

DESCRIPTION OF CERTAIN LOWER DEVONIAN PLATFORM CONODONTS OF THE
SPANISH CENTRAL PYRENEES

BY

KERST TH. BOERSMA*)

ABSTRACT

Certain Lower Devonian platform conodonts are described from the Central Spanish Pyrenees. Of the *Polygnathus foveolatus* group, defined here, *P. foveolatus* Philip & Jackson, *P. lenzi* Klapper, *P. pireneae* n. sp., *P. cf. P. foveolatus* Philip & Jackson and *P. cf. P. lenzi* Klapper are described. *P. pireneae* n. sp. is recorded from the Gedinnian. Furthermore, *Spathognathodus carlsi* n. sp. and a platform conodont not previously recorded are described.

INTRODUCTION

Lower Devonian conodont faunas, collected in the Spanish Central Pyrenees, are of special interest, since they contribute to the knowledge of the conodont zonal succession. The succession of conodont Faunas, informal biostratigraphic units proposed by Ziegler (1971), probably leaves gaps in the record of several important species.

In the Central Spanish Pyrenees faunas were collected from the *Orthoceras* limestones, Rueda Formation, Basibé Formation, Villech Formation and Fonchanina Formation (see Mey, 1967, 1968; Hartevelt, 1970), from the Rio Isabena Valley (prov. Lérida) in the west to the Upper Rio Llobregat Valley (prov. Barcelona) in the east. Data concerning localities, lithological successions, faunal content and age of the formations will be presented in Boersma (1973b).

For some platform conodonts a description of the material presented seemed desirable, especially since a number of new forms are recorded. To the *Polygnathus foveolatus* group, defined here, a new species is added, *P. pireneae*, which is recorded in the *Ancyrodelloides – Icriodus pesavis* Fauna (Ziegler, 1971). The various recorded species of the *P. foveolatus* group are described, including some forms transitional to *P. linguiformis linguiformis* and *P. costatus*. Together with *P. pireneae* a new platform genus is found. Finally, in the *Icriodus woschmidti postwoschmidti* Fauna, a new species of *Spathognathodus* is recognized, *Spathognathodus carlsi*, which is an important step in the development into *Ancyrodelloides*.

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POLYGNATHUS FOVEOLATUS GROUP

In the Emsian of the U.S.A. (Klapper, 1969), Europe (Ziegler, 1956; van Adrichem Boogaert, 1967; Carls & Gandl, 1969; Schönlaub, 1971; Fähræus, 1971; Spassov, 1971) and Australia (Philip, 1966; Philip & Jackson, 1967; Pedder, Jackson & Philip, 1970) species of *Polygnathus* are recorded which are characterized by a basal pit abnormally large for the genus. These species will together be called the *Polygnathus foveolatus* group, the first occurring species of *Polygnathus*. The following species belong to the *P. foveolatus* group:

Polygnathus foveolatus Philip & Jackson, 1967
Polygnathus dehiscens Philip & Jackson, 1967
Polygnathus lenzi Klapper, 1969
and *Polygnathus pireneae* n. sp.

Polygnathus foveolatus Philip & Jackson, 1967
(Plate 1, Figs. 1–12)

- ? 1961 *Polygnathus linguiformis* Hinde – Stoppel; p. 34, 36, 38.
- ? 1964 *Polygnathus linguiformis* Hinde – Lys & Mauvier; p. 394.
- ? 1966 *Polygnathus linguiformis* Hinde – Clark & Ethington; p. 683, 684; pl. 84, figs. 7, 9.
1966 *Polygnathus linguiformis* Hinde – Philip; p. 448, 449; pl. 2, figs. 29–40.
1967 *Polygnathus linguiformis foveolata* n.ssp. – Philip & Jackson; p. 1265; figs. 2d-h, 3b.

*) Geologisch Instituut der Rijksuniversiteit Leiden, Department of Stratigraphy and Palaeontology, Garenmarkt 1b, Leiden, The Netherlands.

- p? 1967 *Polygnathus linguiformis linguiformis* Hinde – van Adrichem Boogaert; p. 184; Encl. 1.
- p 1968 *Polygnathus linguiformis* Hinde – Schulze; p. 148, 152, 154, 159, 162, 180.
- p 1969 *Polygnathus foveolatus* Philip & Jackson – Klapper; p. 13, 14; pl. 6, figs. 19–21, 26–30 (non pl. 6, figs. 22–25 = *P. cf. P. foveolatus*).
- 1969 *Polygnathus linguiformis foveolata* Philip & Jackson – Carls & Gandl; p. 196; pl. 18, figs. 14–19, 22.
- p 1970 *Polygnathus linguiformis foveolatus* Philip & Jackson – Pedder, Jackson & Philip; p. 216, 217; pl. 40, figs. 13, 14 (non pl. 40, figs. 7, 11, 12 = *P. cf. P. foveolatus*).
- 1971 *Polygnathus linguiformis foveolatus* Philip & Jackson – Schönlaub; p. 293; Abb. 4, figs. 1, 2.
- p? 1971 *Polygnathus linguiformis foveolata* Philip & Jackson – Spassov; p. 9, 10; tab. 1.

