SOME FAUNAL REMAINS FROM THE TRIAS OF YORK COUNTY, PENNSYLVANIA.

BY H. E. WANNER.

Plants from the Trias of York County have been reported and described under thirty-three species, twelve of which are new.[1] In the same region, so productive of fossil flora, faunal remains have been less in evidence. Only three species, all based on fragmentary saurian remains, have been described, two by Cope and one by Sinclair.[2]

In the hope that a contribution to the knowledge of the faunal life of this locality would be an acceptable addition to the palaeontology of the Newark System, this paper is presented.[3]

I am indebted to my father for inspiration and for whatever love of the science of geology I possess. He materially assisted in the field work and in the collection of specimens. I am also under obligations to Dr. H. A. Pilsbry for counsel and assistance and for the extension of every courtesy in granting me access to the data in The Academy of Natural Sciences of Philadelphia; to him also belongs the credit for the description and identification of the Mollusca. Dr. John M. Clarke, of the New York State Museum, kindly gave me the benefit of his wide knowledge in the consideration of *Spirorbis*.

DESCRIPTIVE GEOLOGY.

The Trias of York County rests, non-comformably, on the Lower Cambrian.[4] This is shown in the railroad cut just north of Emigsville. The triassic rocks, dipping N. W. at an angle of 16 degrees, rest on the Lower Cambrian shale and limestone. The latter dip

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[1] Ehrenfeld, F. A study of the igneous rocks at York Haven and Stony Brook, Pa. Univ. of Penna., 1898. Wanner, A. Triassic flora of York County, Pa. U. S. Geol. Survey, Ann. Rept., pp. 233–255, 1898–99.

[2] Cope, E. D. Description of vertebrata from the Triassic formations of the United States. Amer. Phil. Soc. Proc., vol. XVII, p. 232, 1878. Sinclair, W. J. A large Parasuchian from the Triassic of Pennsylvania. Amer. Jour. Sci., vol. XLV, pp. 457–462, June, 1918.

[3] Most of the field work and the collection of material were done in the summer of 1920.

[4] Walcott, C. D. The Cambrian rocks of Pennsylvania. U. S. Geol. Survey, Bull. 134, 1892.

to the S. W.[5] The basal layer here is a limestone conglomerate. Sandstones, shale and conglomerates occur in the succeeding layers and farther north a large intrusion of diabase. This forms the elevation known as the Conewago hills. All of the rocks examined dip N. W. at an angle varying from 15 to 24 degrees. No evidences of faulting or folding were observed.

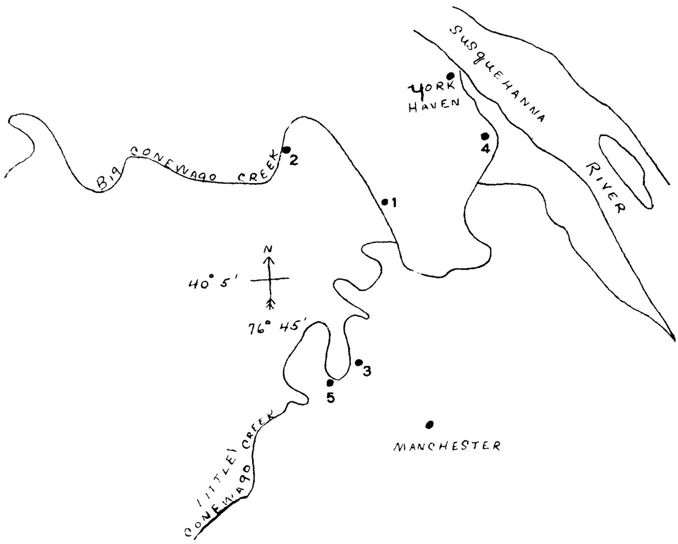
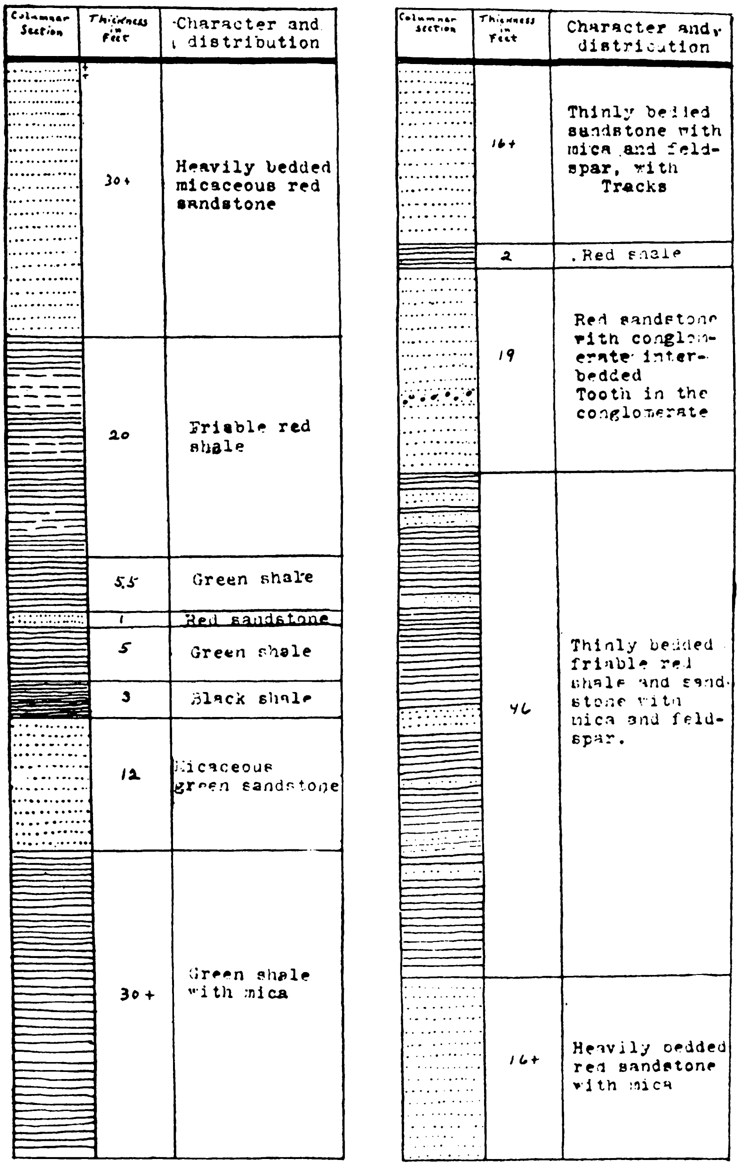


