <i>racemosa</i> , <i>Flk.</i> ,	Menard.
var. <i>subulata</i> , <i>Flk.</i> ,	"
<i>C. squamosa</i> , <i>Hoffm.</i> ,	Fulton, Menard.
var. <i>delicata</i> , <i>Fr.</i>	" "
var. <i>cæspiticia</i> , <i>Nyl.</i> ,	Johnson.
<i>C. rangiferina</i> , (<i>L.</i>) <i>Hoffm.</i> ,	Fulton, Menard, Johnson.
<i>C. uncialis</i> , (<i>L.</i>) <i>Fr.</i> ,	Johnson.
<i>C. macilenta</i> , <i>Hoffm.</i> ,	Fulton, Menard.
<i>C. muscigena</i> , <i>Eschw.</i> ,	Menard.
<i>C. cristatella</i> , <i>Tuck.</i> ,	Fulton, Menard.
var. <i>ramosa</i> , <i>Tuck.</i> ,	" "

LECIDEI.

BIATORA, *Fr.*

<i>B. rufo-nigra</i> , <i>Tuck.</i> ,	S. Ill.
<i>B. coarctata</i> , <i>Th. Fr.</i> ,	Fulton.
<i>B. flexuosa</i> , <i>Fr.</i> ,	"
<i>B. parvifolia</i> , <i>Pers.</i> ,	S. Ill.
<i>B. russula</i> , (<i>Ach.</i>) <i>Mont.</i> ,	Fulton.
<i>B. sanguineo-atra</i> , (<i>Fr.</i>) <i>Tuck.</i> ,	Fulton, Menard.
<i>B. carnulenta</i> , <i>Tuck.</i> ,	Fulton.
<i>B. exigua</i> , (<i>Chaub.</i>) <i>Fr.</i> ,	Fulton, Menard, Union.
<i>B. uliginosa</i> , (<i>Schrad.</i>) <i>Fr.</i> ,	Fulton, Menard.
<i>B. rudis</i> , <i>Willey</i> ,	Fulton.
<i>B. peliaspis</i> , <i>Tuck.</i> ,	"
<i>B. atro-purpurea</i> , (<i>Mass.</i>) <i>Tuck.</i> ,	"
<i>B. hypnophila</i> , (<i>Turn.</i>) <i>Tuck.</i> ,	Fulton, Menard.

<i>B. rubella</i> , (<i>Ehrh.</i>)	Fulton, Menard, Union.
var. <i>spadicea</i> , <i>Ach.</i> ,	Fulton, Menard.
var. <i>suffusa</i> , <i>Fr.</i> ,	" "
var. <i>inundata</i> , <i>Fr.</i> ,	Fulton.
<i>B. umbrina</i> , (<i>Ach.</i>) <i>Tuck.</i> , var. <i>bacillifera</i> , <i>Nyl.</i> , f. <i>muscorum</i> , <i>Sev.</i> ,	"
<i>B. chlorosticta</i> , <i>Tuck.</i> ,	Johnson.
<i>B. chlorantha</i> , <i>Tuck.</i> ,	Fulton.
<i>B. campestris</i> , <i>Fr.</i> ,	Fulton, Menard.
<i>B. fossarum</i> , (<i>Duf.</i>) <i>Mont.</i> ,	" "
<i>B. cyphalea</i> , <i>Tuck.</i> ,	" "
<i>B. geophana</i> , <i>Nyl.</i>	Fulton.
<i>B. resinac</i> , <i>Fr.</i> ,*	Fulton, Menard.

LECIDEA, (*Ach.*)

<i>L. albo-cerulescens</i> , <i>Fr.</i> ,	Union.
<i>L. enteroleuca</i> , <i>Fr.</i> ,	Menard, Johnson.
<i>L. tessellina</i> , <i>Tuck.</i> ,	S. Ill.
<i>L. myriocarpoides</i> , <i>Nyl.</i> ,	Fulton.

BUELLIA, (*D. N.*) *Tuck.*

<i>B. lactea</i> , <i>Mass.</i> ,	S. Ill.
<i>B. atro-alba</i> , (<i>Fl.</i>) <i>Th. Fr.</i> , var. <i>chlorospora</i> , <i>Nyl.</i> ,	"
<i>B. parasema</i> , (<i>Ach.</i>) <i>Kbr.</i> ,	Fulton, Menard.
<i>B. myriocarpa</i> , (<i>D. C.</i>) <i>Madd.</i> ,	Fulton.

OPEGRAPHEI.

OPEGRAPHA, (*Humb.*) *Ach.*, *Nyl.*

<i>O. varia</i> , (<i>Pers.</i>) <i>Fr.</i> ,	Fulton, Menard.
<i>O. vulgata</i> , (<i>Ach.</i>) <i>Nyl.</i> ,	Union.

GRAPHIS, *Ach.*, *Nyl.*

<i>G. scripta</i> , (<i>L.</i>) <i>Ach.</i> ,	Fulton, Menard, Union.
<i>G. eulectra</i> , <i>Tuck.</i> ,	Menard.
<i>G. dendritica</i> , <i>Ach.</i> ,	Fulton, "

ARTHONIEI.

ARTHONIA, *Ach.* *Nyl.*

<i>A. pyrnhula</i> , <i>Nyl.</i> ,	Fulton, Menard.
<i>A. lecideella</i> , <i>Nyl.</i> ,	" "
<i>A. patellulata</i> , <i>Nyl.</i> ,	Fulton.
<i>A. astroidea</i> , (<i>Ach.</i>) <i>Nyl.</i>	
var. <i>epipasta</i> , <i>Nyl.</i> ,	Fulton, Menard.

*“Probably a fungus.”—*Willey.*

<i>A. punctiformis</i> , <i>Ach.</i> ,	Fulton, Menard, Union.
<i>A. polymorpha</i> , <i>Ach.</i> ,	Fulton.
<i>A. tædiosa</i> , <i>Nyl.</i> ,	Fulton, Menard, S. Ill.
<i>A. spectabilis</i> , <i>Fl.</i> ,	Fulton, Menard.

MYCOPORUM, (*Fl.*) *Nyl.*

<i>M. pycnocarpum</i> , <i>Nyl.</i> ,	Fulton, Menard, Union.
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CALICIEI.

ACOLIUM, (*Fee.*) *D N.*

<i>A. tigillare</i> , (<i>Ach.</i>) <i>D N.</i>	Menard.
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CALICIUM, *Pers. Ach. Fr.*

<i>C. subtile</i> , <i>Fr.</i> ,	Fulton, Menard.
<i>C. trachelinum</i> , <i>Ach.</i> ,	“ “
<i>C. curtum</i> , <i>Turn. & Borr.</i> ,	Fulton.
<i>C. roscidum</i> , <i>Flk.</i> , var. <i>trabinellum</i> , <i>Nyl.</i> ,	“
var. <i>dosodes</i> , <i>Tuck., ined.</i> ,	“
<i>C. microcephalum</i> , (<i>Sm.</i>) <i>Turn. & Borr.</i> ,	“
<i>C. populneum</i> (?), <i>DeBrog.</i> ,	S. Ill.
<i>C. tubiforme</i> , <i>Mass.</i> ,	Johnson.
<i>C. turbinatum</i> , <i>Pers.</i> ,	Fulton.

CONIOCYBE, *Ach.*

<i>C. pallida</i> , (<i>Pers.</i>) <i>Fr.</i> ,	Menard.
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ENDOCARPEI.

ENDOCARPON, *Hedw. Fr.*

<i>E. miniatum</i> , (<i>L.</i>) <i>Schaer.</i> ,	Union.
var. <i>manitense</i> , <i>Tuck.</i> ,	Johnson.
<i>E. arboreum</i> , <i>Schwein.</i> ,	Fulton, Menard.
<i>E. cinereum</i> , <i>Nees.</i> ,	Fulton.
<i>E. rufescens</i> , <i>Ach.</i> ,	Fulton, Menard.
<i>E. hepaticum</i> , <i>Ach.</i> ,	S. Ill.
<i>E. pusillum</i> , <i>Hedw.</i> ,	Fulton, “

VERRUCARIEI.

SEGESTRIA, *Fr.*

<i>S. lauveri</i> , (<i>Fl.</i>) <i>Tuck.</i> Found on stones, rails and bark.	Fulton, S. Ill.
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STAUROTHELE, *Norm.*

S. diffractella, (*Nyl.*) *Tuck.*, S. Ill.

SAGEDIA, (*Mass. Kbr.*) *Tuck.*

S. cestrensis, *Tuck.*, S. Ill.

S. lactea, *Kbr.*, Fulton.

VERRUCARIA, (*Pers.*) *Tuck.*

V. epigæa, (*Pers.*) *Ach.*, Fulton, Menard.

V. nigrescens, *Pers.*, Fulton.

V. fuscella, *Fr.*, S. Ill.

V. rupestris, *Schrad.*, Fulton, “

V. muralis, *Ach.*, Adams.

V. pyrenophora, (*Ach.*) *Nyl.*, Fulton.

PYRENULA, *Ach.*

P. thelena, (*Ach.*) *Tuck.*, Fulton, Menard.
var. *micula*, *Fl.*, Fulton.

P. punctiformis, (*Ach.*) *Naeg.*, Fulton, Menard.

P. nitida, *Ach.*, Menard, Fulton.

P. subcinerea, (*Nyl.*) *Tuck.*, “

P. gemmata, (*Ach.*) *Naeg.*, “

P. leucoplaca, (*Walbr.*) *Kbr.*, Fulton, Menard.

P. glabrata, (*Ach.*) *Mass.*, Fulton, Union.

P. lactea, (*Mass.*) *Tuck.*, Fulton, Menard.

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A CATALOGUE OF THE FISHES OF ILLINOIS.

By Prof. DAVID S. JORDAN.

This catalogue is based primarily on the collections in the Illinois State Laboratory of Natural History, at Normal. These collections consist (*a*) of the material on which Mr. Nelson's* list was based, and (*b*) of a large collection made by Professor Forbes during the past summer (1877), chiefly in the streams of southern Illinois. The writer's own collections in Illinois and adjacent states have also been drawn upon, as well as those contained in the United States National Museum. The various scattered notices of Illinois fishes have also been brought together as far as possible, thus giving all that is at present known of the distribution of the species within the limits of the state.

Reference has been made throughout this paper to the second edition of the author's Manual† of Vertebrates, (quoted as "M. V.,") in which nearly all the species here mentioned are described. No synonymy is given except that of Mr. Nelson's list, above mentioned, of which paper the present may be considered as, in a sense, a revised edition.

A few species either new to science or new to our fauna and therefore not noticed in the Manual, are here described in full.

In all cases where I have found exact record of localities of species, these have been inserted. Species not yet taken in Illinois, but included in the catalogue on the strength of our general knowledge of their range, are indicated by a star (*).

*A Partial Catalogue of the Fishes of Illinois, by E. W. Nelson, Bulletin No. 1, Illinois Museum of Natural History, October, 1876.

†A Manual of the Vertebrate Animals of the Northern United States, including the district east of the Mississippi River and north of North Carolina and Tennessee—exclusive of Marine Species, by David Starr Jordan, M. D., Ph. D., professor of Natural History in Butler University. Second edition, revised and enlarged. Chicago—Jansen, McClurg & Co. 1878.

Subclass, TELEOSTEI.

Order, TELEOCEPHALI.

Suborder, ACANTHOPTERI.

Family ETHEOSTOMATIDÆ, (the Darters.)

Genus *PLEUROLEPIS*, Agassiz.

1. *Pleurolepis pellucidus* (Baird) Ag. SAND DARTER, (M. V. 219., Nelson, 35).

Abundant in clear sandy streams, wherever such occur; therefore generally absent in the prairie region, but occurring in the Wabash valley and in the northwestern part of the state. The genus *Pleurolepis*, like *Ammocrypta*, has usually but one anal spine, although two have been generally ascribed to it. Pine Cr. and Rock R., in Ogle Co.

2. *Pleurolepis asprellus* Jordan (sp. nov.) ROUGH SAND DARTER.

A species similar in form to *P. pellucidus*, but less transparent and much more completely scaled. The size is also much larger.

Body very long and slender, nearly cylindrical, about as in *P. pellucidus*, the depth about 8 in the length. Caudal peduncle long and slender, its length nearly 4 times in total. Head long and rather slender, $4\frac{1}{5}$ in length; eyes very large, high up and very close together, shorter than snout, having considerable vertical range.

Mouth not large, sub-terminal, horizontal, the upper jaw rather the longer. Upper jaw sub-protractile, the furrow separating it from the forehead very distinct laterally, but obliterated mesially, the skin covering the middle of the intermaxillaries being continuous with that of the rest of the forehead. Cheeks, opercles and sides of the crown covered with pectinated scales; opercular spine well developed. Teeth as usual, rather feeble. Squamation much more complete than in *P. pellucidus*. Sides and back with well-developed, closely imbricated scales, which are not imbedded as in *P. pellucidus*; the scales larger on the caudal peduncle than anteriorly. Jugular region, and belly between ventrals and anal, entirely naked; space between bases of ventrals scaled; back of neck scaly; lateral line wells developed, with about 98 scales, 10 series above the lateral line. Fines large, the dorsals well separated, the spinous dorsal high, its anterior rays highest; second dorsal smaller and smaller than anal. Anal fin with a single rather flexible spine; caudal lunate, more concave than usual in darters. Pectorals and ventrals large, their tips about even, neither quite reaching the vent. Coloration of smaller specimens much as in *P. pellucidus*, accord-

ing to Prof. Forbes rather opaque in life; sides with 8 to 10 dark, squarish blotches, quite small and far apart; a blackish shade forward from eye and a dusky shade across opercle.

Numerous specimens in the State collection, some about $2\frac{1}{2}$ inches long, taken by Prof. Forbes in the Little Wabash River, (a sandy stream,) in Effingham Co., in July. Two others, larger, one of them, the type of this description, $4\frac{1}{2}$ inches long, collected by Mr. C. K. Worthen, in a small rocky tributary of the Mississippi, in Hancock Co. These were described as *very highly colored* when fresh, presenting "almost all the colors of the rainbow."

Genus *PERCINA*, Haldeman.

3. *Percina caprodes* (Raf.) Grd. LOG PERCH. HOG FISH. (M. V. 219; B. I. M. 36.)

In clear rapid waters; probably generally distributed. Vermilion R., Calumet R., Wabash R., Pine Cr., (Ogle Co.)

4. **Percina manitou* Jordan. MANITOU DARTER. (M. V. 220.)

From Lake Manitou, a tributary of the Wabash in Indiana; also from Wisconsin.

Genus *ALVORDIUS*, Girard.

5. *Alvordius maculatus* Grd. BLACK SIDED DARTER; BLENNY DARTER. (M. V. 220; *Etheostoma blennioides* Nelson, 35.)

In clear waters—generally distributed. Ogle Co.; Tazewell Co.; Clear Cr., Union Co.

6. *Alvordius phoxocephalus* (Nelson) Cope and Jordan; SHARP-NOSED DARTER. (M. V. 221, *Etheostoma phoxocephalum* Nelson, 35.)

Illinois River; a few specimens in the collection; also from Tennessee and Kansas.

Genus *ERICOSMA*, Jordan.

7. **Ericosma evides* Jordan & Copeland. GILDED DARTER. (M. V. 221. *Etheostoma evides* Nelson 36.)

At present known only from White River, a tributary of the Wabash in Indiana.

Genus *IMOSTOMA*, Jordan.

8. *Imostoma shumardi* (Grd.) Jordan. BIG-HEADED DARTER. (M. V. 222.)

Specimens in the Indiana State collection from Wabash River in Crawford Co., and in the National Museum from the Illinois River in La Salle Co.

Genus *RHEOCRYPHA*, Jordan.

9. **Rheocrypta copelandi* Jordan. COPELAND'S DARTER. (M. V. 222.)
Known only from White River, near Indianapolis.

Genus *DIPLESIMUM*, Rafinesque.

10. *Diplesium blennioides* (Raf.) Jordan. GREEN-SIDED DARTER. (M. V. 222.)

Abundant in the Wabash valley, Crawford Co.

Genus *BOLEOSOMA*, Dekay.

11. *Boleosoma olmstedii* (Storer) Agassiz. TESSELLATED DARTER. (M. V. 224; Nelson, 35). Lake Michigan, Ogle Co.

12. *Boleosoma maculatum* Agassiz. JOHNNY DARTER (M. V. 224;
Boleosoma brevipinne Nelson, 36.)

Common throughout the state, in clear streams. Pine Cr., Ogle Co.; Illinois R., Pekin; Normal; Drury Cr., Union Co.; Clear Cr.

- [13. *Boleosoma camurum*, Forbes, n. s.

In re-examining the collections of the Laboratory for the purpose of adding to this paper the details of distribution and other minor points, I made a few observations on some *Etheostomatidae* and *Cyprinidae* which seem worthy of record, and I therefore insert them here, at the suggestion of Dr. Jordan.

Specimens from several localities in the state, mixed sometimes with *Boleosoma maculata* and sometimes with *Boleichthys eos*, prove, on closer examination, to be a *Boleosoma* quite distinct from *maculata*, and apparently undescribed.

