

## ON SOME OF GURLEY'S UNFIGURED SPECIES OF CARBONIFEROUS BELLEROPHON.\*

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In 1883 and 1884 Mr. William F. E. Gurley, at one time state Geologist of Illinois, privately published two small bulletins describing but not illustrating new Carboniferous fossils. As stated in a preface to Bulletin 1, these descriptions were intended merely as preliminary notice of new forms and it was the author's intention to republish the descriptions with figures at some later time. This however was never done. At present paleontologists are almost totally unacquainted with Gurley's species both on account of the rarity of his bulletins and the fact that it is almost impossible to identify specimens from a short description alone.

In connection with some of my work, I have recently had occasion to look up certain of Gurley's types of *Bellerophon* which are preserved in the collections of the Walker Museum at the University of Chicago. It has occurred to me that, as most of these species were established upon Illinois specimens, it would not be unappropriate to reestablish in the Transactions of the State Academy those which are valid as well as assign those which are not to their proper places in our paleontological synonymy. Gurley's original descriptions are presented below together with remarks upon the present status of his species.

*"Bellerophon Harrodi* (sp. nov.)<sup>1</sup> (Plate I, Figures 6a, 6b.)

"Shell commonly attaining a growth above the medium size, outer or body whorl, broadly and regularly expanding; aperture reniform.

"Dorsal margin not reflexed, but conforming to the direction of the growth of the body whorl. Lateral margins rapidly thickening and slightly reflexed, forming a stout flat lip, which, in joining the volution, entirely closes and conceals the umbilicus.

"Dorsum regularly rounded, full semi-circular in section, with a sharp prominent mesial or longitudinal nodose ridge, the nodes being developed by the continuation across the ridge of a series of transverse costæ or undulations extending to the um-

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<sup>1</sup> Bulletin 1, p. 5.

bilicus. These undulations are quite prominent toward the back of the shell, but gradually become faint and indistinct along the last quarter of the outer volution, which is regularly marked by distinct lines of growth that occasionally thicken up, forming slight indications of undeveloped costæ or undulations, extending around the shell at irregular intervals.

"Inner lip callous and in mature specimens it frequently swells out and thickens laterally, being quite prominent.

"This species resembles *B. percarinatus*, Conrad, but is easily distinguished from that form by being less compressed and not having the lateral nodose ridges which so strongly characterize that form. Again, this species shows more clearly the close relation existing between the concentric lines of growth along the latter portion of the body whorl, and the undulating lateral costæ which ornament the shell back of the last quarter.

"The specific name is given in honor of Dr. S. H. Harrod, of Canton, Indiana, an untiring worker, and one to whom palaeontologists are indebted for many new and interesting forms.

"*Position and Locality:* Upper Coal Measures, near Oakwood, Vermilion County, Illinois."

*Remarks:* Three names have been applied to a series of Coal Measures Bellerophons characterized by a prominent nodose median ridge. These are *B. percarinatus* Conrad 1842, *B. tricarinatus* Shumard 1858 and *B. harrodi* Gurley 1883. All specimens, however, that have been figured have been referred to Conrad's species. The original figures are not very good and the description is extremely brief, being as follows:<sup>2</sup>

"Subglobose; back with a sharp, elevated, waved carina; sides with distant transverse acute ribs and intermediate minute striæ; volutions concealed."

Shumard's description of *B. tricarinatus* is as follows:<sup>3</sup>

"*Shell* rather large, elongated, expanding rather gradually from beak to front; *aperture* elongate, subpentagonal; *dorsum* marked by three carinæ, which are rather strong towards the front and become obsolete posteriorly; central one most prominent, rounded; lateral ones broadest and subangular; *sides* descending obliquely from the carinæ to the base, flattened or slightly concave before and rounded posteriorly.

<sup>2</sup> Acad. Nat. Sci. Phil., Jour. Ser. 1, Vol. 8, 1842, p. 268, pl. 16, Fig. 4.

<sup>3</sup> Acad. Sci. St. Louis. Tran. Vol. 1, 1858, p. 204.

from which the description has been drawn is deprived of the test and no surface markings are preserved."

