

*Melampus flavus* Gmel. Abundant.

These shells were not intermingled with marine forms, which strew the shore on both sides of the peninsula. The identifications are by Bryant Walker.

ON THE VALIDITY OF UNIO UNDATUS BARNES.

BY BRYANT WALKER.

This species, which is apparently easily identifiable, has been buried in the synonymy for over half a century. A careful study both of the literature and of a considerable amount of material has convinced me that it is entitled to recognition as a valid species.

The synonymic history of the species is, briefly, as follows; It was described by Barnes in 1823 (Am. Jour. Sci. VI, p. 121, pl. IV, fig. 4) and was based on specimens collected by Schoolcraft in the Wisconsin and Fox rivers.

In 1828, Hildreth (Am. Jour. Sci. XIX, p. 280) recognized the species among the *Unionidæ* of the Muskingum river, Ohio, and as his paper was submitted to Barnes before publication, there is apparently no doubt but that his identification was correct.

In his first attempt at an arrangement of the North American *Unionidæ* in 1829 (Obs. I p. 32) Dr. Lea considered it as a synonym of *U. mytiloides* Raf.

In 1833, (Obs. I p. 200) after his return from Europe, where he had studied the Lamarckian types, he declared Barnes' species to be the same as *U. obliquus* of that author.

In the meantime, in 1831, Lea (Tr. Phil. Soc. IV, p. 110 pl. XVI fig. 40) had described his *Unio trigonus* from the Ohio as a new species.

It is to be noted that Barnes died in 1828 before *trigonus* was described, so that he was not able to express his opinion as to the validity of Lea's species.

In 1834, Conrad in his "Synoptical Table" (New F. W. Shells p. 72) considered the two species as synonymous and gave *undatus* priority.

In the same year, Say in his "Synonymy" (Amer. Con. Pt. VI) did the same.

Ferussac in 1835 (Guer. Mag. I p. 28), after Dr. Lea had visited

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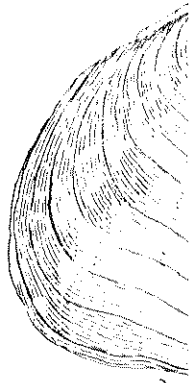
THE NAUTILUS. XIV.



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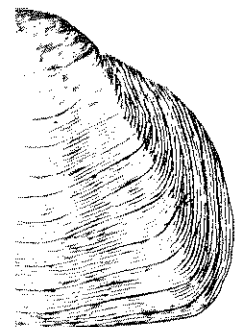
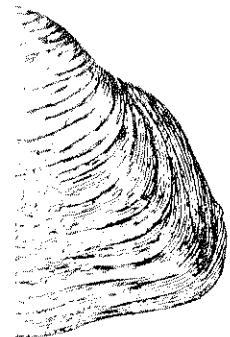
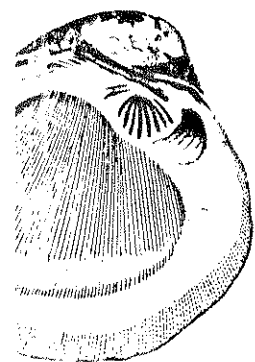


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UNDATA BARNES.

him in Paris and identified his collection and who had had apparently before him authentic examples of both *undatus* and *trigonus*, came to the same conclusion. He disregarded Lea's reference of *undatus* to *obliquus* Lam. and considered that species to be something quite different.

In 1849 the Western Academy of Natural Sciences of Cincinnati published a "Catalogue of the Unios, Alasmodontas and Anodontas of the Ohio River and its Northern Tributaries." It does not appear who compiled it. In this list *undatus* is recognized as a valid species with four synonyms; *i. e.*, *cardiacea* Say, *mytiloides* Raf., *obliqua* Lam, and *pyramidata* Lea. *Trigonus* is doubtfully referred to *flavus* Raf., of which *rubiginosus* Lea is considered a synonym.

Kuester (Conch. Cab. Unio, p. 58, pl. XIII, fig. 4, 1852) differs from every other writer in his disposition of the species. He considers it a white-nacred form of *Obovaria retusa* Lam. His figure represents a shell quite different from *undatus* in shape, with the surface heavily sulcate transversely. I have never seen anything like it and whatever else it may be, it certainly is not the *undatus* of Barnes. I have been unable to find any reference to this figure in Simpson's Synopsis.

In 1853 Conrad (Pr. A. N. S. Phila. VI, pp. 243-269) published an elaborate "Synopsis" of the Naides. In this, *undatus* and *trigonus* are recognized as distinct species and in a note the author gives what he considers the distinguishing characters of each. He emphatically repudiates the reference of *undatus* to Lamarck's *obliquus*, which he considers has priority over one of Lea's species.

This was the last revolt against the arrangement adopted by Dr. Lea in 1833.