The general appearance is much like that of *maculata*, but the lateral line is incomplete, the species is more slender, has a greater number of vertical rows of scales, a blunt nose and a scaly head.

The length is from 45 to 50 mm. Depth $5\frac{1}{2}$ to 6 in length, caudal peduncle $3\frac{1}{2}$, head 4 to $4\frac{1}{2}$. Eye $3\frac{2}{3}$ in head, nose $\frac{2}{3}$ eye, and almost truncate. Mouth inferior, horizontal, upper jaw the longer, and decidedly protractile. There are no naked areas, except a narrow strip before the dorsal. Vertical rows of scales 54 to 57, with the lateral line usually extending over from 23 to 35 scales. 5 longitudinal rows above lateral line. In a few specimens 35 to 50 mm. long, there is only a trace of a lateral line on 4 or 5 scales. Scales smaller before dorsal, about $\frac{4}{5}$ those on sides.

D. IX or X—10 to 12, A. I—8 or 9. Upper D. half as high as long, about $\frac{5}{6}$ height of 2d D., and contiguous to it. Second $\frac{7}{10}$ length of first, and $\frac{2}{5}$ longer than anal. Anal spine weak and short, length of fin $\frac{4}{5}$ its height. Ventrals and pectorals reach the same point, $\frac{2}{3}$ to vent.

Color in alcohol like that of *B. maculata*. A row of about 10 irregular blotches along the side.—sometimes obscure, especially before—and six larger ones on the back. Many smaller, irregular, angular specks between these rows. Belly immaculate. Stripe before eyes and blotch on opercle. Median fins banded, others plain. Cache R. and Clear Cr., Union Co.; Johnson Co.; Pekin.

This species makes it necessary to drop the complete lateral line as a character of *Boleosoma*. In fact, this is often wanting on four or five posterior scales in *B. maculata*. S. A. F.]

Genus *NANOSTOMA*, Putnam.

14. *Nanostoma zonale* (Cope) Jordan. ZONED DARTER. (M. V. 225.)
Many specimens from Pine Creek in Ogle Co.

Genus *NOTHONOTUS*, Agassiz.

15. **Nothonotus camurus* (Cope) Jordan. BLUE-BREASTED DARTER. (M. V. 225; *Poecilichthys niger* Nelson, 34.)
A few specimens from White River in Indiana.

Genus *PÆCILICHTHYS*, Agassiz.

16. *Poecilichthys variatus* (Kirtland) Agassiz. BLUE DARTER. (M. V. 226; *Poecilichthys cæruleus* Nelson, 34.)

Generally common in clear or gravelly streams—especially so in the Wabash Valley: Farmington; Rock R., Ogle Co; Pekin, Ill.

17. *Poecilichthys spectabilis* Agassiz. STRIPED BLUE DARTER. (M. V. 227; Nelson, 34.)

With the preceding; rather less common and more fond of ascending small streams; often found in waters with a muddy bottom. Effingham Co.; Mackinaw Cr., McLean Co.; Pine Cr., Ogle Co.; Cache R., Drury Cr., Clear Cr., and mud holes in Union Co.

- [18. *Poecilichthys asprigenis* Forbes, n. s.

Among some specimens from Pekin, Ill., whose label as *Poecilichthys spectabilis* had apparently served to disguise them, I observed a number with scaly cheeks. Dr. Jordan has decided that these are neither *spectabilis*, nor *jessieæ*, and I have therefore described the series as a new species, although the wide variation of so-called specific characters presented by them suggests that several species of this genus may ultimately have to be merged. I have not been able, however, with a large number of specimens to trace the one wholly into the other, and I therefore leave them distinct for the present.

General appearance much like that of *P. spectabilis*, from which it differs in the scaly cheeks, the more complete lateral line and the greater number of vertical rows of scales. In *spectabilis* the cheeks are either wholly bare, or a few scales appear behind and below the eye. In *asprigenis* they are either wholly covered, or naked only on the lower fourth. The vertical rows vary in my specimens of *spectabilis* from 38 to 43 (counting only complete rows),—in *asprigenis* from 48 to 50. In the former, the lateral line extends over from 25 to 31 scales—in the latter from 34 to 41.

The head is small and pointed, the eye large, (longer than snout,) the outlines regularly curved, the body compressed and rather deep, the mouth terminal, oblique, and the jaws about even.

The dorsal fins are sometimes separated by distances varying from the length of half a scale to a scale and a half, but are occasionally quite continuous, the two being united by membrane.

Length 35 to 45 mm. Depth $4\frac{1}{4}$ to $4\frac{3}{4}$ in length; head $3\frac{2}{3}$ to 4; eye in head $3\frac{1}{2}$ to 4; nose about $\frac{2}{3}$ the eye. Width at pectorals 8 to 10 in length; at middle of second dorsal, 12 to 15. The caudal peduncle is twice long as high. Longitudinal rows $\frac{5}{8}$. Breast always naked, opercle wholly as scaly, back wholly scaled before the dorsal, or a narrow strip left bare.

The first dorsal consists of from 9 to 12 spines. Its height is from $\frac{1}{2}$ to $\frac{1}{3}$ its length, and $\frac{2}{3}$ the height of the second dorsal. The latter contains from 10 to 12 rays, of which, in one case, the first was a stout sharp spine (XI—I, 11). Its length is $\frac{2}{3}$ that of the first, and $\frac{3}{5}$ greater than that of the anal. The anal consists of two spines and 7 or 8 soft rays, the longest ray reaching to the middle of the caudal peduncle. 14 specimens examined. Taken in small creek near Pekin, Ill.

The naked cheeks and contiguous dorsals are evidently not good generic characters of *Pœcilichthys*, S. A. F.]

Genus *ETHEOSTOMA*, Rafinesque.

19. *Etheostoma flabellare* Rafinesque. FAN-TAILED DARTER. (M. V. 227; *Pœcilichthys flabellatus* Nelson, 34.)

In clear waters in the southern part of the state. Specimens from Clear Cr., Union Co., and from Wabash River.

Var. *lineolatum* (Agassiz) Jordan. LINED DARTER. (M. V. 227; *Pœcilichthys lineolatus* Nelson 34.) Clear streams in northern Illinois. Rock River, Ogle Co. Finish.

20. **Etheostoma squamiceps* Jordan. SCALY-HEADED DARTER. (M. V. 228.)

Known only from western Kentucky.

Genus *BOLEICHTHYS*, Girard.

21. *Boleichthys eos* Jordan & Copeland. RED SIDED DARTER. (M. V. 228; Nelson, 34.)

In clear cold streams throughout the state. Effingham Co., Johnson Co.

[22. *Boleichthys elegans*, Gir.

Several specimens from Union and Johnson counties, apparently belong to this species. The following description is made up from Dr. Jordan's account of the species in Ann. N. Y. Lyc., XI, 308, modified to include my larger specimens, some of which are 2 inches long.

Body short, chubby and compressed, bearing some resemblance in form to *Microperca punctulata*. Mouth moderate, with equal jaws.

Dorsal fins usually distinctly separate, the second $\frac{2}{3}$ as long as the first and twice as long as anal. Vertical rows of scales varying from 42 to 56. Lateral line distinct on from 13 to 30 scales, arched high over pectorals, running parallel with the rounded nuchal region, separated from the dorsal fin by but 3 rows of scales. Head and neck scaly, throat bare, as well as a small space behind pectorals and ventrals.

Head $3\frac{2}{3}$ to 4 in length, depth $4\frac{1}{2}$. Eye 3 to 4 in head. Width at pectorals (in adult) $6\frac{1}{2}$ in length. Fin rays, D. IX or X—9 to 11; A. II—7 or 8. Color greenish with dark specks, in Illinois specimens with about 10 dorsal bars, and 6 lateral blotches on posterior half of side. Dark line before eye and in adults another below eye, and an opercular blotch. S. A. F.]

Genus *MICROPERCA*, Putnam.

23. *Microperca punctulata* Putnam. LEAST DARTER. (M. V. 229; Nelson, 34.)

In clear streams. Drury Cr., Union Co.; Crystal Lake, McHenry Co.; Kane Co.

Family PERCIDAE, (the Perches.)

Genus *PERCA*, Linnæus.

24. *Perca americana* Schranck. COMMON YELLOW PERCH, RINGED PERCH. (M. V. 229; *Perca flavescens* Nelson, 36.)

Very abundant in Lake Michigan and all its tributaries, and to a less degree in all the tributaries of the Mississippi River in the northern third of the state. In the southern part of the state it is very rarely or never found, its range, like that of *Eupomotis aureus*, being bounded by lines of latitude. Peoria and Pekin, Ill.; L. Mich.

Genus *STIZOSTETHIUM*, Rafinesque.

25. *Stizostethium canadense* (Smith) Jordan. SAUGER. SAND PIKE, GROUND PIKE, GRAY PIKE (M. V. 230. *Stizostedium griseum* Nelson, 36.)

Generally abundant in the lakes and all the larger streams. L. Mich.; Ill. R. at Peoria, &c.

26. *Stizostethium vitreum* (Mitch.) Jordan & Copeland. WALL-EYED PIKE, SALMON, DORY, GLASS-EYE, YELLOW PIKE. (M. V. 230; *Stizostedium americanum* Nelson, 36.)

Generally abundant in the lakes and larger bodies of water, especially northward. Ill. R. at Peoria.

- var. *salmonium* (Raf.) Jor. WHITE SALMON, BLUE PIKE. (M. V. 230. Nelson, 36.) Ohio River and its larger tributaries.

Family LABRACIDÆ, (the Bass.)

Genus *ROCCUS*, Mitchill.

27. *Roccus chrysops* (Raf.) Gill. WHITE BASS. (M. V. 232; Nelson, 36.) Generally abundant in the larger streams northward. Lake Michigan; Quincy; Henry.

Genus *MORONE*, Mitchill.

28. *Morone interrupta* Gill. SHORT-STRIPED WHITE BASS (M. V. 232; Nelson, 36.) Common in the southern half of the state in the larger streams. Illinois R. at Henry; Mackinaw Creek, McLean Co.; Cairo.

Family CENTRARCHIDÆ, (the Sun-fishes.)

Genus *MICROPTERUS*, Lacepede.

29. *Micropterus pallidus* (Raf.) Gill & Jordan. LARGE-MOUTHED BLACK BASS, OSWEGO BASS (M. V. 236; *Micropterus nigricans* Nelson, 36)

Everywhere abundant, especially northward; found in sluggish waters and small streams, more frequently than the next. Lake Michigan; Rock R., Ogle Co.; Calumet R.; Crystal Lake; Running Lake and Clear Creek, Union Co.; Wabash River; Mackinaw Cr., McLean Co.

30. *Micropterus salmoides* (Lac.) Gill. SMALL-MOUTHED BLACK BASS, MOSS BASS. (M. V. 236; Nelson, 37.)

Everywhere common, seeking the river channels more than the preceding does. Rock R., Ogle Co.; Ill. R.

Genus *AMBLOPLITES*, Rafinesque.

31. *Ambloplites rupestris* (Raf.) Gill. ROCK BASS, RED EYE, GOGGLE EYE. (M. V. 237; Nelson, 37.)

Generally abundant throughout the state. McLean Co.; Henry; Ogle Co.

Genus *CHÆNOBRYTTUS*, Gill.

32. *Chænobryttus gulosus* (C. & V.) Gill. WAR-MOUTH, BLACK SUN-FISH. (M. V. 237; Nelson, 37.)

Rather common. Very abundant in southern Illinois. Prof. Forbes has specimens from Illinois River, and I have taken it in Lake Michigan, and in lakes of Northern Indiana tributary to Wabash River. Mackinaw Cr.; Big L., Jackson Co.

Genus *APOMOTIS*, Rafinesque.

33. *Apomotis cyanellus* (Raf.) Jor. BLUE-SPOTTED SUN-FISH. (M. V. 239; *Telipomus cyanellus* and *T. microps* Nelson, 37.)

Generally abundant, ascending small streams. Embarras River, Calumet R., Illinois R., Cache R., mud-holes on bottoms in Union Co. and Johnson Co., Effingham Co., all small streams in McLean Co.; Fountain Bluff, Jackson Co.

Genus *LEPIOPOMUS*, Rafinesque.

34. *Lepiopomus macrochirus* Raf. CHAIN-SIDED SUN-FISH. (M. V. 239; *Telipomus nephelus* Nelson, 37.)

Not very common; I have one specimen from Illinois River and several from White River in Indiana.

35. **Lepiopomus anagallinus* Cope. RED-SPOTTED SUN-FISH. (M. V. 240.)

Salt River, Ky., where it is abundant. Not yet noticed from Illinois, although it doubtless occurs in the state.

36. *Lepiopomus pallidus* (Mit.) Gill & Jordan. BLUE SUN-FISH, COPPER-NOSED BREAM. (M. V. 241; *Ichthelis incisor* and *I. speciosus* Nelson, 37.)

The most abundant of the sun-fishes. Crystal Lake, Illinois River, Calumet R., L. Michigan, Wabash River, Quincy.

37. *Lepiopomus ischyryus* Jordan & Nelson. (M. V. 241; *Ichthelis aquilensis* Nelson, 37.)

The two original types of this species are all yet known—the one in the Illinois State Laboratory from Illinois River, the other in Mr. son's collection from Calumet River. Renewed examination of Nelson's former specimen has convinced me of its distinctness from *L. pallidus*. The type specimen has palatine teeth, unlike *L. pallidus*. *Pomotis aquilensis* Girard is *Xenotis breviceps*, a Texas species.

Genus *XENOTIS*, Jordan.

38. *Xenotis megalotis* (Raf.) Jordan. BLUE AND ORANGE SUN-FISH. (M. V. 242; *Ichthelis megalotis* and *I. sanguinolentus* Nelson, 38.)
Generally abundant. Illinois River; Clear Cr., in Union Co., Wabash R., Mackinaw Cr., Fox R.
39. **Xenotis aureolus* Jordan. GILDED SUN-FISH. (M. V. 243; *Ichthelis macrochira* Nelson, 38.)
Probably abundant in small streams, but not certainly identified from the state.
40. **Xenotis lythrochloris* Jordan. BLUE AND GREEN SUN-FISH. (M. V. 243.)
Abundant in small streams tributary to the Wabash in Indiana, but not yet recorded from Illinois.
41. *Xenotis inscriptus* (Agassiz) Jordan. BLUE-GREEN SUN-FISH. (M. V. 243; *Ichthelis inscriptus* Nelson, 38.)
Moderately common in grassy ponds and streams in the southern part of the state. Wabash R., Cairo.
42. *Xenotis peltastes* (Cope) Jordan. (M. V. 243; *Ichthelis anagallinus* Nelson 38.)
Probably not very common. I have seen the specimen referred to by Mr. Nelson from Fox R.; and I have one or two more from the Wabash in Indiana.

Genus *EUPOMOTIS*, Gill & Jordan.

43. *Eupomotis aureus* (Wall.) Gill & Jordan. COMMON SUN-FISH. PUMPKIN SEED. (M. V. 244; *Pomotis auritus* Nelson, 38.)
Very common throughout the northern third of the state, its abundance and distribution being the same as of the Yellow Perch. Peoria, Crystal Lake, Ogle Co., Henry, Lake Michigan; Rock River.
44. *Eupomotis pallidus* (Ag.) Gill & Jordan. PALE SUN-FISH. (M. V. 244.)
Probably not common. I have seen specimens from near St. Louis. The resemblance of this species to *Lepiopomus pallidus* is very strong.

Genus *COPELANDIA*, Jordan.

45. **Copelandia eriarcha* Jordan. (M. V. 246.)
As yet known only from streams near Milwaukee. It doubtless occurs in other tributaries of Lake Michigan.

Genus *CENTRARCHUS*, Cuvier.

46. *Centrarchus irideus* (Lac.) Cuv. et Val. SHINING BASS. (M. V. 246 ; Nelson, 37.)

Numerous specimens from the southern part of the state, referable to the southern *Centrarchus irideus*, but not typical specimens of that species, being in some respects intermediate between *C. irideus* and *C. macropterus*. Distinct as these two species appear, they may be found to intergrade so that they will have to be merged into one. In form of body and size of mouth these Illinois specimens are exactly *irideus*, but the ventral spine is more elongate, reaching the first anal spine, and the fins are rather higher than is usual in *irideus*. The dorsal fin in the young specimens has a large jet-black spot, strongly ocellated. The larger specimens examined have the dorsal plain. Union Co., Johnson Co.

Genus *POMOXYS*, Rafinesque.

47. *Pomoxys nigromaculatus* (Les.) Grd. GRASS BASS, CALICO BASS, BARR-FISH, BITTER-HEAD. (M. V. 247 ; *Pomoxys hexacanthus* Nelson, 37.)

Generally very abundant, especially in the northern part of the state. In the southern part of the state, the next species takes its place to a great extent. Peoria, Quincy, Chicago, Rock River, Henry.

48. *Pomoxys annularis* Raf. CROPPIE, NEW LIGHT, CAMPBELLITE, BACHELOR. (M. V. 247 ; Nelson, 37.)

