

# Conodont faunas from Portugal and southwestern Spain

## Part 1. A Middle Devonian fauna from near Montemor-o-Novo

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Conodonts of Couvinian age are recorded from limestone beds incorporated in a sedimentary sequence which was previously considered to be Late Devonian or Early Carboniferous in age.

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## Introduction

The stratigraphy of the Palaeozoic rocks of southern Portugal and southwestern Spain is still not well known in detail, one of the reasons being the scarcity of fossils. Therefore conodonts obtained from local limestone lenses have given welcome information (Höllinger, 1959; van den Boogaard, 1963). Occasionally, new outcrops of limestone have been encountered by geologists presently at work in that region, and during the last few years I have received several samples of these limestones for investigation. Since further limestone outcrops may be discovered and samples thereof sent to me, and since there is no stratigraphical control, I decided to publish the results separately but under the general heading

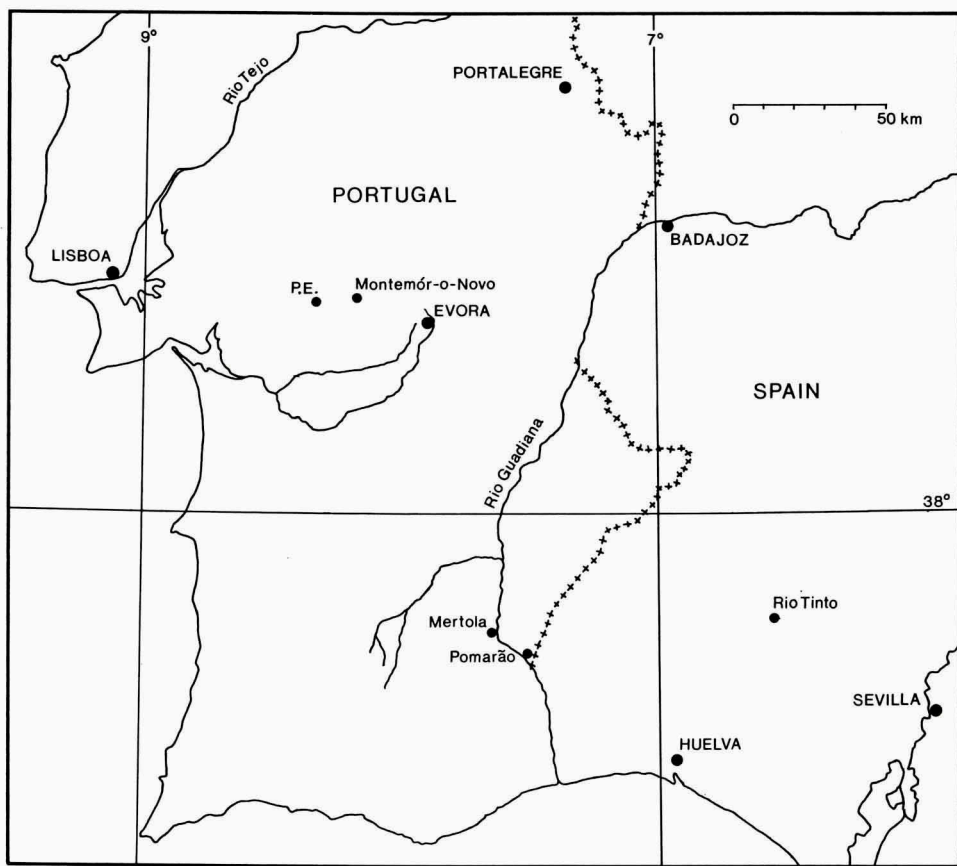


Fig. 1. Map showing the locality of Pedreira da Engenharia (= P.E.).

“Conodont faunas from Portugal and southwestern Spain”, the present paper being the first of a series.

For a long time, Middle Devonian strata were considered to be absent in Portugal. The first discovery of Couvianian fossils was made by Perdigão (1967) at S. Julião near Portalegre. All previously recognized Devonian faunas belong either to the Lower Devonian (Gedinnian and Coblenzian) or to the Upper Devonian (Famennian) (Teixeira & Thadeu, 1967).

In 1970, the author received limestone samples collected by Dr L. J. G. Schermerhorn from the Pedreira da Engenharia, a limestone quarry situated 1 km south of the main road from Lisbon to Evora and 13 km west of Montemor-o-Novo (see Fig. 1). Mr A. Ribeiro of the Serviços Geológicos de Portugal drew attention to this exposure and on his suggestion samples for microfossils were taken. Two of the samples yielded conodont faunas of Couvianian age.

