

have heretofore thrown them away as worthless. But, on careful examination and comparison, I am persuaded it is distinct from *Littorina*. The *entire* margin, and *perfectly circular* aperture bring it nearer to *Delphinula*, if, indeed, it is not a species of that genus. Although I have not had an opportunity to examine the animal inhabitant, nor even the opercle, I am constrained to separate it from *Littorina*, and place it under *Delphinula*, with a doubt, for the present.

ART. XXVIII. — MONOGRAPH OF THE SPECIES OF PUPA FOUND IN THE UNITED STATES: With FIGURES. By AUGUSTUS A. GOULD, M. D.

(Continued from Vol. III. p. 404.)

IN the preceding part of this paper I remarked, that there were two or three described species of the genus Pupa, which I had not then seen, or had failed to identify them with their descriptions. During the long interval which has since elapsed, through the kindness of my friends I have succeeded in obtaining all of them. These I shall now proceed to describe, and also to communicate such facts respecting the species previously noticed, as a more extended observation has disclosed.

PUPA OVATA.

Plate XVI. figs. 7, 8.

P. ovata, umbilicata, castanea; anfractibus quinque, convexis; apertura subcordata, dentibus 5 ad 9 lamellosis armata, quorum 1-3 posticè, duo ad columellam, 2-5 ad labium inflexum adnatis.

“Shell dextral, subovate, brown; apex obtuse; whorls five, glabrous; suture not very deeply impressed; body whorl indented near and upon the labrum; aperture semioval; labium five toothed, of which three are situate on the transverse portion of the lip, parallel to each other, equidistant, the superior and inferior ones being small, the latter sometimes obsolete, the intermediate one lamelliform, prominent, and the two other ones situate on the columella, approximate, extending

at right angles to the three preceding ones, the superior (inferior?) one oblique and smaller; labrum reflected but not flattened, bidentate, teeth lamelliform, prominent; umbilicus distinct.

Length less than $\frac{1}{10}$ inch, breadth nearly $\frac{1}{20}$ inch.

The smallest teeth of the labium are sometimes obsolete." (SAY, *Journ. Acad. Nat. Sc.* II. 375.) See also ADAMS, Catalogue of Mollusca, in *Thompson's Hist. of Vermont*, and *Silliman's Journ.* XL. p. 271.

An opportunity having been afforded for a careful examination of the authentic specimens of this species placed in the Cabinet of the Academy of Natural Sciences at Philadelphia by Mr. Say, and also of his *Pupa modesta*, the latter proves to be merely a specimen of *P. ovata*, with the lip somewhat fractured, by which the aperture has received a somewhat modified form (fig. 8); and this circumstance has been the source of no little embarrassment. Mr. Say's description is as follows:

P. modesta. "Shell suboval, minutely wrinkled; apex obtuse; whorls six; umbilicus distinct; aperture obliquely subovate; labrum with a prominent, compressed, semioval tooth, equidistant from the extremities of the labrum, and a somewhat conic one rather below the middle of the columella; labrum not inflected, joining the preceding whorl at its upper extremity with a curve, bidentate, lower tooth placed opposite to that of the middle of the labium, the other smaller and placed a little above. Length $\frac{3}{20}$ inch." (SAY, *Long's Second Expedition*, II. 260, pl. 15, fig. 5.) See also GOULD'S *Inverteb. of Massachusetts*, 188, fig. 119.

This species is constant in its external characters, but is somewhat variable in its aperture. It is seldom that three teeth are found on the transverse lip, the tooth on the left being almost always, and that on the right being frequently wanting. Sometimes there is a minute tooth at the base of the aperture, and sometimes a third tooth on the posterior part of the outer lip. It is more ventricose than any other American species, and of a darker color. It is shining, but distinctly marked with longitudinal wrinkles. The inflection

of the outer lip is such as to render the aperture heart-shaped, and the flexure extends to a considerable distance round towards the back of the shell. Its true dimensions are, length $\frac{1}{10}$ inch, breadth $\frac{1}{16}$ inch.