After this time the preponderating influence of Dr. Lea in determining the nomenclature of the North American *Unionidæ* was sufficient to impress his opinion as to the standing of Dr. Barnes' species upon collectors, and the name practically disappears from the literature except as a synonym of *obliquus* Lam.

Simpson in his recent Synopsis (1900) follows Lea in his disposition of the species.

## I.

What is the *Unio undatus* of Barnes?

There is no real difficulty in determining this question, if due con-

sideration is given to the original description and figure. It is without doubt one of the most common species in the upper Mississippi and Ohio drainage systems and is commonly known as *Quadrula trigona* Lea.

Barnes's description is very accurate and his figures (Pl. I, figs. 1 & 2) though rude are quite recognizable. As the final determination of the standing of his species must rest upon them, and the publication in which they appeared is out of date and not easily obtained, both are here reproduced, so that they may speak for themselves. In drawing his description, Barnes followed the prevalent error of the day and reversed the ends of the shell, calling the anterior extremity the posterior and *vice versa*. I have therefore interpolated the proper corrections in this particular in parentheses. The italics are as in the original.

#### UNIO UNDATUS.

Shell subtriangular, sub-longitudinal, very tumid, waved; lateral teeth, *two* in each valve.

*Unio obliqua?* M. Lamarck.

Hab. Wisconsin and Fox Rivers. Mr. Schoolcraft.

Diam. 1.5. Length 2.1. Breadth 2.2.

Shell thick, disks swelled behind (before), depressed before (behind), anterior (posterior) side slightly produced, rapidly narrowed, angulated; beaks projecting backward (forward) nearly as far as the posterior (anterior) side, elevated and recurved, with the ligament passing between them; anterior (posterior) lunule long heart-shaped and separated by a slightly elevated heel; hinge margin depressed between the beaks; basal margin waved and rounded behind (before), compressed in the middle, angulated before (behind); epidermis horn-color exhibiting a light yellowish-green where the surface is worn or rubbed, wrinkled and finely striated transversely, surface glabrous. Cardinal teeth deeply sulcated and crenated; lateral teeth *two in each valve*; internal or lower one of the left valve small, but distinct and elevated, and both marked with fine dotted striæ. *Muscular impressions* deep, posterior one rough. Naker pearly white.

*Remarks.* This shell, as will be seen by its dimensions, has a more globose form than perhaps any other *Unio*. It will stand erect

on the posterior (anterior) side, and has a pyramidal appearance.

For comparison with fig. 3) a topotype from the same locality, the dimensions of which are given in the following comparative measurements, are as follows:

Barnes's type: Length 53.

My shell: Length 53.

To be of exactly the same size, the shell I have figured should have

Length, 53, height 56.

That is, the shell figured is proportionately

smaller in diameter than it should be. The difference is really to

be corrected. In all other respects, the description and, making due allowance,

agrees substantially with his figure. I have figured that the shell I have figured is Barnes's.

Is *U. undatus* Bar. = *U.*

If the foregoing identification is clear that *undatus* is not a species universally accepted as *undatus* I have figured with *undatus* I have figured now known as *obliquus*, Lamarck's type.

A comparison of this shell with the monstration to show that

What species Lamarck's *obliquus* is by no means

His original description

"*U. testa sublongitudinalis candida; ligamento subdilatato. \* \* \* Habite la riviere precedente (ligamentina) p*

on the posterior (anterior) side, and in this position has something of a pyramidal appearance.

For comparison with the author's figures I have figured (Pl. I, fig. 3) a toptype from the Fox River, Illinois, the proportionate dimensions of which are almost precisely those given by Barnes. The comparative measurements, translating Barnes's figures into millimeters, are as follows:

Barnes's type: Length 55, height 52.5, diam. 37.5 mm.

My shell: Length 53, height 51, diam. 34 mm.

To be of exactly the same proportions as Barnes's shell, the one I have figured should have the following dimensions:

Length, 53, height 50.7, diam. 36.14.

That is, the shell figured, as compared with the dimensions of the type, is proportionately .8 mm. greater in height and 2.14 mm. less in diameter than it should be to conform exactly with the type. But the difference is really too small to amount to anything.

In all other respects, the specimen corresponds with Barnes's description and, making due allowance for the crude drawing, agrees substantially with his figure. I think that there can be no doubt but that the shell I have figured is a typical example of the *undatus* of Barnes.

## II.

Is *U. undatus* Bar. = *U. obliquus* Lam.?

If the foregoing identification of Barnes's species is correct, it is clear that *undatus* is not the same as the species, which is to-day universally accepted as the *obliquus* of Lamarck. For comparison with *undatus* I have figured (Pl. II, fig. 3) a specimen of the species now known as *obliquus*, of substantially the same dimensions as Lamarck's type.

A comparison of this figure with those of Barnes needs no demonstration to show that the two forms are not the same species.