Abundant everywhere in the tributaries of the Ohio and Mississippi, especially southward. Pekin, Peoria, Quincy ; Wabash R., Ohio R., Mud-holes in bottoms, Johnson Co., Union Co., Mackinaw Cr.

Family ELASSOMATIDÆ, (the Ellassomes.)

Genus *ELASSOMA*, Jordan.

49. *Elassoma zonatum* Jordan. (M. V. 248.)

A large number of specimens of this singular little fish were obtained by Prof. Forbes in ponds and sluggish waters in Union County. From these the anatomy of the species has been partly made out, and the affinities of the genus have probably been ascertained. As suspected by me when *Elassoma* was first discovered, its relations are with *Aphododerus*, and it will doubtless constitute a separate family, which should be placed next to the *Aphododeridæ*. The resemblance of both to the *Umbriidæ* probably indicate real affinities. None of Professor Forbes' specimens are an inch in length. At the time of collection they were supposed to be the young of *Aphododerus*. In these specimens the black shoulder spot is feeble and there are three dark spots at the base of the caudal, vertically placed, imitating the black caudal bar in *Melanura*. The fin formula

is not exactly as originally counted in *Elassoma zonatum*. This last count is however correct, while the first, being made without the assistance of a microscope, may be erroneous. It is best to consider the Illinois, Arkansas and Texas specimens as identical, at least at present.

Fin formula. Dorsal IV, 10, rarely IV 9. Ventrals, I, 5, Anal III, 5, branchiostegals 5, vertebræ 28. Teeth in lower jaw stout, conical, slightly curved, their length about half the depth of the dentary bone; these teeth, for a part of the way at least, in 2 to 4 rows; similar teeth on the premaxillaries in 2 or 3 rows; no teeth on vomer or palatine or on pterygoids; lower pharyngeals narrow, apparently exactly as in *Aphododerus*, somewhat triangular, not united, with a few conic teeth, very sharp and slender; gill rakers small and short, tubercle-like; nostrils double, close together; opercular bones and preorbital not serrated. Scales cycloid; about eleven deep furrows on the imbedded part of each; concentric striae strong. No lateral line. Vent normal.

The *Elassomatidæ* then differ from the *Aphododeridæ* in the position of the vent, in the dentition, (*Aphododeridæ* having teeth on the vomer, palatine and pterygoids,) in the number of ventral rays, and in the want of serratures to the preoperculum and preorbital, the edges of those bones being pectinated in the Pirate Perches.

Family APHODODERIDÆ, (the Pirate Perches.)

Genus *APHODODERUS*, Le Sueur.

50. *Aphododerus isolepis* (Nelson) Jordan. WESTERN PIRATE PERCH.
(M. V. 249; *Sternotremia isolepis* Nelson, 39.)

This species is very closely related to the eastern *A. sayanus*, but apparently differs in the smaller scales and the presence of but three dorsal spines. The other has more frequently four spines, but often only three are developed. The scale formula of *A. isolepis* is subject to some variation. The following is the count of the number of scales in longitudinal series in ten specimens: 48, 48, 50, 50, 50, 51, 53, 53, 54, 55.

A study of the position of the vent in *A. isolepis* has developed some singular things. It becomes evident from the examination of a large series that the position of the vent is not a character of generic importance, as was supposed when the genus *Sternotremia* was proposed, nor is it apparently an individual or a sexual character as has been since suggested. The observations of Professor Forbes, verified by myself, appear to show that the position of the vent is dependent on the *age* of the fish. In the adult the vent is jugular, close behind the little projecting knob at the throat. In the youngest specimens examined, it is more or less behind the ventral fins. In specimens intermediate in size, its position is intermediate, the degree of advancement being proportionate to the size of the fish.

Occasional irregularities occur, but the above rule holds so generally that it can not be merely accidental. From it I infer that in the very young the position of the vent will be found to be as usual in Percoid fishes; as in the young flounder the eyes are symmetrical, but as the fish grows older, its aberrant characters become developed.

The following table shows the position of the vent in 26 specimens.

LENGTH OF FISH IN INCHES.	POSITION OF VENT.
1	Opposite middle of ventrals.
1	same.
1	same.
1	same.
1 $\frac{1}{4}$	“ anterior two-fifths of ventrals.
1 $\frac{1}{4}$	“ anterior third “
1 $\frac{1}{4}$	same.
1 $\frac{1}{2}$	Opposite anterior fourth of ventrals.
1 $\frac{1}{2}$	same.
1 $\frac{1}{2}$	Opposite middle of ventrals.
1 $\frac{3}{4}$	Just behind base of ventrals.
2	Between bases of ventrals (as in type of “ <i>S. isolepis</i> .”)
2 $\frac{1}{4}$	Between bases of ventrals.
2 $\frac{1}{4}$	same.
3	In front of ventrals, $\frac{3}{5}$ of the distances from base of ventrals to the throat “knob.”
3	$\frac{4}{7}$ distance to “knob,” (about as in types of “ <i>A. mesotrema</i> .”)
3 $\frac{1}{4}$	$\frac{4}{7}$ distance from ventrals to “knob.”
3 $\frac{1}{2}$	$\frac{2}{5}$ distance to the “knob.”
3 $\frac{1}{2}$	$\frac{2}{3}$ distance to the “knob.”
4	Half way from ventrals to “knob.”
4 $\frac{1}{4}$	$\frac{7}{9}$ distance to “knob,” (as in “ <i>A. cookianus</i> ” and in <i>A. sayanus</i> .)
4 $\frac{1}{4}$	$\frac{7}{9}$ distance to knob.
4 $\frac{1}{4}$	$\frac{7}{8}$ distance to knob.

No other conclusion seems possible from the above except that the vent moves forward as the fish grows older, by the lengthening of the horizontal part of the intestine or “rectum” of the fish. *Sternotremia isolepis* is the young, *Sternotremia mesotrema* the half-grown and *Aphododerus cookianus* the adult of one and the same fish.

Aphododerus isolepis occurs in sluggish waters and bayous throughout the state. I have seen specimens from Calumet River, from numerous streams and sloughs in the southern part of the state and from the Wabash River at Mount Carmel,—the latter collected at different times by Robert Ridgway and Robert Kennicott. Union and Johnson counties.

Family SCIÆNIDÆ, (the Maigres)

Genus *HAPLOIDONOTUS*, Rafinesqe.

51. *Haploidonotus grunniens* Raf. SHEEPSHEAD, CROAKER, GRUNTING PERCH, DRUM, WHITE PERCH. (M. V. 250. Nelson 40.)

Common in all the lakes and larger streams throughout the state. La Salle ; Peoria.

Family COTTIDÆ, (the Sculpins.)

Genus *TRIGLOPSIS*, Girard.

52. *Triglopsis stimpsoni* Gill (Mss). DEEP WATER SCULPIN.

A species of this genus, which has received the above manuscript name, but which has never been described, occurs in the deeper waters of Lake Michigan.

Genus *URANIDEA*, DeKay.

53. *Uranidea kumlieni* Hoy. KUMLIEN'S BULL-HEAD. (M. V. 253 ; NELSON 41.)

Deep water in Lake Michigan.

54. *Uranidea hoyi* Putnam. (M. V. 253 ; Nelson 41.)

Deep water in Lake Michigan.

Genus *POTAMOCOTTUS*, Gill.

55. *Potamocottus alvordi* (Grd) Gill. ALVORD'S BULL-HEAD. (M. V. 254, *Pegedichthys alvordii*, Nelson 41.)

Rock River.

56. **Potamocottus wilsoni* (Grd) Gill. WILSON'S BULL HEAD. (M. V. 255.)

White River, Indiana, and probably also in Illinois—a doubtful species.

57. **Potamocottus meridionalis* (Grd) Gill. CAVE BULL-HEAD, GOBLIN, BLOB, MUFFLE-JAWS. (M. V. 254.)

Streams in the limestone region—often found in caves ; abundant in Southern Indiana, but not yet recorded from Illinois.

Genus *TAURIDEA*, Jordan & Rice.

58. *Tauridea spilota* (Cope) Jordan & Rice. COW-FACED SCULPIN. (M. V. 255 ; *Cottopsis ricei* Nelson 40).

In deep water in Lake Michigan.

Suborder ANACANTHINI.

Family GADIDÆ (the Cod-fishes.)

Genus *LOTA*, Cuvier.

59. *Lota lacustris* (Walbaum) Gill. LING, BURBOT, LAWYER, EEL-POUT, CUSK. (M. V. 257, Nelson 42.)

Very abundant in Lake Michigan; stray specimens rarely taken in Illinois River, and in the Ohio and Mississippi. These probably have escaped through the canals.

Suborder HEMIBRANCHII.

Family GASTEROSTEIDÆ, (the Sticklebacks.)

Genus *EUCALIA*, Jordan.

60. *Eucalia inconstans* (Kirt.) Jordan. BLACK STICKLEBACK. (M. V. 259, Nelson 42.)

Abundant in small streams in the northern part of the state only. Rock R., Pecatonica R., tributaries of Lake Michigan; Crystal L., McHenry Co.

Genus *PYGOSTEUS*, Brevoort.

61. *Pygosteus occidentalis* (C. & V.) var. *nebulosus* (Ag.) Jor. MANY SPINED STICKLEBACK. (M. V. 260, Nelson 42.)

Lake Michigan—rather abundant in deep water.

Suborder PERCESOCES.

Family ATHERINIDÆ (the Silversides.)

Genus *LABIDESTHES*, Cope.

62. *Labidesthes sicculus* Cope. SILVERSIDES. (M. V. 261, Nelson 42.)

Generally abundant through the state, especially in ponds and bayous. Crystal L., McHenry Co; Creeks, Peoria Co.; Rock R., Ogle Co.; Ill. R., Pekin; Mackinaw Cr., McLean Co.

Suborder HAPLOMI.

Family CYPRINODONTIDÆ, (the Toothed Minnows.)

Genus *FUNDULUS*, Lacepede.

63. *Fundulus diaphanus* (L S.) Ag. BARRED KILLIFISH. (M. V. 263, Nelson 42.)

Very abundant in lakes and clear or sandy streams in the northern part of the state. In Lake Michigan it abounds about the sandy mouths of tributaries, keeping in schools in the shallow water near the edge. Calumet R.

64. *Fundulus menona* Jordan & Copeland. (M. V. 263.)
Rock River; Crystal Lake, McHenry Co.

Genus *ZYGONECTES*, Agassiz.

65. *Zygonyctes notatus* (Raf.) Jor. TOP MINNOW. (M. V. 264, Nelson 42.)
Generally abundant in sluggish waters and canals, especially southward. Ill. R. at Pekin; Livingston Co.; Jackson Co.

66. *Zygonyctes melanops* (Cope) Jordan. BLACK-EYED TOP MINNOW.
(M. V. 264.)

Numerous specimens of this species were obtained by Professor Forbes in the streams and ponds of the southern part of the state. They agree exactly with Prof. Cope's description of his *Haplouchilus melanops* from the Neuse River in North Carolina. The wide distribution of this species is rather unexpected. Cache R. and tributaries, Johnson Co.

67. *Zygonyctes dispar* Agassiz. STRIPED MINNOW. (M. V. 264, Nelson 42.)

Generally abundant in lakes, ponds and sluggish streams through the state, swimming in schools near the surface, slowly as if it were hard work. Specimens obtained by Prof. Forbes in the southern part of the state, are larger than any hitherto noticed, being more than two inches in length. Large specimens show a dark spot under the eye, somewhat as in the preceding species but fainter. Pekin; Beardstown; ponds and streams, Union and Johnson Counties.

Family UMBRIDÆ, (the Mud Minnows.)

Genus *MELANURA*, Agassiz.

68. *Melanura limi* (Kirtland) Ag. MUD MINNOW, MUD DACE, DOG-FISH.
(M. V. 265, Nelson 43.)

Very abundant in ditches, muddy streams and prairie sloughs; found throughout the state, but much commonest northwards; numerous specimens from mud-holes in the bottoms of Johnson and Union Counties. Common in ditches near Crystal L., McHenry County.

Family ESOCIDÆ, (the Pikes.)

Genus *ESOX*, Linnæus.

69. *Esox nobilior* Thompson. MUSKALLUNGE. (M. V. 266, Nelson 43.)

In Lake Michigan and, according to Mr. Nelson, said to occur in some of the small lakes of the northern part of the state.

70. *Esox lucius* L. PIKE, GRASS PICKEREL. (M. V. 266; *E. lucius var-estor*, and *E. boreus*, Nelson 43.)

Very abundant in all large streams in the northern third of the state, its distribution being similar to that of *Perca*. Rock R., Ill. R.

71. *Esox salmoneus* Raf. LITTLE PICKEREL. (M. V. 267; *E. salmoneus* and *E. umbrosus* Nelson 43.)

Everywhere very abundant in ponds and bayous; especially common in ponds in Union Co.; also specimens from Fox R., and Ill. R. at Pekin.

72. *Esox cypho* Cope. HUMPBACK PICKEREL. (M. V. 267; Nelson 43.)

The specimen referred to by Mr. Nelson, from the Fox River at Geneva, is the only one which I have seen from the state.

- [73. *Esox ravenelli*? Holbr.

A small, barred pickerel from Union Co., much more slender than *salmoneus*, with smaller scales, longer dorsal and anal fins, and different proportions generally, is perhaps referable to this species. It measures $2\frac{2}{3}$ inches to the caudal. Depth $7\frac{1}{2}$ in length, head $3\frac{1}{3}$, depth of head 10 and width of head 12. Eye $2\frac{2}{4}$ in nose (to tip of lower jaw) and $5\frac{2}{4}$ in whole head, its depth equal to the deeply grooved inter-orbital space. The middle of the head is at the front margin of the pupil.

The dorsal commences half its length in front of the anal. The paired fins are very short (V. $3\frac{1}{2}$ in head, P $4\frac{1}{2}$.) The pectorals are nearer ventrals than front of premaxillary, and the ventrals are midway between pectorals and anal.

Obscure vomerine teeth extend further back than the palatine bands.

The cheeks and opercles are wholly scaly. Lat. 1. 125 scales, longitudinal rows 27, from dorsal to anal. D. 14 (complete rays), A. 14, V 10, Br. 14.

Color in alcohol dusky, with 12 yellowish, nearly vertical bands, plainest behind, narrow above, but widening below into triangular blotches, which merge in the pale color of the belly. A dark stripe extends from the tip of the nose to the hind edge of the opercle, and a vertical bar downward from the eye. The fins are all dusky. S. A. F.]

Family AMBLYOPSIDÆ, (the Blind Fishes.)

No species of Blind-fish has yet been recorded from Illinois.

Suborder ISOSPONDYLI.

Family PERCOPSIDÆ, (the Trout Perches.)

Genus PERCOPSIS, Agassiz.

74. *Percopsis guttatus* Ag. TROUT PERCH. (M. V. 270; Nelson 43.)

Very abundant in Lake Michigan, caught by the hundred by boys from the Chicago wharves. Occasionally found in the larger streams through the state.

Family SALMONIDÆ, (the Salmon.)

Genus CRISTIVOMER, Gill & Jordan.

75. *Cristivomer namaycush* (Walbaum) Gill & Jordan. GREAT LAKE TROUT, MACKINAW TROUT, LONGE, TOGUE. (M. V. 359; *Salmo namaycush* Nelson 44.)

Abundant in Lake Michigan.

Genus COREGONUS, Linnæus.

76. **Coregonus tullibee* Rich. (M. V. 361.)

This strongly marked species occurs in Lake Superior, and it—or a closely related one, known as the “mongrel White Fish,”—is found in the eastern part of Lake Erie. (*Sterling—Milner.*) It has not yet been recorded from Lake Michigan.

77. *Coregonus nigripinnis* (Gill) Jor. BLUE FIN, BLACK FIN. (M. V. 362; *Argyrosomus nigripinnis* Nelson 44.)

Abundant in the deep water of Lake Michigan. Specimens may be obtained in any market in which lake fishes are sold.

78. *Coregonus artedi* Le Sueur. COMMON LAKE HERRING. (M. V. 362; *Argyrosomus clupeiformis* Nelson 44.)

Very abundant in Lake Michigan, and probably found in some of the small lakes in the northeastern part of the state.

79. *Coregonus hoyi* (Gill) Jor. MOON-EYED CISCO, CISCO OF LAKE MICHIGAN. (M. V. 362; *Argyrosomus hoyi* Nelson 44.)

Not rare, in the deeper waters of Lake Michigan, but not often seen in the fish markets.

80. *Coregonus clupeiformis* (Mitchill) Milner. COMMON WHITE FISH. (M. V. 362; *Coregonus albus* Nelson 44.)

Very abundant in Lake Michigan.

81. *Coregonus quadrilateralis* Rich. ROUND FISH, MEMONEE WHITE FISH. (M. V. 362.)

This species is frequently taken in Lake Michigan.

Family HYODONTIDÆ, (the Moon-eyes.)

Genus HYODON, Le Sueur.

82. *Hyodon tergisus* Le Sueur. COMMON MOON-EYE, TOOTHED HERRING. (M. V. 277; Nelson 44.)