It lives in damp places, around the borders of ponds, or in rich, moist fields under fragments of board, sticks, &c. Mr. Say found his *ovata* in Pennsylvania and his *modesta* in the Northwest Territory. It is common about Boston, and I have received it from near Portsmouth, N. H., from Troy, N. Y., from Worcester County, Md., and from Jacksonsborough, S. C.; and Professor Adams found it near Middlebury, Vt., and Dr. J. W. Mighels near Portland, Me.

The animal is of a dark claret color above, lighter beneath; tentacles two, remarkably clavate or pestle-shaped; the front of the foot is trilobate, the central lobe being very small, and there is a constriction behind the two lateral ones.

PUPA GOULDII.

Pl. XVI. Fig. 9.

"Testâ minutâ, ovato-cylindricâ, sub-castaneâ; anfractibus pluribusquàm quatuor; apice obtuso; apertura subcordatâ, bilobatâ, dentibus quinque armatâ; labro subreflexo."

"Animal with two tentacles only, black above; foot gray, short posteriorly. Shell light chestnut, cylindrical ovate; whorls between four and five, rather ventricose, the last occupying nearly half the length of the axis; apex obtuse; aperture lateral, composed of two unequal curves, meeting in the centre of the outer lip, with five prominent white teeth, viz.: one upon the transverse margin, two upon the umbilical margin, and two upon the labial margin; lip thickened, not reflected; umbilicus a little open." (BINNEY, in *Proceedings of the Boston Soc. Nat. History*, p. 105, March 15, 1843.)

This very distinct species is unusually constant in its characters. Its shape may be more properly called elliptical. In size it is intermediate between *P. ovata* and *P. milium*, approaching more nearly to the latter in form and color. In adult specimens I have never found any variation in the num-

ber or situation of the teeth. At a little distance back of the outer lip, and answering to the two teeth within, are seen two indentations, showing that the parts within are folds rather than teeth; and this is very plainly seen to be the case in young specimens. Its length is about $\frac{1}{14}$ inch, breadth $\frac{1}{26}$ inch.

It was first sent to me by Dr. W. Newcomb, of Troy, N. Y., and subsequently by Prof. E. Foreman, from Baltimore and Worcester County, Md. Since then I have found it, in August, upon sticks and about the roots of trees in the woods in Cambridge and Roxbury. It seems to be abundant.

PUPA PENTODON.

Plate XVI. fig. 10. 11.

P. ovato-oblonga, albidâ, umbilicatâ; anfractibus quinque, convexis, apice subacuta; aperturâ obliquè semiovatâ, dentibus 5-8 instructâ, quorum 1-2 posticè, 2 ad columellam, 2-5 ad labrum positâ; labro expanso.

“Shell dextral, subovate, whitish horn-color; apex obtuse; whorls five, glabrous, convex; suture not very deeply impressed; aperture semioval; labrum two-toothed, of which a single very prominent one is on the middle of the transverse labium, and the other remote, much smaller, and placed on the basal angle of the columella; labrum regularly arcuated, tridentate, tooth nearest the base very small and placed near the smaller tooth of the columella; the two others larger, subequal; umbilicus distinct. Length less than $\frac{1}{10}$ inch.

Lower tooth of the labrum sometimes obsolete.

Animal, foot white, head and neck, as far as the mantle, black.” (SAY, *Journ. Acad. Nat. Sc.* II. 376.)

This is the most variable of all our species. While there is no doubt as to this being the shell intended by Mr. Say as his *péntodon*, it is unfortunate that he should have selected so inappropriate a name, inasmuch as the shell is never found with five teeth except in an immature state, when the number is even reduced to four. It is nevertheless true that five of the teeth are constant, viz.: one upon the transverse lip, two on the columella and two on the outer lip. Then there is

sometimes an additional small one on the transverse lip, to the left of the constant one; and the teeth on the outer lip vary in many ways, as may be best exhibited by the following table of varieties which I have observed, intended to represent the teeth in succession as they occur, beginning at the outer posterior angle and going round to the left.