What species Lamarck really had before him when he described his *obliquus* is by no means free from doubt.

His original description is as follows:

"*U. testa sublongitudinali, ovato-rotundata, obliqua, sub-epiderme candida; ligamento subduplici; dente cardinali crasso, sulcato, bipartito.* \* \* \* *Habite la riviere de l'Ohio. A. Michaud. Distincte de la précédente (ligamentina) par sa forme: elle est renflée vers les crochets,*

*déprimée vers l'autre extrémité, bisillonnée sur le côté antérieur. Longueur apparente, 61 millimètres."*

This description taken by itself is too imperfect to be recognizable. Dr. Lea himself so declared in 1829 (Obs. I p. 36) and consequently omitted it entirely from his Synopsis of that date.

Prior to Dr. Lea's visit to Paris in 1832, owing to the indefinite character of Lamarck's descriptions, there was great uncertainty and considerable diversity of opinion among American conchologists in regard to nearly all of his species. And it was no doubt owing to that fact, that Barnes, in describing his *undatus*, intimated that it might be the *obliquus* of Lamarck. Dr. Lea never figured or described *obliquus*. But there can be no doubt but that the well-known species, which for the last fifty years at least has been called by that name, was determined by him as being the Lamarckian species.

But his decision did not meet with universal acceptance.

Ferussac in 1837 (*loc. cit.*), in whose possession were many of Lamarck's types, and who no doubt had access to the type of *obliquus*, which was then in the museum in the Garden of Plants at Paris, and after Dr. Lea had spent eight mornings critically examining and identifying his collection of American *Unionidæ*, believed that Lamarck's *obliquus* was the species described by Lea as *ebenus*.

And Conrad in his "Synopsis" of 1853 held the same opinion, remarking that "Lamarck's description is wholly inapplicable to *undatus*, which is not oblique, and certainly not "*ovate-rotundate*."

What Lamarck's *obliquus* really is, can probably be only determined by a critical re-examination of the original type, if it is still in existence.

But whatever it may be, it is certain that if the current acceptance of *obliquus* is correct, then it is clear that Lea's reference of *undatus* to it was erroneous. On the other hand, if Lee was right in his determination, then it is equally certain that the species now known as *Quadrula obliqua* cannot bear that name.

What it should be called in that case is "another story" as Kipling would say and may well be held in abeyance until we know what Lamarck's *obliquus* really is. And until that is definitely determined, it is, no doubt, the better part to consider the shell we call *obliquus* to be Lamarck's species and for the time being to deal with Barnes's species on that basis.

(To be continued.)

#### BOSTON MALACOL

A few persons interested in the subject on the evening of Washington's birth at his home in Jamaica Plain. Plans for organizing was called. As a result, Boston, adopted a constitution, and Mr. Francis M. Dent; Rev. Henry W. Winkley, of Salem, President; Mr. Francis M. Dent; Rev. Henry W. Winkley, of Salem, President; Mr. Francis M. Dent; Rev. Henry W. Winkley, of Salem, President. Mr. John Ritchie, Jr., and Mr. John Ritchie, Jr., were elected to serve with the other officers.

At the April meeting, Professor Parr Whitfield, protesting against the multiplication of some interesting points for study, spoke on his recent visit to Washington, D. C., and showed specimens obtained by the "Albatross" at the National Museum on mollusks and gentlemen are now on the roll of members.

#### NOTES

Professor Robert Parr Whitfield, of Natural History, author of important papers on April 6, at the age of eighty-two.

A NEW SPECIES FOR THE UNITED STATES. Over of Date, S. D., has recently discovered a *Segmentina*, collected by him in the Coteau Hills, five miles north-east of Boston, very exactly with the description and sculpture and size, the largest specimens and I have no doubt as to their being new. Seven specimens sent show any in the collection.

A LARGE FOSSIL TRIVIA: Among the fossils obtained by Mr. Wm. F. Clapp, from the shales of Lake Flint, above Ft. Thompson, is a *pediculus* of an unusually large size.

and at the same time looking for pearls. They have some common names for certain kinds of mussels; and an official of button factories I met at Marietta, was kind enough to verify the names and to give some additional information.

"Mucket." *Lampsilis ligamentina*, also *orbiculata*.

"Pig-toe." *Quadrula obliqua*, and the whole group of approximately the same shape, also *subrotunda*, *vesopus*, etc.

"Warty pig-toe." *Q. cooperiana*, *pustulosa*, etc.

"Nigger-head." *Q. ebena*; sometimes also *Obovaria retusa*.

"Monkey face." *Q. metanoeira*.

"Butterfly." *Plagiola securis*.

"Pocketbook." *L. ventricosa*, also *capax*.

"Sand clam." or "Black sand clam." *L. recta*, occasionally also

*Unio gibbosus*.

"Lady's finger." *L. anodontooides*, no doubt also *fallaciosa*.

