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Intraspecific Variation Within the Conodont *Polygnathus brevilamina*

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Abstract: Intraspecific variation was observed in a study of 177 well preserved specimens of the conodont *Polygnathus brevilamina.* Variations in the size of platform and in the degree of ornamentation of the platform are illustrated. These variations are present in juvenile specimens. The study indicates that the original definition of *Polygnathus brevilamina* is too narrow and that a broader concept of speciation is needed if conodont species are to be useable.

Although the exact zoological affinity of conodonts is not known it seems apparent that they belonged to pelagic organisms since they are found in a variety of marine lithofacies. Conodonts are widespread geographically and are useful in delineating time stratigraphic units. Ziegler (1962) and Collinson *et al.* (1962) have presented works on Upper Devonian and Mississippian conodont zones.

The potential use of conodonts as time indicators is hindered by problems of nomenclature. Generic and specific names are given to the discrete conodonts although several different discrete species have been found in "assemblages" which represent parts of the conodont-bearing animal. Rhodes (1952) has proposed generic and specific names for the "assemblages." This would result in a confusing classification with complicated synonomies if followed strictly. Moore and Sylvester-Bradley (1957) have proposed that the Rules of Zoological Nomenclature be modified to allow for a classification of fossils based on parataxa. This would provide a practical scheme for classifying fragmentary fossils of all types. This suggestion has not been approved however, and paleontologists have continued to classify discrete conodonts according to the Rules of Zoological Nomenclature, even though there is no official approval of the practice.

Many of the discrete conodont species have been based on a narrow typological species concept. This has resulted in numerous specific names being given to variants of a single species. Because of this, comparisons of conodont faunas and faunal lists are difficult and are many times misleading.

The obvious solution to this problem is to base a species on a large number of specimens so that various stages can be recognized and so that the variation of the species can be defined. Ziegler (1962) studied sufficient numbers of specimens so that he could describe and illustrate the allowable variation within certain Devonian conodonts.

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Collinson and Scott (1959) published a paper on intraspecific variability in *Palmatolepis glabra*. Three hundred and fifty representatives from a single sample were used in this study. In this study Collinson and Scott recognized six morphotypes of the species.

Variation Within Polygnathus brevilamina

Most of the specimens used in this study were obtained from the upper Sheffield Formation at the Sheffield Brick and Tile Company pit (center NW ¼, sec. 16, T. 93N., R20W., Franklin County, Iowa). A few specimens from the lower Aplington Formation are included in the study (E. side of Hwy. 65, SW ¼, SW¼, sec. 10, T. 93N., R.20W., Franklin County, Iowa).

The types of variants recognized in this study are shown in table 1 and illustrated on plate 3. All degrees of variation in platform size are observable in this species. Mature specimens similar to figure *15*, plate 1 are listed under the heading "small platform" and the carina extends posteriorly from the platform. Specimens similar to figures *1*, *4*, *5*, and *11* of plate 1 are listed under the heading "large platform". Transitional specimens between the two above mentioned groups are recognizable (see plate 3). These forms have been included in the "large platform" group in table 1.

Table 1. Distribution of variants from 177 specimens of *Polygnathus brevilamina*

	Mature		Juvenile	
	Sheffield	Aplington	Sheffield	Aplington
Large platform				
coarse	9	1	1	—
weak	62	2	21	1
smooth	23	—	4	3
Small platform				
coarse	7	—	—	—
weak	20	3	5	2
smooth	7	3	3	—

The degree of ornamentation of the platform also varies. Specimens similar to figures *8*, *10*, *11*, and *14* on plate 2 are listed as "smooth". Figures *2*, *12*, and *16* on plate 2 are typical of "weakly ornamented" specimens and specimens similar to *4*, *6*, and *13* of plate 2 are considered to have "coarse" ornamentation on the platform margins.

Variation in ornamentation and platform size is also found in juvenile specimens (see plate 1, fig. *7*, plate 2, fig. *8* & *9* and plate 3, fig. *J* and *K*). Specimens less than one millimeter in length are listed as juvenile forms and specimens longer than one millimeter are listed as mature. Even in juvenile specimens the platform size is variable. Coarse ornamentation was not observed in juvenile specimens.