1	1	1	1	0	1	0	1	0	1	0
1	1	1	1	0	0	0	1	0	1	0
1	1	1	1	0	1	0	1	0	1	1
1	0	1	1	1	1	1	1	0	1	0
1	0	1	1	0	1	0	1	1	1	1
1	0	1	1	0	1	0	1	0	1	0
1	0	1	1	0	0	0	1	0	1	0

By this table it appears that there may be as many as even eleven teeth, though I have never seen more than eight on one individual. Of the two teeth which are shown by this table to be constant on the outer lip, the largest is situated nearly opposite the tooth on the transverse lip, and the other less than half the distance between it and the posterior angle. Such remarkable deviations have led to the proposal of two new species which may with propriety be noticed, and may be considered as the two extremes of the varieties, viz.:

P. Tappaniàna, ADAMS, a name adopted by him from the manuscripts of the late Dr. Ward of Roscoe, Ohio, and described in a supplementary sheet to the 40th volume of Silliman's Journal, and afterwards in Thompson's History of Vermont. The finest examples of the species come under this variety. They are such as occur in Ohio, of a very light color, quite translucent, without epidermis, and with the lip distinct and white. It is $\frac{3}{40}$ inch in length, and about half as broad, fig. 10.

P. carvidens, GOULD, (*Inverteb. of Massachusetts*, 189, fig. 120) is about one seventh smaller, has a very thin, greenish epidermis, and generally eight teeth, and the large one on the transverse lip decidedly curved to the left, (fig. 11.) Such are specimens usually found in Massachusetts; and though in size, exterior, and armature they are so different from the

Ohio specimens, yet as I have seen so many intervening varieties, I think this form should be abandoned as a species.

Notwithstanding all these discrepancies, there is a certain aspect about the shell which enables one to distinguish it without much difficulty. Its ovate form, its very small aperture, with the transverse portion so oblique that the inner lip is very short in proportion to the outer one, will serve to determine the species with a very small magnifying power.

Mr. Say found his specimens in Pennsylvania ; it is not infrequent in the vicinity of Boston, under fallen leaves in shady woods ; Professor Adams found it near Middlebury, Vt. ; Dr. Newcomb found it near Troy, N. Y. ; it is one of the most common species in Ohio, and has been sent me by Dr. Foreman from near Baltimore, and from Jacksonborough, S. C. Thus, with the exception of *P. contrácta* it has been observed over a wider region than any other species.

PUPA RUPICOLA.

Plate XVI. fig. 13.

P. ovato-conica, glabra, albida, umbilicata ; apice subacutà ; anfractibus sex convexis : aperturà obliquà, semi-ellipticà, dentibus quinque lamellosis armatà, quorum unus posticè, duo ad columellam, duo ad labium expansum dispositi.

“Shell dextral, attenuated to an acute apex, white ; suture deeply impressed ; labrum bidentate, superior tooth lamellar, emarginate in the middle, and at the anterior tip uniting with the superior termination of the labrum ; inferior tooth placed on the columella, and extending nearly at a right angle with the preceding ; labrum tridentate, teeth placed somewhat alternately with those of the labium ; inferior tooth situated at the base and immediately beneath the inferior tooth of the labium. Length $\frac{1}{10}$ inch.”

About the size of *P. corticària*, and considerably resembles that species, but is sufficiently distinguished by the circumstance of its gradually decreasing in diameter from the body whorl to its tip, and in the character of the mouth it is widely distinct. (SAY, *Journ. Acad. Nat. Sc.* II. 163.)

Found by Mr. Say in Florida, and sent to me by Dr. Ravenel from Charleston, S. C., and by Dr. Foreman from Jacksonborough and Manchester, S. C., and from Savannah and Whitmarsh's Island, Georgia. It seems to be a southern species; and although I have very often received shells from Ohio under this name, yet no one of them has actually proved to be this species.

I have met with little or no variety in this species, and the above description can scarcely be amended, except to say that the teeth are compressed, and protracted for a considerable distance within the aperture. The place of the two teeth or folds on the outer lip is marked externally by two prolonged indentations. The distinctive marks between this species and *P. corticària* are clearly given; but it has a much closer resemblance, in its armature especially, to *P. prócera*. It is, however, distinguished by its less cylindrical form, its lighter color, its smoother surface, its white instead of brown lip; the tooth on the transverse lip is less twisted, and that which is at the base is not so remote or so transverse in position. Its spire is also at least half a whorl shorter.