In spite of their many defects the above descriptions seem to indicate quite clearly that the specimens under consideration represent the two extremes of the *B. percarinatus* series. The specimen figured by Norwood and Pratten<sup>4</sup> and referred to Conrad's species is, however, clearly of the *tricarinatus* type and subsequent authors, including Meek, followed their example with the result that the *tricarinated* form came to be considered the typical *B. percarinatus*. Gurley erred in comparing his specimen with descriptions and illustrations other than the original. His form is clearly conspecific with Conrad's and his name is therefore a synonym.

There may be some question as to the advisability of retaining two forms of full specific rank within the *B. percarinatus* series as almost complete intergradation is known to occur. Although my collections contain specimens from the same locality which vary considerable in the prominence of the lateral nodes, I have not as yet observed the association of the two extremes. It may, therefore, be best for the present to retain *B. tricarinatus* in full specific rank bearing in mind, however, that in the future it may be necessary to reduce it to a variety of *B. percarinatus*.

Girty has established the genus *Pharkidonotus* upon *B. percarinatus* as its type species. *B. harrodi* Gurley will therefore take its place in the synonymy under *Pharkidonotus percarinatus* (Conrad.)

"*Bellerophon textiliformis* (sp. nov.)<sup>5</sup> (Plate I, Figures 7a, 7b, 8.)

"Shell medium size, subglobose, body whorl rapidly expanding, slightly embracing; aperture broad, ovate reniform with the lips thin and sharply reflexed laterally, joining the whorl in a thin raised reflexed plate and gradually becoming obsolete as it follows the curvature of the umbilicus, which is thereby partially concealed.

"The dorsal margin of the lip conforms to the general direction of the growth of the shell, not being reflexed, but is divided by a deep slit, which is equal in width to the narrow band passing around the shell.

"Shell ornamented by fine longitudinal raised striae, there

<sup>4</sup> Acad. Nat. Sci. Phil., Jour. Ser. 1, Vol. 3, 1854, p. 74, pl. 9, fig. 4.

<sup>5</sup> Bulletin 1, p. 6.

being about fifteen on each side of the mesial band, and increasing by implantation with the growth of the shell.

"The mesial band consists of a flattened carina about twice as broad as the lateral striæ and bounded on either side by a shallow depression, each being about the same width as the carina.

"On each side of the shell there are raised transverse costæ, which extend from the umbilicus, following the lines of growth and gently curving backward as they join the mesial band, where they become quite obsolete. They are separated by a rather deep space, equal to about three times the breadth of the costa.

"These transverse costæ and longitudinal striæ regularly cross each other, giving the surface a fine and even imbricate appearance.

"This species is quite distinct from any of the known Upper Carboniferous forms, and strongly resembles *B. textilis*, Hall, from the St. Louis division of the Sub-Carboniferous series, but differs from that form in having fewer and less prominent longitudinal striæ, stronger and more clearly defined lateral costæ, which in that species are barely developed beyond well marked lines of growth.

"The slit in the dorsal margin is a feature not mentioned by either Hall or Whitfield as being a characteristic of *B. textilis*, and it is hardly possible that its presence would have escaped their observation.

"*Position and Locality:* Upper Coal Measures, Kansas City, Missouri, collected by Mr. David H. Todd."

*Remarks:* Unfortunately, the type specimen of *B. textiliformis* has been mislaid. The figures of this species presented herewith and the remarks concerning its affinities are based upon a series of specimens in the Gurley collection which were also obtained from Kansas City and on account of these reasons there can be little doubt but that they are representative of the same form.

This species has never been figured. On the basis of the description alone Ulrich<sup>6</sup> and later Girty<sup>7</sup> have referred it to the genus *Patellostium*. An examination of the specimens in the Gurley collection show conclusively that such a reference is in error as *B. textiliformis* lacks both of the most important charac-

<sup>6</sup> Pal. Minn., Vol. 3, pt. 2, 1897, p. 854.

<sup>7</sup> U. S. G. S., 19th An. Rpt. pt. 3, 1899, p. 539.



ters of *Patellostium*, i. e., the greatly expanded aperture and the peculiar callosity such as is present in *B. patulus*, Hall. The callosity of *B. textiliformis* is thickest in its median portion and greatly accentuated the convexity of the interior whorl at the aperture. It also differs greatly from *B. montfortanus*, Norwood and Pratten, our common Coal Measures *Patellostium* in the nature of its transverse markings. In *B. textiliformis* these are simply prominently developed lines of growth while in Norwood and Pratten's species they are produced by a folding of the shell and are plainly represented on interior casts.

