TRABAJOS DE GEOLOGÍA, 4, Fac. Ci. Univ. Oviedo
«The Carboniferous of Northwest Spain»
pp. 677-686, text-figs 1-2, pls 1-2

THE ROAD SECTION EAST OF VALDETEJA WITH ITS CONTINUATION ALONG THE ARROYO DE BARCALIENTE (CURUEÑO VALLEY, LEON)

C. F. WINKLER PRINS *

(with a NOTE ON *LEONARDOPHYLLUM LEONENSE* SP. NOV. by G. E. DE GROOT*)

ABSTRACT

A section E of Valdeteja along the road to the Curueño river and its continuation along the Arroyo de Barcaliente is described. The section starts in the Arroyo de Barcaliente with the Lower Carboniferous Vegamián Formation which lies with a faulted contact on sandstones of the Ermita Formation. The section continues with the Genicera and Barcaliente formations separated by a sharp boundary. The latter formation has its type section here and is, of course, named after the brook. It consists of dark grey to black, fetid, laminated, practically unfossiliferous limestones with an important limestone breccia band of blocks up to 2 m in diameter. The Barcaliente Formation ends with another thin breccia band at the junction of the road along the Curueño river, with that going westwards to Valdeteja and Cármenes. The type section of the Valdeteja Formation (named after the village) is exposed along the road to Valdeteja. This formation follows onto the Barcaliente Formation and is distinguished by the lighter colours of its limestones (usually light grey, but sometimes greenish, red or black). The limestone is banked to massive, often recrystallized, and locally rich in fossils. It contains dolomite lenses. Faunal bands have been named after important constituents and the total faunal contents are summarized in Table A. The section ends with the basal shales of the «San Emiliano Formation» which is badly exposed here.

In a palaeontological note two specimens of *Leonardophyllum leonense* sp. nov. are described from the type section of the Valdeteja Formation. *Leonardophyllum* was previously recorded from Pennsylvanian and Permian strata in the U.S.A.

RESUMEN

Se describe un corte al este del pueblo de Valdeteja que aflora en la carretera que baja al valle del río Curueño y que continúa en el valle del Arroyo de Barcaliente. Este corte comienza en el arroyo con la Formación Vegamián del Carbonífero Inferior que tiene un contacto por falla con la Formación La Ermita y que pasa gradualmente a la Formación Genicera («Mármol grioto»). La Formación Barcaliente se delimita claramente de la Formación Genicera y toma su nombre del Arroyo de Barcaliente donde tiene su sección tipo. Esta formación consta de calizas fétidas, de color gris oscuro tirando a negro. Están bien laminadas y se encuentran prácticamente exentas de fósiles macroscópicos. Contienen un nivel importante de brecha caliza con bloques de hasta 2 m diámetro en espato calizo. La Formación Barcaliente se termina por otro nivel de brecha, mas reducido, que aflora en el cruce de la carretera siguiendo el río Curueño con la que va a Valdeteja.

* Rijksmuseum van Geologie en Mineralogie, Hooglandse Kerkgracht 17, Leiden, the Netherlands.

En aquella carretera aflora la sección tipo de la Formación Valdeteja. Esta formación sigue a la de Barcaliente y se distingue por sus calizas generalmente menos oscuras, de color gris claro, sobre todo, aunque existen también tonalidades verdes, rojas y negras. Estas calizas son masivas o bancadas, a menudo recristalizadas, con niveles fosilíferos y lentejones de dolomía. Los niveles fosilíferos han recibido un nombre por su constituyente faunístico más importante. El contenido fosilífero total se representa en el cuadro A. El corte se termina con las lutitas inferiores de la «Formación San Emiliano» que está mal definida en este lugar.

En la nota de G. E. DE GROOT se describe *Leonardophyllum leonense* sp. nov., representado por dos ejemplares (holotipo y paratipo) recogidos en la sección tipo de la Formación Valdeteja. Antes se conocía *Leonardophyllum* solamente del Pennsylvaniense y del Pérmico de los Estados Unidos. La nueva especie se distingue por sus elementos estructurales muy fuertes y por sus tabiques septales mayores unidos todavía a la estructura axial en el estado adulto.