Very common throughout the state in all large bodies of water. Cairo, Peoria.

Family DOROSOMATIDÆ, (the Gizzard Shad.)

Genus *DOROSOMA*, Rafinesque.

83. *Dorosoma cepedianum* (Le S.) var. *heterurum* (Raf.) Jor. GIZZARD SHAD, HICKORY SHAD. (M. V. 279; *Dorosoma notatum* Nelson 44.)
Abundant in all the larger streams, and escaped through the canals into Lake Michigan. Ohio R. at Cairo, Ill. R. at La Salle, Pekin and Peoria.

Family CLUPEIDÆ, (the Herrings.)

Genus *POMOLOBUS*, Rafinesque.

84. *Pomolobus chrysochloris* Raf. SKIP JACK, OHIO SHAD. (M. V. 279; Nelson 44.)
Found in all the larger streams and escaped into Lake Michigan. Cairo, Henry.

Genus *ALOSA*, Cuvier.

85. *Alosa sapidissima* (Wilson) Storer. COMMON SHAD. (M. V. 278; Nelson 44.)
Introduced into some streams.

Suborder EVENTOGNATHI.

Family CYPRINIDÆ.

Genus *CAMPOSTOMA*, Agassiz.

86. *Campostoma anomalum* (Raf.) Ag. STONE LUGGER. (M. V. 288, Nelson 44.)
Everywhere very abundant, ascending every small brook in the spring. Vermilion R., La Salle Co.; Rock R., Ogle Co. and Pine Cr., Union Co.

Genus *PIMEPHALES*, Rafinesque.

87. *Pimephales promelas* Raf. FAT-HEAD, BLACK-HEAD. (M. V. 288; *P. promelas* and *P. milesii* Nelson 45.)
Found throughout the state, but probably not generally abundant. Bailey's Cr., La Salle Co.; Rock R., Ogle Co.

Genus *HYBORHYNCHUS*, Agassiz.

88. *Hyborhynchus notatus* (Raf.) Ag. BLUNT-NOSED MINNOW. (M. V. 288; Nelson 45.)
Generally abundant, especially in the northern part of the state. Southward its place is taken by the next, if the two be really distinct. Mackinaw Cr., Woodford Co.; McLean Co.; Rock R., at Oregon; Little Wabash, Effingham; Ill. R., Peoria; Crystal L., Kane Co.

89. *Hyborhynchus superciliosus* Cope. (M. V. 289.)

Very abundant in the bottoms of Johnson and Union counties, and in the southern part of the state generally. It is very close to the preceding, and may not be really different. Cache R. and Clear Cr., Union Co.; Rock R., Ogle Co.

Genus *HYBOGNATHUS*, Agassiz.

90. *Hybognathus argyritis* Grd. SILVERY MINNOW. (M. V. 289; Nelson 45.)

Abundant in the southern third of the state. Bottoms of Johnson and Union counties; Wabash River; Ohio River; Peoria.

91. *Hybognathus nuchalis* Agassiz. BLUNT-JAWED MINNOW. (M. V. 289; Nelson 45.)

Wabash R. "A few specimens in the state collection from central Illinois." (Nelson.) The distinctions between this species and the preceding do not appear to be very clear. Normal, Pekin.

Genus *ALBURNOPS*, Girard.

(*Hybopsis* Cope, not of Ag.)

92. *Alburnops storerianus* (Kirt.) Jor. STORER'S MINNOW. (M. V. 290; Nelson 46.)

Rather frequent in Lake Michigan and in the small lakes of northern Indiana. Peoria, Chicago.

93. *Alburnops hudsonius* (Clint) Jor. SPAWN EATER. (M. V. 290; Nelson 46.) L. Mich., Ill. R.

94. **Alburnops tuditanus* Cope. (M. V. 290; Nelson 46.)

Found by Prof. Cope in various tributaries of Lake Michigan and of the Wabash in Indiana. The species is unknown to me.

- [95. *Alburnops nubilus* Forbes, n. s.

Twenty specimens from Rock R., in Ogle Co., approaching *H. spectrunculus*, are not referable to any species or description of the group *Alburnops*, (M. V., *Hybopsis* Jordan & Copeland's Check-list) to which they undoubtedly belong.

The mouth is inferior and horizontal; the teeth are in one row, 4-4, but slightly hooked, with large masticatory surface, and the dorsal is over the ventrals.

The length is $2\frac{1}{4}$ inches to the caudal. Depth $3\frac{2}{3}$ to 4 in length, head $4\frac{1}{2}$, eye 3 in head, nose $3\frac{2}{3}$, interorbital space 3 to $3\frac{1}{2}$. The depth of the head is contained $6\frac{1}{2}$ to 7 times in the head and body.

D I-8, A I-9. Scales 5-37-3, 14 before D. The lateral line is flexed on the anterior fourth. The deep body, narrow head and large eye,

are the conspicuous characters. The color is unusually dusky, a broad dark lateral band extends forward over the opercle through the eye to the tip of the nose. There is no caudal spot, and all the fins are plain. S. A. F.]

96. *Alburnops stramineus* Cope. STRAW-COLORED MINNOW. (M. V. 291; Nelson 46.)

Probably common in the southern two-thirds of the state. The only specimens noticed by me were from McLean, Crawford and Union Counties.

97. *Alburnops microstomus* (Raf.) Jor. (M. V. 291.)

Specimens apparently of this species, from Clear Creek, in Union County. It occurs in the streams of Kentucky.

98. *Alburnops volucellus* Cope. (M. V. 291; Nelson 46.)

Specimens collected by Professor Copeland in the Rock and Pecatonica Rivers.

99. *Alburnops fretensis* Cope. (M. V. 292; Nelson 47.)

Specimens are in the collection from Rock River, and from McLean Co. Pine Cr. and Rock R., Ogle Co.; Henry, Normal.

100. *Alburnops hæmaturus* Cope. (M. V. 292; Nelson 47.)

Several specimens are in the collection from the Illinois River at Peoria.

Genus *LUXILUS*, Rafinesque.

101. *Luxilus cornutus* (Raf.) Jor. SHINER. (M. V. 293; Nelson 47.)

The commonest fish in the state, occurring by thousands in every stream. Mackinaw Cr., McLean Co.: Rock R., Ogle Co.; Pine Cr.; Ill. R., Pekin; Effingham; Cache R., Union Co.; Johnson Co.; Crystal L., Kane Co.

Genus *PHOTOGENIS*, Cope.

102. *Photogenis analostanus* (Grd.) Jor. SILVER FIN. (M. V. 294; *Cyprinella analostana* Nelson in Errata; *Cyprinella galactura* Nelson 47.)

Everywhere abundant, perhaps most so in the valley of the Washash. McLean Co.; very common in Rock R., Ogle Co.; Effingham; Peoria; Union Co.

Genus *CYPRINELLA*, Girard.

103. *Cyprinella forbesi* Jordan (sp. nov.) FORBES' RED FIN.

A small deep, strongly compressed species, belonging to the group called by Girard *Moniana*,* and related to the species called *complanata*, *gibbosa*, etc. Body oblong, elevated, strongly compressed, the depth great-

est just in front of the dorsal fin, contained 3 times in the length to base of caudal; caudal peduncle moderately slender. Head rather stout and deep, $3\frac{2}{3}$ in length of body; its upper outline depressed, the nape elevated, so that the profile is somewhat concave; thickness of head through the cheeks, greater than the thickness of the body. Mouth tolerably large, quite oblique, the lower jaw slightly included. Eye not large, its length about 4 in head.

Scales, as usual in the genus, closely imbricated. Lateral line strongly decurved, with 35 scales in its course, six rows above it, and about two below. Thirteen scales in front of the dorsal.

Dorsal fin inserted just behind beginning of ventrals, about half higher than long, its rays 1-7; anal fin somewhat elevated in front, its rays 1-8; its anterior rays rather longer than the base of the fin. Caudal fin moderate, widely forked. Pectorals barely reaching the ventrals; ventrals barely reaching anal.

Teeth 4-4, hooked, sharp-edged, the edges of the teeth somewhat crenate.

Head and ante-dorsal region in the male fish covered with rather small white prickles, larger than in the genus *Lythrurus*; caudal peduncle covered below the lateral line with similar tubercles. Chin with a few prickles.

Colors, in spirits bluish above, pale below, a vague dark shoulder blotch; upper part of dorsal dusky; lower part of anal and ventrals somewhat milky.

In life the colors are as follows, according to Professor Forbes: General color steel-blue with a reddish tinge, a crescent shaped mark of a violet blue color behind the shoulders, followed by a crimson crescent; belly orange red; anal and caudal blood red.

Length of adult $2\frac{3}{4}$ inches.

Many specimens obtained by Professor Forbes in clear streams of southern Illinois, a few from mud-holes on the bottoms.

This species resembles the figures given of *Moniana complanata* and *M. gibbosa* Girard, but the known inaccuracy of those figures and the utterly slovenly character of the accompanying descriptions, prevents any attempt at the identification of our specimens with them. Girard's specimens were from the Rio Grande, and "on general principles" are probably different. Those interested in knowing the character of Dr. Girard's work on the smaller *Cyprinidæ* cannot do better than to read his description of *Moniana rutila* and *Moniana gracilis* and then, as suggested by Dr. Gunther, to compare the figure of *Moniana frigida* given in the Pacific R. R. Surveys, (1858) with that of the same species drawn by the same artist in the Mexican Boundary Survey (1859.) All the fishes drawn by this artist at one "sitting," are cast in the same mould regardless of the appearance of the fish from which they were drawn.

Most of the types of Girard's *Cyprinellæ* are lost. The others can only be identified almost at random by future students of Texan ichthyology.

Since writing the above, I have examined specimens of *Moniana complanata* Grd. (*Moniana gibbosa* Grd.) from the Rio Grande, *C. forbesi*, though closely related is unquestionably distinct, the form of the profile being notably different.

Genus *LYTHRURUS*, Jordan.104. *Lythrurus atripes* Jordan. (sp. nov.) COMPRESSED RED-FIN.

Body moderately elongate, very strongly compressed and elevated, the greatest depth about $3\frac{1}{2}$ in length; head comparatively pointed; somewhat depressed above, so that an angle is formed at the occiput; length of head about $3\frac{2}{3}$ in that of body; mouth rather large, quite oblique, the maxillary reaching about to the front of the eye; the lower jaw slightly projecting beyond the upper; eye small, smaller than in the other *Lythruri*, 4 in head, rather shorter than the snout.

Scales of the usual type in the genus, very closely imbricated, their exposed surfaces notably higher than long, especially anteriorly. Lateral line very strongly decurved; scales 8-44-3. Dorsal fin beginning about midway between ventrals and anal, rather high anteriorly, its rays I-7, anal rays I-11. Pectorals not quite reaching ventrals, the latter just to vent.

Color in spirits dusky bluish or livid, much as in *L. cyanocephalus*; no traces of the vertical bars sometimes noticed in *L. diplæmius*, each scale with many fine black punctulations. Coloration of fins peculiar, the usual dusky spot at the base of the dorsal in front, this spot smaller than in the other species, a black transverse bar across the upper part of the dorsal; anal similarly colored to the dorsal, the markings paler. In *L. diplæmius* the anal fin is plain. Tips of ventrals dusky, belly and lower fins probably crimson in males in the spring; male specimens profusely covered on head, front of back, sides of body anteriorly, and on lower jaw with small white tubercles as in the other species of the genus.

Length of types $2\frac{1}{2}$ to 3 inches. Collected by Prof. Forbes in various streams in Union and Johnson counties.

The four species now known of this genus, *atripes*, *cyanocephalus*, *diplexmius* and *ardens*, are closely related, but may be readily distinguished when compared. *Ardens* is most elongate and looks somewhat like a *Notropis*; *cyanocephalus*, small and short, resembles *Pimephales*; *atripes* has the smallest eye and the most compressed body. The coloration of the lower fins will probably always distinguish it.

105. *Lythrurus diplæmius* (Rafinesque) Jordan. RED FIN. (M. V. 295; Nelson 47.)

Abundant in the southern two-thirds of the state, especially in tributaries of the Wabash and the Ohio. Mackinaw Cr., McLean Co.; Normal; Effingham; Union Co; Rock R., Ogle Co.; Peoria.

[var. *gracilis* Forbes.

Length $2\frac{1}{2}$ to 3 in, depth $4\frac{2}{3}$ in length, head $4\frac{1}{2}$, eye $3\frac{1}{3}$ in head, nose 3, D, I-8, A, I-10. Scales 8-48-4. Dorsal and anal fins marked as in *atripes*. Several specimens from Rock R., Ogle Co. S. A. F.]

106. **Lythrurus cyanocephalus* Copeland. HOY'S RED FISH. (M. V. 295; Nelson 47.)

Professor Copeland's types were from Root River at Racine. Others have been taken in tributaries of Rock R. near Beloit, within a few miles of the state line.

Genus *NOTROPIS*, Rafinesque.

107. *Notropis rubrifrons* (Cope.) Jordan. ROSY FACED MINNOW. (M. V. 296; *Minnilus rubrifrons* Nelson 47.)

Abundant in the Ohio and Wabash vallies. I have examined specimens from Rock River, and Mr. Nelson gives it from tributaries of the Illinois. Oregon; Ill. R.

108. *Notropis atherinoides* Raf. EMERALD MINNOW. (*Notropis rubellus*, *dinemus* and *dilectus* M. V. 296; *Minnilus dilectus*, *amabilis*, *rubellus* and *dinemus* Nelson 46, 47.)

Everywhere very abundant, caught by the thousand for bait off the wharves at Chicago. The species termed *dinemus*, *rubellus*, *jaculus*, *arge*, *dilectus*, and *amabilis*, seem to shade into one another in the most exasperating way, and until some permanent character is shown, I propose to drop the farce of considering them as distinct, and to adopt for all the oldest specific name applied to one of the type, viz: *atherinoides* Raf. The species as thus defined, is a very variable one, but not more so than *Luxilus cornutus*, *Semotilus corporalis*, *Camptostoma anomalum* or *Ceratichthys biguttatus*, all species of similarly wide distribution. Normal, Geneva, Pine Cr., Chicago, Henry, Union Co., Peoria, Oregon, Ill.

Genus *EPISEMA*, Cope & Jordan.

109. **Episema ariomma* (Cope) Jor. BIG-EYED SHINER. (*Chiola ariomma* M. V. 298.)

White River, Indiana, abundant in still places in the river; not yet recognized elsewhere, though doubtless occurring in Illinois.

110. **Episema scabriceps* Cope. ROUGH-HEADED SHINER. (*Chiola scabriceps* M. V. 298; *Photogenis scabriceps* Nelson 47.)

White River; not yet noticed in Illinois.

- [111. *Episema jejuna* Forbes, n. s.

A number of specimens, from the Ill. R., of a pale fish of rather slender and graceful form have been assigned to this genus with some doubt. The irregularly beveled face of the pharyngeal teeth simulates a masticatory surface, although the extreme edge is more or less crenate. The teeth are distinctly hooked, 1 or 2, 4-4, 1 or 2, (in one case, apparently abnormal, 5, 2.) The dorsal begins a little before the ventrals; the mouth is large and oblique, the upper jaw (from middle of front margin to tip of maxillary) being contained $\frac{3}{2}$ times in the head.

The total length of my largest specimens is 3 inches. Depth $4\frac{2}{3}$ in length to caudal, head 4; eye $3\frac{2}{3}$ in head, equal to nose, interorbital space $2\frac{2}{3}$ in head; depth of head in length to caudal 6 or 7 times.

The scales are 5-37-3, with 15 or 16 before the dorsal. The lateral line is decurved on the anterior fifth.

D. I-8, $\frac{2}{3}$ as long as high, anterior rays nearly or quite 3 times as long as posterior. The front of the fin is about equidistant from nose and middle of base of caudal. The anal has 1 spine and 7 soft rays, and is about $\frac{2}{3}$ as long as high.

The caudal is deeply forked. The head is nearly flat above, the nose blunt and regularly rounded.

Color in alcohol pale, with a broad silvery band overlying a plumbeous shade on sides. The dorsal is sometimes clouded with minute black specks, and the belly (usually colorless) is occasionally rosy-tinted. S. A. F.]

This species and the two preceding belong to a group termed *Episema* by Cope and Jordan, and distinguished from *Cliola* proper by the usual presence of teeth 2, 4-4, 2, instead of 4-4. *Episema* should probably be restored to generic rank. D. S. J.

Genus *ERICY MBA*, Cope.

112. *Ericymba buccata* Cope. SILVER-MOUTHED DACE. (M. V. 299; Nelson 45.)

Very abundant in White River and other tributaries of the Wabash, with sandy or gravelly bottoms. Several specimens from the Little Wabash, at Effingham.

Genus *PHENACOB IUS*, Cope.

113. *Phenacobius scopiferus* (Cope) Jordan. (M. V. 299; *Phenacobius teretulus* var. *liosternus* Nelson 46.)

Small streams in McLean Co.

Genus *G I L A*, Baird & Girard.

