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Palaemon vesolensis n. sp. (Crustacea, Decapoda) from the Plattenkalk of Vesole Mount (Salerno, Southern Italy)

Abstract - The decapod crustacean assemblage preserved into an outcrop of thin laminated limestones (Plattenkalk) Upper Cretaceous (Campanian-Maastrichtian) in age, is studied. This horizon crops out in the highest part of the Mesozoic stratigraphic succession of Vesole Mount (tab. IGM 1:25.000: 198 - III SE, Trentinara), few tens of metres below the transgressive boundary of the Upper Paleocene-Eocene Trentinara Formation.

One hundred, both complete and incomplete specimens were studied, and this sample led to describe *Palaemon vesolensis* n. sp. (infraorder Caridea Dana, 1852, family Palaemonidae Rafinesque, 1815). This finding increases the stratigraphic range of *Palaemon* Weber, 1795, only known to date from the Oligocene fossil record.

The new biostratigraphic, sedimentologic and palaeoecologic observations carried out on this decapod crustacean outcrop have confirmed not only the ascription to the Upper Cretaceous, but have also allowed to suppose its scarce circulation of waters and low oxygenation conditions, high ecological stress, sedimentation linked to tide contributions, subject to storm events and populated by oligotypic faunae.

Key words: Crustacea, Decapoda, Upper Cretaceous, Plattenkalk, Southern Italy.

Riassunto - *Palaemon vesolensis* n. sp. (Crustacea, Decapoda) del Plattenkalk del Monte Vesole (Salerno, S. Italia).

Viene studiata la fauna a crostacei decapodi presente in un pacco di strati calcarei sottilmente laminati (Plattenkalk) del Cretacico superiore (Campaniano-Maastrichtiano), affioranti nella parte più alta della successione stratigrafica mesozoica del Monte Vesole (tav. IGM 1:25.000: 198 - III SE, Trentinara), poche decine di metri al di sotto del limite trasgressivo con i terreni del Paleocene superiore-Eocene della Formazione di Trentinara.

Gli esemplari esaminati ammontano complessivamente a un centinaio, tra completi e frammentari, e sono stati attribuiti a *Palaemon vesolensis* n. sp. (infraordine Caridea Dana, 1852, famiglia Palaemonidae Rafinesque, 1815). Questa descrizione amplia la distribuzione stratigrafica di *Palaemon* Weber, 1795, sino a ora segnalato nel record fossile solo nell'Oligocene.

Le nuove osservazioni biostratigrafiche, sedimentologiche e paleoecologiche condotte sul giacimento a crostacei decapodi, oltre a confermarne l'attribuzione al Cretacico superiore, ne lasciano ipotizzare la deposizione in una laguna probabilmente prospiciente ad ambienti dulcacquicoli e terre emerse, con condizioni di scarsa circolazione delle acque e scarsa ossigenazione, elevato stress ecologico, sedimentazione legata ad apporti mareali, soggetta a episodi di tempesta e popolata da faune oligotipiche.

Parole chiave: Crustacea, Decapoda, Cretacico superiore, Plattenkalk, S. Italia.

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Introduction

Scorziello & Sgrosso (1965) reported about a decapod crustacean level at Vesole Mount (Salerno), ascribing it to the Paleocene.

Sgrosso (1968) ascribed this level to the upper part of the Senonian, or probably Maastrichtian, but without excluding the Lower Paleocene, after a new biostratigraphic study on Vesole Mount's sequence.

This paper deepens the systematic study of the decapod crustaceans of this level (here named Vesole Mount Plattenkalk). The importance of this study is due to the absence of data about these organisms referring to the Southern Apennines and to the studied period (Upper Cretaceous - Paleocene). The Plattenkalk's age is also re-examined and a reconstruction of the depositional environment by a biostratigraphic and sedimentologic study in thin sections and by new field observations is suggested.