INTRODUCTION

A good section through the «caliza de montaña» (also called calcaire des cañons or Escapa Formation) is found along the road E of Valdeteja leading to the Curueño river valley. This section is continued ENE-wards along the Arroyo de Barcaliente, where the underlying Genicera Formation (formerly called Alba Formation, see WAGNER, WINKLER PRINS & RIDING 1971) is reached. This continuous section through a full succession of «caliza de montaña» is almost entirely exposed in steeply dipping limestones showing little dolomitization, comparatively little tectonic disturbance, and several fossil bands in the upper part (text-fig. 2, Pl. 1, fig. 1). For these reasons, it was selected as the type section of the Valdeteja Member and as a reference section for the Vegacervera Member —together forming the Escapa Formation— by WINKLER PRINS (1968, pp. 47, 49). These two members were later raised to formational rank. The Valdeteja Formation has its type section along the road E of Valdeteja, and the Barcaliente Formation along the Arroyo de Barcaliente (WAGNER, WINKLER PRINS & RIDING 1971). The fauna has been listed by the author in 1968 (Table III, which by a printer's error is continued after Table IV). Because of the difficulties in reading Table III and since some additions could be made, the faunal contents of the Valdeteja Formation in its type section are summarized here in Table A.

DESCRIPTION

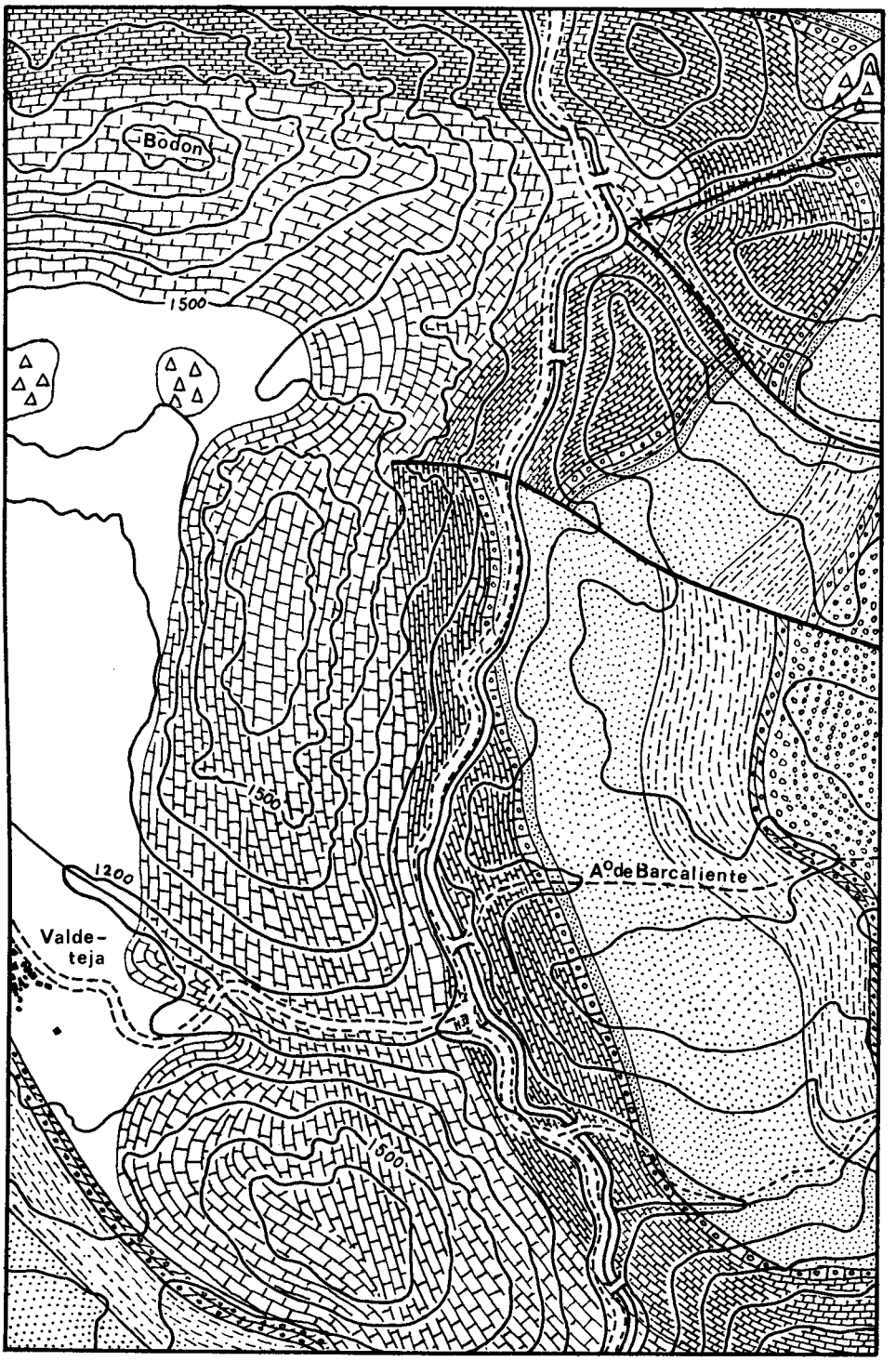
The section (text-figs. 1, 2) commences in the Arroyo de Barcaliente with black shales of the Vegamián Formation which lie with a faulted contact on Upper Devonian (or early Carboniferous) sandstones of the Ermita Formation. The latter lies disconformably on Ordovician quartzites of the Barrios Formation (compare COMTE 1959, EVERS 1967). The black shales are much crumpled and unfossiliferous except for some nodules with radiolarians. The Vegamián Formation can be studied better at its reference section near the «Mirador de Vegamián» along the road ENE of the Porma Dam (EVERS 1967, fig. 18) or SW of Genicera where it is richly fossiliferous (WAGNER 1963, p.54; WINKLER PRINS 1968, Table I). The Vegamián Formation is followed by the Genicera Formation (Alba Formation of previous authors, see WAGNER, WINKLER PRINS & RIDING 1971). First, *ca.* 5 m. of red shales are found