Diagnosis. – *Polygnathus foveolatus* is a species of *Polygnathus* with a large basal pit, with adcarinal grooves and a sharp angular deflection at the outer side of the platform. The platform is ornamented with nodes and/or ridges, which may or may not cross the platform at the posterior.

Description. – The outer side of the platform is broader than the inner side. The angular deflection is closer to the posterior than to the anterior of the platform. The platform is inclined both sideways and downwards. At both sides of the carina an adcarinal groove has developed. The adcarinal groove at the outer side is deeper than the adcarinal groove at the inner side. Towards the posterior the groove at the inner side disappears, often before the point of inclination, while the groove at the outer side becomes broader here and less deep. The lateral sides of the platform, especially at its anterior side, are strongly upturned, often to a height equal to that of the carina. The platform is ornamented with nodes or short ridges along the platform margins at the anterior, and with ridges at the posterior. Whether the ridges at the posterior cross the platform depends upon the size of the platform. In the present material platforms smaller than 0.42 mm never have crossing ridges, while platforms larger than 0.64 mm always have. In very small specimens only a platform at the outer side has developed. In the case in which ridges cross the posterior part of the platform, the carina does not reach as far as the posterior, but roughly up to the point of the angular deflection.

The basal pit is large compared with the length of the conodont. It may be concluded that in specimens larger than about 1.00 mm the basal pit has reached its maximum size. The basal pit tapers towards the posterior. In juvenile specimens the posterior margin of the basal pit coincides with the posterior margin of the platform; in adult specimens, however, a short groove is often found. The lips of the basal pit are slightly asymmetrical, the inner lip is somewhat greater than the outer lip.

The free blade is relatively short and high. Towards the posterior the high denticles of the free blade pass rather abruptly into the much lower denticles of the carina. The denticles of the free blade and carina are partly or completely fused.

Material. – 45 specimens. Samples: 0247(3), 0402(5), 0403(1), 0406(1), 0409(5), 0605(27), 0606(2).

Occurrence. – Uppermost part of the Basibé Formation (Castellar de Nuch, Villech, Castells), lower part of the Villech Formation (Castellar de Nuch, Villech) and Fonchanina Formation (Castells).

Discussion. – The material described by Klapper (1969) as *P. foveolatus* does not seem monospecific. His specimens from 150 feet above the base of the Blue Fiord Formation have a much smaller basal pit than those from 100 feet above its base. The first specimens will here be classified as *P. cf. P. foveolatus*. The specimens classified as *P. linguiformis linguiformis* by Philip & Jackson (1967), and partly reclassified as *P. linguiformis foveolatus* by Pedder, Jackson & Philip (1970), as well as some of the specimens figured by Pedder, Jackson & Philip possess a basal pit of equal size as that of *P. linguiformis linguiformis*. The position in the platform of the basal pits of these specimens is, however, more like *P. foveolatus*. These specimens, too, are classified here as *P. cf. P. foveolatus*.

Carls & Gandl (1969) considered the crossing of the ridges at the posterior side of the platform as a specific characteristic of *P. foveolatus*. Klapper (1969) considered the sharp angular deflection as the distinctive characteristic with respect to *P. lenzi*. The present author agrees with Klapper, since it is demonstrated that the crossing of the ridges depends on the size of the platform, while the angular deflection is a constantly present characteristic. Klapper stated that *P. lenzi* has a larger basal pit than *P. foveolatus*. The species could not be differentiated by this character.

Ziegler (1971, p. 247) suggested that *P. dehiscens* Philip & Jackson may be partly consubspecific and partly synonymous with *P. foveolatus* but since the aboral side of the holotype (Philip & Jackson, 1967, fig. 2i) is obscured by the basal plate, the present author prefers to consider them as different species. Furthermore, *P. dehiscens* differs from *P. foveolatus* by the absence of adcarinal grooves, so that the platform is relatively flat. It is not known whether the basal pit of *P. dehiscens* is larger than that of *P. foveolatus*, since the first species is not recorded in the material presented.

Age. – Philip & Jackson (1967) concluded a Lower Emsian age for *P. linguiformis foveolata*. Carls & Gandl (1969) found the species together with macrofossils which indicate that it occurs from the uppermost Lower Emsian to the lowermost Upper Emsian (d 4aβγ). Ziegler (1971) restricted the occurrence of *P. foveolatus* to the *Icriodus bilatericrescens bilatericrescens* *Spathognathodus steinhornensis steinhornensis* *Polygnathus* Fauna which he correlated with the upper Lower and lower Upper Emsian. Spassov (1971) recognized *P. linguiformis foveolata* in his *sigmoidalis* zone and *linguiformis linguiformis* zone, which he respectively placed in the upper part of the Siegenian and Emsian. However,

since he did not record an accompanying macrofauna, his age designation seems rather arbitrary.