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Fig. 2a. Pedreira da Engenharia seen from the south (Photograph by Dr L. J. G. Schermerhorn).

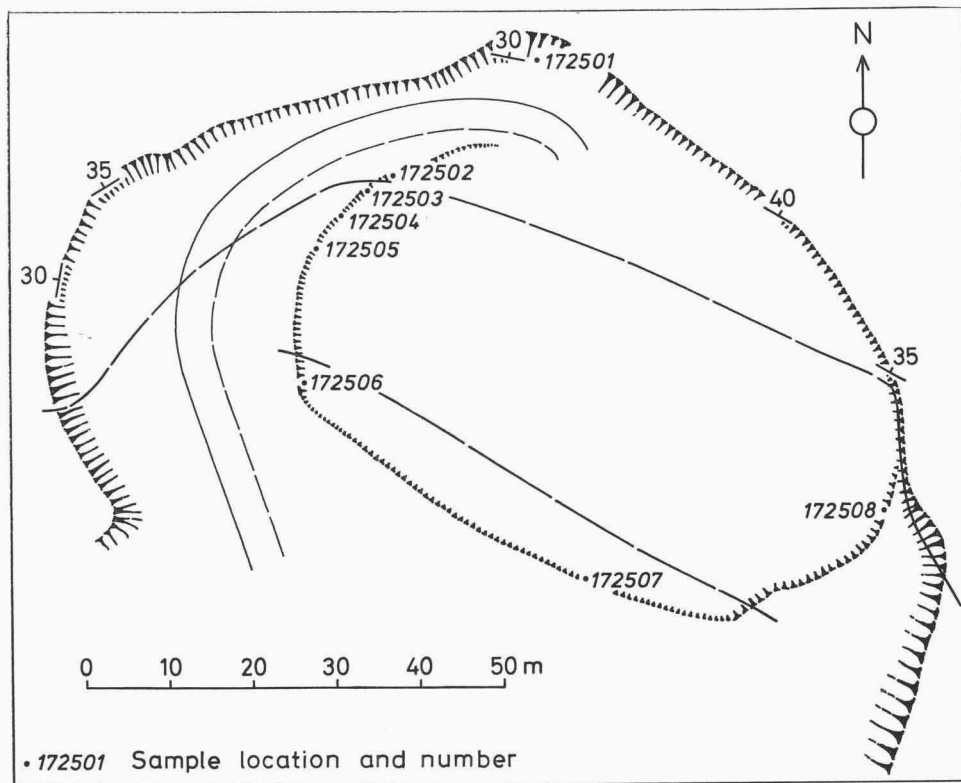


Fig. 2b. Sketch of the quarry Pedreira da Engenharia, showing the sample localities (Drawn by Dr L. J. G. Schermerhorn).

T. Veldhuyzen and Mr B. F. M. Collet of the Rijksmuseum van Geologie en Mineralogie thanks are due for preparing the photographs and giving other technical assistance. The numbers preceded by RGM are registration numbers of the Rijksmuseum van Geologie en Mineralogie (National Museum of Geology and Mineralogy).

### Geological setting

In the quarry Pedreira da Engenharia (Fig. 2) three limestone zones can be distinguished which show a moderate northeast dip. In the northern part of the quarry a sequence is found of dark grey limestone beds (samples RGM 172 501, 172 502), 3-25 cm thick, separated by laminae of black slate. The rock shows undulating bedding planes. This sequence overlies a massive, dark grey limestone with a sharp contact. The latter limestone, partly dolomitized, is a rather coarse-grained, recrystallized rock (samples RGM 172 503, 172 504, 172 505 and 172 508) in which a few crinoidal stem fragments were found. It grades into the southernmost zone of similar unbedded limestone which is, however, medium grey in colour (samples RGM 172 506 and 172 507).