above the black shales, and these are followed by another 5 m of dark red, bedded cherts with black and white stains (Lavandera Member). The Genicera Formation ends with the 15 m thick Canalón Member, which starts with red nodular limestone, slightly siliceous at the base, becoming pink and light grey higher up. As long as the grey beds are found intercalated with pink layers they are pink on fresh surfaces, but eventually true grey beds occur. Elsewhere, e. g. about 0.5 km to the north along the strike at La Venta (Vega de San Pedro) (compare WINKLER PRINS 1968, Table II), the red and pink limestones have yielded Upper Viséan goniatites, whilst the grey layers yielded Lower Namurian (E Zone) goniatites (KULLMANN 1963, p.314; WAGNER-GENTIS 1963, p.8).

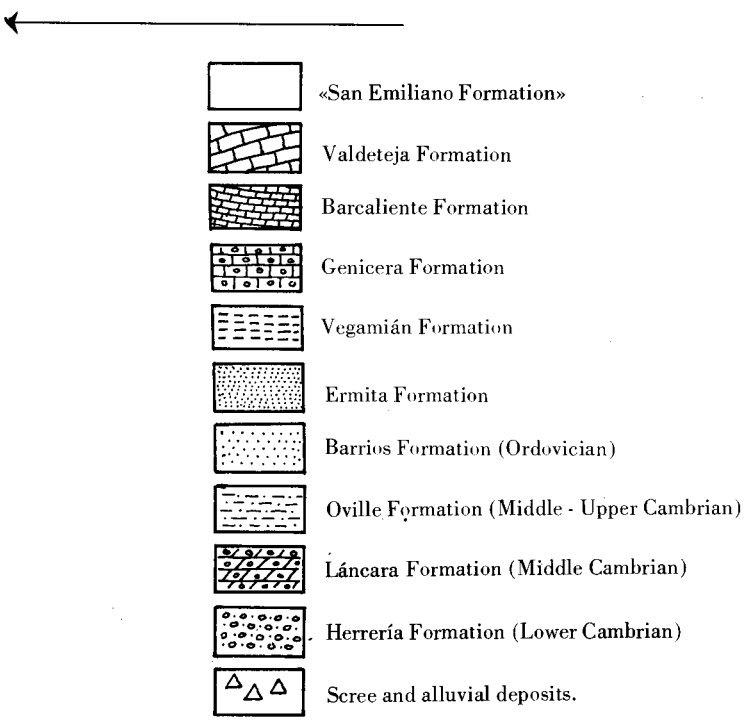
In this section, a sharp boundary exists between the grey, slightly nodular limestones at the top of the Genicera Formation and the black, fetid, laminated, micritic limestones of the Barcaliente Formation (named after the stream containing the type section). These laminated limestones, sometimes appearing massive by weathering (see WINKLER PRINS 1968, text-fig. 5), continue for 160 m. Then, a remarkable breccia is found with large, rotated, angular blocks (up to 2 m in diameter) of the laminated limestone in a matrix of white sparry calcite and dark grey micrite (Pl. 1, fig. 2). Somewhat below the breccia, patches of the normal laminated limestone are found with large (a few cm long) authigenic quartz crystals, completely replaced by calcite. Fragments of this rock type also occur in the breccia. After the brecciated interval, the laminated limestone reappears for 40 m after which it grades through a marly limestone into a thin bed of slightly calcareous black shales with reticulariid spirifers and crinoid ossicles («*Martiniopsis*» Band of WINKLER PRINS 1968). This shale level is found along the road in the Curueño Valley leading from La Vecilla to the Puerto de Vegarada near the junction with the road to Valdeteja and Cármenes (see text-fig. 1). The shale horizon is followed by 2 m of dark grey, laminated limestone with a thin breccia band, probably erosional in origin.