Polygnathus lenzi Klapper, 1969

(Plate 1, Figs. 13–18)

- ? 1961 *Polygnathus webbi* Stauffer – Stoppel; p. 35, 38.
 ? 1964 *Polygnathus webbi* Stauffer – Lys & Mauvier; p. 394.
 p? 1966 *Polygnathus* sp. aff. *P. webbi* Stauffer – Clark & Ethington; p. 684.
 p? 1967 *Polygnathus linguiformis linguiformis* Hinde – van Adrichem Boogaert; p. 184; pl. 3, fig. 1.
 p? 1968 *Polygnathus webbi* Stauffer – Schulze; p. 152, 154, 159, 162, 180.
 1969 *Polygnathus lenzi* n. sp. – Klapper; p. 14, 15; pl. 6, figs. 9–18.
 1969 *Polygnathus webbi excavata* n. ssp. – Carls & Gandl; p. 193–195; pl. 18, figs. 9–13.
 1971 *Polygnathus lenzi* Klapper – Schönlaub, p. 293.
 ? 1971 *Polygnathus dehiscens* Philip & Jackson – Fähræus; p. 677, 678; pl. 78, figs. 1–12.

Diagnosis. – A species of *Polygnathus* with a large basal pit and adcarinal grooves. The platform is moderately inclined at approximately mid-length. The platform is ornamented with nodes and/or ridges, which never cross the platform at the posterior.

Description. – The outer side of the platform is broader than the inner side. The platform is inclined sideways and downwards. At both sides of the carina an adcarinal groove is found. The groove at the outer side is deeper than the groove at the inner side. At the point of maximum inclination the grooves become flatter. At the anterior of the platform the lateral sides are upturned, but never as high as the carina. The platform is ornamented with nodes or short ridges at the anterior and with short ridges at the posterior. The ridges at the posterior never cross the platform.

Compared with the length of the conodont, the basal pit is large. The basal pit tapers towards the posterior. In juvenile specimens the posterior margin of the basal pit coincides with the posterior margin of the platform, in adult specimens, however, a short groove is present. The basal pit is slightly asymmetrical, the inner lip is somewhat greater than the outer lip. The basal pit is rather flat.

The free blade is relatively short. Towards the posterior the denticles of the free blade pass gradually into the denticles of the carina. The denticles are partly fused.

Material. – 21 specimens. Samples: 0105(8), 0107(2), 0109(6), 0110(4), 0238(1).

Occurrence. – Uppermost part of the Basibé Formation at La Guardia de Arés and Castells and lower part of the Villech Formation at La Guardia de Arés.

Discussion. – The material presented coincides with the material described by Klapper (1969) and Carls & Gandl (1969). The specimens presented are perhaps only some-

what flatter than the specimens previously described. The specimen figured by van Adrichem Boogaert seems to coincide with the description of *P. lenzi*.

Klapper (1969) stated that *P. lenzi* has a larger basal pit than *P. foveolatus*, while Carls & Gandl (1969) argued that the basal pit of *P. webbi excavata* tapers more rapidly towards the posterior than that of *P. foveolatus*. None of these differences could be demonstrated. The only useful distinction between both species seem to be the angular deflection of *P. foveolatus* which is absent in *P. lenzi*. For further differences with *P. foveolatus* see under *P. foveolatus*.

Fähræus (1971) placed *P. lenzi* in synonymy with *P. dehiscens*. His specimens figured seem, however, to belong to *P. lenzi*, considering the development of the adcarinal grooves.

For differences with *P. pireneae* see under *P. pireneae*.

Age. – Klapper (1969) placed *P. lenzi* in the lower part of the Emsian, while Garls & Gandl (1969) recorded their *P. webbi excavata* in the uppermost part of the Lower Emsian (d 4a α). Van Adrichem Boogaert (1967, p. 184) concluded a, probably lower, Emsian age. Ziegler (1971) limited the range of *P. lenzi* to the *Icriodus bilatericrescens bilatericrescens* – *Spathognathodus steinhornensis steinhornensis* – *Polygnathus* Fauna. The material presented belongs to this Fauna.

Polygnathus pireneae n. sp.

(Plate 2, Figs. 1–12)

Derivatio nominis. – After the occurrence in the Pyrenees (los Pireneos in Spanish).

Holotype. – Specimen 06-035 (Plate 2, Figs. 1–3).

Paratypes. – Specimen 06-036 and specimen 06-038.

Locus typicus. – Castells.

Stratum typicum. – Lowermost part of the Basibé Formation.

Diagnosis. – A slender species of *Polygnathus* with a high platform, without adcarinal grooves. The platform is ornamented with nodes or short ridges which reach the carina in adult specimens, but which do not cross the platform at the posterior.

Description. – The platform is slender and sharply pointed at the posterior. The platform is inclined sideways and downwards. The platform does not completely reach the most posterior margin of the blade. No adcarinal grooves are present; only in adult specimens does the platform display a slight depression at the anterior. The platform is ornamented with thick nodes in juvenile specimens, and with short thick ridges in adult specimens. The ridges may reach the carina, and are approximately perpendicular to the carina. The ridges never cross the posterior of the platform.

The basal pit is deep and large compared with the length of the conodont. In juvenile specimens the whole lower side is excavated by the basal pit. Only in adult specimens does the basal pit taper towards the posterior to a slender groove. The lips of the basal pit are slightly asymmetrical, the inner lip is somewhat larger than the outer lip.