In the vicinity of the quarry, shales and fine-grained greywackes occur displaying a much lesser degree of deformation. These are assigned on the Carta Geológica de Portugal (1968 edition) to the Upper Westphalian and Stephanian. They probably overlie the quarry-limestone sequence unconformably. One kilometre to the southwest, fossiliferous calcareous sediments (limestones and calcareous slates) outcrop near the farm Defesa Grande. They contain abundant crinoids, lamellibranchs, some brachiopods, gastropods, corals and trilobite remains. These faunas were examined by Pruvost (1914), who concluded to a Devonian or Carboniferous age, probably high in the Devonian or possibly Lower Carboniferous, because trilobites other than Proetidae were absent and spirifers were rare. Since Pruvost's time, this fauna has not been studied in more detail. The relation between the Defesa Grande beds (assigned to the Upper Devonian on the Carta Geológica de Portugal), the slates and greywackes near the quarry, and the Pedreira da Engenharia limestone remains unknown and detailed mapping has to be done before this question can be solved.

### Comments on the faunas

The samples RGM 172 502 and RGM 172 504 yielded rather small conodont faunas. One kilogramme of limestone did not contain more than 40 specimens. The fossil content is listed in table 1.

From this table it appears that *Polygnathus costatus costatus* is the dominant subspecies and that all other species occur in minor amounts. The indeterminate fragments are chiefly from blade and bar type conodonts.

Table 1. Distribution and frequency of the conodonts in the samples from Pedreira da Engenharia.

	sample nr.	
	172 502	172 504
<i>Coelocerodontus triangularis</i> (Stauffer, 1940)	6	7
<i>Icriodus</i> sp. A		1
<i>Icriodus</i> sp. B		6
<i>Polygnathus angusticostatus</i> Wittekindt, 1965	6	1
<i>Polygnathus costatus costatus</i> Klapper, 1971	85	104
<i>Polygnathus linguiformis linguiformis</i> Hinde, 1879, $\gamma$ morphotype		7
<i>Spathognathodus bidentatus</i> Bischoff & Ziegler, 1957		3
<i>Spathognathodus intermedius</i> Bultynck, 1970	6	
<i>Spathognathodus obliquus</i> Wittekindt, 1965	3	
<i>Synprioniodina alternata</i> Ulrich & Bassler, 1926	1	
Indeterminable fragments	70	87

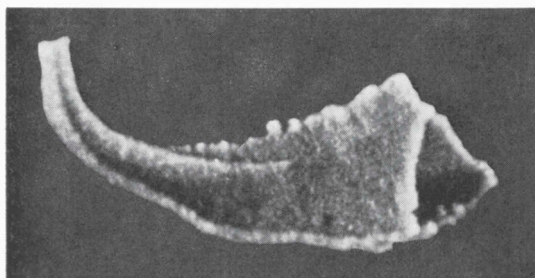


Fig. 3. *Coelocerodontus triangularis* (Stauffer), lateral view, 97x. Specimen RGM 172 596, from sample RGM 172 504.

*Coelocerodontus triangularis* (Stauffer, 1940)  
Fig. 3.

1940 *Belodus triangularis* n.sp. – Stauffer, p. 420, pl. 59, fig. 49.

1970 *Coelocerodontus triangularis* (Stauffer) – Bultynck, p. 95, pl. 27, figs. 6, 9, 16.

For further references see the list of synonyms in Bultynck 1970 p. 95.

The specimens are conspecific with those figured by Stauffer (1940), Philip (1966) and Bultynck (1970). They clearly show the triangular cross section of the basal cavity and the ridges at the junctions of lateral and anterior faces.

Figured specimen: RGM 172 596; other material: RGM 172 563 and 172 577.

*Icriodus* sp. A  
Pl. 1, fig. a.

One single broken specimen of a form of *Icriodus* with two lateral processes. The large process, nondenticulate, directed anteriorly at an angle of approximately 45° with the axis of the platform. The other, short, steeply plunging downward from the posterior end at approximately 90°, bearing a thin crest which seems to consist of three or four fused nodes. In the ornamentation of the platform, the specimen resembles *Icriodus bilatericrescens* Ziegler, 1956. It differs, however, from that species in the dimensions of the lateral processes.

Figured specimen: RGM 172 579.

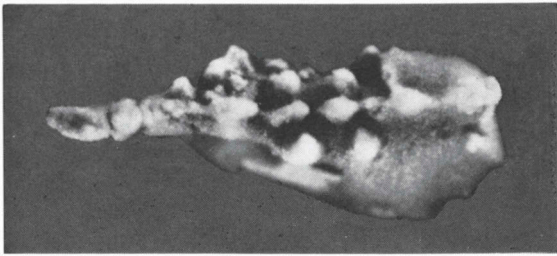


Fig. 4. *Icriodus* sp. B., oral view, 60 x. Specimen RGM 172 598, from sample RGM 172 504.