Along the road to Valdeteja the section is continued with 45 m of light brownish-grey, massive, recrystallized limestone with dark grey to black masses, forming the basal part of the Valdeteja Formation (named after the village of Valdeteja immediately west of the termination of the type section as described here). At the top of the massive limestone a thin, light grey limestone is found grading into a greenish-grey marl which turns into grey and purplish limestone with shale partings. This 10 m thick sequence contains many corals, especially *Cladochonus* (see Pl. 2, figs. 4-5) which sometimes covers limestone surfaces. This is the *Cladochonus* Band (Cl.) as mentioned in text-fig. 2. Among the other corals are additional tabulates (e. g. *Pseudofavosites*, see Pl. 2, fig. 3) and rugose corals (e.g. *Leonardophyllum*, see the palaeontological note appended to this paper). At the base some brachiopods (a reticulariid and *Plicatifera* aff. *plicatilis*) are found in fair abundance, but on single bedding planes only. The *Cladochonus* Band is followed by 15 m of thickly bedded, dark grey, crinoidal limestones with thin shale partings.

These are followed by 440 m of thickly bedded to massive, greyish recrystallized limestones, generally unfossiliferous, but with occasional corals (*Lithostrotionella*


Bodon
1500
1500
1200
Aº de Barcaliente
Valde-
teja
1500

sp.) and algae. Patches of dolomite with white calcite veins are found in these limestones. A 10 m thick, grey, banked limestone follows onto the massive limestone sequence. It contains a varied, partly silicified fauna including a primitive fusulinid fauna and was named the *Fenestella-Composita* Band (F. C.) in WINKLER PRINS 1968. After another 5 m of unfossiliferous grey limestone a 2 m thick, dark grey to grey-brown, banked limestone occurs which is moderately fossiliferous. In the middle, a thin, reddish weathering, laminated limestone contains abundant productid brachiopods, especially *Chaoiella gruenewaldti*. This is the *Chaoiella* Band (Ch.) of text-fig. 2. It is succeeded by 130 m of massive, light grey, recrystallized limestone with a few dolomite lenses, up to 5 m thick, containing calcite, malachite and quartz. There follows a crinoidal limestone which grades into a light grey, tough limestone with abundant brachiopods, the *Echinoconchus* Band (E.). This band is continued by approximately 25 m of massive, grey limestone followed by black, well-bedded, in part finely laminated limestones with brachiopods and some other fossils, the *Linoproductus* Band (L.). The brachiopods are well-preserved and easily observed since they are brilliant white; the productids often have their spines preserved (see text-fig. 10 of WINKLER PRINS 1968). The top of the Valdeteja Formation is composed of 20 m of grey, banked, dirty limestones with a poor fauna, separated by prominent shale intercalations which herald the thick shale sequence at the base of the «San Emiliano Formation». The latter has been described from the San Emiliano (Babia Baja)



Text-fig. 1.—Geological map of the Valdeteja area (scale 1 : 25,000).