The free blade is short and high. The denticles of the free blade pass rather abruptly into the lower denticles of the carina. The denticles are partly fused, but become less fused and less distinct towards the posterior.

Material. — 5 specimens. Samples: 0216(1), 0218(2), 0910(1), H 553 (1).

Occurrence. — Lowermost part of the Basibé Formation at Castells and Torres, lower part of the Llavierno Limestone Member of the Basibé Formation in the Rio Isabena Valley.

Discussion. — *Polygnathus pireneae* resembles *P. lenzi* and *P. dehiscens*. It differs from *P. lenzi* by the absence of adcarinal grooves and the slenderer and higher platform, it differs from *P. dehiscens* by the absence of the angular deflection and the still slenderer and higher platform. Furthermore, *P. dehiscens* still possesses shallow and short adcarinal grooves at the anterior of the platform. *P. pireneae* differs from *P. foveolatus* by the form of the platform, the absence of the angular deflection, and by the absence of adcarinal grooves.

Age. — Except *P. pireneae*, sample 0216 contains N. gen. n. sp. and *Pelekysgnathus serrata* n. ssp. A Carls, 1969, while sample 0218 also contains *Spathognathodus steinhornensis repetitor* Carls & Gandl. Sample 0219, taken 7 m above sample 0218, contains *Spathognathodus steinhornensis* n. ssp. A Carls, 1969. All three species were recorded by Carls (1969) from the Lower Devonian of the Guadarrama (Spain). On the basis of the occurrence of *Ancyrodelloides trigonica* Bischoff & Sannemann and *Icriodus pesavis* Bischoff & Sannemann, the faunas of Carls were placed by Ziegler (1971) in the *Ancyrodelloides* — *Icriodus pesavis* Fauna, which corresponds (Ziegler, 1971) with the upper Lower Gedinian, Upper Gedinian and a boundary zone between the Gedinian and Siegenian. Although it is remarkable that neither *Ancyrodelloides* nor *Icriodus pesavis* are recorded (see Boersma, 1973b) it seems justified to place *P. pireneae* in the *Ancyrodelloides* — *Icriodus pesavis* Fauna.

Polygnathus cf. *P. foveolatus* Philip & Jackson, 1967
(Plate 2, Figs. 16–18)

- ? 1956 *Polygnathus linguiformis* Hinde — Ziegler; p. 103, 104; figs. 11, 12, 19, 20 (non pl. 7, figs. 15–18 = *P. linguiformis linguiformis*).
- p 1969 *Polygnathus foveolatus* Philip & Jackson — Klapper; p. 13, 14; pl. 6, figs. 22–25 (non pl. 6, figs. 19–21, 26–30 = *P. foveolatus*).

- p 1970 *Polygnathus linguiformis foveolatus* Philip & Jackson — Pedder, Jackson & Philip; p. 216, 217; pl. 40, figs. 7, 11, 12 (non pl. 40, figs. 13, 14 = *P. foveolatus*).

Specimens with a basal pit smaller than *P. foveolatus* and larger than *P. linguiformis linguiformis* are classified here as *P. cf. P. foveolatus*.

Material. — 3(4?) specimens. Samples: 0112(1?), 0116(1), 0608(2).

Occurrence. — Villech Formation at La Guardia de Arés and Castellar de Nuch.

Age. — Nonlatericrescid — *Icriodus* — *Polygnathus* Fauna (Ziegler, 1971).

Polygnathus cf. *P. lenzi* Klapper, 1969

(Plate 2, Figs. 13–15)

- 1956 *Polygnathus webbi* Stauffer — Ziegler; p. 104; pl. 7, figs. 13, 14, 22, 23.

Specimens with a basal pit smaller than *P. lenzi* and larger than *P. costatus* Klapper are classified here as *P. cf. P. lenzi*.

Material. — 2 specimens. Sample: 0117(2).

Occurrence. — Villech Formation at La Guardia de Arés.

Age. — Nonlatericrescid — *Icriodus* — *Polygnathus* Fauna (Ziegler, 1971).

Discussion on the Polygnathus foveolatus group

By the discovery of *Polygnathus pireneae* the history of *Polygnathus* is shifted back into the Gedinian. A gap in the record of the *P. foveolatus* group exists, however, between the occurrence of this species and the species previously described, during the Siegenian, although Philip & Jackson (1967) suggested a latest Siegenian or earliest Emsian age for *P. dehiscens*.

Ziegler (1971) suggested an equal range for *P. foveolatus* and *P. lenzi*, i.e. the *Icriodus bilatericrescens bilatericrescens* — *Spathognathodus steinhornensis steinhornensis* — *Polygnathus* Fauna. In so doing he neglected the records of Klapper (1969) and Carls & Gandl (1969). Both authors recorded an occurrence of *P. lenzi* earlier than that of *P. foveolatus*. These two species are not recorded together. In the material presented both species only occur in the same section at Castells and again first *P. lenzi*. Philip & Jackson (1967) and Pedder, Jackson & Philip (1970) recorded *P. dehiscens* and *P. foveolatus* in one section. The first mentioned species occurs first. It is also remarkable that Philip (1966) and Spassov only recorded *P. foveolatus*, and that Fähraeus (1971) only recorded *P. lenzi* (?). It is therefore suggested that *P. lenzi* occurs in the lower part of the *Icriodus bilatericrescens bilatericrescens* — *Spathognathodus steinhornensis*

steinhornensis – *Polygnathus* Fauna, and *P. foveolatus* in the upper part.