Fig. 1.—Localities of triassic exposures mentioned herein.

The localities described in this paper are about three miles north of Emigsville (fig. 1). Taking the average dip as 20 degrees and calculating from the dip and horizontal distances, the productive layers are, approximately, 6600 feet above the basal conglomerate.[7] Correlation and definite location of these layers is difficult without a section across the Trias.

Two columnar sections are given (figs. 2 and 3) showing the relative positions of the productive strata. These sections are of interest because they show the rapid alternation of the sediments. The physical and lithological character of the shale varies considerably even in the same layer. In one place it may be hard and compact

[5] Frazer, P. Penna. Geol. Survey, Report C 3, Sec. 2, 1876.
[6] Russell, I. C. The Newark System. U. S. Geol. Survey, Bull. 85, p. 34, 1892.
[7] Ehrenfeld, F. A study of the igneous rocks at York Haven and Stony Brook, Pa. Univ. of Penna., 1898. Wanner, A. Triassic flora of York County, Pa. U. S. Geol. Survey, Ann. Rept., pp. 233–255, 1898–99.



Figs. 2 and 3.—Sections showing relative positions of fossiliferous strata.

and in another friable and soft. The color may be red or green. Its content of silica, clay, feldspar and mica varies.

Historical Geology.

In general, geologists now regard the theory of continental origin of the beds of the Newark System as definitely proven.[8] [9] [10]

From the floral remains the triassic rocks of York County are placed by Fontaine in the Upper Trias and correlated with the Rhetic of Bavaria.[11] Lull, from the faunal remains of the Connecticut valley, states that "the Newark System may bridge the time between the Triassic and Jurassic."[12]

The presence of at least five different fresh-water mollusca in the York County Trias is indicative of fresh rather than saline-water conditions. The carbonaceous black shale containing the fish scales and fossil plants proves the presence of luxuriant vegetation in swamps, or lakes. This conclusion is still further verified by the occurrence of thin coal lenses and numerous casts of limbs.[13]

CRUSTACEANS.

The shells of two species of small crustaceans are found closely associated in the black shales. These were identified as *Candona rogersi* (Lea) and *Estheria ovata* (Jones).[14] The former are found more abundantly and often cover the surface of the matrix in densely crowded masses. Localities: Carbonaceous shale, Little Conewago (loc. 3); Black shale, York Haven (loc. 4).

FISHES.

The great variety of fish scales (Plate I, figs. 1–17) warrants their presentation. Some of the specimens are sufficiently different from known forms to indicate the presence of new species. The scales

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[8] Russell, I. C. The Newark System. U. S. Geol. Survey, Bull. 85, Chapter V, 1892.

[9] Davis, W. M. The Triassic formation of Connecticut. U. S. Geol. Survey, 18th Ann. Rept., pp. 32–34, 1898.

[10] Barrell, J. Relations between climatic and terrestrial deposits. Jour. Geol., vol. XVI, pp. 182, 259, 1908.

[11] Ward, L. F. Status of the Mesozoic floras of the United States. U. S. Geol. Survey, 20th Ann. Rept., p. 255, 1898–99.

[12] Lull, R. S. Triassic life of the Connecticut Valley. Geol. and Nat. Hist. Survey of Conn., Bull. 24, p. 20, 1915.

[13] Wherry, E. Silicified wood from the Trias of Pennsylvania. Acad. Nat. Sci. Proc., Phila., 1912.

