New fusulinid evidence for the Permian age of the Palaeozoic rocks of Hydra, Greece

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Summary. The Palaeozoic rocks of Hydra consist of a sequence of limestones and dolomites with some interbeds of shales and sandstones. Fusulinid foraminifera indicate the sequence is entirely Permian in age and not Carboniferous and Permian as previously thought.

1. Introduction

This paper is the result of work carried out in the summer of 1972, on the small island of Hydra off the SE coast of the Peloponnesus, SE Greece. The rock sequence exposed ranges from late Palaeozoic to Jurassic in age (Renz, 1955; Römermann, 1968). Limestones and dolomites predominate; there are some interbeds of shales and sandstones. The beds for the most part dip gently northwards, and several normal faults, downthrowing to the W, cross the island.

During detailed mapping on the S side of the island of the rocks termed 'Jung Palaozoik' by Römermann (1968), many new fossiliferous localities were found. These have yielded fusulinid foraminifera which indicate a Permian age for the rocks, rather than Carboniferous and Permian as suggested by Renz and Römermann.

2. Stratigraphic sequence

Upper Palaeozoic rocks outcrop over 8.5 km^2 (Fig. 1). Not all the limestones are clearly bedded, and much of the eastern part of the area is covered with Quaternary breccia; nevertheless all available evidence indicates dips predominantly between 30 and 60° N. The few minor faults are too small to affect the simple stratigraphic sequence suggested, and the major Nisitsa fault which traverses the whole island is a normal fault dipping at 50–60° W and downthrown on that side.

The palaeozoic succession underlying Triassic limestones, exposed on either side of the major fault, have about the same stratigraphical thickness. The only lithological correlation across the fault is by means of a distinctive unit of red-brown shales and siltstones. These do not form continuous outcrops and are interpreted as lenticular bodies at one horizon.

The bedding relationships between the shales and other siltstone–sandstone bodies are never clear. They are commonly complicated by many small faults (not shown on Fig. 1) as seen in the cliffs around locality 3. These faults, as well as the two main ones, are usually associated with disturbed chalky rocks containing many fragments of red shale and yellow sandstone, which are interpreted as fault breccias. Two small outcrops of quartz-sand limestone occur just below the Triassic limestone. These are also probably lenticular bodies.

Two cross-sections (Figs 2, 3) and the inferred stratigraphy (Fig. 4) are shown.

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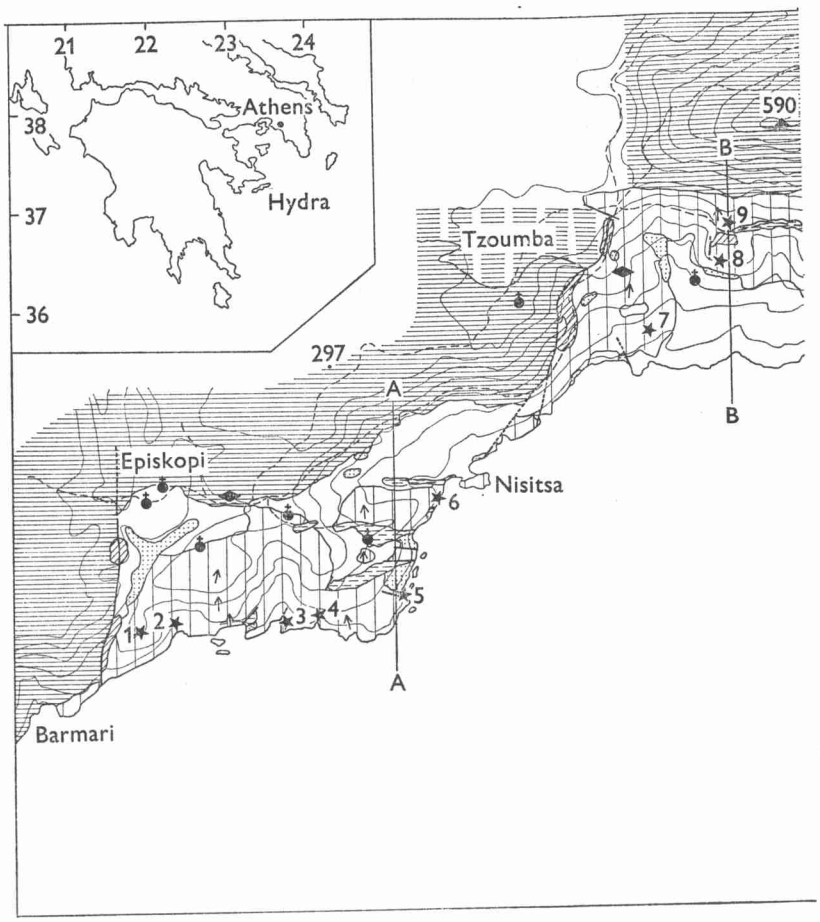
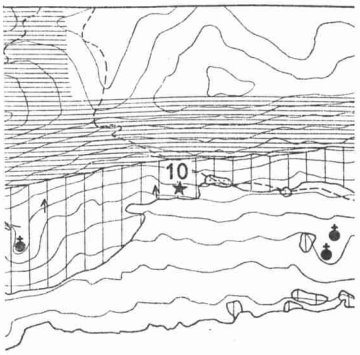
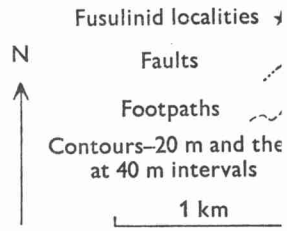