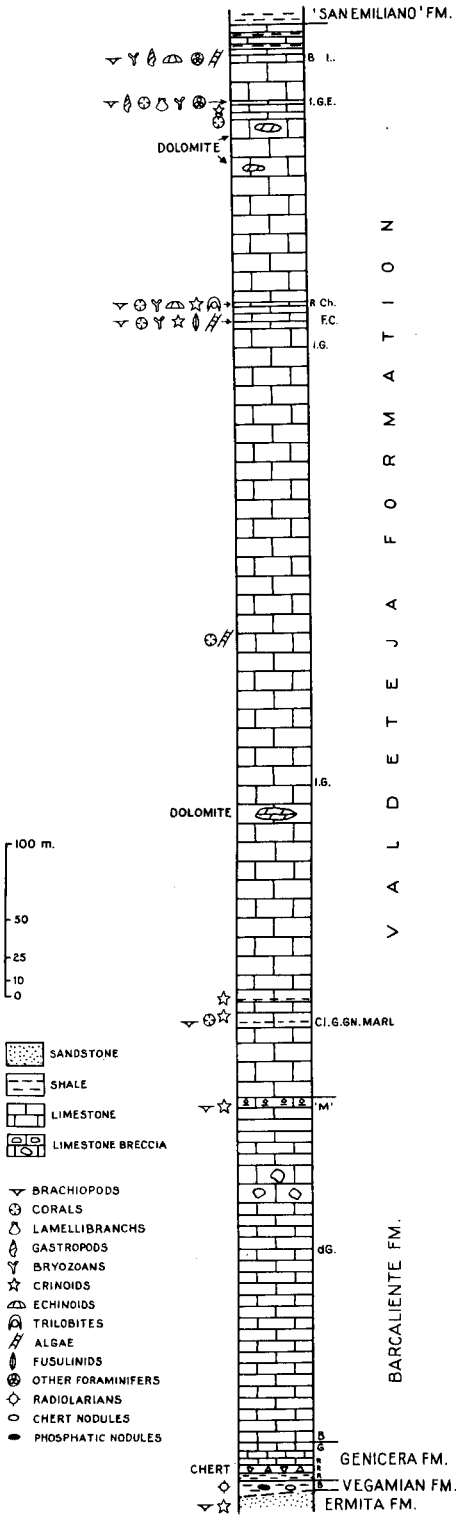

'SAN EMILIANO' FM.
B l.
I.G.E.
DOLOMITE
R Ch.
F.C.
I.G.
I.G.
DOLOMITE
VALDETEJA FORMATION
100 m.
50
25
10
0
CI.G.GN.MARL
'M'
dG.
BARCALIENTE FM.
SANDSTONE
SHALE
LIMESTONE
LIMESTONE BRECCIA
BRACHIOPODS
CORALS
LAMELLIBRANCHS
GASTROPODS
BRYOZOANS
CRINOIDS
ECHINOIDS
TRILOBITES
ALGAE
FUSULINIDS
OTHER FORAMINIFERS
RADIOLARIANS
CHERT NODULES
PHOSPHATIC NODULES
CHERT
GENICERA FM.
VEGAMIAN FM.
ERMITA FM.

TABLE A.— FAUNA OF THE VALDETEJA FORMATION AT ITS TYPE SECTION

	Cl.	C.F.	Ch.	E.	L.
ALGAE		x			x
FUSULINIDAE		x			
TRILOBITA			x		
MOLLUSCA				x	x
CRINOIDEA	x	x	x	x	
BRYOZOA		x	x	x	x
ANTHOZOA			x		
Rotiphyllum sp., *Amplexocarinia* sp., *Plerophyllum (Ufimia)* sp.	x				
Leonardophyllum leonense DE GROOT, sp. nov.	x				
aulophyllids		x			
carcinophyllid				x	
Pseudofavosites sp.	x				
Cladochonus sp.	x				
BRACHIOPODA					
Spiriferidina	x	x	x	x	
Rhynchonellida				x	
Plicatifera aff. *plicatilis* (SOWERBY)	x				
Avonia (Quasiavonia) aculeata (SOWERBY)			x	x	x
Krotovia cf. *spinulosa* (SOWERBY)				x	
Eomarginifera cf. *praecursor* (MUIR-WOOD)			x	x	
Productus carbonarius DE KONINCK			x		x
Echinoconchus punctatus (SOWERBY)			x		x
Echinoconchus elegans (M'COY)			x	x	x
Pustula sp.				x	x
Dictyoclostus? inflatiformis IVANOV				x	
Antiquatonia costata (SOWERBY)				x	
Chaoiella gruenewaldti (KROTOW)			x	x	
Reticulatia moelleri (STUCKENBERG)				x	
Balakhonia continentalis (TORNQUIST)				x	x
Ovatia ovata (HALL)			x	x	x
Rhipidomella sp.			x	x	

region 48 km to the west by BROUWER & VAN GINKEL 1964 (see also MARCOS 1968, VAN DEN BOSCH 1969), where a different suite of rocks occurs. It is doubtful that this name should be used here.

NOTE ON LEONARDOPHYLLUM LEONENSE sp. nov.

(G. E. DE GROOT)

The corals collected by C. F. WINKLER PRINS in the type section of the Valdeteja Formation include two specimens of *Leonardophyllum*, a genus previously known only from the Pennsylvanian and Permian of North America. Since this is the first record of *Leonardophyllum* in the Carboniferous of Europe, the corallites are described here. The specimens are deposited in the Rijksmuseum van Geologie

Text-fig. 2.—Section of the Carboniferous deposits along the Arroyo de Barcaliente and the road to Valdeteja. The faunal bands are indicated by abbreviations which are explained in the text. The section is modified according to new information after figs. 7 b and 8 A of WINKLER PRINS (1968).

en Mineralogie (National Museum of Geology and Mineralogy) of the Netherlands, and are catalogued under the numbers RGM-St. 97973 and 97974.