"Three-ridge washboard," or "Three-ridge," or "Washboard,"

*Q. undulata*, also *plicata*, and *multiplicata*.

"Razor-back," "Rudder-back," "Hatchet-back." *Proptera alata* (and, no doubt, *Symphyn. complanata*).

Some other large and common mussels may have common names, but I failed to find them out, e. g. *U. crassidens*, *Tritogonia*, *Q. lachrymosa*.

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#### ON THE VALIDITY OF UNIO UNDATUS BARNES.

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BY BRYANT WALKER.

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(Concluded from p. 10.)

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#### III.

Is *U. undatus* Bar. = *U. trigonus* Lea.

Lea's description of his *trigonus* is as follows:

"Shell subtriangular, inflated, nearly equilateral, depressed before the umbonial slope, angular behind; umbonial slope carinate; basal margin emarginate; substance of the shell thick, beaks prominent,

incised and slightly undulated at the tips; ligament short and thick; epidermis brown; rays obsolete: cardinal tooth large, elevated and widely cleft in the left valve and emerging from a pit in the right valve; lateral teeth thick and curved in a direction over the cardinal tooth; anterior and posterior cicatrices both distinct; dorsal cicatrices situated on the under part of the cardinal tooth; cavity of the beaks deep and angular; nacre pearly white and iridescent. Length 2.3; alt. .2; diam. 1.5 in."

It is to be noted that while this description is quite exactly in accord with the Ohio river species commonly called *trigonus*, the figure, while its dimensions are those given in the description, is not in strict accordance with its specifications nor with the shell as usually found. The shell as figured (Pl. II, fig. 1) would scarcely be called "subtriangular," but rather subquadrate; the beaks though prominent are not characteristic of the shell as it actually occurs and there is a decided emargination of the posterior slope, which is not mentioned at all in the description, and which, so far as my experience goes, does not occur in any form of *trigonus*. The figure, as it stands, would do better for a representation of the not uncommon quadrate form of *rubiginosus* than of *trigonus*.

It was probably on this account that the Western Academy of Natural Sciences, in their "Synopsis" of 1849, felt unable to determine exactly what *trigonus* was and doubtfully referred it to *flavus* Raf., of which they considered *rubiginosus* an unquestionable synonym.

Dr. Lea in his "Rectification" (Separate p. 6) speaks in the highest terms of the judicial attitude maintained by the Academy in the preparation of this list and of the impartiality with which they attempted to "render strict justice to every author."

It is to be noted in this connection that the figure of *U. pyramidatus* on Lea's plate is evidently exaggerated and out of proportion and that of *rubiginosus* in the same volume is even more so. It would therefore seem that the figure given cannot be confidently relied upon as an accurate representation either of the species or of the type.

But, however that may be, there is no real question as to what Lea's species is, although it does not appear to be a common one in the Ohio River. I have myself seen only one specimen, that figured (plate II, fig. 2). Of sixty specimens of the group recently submitted by Dr. V. Sterki for examination from the Ohio at Marietta and

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*pestulosa*, etc.

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O UNDATUS BARNES.

WALKER.

n p. 10.)

*U. trigonus* Lea.

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intended to be a representative series of the fauna of the river at the place, not a single specimen could be satisfactorily referred to "*trigona*." It would seem as though it did not extend up the river as far as that place.

It is unquestionable that the form I have identified as the *undatus* of Barnes has for the last half-century been uniformly considered to be the *trigonus* of Lea.

It is also true that prior to 1850, Lea's species was considered to be the same as Barnes's by a very large and respectable element among the conchologists of that time.

It is evident, also, that Dr. Lea had considerable difficulty in enforcing the adoption of his disposition of *undatus* (Syn. 4th, Ed., p. 38 n; Rectification 1st Ed. p. 15) at that time.

In considering the question *de novo* it must be admitted at once that the typical forms of the two "species" are not exactly the same.

Conrad in a note to his last Synopsis (1853), in which he considers the two forms to be distinct species states the difference aptly: it (*undatus*) "is much more ventricose anteriorly and over the umbra than *trigonus*; has more elevated beaks and is very inequilateral, whilst the latter is nearly equilateral." Dr. Lea remarks (Syn. 4th Ed. p. 38 n 3) that *trigonus* is always more angular on the umbonal slope and the undulations at the tip of the beaks differ."

This comparison does not apply to the true *undatus* of Barnes, but is correct in the first item when applied to *obliquus*, with which he considered Barnes's species to be synonymous. I have not been able to ascertain the beak characters of *obliqua* from the material at my disposal.

In considering Lea's conception of his species and whether he considered it to include the form believed to be the real *undatus* of Barnes, it may be of service to note his treatment of both species before and after his identification of *undatus* with *obliquus* in 1832.