*Icriodus* sp. B

Fig. 4.

Six specimens with parts of the expansion of the basal cavity missing and therefore unidentifiable. The specimens are slender and have a middle row consisting of seven to eight partly fused, laterally compressed, denticles. The marginal rows have two to four discrete denticles which tend to be round.

Figured specimen: RGM 172 598; further material RGM 172 578 and 172 597.

*Polygnathus angusticostatus* Wittekindt, 1965

Pl. 1, fig. b.

1965 *Polygnathus angusticostata* n.sp. – Wittekindt, p. 631, pl. 1, figs. 15-18.

1971 *Polygnathus angusticostatus* Wittekindt – Klapper, p. 65, pl. 3, figs. 21-25.

For further references see the list of synonyms in Klapper 1971.

The few specimens in the faunas have a nearly symmetrical platform, short transverse ridges separated from the carina by wide and rather deep adcarinal grooves, and a carina which extends slightly beyond the posterior end of the platform. The basal pit is small and situated on the anterior part of the aboral side of the platform.

Figured specimen: RGM 172 581; further material: RGM 172 565.

*Polygnathus costatus costatus* Klapper, 1971

Pl. 1, figs. e-h

1971 *Polygnathus costatus costatus* subsp. nov. – Klapper, p. 63, pl. 1, figs. 30-36; pl. 2, figs. 1-7.

For further references see the list of synonyms in Klapper 1971, p. 63.

The specimens have strong transverse ridges separated from the carina by adcarinal grooves. The carina reaches the posterior end. The platform is widest in its posterior third and is somewhat constricted in its anterior part. The free blade is rather short, usually about one third the length of the total unit. The basal pit is small and situated in the anterior part of the aboral side of the platform. Some specimens (Pl. 1, fig. h) are slenderer than those pictured by Klapper (1971) but in my opinion still remain within the range of variation of *Polygnathus costatus costatus*.

Figured specimens: RGM 172 599-172 602; further material: RGM 172 566, 172 582, 172 583.

*Polygnathus linguiformis linguiformis* Hinde 1879,  $\gamma$  morphotype of Bultynck, 1970  
Pl. 1, fig. c.

1970 *Polygnathus linguiformis linguiformis* Hinde  $\gamma$  forma nova – Bultynck, p. 126-127, pl. 11, figs. 1-6; pl. 12, figs. 1-6.

The posterior third (tongue) of the platform is deflected inward and downward. The anterior two-thirds of the outer platform is trough shaped and is widest near the beginning of the tongue where the outer margin is deflected sharply inward. The anterior two-thirds of the inner platform is much shallower and less wide, and tapers somewhat towards the beginning of the tongue.

Figured specimen: RGM 172 592; further material: RGM 172 584.

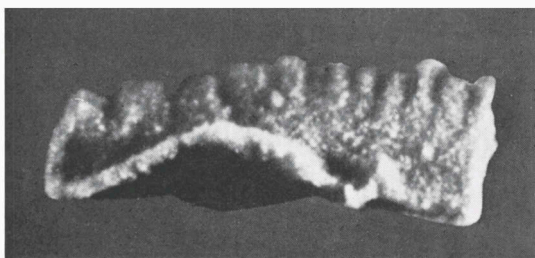


Fig. 5. *Spathognathodus bidentatus* Bischoff & Ziegler, lateral view, 110x. Specimen RGM 172 594, from sample RGM 172 504.

*Spathognathodus bidentatus* Bischoff & Ziegler, 1957  
Fig. 5

1957 *Spathognathodus bidentatus* n.sp. – Bischoff & Ziegler, p. 114-115, pl. 6, figs. 8-10.

The specimens clearly show the two groups of different denticles on the oral side and the large symmetrical basal cavity, which are typical of the species.

Figured specimen: RGM 172 594; further material: RGM 172 587.

*Spathognathodus intermedius* Bultynck, 1970  
Pl. 1, fig. d.

1970 *Spathognathodus intermedius* nom. nov. – Bultynck, p. 133-134, pl. 18, figs. 2-6. For further references see the list of synonyms in Bultynck 1970.

Six specimens, though in denticulation resembling *Spathognathodus bidentatus*, are nevertheless considered conspecific with *Spathognathodus intermedius*, because of their narrow basal cavity.

Figured specimen: RGM 172 603; further material: RGM 172 571.