I am much indebted to Dr. WINKLER PRINS for placing his collection of corals at my disposal and to Mr. J. J. F. HOFSTRA and Mr. B. F. M. COLLET for their technical assistance.

Class ANTHOZOA
Order RUGOSA
Family Timorphyllidae SOSHKINA 1941
Genus *Leonardophyllum* MOORE & JEFFORDS 1941

Type-species: *Leonardophyllum distinctum* MOORE & JEFFORDS, 1941, from the Leonardian (Lower Permian) of the Glass Mountains, Texas.

Leonardophyllum leonense sp. nov.
Pl. 2, figs. 1, 2.

Diagnosis. A species of *Leonardophyllum* with very thick skeletal elements and major septa not withdrawn from the axial structure in adult stages.

Description. The corallites are ceratoid and show distinct septal grooves. They bear a prominent calicular boss. The boss is crowned by a strong median ridge, with 4 septal lamellae abutting on each side. The corallites are 25 mm long and measure at the calyx 10 to 12 mm in diameter.

In the neanic stage the very thick, laterally contiguous septa are pinnately arranged. Their microstructure is lamellar with a dark median line or fibronormal. The metasepta are on the whole equally divided over the four quadrants. In the ephebic stage the counter quadrants are slightly accelerated.

Development of the axial structure: In the earliest section observed (at a diameter of 2.2 mm with 14 septa) the counter septum is axially elongated. More distally the axial end of the counter septum is deflected. It forms a short median plate which connects counter and cardinal septa and which is also reached by the alar septa (Pl. 2, fig. 2a). With further growth the median plate, which remains joined to the counter septum, lengthens, becomes more or less twisted and septal lamellae are added (Pl. 2, figs. la, 2a). The total number of septal lamellae is 7 or 8. They may be forked and crooked but distally tend to become straight.

In the ephebic stage the septa become thinner and more radially arranged. At the base of the calyx 24 to 26 septa are present. Apart from the cardinal septum, which is shortened early, most major septa may extend to the axial structure, or they may abut onto a tabula and have their axial ends joined. The minor septa start to project from the thick wall in which they were hidden. The counter minors are the first to appear.

Remarks. A typical feature of *Leonardophyllum* is not observed in the Spanish specimens, viz. the withdrawing of the major septa from the axial structure in adult stages with the exception of the counter septum which remains joined to it.

In this respect and also in its very thick structural elements, *Leonardophyllum leonense* shows a certain resemblance to *Verbeekiella* from the Permian of Timor. MOORE & JEFFORDS (1941, p. 88) discussed the similarities and differences between the adult stages of *Leonardophyllum* and *Verbeekiella*. Afterwards SCHOUPPÉ & STACUL (1955) restudied the Permian coral fauna of Timor, including the type species of *Verbeekiella*, *V. australis* (BEYRICH). According to their interpretation, *Verbeekiella* comprises corals in which the axial structure is initially formed by septal lamellae derived from the six protosepta; and in which the steeply raised axial tabellae are sharply differentiated from the gently sloping periaxial tabellae, thus forming a distinct wall bounding the axial structure; and in which only one order of septa is developed. In *Leonardophyllum*, on the other hand, the axial structure is initiated by the counter septum; axial tabellae, when developed, have the same inclination as the periaxial tabellae, and two orders of septa are developed.

Compared with previously described species of *Leonardophyllum*, *L. leonense* shows the closest resemblance to *Leonardophyllum morrowense* ROWETT & SUTHERLAND 1964 (p. 41, Pl. 4, figs. 1-9, Pl. 5, figs. 1-5). This species occurs in the Wapanucka Formation (Morrowan, Lower Pennsylvanian) of Oklahoma. Specimens of *L. morrowense* number as many septa (22 to 26) and reach about the same diameter (8-11 mm) as the corallites just described. Some sections show that the major septa may continue to extend to the axial structure, even in late ephebic stages (*Ibid.*, Pl. 4, figs. 6b-d, 7c). *L. leonense* differs from *L. morrowense* in having much thicker structural elements, in the earlier shortening of the cardinal septum and possibly also in the earlier development of the axial structure, although ROWETT & SUTHERLAND remark (pp. 44-45) that «the diameter and height at which the first suggestion of a complex axial structure appears are variable».

Material. The holotype, specimen RGM-St. 97974 and the paratype, RGM-St. 97973 are from the *Cladochonus* Band in the type section of the Valdeteja Formation, east of Valdeteja, province of León, coll. C. F. WINKLER PRINS. These rocks are probably of Bashkirian age.