114. *Gila elongata* (Kirt) Jordan. RED-SIDED MINNOW. (M. V. 300; Nelson 47.)

Northern part of the state chiefly. Rock River, Lake Michigan.

Genus *NOTEMIGONUS*, Rafinesque.

115. *Notemigonus chrysoleucus* (Mitch.) Jor. SHINER, BREAM. (M. V. 301; *Notemigonus americanus* Nelson 48.)

Everywhere very abundant in ponds and bayous. The most tenacious of life of the Minnows. Pekin, Normal, Effingham, Henry, Union Co., Ogle Co.

Genus *CHROSOMUS*, Rafinesque.

116. *Chrosomus erythrogaster* Rafinesque. RED-BELLIED DACE. (M. V. 302; Nelson 47.)

Abundant in all small clear streams, especially in the northern part of the state. Normal; Vermilion R., La Salle Co.; Rock R., Ogle Co.

Genus *PHOXINUS*, Rafinesque.

117. *Phoxinus neogæus* Cope. NEW WORLD MINNOW. (M. V. 302. Nelson 47.)

“A single specimen obtained in the Fox River at Geneva”
(Nelson.) Specimens also from Wisconsin River.

Genus *HEMITREMIA*, Cope.

118. *Hemitremia heterodon* Cope. (M. V. 303; Nelson 47.)

Abundant in northern Illinois and Wisconsin. Lake Michigan; Calumet R.; Fox R.; Rock R.; Bailey's Cr., La Salle Co. This species has the teeth 4-4 and should probably be referred to *Alburnops*.

Genus *SEMOTILUS*, Rafinesque.

119. *Semotilus corporalis* (Mitch.) Putnam. CHUB, CREEK CHUB, HORNED DACE. (M. V. 304; Nelson 45.)

Everywhere very abundant, frequenting small creeks, commonest of fishes. McLean Co.; Ogle Co.; Jackson Co.; Pekin; Effingham; Union Co.

Genus *CERATICHTHYS*, Baird.

120. *Ceratichtys biguttatus* (Kirt.) Girard. HORNED CHUB, HORN-HEAD, RIVER CHUB. (M. V. 305; Nelson 45.)

Everywhere very abundant, frequenting the river channels more than the preceding species. Rock R., Ogle Co.

121. *Ceratichtys amblops* (Raf.) Girard. BIG-EYED CHUB. (M. V. 306.)
Abundant in the Wabash valley.

122. *Ceratichtys dissimilis* (Kirt.) Cope. SPOTTED SHINER. (M. V. 306; Nelson 45.)

In tributaries of the Wabash and Illinois, frequenting the river channels. Probably abundant. Rock R., Ogle Co.

Genus *COUESIUS*, Jor., Mss.

123. *Couesius prothemius* Cope. LAKE CHUB. (M. V. 307.)

In Lake Michigan. Specimens in the National Museum from near Evanston.

Genus *RHINICHTHYS*, Agassiz.

124. *Rhinichthys cataractæ* (C. & V.) Jor. LONG-NOSED DACE. (M. V. 307; *Rhinichthys nasutus* and *R. maxillosus* Nelson 45.)

In clear tributaries of Lake Michigan. Chicago.

125. *Rhinichthys obtusus* Agassiz. BROWN-NOSED DACE. (M. V. 308 ; *Rhinichthys atronasus* and *R. lunatus* Nelson 45-46.)

Found throughout the state in clear streams and "spring runs." The distinctions between this species and the eastern *R. atronasus* do not seem to be very important. Oregon, Ill.

126. *Rhinichthys meleagris* Agassiz. (M. V. 308 ; Nelson 46)

Streams of central and western Illinois. Vermilion River, Bai-Creek, La Salle Co.; McLean Co. Prof. Agassiz's types were from the Mississippi River.

Genus *CARASSIUS*, Nilsson.

127. *Carassius auratus* (L.) Bleeker. GOLD-FISH. (M. V. 308 ; Nelson 48.)

Naturalized in some streams. Pecatonica R., Freeport.

Family CATOSTOMIDÆ, (the Suckers.)

Genus *PLACOPHARYNX*, Cope.

128. *Placopharynx carinatus* Cope. (M. V. 311 ; Nelson 49.)

I have two young specimens of this species from Illinois River, and a pair of the stout pharyngeal bones from the Wabash River at Terra Haute. It is said by fishermen to be rather common in the Wabash River.

Genus *MYXOSTOMA*, Rafinesque.

129. *Myxostoma carpio* (Cuv. & Val.) Jordan. WHITE LAKE MULLET. (M. V. 312 ; *Teretulus carpio* Nelson 49.)

In Lake Michigan, and the larger rivers. Probably not very common.

130. *Myxostoma macrolepidotum* (Le S.) Jordan. COMMON MULLET. (M. V. 313 ; *Teretulus macrolepidotum* Nelson 49.)

Lake Michigan, etc. Ill. R. at La Salle, Rock R.

- Var. duquesnii* (Le S.) Jor. COMMON RED HORSE, MULLET, WHITE SUCKER. (M. V. 313 ; *Teretulus duquesnii* Nelson 49.)

Everywhere very abundant, ascending all the streams in the spring. Rock R., Ogle Co.; Pekin ; Cache R., Union Co.; Mackinaw Cr.; Little Wabash.

131. *Myxostoma aureolum* (Le S.) Jor. SMALL-HEADED MULLET, GOLDEN RED HORSE. (M. V. 314 ; *Teretulus aureolus* Nelson 49.)

Abundant throughout the state in the larger bodies of water, especially northward. Pekin, Peoria.

132. **Myxostoma anisurum* (Raf.) Jor. LONG-TAILED SUCKER. (M. V. 315.)

Abundant in Ohio River near Cincinnati; not yet noticed in Illinois.

133. *Myxostoma velatum* (Cope) Jor. SMALL-MOUTHED RED HORSE, WHITE NOSE. (M. V. 317; *Teretulus anisurus* and *T. velatus* Nelson 49.)

Generally abundant in the larger streams.

Genus *MINYTREMA*, Jordan.

134. *Minytrema melanops* (Raf.) Jor. SPOTTED SUCKER. (M. V. 318; *Erimyzon melanops* Nelson 48.)

Generally abundant, especially southward.

Genus *ERIMYZON*, Jordan.

135. *Erimyzon sucetta* (Lac.) Jord. CHUB-SUCKER, CREEK-FISH. (M. V. 319; *Erimyzon oblongus* Nelson 48.)

Everywhere very abundant, ascending small streams in spring. Union Co., Johnson Co.

Genus *CATOSTOMUS*, Le Sueur.

136. *Catostomus nigricans* Le S. STONE-ROLLER, HOG SUCKER, CRAWL-A-BOTTOM, HAMMER-HEAD. (M. V. 319; Nelson 48.)

Everywhere common, frequenting rapids and shallows in clear streams. Rock R., Ogle Co.; Mackinaw Cr.

137. *Catostomus commersonii* (Lac.) Jor. COMMON SUCKER, WHITE SUCKER. (M. V. 320; *Catostomus teres* Nelson 48.)

Everywhere very abundant. Ill. R., Mackinaw Cr., Pine Cr.; Cache R., Union Co.; Rock R.

138. *Catostomus longirostrum* Le Sueur. RED-SIDED SUCKER, LONG-NOSED SUCKER. (M. V. 320; *Catostomus hudsonius* Nelson 48.)

Abundant in Lake Michigan.

Genus *CYCLEPTUS*, Rafinesque.

139. *Cycleptus elongatus* (Le S.) Ag. GOURD-SEED SUCKER, BLACK-HORSE, MISSOURI SUCKER. (M. V. 320; Nelson 50.)

In the Ohio and Mississippi Rivers, and all their larger tributaries; not generally common, but often seined in large numbers. Peoria, Ill.

Genus *CARPIODES*, Rafinesque.

140. *Carpiodes velifer* (Raf.) Ag. SPEAR-FISH, SAIL-FISH, SKIM-BACK, QUILL-BACK. (M. V. 321; *Ichthyobus velifer* Nelson 49.)
Generally common in the larger streams. Peoria.
141. *Carpiodes selene* Cope. MOON CARP-SUCKER. (M. V. 321.)
Abundant in Lake Michigan. The distinctions between this species and the next do not seem to be very important.
142. *Carpiodes cutisanserinus* Cope. LONG-FINNED CARP-SUCKER. (M. V. 321.)
Generally abundant in the larger tributaries of the Ohio. Rock R., at Oregon, Ill.
143. *Carpiodes difformis* Cope. DEFORMED CARP-SUCKER. (M. V. 321; *Ichthyobus difformis* Nelson 49.)
Numerous specimens in the collection from Illinois River. Professor Cope's types came from the Wabash. Henry, Ill.
144. *Carpiodes bison* Agassiz. BUFFALO CARP-SUCKER. (M. V. 322; *Ichthyobus bison* 49.)
"Found in the larger rivers." (Nelson.)
145. *Carpiodes cyprinus* (Le S.) Ag. SILVERY CARP-SUCKER. (M. V. 322.)
Specimens apparently identical with this eastern species are in the state collection from Illinois River. Henry, Ill.
146. *Carpiodes thompsoni* Agassiz. LAKE CARP-SUCKER. (M. V. 322; *Ichthyobus thompsoni* Nelson 49.)
The specimens from Lake Michigan noticed by Mr. Nelson, are in the collection. Henry, Ill.
147. *Carpiodes carpio* (Raf.) Jordan. RIVER CARP-SUCKER. (M. V. 322; *Ichthyobus carpio* Nelson 49.)
Specimens from Wabash River and from the Ohio at Cairo.

Genus *ICHTHYOBUS*, Raf.

148. *Ichthyobus bubalus* (Raf.) Ag. BROWN BUFFALO, RED MOUTH. (M. V. 322; Nelson 49.)
Specimens examined from Wabash River and from the Illinois at Peoria, where it is the most abundant buffalo fish. Peoria, Henry, and McLean Co.

Genus *BUBALICHTHYS*, Agassiz.

149. *Bubalichthys urus* Ag. BLACK BUFFALO, BIG-MOUTHED BUFFALO. (*Bubalichthys niger* M. V. 323; Nelson 50.)
Mississippi River at Quincy. Probably generally abundant in the larger streams. Peoria.

150. *Bubalichthys cyanellus* (Nelson) Jordan. SMALL-MOUTHED BUFFALO. (*Bubalichthys bubalinus* and *Bubalichthys altus*. M. V. 325; *Ichthyobus cyanellus* Nelson 49.)

Abundant in all the larger streams throughout the state. An examination of Mr. Nelson's typical specimens shows that they are the young of the common *Bubalichthys bubalus* of Agassiz. As the specific name "*bubalus*" is hardly tenable for this species, if we conceive that the *bubalus* of Rafinesque is an *Ichthyobus*, I have lately suggested the name *bubalinus* as a substitute. *Cyanellus* has however priority over *bubalinus*. I therefore propose to adopt Mr. Nelson's name for this species.

Order NEMATOGNATHI.

Family SILURIDÆ, (the Cat-fishes.)

Genus *ICHTHÆLURUS*, Rafinesque.

151. **Ichthælurus furcatus* (C. & V.) Gill. FORK-TAILED CAT. (M. V. 328.)

Ohio and Mississippi rivers; probably not common. I have seen none from within the limits of the state.

152. *Ichthælurus robustus* Jordan. CHUCKLE-HEADED CAT. (M. V. 328; *Ictalurus furcatus* Nelson 50.)

Illinois River; probably not rare in the larger streams. Peoria:

153. *Ichthælurus punctatus* (Raf.) Jordan. COMMON CHANNEL CAT, BLUE CAT, WHITE CAT. (M. V. 328; Nelson 50.)

Very abundant in all the large streams throughout the state. Cairo; Pekin; Rock R., Ogle Co.; Bottoms, Union Co.

Genus *AMIURUS*, Rafinesque.

154. *Amiurus nigricans* (Le S.) Gill. GREAT FORK-TAILED CAT, GREAT MISSISSIPPI CAT, GREAT LAKE CAT-FISH. (M. V. 329.)

Abundant in the Mississippi and Ohio rivers and in Lake Michigan. This species reaches an immense size and is probably the largest of all our fresh water fishes.

155. *Amiurus natalis* (Le S.) Gill. YELLOW CAT. (M. V. 331; *Amiurus cupreus* Nelson 50.)

Everywhere more or less abundant in ponds and bayous. McLean Co.; Cache R., Johnson Co.

156. *Amiurus vulgaris* (Thompson) Nelson. LONG-JAWED CAT. (M. V. 331; Nelson 50.)

Abundant in the Mississippi River at St. Louis, and in Lake Michigan. Pekin, Ill.

157. *Amiurus catus* (L.) Gill. BULL-HEAD. (M. V. 332; *Amiurus atrarius* Nelson 332.)

Great Lakes and their tributaries. Vermilion R.; Ill. R.; McLean Co.

158. *Amiurus marmoratus* (Holbrook) Jordan. MARBLED CAT. (M. V. 332.)

Numerous specimens of a cat-fish, marbled in color, and not evidently distinguishable from *A. marmoratus*, Holbrook, were collected by Professor Forbes in southern Illinois, and one or two from Illinois River. Considerable variation is shown in the coloration, some being nearly plain, others much variegated. In one specimen, the broad head with depressed front much resembles that of *A. xanthocephalus*. In all the adipose fin is very large and the dorsal spine is quite high. Henry, Ill., Johnson Co.

159. *Amiurus melas* (Raf.) Jordan & Copeland. BLACK CAT. (M. V. 332; *A. confinis* and *A. pullus* Nelson 50.)

Abundant in the streams of the southern half of the state. McLean Co., Union and Johnson Co's., (Clear Cr., Bottoms, Cache R.)

160. *Amiurus xanthocephalus* (Raf.) Gill. YELLOW-HEADED CAT. (M. V. 333; *A. albidus* Nelson 50.)

Common in the southern part of the state. This is not "our commonest cat-fish" as stated by Mr. Nelson. [The specimens upon which Mr. Nelson based this statement were labeled *nebulosus* in the collection (given as a synonym of *albidus* in M. V., first edition,) but have been identified with *catus* by Dr. Jordan. S. A. F.] Peoria.

Genus *PELODICHTHYS*, Rafinesque.

161. *Pelodichthys olivaris* (Rafinesque) Gill & Jordan. MUD CAT. (M. V. 334; *Hopladelus olivaris* Nelson 50.)

Common in the larger streams, reaching a large size. Peoria.

Genus *NOTURUS*, Rafinesque.

162. *Noturus flavus* Rafinesque. YELLOW STONE CAT. (M. V. 335; Nelson 50.)

Rather common, especially southward and in the larger streams.

163. *Noturus exilis* Nelson. SLENDER STONE CAT. (M. V. 335; Nelson 51.)

Besides Mr. Nelson's types, which were from McLean Co., I have obtained specimens from Root R., Wis., and from Kansas.

164. *Noturus miurus* Jordan. SAW-SPINED STONE CAT. (M. V. 336 ;
Noturus marginatus Nelson 50.)

Abundant, especially southward. Specimens from the Wabash and from the Cache R., in Johnson Co.

165. *Noturus sialis* Jordan. CHUBBY STONE CAT. (M. V. 337.)

Generally abundant, with the preceding. Also Ill. R. at Pekin, Cairo, Ill.

Order APODES.

Family ANGUILLIDÆ, (the Eels.)

Genus *ANGUILLA*, Thunberg.

166. *Anguilla rostrata* (Le S.) D K. COMMON EEL. (M. V. 338 ; Nelson 51.)

Occasionally taken in most of the waters of the state, but not common. It is probably not indigenous in the upper lakes, having been introduced, or else having escaped through the canals from the Ohio, or probably both. Ill. R. at Peoria.

Sub-class GANOIDEI.

Order CYCLOGANOIDEI.

Family AMIIDÆ, (the Bow-fins.)

Genus *AMIA*, Linnæus.

167. *Amia calva* Linnæus. DOG-FISH, MUD-FISH, BOW-FIN. (M. V. 340 ; Nelson 51.)

Abundant throughout the state in the lakes and larger streams. In the small streams it is seldom found. [Common in ponds in S. Ill., where it is generally eaten, and is known as the "Grinnel," (Gunnel ?). S. A. F.] Ponds S. Ill., Ill. R., Ohio R., Miss. R.

Order RHOMBOGANOIDEI.

Family LEPIDOSTEIDÆ, (the Gar-Pikes.)

Genus *LEPIDOSTEUS*, Lacepede,

168. *Lepidosteus osseus* (L.) Ag. GAR PIKE. (M. V. 342 ; Nelson 51.)

Abundant in the larger streams throughout the state. Illinois and Ohio rivers.

169. *Lepidosteus platystomus* Raf. SHORT-NOSED GAR. (M. V. 342; Nelson 51.)

Occurs throughout the state in the larger streams. It is much more abundant in tributaries of the Mississippi than in the Lake. The commonest gar in the Ill. R. Peoria, Pekin.

Genus *LITHOLEPIS*, Rafinesque.

170. *Litholepis spatula* (Lac.) Jor. ALLIGATOR GAR. (M. V. 342; *Litholepis adamantinus* Nelson 51.)