*Spathognathodus obliquus* Wittekindt, 1965  
Fig. 6

1965 *Spathognathodus obliquus* n.sp. – Wittekindt, p. 643, pl. 3, figs. 25-29.

The specimens show all characteristics described by Wittekindt (1965). The large

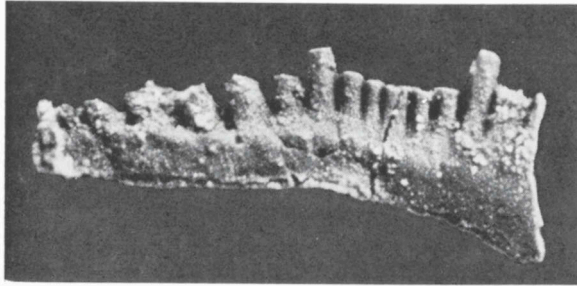


Fig. 6. *Spathognathodus obliquus* Wittekindt, lateral view, 55x. Specimen RGM 172 593, from sample RGM 172 502.

denticles occur in the anteriormost and posterior part of the oral side, the smaller ones in between. The obliquely sideward pointing denticles in the posterior part give the unit a twisted appearance. The small and narrow basal cavity is situated in the middle of the aboral side.

Figured specimen: RGM 172 593; further material: RGM 172 572.

### Stratigraphic results

In both the samples numbered RGM 172 502 and 172 504 (see table 1) *Polygnathus costatus costatus* Klapper is the dominant species. According to Klapper (1971) the range of *P. costatus costatus* in the Belgian Couvinian is Co2bIII to Co2cIII (Bultynck, 1970, pl. 38, listed als *Polygnathus webbi*).

Bultynck (1970) found *Polygnathus linguiformis linguiformis*  $\gamma$  morphotype in Co2c and Co2d of the Belgian Couvinian; *Polygnathus angusticostatus* from Co2cIII into Co2d; *Spathognathodus intermedius* in the upper part of Co2c; *Spathognathodus bidentatus* in Co2d and Lower Givetian.

Wittekindt (1965) found *Spathognathodus obliquus* in the *bidentatus* zone.

According to Ziegler (1970, chart 2) *Polygnathus angusticostatus*, *Spathognathodus bidentatus* s.l. and *Spathognathodus obliquus* make their first appearance in the *Spathognathodus bidentatus* zone of the Eifelian of Germany.

The joint occurrence of *Polygnathus costatus costatus* and *Spathognathodus bidentatus* – which were not found together in the Belgian Couvinian (Bultynck, 1970, pl. 38) – may indicate that in other facies outside Belgium the range of both species still needs to be established.

According to the ranges of the conodont species, except *Spathognathodus bidentatus*, the Pedreira da Engenharia limestone appears to correlate with the Belgian Couvinian Co2cIII. *Spathognathodus bidentatus* suggests a Couvinian Co2d age. The correct age may be somewhere in the interval Co2cIII up to and including Co2d.

The occurrence of the older species *Spathognathodus intermedius* in sample 172 502 and the younger species *Spathognathodus bidentatus* in sample 172 504 might indicate that the layer from where sample 172 502 was taken is older than the bed that yielded 172 504. In the field (Fig. 2) the bed of 172 502 overlies that of 172 504 but whether this is the normal sequence or a reversed one is uncertain.



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## PLATE 1

- a. *Icriodus* sp. A, oral view, 60x. Specimen RGM 172 579, from sample RGM 172 504.
- b. *Polygnatus angusticostatus* Wittekindt, oblique lateral view, 56x. Specimen RGM 172 581, from sample RGM 172 504.
- c. *Polygnatus linguiformis linguiformis* Hinde,  $\gamma$  morphotype of Bultynck, oral view, 70x. Specimen RGM 172 592, from sample RGM 172 504.
- d. *Spathognathodus intermedius* Bultynck, lateral view, 88x. Specimen RGM 172 603, from sample RGM 172 502.
- e-h. *Polygnatus costatus costatus* Klapper,
  - e. oral view, 65x, Specimen RGM 172 599, from sample RGM 172 504.
  - f. oblique oral view, 55x. Specimen RGM 172 601, from sample RGM 172 504.
  - g. aboral view, 70x. Specimen RGM 172 602, from sample RGM 172 504.
  - h. oblique oral view, 60x. Specimen RGM 172 600, from sample RGM 172 504.

PLATE 1