Important characteristics of the *P. foveolatus* group are the size (and possibly also the location) of the basal pit, the adcarinal grooves, the angular deflection and the height of the platform. Biometric analysis on large populations, possibly in a manner indicated by Barnett (1971, 1972) or Boersma (1973a), is strongly recommended in separating the different species of the group. The question whether *P. dehiscens* and *P. lenzi* are synonyms may be solved in this way.

Ziegler (1971, p. 251) suggested that *Polygnathus* according to its "... inflated basal pit may have come from *Spathognathodus*". The development of the *P. foveolatus* group from *Spathognathodus* seems very probable for a number of reasons. Firstly, the basal pit is much larger than that of the later species of *Polygnathus* (e.g. *P. costatus*, *P. linguiformis linguiformis*, and the specimens classified as *P. cf. P. foveolatus* and *P. cf. P. lenzi*). Secondly, juvenile specimens of *P. foveolatus* show that the platform was formed relatively late in the ontogeny. Thirdly, the species of the *P. foveolatus* group possess a groove posterior to the basal pit, which is characteristic of *Spathognathodus*, and not a keel, which is characteristic of the later species of *Polygnathus* (e.g. *P. costatus*, *P. linguiformis linguiformis*, and the specimens classified as *P. cf. P. foveolatus* and *P. cf. P. lenzi*). Although Ziegler stated that no transitional species between *Spathognathodus* and *Polygnathus* are known (p. 251), some species of *Spathognathodus* do possess characteristics which may be interpreted as steps in the development into *Polygnathus*. *Spathognathodus exiguus exiguus* Philip and *S. exiguus philipi* Klapper are characterized by enlarged anterior denticles and by an asymmetrical basal cavity. On some of the specimens of *S. exiguus exiguus* figured by Philip (1966) a thickening of the blade can be observed. The thickening of the middle and posterior part of the blade and enlarged anterior denticles were also mentioned by Bischoff & Sannemann (1958) in their description of *S. frankenwaldensis* Bischoff & Sannemann. The enlarged denticles may be interpreted as a primordial development of a free blade, while the thickening may be interpreted as a primordial development of a platform. Klapper (1969) placed the occurrence of *S. exiguus philipi* in the Siegenian, Philip (1966) suggested an Emsian age for *S. exiguus exiguus*, while *S. frankenwaldensis* occurs in the uppermost part of the *Icriodus woschmidti post-woschmidti* Fauna and in the main part of the *Ancyrodelloides* – *Icriodus pesavis* Fauna (Ziegler, 1971). It might therefore be suggested that the *P. foveolatus* group developed from *S. frankenwaldensis*.

Although the exact nature of the basal opening of *P. pirenae* could not be established (it is presumed to possess a basal pit), it seems most likely that in the development into *Polygnathus* the important step is made from basal cavity to basal pit.

OTHER PLATFORM SPECIES

Spathognathodus carlsi n. sp.
(Plate 3, Figs. 1–6; Plate 4, Figs. 1–9)

1958 *Spathognathodus steinhornensis* Ziegler – Bischoff & Sannemann; p. 106, 107; pl. 13, figs. 2, 3, 7, 9.

Derivatio nominis. – In honour of Dr. P. Carls.

Holotype. – Specimen 07-001 (Plate 3, Figs. 1–3).

Paratype. – Specimen 07-002.

Locus typicus. – Bahent.

Stratum typicum. – *Orthoceras* limestones.

Diagnosis. – A species of *Spathognathodus* with broadly flaring lips of the basal cavity. The inner lip is rounded and unornamented in upper view. The outer lip is slender, ornamented at the upper side with 1–3 thick denticles, and roughly perpendicular to the blade.

Description. – The blade is nearly straight in juvenile specimens. In adult specimens the posterior part of the blade may be inclined sideways up to about 30°, while it is also inclined downwards. In adult specimens the blade is strongly thickened. The blade bears up to about 17 ovate denticles, perpendicular to the blade, which are only partly fused. At the anterior and above the deepest part of the basal cavity the denticles may be enlarged.

In upper view the inner lip is about semicircular, tapering gradually towards the posterior. The inner lip is not ornamented. The outer lip is very broadly flaring, slender and somewhat directed towards the anterior. The posterior margin of the outer lip, roughly parallel to the anterior margin, forms an angle before tapering towards the posterior. The outer lip is ornamented with 1–3 strong, circular, sharply pointed denticles, which may reach as high as the blade in adult specimens. In juvenile specimens only one denticle is present, which may be connected to the blade by a thin ridge. In very juvenile specimens the outer lip is also unornamented.

The basal cavity is strongly asymmetrical and shallow. To the anterior it abruptly becomes more slender and continues in the groove. It tapers gradually towards the posterior.