In the Mississippi and Ohio, not common, "occasionally straying up smaller rivers into the interior of the state." (Nelson.)

Order SELACHOSTOMI.

Family POLYODONTIDÆ, (the Spoonbills.)

Genus *POLYODON*, Lacepede.

171. *Polyodon folium* Lacepede. PADDLE-FISH, DUCK-BILL, SPOON-BILL. (M. V. 344; Nelson 51.)

Common in all the larger streams, especially southward. Ohio R. at Cairo; Ill. R. at Pekin, Peoria, &c.

Order CHONDROSTEI.

Family ACIPENSERIDÆ, (the Sturgeons.)

Genus *ACIPENSER*, Linnæus.

172. *Acipenser maculosus* Le Sueur. SPOTTED STURGEON. (M. V. 345; Nelson 51.)

Ohio and Mississippi rivers, probably not in the Lake.

173. *Acipenser rubicundus* Le Sueur. LAKE STURGEON. (M. V. 345; Nelson 51.)

Very abundant in the Lake; whether found in the Mississippi or not I do not know.

Genus *SCAPHIRHYNCHOPS*, Gill.

174. *Scaphirhynchops platyrhynchus* (Raf.) Gill. SHOVEL-NOSED STURGEON. (M. V. 345; Nelson 51.)

Common in the Ohio and Mississippi rivers. Ohio R., Cairo; Ill. R., Peoria.

Class MARSIPOBRANCHII.

Order HYPEROARTIA.

Family PETROMYZONTIDÆ, (the Lampreys.)

Genus *AMMOCETES*, Dumeril.

175. *Ammocoetes niger* (Raf.) Jor. SMALL BLACK LAMPREY. (M. V. 349; *Petromyzon niger* Nelson 52.)

Common in small streams in many places, ascending to spawn in the spring. Pecatonica R., Freeport.

176. *Ammocoetes argenteus* (Kirt.) Jor. SILVERY LAMPREY. (M. V. 349; *Ichthyomyzon argenteus* Nelson 52.)

Probably more or less abundant through the state. Ill. R., Pekin.

177. *Ammocoetes hirudo* (Grd.) Jor. LEECH LAMPREY. (M. V. 350; *Ichthyomyzon hirudo* Nelson 52.)

A species supposed to be the one to which Girard gave the name of *hirudo* is quite abundant in the Mississippi and lower Ohio. *Ohio R., at Cairo.

* Where exact localities are given in the preceding paper, they are in nearly every case taken from specimens now in the Laboratory, collected by myself or my assistants. S. A. F.

THE FOOD OF ILLINOIS FISHES.

By S. A. FORBES.

But little has been written on the food of the fresh water fishes of this country, and nothing whatever, so far as I can learn, on the food of the fishes of this state. I have not found anything more elaborate than a short paper* by Prof. S. I. Smith, of Yale College, on the food of a few specimens of White Fish, Red Horse (*Myxostoma aureolum*), Yellow Perch and Sturgeon (*Acipenser rubicundus*), from Lakes Superior and Erie. An item † relating to the food of the White Fish was published by Dr. Stimpson, of the Chicago Academy of Sciences, in 1870, and a few scattered notes of single observations occur in various papers on classification. ‡

The importance of the subject, both to the scientific student and to the practical fish breeder, seems to warrant more systematic work; and a methodical investigation has therefore been begun at the State Laboratory, the first results of which are given in the following memoranda.

PURPOSES OF THE INVESTIGATION.

A thorough knowledge of this subject should contribute something to our theories of distribution, since the food of those forms having appetites at all discriminating must have much to do with their range. Light might even be thrown upon past distribution, and the causes be suggested of extensive migrations. The chosen *haunts* of different groups within their habitat, are probably determined largely by their gastronomic needs and preferences. Do the wide-spread species eat similar articles throughout their range, or are they wide-spread because they are omnivorous, or because their food habits are more *flexible* than those of other fishes? On the other hand, are the narrowly limited species ever restricted by the local character of their food?

* Report of U. S. Commissioner of Fish and Fisheries, Pt. II, p. 690.

† American Naturalist, Sept. 1870, p. 403.

‡ A paper by Dr. C. C. Abbot in the Report of the U. S. Fish Commissioner for 1875-6 will also repay examination.

We ought also to gain, by this means, some addition to our knowledge of the causes of variation, of the origin and increase, the decline and extinction of species, and of the remarkable persistence of such forms as the river gar. What groups crowd upon each other in the struggle for subsistence? Do closely allied species, living side by side, ever compete for food? What relation, if any, do specific and generic differences bear to differences of food? These, and many similar questions, may not improbably be helped toward a solution.

Several *structures* not now fully understood, ought to receive their explanation. The variously developed grinding surfaces on the pharyngeal teeth of some cyprinoids, the differences in the structure of the gill-rakers among sun-fishes and of the lips among suckers, are cases in point.

It seems likely, however, that the food habits of fishes will be found, like their structure, much less highly differentiated than those of birds. This is what we should expect *a priori*, and it is indicated by the observations I have made upon both classes.* Prominent peculiarities, having apparently an important bearing upon the taking of food, will probably be found merely to extend a little the capacities of the species, or to enable it to take those slight advantages of its competitors when the struggle for existence comes to the death grapple, which after all are sufficient to decide the contest. To bring out such facts as this, a great number of observations will be necessary, covering all varieties of circumstance, and made with reference to the relative proportions of the different elements in the food of each species. The Top Minnows, for example, will probably be found to take the surface-swimming insects *more frequently* than the *Cyprinidae* do, but not by any means to depend on them *chiefly*.

Really *intelligent fish-culture*, on any large scale, implies a full acquaintance with the food of the native species. It is a matter of especial importance that the predaceous fishes should all be known, as well as the kinds of fishes on which each chiefly preys. A knowledge of the food of all species worth saving is, of course, indispensable, in order that proper measures may be taken to preserve their food supplies. It will also be of interest to know what fishes there are at once worthless for human food and harmless in their habits, and therefore worth encouraging, or perhaps even hatching, as food for the more valuable "game fishes." The gizzard shad (*Dorosoma cepedianum*), seems to be a fish of this character, as it lives chiefly on vegetable food and minute crustacea, and contributes largely to the food of the marketable fishes. Apparently ignorant of this fact, the fishermen often leave long lines of this species to rot on the bank where the seines are hauled.

* See "The Food of Birds," in Trans. Ill. Hort. Soc., Vol. X, p. 37, 1876.

Some valuable fishes may be found dependent on food too liable to injury or destruction by man or nature, to make it worth while to cultivate them, while others, equally valuable, may be proven to subsist on food practically indestructible.

Such species as eat *mixed food*, so that, in case of scarcity of one kind, another may be drawn upon, are evidently more promising, other things being equal, than those of a more limited diet.

That a full understanding of the *competitions* among the fishes of a stream or lake is necessary to anything better than guess-work in fish-culture, or an expensive and improvident trusting to luck, is evident at once.*

The *scavenger* fishes, which, by devouring the filth of streams, help to purify them, are doubtless worthy of recognition. Whether a filth-eating fish is better or healthier food than a bird or a mammal of similar habits, may, perhaps, be profitably discussed.

An acquaintance with the subject sufficient for the purposes above mentioned must, of course, include the whole life of the fish, at all ages and in all seasons. It is not impossible, for example, that the draining of stagnant waters connected with a stream may unfavorably affect some of its fishes, by lessening the supply of *Entomostraca*, especially *Cladocera*, for the food of the fry.

So much may properly be said concerning the purpose and promise of the research, to justify the labor given to it,—especially since the general neglect it has received may seem to indicate that it is not worth elaborate study.

METHODS.

The stomachs and intestines were taken out of the fishes just as these came from the seine; were labeled with specific name, place and date, and preserved in strong alcohol. They were afterward opened and the contents examined (usually with the microscope). Notes were made upon the objects found in each, as far as they were recognizable—the species being determined, if possible, otherwise the genus, family, order, or even only the class. The contents of each stomach were then bottled separately in alcohol, labeled and preserved for future verification and further study. The emptied stomachs have also been kept for anatomical purposes, and as a means of verifying the species. It was found unnecessary to remove the stomachs of the minnows, as these were well enough preserved in the bodies of the fishes themselves.

* That fishes and land birds should ever come into competition, seems at first sight remarkable; nevertheless some of the former eat large numbers of land insects which fall into the water. The supply of these would, of course, be limited by the depredations of birds.

In summing up, all the notes on the food of each species were collated, and an attempt was made to arrange the essential facts in a compact and simple form. The classification of fishes used is that of the preceding paper on the fishes of Illinois.

RESULTS.

Only a mere beginning has as yet been made. One hundred and forty-nine specimens have been examined, representing fifty-four species—taken chiefly (except the minnows) from the Illinois River, near Peoria and Henry, in June and November, 1877, and April and May, 1878. The specimens were all of a fair average size. In this preliminary report upon so small a number of specimens, it has not been deemed worth while to specify dates and places.

When the facts relating to any species are numerous and varied enough to make systematic condensation desirable, the articles of food have been arranged according to the natural classification of plants and animals, in such a way that one wishing to know only the general conclusions reached can readily learn them, without being embarrassed by unessential details.

The importance of a knowledge of the *proportions* of the different elements of the food has been kept in mind, and an attempt made to indicate these rudely by placing after each the number of specimens of the species in which the given element was found. Thus, under *Lepiopomus pallidus* (No. 18), of which two specimens were examined, "Chrysomelidæ 2" indicates that *one or more beetles* of this family were found in the stomachs of each of *two specimens* of that species. The figures in parentheses placed after the family and specific names of *fishes* indicate the number of specimens examined.

DETAILS OF FOOD.

DARTERS. ETHEOSTOMATIDAE. (9.)

Entomostraca and larvae of diptera and neuroptera.

1. *Sand Darter.* *Pleurolepis pellucidus*, Ag. (2.) Larvae of small diptera.

2. *Black-sided Darter.* *Alvordius maculatus*, Grd. (1.) Small diptera (gnats), larvae of May-flies (Ephemeridae), and many unknown minute eggs?, oval, tuberculated, with tubercles in longitudinal rows.

3. *Johnny Darter.* *Boleosoma maculata*, Ag. (1.) Several Cyclops and many larvae of gnats.

4. *Banded Darter.* *Nanostoma zonalis*, Put. (1.) Larvae of gnats, including some with antennae similar to those of *Corethra pictipennis*.

5. *Rough-cheeked Darter*. *Poecilichthys asprigenis*, Forbes, (2.) Larvae of *Chironomus* (diptera), and other aquatic larvae; also pupae of a small Ephemeroidea approaching *Baetisca*.

6. *Striped Darter*. *Etheostoma lineolata*, Ag. (1.) Many larvae of *Chironomus* (diptera).

7. ——— ——— *Boleichthys elegans*, Gir. (1.) Larvae of gnats and of May-flies, with a few copepoda.

PERCHES. PERCIDAE. (7.)

Chiefly fishes, including perch, bass, sun-fish, gizzard shad, minnows, (Cyprinidae) and cat-fish; also water-bugs (*Corixa*).

8. *Ringed Perch*. *Perca americana*, Schrank, (1.) A cyprinoid fish.

9. *Black "Salmon." Wall-eyed Pike*. *Stizostethium vitreum*, Mitch. (1.) A bony fish with sub-globular stomach; probably one of the suckers.

10. *White "Salmon." Wall-eyed Pike*. *Stizostethium canadense*, Smith, (4.) A common perch (*Perca*), a sun-fish (Ichthelidae), a black bass (*Micropterus salmoides*), a gizzard shad (*Dorosoma*), a cat-fish (*Siluridae*), and an undetermined bony fish with cycloid scales.

11. *Wall-eyed Pike*. *Stizostethium*, (species undetermined) (1.) An unrecognizable bony fish and several water-bugs (*Corixa alternata*, Say).

WHITE BASS. LABRACIDAE. (4.)

Sun-fish, larvae of neuroptera and diptera, and other insects.

12. *White Bass*. *Roccus chrysops*, Raf. (3.) Chiefly larvae of May-flies (Ephemeroidea); also a sun-fish, (Centrarchidae) and another spiny-finned fish, and a few larvae of *Chironomus* and other diptera.

13. *Yellow Bass*. *Morone interrupta*, Gill. (1.) Chiefly larvae of Ephemeroidea (May-flies). An amphipod crustacean (*Allorchestes dentata*, Sm.), some larvae of dragon flies (*Agrion*) and a few young grasshoppers.

BLACK BASS AND SUN FISHES. CENTRARCHIDAE. (31.)

Food mixed, animal and vegetable, the former largely predominating. A few fishes (a darter, another percoid fish, and two or three cyprinoid minnows), a multitude of insects, land and water, representing all orders but Hymenoptera; arachnida (spiders and water mites), amphipod and isopod crustacea (*Allorchestes* and *Asellus*), hosts of Entomostraca (Cladocera and Copepoda, chiefly the former), a few mollusks, bivalve and univalve, an earth worm, and masses of *Plumatella*-like polyzoa; also a good deal of Potamogeton, Ceratophyllum and other water weeds, and algae, together with miscellaneous floating vegetable trash.

14. *Black Bass*. *Micropterus pallidus*, Raf. (3). A large mouse, a percoid fish, a small stone roller (*Campostoma anomalum*), pupae of dragon flies, a water bug (*Zaitha fluminea*) and a few confervoid algae.

15. *Black Croppie*. *Pomoxys nigro-maculatus* LeS. (10). Chiefly larvae of May-flies (Ephemerae). Many larvae of small diptera (various species of gnats), and occasionally a small percoid fish. The following is a detailed exhibit of the food of these ten specimens :

FISHES (Ctenoid.) 2.

INSECTS 10.

COLEOPTERA 3 (Larvae of Gyrinidae 2.)

DIPTERA 6 (Gnats and their larvae.)

HEMIPTERA 2 (*Corixa alternata*, Say.)

NEUROPTERA 9 (Larva of Ephemerae 8, pupae of Agrioninae 1).

CRUSTACEA 3 (Entomostraca.)

CLADOCERA 2 (**Ceriodaphnia angulata* (Say) Forbes 2). **Bosmina* (Sp. ? 1).

COPEPODA 1 (*Diaptomus*).

POLYZOA Sp ? 1.

A few seeds and blossoms of trees in 2.

16. *White Croppie*. *Pomoxys annularis*, Raf. (9). Specimens taken in midsummer were feeding chiefly on the larvae of May flies. A number collected in March were distended with *Ceriodaphnia angulata* and larvae of may flies and dragon flies (Agrioninae). A small fish was found occasionally, and a few water bugs.

FISHES 4.

Etheostomatidae 1, Cyprinidae 1 (*Luxilus analostanus*), undetermined cycloid fish 1.

INSECTS 8.

COLEOPTERA 1 (larvae of Gyrinidae).

HEMIPTERA 1 (*Corixa alternata*, Say).

NEUROPTERA 8 (Larvae of Ephemerae 5, of Agrioninae 5).

CRUSTACEA 5 (Entomostraca).

Ceriodaphnia angulata, Say, 5.

17. *Croppies*. *Pomoxys*, Sp. undet. (2). A cyprinoid minnow, a few spiders, a hemipter, and larvae of May flies.

18. *Common Sun Fish*. *Blue Sun Fish*. *Lepiopomus pallidus*, Mit. (5). Almost wholly insects (many of them terrestrial.) A few mollusks and a little pond weed (*Potamogeton*).

* See appendix.

INSECTS 4.

LEPIDOPTERA 2 (Caterpillars).

COLEOPTERA 3.—Carabidae 1 (*Agonoderus pallipes*), Gyrinidae 1 (larva), Scarabaeidae 1 (*Aphodius inquinatus*), Chrysomelidae 2 (*Diabrotica* 12-guttata and a *Haltica* ?).

DIPTERA 2 (larvae of gnats).

ORTHOPTERA 1 (*Phaneroptera curvicauda*, a *Tettix* and a cricket.)

HEMIPTERA 3 (*Corixa alternata* 2, *Arma* ? 1).

NEUROPTERA 2 (Larvae of Ephemeraeidae.)

ARACHNIDA 3.

Spiders 2, Hydrachnidae (water mites) 1.

MOLLUSKS, 2.

Gasteropoda 2 (*Physa*, *Planorbis*).

Also an earthworm, some Potamogeton, and a number of unrecognized small seeds.

19. *Bluc-checked Sun-fish*. *Lepiopomus ischyurus*, Nels. (1). Full of hornwort (*Ceratophyllum demersum*) and a polyzoan (*Plumatella* ?); also fragments of small bivalve shells, some small crustacea (*Asellus*, * *Allorchestes dentata*, Sm., and *Cypris*, sp.) and a little mixed vegetable matter.

20. *Bream. Pumpkin Seed*. *Eupomotis aureus*, Walb. (1). Several *Aselli*, univalve mollusks, and some unrecognized vegetable matter.

PIRATE PERCHES. *APHODODERIDAE*.