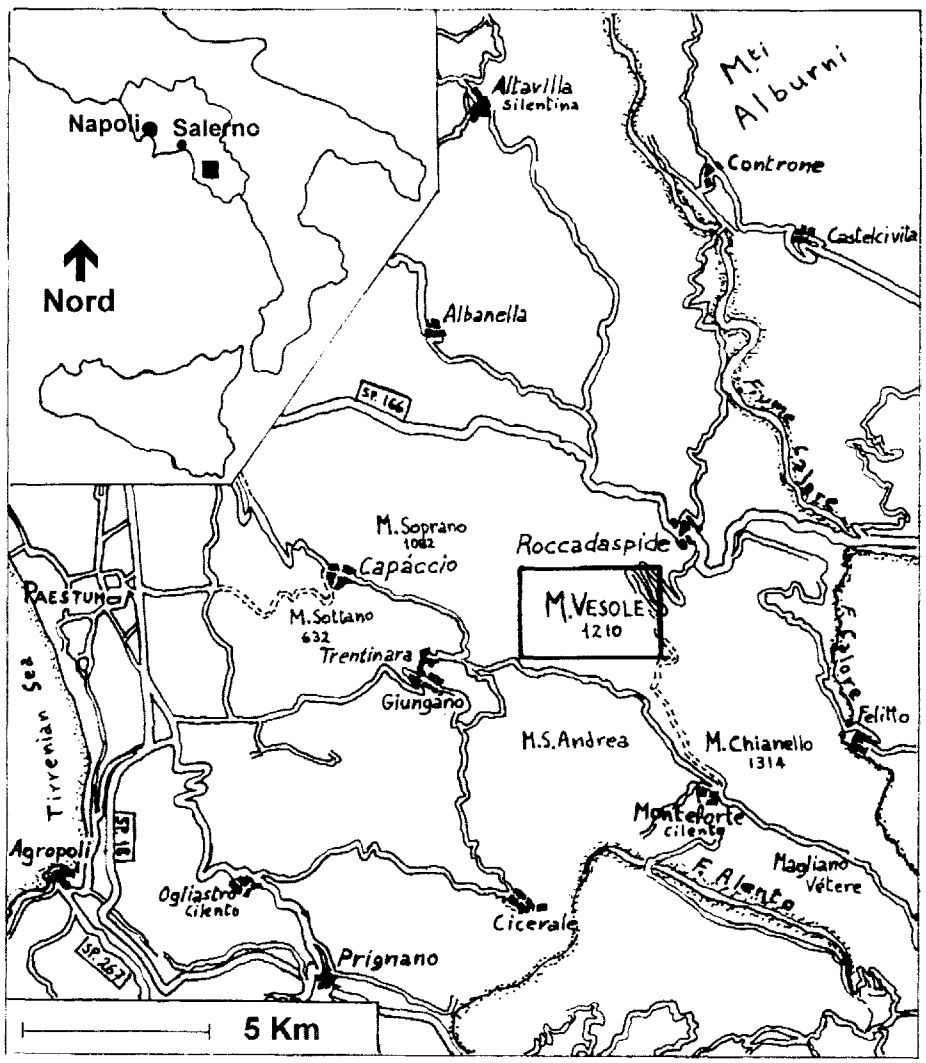

Fig. 1 - The geographical position of Vesole Mount, in the Province of Salerno (Southern Italy).

Geological setting

The essentially carbonatic geological structure to which Vesole Mount belongs (tab. IGM 1:25.000: 198 – III SE, Trentinara; Fig. 1), forms a ridge extending about 20 km WNW – ESE, included between the small towns of Capaccio Vecchio and Magliano Nuovo (Salerno, S Italy). Moreover, two parallel and smaller ridges are present W of Vesole Mount: the higher and wider culminating in Soprano Mount (1083 m), and the lower one culminating in Sottano Mount (832 m). The main ridge represents a steep relief whose highest peak is Chianiello Mount (1314 m). This Mount divides the basins of the rivers Calore to the North and Alento to the South, both getting set on terrigenous formations and characterized by gentle landscapes. This ridge represents a deformed portion of a Meso-Cenozoic carbonatic platform domain («Campania-Lucania platform» by D'Argenio *et al.*, 1973; «Apennine platform» by Mostardini & Merlini, 1986). The stratigraphic sequence of this carbonatic platform is about 4 km thick and it is constituted by: 1) Upper Triassic dolomite; 2) Jurassic-Cretaceous limestones and dolomitic limestones; 3) Upper Paleocene-Middle Eocene mudstones, rudstones and marls (Trentinara Formation – Selli, 1962); 4) Aquitanian-Burdigalian (Lower Miocene) bioclastic and glauconitic grainstones (Capaccio and Roccadaspide Formations – Selli, 1957, 1962; Sartoni & Crescenti, 1963); 5) Middle Miocene clays, marls, quartzose and lithic sandstones (Bifurto Formation – Selli, 1957). However, the rising portion of the ridge essentially consists of Cretaceous and Paleocenic-Miocenic formations. The Meso-Cenozoic carbonatic platform is covered, in the region, by the oceanic materials belonging to the Auct. «Ligurid Units», consisting of limestones, marls, clays and sandstones (North-Calabrian and Sicilid Units by Bonardi *et al.*, 1988). Above the Auct. «Ligurid Units», in stratigraphic unconformity, the sandstones, marls and limestones of the Cilento group, Upper Burdigalian and Langhian in age, are present (Amore *et al.*, 1988).