REFERENCES

BOSCH, W. J. VAN DEN (1969).—Geology of the Luna-Sil region, Cantabrian Mountains (NW Spain). *Leidse Geol. Meded.*, 44, pp. 137-225, with map and sections.

BROUWER, A. & GINKEL, A. C. VAN (1964).—La succession carbonifère dans la partie méridionale des Montagnes Cantabriques (Espagne du Nord-Ouest). *C. R. 5e Congrès Carbonifère, Paris 1963*, I, pp.307-319.

COMTE, P. (1959).—Recherches sur les terrains anciens de la Cordillère Cantabrique. *Mem. Inst. Geol. Min. España*, 60, pp.1-440.

EVERS, H. J. (1967).—Geology of the Leonides between the rivers Bernesga and Porma (Cantabrian Mountains, NW Spain). *Leidse Geol. Meded.*, 41, pp. 83-151, with map and sections.

KULLMANN, J. (1963).—Die Goniatiten des Unterkarbons im Kantabrischen Gebirge (Nordspanien). II. Paläontologie der U. O. Prolecanitina MILLER & FURNISH. Die Altersstellung der Faunen. *Neues Jahrb. Geol. Paläont., Abh.*, 116, pp.269-324, Tafn 17-20.

MARCOS, A. (1968).—La tectónica de la Unidad de la Sobia-Bodón. *Trabajos de Geología, Fac. Ci. Univ. Oviedo*, 2, pp.59-87, mapa y cortes.

MOORE, R. C. & JEFFORDS, R. M. (1941).—New Permian corals from Kansas, Oklahoma and Texas. *Kansas State Geol. Survey Bull.*, 38, pt.3, pp.65-120, pls. 1-8.

ROWETT, C. L. & SUTHERLAND, P. K. (1964).—Wapanucka Rugose Corals. *Okla. Geol. Survey Bull.*, 104, pp.1-124, pls 1-9.

SCHOUPPÉ, A. VON & STACUL, P. (1955).—Die Genera *Verbeekiella* Penecke, *Timorphyllum* Gerth, *Wannerophyllum* n.gen., *Lophophyllidium* Grabau aus dem Perm von Timor. *Palaeontographica Suppl.* IV, 5 (3), pp. 95-196, Tafn VII-VIII.

WAGNER, R. H. (1963).—A general account of the Palaeozoic Rocks between the Rivers Porma and Bernesga (León, NW. Spain). *Bol. Inst. Geol. Min. España*, 74, pp. 171-334, figs 1-35, map and sections.

WAGNER, R. H., WINKLER PRINS, C. F. & RIDING, R. E. (1971).—Lithostratigraphic units of the lower part of the Carboniferous in northern León, Spain. *Trabajos de Geología, Fac. Ci. Univ. Oviedo*, 4, pp. 603-663, text-figs 1-10, pls 1-3.

WAGNER-GENTIS, C. H. T. (1963).—Lower Namurian goniatites from the Griotte Limestone of the Cantabric Mountain Chain. *Notas y Comuns Inst. Geol. Min. España*, 69, pp. 5-41, pls I-VIII.

WINKLER PRINS, C. F. (1968).—Carboniferous Productidina and Chonetidina of the Cantabrian Mountains (NW Spain): Systematics, Stratigraphy and Palaeoecology. *Leidse Geol. Meded.*, 43, pp. 41-126, pls 1-9.

