A New Habitat for Gastrophilus. By A. W. Bitting.

The genus *Gastrophilus* contains two well known species, *Gastrophilus equi* and *Gastrophilus haemorrhoidalis*. These parasites are commonly known as bots and inhabit the stomach and duodenum of the horse.

The life cycle is as follows: The female deposits her eggs upon the ends of the hairs upon the fore limbs or some other part of the body that the horse is likely to touch with his mouth in fighting flies. The eggs hatch and the lid breaks open to permit their escape in from five to fifteen days. They attach themselves to the lips or tongue when the host is fighting flies and soon find their way into the stomach or interior part of the duodenum. Here they pass a period of development lasting about seven months. Their food consists of the nutriment found in solution in the juices of the stomach. They escape from the body with the excrement, pass a pupa state in the ground to emerge in a short time as adult.

The particular observation to be recorded here is the finding of this parasite in the alveoli of the horse's teeth.

Last September there were an unusual number of cases of caries of the teeth at the clinics.

While extracting teeth six larvae were obtained attached to the tissues of the teeth or alveolar cavity. They were alive and active. They were about three centimeters from the surface of the gums and there was no visible point for entrance.

The question remains how did they get to their destination and how did they accommodate themselves to take nutriment from the blood when it is believed that they are dependent upon the juices of the stomach?

Are they a factor in producing caries of the teeth?

Second Contribution to a Knowledge of Indiana Mollusca. By R. Ellsworth Call.

The sources of information on which the facts stated in this brief paper are based are various. No single source has availed largely in determining the locality references that are given, though the collection in the Geological Museum, in the State Capitol, has furnished the greater number. All the rest have been contributed by specimens submitted through several gentlemen practically interested in the work of the biological survey of the State. For this aid thanks are

due W. S. Blatchley, State Geologist; Dr. J. T. Scoville, Terre Haute High School; Dr. C. H. Eigenmann, State University, Bloomington; Mr. Harry Dodge, Charleston, Indiana, and Mr. Charles Dunn, Chicago.

The specimens which have been seen are mainly the most common forms. In some few cases they have been found to be widely distributed over the State; others are, apparently, confined to the Ohio and its principal tributary stream, the Wabash. North of the divide that separates the Ohio and lake drainages fewer forms of *Unionidæ* occur, but the *limnæid* fauna appears to represent both an increased number of individuals and of species. The land shells of the Ohio drainage are both more abundant and varied. But no really final generalizations can yet be ventured in the absence of extended collecting and large numbers of shells—a condition which the present activity of members in this branch of the State's biological survey indicates to be very remote. The facts collected for the year past are the following:

Land Mollusca.

Mesodon albolabris Say.

Charleston, Terre Haute, Indianapolis, New Albany.

Mesodon clausus Say.

Vigo County, Indianapolis, Peru.

Mesodon elevatus Say.

Terre Haute, Indianapolis, Corydon.

Mesodon exoletus Binney.

Vigo County, Indianapolis.

Mesodon multilineatus Say.

Terre Haute, Indianapolis.

Mesodon profundus Say.

Charleston, Indianapolis, Terre Haute.

Mesodon thyroides Say.

Vigo County, Indianapolis, Charleston.

Patula alternata Say.

Vigo County, Charleston.

Patula solitaria Say.

Vigo County, Charleston.

Patula perspectiva Say.

Vigo County.

Patula striatella Anthony.

Vigo County.

Zonites arboreus Say.

Vigo County, Bloomington, Charleston.

Zonites ligerus Say.

Vigo County.

Zonites gularis Say.

Charleston.

Zonites fuliginosus Griffith.

Gibson County.

Triodopsis fallax Say.

Vigo County, Indianapolis.

Triodopsis inflecta Say.

Charleston, Vigo County.

Triodopsis appressa Say.

Vigo County, Indianapolis.

Triodopsis palliata Say.

Vigo County.

Triodopsis tridentata Say.

Charleston, Vigo County.

Tebenophorus dorsalis Binney.

Vigo County.