On account of its revolving longitudinal markings and otherwise similarity to *Bellerophon*, *B. textiliformis* must be classed as *Bucanopsis textiliformis* (Gurley.)

"*Bellerophon incomptus* (sp. nov.)<sup>s</sup> (Plate I, Figures 9a, 9b).

"Shell thick, rather below the medium size, subglobose; body whorl, embracing, regularly and moderately expanding; aperture lunulate, strongly arcuate, reniform. Lip thin, becoming quite stout where it joins the inner volution, entirely closing and concealing the umbilicus. The margin of the lip conforms to the general direction of the growth of the outer whorl, showing slight indications of becoming reflexed a short distance from the umbilicus. The lip is divided by a central depression, formed by each side of the margin slightly and regularly curving backward to the mesial band.

"The surface is quite smooth, being entirely destitute of any ornamentation beyond a narrow, smooth mesial band, which on either side is separated from the lateral portions of the shell by a fine, sharp groove. There are numerous fine lines of growth at irregular intervals being more clearly defined close to the umbilicus, with an occasional line extending across the shell and curving gently backward as it approaches the carina. These lines of growth are not prominent and do not interfere with the smoothness of the surface.

"This form closely resembles *B. sublaevis*, Hall, in its globose shape, smooth unornamented surface, closed umbilicus and emarginated lip; it is, however, slightly more embracing, shows fewer lines of growth, and is at once distinguished by its narrow carina, bounded on either side by a fine, sharp groove.

<sup>s</sup> Bulletin 2, p. 9.

“*Position and Locality:* From the black roof shales of coal No. 7, Danville, Illinois.”

• *Remarks:* The specimens upon which Gurley based this species are completely pyritized, much broken and considerably compressed. This was poor material upon which to base a new species and in spite of having been preserved in oil the types have somewhat disintegrated during the intervening years.

*B. incomptus* apparently differs from all other described Coal Measures Bellerophons with the exception of *B. crassus we-wokanus*, Girty, in having its umbilici closed so solidly that it must possess a continuous imperforate columella. From this species it differs in having its mesial band much narrower and not raised above the shell upon either side and in consequence this feature is rather insignificant.

I am inclined to consider that the distinguishing characters of *B. incomptus* are not of specific rank and therefore propose that it be reduced to a variety of *B. crassus* Meek and Worthen and be referred to as *Bellerophon crassus* var. *incomptus*, Gurley.

“*Bellerophon nodocostatus* (sp. nov.)<sup>9</sup> Plate I, Figures 1, 2).

“Shell medium size, subglobose, moderately expanding body whorl, slightly embracing. Aperture subovate, robust, reniform. Margin of lip thin, conforming to the general direction of the growth of the outer whorl, slightly recurved as it joins the inner volution close to the umbilicus, which is distinct and partially concealed by the thin, raised, reflexed termination of the lip.

“Surface ornamented by fine revolving striæ, extending around the shell to the margin of the lip, there being about nine on either side of the mesial band, and increasing by implantation with the growth of the shell.

“There are numerous prominent, regularly arranged transverse costæ, which extend from the umbilicus across the shell with a gentle backward curve as they approach the center, and crossing the mesial band in a thin, sharply raised ridge, which is not in the same line as the costa but alternates with the lateral furrows on either side. The revolving striæ and transverse costæ in crossing each other become nodulose at the junction, developing small rather prominent nodes which assume a regularity in arrangement and give the surface a fine cancelled appearance, presenting a form readily distinguished from any of the known

<sup>9</sup> Bulletin 2, p. 9.

forms of this genus. The mesial band is narrow and the imbrication of the sharp transverse costæ and the few revolving striæ give it the fine nodose appearance possessed by the lateral portions of the shell.

“*Position and Locality:* Upper Coal Measures, near Oakwood, Vermilion County, Illinois.”

*Remarks:* This species was based upon a number of cotypes from a band of very impure limestone. The matrix adheres tenaciously to the rough surfaces of these shells and although the character of the markings may be clearly observed it is exceedingly difficult to obtain them in all their details in a photograph. Consequently the figures of this species upon the accompanying plate, which are the first illustrations of this form to be published, are not as expressive as might be desired.