Material. – 41 specimens. Samples: 1104(19), 1105(21), 1106(1).

Occurrence. – *Orthoceras* limestones at Bahent.

Discussion. – The material described conforms completely with that described by Bischoff & Sannemann (1958) as *S. steinhornensis*. Specimens with 4 denticles on the outer lip, as recorded by Bischoff & Sannemann, are not found.

The outline of the basal cavity resembles that of *S. steinhornensis steinhornensis* (e.g. Carls & Gandl, 1969; pl. 19, fig. 8). However, this subspecies of *S. steinhornensis*, which first occurs in the *Icriodus bilatericrescens bilatericrescens* - *Spathognathodus steinhornensis steinhornensis* - *Polygnathus* Fauna (Ziegler, 1971), possesses no denticles on the outer lip.

Spathognathodus asymmetricus Bischoff & Sannemann differs from *S. carlsi* by its less flaring inner lip and by the more flaring outer lip, which bears 3-6 denticles. The basal cavity (?) of *S. asymmetricus* is more restricted than in *S. carlsi*.

It may be suggested that *S. carlsi* developed from *S. remscheidensis* Ziegler, a species which shows not only a similar form of blade, but which may also bear some primordial denticles on the outer lip (Ziegler, 1960).

S. asymmetricus evidently developed from *S. carlsi*, so that the phylogenetic line suggested by Carls (1969, p. 342) may be extended: *S. remscheidensis* - *S. carlsi* - *S. asymmetricus* - *S. transitans* - *Ancyrodelloides trigonica*.

Age. - Bischoff & Sannemann recorded *S. steinhornensis* from the Tentakulitenkalk of the Frankenwald, together with, among others, *Ancyrodelloides trigonica* Bischoff & Sannemann and *Icriodus pesavis* Bischoff & Sannemann, which place their faunas in the *Ancyrodelloides* - *Icriodus pesavis* Fauna (Ziegler, 1971). In the present material *S. carlsi* occurs together with *Icriodus woschmidti postwoschmidti* Mashkova, *I. angustoides bidentatus* Carls & Gandl, *I. rectangularis* Carls & Gandl s.l., *Spathognathodus remscheidensis* Ziegler and *S. steinhornensis repetitor* Carls & Gandl, so that it may be concluded that *S. carlsi* is recorded from the *Icriodus woschmidti postwoschmidti* Fauna (Ziegler, 1971).

N. gen. n. sp.

(Pl. 4, Figs. 10-13)

Diagnosis. - A short platform genus with a left and right lobe at the anterior of the platform, without carina or blade, ornamented with ridges and nodes. The lower side is excavated by a large basal cavity(?).

Description. - The platform consists of a posterior part, ornamented with short alternating transverse ridges, and

an anterior part which is lobed to the right and left. The right lobe is roughly circular and is ornamented with thick elongated nodes, about perpendicular to the platform margin. The most anterior node is connected with a central node by a thin ridge. The left lobe (the outermost part of which is broken off) is slender and probably sharply pointed, and roughly perpendicular to the posterior part of the platform. A thin ridge runs over the entire length of the lobe. The ridge is connected with the central node of the right lobe. Neither a free blade nor a carina is present. The platform is not inclined.

The lower side is completely excavated by the deep symmetrical basal cavity (?). The lips of the basal cavity are steep and not fused with the platform. The left and right side of the basal cavity is angular, the posterior side is sharply pointed and the anterior side is rounded.

Material. - 1 specimen. Sample 0216(1).

Occurrence. - Lowermost part of the Basibé Formation at Castells.

Discussion. - The specimen differs strongly from all other Devonian platform conodonts, by the absence of a blade and carina. Only in adult specimens of *Icriodus* has the carina often been lost. The shape of the basal cavity is, however, completely different. *Ancyrodelloides* shows pointed lobes, directed towards the anterior, at the anterior of the platform. The specimen differs, however, from *Ancyrodelloides* by the absence of a blade and carina, and shape and size of the basal opening.

The general form of the platform and form and size of the basal cavity somewhat resemble *Astrognathus*, recorded from the Upper Silurian *celloni-* and *amorphognathoides* zone of the Carnic Alps (Walliser, 1964). However, *Astrognathus* possesses a blade.

The general form of the platform also somewhat resembles that of *Hadragnathus staurognathoides* Walliser, of the same age and recorded from the same locality as *Astrognathus*. The shape and size of the basal cavity are, however, completely different.

Age. - The specimen is found together with *Polygnathus pireneae*, which is placed in the *Ancyrodelloides* - *Icriodus pesavis* Fauna (Ziegler, 1971) (see under *P. pireneae*).

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PLATES

PLATE 1

(all magnifications X 150)

Figs. 1–12: *Polygnathus foveolatus* Philip & Jackson

Figs. 1–3: Specimen 06-005, sample 0605. 1: upper view, 2: lateral view, 3: lower view.

Figs. 4–6: Specimen 06-009, sample 0605. 4: upper view, 5: lateral view, 6: lower view.

Figs. 7–9: Specimen 06-033, sample 0605. 7: upper view, 8: lateral view, 9: lower view.