PUPA SERVILIS.

Plate XVI. fig. 14.

Testa ovato-elongatà, glabra, rufescens, umbilicatà; anfractibus quinque convexis; apertura semi-elliptica, dentibus quinque armata, quorum unus contortus posticè, unus ad basin, duo ad labium affixi; labro reflexo.

Shell elongated; tapering to a somewhat acute apex, of a pale chestnut or horn color; whorls five and sometimes somewhat more, very delicately wrinkled; suture well defined. Aperture semi-oval, nearly in the axis of the shell, the transverse portion slightly oblique, and the two extremities of the lip very nearly meeting behind. Revolving under the middle of the transverse lip is a contorted, lamellar tooth which arises near the junction of the outer lip; on the middle of the columella is a large conical tooth; at the base is a small tooth, then a third large tooth, placed so as to form a regular tripod

with the other two, and above this is a fifth inconspicuous tooth. Lip slightly everted, not flattened, sometimes a little inflected at the right, umbilicus small. Length, $\frac{1}{10}$ breadth $\frac{1}{20}$ inch.

At first sight this species would be referred either to *P. rupicola* or *P. prócera*. But a closer examination shows that while it has the pale brown lip of the latter, it is a shorter and much more ventricose shell; and while the number and arrangement of the teeth are as in *rupicola*, the latter has a much more slender form, the aperture is more oblique and less elongated, the apex is obtuse, and the lip is white.

Notwithstanding the distinctions mentioned above, perhaps most observers, on ordinary inspection, would maintain that these three were merely local varieties of the same species. I will add, therefore, that by means of an excellent microscope, to which a camera lucida is attached, I have made accurate figures three inches in length, which render the differences in form unequivocal.

Found at Santa Cruz by Dr. R. E. Griffiths, and near Matanzas by John Bartlett, Esq.

I have inserted this species here, although it cannot strictly be considered as belonging to the United States, because of its proximity to the States, and more especially because it helps to illustrate two of our species.

PUPA FALLAX.

Plate XVI. fig. 15.

P. turrita, glabra, pallidé castaneâ, umbilicata; anfractibus sex convexis; apertura obliqua, subrotundata, edentula; labro albo, valdè reflexo, striato.

“*Cyclostoma marginata*. Shell turreted, pale horn color or dusky, obsoletely wrinkled across; suture rather deeply impressed; volutions six; aperture suboval, truncate transversely above by the penultimate whorl, nearly one third the length of the shell; labium nearly transverse, color of the exterior part of the shell; labrum equally and widely reflected, thick, white; umbilicus distinct. Length $\frac{1}{8}$ inch.” (SAY, *Journ. Acad. Nat. Sc.* II. 172.)

This shell is clearly not a *Cyclostoma*, and on that account, as Mr. Say suggests, the specific name must be changed. As the shell afterwards described by him under the name of *Pupa fallax* (*Journ. Acad. Nat. Sc.* V. 121.) is only a finely developed shell of this species, that name may well be retained for the species. It was therefore adopted in the Report on the Invertebrata of Massachusetts, p. 192, fig. 123. Professor Adams also applied to it the specific term *albilabris*, in Silliman's Journal, XL. 271, and in his Catalogue of the Mollusca of Vermont in Thompson's History, a name suggested by the late Dr. Ward. Some doubt still remains as to whether it belongs to the genus *Pupa*, or to *Bulimus*, as the animal has not been described.

This shell is so well known as to require no more particular illustration. The lip, however, is not often equally reflected, but is much narrowed near the junction of the outer portion with the body whorl. There are also two or three deeply cut lines running parallel and near to its margin.

Mr. Say found his specimens in the North-West Territory, and it is not uncommon in Massachusetts, Vermont, New York, Maryland and South Carolina.

Its foreign analogue is *P. umbilicata*, Drap.

Having recently had an opportunity, by means of one of Chevalier's large microscopes, of tracing off greatly enlarged figures of these minute shells, with great accuracy, I will now review the species described in the former part of this paper, and notice those points which were inaccurately stated, or which need further illustration, and add such further information as I may have since obtained respecting them.