Problems in Nomenclature of Polygnathus Brevilamina

Müller & Müller (1957, p. 1084-1085) differentiated the conodont genus *Ctenopolygnathus* from *Polygnathus* on the basis of the termination of the posterior portion of the platform. According to these authors, in *Ctenopolygnathus* the platform does not extend to the posterior tip of the carina, whereas in *Polygnathus* the platform always extends to the posterior tip. Müller & Müller regarded the genus *Ctenopolygnathus* as morphologically intermediate between the genus *Spathognathodus* and *Polygnathus*. They assigned *Polygnathus brevilamina* Branson & Mehl, 1934, to the genus *Ctenopolygnathus* along with several other species of *Polygnathus*. *Polygnathus angustidisca* Youngquist, 1945, was choosen as the type species of the genus.

This distinction between *Ctenopolygnathus* and *Polygnathus* does not appear to be valid since the position of the posterior termination of the platform is highly variable within some species of *Polygnathus*. Specimens of *Polygnathus brevilamina* studied in this investigation show a considerable variation in point of platform termination (See Plate 3). Variation of the position of platform termination has also been noted in *Polygnathus angustidisca* (Anderson 1964, p. 92-94, pl. 8, figs. *17*, *19*, *20*).

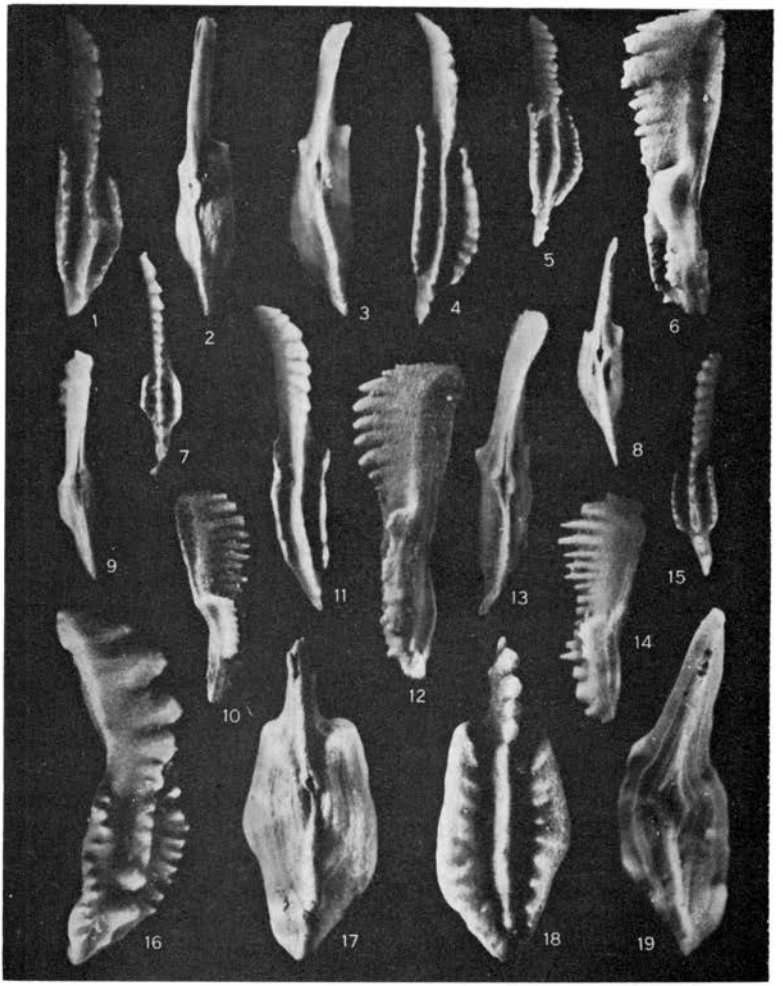
Youngquist's holotype of *Polygnathus angustidisca* is a small fragmental specimen. Juvenile specimens of *Polygnathus angustidisca* may have platforms that terminate before reaching the posterior tip of the carina but larger and more mature specimens of both *Polygnathus angustidisca* and *P. brevilamina* generally have platforms that reach the posterior tip of the carina or at least terminate near the posterior tip of the carina. Juvenile specimens of *P. brevilamina* may or may not have platforms that terminate before reaching the posterior tip of the carina. Variation in platform size is observable in juvenile specimens (see pl. 3, figs. *J* and *K*).

In addition to platform size and ornamentation there is variation in number of denticles, degree of arching, and curvature of blade and carina in *Polygnathus brevilamina*. These variations were not itemized because of the subjectivity involved in differentiating distinct groups of these variants.

Explanation of Plate 1

Figures *17* and *18* are from the Aplington Formation; all others are from the Sheffield Formation.