[14] Jones, T. R. A monograph of fossil Estheriae. Palaeontographical Soc., pp. 84, 124, London, 1862.

occur in a matrix containing macerated and obscured remains of vegetation, an occasional fish spine, and minute fragments of bones. A striking characteristic of nearly all the scales found is their highly enamelled coating. By reason of the fragmentary nature of the material, no attempt has been made at identification. However, because of the enamelled surfaces of the scales, there is probably sufficient justification for provisionally classifying the fishes as ganoids.[15]

Locality: Carbonaceous shale, Little Conewago (loc. 3).

REPTILIAN REMAINS.

Coprolites (Plate I, figs. 18, 19) are found associated with the fish remains. These are usually of an elongated, oval form, varying in shape, and from 2 to 60 mm. in length. A cross section made through one of these reveals fish scales and microscopic fragments of bones.

Localities: Shale, York Haven (loc. 4); Carbonaceous Shale, Little Conewago (loc. 3).

A few bones and teeth have been found in the Trias of York County. Some of these have been referred to species by Cope and Sinclair.[16] No attempt was made by either of these authorities to locate the horizon. The conglomerate layer shown in the section made along the Big Conewago creek yielded a fragment of a tooth with serrated edges. An extensive search failed to uncover additional fossil remains, but further search may be productive.

Locality: Conglomerate, Big Conewago (loc. 2).

TRACKS.

Reptilian footprints have been reported from the Trias of York County.[17] Two new localities have produced small tracks on thinly bedded micaceous sandstone. These differ from any previously described from this region. They can be referred to three types.

One consists of two parallel rows of crescent-shaped impressions with the longer diameter at right angles to the trend of the trail. Spread of track 10 mm. and average distance between successive footprints, 4 mm. (fig. 4, no. 1).

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[15] Newberry, J. S. Fossil fishes and fossil plants of the Triassic rocks of New Jersey and the Connecticut Valley. U. S. Geol. Survey, Mon. XIV, 1888.

[16] Cope, E. D. Description of vertebrata from the Triassic formations of the United States. Amer. Phil. Soc. Proc., vol. XVII, p. 232, 1878. Sinclair, W. J. A large Parasuchian from the Triassic of Pennsylvania. Amer. Jour. Sci., vol. XLV, pp. 457–462, June, 1918.

The second type consists of indistinct, circular tracks. The distance between successive imprints is 15 mm. Running parallel on the same slab, 90 mm. distant, is a similar series; the two are probably associated. Their rounded outlines indicate that these trails were made under water by a creature either wading or swimming (fig. 4, no. 2).

The third type consists of three related impressions, similarly placed. The distance between impressions is 30 mm. The lack of distinctness prevents a more detailed description. From their appearance they were evidently produced under water (fig. 4, no. 3).

Locality: Sandstones, Big Conewago (loc. 1 & 2).

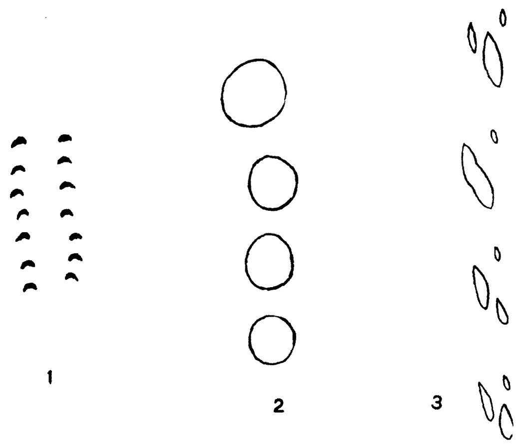

Fig. 4.—Tracks.

MOLLUSKS.

Shells and casts of different Mollusca were found. Some of them evidently represent new species. Since the literature on the Triassic fresh-water Mollusca is meager, it was considered desirable that these specimens should be identified and described by an authority. In consonance with this decision, they were referred to Dr. H. A. Pilsbry, whose report follows.

The Mollusca so far found belong to the fresh-water families Unionidæ and Mutelidæ. Species of the former family have been described from the Trias of the Dockum beds of the Staked Plains

[17] Wanner, A. The discovery of fossil tracks in the Trias of York County, Pa. Second Geol. Survey of Penna., Ann. Rept., pp. 31–35, 1887.

of Texas by C. T. Simpson,[18] and from the Connecticut Valley by Emerson and Troxell.[19] All of these authors referred their species to the northern genus *Unio;* but Simpson subsequently[20] decided that at least part of the Texan species were related to South American genera, though he did not expressly alter the generic references. A list of American Triassic species follows:

Species from the Dockum beds, Staked Plains of Texas: *Unio subplanatus, Unio dumblei, Unio graciliratus, Unio dockumensis,* all of Simpson.

Species from Trias of the Connecticut Valley: *Unio emersoni* Troxell, *Unio wilbrahamensis* Emerson.

The third and fourth species, at least, might better be referred to the genus *Diplodon,* having radial beak sculpture. Probably the others will also prove to have similar sculpture when material sufficiently well preserved comes to hand.

In three of the York species the radial sculpture of the beaks shows relationship with South American genera, being like that of *Diplodon* and *Hyria,* and totally unlike that of *Unio* and allied genera of the Northern Hemisphere. These species are herein referred to the genus *Diplodon.* In two other York species the beaks themselves are not preserved well enough to make out their sculpture; but as there is corrugation of the posterior slope, it is likely that the beaks are radially folded and that these also are referable to *Diplodon.*

The genus *Mycetopoda,* here recognized as a Mesozoic fossil for the first time, is a South American genus belonging to the Mutelidae, a family of the southern continents.