21. *Western Pirate Perch*. †*Aphododerus isolepis*, Nels. (3). The largest specimen (3 in. long) had eaten several *Aselli*, some larvae of diptera, a *Corixa* and another water-bug—apparently a *Galgulus*. The second in size (2½ in.) contained only a small cycloid fish and several larvae of neuroptera. In the stomach of the smallest were several ostracoda (*Cypris*), a larval *Corixa* and a few gnats.

MAIGRES. *SCIAENIDAE*.

22. *Sheepshead*. *Haploidonotus grunniens*, Raf. (7). Mollusks and larvae of May flies, with a few larvae of gnats.

Unios 2, *Planorbis* 2, *Limnea* 1, Ephemeraeidae 6, diptera 2.

* See appendix.

† An observation of the intestines shows that one effect of the remarkable change in the position of the vent in this species is the lengthening of the alimentary canal and a consequent increase of the digestive surface. The intestine passes from its origin at the stomach first upward, then backward, then downward, reaching the ventral wall at a point about half way from the bases to the tips of the ventrals. In the smallest specimens, it opens at this point. In the others, it turns forward along the middle line of the belly, and opens at a point more or less to the front, according to the size of the fish, leaving a seam of naked skin behind.

STICKLEBACKS. *GASTEROSTEIDAE*.

23. *Brook Stickleback*. *Eucalia inconstans*, Kirt. (1). Entomotraca (Cyclopidae and Eurycerus), and many mulberry-like masses of eggs (mollusks?)

SILVERSIDES, *ATHERINIDAE*.

24. *River Silverside*. *Labidesthes sicculus*; Cope. (5). Chiefly minute crustacea (copepoda and cladocera). A few small diptera and larvae of small dragon flies.

Cyclopidae 3, Daphniidae 3, (Bosmina, * Daphnia *), Lynceidae 1, (Eurycerus *), small diptera 3, larvae of Agrioninae 1.

TOOTHED MINNOWS. *CYPRINODONTIDAE*. (7).

Chiefly insects, aquatic and terrestrial; crustacea (amphipoda and cladocera), and gasteropod mollusks.

25. *Barred Killifish*. *Fundulus diaphanus*, Le S. (2). Planorbis and Pisidium, larvae of small diptera, Allorchestes, and cladocera of the family Lynceidae.

26. *Top Minnows*. *Zygonectes notatus*, Raf. (3). Bones of a small fish. Several small winged hymenoptera, small wingless ants, a spring beetle (Elateridae), a few hemiptera, several diptera and diptera larvae and pupae, a small spider, *Crangonyx gracilis*, and a number of Daphniidae and Lynceidae (Eurycerus, &c.)

27. *Striped Top Minnow*. *Zygonectes dispar*, Ag. (2). Physa and Planorbis, hemiptera and small diptera, and a few Lynceidae.

MUD MINNOWS. *UMBRIDAE*.

28. *Mud Minnow*. *Melanura limi*, Kirt. (2). Many water mites (Hydrachnidae), diptera larvae, Cypris, Planorbis, and fragments of unrecognizable insects.

PIKES. *ESOCIDAE*. (8.)

Fishes of several families, and tadpoles.

29. *Northern Pike*. *Esox lucius*, L. (8.) Only fishes. The eight specimens contained remains of 12 fishes, among which were a black bass (*Ambloplites rupestris*), and another ctenoid fish, a gizzard shad (*Dorosoma*), a toothed herring (*Hyodon*), 3 cyprinoids (1 *Campostoma anomalum* and 1 *Alburnops*?), an *Ichthyobus* and another large cycloid fish.

* See appendix.

30. *Little Pickerel.* *Esox salmoneus*, Raf. (2.) A small fish and two tadpoles of frogs.

MOON EYES. *HYODONTIDAE.*

31. *Toothed Herring.* *Hyodon tergisus*, Le S. (3.) Numerous insects, including a bee, carabid beetle, some aquatic hemiptera, numerous larvae of Ephemerae; a remarkable crustacean of which but a single specimen has hitherto been found in this country (*Leptodora hyalina*,* Lillj.); some rotten wood, elm seeds and other vegetable trash, evidently gathered from the drift-wood where one of the specimens had found its food.

HERRINGS. *CLUPEIDAE.* (6.)

32. *Ohio Golden Shad.* *Pomolobus chrysochloris*, Raf. (1.) A small bony fish and a few fragments of insects.

33. *Gizzard Shad.* *Hickory Shad.* *Dorosoma cepedianum*, Le S., var. *heterurum*, Raf. (5.) Extremely dirty. Every stomach examined was at least half full of mud. The food was chiefly vegetable, consisting largely of algae and a few crustacea, such as would naturally be entangled in the vegetation eaten. The objects recognized were a few diptera larvae, *Leptodora hyalina*, Cypris, Cyclops, masses of *Chara*, confervoid algae, desmids, and vast numbers of diatoms.

MINNOWS. *CYPRINIDAE.* (15.)

Time has failed for the examination of any sufficient number of this family, some of the most important genera having been omitted entirely. Enough has been learned, however, to show that these fishes live, some chiefly on aquatic vegetation (especially algae) and others on insects, of which small diptera and their larvae seem to constitute the greater part. The section whose teeth are not hooked probably eat vegetable food more largely than those with raptorial teeth, no insects at all having been found in the intestines of the five specimens of that section examined.—I found a surprising amount of dirt in the intestines of these herbivorous minnows,—too much, I think, to have been taken incidentally.

34. *Stone Roller.* *Campostoma anomalum*, Raf. (1.) Full of dirt and confervoid algae.

35. *Blunt-nosed Minnow.* *Hyborhynchus notatus*, Raf. (3.) Full of dirt, with fragments of endogenous vegetation, confervoid algae, and many diatoms.

36. *Silvery Minnow.* *Hybognathus argyritis*, Grd. (1.) Full of sand and an immense number of diatoms, with a few filaments of confervoid algae and fragments of other vegetable matter.

* See appendix.

37. *Red-finned Shiner*. *Luxilus cornutus*, Mit. (2.) Chiefly vegetable. Fragments of unrecognizable insects, a mass of confervoid algae and parts of a netted-veined leaf.

38. *Silver Fin*. *Luxilus analostanus*, Gir. (3.) Insects of several orders and a few algae.

39. *Red Fin*. *Lythrurus diplaemius*, Raf. (1.) A few small diptera.

40. *Emerald Minnow*. *Notropis atherinoides*, Raf. (2.) Several small gnats, an unknown hemipter and a little vegetable matter.

41. *Silver-mouthed Dace*. *Ericymba buccata*, Cope. (1.) A few small larvae of diptera, much sand and indeterminable matter, partly vegetable.

42. *Common Chub*. *Semotilus corporalis*, Mit. (1.) Many Ephemera larvae and a larva apparently belonging to the Dytiscidae.

SUCKERS. CATOSTOMIDAE. (24.)

My observations on this family indicate that its food is chiefly animal, consisting principally of mollusks, insect larvae and entomostraca. It is not impossible that in this, as in some other cases, the proportion of vegetable food is under-estimated, owing to the rapidity with which it is digested, as compared with the chitinous and calcareous coverings of arthropods and mollusks. The intestines of the family contain usually large quantities of mud.

There seems to be a well defined difference between the food of the Catostominae (Red Horse) and that of the Bubalichthyinae (Buffaloes), the former group feeding much more freely on mollusks than the latter, and less generally on entomostraca. Of the eight *Myxostomas* examined, the principal food of each was small, thin-shelled Unionidae (Anodonta), while no entomostraca at all were observed in them, and annulate worms (Naididae) were found in but two specimens. On the other hand, mollusks were found in only four out of fourteen carp and buffaloes (gasteropods 2, bivalves 2), and in these insignificant in quantity, while large numbers of entomostraca were noticed in twelve of the specimens. The intestines of many of the buffaloes were filled with a yellowish, shreddy, corpuscular fluid which I could only interpret as altered intestinal mucus and broken down membrane. The fishermen at Peoria report, however, that these fishes frequent the mouths of the gutters from the still-houses of which the river front is redolent, apparently feeding upon the distillery slops.

43. *Red Horse*. *Myxostoma macrolepidotum*, Le S. (3.) Chiefly mollusks, (Unionidae, Physa, Planorbis.) A number of ringed worms (Naididae), fragments of Chara and endogenous vegetation, and much mud.

44. *Golden Red Horse*. *Myxostoma aureolum*, Le S. (2.) Chiefly mollusks, (*Anodonta*, *Paludina*), a few slender ringed worms (*Naididae*), much dirt and a little unrecognized vegetation.

45. *Myxostoma*, sp. undet. (3.) Only mud and *Unionidae*.

46. *Chub Sucker*. *Eremyzon sucetta*, Lac. (2.) Confervoid algae, diatoms, mud.

47. *Carp Suckers*. *Carpiodes*, sp. (6.) I have found it quite impossible to recognize the species of this genus with certainty by the descriptions extant, and until they have been revised prefer not to attempt to separate them.

Mollusca 1 (*Gasteropoda*).

Insecta 3 (*Chironomus* larvae).

Crustacea 4; *Cladocera* 3 (*Bosmina* 1, *Ceriodaphnia* 1, *Lynceidae* 1), *Ostracoda* 2 (*Cypris*), *Copepoda* 3 (*Cyclops* 2, *Canthocamptus* 2.) Also nematoid worms 1, and various algae 2.

48. *Red-mouth Buffalo*. *Ichthyobus bubalus*, Raf. (6.) Chiefly entomostraca.

Mollusca 1 (*Limnea* ?).

Insecta 4 (larvae of diptera.)

Crustacea 6, *Cladocera* 5, (*Bosmina* 4, *Daphnia* 2, *Ceriodaphnia angulata* 4, *Lynceidae* 2) *Ostracoda* 2 (*Cypris*), *Copepoda* 5 (*Cyclops* 5, *Canthocamptus* 1). Also diatoms 1, and seeds and glumes of grasses 1.

49. *Black Buffalo*. *Bubalichthys niger*, Raf. (2.) Larvae of gnats and May flies, *Unionidae*, *Ceriodaphnia*, *Cyclops*, a *Lumbricus*, diatom s, mud.

CAT FISHES. *SILURIDAE*, (8.)

Very miscellaneous feeders, eating both animal and vegetable food, the former the more freely. Bones and pieces of fish were found, evidently from too large animals to have been swallowed alive. Aquatic larvae of all kinds, worms, water bugs, mollusks (rarely), algae, stems and leaves of both exogens and endogens, masses of fine roots, with an occasional craw-fish make up the bill of fare.

50. *Common Channel Cat*. *Ichthaelurus punctatus*, Raf. (6.) Bones and pieces of large fishes 3, fragments of bivalve mollusks (no shells) 1, land insects 1 (bees, plant bugs), aquatic larvae 6 (*Dytiscidae*, *Agrioninae*

and other dragon flies, May flies, caddis flies), water bugs, 1 (Corixa and Notonecta), vegetable matter 4, (algae, Naiadaceae, roots stems and leaves of various plants).

51. *Black Cat Fish*. *Amiurus melas*, Raf. (2). Taken in small prairie creeks, McLean Co. Stomach of one was full of purely vegetable food, consisting chiefly of a mass of confervoid algae; that of the other contained no vegetation, but exhibited fragments of various insects, some of them terrestrial, and remains of young craw-fishes and aquatic larvae.

DOG FISHES. AMIIDAE.

52. *Dog Fish*. *Grinnel*. *Amia calva*, L. (1.) A single small specimen, 5 in. long, from S. Ill., had eaten some Ephemera larvae, a few ostracoda (Cypris) and some confervoid algae, with numerous diatoms.

GAR PIKES. LEPIDOSTEIDAE.

53. *Broad-nosed Gar*. *Lepidosteus platystomus*, Raf. Seven or eight specimens were opened, but the stomachs of all but one were entirely empty. This one contained a common river craw-fish, (*Cambarus immunitis*, Hagen.) Is the gar a nocturnal feeder?

SPOON-BILLED CATS. POLYODONTIDAE.

54. *Shovel Fish*. *Bill Fish*. *Polyodon folium*, Lac. (5.) This is by far the most remarkable fish in our rivers, and is not less remarkable in its food than its structure. By the fishermen it is supposed to live on the slime and mud of the river bottom. The alimentary canal of each of the five specimens examined was found full of a brownish, half fluid mass, which, when placed under the microscope, was seen to be made up chiefly (in one case almost wholly) of countless myriads of entomostraca, of nearly every form known to occur in our waters, including many that have been seen as yet nowhere but in the stomachs of these fishes. Mixed with these, in varying proportion, were several undetermined and probably undescribed species of water worms (Annulata), most of them belonging to the family Naididae. Sometimes as much as a fourth of the mass was composed of vegetable matter,—largely algae, but including fragments of all the aquatic plants known by me to occur in the waters of the Illinois, except Ceratophyllum. Occasional leeches (Clepsine), water beetles (*Coptotomus interrogatus* &c.), a few larvae of diptera and Ephemerae and water bugs (*Corixa*) were noticed. Among the crustacea several specimens of the remarkable *Leptodora hyalina* already referred to were found.

I have not had time for anything more than a general examination of the mass of matter presented,—sometimes more than a pint from a single fish,—and cannot, therefore, give a list of the species. Curiously, very little mud was mixed with the food.

The remarkably developed gill-rakers of this species thus receive their explanation. These are very numerous and fine, arranged in a double row on each gill arch, and are twice as long as the filaments of the gill. By their interlacing they form a strainer scarcely less effective than the fringes of the baleen plates of the whale, and probably allow the passage of the fine silt of the river bed when this is thrown into the water by the shovel of the fish, but arrest everything as large as a *Cylops*. The fish is said by the fishermen to plow up the mud in feeding, with its spatula-like snout, and then to swim slowly backward through the muddy water. Its mouth, it may be noticed, is very large, even for a fish.

It is possible that this wholesale destruction of entomostraca may affect the food supply of other and more valuable fishes, especially of the very young of the predaceous species. We cannot yet say, however, where the *stress* of the struggle comes in the life of any given species, and consequently are unable either to relieve or heighten it at will, or to perceive the full effect of the forces already at work. Fuller knowledge must precede any but the most cautious and conservative recommendations.

RECAPITULATION.

A summary of the leading facts presented in this paper is given in the following table. The figures taken from left to right give, in a general way, the food of each family and species, and taken vertically show the fishes which eat any given kind of food. The line of totals will show something of the relative importance to fishes as a class of the different food elements. The figures in the table have the same use as those in the preceding list, showing the *number of specimens* of the given species found to eat the food mentioned at the head of the column.

It will be seen that, estimated in this way, the most important kinds of food are insects, crustacea, plants, fishes and mollusks, in the order named. These data apply entirely to adult fishes, however; if the young were also taken into account, crustacean food would doubtless be found more important.

The best food fishes ("fine fish" of the markets—Percidae, Labracidae, Centrarchidae, Esocidae) are chiefly piscivorous, except the Centrarchidae, which are nearly omnivorous, but prefer insects. Scarcely any fishes examined, except some Cyprinidae, can be called strictly herbivorous, although the gizzard shad (*Dorosoma*) is chiefly so, the animal food taken being probably incidental.

That the sheepshead, with its enormous crushing pharyngeals, should eat fewer mollusks than the red-horse, was scarcely to be expected, and may yet prove untrue.

Cat-fishes are the only ones shown to be scavengers. The fishermen, however, attribute similar habits to sheepshead and buffalo-fish.

Cyprinidae seem to be divided into two sections, corresponding to the shapes of the pharyngeal teeth, those without raptatorial hooks being herbivorous.

All these general statements ought, perhaps, to be put in the form of questions for future solution, since the number of specimens is too small and the space and time represented too limited to justify settled conclusions.