The general structure of the limestone ridge has been traced back as a simple monocline or, as much as a gentle anticline, subsequently cutted by faults (Scandone, 1967; Sgrosso, 1968; Cestari, 1971). In fact its morphology is asymmetric, with a steep southern side controlled by high-angle border faults, and a more gentle northern side.

Recently, a greater structural complexity of the ridge has been recognized. Berardi *et al.* (1996) suggested that the Soprano Mount relief could correspond to a hinge-faulted ramp anticline. The recent geological survey in a 1:10.000 scale and the structural analysis carried out by one of us (S. Bravi), between Trentinara and Magliano Nuovo villages, attest a sequence of thrusts with local phenomena of backthrusting, followed by a dislocation of the folds and thrusts due to WNW-ESE and NW-SE trending high-angle poliphasic faults. Similar overthrust sequences have also been reconstructed in the adjacent area of Cervati Mount (Castellano & Schiattarella, 1998).

Previuos observations on the stratigraphy of Vesole Mount

Sgrosso (1968) described the stratigraphic succession of Vesole Mount dividing it into ten stratigraphic intervals (*a* to *l*) the first six (*a-f*) of which are surely ascribed to the Upper Cretaceous. They represent a cronostrati-

graphic sequence about 710 m thick, ranging in age from the Cenomanian to the Senonian. A 40 m thick interval (*g*) including the decapod crustacean layers, follows the first six. The described microfauna for this interval is chiefly represented by *Spirolina* sp., *Rotalia* sp., rotaliform foraminifers, Nubeculards, Trochamminids, Ophtalmidids and Miliolids. Charophytes gyrogonites are also present. Sgrosso (1968) ascribed this faunistic assemblage to the Senonian and, probably, to the Maastrichtian, even though forms with paleocenic affinities are present (e.g. *Spirolina* sp.). This ascription was also confirmed by an additional sampling of heteropic strata (interval *m*), carried out in a close area, highlighting a constant presence of Rudists, together with microfossils certainly ascribed to the Upper Senonian, among which *Rhaphydionina liburnica* (Stache), *Accordiella conica* Farinacci, *Moncharmontia apenninica* (De Castro), *Rotorbinella scarsellai* Torre and *Sgrossoella parthenopeia* De Castro.

The presence of forms showing a Paleocenic affinity is therefore explained by an ecological variation due to the particular sedimentary environment of the decapod crustacean limestsones.

Intervals *h* (about 70 m thick and also ascribed to a probable Maastrichtian) and *i* follow interval *g*. Interval *i*, starting with a transgressive horizon, perfectly represent the Paleocenic Trentinara Formation (Selli, 1962; Barattolo & Parente, 1991), both for the lithologies and for microfossiliferous contents. A thick, lenticular horizon of red clays with bauxitic nodules follows interval *i*, preluding a new trasgression represented by a 10 m thick sequence of glauconitic grainstones containing Miocenic microfaunae, which can be ascribed to Roccadaspide Formation (Selli, 1957).

Interval *g* including the decapod crustacean layers, is widely described in the following section, from a sedimentologic and cronostratigraphic point of view.

Fig. 2 - The southern slope of Vesole Mount. In the upper part is present the Plattenkalk.

«Interval g», with decapod crustaceans

This horizon, about 45 m thick, is present at 1100 m above sea-level, in the portion of stratigraphic sequence cropping out at the southern side of Vesole Mount (1210 m), few tens of metres beneath the top (Fig. 2). The prevailing thin stratified limestones and marly limestones make it easy erodible and therefore covered by a grassland, compared to the underlying and over-lying thick, calcareous well rising strata. The average strata dip is 25° NE. The decapod crustacean interval is laterally limited by a fault on the right, which is marked by a narrow band of cataclastic breccia, putting it in touch with the light-brown mudstones that are probably ascribed to interval *f* (Sgrosso, 1968). On the left it seems to turn into light-brown mudstone thicker strata.