The records for Triassic Unionidæ are as yet few; but the wide separation of the localities, the presence of several species and their considerable diversity in shape and sculpture in each area, may permit the inference that Triassic North America possessed a large and varied Naiad fauna of South American type, Hyriinæ and Mutelidæ. The next fauna of these mussels of which we have any definite knowledge is that of the Jurassic in Colorado and Wyoming. Here the South American types have entirely disappeared, and in their place are distinctively Holarctic Unioninæ, in which

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[18] Description of four new Triassic Unios from the Staked Plains of Texas. Proc. U. S. Nat. Mus., 1895, pp. 381–385.
[19] American Journal of Science (4), vol. 38, 1914, p. 460.
[20] Synopsis of the Naiades or Fresh-water Pearly Mussels, 1900.

the beak sculpture when known is of the concentric type.[21] These were probably immigrants from Asia. Similar forms occur more abundantly in the Laramie.

Williston, from a study of the reptiles, holds that America was isolated from the Old World throughout the Permian and well into the Triassic, a broad connection being established in the Upper Trias.[22] It appears likely that the subfamilies of Unionidæ were differentiated in this long interval from the Pennsylvanian to the Trias, the Unioninæ in Eurasia, while America had Hyriine mussels, which disappeared with the advent of Old World forms in Upper Trias or Jurassic. The migration of Unionidæ would doubtless lag far behind that of reptiles after the connection was established.

Diplodon pennsylvanicus n. sp. Pl. II, figs. 1 (type), 2, 3; pl. III, fig. 4.

The type consists of the two valves of one individual, spread open. On the same piece of hard gray shale there is another imperfect valve of the same species.

The shell is oblong, not unlike a young *Unio complanatus* (Sol.) in shape, being rather compressed. The beaks are at about the anterior third. The posterior ridge is rounded, a radial depression above it on the posterior slope. Sculpture of numerous folds radiating from the beaks and reaching to about the middle of the valve except posteriorly, where they are longer. Below the radial folds there are some low, concentric wrinkles.

Length 21 mm.; alt. 10.5 mm.; diam. about 6 mm.

Locality: Shale, Little Conewago Creek (loc. 5).

The specimen selected as type is not full grown, but the valves are free from distortion, and the sculpture is finely preserved. Adult shells, such as that shown in Plate III, figure 4, reach a length of 32 mm., alt. about 18 mm., diam. about 10 mm. The radial sculpture covers a relatively smaller part of the valves, though actually about the same area as in the type.

Another specimen, obliquely compressed, is shown in dorsal aspect in Plate II, fig. 2. Alt. about 20 mm.

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[21] In some of the Laramie and later Uniones there are oblique folds, superficially like those of Diplodon, as in *Unio* (*Loxopleurus*) *belliplicatus* Meek; but on the beaks the sculpture is concentric. Certain Uniones described by Whitfield, Bull. Amer. Mus. N. H., XIX and XXIII, from the Montana Laramie, have sculpture recalling *Diplodon*, but more like the Asiatic *Parreysia*. They form, I think, a special group, near *Parreysia* or a subgenus thereof, which may be called *Proparreysia*, the type being *Unio percorrugata* Whitfield.

[22] This connection is usually mapped as across the North Atlantic (see Arldt, Handbuch der Palaeogeographie, I, 1919); but it may have been in the northwest.

The interior of a left valve (Plate II, fig. 3) shows a moderately deep beak cavity. The muscle scars are indistinct, but so far as visible seem as in *Unio*. The pseudocardinal teeth are moderately strong, double, nearly smooth. The single blade-like lateral tooth is well developed but short, and rather widely separated from the pseudocardinals. This shell was 32 or 33 mm. long.

This is the most abundant species; remains of some 14 individuals have been found.

This species appears to be related to *Unio dockumensis* Simpson, from the Trias of Garza County, Texas, having similar though more extensive radial corrugation. That shell is about double the size of *pennsylvanicus*.

Diplodon borealis n. sp. Figs. 5, a, b, c.

Three specimens represent a species resembling *D. pennsylvanicus*, but plumper, smaller (if these are of full growth), with the beaks nearer the middle, at about the anterior two-fifths of the length.

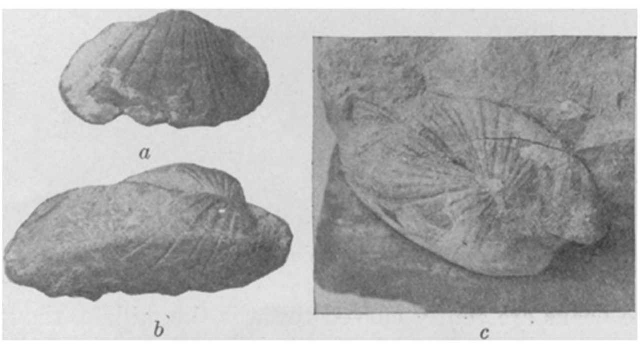


Fig. 5.—*Diplodon borealis* n. sp.