Limax campestris Binney.

Vigo County, Turkey Lake.

The "slugs" or shell-less terrestrial mollusks of Indiana are hardly known. Very few collections contain any representatives. Inasmuch as they do not appeal to the conchologist and are rather difficult of preservation, requiring alcoholic methods, they have been neglected. They promise useful facts if particular attention is directed to their systematic collection. They are to be sought under chips, boards, logs, flat rocks, bark, sidewalks, in cellars and about barns and other outhouses in damp situations. A track of dried mucus will often lead one to their hiding place, if carefully traced. They should receive especial attention from the collectors of the survey.

Stenotrema monodon Rackett.

Vigo County.

Stenotrema hirsutum Say.

Vigo County.

Macrocylis concava Say.

Charleston, Indianapolis, Terre Haute.

Succinea avara Say.

Vigo County.

Succinea obliqua Say.

Vigo County.

FRESH WATER UNIVALVES.

Bulinus hypnorum Linnæus.

Coffee Chute, Gibson County.

Limnæa caperata Say.

Vigo County.

Limnophysa humilis Say.

Very abundant on marshy banks of the Ohio, in springs at New Albany; found in 1894 in myriads.

Limnophysa reflexa Say.

Ponds, Vigo County.

Physa gyrina Say.

Marion County; probably found everywhere in the State; exceedingly abundant in pools on the Falls of the Ohio.

Helisoma trivolvis Say.

Vigo County.

Planorbella campanulata Say.

Ponds, Vigo County; Lake Maxinkuckee.

Pleurocera subulare Lea.

Wabash River, Vigo County.

Plurocera canaliculatum Say.

Very abundant on the Falls of the Ohio; on muddy banks of the Wabash River, at Terre Haute, occurs in myriads. A large number of specimens were collected in October, 1895, at the last named locality, which present a wide range of variation, both in the characteristic grooving of the body-whorl and in coloration. Many specimens occurred without any indication of a groove; in others the angle, which is found along the lower border of the body-whorl, may be sharp, or obtuse, and is frequently thickened at intervals, constituting a character that makes a number of specimens approximate *Pleurocera moniliferum* Lea. Any one of a half dozen species belonging to the pleurocerid group, of which *canaliculatum* is a type, might be separated from the material before me. Many thousands of this shell have been taken at the Falls of the Ohio

opposite Louisville. They present a still wider range of variation, perhaps from the character of their habitat. The very wide range of variation suggests some interesting synonymic conclusions that it is hoped will be elaborated during the coming year.

Goniobasis pulchella Anthony.

Wabash River, Ohio River at the Falls, Turkey Creek.

Widely distributed over the State, and with *Goniobasis livescens* Menke, ranges farthest north.

Goniobasis livescens Menke.

Turkey Creek, St. Joseph River.

Goniobasis sp.

A very great quantity of these small shells were collected by me at the Falls of the Ohio during the past three years, but opportunity to work it up has not yet been afforded. As in the pleuroceroid section, this material promises an abundant synonymy.

Lioplax subcarinata Say.

Wabash River, Ohio River.

Vivipara intertexta Say.

Wabash River, Gibson County, Lake Maxinkuckee.

Vivipara contectoides Binney.

Lake Maxinkuckee, ponds along Wabash River.

Campeloma decisum Say.

St. Joseph River, Lake Maxinkuckee.

Campeloma ponderosum Say.

Ohio River, Wabash River, ponds in Vigo County.

Campeloma rufum Haldeman.

St. Joseph River.

Campeloma subsolidum Anthony.

Peru, Lake Maxinkuckee, White River.