Ulrich<sup>10</sup> and later Girty<sup>11</sup> have referred *B. nodocostatus* to *Patellostium* but such a reference is totally unwarranted for the same reasons as were mentioned in the discussion of *B. textiformis*. These two species are quite similar in form but differ greatly in their markings, those of *B. nodocostatus* being much coarser. The transverse costæ of this species are quite different from those of the other in that they do not represent prominent lines of growth but are produced by a folding of the shell similarly, but to a smaller degree, to *Patellostium montfortianum*. *B. nodocostatus* is easily distinguished from this latter species by its unexpanded aperture, coarser and more widely spaced revolving striæ, less prominent transverse costæ and the presence of sharply upraised crescentic ridges which cross the mesial bend and correspond to the transverse costæ.

The surface markings of *B. nodocostatus* appear to be intermediate between those characteristic of *Bucanopsis* and *Patellostium* as represented by *P. montfortianum*. Lacking, however, the greatly expanded aperture and peculiar callosity of *Patellostium* this species should probably be referred to *Bucanopsis*.

It seems probable that Gurley's species may prove to be identical with *B. kansasensis*, Shumard, which was described as follows:<sup>12</sup>

“Shell of small size, subglobose, very rapidly expanding at the front; aperture very transverse, short, reniform, the sides becoming much thickened, extended and gently recurved poster-

<sup>10</sup> and <sup>11</sup> Op. cit.

<sup>12</sup> Op. cit.

iorly, where the volution is covered by a smooth and thick callosity; umbilicus small, round, sometimes partially hidden by the thickening of the lip; surface ornamented with from twenty-two to twenty-four transverse, rounded ribs, which are gently arched forward on either side of the dorsal sinus and become nearly obsolete before reaching the umbilicus; these are decussated on each side of the sinus by from ten to twelve revolving thread-like lines, distinct on the dorsum, but becoming indistinct towards the umbilicus; at the points of intersection of the transverse and revolving lines there is a thickening which gives to the surface a very beautiful subgranulose appearance; dorsal band narrow, rather strongly depressed anteriorly, becoming shallow posteriorly, bounded on either side by a thread-like line, and marked by the transverse furrows, which are backwards.

"Dimensions: Length, .44; height, .32; width of aperture, .40; length of same, about .19.

"There is in the collection a specimen which is double the size of that from which the above proportions were taken."

Until Shumard's species becomes better known, however, it it would be well to consider it as being distinct and Gurley's form may therefore be termed *Bucanopsis nodocostata* (Gurley.)

"*Bellerophon tenuineatus* (sp. nov.)<sup>13</sup> (Plate I, Figures 4, 5a, 5b)

"Shell medium size, subglobose, body whorl, moderately expanding; aperture broadly subovate, reniform, arcuate; umbilicus distinct, partially concealed by the thin, recurved extremity of the lip, which along the greater portion of the margin conforms to the general direction of the growth of the shell; the lateral margins of the lip gradually curve backward to the mesial band, where they join each other with a sharp backward curve, thereby forming a shallow sinus, which distinctly divides the lip into two parts.

"Surface marked by fine, closely arranged longitudinal striæ, which continue, without interruption to the margin of the lip, there being about thirty-five on each side of the shell and seven on the mesial band. The mesial band is small, slightly depressed, and barely distinguishable from the rest of the shell, being bounded on either side by a fine raised line which is somewhat heavier than those on the lateral portions of the shell. Regularly arranged, faint transverse lines of growth cross the shell,

<sup>13</sup> Bulletin 2, p. 10.



with a moderate backward curve in the same direction as the margin of the lip; they are not sharp or prominent and do not interrupt the evenness of the revolving striae.

"This shell bears a strong resemblance to *B. marcouianus*, Geinitz in its ornamentation, but does not possess the broad, flattened lip of that form, and also differs materially in the form of the mesial band, which in that species is distinctly elevated in the center, whilst in this form it is depressed.

"*Position and Locality:* Same as the preceding."

*Remarks:* Girty has referred this species to *B. meekianus*, Swallow<sup>14</sup>. In doing so he is possibly correct although there is some doubt because of Swallow's statement in regard to the expanded aperture and carination. Neither Gurley's type specimen nor the other from his collection which is figured herewith show any dilation of the aperture except in the vicinity of the umbilicus, nor is there the slightest indication of carination. Swallow's original description is as follows<sup>15</sup>:

"Shell small, gibbous, broadly rounded on the dorsal margin, carinated near the aperture, ornamented with fine, crowded, longitudinal striae and very minute transverse lines; aperture very much expanded, reniform, transverse, much modified by the preceding whorl, lip thickened and reflected over the umbilicus, with a linear callosity extending back from the points of junction on to the adjacent whorl; volutions concealed; umbilicus shallow, distinctly modified by the thick reflexed lip.