Figure 1. Geological map of the Permian rocks on the S coast of Hydra, with fusulinid localities referred to in text.

3. Fusulinid foraminifera

Fusulinids are the most abundant fossils in the Upper Palaeozoic rocks of Hydra and were found at the localities as shown on the map (Fig. 1). They occur in the bedded limestones, and also in argillaceous layers where the two are intercalated. In places they occur in small numbers with corals, brachiopods, molluscs, crinoids and bryozoans. Locally they are so abundant as to form a small body of completely fusulinid limestone. The limestone of these bodies is generally a darker grey-black than the surrounding rocks, and the beds are often wavy, with considerable calcite veining. Only a few beds are composed completely of fusulinids, the concentration diminishing rapidly within a small area, giving place to irregular patchy concentrations resembling hollows in the substratum.





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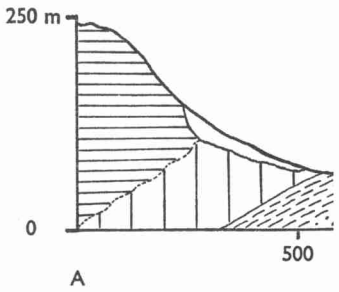
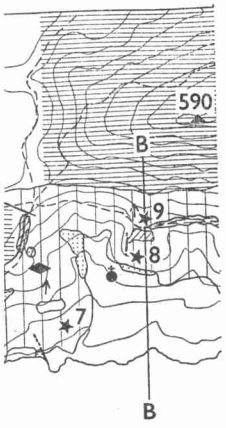


Figure 2. N–S section W



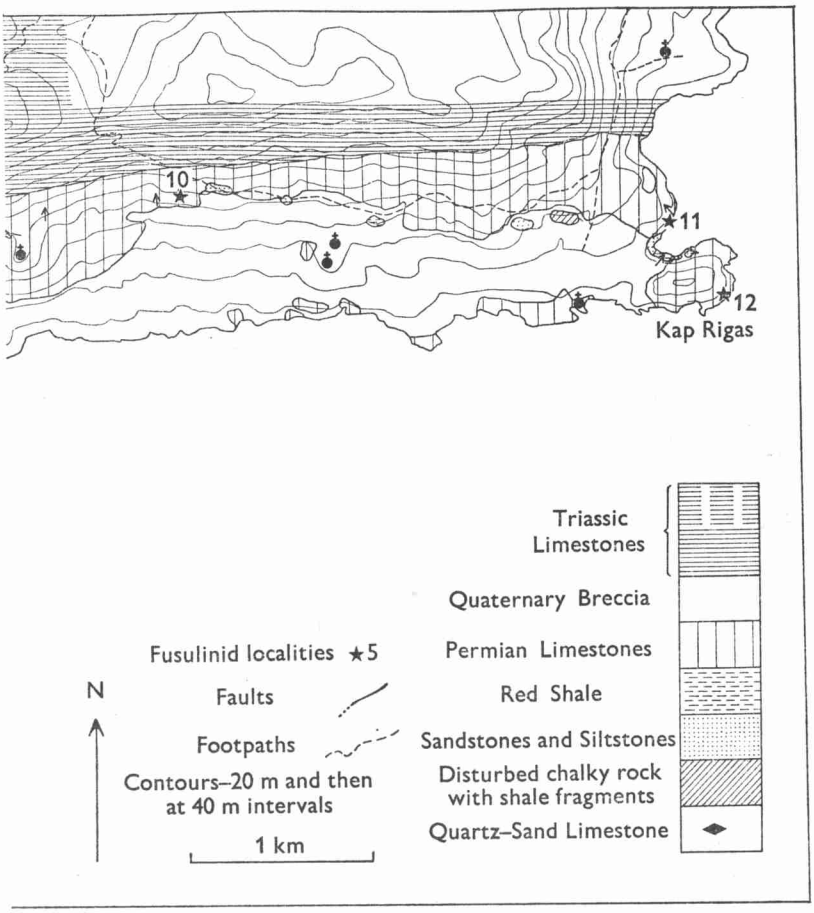


Fig. 1 (*cont.*). For legend see facing page.