The very interesting and very difficult group of shells comprised in *Campeloma* is probably the least understood and the most abused of any in the North American fauna. At brief intervals some tyro arises to declare his "discovery that after all there is but one species," etc., etc., the latest of these being a writer in the "Proceedings of the Iowa Academy of Sciences."* In this paper the remarkable suggestion is confidently made that "Mr. Binney's disposition of these forms is still the best." Now, Mr. Binney wrote on these mollusks thirty

* Proc. Iowa Acad. of Sciences, 1893 [1894], p. 108. Shimek, "Additional Notes on Iowa Mollusca."

years ago, with poor and scanty materials at his command. He succeeded in involving the group in almost inextricable confusion for nearly a quarter of a century, a result hardly to be wondered at with paucity of material and want of familiarity with fresh water forms. So far from the truth is it that Mr. Binney's disposition of these forms was wise that, without detracting a whit from his well earned reputation as a student of our terrestrial mollusca, it may be fairly stated that had he left the group severely alone its limitations would sooner and better be reached. As species go, every form listed from Indiana is distinct and is easily separable, no matter how mixed the material may be. The embryonic forms differ; the mature shells differ; their character is obvious to any who will carefully study extensive series. What the specific value of certain forms may eventually prove to be does not in the least affect the general proposition that the group is composed of a number of forms which must be recognized as species. It would, indeed, be a striking commentary on the acumen of American conchologists if, after thirty years, no advance had been made in this group. And this same writer accepts several undoubted synonyms of the circumpolar *Vallonia pulchella* Müller, as good species!

Corbiculadæ.

Sphærium sulcatum Lamarck.

Ponds, Vigo County.

Sphærium striatinum Lamarck.

Turkey Creek; Ohio River; Ponds, Vigo County.

Sphærium transversum Say.

Abundant in the Ohio at Charleston.

Unionidæ.

Anodonta edentula Say.

Ponds, Vigo County; Bennett's Creek; Wabash River; Cedar Creek; St. Joseph River.

Anodonta ferussaciana Lea.

Bennett's and Coal creeks, Vigo County; Five Mile Pond, Vigo County; St. Joseph River.

Anodonta footiana Lea.

Lake Hamilton; Lake Maxinkuckee.

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*All names thus marked have Indiana representatives in the State Museum, at Indianapolis.

Anodonta grandis Say.

Fourteen Mile Creek, Charleston; Lake Hamilton; Five Mile Pond, Vigo County; Raccoon Creek.

Anodonta imbecillis Say.

Bennett's Creek, Vigo County.

Anodonta pavonia Lea.

Pond, near Terre Haute; Bennett's and Coal creeks, Vigo County.

Anodonta salmonia Lea.

Yellow River; Cedar Creek; St. Joseph River.

Anodonta suborbiculata Say.

Wabash River.

Anodonta subcylindracea Lea.

Wabash River; Cedar Creek.

Anodonta undulata Say.

Lake Maxinkuckee.

Anodonta wardiana Lea.

Fourteen Mile Creek, Charleston.

Margaritana calceola Lea.

Wabash River, White River, Turkey Lake.

Margaritana complanata Barnes.

Wabash River, White River, Ohio River, Bruiett's Creek.

Margaritana confragosa Say.

Wabash River.

Margaritana dehiscens Say.

Wabash River, Ohio River.

Margaritana deltoidea Lea.

Lake Maxinkuckee, St. Joseph River.

This form is a synonym of *Margaritana calceola* Lea.

Margaritana hildrethiana Lea.

Wabash River.

Margaritana marginata Say.

Wabash River, White River, Ohio River, St. Mary's River.

Margaritana monodonta Say.

Ohio River, Wabash River.

This shell was described, in 1830, from the Falls of the Ohio, by Mr. Say, but was by him regarded as a *Unio*. Mr. Lea described it the same year as *Unio soleniformis*. Mr. Lea's shell is given the indefinite locality "Ohio," and the shell probably came from the Ohio River, near Cincinnati. Mr. Say's name has

priority, even though it is now recognized that the species falls in *Margaritana* rather than in *Unio*.

In habit the species resembles *Margaritana dehiscens* in that it is often deeply buried in the gravelly banks it affects, in rather swiftly flowing water. Most commonly, however, it may be found buried deeply under large flat rocks, and between clefts in rocky bottoms. It is a rather rare shell in collections.

**Margaritana rugosa* Barnes.

Wabash River, White River, Blue River, Fourteen Mile Creek.