In his original description of *trigonus* (Obs. I, p. 121) he remarks that his species belongs to the group of species which are known as *mytiloides* Raf. and has been considered a variety of that species, but that he believes that the group may be divided into four species, *mytiloides* Raf., *undatus* Bar., *pyramidatus* Lea, and *trigonus* Lea.

It is to be noted that this was before he had identified *undatus* with *obliquus*, but tends to show that he even then identified Barnes's species with the form, which he subsequently declared to be *obliquus*

Lea, which at original description (1832), read Dec. distinguishes it more elevated b

In his description 1840, he differs as being more rounded and being higher than *obliquus*.

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It is curious to ignore *obliquus*

But after that Rectification and Syn

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Lam., which at that time he had been unable to identify from the original description. In his description of *Unio solidus* (Obs. II, p. 13), read Dec. 19, 1834, he compares that species with *undatus* and distinguishes it by "being more rounded at the basal margin, by its more elevated beaks and by its color."

In his description of *Unio planus* (Obs. III, p. 51), read Oct. 2, 1840, he differentiates that species from both *obliquus* and *trigonus* as being more rounded at the base, the emargination being very small and being higher in the beaks than *trigonus* and more flattened there than *obliquus*.

In the same paper he remarks (p. 54) that his *dolabelloides* stands between *undatus* and *cor*.

It is curious to note that as late as Feb. 19, 1841, he seems still to ignore *obliquus* on occasion and to use *undatus* (Obs. III, p. 69).

But after that date, *undatus* is not referred to except in his Rectification and Synopses.

In his description of *Unio tumescens* (Obs. iv, p. 45), read May 2, 1845, he says that that species is allied to *trigonus*, but differs in being more rounded and in having rays. The comparison is certainly not a very apt one to say the least.

In his description of *Unio chunii* (Obs. ix, p. 18), read June 3, 1862, he states that this species is closely allied to *trigonus*, but may be distinguished by being more lenticular in form and in not having so sharp an umbonial slope. The undulations of the beaks of that species, however, are few, as in *trigonus*, and follow down the angle of the umbonial slope. In the same paper (p. 21) in his description of *Unio riddellii*, he remarks that that species belongs to the group of which *trigonus* may be considered the type, but differs in being rounded, even more inflated and in the character of the undulations, which are "remarkably close," while in *trigonus* they are few and follow down the angle of the umbonial slope for a short distance."

It is evident from these comparative remarks that, in Lea's mind, *trigonus* was a shell with prominent beaks, though less so than in *solidus* and *plenus*, with a rather wide basal emargination, a sharp umbonial angle, and having the beak's undulations few and following down the umbonial angle for a short distance.

These specifications apply accurately to the shell above identified as *undatus* Barnes, and do not apply to any other *Quadrula* of the Ohio drainage.

Of the fourteen species included in the "*trigona* group" by Simpson in his excellent arrangement, seven are found in the Ohio River, viz.:

<i>Q. rubiginosa.</i>	<i>Q. coccinea.</i>
<i>Q. trigona.</i>	<i>Q. solida.</i>
<i>Q. obliqua</i>	<i>Q. plena.</i>
<i>Q. pyramidata.</i>	

Of these *coccinea* is quite different from any of the others, and possibly does not belong to the genus at all. (Ortmann, Naut. XXII, p. 10.) At any rate it is so entirely distinct from *trigona*, *undata* and *obliqua* that it may be dismissed from further consideration in this connection. The remaining species may be separated into two very natural groups by a characteristic difference in the form and position of the pseudo-cardinals. In his description of *trigonus*, Dr. Lea states that the "cardinal (is) large, elevated and widely cleft in the left valve and emerges from a pit in the right valve." This is absolutely correct and is one of the most characteristic specific details.

The pseudo-cardinal of the left valve is composed of two deltoid teeth separated by a deep, triangular cavity for the reception of the pseudo-cardinal of the right valve. At their upper extremity they meet and in most cases are completely fused together so that they might well be termed a single "widely cleft tooth" rather than distinct teeth. The anterior tooth is high and sharply beveled upwards to a narrow, nearly rectilinear edge, which is nearly parallel with the lower margin of the lunule. The cavity between them is deep and comparatively narrow and extends obliquely backward and upward until terminated by the fused extremities of the pseudo-cardinals. The pseudo-cardinal in the right valve is triangular in shape, with a sharp apex directed toward the beak. The posterior side is short and nearly straight up and down; the anterior side is much longer and more oblique. On both sides are deep cavities for the reception of the pseudo-cardinals of the left valve, and owing to the fusing of the upper extremities of these teeth these cavities are continued entirely around the pseudo-cardinal, which consequently appears to be "emerging from a pit."

The space between the pseudo-cardinal and lateral teeth ("inter-dentum") is comparatively narrow. This is clearly shown on both Barnes's and Lea's figures. This arrangement of the pseudo-car-

dinals is also characteristic of the species above the pseudo-cardinal.