Thick and hard light-brown wackestone and packstone strata are present just under interval *g*.

The studied interval can be divided into seven parts, from bottom to top (Fig. 3):

g1) about 2 m of light-brown marly and bituminous mudstones, with centimetric strata and sometimes millimetric laminae;

g2) about 1.5 m of dark-grey, finely laminated mudstones, bituminous and fetid if hammered, sometimes including small clasts; not laminated, thin mudstone strata are sometimes intercalated among the laminated ones. The first occurence of decapod crustaceans and turriculated gastropods have been observed inside this laminated facies;

g3) about 2 m of hard wackestone and packstone strata;

g4) about 2.5 m of bituminous, closely stratified mudstones, with millimetric laminae and centimetric strata. The lamination is sometimes convolute. Remains of decapod crustaceans in bad state of preservation are present;

g5) about 22 m of dark-grey or black bituminous and closely laminated mudstones, fetid if hammered, very rich in crustacean decapod remains, sometimes in a good state of preservation. The laminae sometimes show a weak undulated course to the metric and decimetric scale. The better preserved decapod crustaceans are usually present where the laminae have a flat-parallel course. The fossil remains are distorted, incomplete or absent where the lamination has an undulated course;

g6) about 8 m of light-brown packstones and wackestones in 50-100 cm thick, non-laminated strata, alternated with sets of calcareous-marly bituminous millimetric laminae. These laminae still preserve rare fragments of decapod crustaceans and turriculated gastropods. The frequence of the laminated horizons decreases upwards;

g7) about 7.5 m of white mudstones in 80-100 cm thick strata, with dessiccation cavities filled by geopetal silt.