"Diameter, 0.77; width of aperture 0.60; length of aperture 0.35."

On account of the discrepancies between Swallow's description and Gurley's specimens which have been pointed out above, it seems to me to be inadvisable at this time to class *B. tenuilineatus* as a synonym of Swallow's species, which is by no means well established. Gurley's description and specimens characterize a distinct and easily recognizable species and recognition should be given to his name. It is, however, entirely possible that future investigation will prove beyond a reasonable doubt that *B. tenuilineatus* and *B. meekianus* are synonyms. Two other names that may also fall into the same category are *B. marcouianus* Geinitz and *B. perlatus* Conrad.

On account of its longitudinal markings Gurley's species has

<sup>14</sup> U. S. G. S., Bull. 544, 1915, p. 169.

<sup>15</sup> Acad. Sci. St. Louis, Tran. Vol. 1, 1858, p. 204.

been removed from *Bellerophon* and is now to be known as *Bucanopsis tenuilineata* (Gurley.)

"*Bellerophon rugopleurus* (sp. nov.)<sup>16</sup> (Plate I, Figures 3a, 3b.)

"Shell rather large, outer volution greatly expanding, forming a broad, rounded lip, which is slightly depressed toward the margin. Umbilicus moderately small, open and distinct. Aperture large, transversely reinform; inner margin of aperture callous, being quite elevated and prominent. Lip thin along the center, thickeneing up laterally and becoming very stout and callous at its junction to the inner whorl; distinctly divided in the center by a shallow sinus formed by the lip abruptly curving backward as it approaches the center.

"Mesial band consisting of a narrow shallow groove with rounded margins.

"Surface marked by small rather closely arranged, more or less prominent and irregular transverse costæ or undulations which vary in size from a prominent ridge to a mere line of growth, being more closely and regularly arranged on the body of the shell and becoming less prominent, and in many instances obsolete, near the margin. The transverse costæ extend from the umbilicus, with a gentle backward curve, around the shell to the margin of the mesial band, where they entirely disappear, the mesial band or furrow being uninterrupted by any traces of these ridges.

"Towards the margin of the shell there are faint traces of closely arranged, fine longitudinal striæ which are for the most part obsolete upon the transverse costæ along the body of the shell, but are quite distinct where they cross the transverse furrows between the more prominent ridges.

"This species has the general form of *B. marcouanus*, Geinitz, being one of those rapidly expanding forms with a small body whorl and a broad, dilated lip. The ornamentation is so entirely different that any comparison is unnecessary.

*Locality and Position:* Same as preceding."

*Remarks:* A careful examination of the type of this species and comparison with the types of *B. nodocostus* have lead me to the conclusion that these are conspecific. The type of *B. rugopleurus* is a large individual nearly twice the size of any of the

<sup>16</sup> Bulletin 2, p. 11.

cotypes of *B. nodocostatus*. Its proportions are somewhat different but this may be the result of compression. This shell is obviously much water worn and the details of the surface markings are largely obliterated but those which remain agree well with the smaller forms. The types of both species were collected from the same locality and when this is considered in connection with their other similarities there can be little doubt as to their identity. The outer lip of the larger shell is broken away and the prominent callosity is revealed to a greater degree than in any of the smaller specimens.

As *B. nodocostatus* was described upon a page preceding the description of *B. rugopleurus* this latter species will take its place in the synonymy under *Bucanopsis nodocostata* (Gurley).

## EXPLANATION OF PLATE

NOTE: All figures are enlarged two diameters.