The sculpture consists of rather widely spaced radial furrows, much narrower than their intervals, which are flattened and show irregular, weakly festooned concentric wrinkles in places. At the anterior and posterior ends the radii are finer, and have the form of corrugations. The best preserved specimen measures:

Length 14.5 mm., alt. 8.5 mm., diam. 7.3 mm. (fig. 5a).

Another distorted shell is 20 mm. long (fig. 5b). This is also about the length of the third specimen, in which one valve is partially imbedded in hard shale, and the other somewhat compressed towards the base (fig. 5c).

Locality: Gray shale, Little Conewago Creek (loc. 5).

Diplodon wanneri n. sp. Plate III, fig. 5.

The shell is oblong, compressed, with small beaks, but little projecting, at about the anterior fourth of the length. The dorsal outline is moderately arched; anterior end evenly rounded, posterior end somewhat oblique, rounded; basal margin straightened. The posterior ridge is prominent but rounded. Surface is smooth, except for unequal wrinkles of growth. There is a gray-white calcareous layer about the thickness of writing paper, covering the shell like a periostracum (broken away in places). The interior is unknown.

Length 37 mm.; alt. 22 mm.; diam. 11.7 mm.

No traces of beak sculpture are discernible in the type specimen, which, as mentioned above, is covered with a thin layer of calcite. A much flattened specimen shows the beak sculpture (fig. 6). There are fine corrugations diverging from the posterior ridge, gradually weakening, and finally disappearing about 17 mm. from the beak. In the median part of the valve the fine corrugations radiating

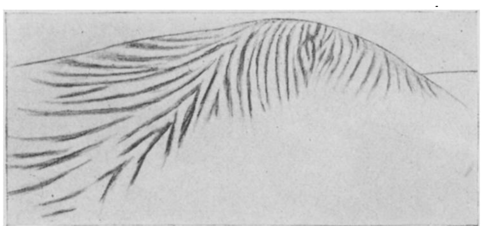


Fig. 6.—Beak sculpture of *Diplodon wanneri*, paratype. Diagrammatic.

from the beaks are gently curved towards the middle, though only a few of them meet (*Hyria* fashion). The branching of the corrugations produces some faint appearance of zigzag pattern in the middle. In this region the sculpture reaches only about three or four mm. from the beaks. Total length of this shell is about 33 mm.

Locality: Shale, Little Conewago Creek (loc. 5).

Diplodon carolus-simpsoni n. sp. Plate II, figs. 4, 5, 6.

The type is a left valve, imperfect in the anterior-basal region, with part of the right valve almost wholly imbedded in the hard, dark gray shale.

The shell is oblong, plump, rather thick (1.6 mm. at about the posterior third). The beaks are full and prominent, near the anterior end, which is rounded. Posterior end is oblique, being produced at the post-basal extremity. The posterior ridge is prominent and rounded. Sculpture of rather strongly marked lines and wrinkles of growth, and on the posterior ridge, radiating, fine folds; dorsad of the ridge, on the posterior slope, the folds form a dorsally curved corrugation. The ligament is strong and prominent.

Length 34 mm.; alt. 22 mm.; diam. 19 mm.

Another specimen (Plate II, fig. 6) from the same locality, but from a different bed, is in the conglomerate of a deep brownish drab color. As usual in this rock, the surface is not well preserved, but the outlines are perfect. The corrugation of the posterior slope, distinct in the type, is not legible. It measures:

Length 45.5 mm.; alt. 25 mm.; semi-diam. 9.5 mm.

In outline, this species resembles *Unio graciliratus* Simpson of the Dockum beds, Dickens County, Texas; but in that shell the lirations of the posterior slope appear to run parallel to the posterior ridge, not diverging upwards towards the ligament, as in the Pennsylvanian species; also they continue to the posterior end, while in our species the corrugated area is much less extended.

It is named in honor of Mr. Charles T. Simpson, whose work initiated the modern classification of Unionidæ.

Locality: Shale, Little Conewago Creek (loc. 5).

Diplodon yorkensis n. sp. Plate III, figs. 2, 2a.

The type is a nearly perfect specimen showing nothing suggesting distortion of the original form.

The shell is long, narrow and plump, the diameter and altitude about equal. The moderately full beaks are about 28 per cent. of the length from the anterior end, which is rounded. The posterior end slopes obliquely, the posterior-basal angle being produced. The posterior ridge is prominent, rounded, the basal margin straight, the middle of the valves flat. The surface shows rather strong, unequal wrinkles of growth where best preserved. On the dorsal slope there appears to be some trace of fine, curved, radial corrugation posterior of the beaks.

Length 32 mm.; alt. 11.5 mm.; diam. 11.7 mm.

This species is quite distinct by its long, plump shape. Since the above account was written a second specimen has been found. In this the valves are spread partly open. Each shows a depression running from the beaks obliquely downward and backward to the basal margin. There are radial riblets on the beaks, though mostly obliterated, and a fine corrugation on the dorsal slope behind the beaks, the corrugations radiating from the posterior ridge and curving towards the dorsal margin, thus confirming the indistinct traces of such sculpture shown by the type specimen. This shell is larger than the type, 40 mm. long, and similar in other proportions.