Taking *obliqua* as a type, the posterior pseudo-cardinal is triangular in shape, not directly upward but bends around the opposing pseudo-cardinal, extends obliquely to the corner, and is almost triangular in shape. The valve is broadly triangular, about equal. It is lower in front of the beak than in the *trigona*.

The whole effect is subparallel and the angle under the *trigona* group is decidedly under.

This arrangement affects the external appearance on occasion for mistake shell belongs.

It would seem correct in founding the *undata* group about *obliqua* and that its allies may be distinguished.

If this be conceded, the *undata* is identical with *undata* either. That the *rubiginosus* does not differ from the two species by no doubt by the unc.

*Rubiginosus* is wedge-shaped or subquadrate and which are less incurved angle on the posterior.

The possibility that the *undata* is identical may be con-

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o-cardinal and lateral teeth ("inter-  
row. This is clearly shown on both  
his arrangement of the pseudo-car-

dinals is also characteristic of *rubiginosus*. In the remaining four of  
the species above mentioned, the character and relative position of  
the pseudo-cardinals are quite different, and are similar in all.

Taking *obliqua* as an example, the interdentum is very broad.  
The posterior pseudo-cardinal of the left valve is low and broadly  
triangular in shape and the blunt apex points obliquely forward and  
not directly upward; the anterior pseudo-cardinal is very low and  
bends around the broad and comparatively shallow socket for the  
opposing pseudo-cardinal. This socket is almost quadrate in shape,  
extends obliquely forward and a line from the upper to the lower  
corner is almost perpendicular. The pseudo-cardinal of the right  
valve is broadly triangular, and the anterior and posterior sides are  
about equal. It is surrounded above by a "pit" which is very shall-  
ow in front of the tooth and longer and shallower behind the tooth  
than in the *trigonus* group, triangular in shape and quite oblique.

The whole effect of the hinge in this group is that all the teeth are  
subparallel and project obliquely backwards from the beak; while in  
the *trigona* group the pseudo-cardinal and lateral teeth met at a de-  
cided angle under the beak.

This arrangement of the hinge in *obliqua* and its allies sensibly  
affects the external form of the shell, so that there is seldom any  
occasion for mistaking to which of the two groups any particular  
shell belongs.

It would seem clear, therefore, that there is no occasion for con-  
founding the *undatus* of Barnes with any of the four species grouping  
about *obliqua* and that in seeking to identify that species, *obliqua* and  
its allies may be dismissed from further consideration.

If this be conceded, then it follows that Lea's *trigonus* is either  
identical with *undatus* or *rubiginosus* or is a distinct species from  
either. That the *trigonus* of Lea is specifically distinct from his  
*rubiginosus* does not require argument in spite of the tentative union  
of the two species by the Western Academy of Nat. Sciences caused  
no doubt by the uncharacteristic figure given by Lea of his type.

*Rubiginosus* is well characterized by its more broadly triangular  
or subquadrate and more compressed shape and less prominent beaks,  
which are less incurved at the tips, and the lack of the pronounced  
angle on the posterior ridge.

The possibility that *trigonus* and *rubiginosus* can be specifically  
identical may be consequently most emphatically answered in the

negative. It follows therefore that *trigonus* is identical with *undatus* or is a distinct species.

In considering this question, it is to be borne in mind that nearly all of our *Unionidæ* are subject to a large amount of variation and that the wider the range of a species, the greater the amount of variation it exhibits under the influences of diverse conditions of local environment.

*Trigonus* (using the term in its broad, current acceptation and not confining it to the form of Lea's type) has a very extensive range.

In the Mississippi Valley from Minnesota (Grant) south to Arkansas (Call) and northern Louisiana (Frierson); in the Ohio drainage it ranges east through Ohio (Sterki) but apparently does not extend into Pennsylvania (Ortmann) nor southwestern N. Y. (Marshall); through the ancient post-glacial connections of Lake Michigan with the Mississippi and Lake Erie with the Ohio, it has invaded the St. Lawrence system and is found in the lake drainage of Wisconsin, Illinois and southern Michigan, whence it ranges east as far as Buffalo, N. Y. (Marshall) and Port Dover, Ont. (Whiteaves), but does not appear in the valley of the Ottawa (Latchford); in Kentucky it has been recorded from the Barren River (Walker) and Warren Co. (Price) in the Ohio drainage; apparently it does not occur in the Tennessee drainage area at all; but, curiously enough it reappears in the Alabama system where it is usually, but erroneously, called *chunii* Lea.

Through Texas, southern Louisiana and Mississippi, the *trigona* group is represented by a number of "species," whose relations with each other and with *trigona* are uncertain, and can only be definitely determined by a much larger amount of material than is apparently accessible at the present time. *Trigona* as such, so far as I have been able to ascertain, has not been listed from any of those States except northern Louisiana.