**Unio asopus* Green.

Wabash River, Ohio River.

**Unio alatus* Say.

White River, Ohio River, Wabash River.

**Unio anodontoides* Lea.

Wabash River, Ohio River, Bruisett's Creek, Vigo County.

**Unio asperrimus* Lea.

Wabash River, Ohio River, at the Falls; this form is equivalent to *Unio lachrymosus* Lea.

**Unio camelus* Lea.

Ohio River; this is an old and heavy *Unio phaseolus*, of which it is a synonym,

**Unio camptodon* Say.

Wabash River, Ohio River.

**Unio capax* Green.

Wabash River, Ohio River.

**Unio cicatricosus* Say.

Wabash River, Ohio River.

**Unio circulus* Lea.

St. Mary's River, Ohio River, Wabash River, Peru.

**Unio clavus* Lamarck.

Wabash River, very abundant; St. Joseph River.

**Unio coccineus* Hildreth.

Wabash River, Ohio River.

**Unio cooperianus* Lea.

Wabash River, Ohio River.

**Unio cornutus* Barnes.

Ohio River, Wabash River.

* *Unio crassidens* Lamarck.

Wabash River, Falls of the Ohio, abundant.

* *Unio cylindricus* Say.

Ohio River, Wabash River, White River.

These shells, as are indeed most others from the Wabash River, are singularly beautiful and perfect. Even the largest and oldest examples present perfect umbones, with epidermis and apical crenulations entire. It is rare indeed to find these forms so perfect. Both this species and *Unio metanervus*, which are characterized by peculiar arrow-shaped green color-markings over the whole disk, present this feature in singular beauty. The State Collection, at Indianapolis, contains several well-marked and beautiful specimens.

* *Unio donaciformis* Lea.

Wabash River, Ohio River at Falls of the Ohio; found, also, in collections under the name of *Unio zigzag* Lea. The latter name was given two years after *Unio donaciformis* was characterized.

* *Unio ebenus* Lea.

Wabash River, Ohio River, Falls of the Ohio.

* *Unio elegans* Lea.

Wabash River, Ohio River, Falls of the Ohio.

* *Unio ellipsis* Lea.

Wabash River, Ohio River, Falls of the Ohio, common.

* *Unio fabalis* Lea.

Wabash River.

Unio lapillus Say, is a synonym of this form.

* *Unio fragosus*, Conrad.

Wabash River, Ohio River, White River.

* *Unio gibbosus* Barnes.

Wabash River, Sand Creek, Ohio River, Turkey Lake, Lake Tippecanoe, St. Joseph River, Lake Maxinkuckee, Falls of the Ohio, St. Mary's River.

The white and heavy variety of this shell, called by Dr. Lea, *Unio arctior*, occurs somewhat commonly in both the Ohio and Wabash rivers.

* *Unio glans* Lea.

Wabash River, White River, Lake Maxinkuckee.

* *Unio gracilis* Barnes.

Wabash River, Ohio River on Falls of the Ohio, Muscatatuck Creek, Jennings County.

* *Unio graniferus* Lea.

Wabash River, Ohio River.

* *Unio iris* Lea.

Wabash River, Delaware River, Lake Maxinkuckee.

* *Unio irrorratus* Lea.

Wabash River, Ohio River. Very abundant, perfect and beautiful in the Wabash.

* *Unio lens* Lea.

See *Unio circulus*, of which it is a synonym.

* *Unio ligamentinus* Lamarck.

Wabash River, Ohio River, Yellow River, Turkey Creek, Delaware River, St. Joseph River. Widely distributed over the State. The most common *Unio* of our waters, with the possible exception of *Unio luteolus*.

* *Unio luteolus* Lamarck.

Whitewater River, White River, Wabash River, Ohio River, St. Mary's River, Turkey Creek, Cedar Creek, Fourteen Mile Creek, Charleston; Lake Maxinkuckee.

* *Unio metanevrus* Rafinesque.

Wabash River, Ohio River.

* *Unio multiplicatus* Lea.