Locality: Shale, Little Conewago Creek (loc. 5).

Mycetopoda diluculi n. sp. Plate III, fig. 1.

The single example is imbedded in reddish shale, showing part of one side and a section, from presumably near the anterior end, which is broken away.

The shell is quite compressed, apparently rather thin, of long, narrow, straight form. The surface shows distinct wrinkles of growth, which by their outlines indicate a rather strongly tapering posterior end.

The length of the part preserved is 99 mm. Alt. at broken end 30 mm.; further back, where the ventral margin is visible, the alt. is about 25 mm. Diam. at broken end 9.5 mm.

Mycetopoda is a recent genus of South America, with a few species as far north as Nicaragua and Guatemala. While the generic reference of the fossil is not positive, the interior being unknown, its characters, so far as they are legible, agree well with *Mycetopoda*, and appear to indicate this genus or one closely similar.

Locality: Shale, Little Conewago Creek (loc. 5).

POLYCHAETA.

Spirorbis inexpectatus n. sp. Plate III, fig. 3.

In the "red" (deep brownish drab) shale there are small, spiral bodies resembling the tubes of *Spirorbis*. They occur in groups scattered on surfaces of uncertain nature, or sometimes shells. They occur about half immersed in the matrix, or somewhat deeper.

The spiral is in one plane. The largest individuals measure 2 mm. About one and a half turns seem to be present, but only the last is clearly seen. This increases in width rather slowly, always in clockwise direction. The surface of the spiral shows sculpture of weak, retractively radial folds on the lateral convexity, and there are also fine striae in the same direction. The tube appears to be oval in section, its periphery rounded.

From the uniform direction of coil it appears that the same side is always exposed, the under side probably being attached.

Locality: Shale, Little Conewago Creek (loc. 5).

Feeling some uncertainty about these fossils a specimen was submitted to Dr. John M. Clarke, who reported as follows:

"I think there is little doubt that the specimen you have sent to me is Spirorbis. These tube-secreting worms show themselves to have been highly adaptable throughout Mesozoic and Paleozoic history. In the Carboniferous their tubes cover the leaves of coal plants and they are not unknown to us attached to terrestrial water-carried plants of the Devonian.

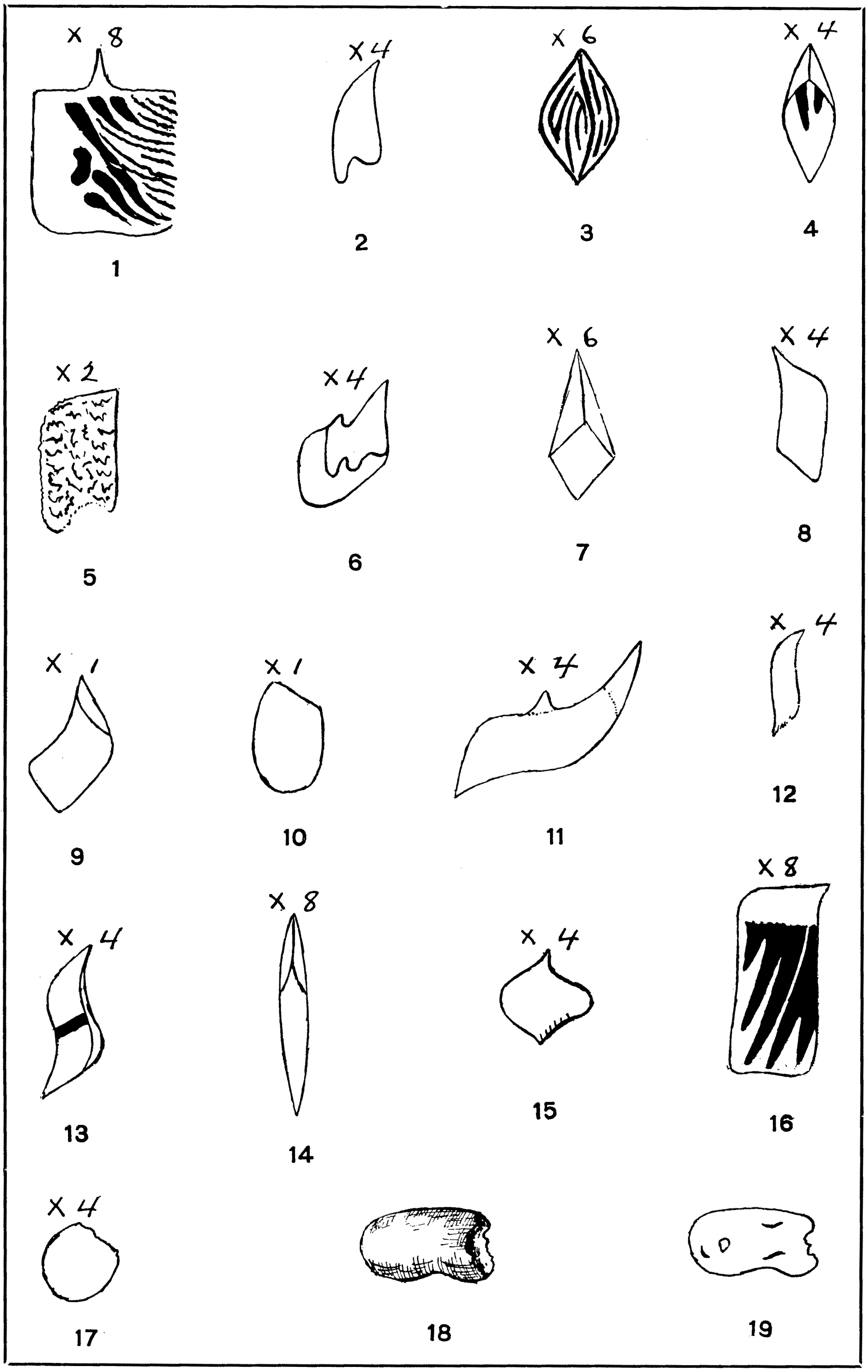
"This specimen before me carries the impression of a leaf or the interior of some thin-shelled mollusk which might well have been washed out from the land into the brackish or salt waters and thus given the worm a chance for attachment. You will notice that with the coiled shells there are little ostracodes which are also indicative of brackish water conditions. It would be perfectly orderly to find this specimen in continental sediments."