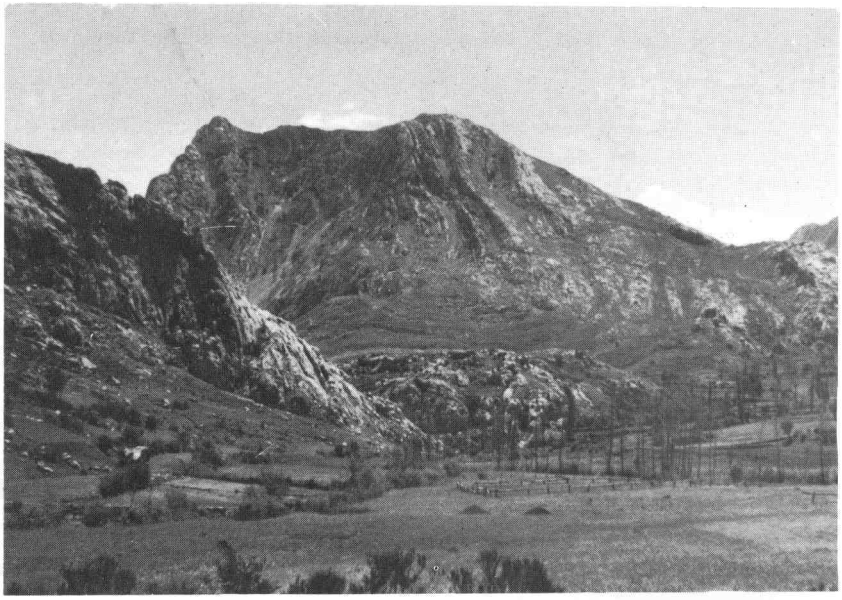


Fig. 1.—View of the Valdeteja Formation east of Valdeteja on the opposite side of the Arroyo de Valdeteja (type section of the formation). The mountain (Peña La Verde) shows the bending of the limestones from a N-S direction to an E-W strike (compare the map of text-fig. 1).

Fig. 2.—Photograph of the limestone breccia in the Barcaliente Formation showing large blocks in a sparry calcite matrix (photograph by Mr. F. J.

PLATE 2

Corals from the *Cladochonus* Band in the type section of the Valdeteja Formation, east of Valdeteja (León).

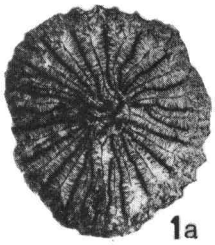
Figs. 1-2.—*Leonardophyllum leonense* sp. nov. Fig. 1, paratype RGM-St. 97973: —1a: transverse thin section, neanic stage, × 5, —1b-d: transverse sections, late neanic and ephebic stages, × 4.

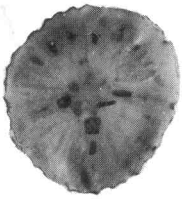
Fig. 2.—Holotype RGM-St. 97974: —2a: transverse thin section, neanic stage (reversed), ×10; —2b: transverse thin section, neanic stage, ×7; —2c-d: transverse sections, ephebic stage, × 3.

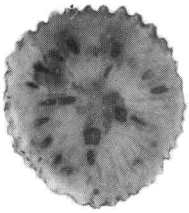
Fig. 3.—*Pseudofavosites* sp. RGM-St. 97975: —3a: transverse thin section, × 2; —3b: longitudinal thin section, × 2.

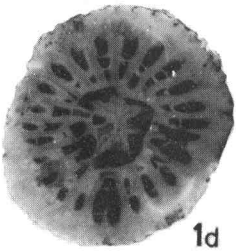
Figs. 4-5.—*Cladochonus* sp. Fig. 4, RGM-St. 97976, ×1. Fig. 5, RGM-St. 97977, ×1.

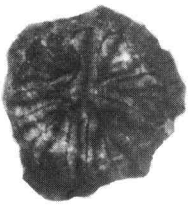
N. B.: R. G. M.- Rijksmuseum van Geologie en Mineralogie, Leiden.

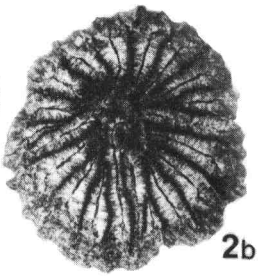

1a

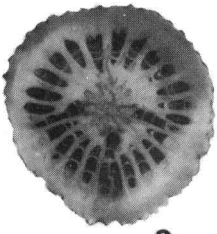

1b

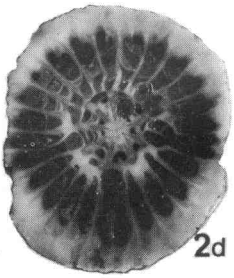

1c

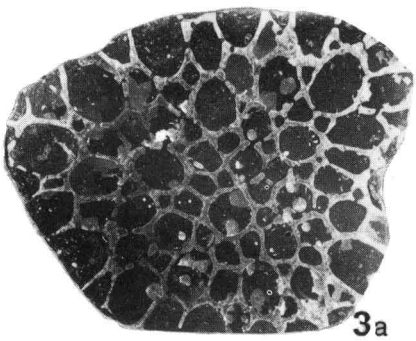

1d

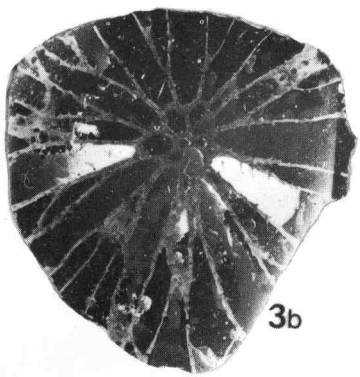

2a


2b


2c


2d


3a


3b


4


5