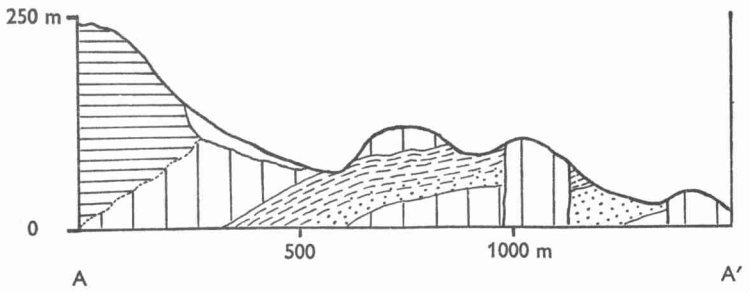


Figure 2. N–S section W of Nisitsa. Legend as for Figure 1.

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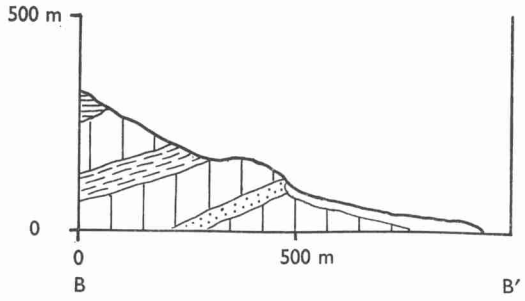

Figure 3. N–S section S of Mt Eros. Legend as for Figure 1.

The complete body is generally no more than 10–15 m thick, and about the same width.

The following fusulinids have been identified.

(*a*) From above the red shale horizon:

Locality 9	*Quasifusulina*	Dominant
	Japonella	Poorly preserved due to recrystallization
	Parafusulina	From loose block a few metres up slope
Locality 11	Schwagerinids	Dominant
	Quasifusulina	
	Pseudoschwagerina	
Locality 6	*Pseudoendothyra*	

(*b*) From just below red shale horizon:

Locality 8	*Schwagerina-Parafusulina*	Intermediate between these two

(*c*) From low sections W of the main Nisitsa fault:

Localities 3–5	*Schwagerina-Parafusulina*	Intermediate form dominant
	Schubertella	
Locality 2	Schwagerinids	
	Neoschwagerina	An early form
	Pseudoendothyra	

(*d*) From low sections E of the main Nisitsa fault:

Locality 7	Schwagerinids	
	Verbeekina	
Locality 12	Schwagerinids	

The probable positions of these localities in the Upper Palaeozoic succession are shown in the stratigraphic section (Fig. 4).

4. Permian age of the rocks

As has been shown the fusulinid localities are well scattered both E and W of the main Nisitsa fault (Fig. 1). Those nearest the coast are lowest in the succession and no more than a few metres stratigraphically above the oldest rocks on the

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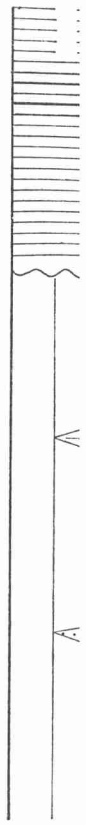

Figure 4. Stratigraphical section
Legend as for Figure 1.

The area of Upper Palaeozoi
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the island.

5. Review of other work

Römermann (1968) is the most comprehensive recent account of the general geology of Hydra. He does not deal at any length with the fauna from the Upper Palaeozoic rocks and its bearing on the ages of the formations; but mentions Upper Carboniferous limestones of Kap Rigas.

The maps and interpretations of Renz (1955) have largely been superseded by Römermann's work. However, Renz gave far more palaeontological data with approximate fossil localities. He considered many of his fusulinids to be of Upper Carboniferous age – at both coastal and inland localities, although he gave little discussion regarding their age.

Ozawa & Tobler (1929) described some of the fusulinids collected by Renz from the islands of Hydra and Katakupho. None of the genera identified is given a specific locality, although they are said to be widely separated from each other. All are considered to be of Middle Permian age, occupying approximately the same stratigraphical horizon.

Grant (1972) introduced 3 new genera of productid brachiopod from the late Permian limestones of Hydra. These would appear to come from just above the red shale horizon in the succession (Fig. 4).

Acknowledgments. To various colleagues for their help in the field, and to Drs J. L. Cutbill and D. J. Gobbett for their identifications of fusulinids and assistance in preparation of this paper.

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