Explanation of Plates I-III.

Plate I.—Figs. 1–17. Various forms of fish scales.
Figs. 18, 19. Coprolite, exterior and section.

Plate II.—Fig. 1. *Diplodon pennsylvanicus* n. sp. Type.
Fig. 2. *Diplodon pennsylvanicus.* Dorsal view of an obliquely compressed specimen.
Fig. 3. *Diplodon pennsylvanicus.* Interior of another specimen.
Figs. 4, 5. *Diplodon carolus-simpsoni* n. sp. Type, dorsal and lateral views.
Fig. 6. *Diplodon carolus-simpsoni.* Lateral view of a larger specimen, in red shale.

Plate III.—Fig. 1. *Mycetopoda diluculi* n. sp. Type, lateral view.
Figs. 2, 2a. *Diplodon yorkensis* n. sp. Type, dorsal and lateral views.
Fig. 3. *Spirorbis inexpectatus* n. sp. Type and paratypes.
Fig. 4. *Diplodon pennsylvanicus* n. sp.
Fig. 5. *Diplodon wanneri* n. sp. Type, lateral view.



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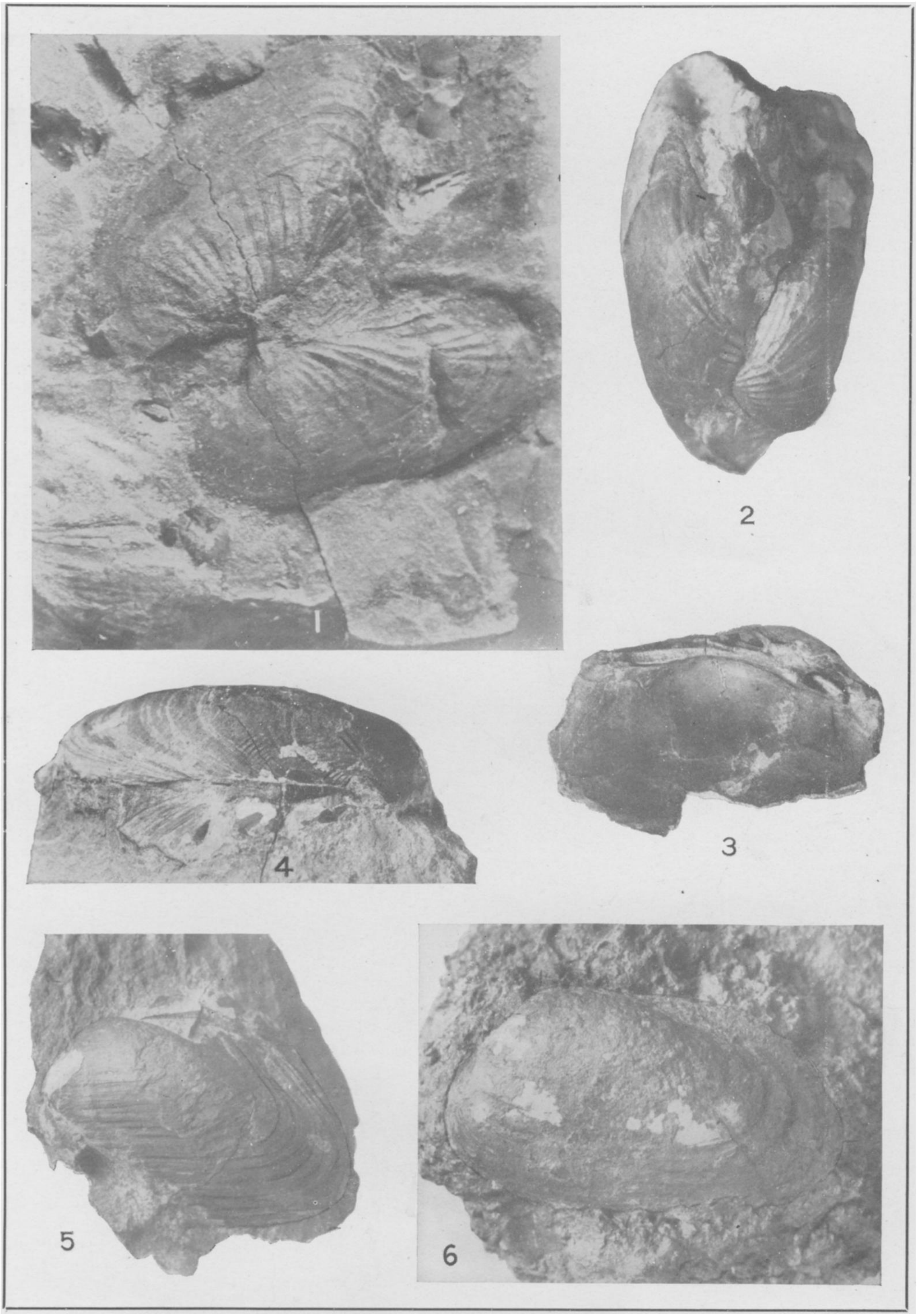