Figs. 10–12: Specimen 06-013, sample 0605. 10: upper view, 11: lateral view, 12: lower view.

Figs. 13–18: *Polygnathus lenzi* Klapper

Figs. 13–15: Specimen 06-030, sample 0109. 13: upper view, 14: lateral view, 15: lower view.

Figs. 16–18: Specimen 06-027, sample 0109. 16: upper view, 17: lateral view, 18: lower view.

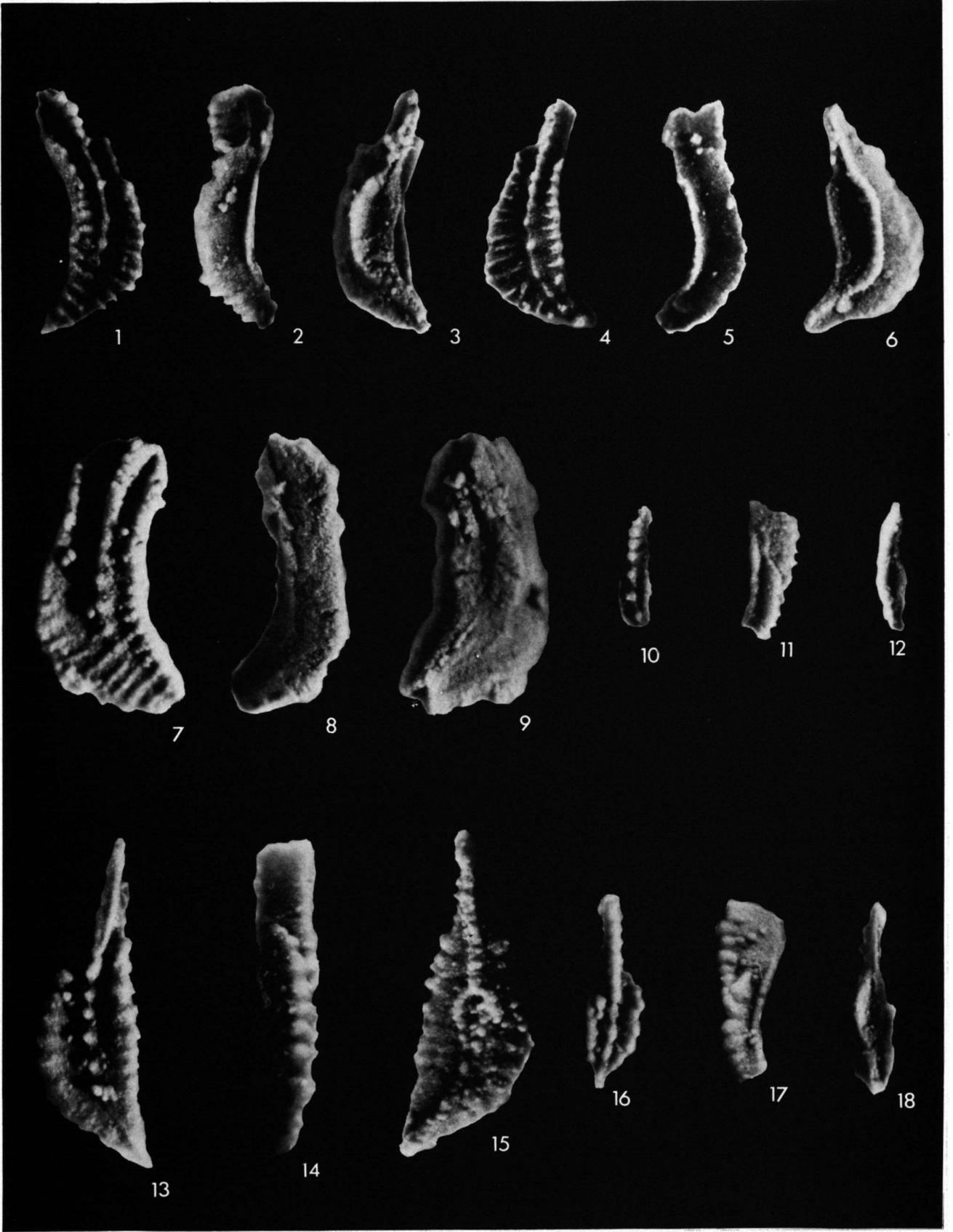


PLATE 2

(all magnifications X 150)

Figs. 1–12: *Polygnathus pireneae* n. sp.

Figs. 1–3: H o l o t y p e, specimen 06-035, sample 0218. 1: upper view, 2: lateral view, 3: lower view.

Figs. 4–6: P a r a t y p e, specimen 06-036, sample 0910. 4: upper view, 5: lateral view, 6: lower view.

Figs. 7–9: P a r a t y p e, specimen 06-038, sample H 553. 7: upper view, 8: lateral view, 9: lower view.

Figs. 10–12: Specimen 06–037, sample 0218. 10: upper view, 11: lateral view, 12: lower view.

Figs. 13–15: *Polygnathus* cf. *P. lenzi* Klapper

Specimen 06-039, sample 0117. 13: upper view, 14: lateral view, 15: lower view.