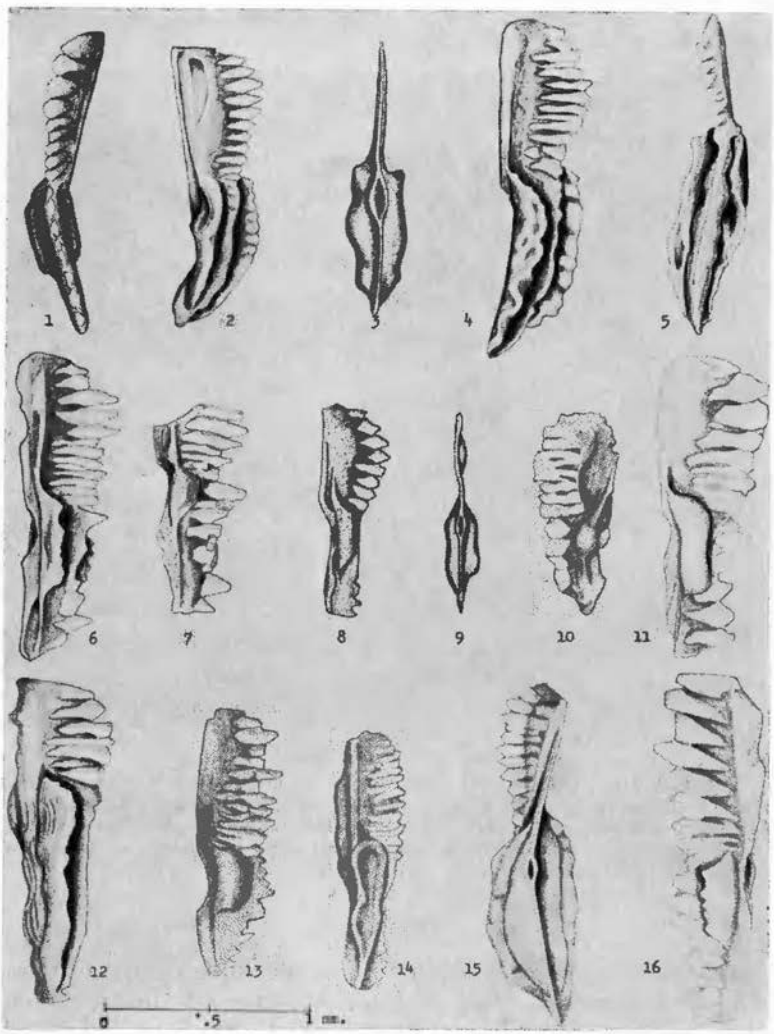
Figures *1-15*—*Polygnathus brevilamina* Branson & Mehl. *1*, oral view 2, aboral view, 6, lateral view of S.U.I. hypotype 11232, x20.5, note large platform and weak ornamentation; *3*, aboral view, *4*, oral view of S.U.I. hypotype 11325, x20.5, note large platform and weak ornamentation; 5, oral view, *8* aboral view of S.U.I. hypotype x11, note intermediate sized platform and weak ornamentation; *7*, oral view, *9*, aboral view, *14*, lateral view of S.U.I. hypotype 11326, x20.5, note small platform and weak



ornamentation; *10*, lateral view, *15*, oral view of S.U.I. hypotype 11327, x16.5 note small platform and weak ornamentation; *11*, oral view, *12*, lateral view, *13*, aboral view of S.U.I. hypotype 11324, x20.5, note large platform, curvature of blade and carina in opposite directions and weak ornamentation.

Figures *16, 19—Polygnathus brevicornis* Youngquist & Peterson. *16*, oral view, *19*, aboral view of S.U.I. topotype 11322, x16.5 Sheffield Formation, Sheffield Brick & Tile Company pit. This species is known only from the holotype and the specimen illustrated here, therefore the variation of the species can not be defined.

Figures *17, 18—Polygnathus communis* Branson & Mehl. *17*, aboral view, *18*, oral view of S.U.I. hypotype 11331, x20.5, Aplington Formation, type locality, Butler County, Iowa. Scott & Collinson (1961) suggested that certain morphologic variants of this species might serve as stratigraphic markers.