While *trigona*, commonly so-called, throughout this enormous extent of territory sustains its specific identity sufficiently to be recognized in most cases without difficulty, yet, as might be expected, it exhibits in different parts of its range a considerable amount of variation.

Thus in the Mississippi, Illinois and Fox rivers, the high triangular form, which I have identified with *undatus*, is the prevalent phase; in the Ohio a more equilateral form (typical *trigona*) occurs

and similar shells are before Wis., and the Mississippi, Kaskia and Spoon rivers, is found, which apparently. The Alabama form is close to the northern species, that has retained their specific identity resembles a half-grown specimen of the species.

But taking the series throughout, which is completely separates it as a whole from And in this assemblage a intermediates are the *undatus*

If, in addition to what I needed to prove the identity of the specific characters, the original descriptions will be comparing their specific identity.

#### *Undatus.*

- Subtriangular.
- Disks swelled before, depressed behind, posterior side produced, rapidly narrowed, angulated.
- Basal margin waved.
- Shell thick.
- Beaks elevated, recurved, projecting forwards nearly as the anterior side.
- Ligament passing between beaks.
- Epidermis horn-colored, wavy and finely striated transverse surface glabrous.
- Cardinal teeth deeply serrated and crenated.

*trigonus* is identical with *undatus*.

to be borne in mind that nearly large amount of variation and sizes, the greater the amount of differences of diverse conditions of

and, current acception and not) has a very extensive range.

Minnesota (Grant) south to Arkansas (Prierson); in the Ohio drainage (Litchford) but apparently does not extend southward N. Y. (Marshall) connections of Lake Michigan with the Ohio, it has invaded and in the lake drainage of Wisconsin, whence it ranges east as far as Port Dover, Ont. (Whiteaves), the Ottawa (Litchford); in Kentucky the Barren River (Walker) and drainage; apparently it does not reach at all; but, curiously enough, where it is usually, but erroneously

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ed, throughout this enormous extent identity sufficiently to be recognized, yet, as might be expected, it shows a considerable amount of variation

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and similar shells are before me from the Wisconsin river, Sauk Co., Wis., and the Mississippi River at Davenport, Ia.; while in the Kaskaskia and Spoon rivers, Ills., a shell more broadly triangular in form is found, which apparently represents the extreme in that direction. The Alabama form is closer to typical *undatus*, but like many of the northern species, that have obtained a foothold in that system and retained their specific identity, is apparently uniformly smaller and resembles a half-grown example of the common Mississippi expression of the species.

But taking the series thus specified as a whole, it exhibits a similarity throughout, which is congruous only with specific identity and which separates it as a whole from union with any other described species. And in this assemblage and united by a series of unmistakable intermediates are the *undatus* of Barnes and the *trigonus* of Lea.

If, in addition to what has already been said, anything further is needed to prove the identity of the two forms, the following comparison of the specific characters of the two species as given in the original descriptions will show that there is no ground for questioning their specific identity.

*Undatus.*

Subtriangular.  
Disks swelled before, depressed behind, posterior side slightly produced, rapidly narrowed, angulated.  
Basal margin waved.  
Shell thick.  
Beaks elevated, recurved, projecting forwards nearly as far as the anterior side.  
Ligament passing between the beaks.  
Epidermis horn-colored, wrinkled and finely striated transversely, surface glabrous.  
Cardinal teeth deeply sulcated and crenated.

*Trigonus.*

Subtriangular, nearly equilateral.  
Inflated, depressed before the umbonal slope, angular behind, umbonal slope carinated.  
Basal margin emarginate.  
Substance of shell thick.  
Beaks prominent, incurved.  
Ligament short and thick.  
Epidermis brown, rays obsolete.  
Cardinal tooth in the left valve large, elevated and widely cleft.

Lateral teeth two in each valve.	Lateral teeth thick and curved in a direction over the cardinal tooth.
Muscular impression deep, posterior one rough.	Anterior and posterior cicatrices both distinct.
Nacre pearly-white.	Nacre pearly-white and iridescent.
Length 2.2. in.	Length 2.3 in.
Alt. 2.1 in.	Alt. 2.0 in.
Diam. 1.5 in.	Diam. 1.5 in.

If then, our contention is correct as to the absolute specific identity of the two species, priority must be given to Barnes's name and the synonymy must be written as follows:

QUADRULA UNDATA (Barnes).

1823, *Unio undatus* Barnes, Am. J1. Sci. VI, p. 121, pl. IV, fig. 4.  
1831, *Unio trigonus* Lea, Tr. Am. Phil. Soc. IV, p. 110, pl. XVI, fig. 40.

EXPLANATION OF PLATES I AND II.