P. CORTICARIA. The single tooth which Mr. Say describes as being on the pillar lip, should read on the transverse lip, to correspond with his subsequent descriptions of species. In the figure (Vol. III. pl. 3, fig. 19,) the body whorl is represented too long. I have received it from Worcester county, Maryland.

P. EXIGUA. In the figure of this shell (Vol. III. pl. 3, fig. 20,) the body whorl is represented proportionally too large.

Its length is .08 inch. The only additional locality from which I have received it is Troy, N. Y.

The animal is colorless, and has only two tentaculæ developed, which are stout, hyaline, about one third as long as the foot. See *Rep. on the Invertebrata of Mass.*, 191, fig. 122.

P. CONTRACTA. The aperture, in Vol. III. fig. 22, should be placed much farther to the right. It is probably common in all the States, as I have received specimens from the Island of Cuba. Found about rotten stumps or under stones in moist pastures. See *Invertebrata of Mass.* 186, fig. 117, and ADAMS, in *Thompson's Hist. of Vermont.*

P. MILIUM. The teeth on the outer lip are more properly folds, as indicated by the two elongated indentations on the exterior of the shell corresponding to them. I have a specimen from Mr. Anthony which he received from Louisiana. See GOULD, *Invertebrata of Mass.* 187, fig. 118. ADAMS, in *Silliman's Journ.* Vol. XL. 270, and *Thompson's Hist. of Vermont.*

P. PROCERA. Both the description and figure of this species are so incorrect that I reproduce an accurate figure, (fig. 12.) Its peculiar characters have been noticed under *P. rupicola*. It has not yet been sent me from any other locality than the vicinity of Baltimore.

On the cover of the Society's Journal, Vol. IV. No. 1, I indicated a species by the name of *P. carinata* which I supposed to be new. But the examination of another specimen has satisfied me that it was merely an immature or a fractured specimen of *P. procera*.

P. ARMIFERA. Professor Adams has found this species plentifully at Crown Point, and some other places near Lake Champlain. I have also received it from Maryland. See also ADAMS, *Catalogue of Mollusca* in *Thompson's Hist. of Vermont.*

P. SIMPLEX. Very few of these shells have as yet been found, and none, that I know of, in any other except the original locality. They are enough, however, to establish the validity of the species.

P. BADIA has been found by Dr. Newcomb near Troy, N. Y. See also ADAMS, *Catalogue of Mollusca in Thompson's Hist. of Vermont*.

Thus there are at present known, in the United States, thirteen species of this genus. They are remarkable, as compared with those found in other countries, for their minuteness; the two largest species, *armifera* and *badia*, scarcely exceeding in size the smallest of the European species. It is also singular that no species of the allied genus *Clausilia*, so abundant in Europe and Asia, should have been found, as yet, on the North American continent; and indeed I am not aware that any shell possessing a true *clausium* has been found in any part of America.

ART. XXIX.—DESCRIPTIONS OF TWO UNDESCRIBED SPECIES OF NORTH AMERICAN HELICES. BY AMOS BINNEY.

HELIX TUDICULATA.

Plate XX.

H. testâ orbiculato-convexâ, imperforatâ, rufo-olivaceâ, fasciâ unicâ castaneâ cinctâ, et impressionibus squamatis undique signatâ; aperturâ transversâ; labro al-bido, sub-reflexo; basi convexâ.

DESCRIPTION.

Animal. Not observed.

Shell. Orbiculate-convex; epidermis olivaceous; spire a depressed cone; whorls between five and six, slightly convex; body-whorl voluminous, expanding somewhat towards the aperture; aperture transverse, rather circular; lip whitish, slightly reflected; umbilicus covered by a testaceous callus uniting with the reflected lip; base convex; a well defined, rather wide, dark chestnut band, margined with a lighter color above and below, revolves near the centre of the body whorl, and is more or less visible above the suture on the two whorls preceding the last; surface of the outer whorl covered with



Gould, Augustus A. 1843. "Monograph of the species of Pupa found in the United States." *Boston journal of natural history* 4, 350–360.

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