Wabash River, Ohio River; a mud-loving form which reaches gigantic size in both these streams. Very large and fine specimens are in the State collection.

* *Unio multiradiatus* Lea.

Wabash River, White River, St. Joseph River.

* *Unio mytiloides* Rafinesque.

Wabash River, Ohio River.

* *Unio nigerrimus* Lea.

Wabash River; a single specimen is in the State collection, labelled correctly as above—though the locality can not be vouched for. Mr. Lea described the form from Alexandria, Louisiana. The collection contains many southern shells and I am inclined to regard this locality reference as an error and to think the shell should not be reckoned as an Indiana form.

* *Unio obliquus* Lamarck.

Wabash River, Ohio River; probably the same form Rafinesque called *mytiloides*.

Unio occidens Lea.

Decatur County, Ohio River, Wabash River, Falls of the Ohio, Bennett's Creek, Vigo County.

* *Unio orbiculatus* Hildreth.

Wabash River; Mr. Lea later described the female of this species under the name of *Unio higginsii.*

* *Unio parvus* Barnes.

Wabash River, Ohio River, Creek at Greencastle (Underwood), Lake Maxinkuckee.

Very large specimens of this usually small shell are obtained in the Wabash. So marked is their development that they are commonly known as "the big *parvus* of the Wabash."

* *Unio perplexus* Lea.

Wabash River, White River.

Mr. Lea later twice described again this form, once as *Unio rangianus* and then as *Unio sampsonii*, both the latter from Indiana waters. It has other synonyms, by the same writer, in Tennessee waters.

* *Unio phaseolus* Barnes.

Wabash River, Ohio River, St. Joseph River, Lake Maxinkuckee, Fourteen Mile Creek, near Charleston.

* *Unio plenus* Lea.

Wabash River.

* *Unio plicatus* Le Sueur.

Ohio River, Wabash River.

This shell, widely distributed, has a number of synonyms which I have elsewhere indicated.† It is also often confounded with *Unio undulatus* Barnes, which is, however, a markedly different shell, very much more compressed.

* *Unio pressus* Lea.

Sand Creek, Decatur County; Bruiett's Creek, Vigo County; St. Joseph River, Lake Maxinkuckee.

* *Unio pustulatus* Lea.

Ohio River, Wabash River, White River.

* *Unio pustulosus* Lea.

Wabash River, Ohio River.

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† See Trans. St. Louis Acad. Sci., Vol. VII, No. 1, pp. 36, 37; 1895.

* *Unio rectus* Lamarck.

Wabash River, Ohio River, White River, St. Joseph River.

* *Unio retusus* Lamarck.

Wabash River.

* *Unio ridibundus* Say.

White River, Wabash River.

* *Unio rubiginosus* Lea.

Ohio River, Wabash River, Lake Maxinkuckee.

* *Unio securis* Lea.

Wabash River, Ohio River.

* *Unio solidus* Lea.

Wabash River.

* *Unio subovatus* Say.

Wabash River, Ohio River, White River.

* *Unio subrostratus* Say.

Wabash River, Lake Maxinkuckee, Bruiett's Creek, Vigo County.

Wrongly labelled *Unio nasutus* in the State collection.

* *Unio sulcatus* Lea.

White River, Marion County.

* *Unio tenuissimus* Lea.

Wabash River, Ohio River.

A specimen in the State collection is labelled *Unio vellum* Say.

* *Unio triangularis* Barnes.

Wabash River, White River.

* *Unio trigonus* Lea.

Wabash River, Ohio River.

* *Unio tuberculatus* Barnes.

Ohio River, Falls of the Ohio, Wabash River.

* *Unio undulatus* Barnes.

White River, Ohio River, Wabash River, Bruiett's Creek, Vigo County.

* *Unio varicosus* Lea.

Ohio River.

* *Unio ventricosus* Barnes.

Lake Maxinkuckee, St. Joseph River.

* *Unio verrucosus* Barnes.

Wabash River, Ohio River, White River.

CINCINNATI, OHIO, December 23, 1895.