Figs. 16–18: *Polygnathus* cf. *P. foveolatus* Philip & Jackson

Specimen 06-020, sample 0608. 16: upper view, 17: lateral view, 18: lower view.

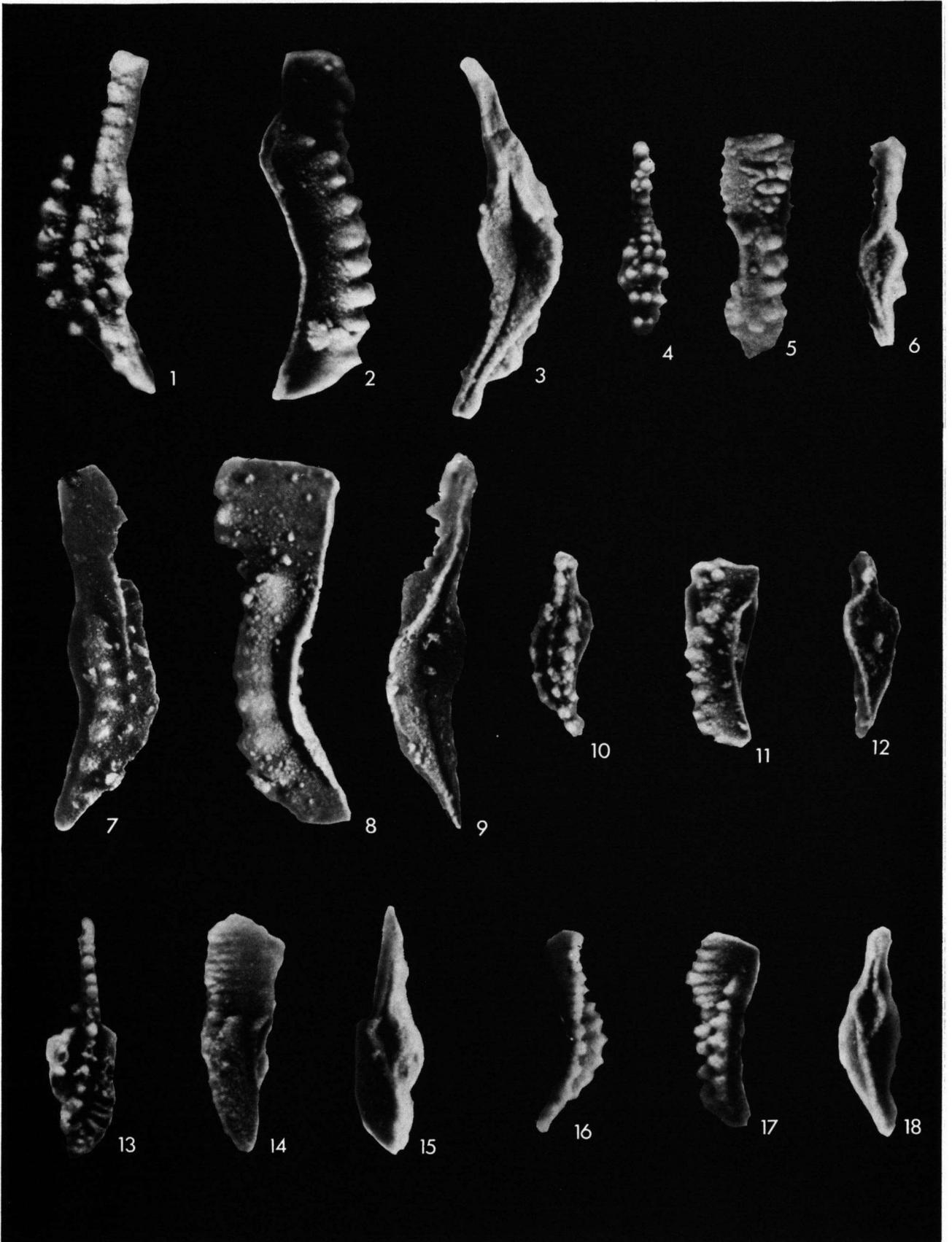


PLATE 3

(all magnifications X 150)

Figs. 1–6: *Spathognathodus carlsi* n. sp.

Figs. 1–3: H o l o t y p e , specimen 07-001, sample 1104. 1: upper view, 2: lateral view, 3: lower view.

Figs. 4–6: P a r a t y p e , specimen 07-002, sample 1104. 4: upper view, 5: lateral view, 6: lower view.



PLATE 4

(all magnifications X 150)

- Figs. 1–9: *Spathognathodus carlsi* n. sp.
Figs. 1–3: Specimen 07-003, sample 1104. 1: upper view, 2: lateral view, 3: lower view.
Figs. 4–6: Specimen 07-007, sample 1105. 4: upper view, 5: lateral view, 6: lower view.
Figs. 7–9: Specimen 07-008, sample 1105. 7: upper view, 8: lateral view, 9: lower view.
- Figs. 10–13: N. gen. n. sp.
Specimen 08-001, sample 0216. 10: upper view, 11: lower view, 12: right lateral view, 13: left lateral view.