1. *Bellerophon nodocostatus*—cotypes WM 6328.  
Anterior view of a small specimen.
2. *Bellerophon nodocostatus*—cotype WM 6328.  
Side view of a larger somewhat crushed specimen.
3. *Bellerophon rugopleurus*—type WM 6326.
  - a. Anterior view.
  - b. Side view. The outer lip is broken away showing the callosity.
4. *Bellerophon tenuilineatus*—type WM 6329.  
Anterior view of the type specimen.
5. *Bellerophon tenuilineatus*—WM 11639.
  - a. Side view of another specimen in the Gurley collection from Kansas City, Missouri.
  - b. Anterior view of the same.
6. *Bellerophon harrodi*—type WM 6319.
  - a. Side view of the type specimen.
  - b. Anterior view of the same.
7. *Bellerophon textiliformis*—WM 11624.
  - a. Side view of a specimen in the Gurley collection from Kansas City, Missouri.
  - b. Anterior view of the same.
8. *Bellerophon textiliformis*—WM 11624.  
Anterior view of a larger somewhat crushed specimen from the same locality, also in the Gurley collection.
9. *Bellerophon incomptus*—cotype WM 6325.
  - a. Side view of a crushed pyritized specimen.
  - b. Anterior view of the same.



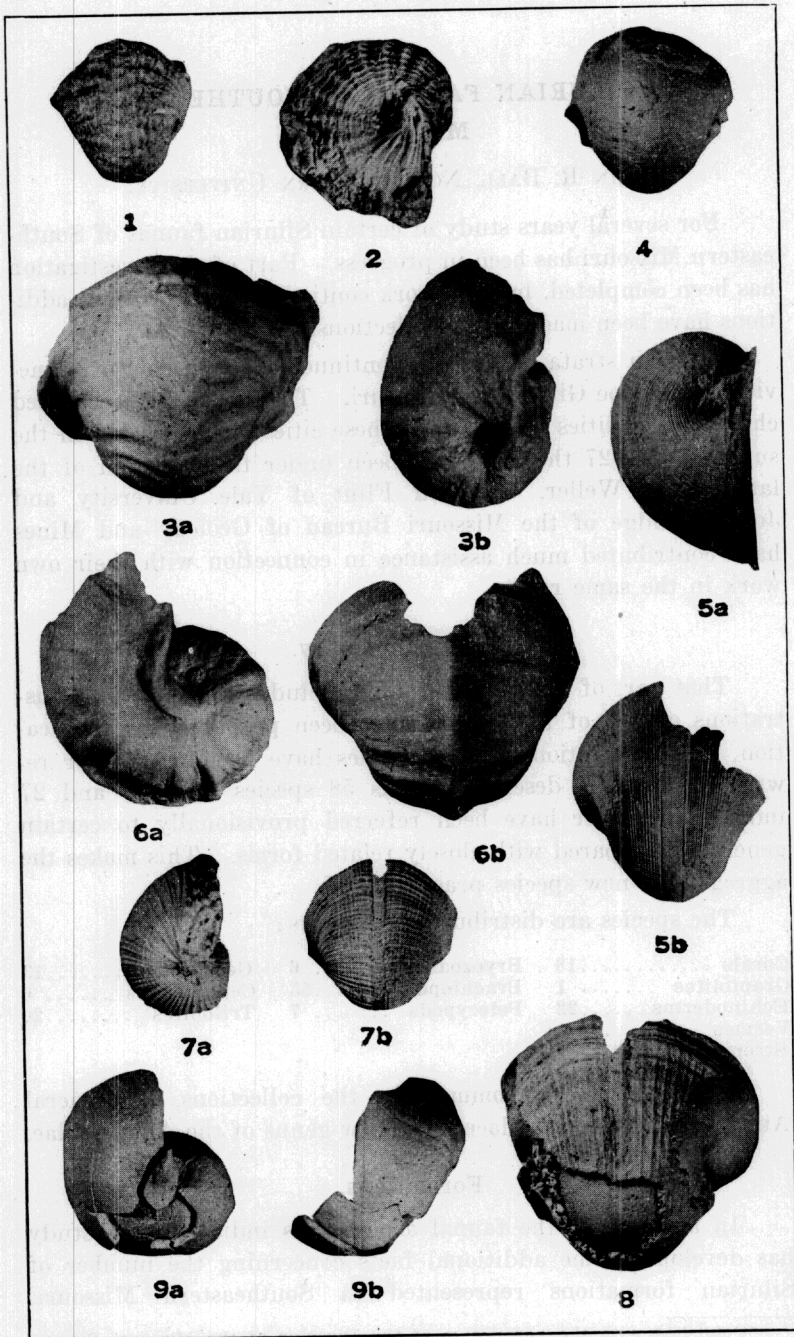


PLATE I.