No. on List.	Names of Fishes.	No. examined.	Fishes.	Otenoid.	Cycloid.	Silurid.	MOLLUSCS.	Univalve.	Bivalve.	INSRCTS.	<i>Terrestrial.</i>	Hymenoptera.	Lepidoptera.	Diptera.	Coleoptera.	Hemiptera.	Neuroptera.	Arachnida.	Araneidae.	Hydrachnidae.	MYRIAPODA.	CRUSTACEA.	Decapoda.	Tetradecapoda.	Entomostraca.	WORMS.	POLYZOA.	PLANTS.	Phaenogam.	Cryptogam.	GARBAE.		
	<i>Etheostomidae</i>	9							9		<i>Terrestrial.</i>	Hymenoptera.	Lepidoptera.	Diptera.	Coleoptera.	Hemiptera.	Neuroptera.	Arachnida.	Araneidae.	Hydrachnidae.	MYRIAPODA.	CRUSTACEA.	Decapoda.	Tetradecapoda.	Entomostraca.	WORMS.	POLYZOA.	PLANTS.	Phaenogam.	Cryptogam.	GARBAE.		
1	<i>Pleurolepis pellucidus</i>	2							2					7									2										
2	<i>Alvordius maculatus</i>	1							1					2									2										
3	<i>Boleosoma maculatum</i>	1							1					1									1										
4	<i>Nanostoma zonale</i>	1							1					1									1										
5	<i>Poecilichthys asprigenis</i> ...	2							2					2									2										
6	<i>Etheostoma lineolatum</i>	1							1					1									1										
7	<i>Boleichthys elegans</i>	1							1					1									1										
	<i>Percidae</i>	7		3	4	1								1									1										
8	<i>Perca americana</i>	1		1	1									1									1										
9	<i>Stizostethium vitreum</i>	1		1	1									1									1										
10	<i>S. canadense</i>	4		4	3	2								1									1										
11	<i>Stizostethium, sp.</i>	4		2					4					4									1										
	<i>Labracidae</i>	4		2					4					3									1										
12	<i>Roccus chrysops</i>	3		2					3					3									1										
13	<i>Morone interrupta</i>	1							1					1									1										
	<i>Centrarchidae</i>	31		8	4	5			4					24								10		2	9	1	1	2	4	2	1		
14	<i>Micropterus pallidus</i>	8		2	1	1			1					1								3		1									
15	<i>Pomoxys nigro-maculatus</i> ...	10		2	2				10					10								3		3									
16	<i>P. annularis</i>	9		3	1	2			8					8								5		5									
17	<i>Pomoxys, sp.</i>	2		1	1				2					2								1		1									
18	<i>Lepiopus pallidus</i>	5							2					3								1		1									
19	<i>L. ischyurus</i>	1							1					1								1		1									
20	<i>Eupomotis aureus</i>	1							1					1								1		1									
	<i>Aphododeridae</i>	3							3					3								2		2									
21	<i>Aphododeris sayanus</i> *...	3		1	1				3					3								2		1									
	<i>Sciænidæ</i>	7							7					6								6		6									
22	<i>Haplodonotus grunniens</i> ...	7							6					2								2		2									

* While these pages are being printed, I learn from Dr. Jordan that he finds no constant differences between the eastern and western forms of Aphododeris.

APPENDIX.

ON THE CRUSTACEA EATEN BY FISHES.

I have recognized the following genera and species of crustacea in the stomachs of the fishes of the preceding list, several of them being new to the state. The material afforded has been by no means exhaustively studied, and the list of species could probably be quadrupled. I have refrained from formal description of some species which are evidently new, preferring to wait for specimens in more perfect condition.

Cambarus immunis, Hagen.

This is the only craw-fish I have yet noticed in the stomachs of fishes, and this I have seen but once (in the short-nosed gar), unless young individuals eaten by a small cat-fish (*Amiurus melas*) also belonged to this commonest of our species.

Allorchestes dentata, (Smith) Faxon.

Specimens of *Lepiopomus pallidus*, taken in Crystal Lake, McHenry Co., in June, were feeding chiefly on this crustacean. It has also been found in the same species, in *L. ischyurus* and in *Morone interrupta* from the Illinois at Peoria.

Crangonyx gracilis, Smith.

The western form of this species (see Bull. No. 1, p. 6) occurs abundantly throughout central and southern Illinois. It is a very agile and voracious creature, behaving in a jar of entomostraca like a tiger in a sheep-fold. I have noticed that ponds in which it is at all common are nearly or quite destitute of *Eubbranchipus*. The "handiness" with which it uses its anterior feet in feeding is quite amusing. I have found it eaten only by the Top Minnow (*Zygonectes notatus*.)

Asellus intermedius, Forbes.

Eaten by *Aphododerus* from Union Co. A species of *Asellus* described by Mr. O. P. Hay, in the paper following this, as *A. militaris*, has recently been collected in the Illinois River, and has been noted in the stomachs of

Lepiopomus ischyryus and *Eupomotis aureus*. Another form which, from its variability, I have not yet ventured to describe as distinct from *intermedius*, is very common in slow streams and fresh pools in McLean Co., especially in early spring, and has reached me also from La Salle Co., and from Wisconsin. Its size is equal to that of *communis*, and it differs from typical *intermedius* also in the much more robust development of all its appendages, and in the large size of the second joint of the outer ramus of the second genital plates of the male. The form and proportions of these genital plates must be used with caution, however, in describing species, as they evidently vary greatly.

Leptodora hyalina, Lilljeborg.

This extremely curious crustacean, which may be known by its peculiar, slender form (that of a true cross, the arms of which are the swimming appendages), by its extreme transparency and by the single eye in the front end of its cylindrical head, has hitherto been observed in this country only by Prof. S. I. Smith, by whom a single specimen was dredged in L. Superior in 1871.* It evidently stands between the other Cladocera and the Phyllozoa in many respects, having no slight resemblance to a larval *Eubranchipus*.

It occurs in considerable numbers in Peoria Lake, a mere expansion of the Illinois River, the depth of which does not exceed eighty feet. Specimens taken in a small surface net, in June, 1877, were lost in transit, and it was not again seen until found in the stomachs of *Polyodon*, *Dorosoma* and *Hyodon*. It is not at all certain that this is identical with the European species, all the specimens yet studied being too imperfect to decide this point.

Eurycercus lamellatus, Muell. ?

Specimens apparently of this species appear in the stomachs of fishes from Crystal Lake, McHenry Co., (*Apeltes*, *Labidesthes*, *Fundulus*) and also in shovel fishes from Peoria Lake. It is likewise common in ponds in McLean Co.

Bosmina, sp. ?

This genus belongs to a section of *Dapniadae* (*Lyncodaphnia*) distinguished by the long and strong anterior antennae and by the reduced importance of the posterior pair. The former are tapering, curved and cylindrical, (containing in our species about 14 slightly spinulose joints, with a tuft of bristles on the front of the third) and project from the front of the head like a bifid beak. Occurs in myriads in food of shovel fish, in carp, buffalo, &c., and in *Labidesthes* from Crystal Lake.

Ceriodaphnia angulata, (Say) Forbes.

Very abundant in central Illinois, (McLean and Rock I. counties), but

* Invertebrate Fauna of L. Superior, p. 696.

not hitherto reported. The following is Say's description, in Jour. Acad. Nat. Science, Phil., Vol. I, p. 440, 1818:

"*D. angulata*. Body viewed laterally, sub-oval, contracted before, gibbous above near the posterior edge, beneath ventricose in the middle; back sub-ovate, acute behind and contracted before; sides striate with numerous minute, parallel, oblique lines. Hind edge of the body with a prominent angle in the middle, which is obtuse at tip; above the angle it is ciliated. *Antennae*, 4 filaments on the superior branch, and 5 on the inferior branch; color white or red. Length $\frac{1}{10}$ of an inch. Cabinet of the Academy. Very common in the stagnant marsh water of the forests of the Southern States."

In the Illinois specimens the head is marked off from the body by a dorsal indentation. The color is usually white. Found in the stomachs of carp, buffalo, sun-fish, &c. It constituted the principal part of the food of a number of croppies taken in April, from the Illinois R. The eggs beneath the carapace were so numerous as to give an orange color to the whole mass of the food at this time.

Daphnia pulex? L.

The species referred to by Prof. Smith, under this name,* is our commonest *Daphnia*, occurring everywhere in immense numbers. It is eaten by *Polyodon* and by many small fishes.

Daphnia galeata, Sars.

A species probably the same as that figured by Prof. Smith in the paper already cited, was found in Crystal Lake,—a shallow sheet of water about 2 miles long—and was eaten in numbers by the abundant little silversides (*Labidesthes*.)

Canthocamptus illinoisensis, Forbes.

This minute crustacean was frequently found in carp, buffalo and shovel fishes from the Illinois R.

Diaptomus sanguineus, Forbes.

In *Pomoxys nigro-maculatus*. Numbers of the genus unrecognizable as to species were observed in a variety of fishes.

Many *Cyclops* and *Cypris*, the species of which I have not attempted to discriminate, occurred in fishes from all waters and of a dozen families.

* Loc. cit.

DESCRIPTION OF A NEW SPECIES OF ASELLUS.

By O. P. HAY.

Aseellus militaris. (Sp. nov.)

Length of male 17 mm., of female 11 mm. Color brown, ornamented with irregular shaped yellow spots, somewhat symmetrically arranged on each side of the median line. Feet and caudal stylets with a tinge of rose. Upper surface of the body covered with minute scattered hairs. All the free margins of the body abundantly furnished with slender spines; these longest on the lateral margin. Head narrow, only about one-half the width of the first thoracic segment; the anterior margin concave; antero-lateral angles obliquely truncated; lateral margins diverging posteriorly, with a small outwardly projecting lobe at the posterior angle; this lobe furnished with several short spines. Eyes comparatively small. Anterior segments of thorax concave in front, convex behind; becoming less so to fifth segment, whose anterior and posterior margins are nearly straight. Sixth and seventh segments convex in front, concave behind, the concavity being deepest in the seventh. All the thoracic segments after the second about the same width; the second a little narrower than the succeeding segments; the first about three-fourths as wide as the widest. Antero-lateral angles of first segment excavated and filled by the broad epimera. Second segment very slightly notched in front. In the succeeding segments this notch is pushed further back and becomes deeper, especially in the last three. As the notch becomes deeper, the antero-lateral angle is lengthened and turned backward. The epimera again make their appearance in the fifth, sixth, and seventh segments, only partially filling the lateral notches. Postero-lateral angles of all the thoracic segments rounded.

Abdomen sub-orbicular; width and length equal; anterior and posterior angles quite well marked. Posterior margin excavated at insertion of caudal stylets, prolonged behind into a median lobe. This, in the male, reaches back scarcely one-third the length of the pedicel of the caudal stylets, but in the female about one-half the length of the pedicel. Width of abdomen less than that of any of the thoracic segments, except the first and second, about equal in width to second. Antennulæ shorter than the peduncle of the antennæ; basal segment short, a little curved and having a diameter nearly three times that of the next segment; second segment

longer than the first; third sub-equal to the first. Flagellum equal to the peduncle and consisting of about twelve segments.

First three segments of the antennæ short; fourth as long as the three preceding; fifth as long as the second, third and fourth together; flagellum long, reaching back three-fourths the length of the thorax, and consisting of about seventy-five segments.

Right mandible with a single dentigerous lamella furnished with four obtuse teeth. Left mandible with two dentigerous lamellæ, each with four obtuse teeth. Palpus consisting of three segments; the first clavate: the second widest in the middle, its inner margin being straight and its outer formed by two straight lines meeting at an obtuse angle at the middle of the segment; last segment falcate, furnished with numerous plumose hairs along its outer concave margin.

Palpus of maxilliped with five segments. The first very short. The second three times as long as the first and rather broader than long, with the inner margin straight and the outer curved. Third segment short, broadest just above the proximal articulation, becoming narrower distally. Fourth segment clavate and bent inward at the base. Last segment short and only half as wide as the preceding. All the segments provided with scattered hairs along their outer margin and crowded with similar hairs along the inner margin.

Propodus of the first pair of legs in the male ovate, nearly two-thirds as wide as long; the palmar margin slightly convex, armed with a stout conical tooth in the middle, and at the posterior angle with another short obtuse one, surmounting a rough process of the body of the propodus. There are thus really two stout teeth on this margin. Dactylus with its claw reaching beyond the palmar margin, curved strongly, and armed with about fifteen teeth appressed towards the tip.

In the female the first propodus is more slender, being one-half as wide as long. Palmar margin nearly straight and armed with several slender spines, and near the posterior angle with one moderately strong acute tooth. Dactylus long, curved, and armed with about eight teeth longer than those of the male. Dactylus terminating in a claw, which extends beyond the palmar margin.

Anterior genital appendages of the male consisting each of two segments, the first three-fourths the length of the second, sub-quadrate, with four curved spines along the inner margin; the second segment ovate, with an obliquely truncate extremity, which, as well as the adjacent parts of the inner and outer margins, is sparsely ciliated. Posterior genital appendages consisting each of a peduncle and two rami. The peduncle about as broad as long, outer margin straight, inner margin approaching the outer distally by a broad curve. Inner ramus navicular, notched at the distal extremity. Outer ramus bi-articulate; first segment triangular; second linguiform, twice as long as broad, with the outer margin and the lower portion of the inner margin furnished with long plumose hairs. Caudal stylets of the male as long as the abdomen; the peduncle a little less than two-thirds as wide as long, expanding distally, where it is excavated for the insertion of the rami. The rami are ovate, moderately acute, width about one-third of the length; the outer ramus about two-thirds as long as the

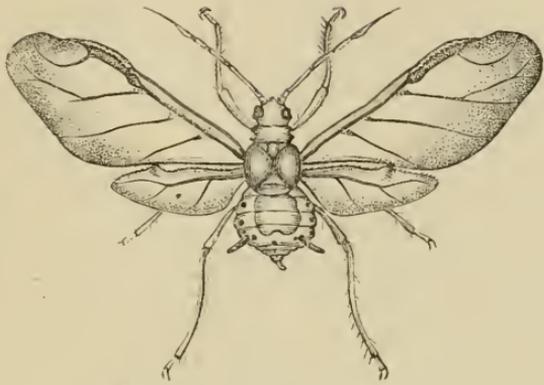
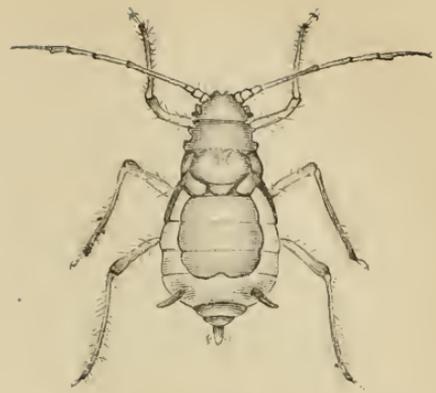
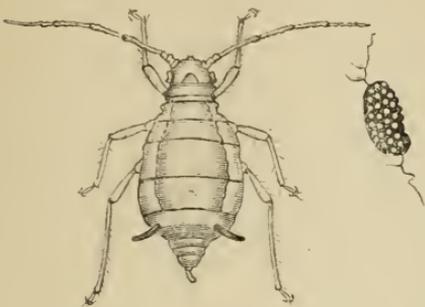
inner, and both tipped with a brush of long hairs, and fringed with numerous setæ: as are also the margins of the peduncle

Caudal stylets of the female only two-thirds the length of the abdomen, peduncle wider proportionally than in the male, and obtriangular. Rami more lanceolate in outline, scarcely a fourth as wide as long; the outer nearly as long as the inner, which is nearly a third longer than the peduncle.

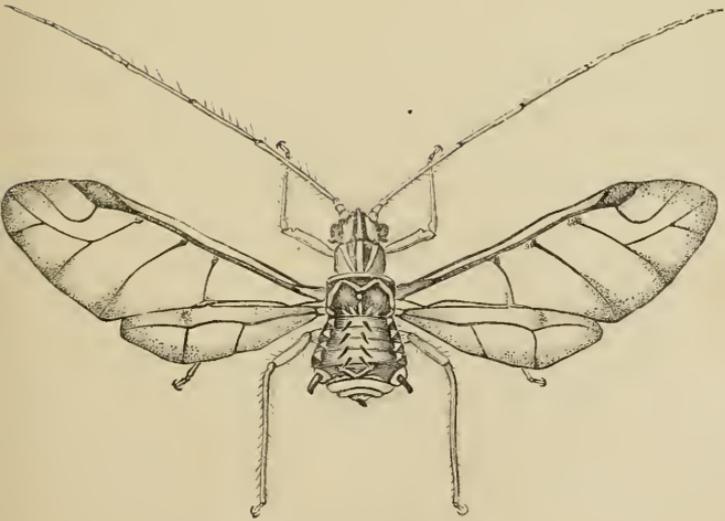
Found in large numbers in shallow pools of a slow prairie stream, near Abingdon, Knox county, Illinois.

This fine large species is probably nearly related to *Asellus intermedius*, Forbes. It differs, however, from all the forms of this that I have seen, not only in its much greater size, but also in some other important respects. The head is much narrower in the present species than in *intermedius*. The abdomen is narrower in this than the species described by Prof. Forbes, as compared with the width of the thoracic segments. The thoracic segments in specimens of undoubted *intermedius* which I have, increase in width from the first to the last, while in *A. militaris* they are, after the second, of uniform width. The two posterior segments in *A. militaris* are also much more deeply concave along their posterior margin than in the other species mentioned. The propodus in the present species is broader than in *intermedius*, but I have specimens of an *Asellus* from Prof. Forbes, which he provisionally regards as *A. intermedius*, in which the propodus is rather broader than in my species. The genital plates, however, differ much from those of *A. militaris*. The plates, again, are, in *militaris*, almost exactly as in the typical specimens of *intermedius*. The doubtful forms of *intermedius*, however, differ from the present species in the width of head, abdomen, concavity of posterior thoracic segments and in the form of the caudal stylets.

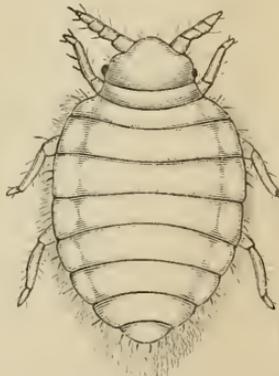
My thanks are due Prof. Forbes for specimens of his two forms of *A. intermedius* and for the use of microscope slides.



Siphonophora coreopsidis. THOS.



Siphonophora acericola. THOS.



Schizoneura paullet. THOS.