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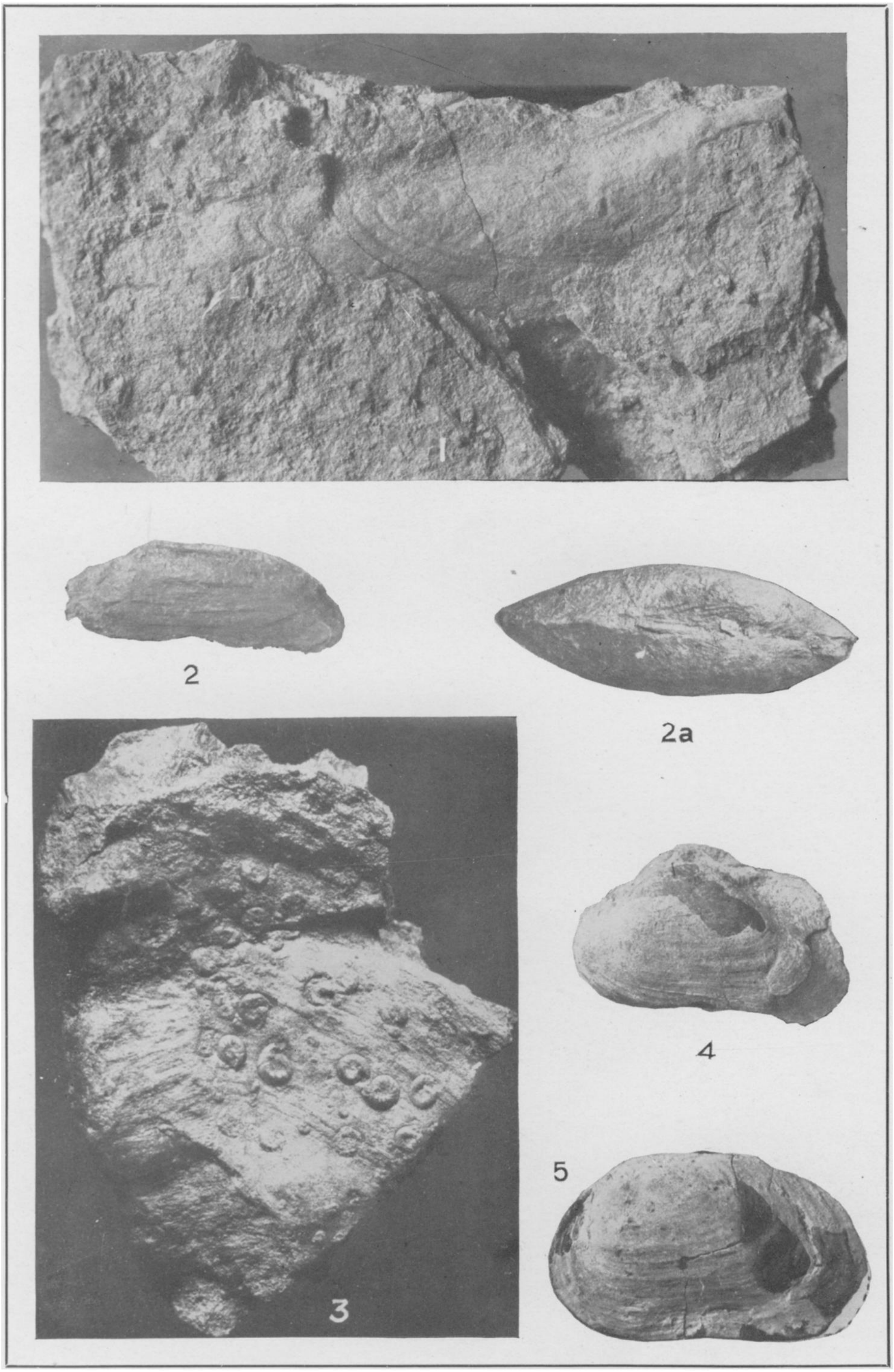

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