- Pl. I fig. 1. *Q. undata*, Facsimile of one of Barnes's figures.  
Pl. I fig. 2. Copy of Barnes's other figure.  
Pl. I fig. 3. *Q. undata*, Fox River, Ill. (original).  
Pl. II fig. 1. Facsimile of Lea's figure of *Unio trigonus*.  
Pl. II fig. 2. *Q. trigona* Lea, Ohio River (original).  
Pl. II fig. 3. *Q. obliqua* Lam. Paint Rock River, Jackson Co., Ala. (original).

NOTES.

THREE SHELLS NOT HITHERTO REPORTED FROM THE DISTRICT OF COLUMBIA.—Recent collecting has added the following hitherto unreported shells to the fauna of the District of Columbia or its environs: *Polygyra palliata* Say (on the Virginia side of the Potomac near Great Falls); *Zonitoides milium* Morse, *Punctum pygmaeum* Drap.—G. DALLAS HANNA.

The albino *Oliva angulata*, noticed in the March number, has now found a home with the Academy of Science at Minneapolis, Minn.—A. L. HETTRICH.

# THE N

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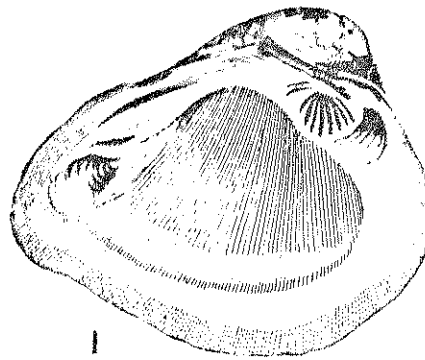
SHELL COLLECTING

BY DR. FRED

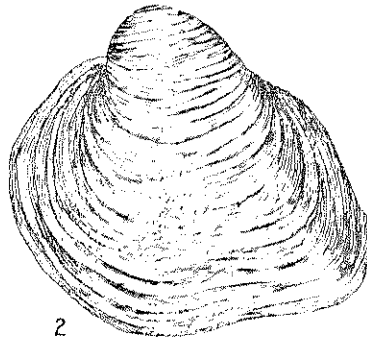
During the last summer I enjoyed an enjoyable trip to Seattle, where the Pacific Fair was in full swing at the Sound, where the Summer Session was in session; and on to Cook's Inlet. At all points of species and localities follow a grateful task to acknowledge the hands of Dr. W. H. Dall, Museum, and the Rev. Geo. ... Without their help this of the wanderings of a very a

The University of Washington institutions which join forces a group of islands in Puget Sound them which constitute the coronation,—and here my wife and best people on earth, as biologists trying the experiment of doing just in time to help them move on Orcas Island, thirteen miles

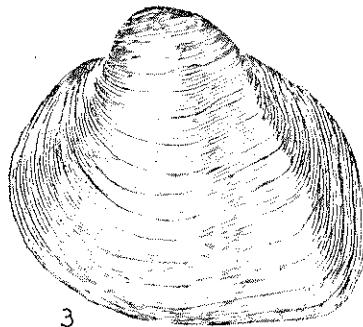
Orcas Island, the second largest able farming population, but in Constitution, 2660 feet high,



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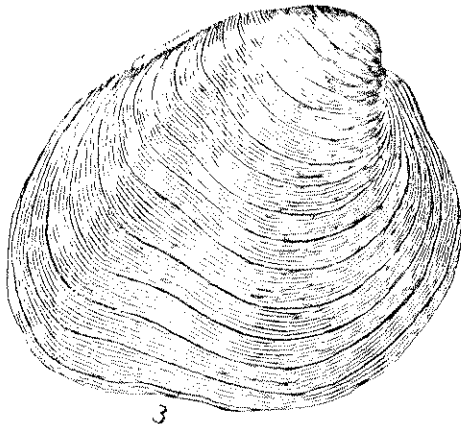
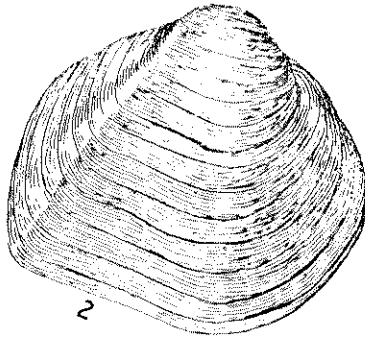
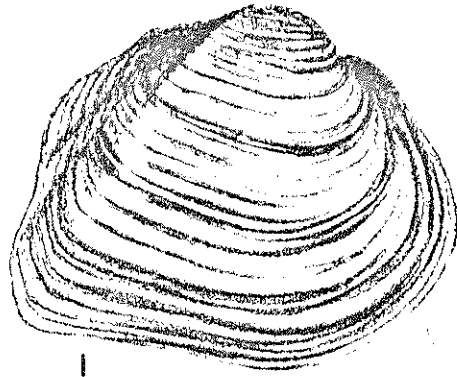
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