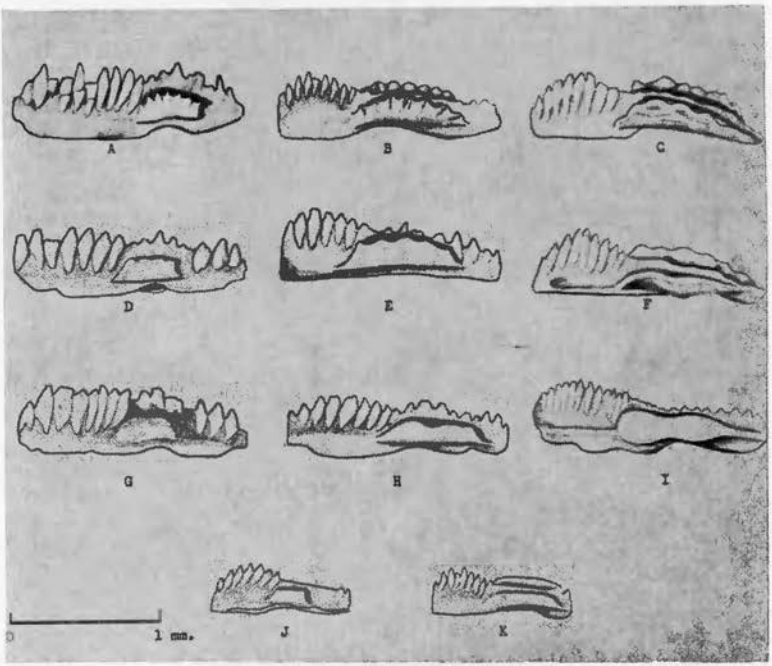


Explanation of Plate 2

Figure *10* is a specimen from the Aplington Formation. All other specimens are from the Sheffield Formation. All specimens are *Polygnathus brevilamina*. Drawings by Karen Ozias.

Figure *1*, oral view of a specimen with small, smooth platform; Figure *2*, oral view of a large, weakly ornamented platform type; Figure *3*, aboral view of a specimen with a large platform; Figure *4*, oral view of a large, coarse platform; Figure *5*, oral view of a large, weakly ornamented platform; Figure *6*, lateral view of a small, coarse platform; Figure *7*, lateral view of a small, smooth platform with a broken blade; Figure *8* and *9*, lateral and aboral view of juvenile specimen with a smooth platform, Figure *10*, lateral view of a small, smooth platform; Figure *11*, lateral view of a small, smooth platform; Figure *12*, lateral view of a large, weakly ornamented platform; Figure *13*, lateral view of a small, coarse platform; Figure *14*, lateral view of a large, smooth platform; Figure *15*, aboral

view of a large platform; Figure *16*, lateral view of a small, weakly ornamented platform.



Explanation of Plate 3

Figures *J* and *K* are juvenile specimens. *A-I* are mature specimens. *A-C* show variation in platform size in specimens with coarse platform margins. *D-F* show variation in platform size in specimens with weakly ornamented platform margins. *G-I* show platform variation in specimens with smooth platforms. Drawings by Karen Ozias.

Conclusion

Polygnathus brevilamina shows a considerable degree of morphological variation. The range of variation is illustrated on plate 3. An average or so called "typical" specimen would be similar to figure *E* of plate 3 and figure 5 of plate 1. These forms have platforms that terminate near but not at the posterior end of the carina. They also possess a weak ornamentation at the platform margin.

Because of the wide variation in conodont species, conodont workers should use a broader species concept and base specific identifications and definitions on a large sample of material wherever possible.

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Solenochilus Springeri (White & St. John, 1868) from the Pennsylvanian of Southern Iowa

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Abstract. The unique Pennsylvanian nautilid *Solenochilus springeri* is described with reference to material from the lower Cherokee Group (Atokan or Desmoinesian) of Marion County, Iowa, and the Bloyd Formation (Morrowan) of northwestern Arkansas. The species was based originally on a specimen, now lost, from Adair County, Iowa; a neotype is selected from the Marion County collections. The detailed morphology of the pair of dorsolateral spines which characterize mature *Solenochilus* is described for the first time. These spines, whose length approximates the width of the mature body chamber, are hollow throughout. Each spine originated as a lateral expansion of a prominent dorsolateral ridge located on the umbilical shoulder.

Introduction

The Order Nautilida constitutes a group of coiled or curved cephalopods which appeared in the Early Devonian and includes most representatives of the Subclass Nautiloidea from the Carboniferous to the Recent. Many possess prominent sculpture, especially ventrolateral nodes and lateral ribs. One Permian nautilid, *Cooperoceras* Miller 1945, is characterized by the development of a paired series of long curved ventrolateral spines. The present study is a consideration of the occurrence, in Iowa, of a unique group of Late Paleozoic nautilids which developed a single pair of long dorsolateral spines at maturity. Represent-

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