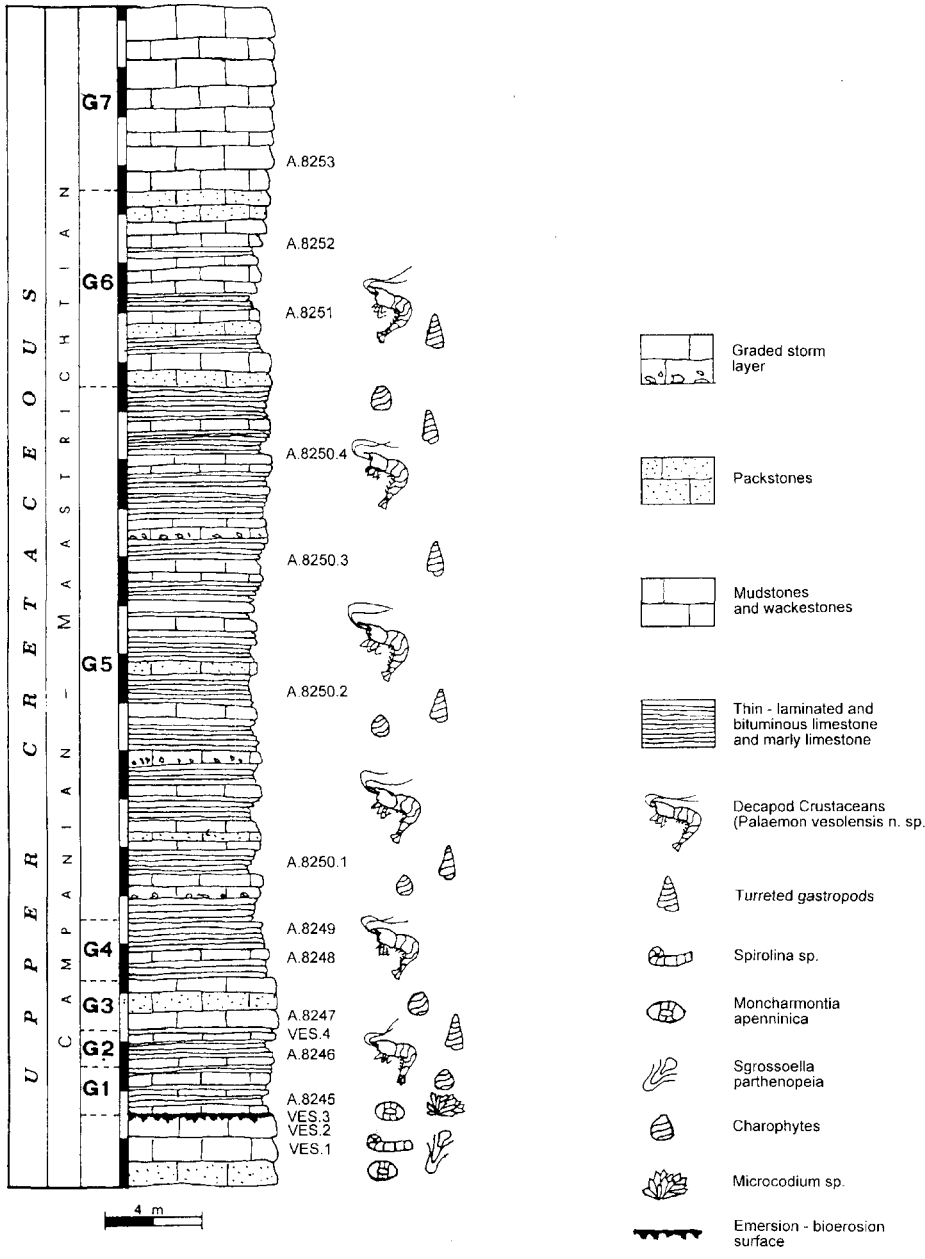

Fig. 3 - Stratigraphic log of the interval «*g*» with decapod crustaceans at Vesole Mount (Southern Italy).

Biostratigraphy and age

A stratigraphic sampling was carried out in «interval *g*» and in the underlying strata. The lowest samples (e.g. VES.1, Fig. 4a), picked up in the wackestones and packstones underlying the first laminated horizons, have

highlighted a foraminifer microfauna assemblage with *Moncharmontia apenninica* (De Castro), *Cuneolina* sp., *Accordiella conica* Farinacci, *Dicyclina* sp., *Quinqueloculina* sp., *Pyrgo* sp., *Nummoloculina* sp., *Rotorbinella scarsellai* Torre, *Sgrossoella parthenopeia* De Castro, Nubecularids, Miliolids, Textulariids, Soritids, Rotaliids, together with *Thaumatoporella* sp., *Clypeina*-like Dasycladaceans (Fig. 4b), fragments of Radiolitids, ostracods and charophyta gyrogonites. Nevertheless a horizon in this basal portion of the sequence (sample: VES.2, Fig. 5a) has highlighted a microfauna assemblage with forms ascribed to *Spirolina* sp., together with Textularids, *Chrysalidina*-like forms, rare Miliolids and ostracods.

A reddish decimetric layer, with bioerosion and a very rich development of *Microcodium* colonies (sample: VES.3, Fig. 6), is located right under the first laminated strata of decapod crustacean facies. Remaining zones of the original, very rich microfossils wackestone-packstone (Fig. 5b) are present among *Microcodium* colonies and contain *Moncharmontia apenninica* (present with well developed individuals), *Moncharmonthia compressa* (De Castro), *Sgrossoella parthenopeia*, *Rotorbinella scarseelai*, Miliolids, Textulariids, *Aeolisaccus* sp. and *Thaumatoporella* sp.

The finely laminated and bituminous facies, with crustacean decapods and sometimes rich in turreted gastropods, rare plant remains and elongate leaves, grows upwards in the subintervals from *g1* to *g5* (samples: from A.8245 to A.8250; VES.4). This part of the sequence, also in the more detrital layers, includes rare microfaunas, poorly indicative by a cronostratigraphic point of view, essentially consisting in ostracods (Fig. 12b), small-sized and often re-crystalized hyaline and arenaceous foraminifers, small-sized Texturaliids and Miliolids, charophyta gyrogonites. Stromatolitic laminations are sometimes present.

Subintervals *g6* and *g7* are characterized by a progressive reduction of the finely laminated horizons and by the prevalence of 1 m thick mudstone and packstone layers. They also contain a poorly indicative microfauna, very similar to that of the previous horizons.

The described microfauna allows to ascribe with certainty the basal part of the examined sequence to the Upper Cretaceous and in particular to the Upper Senonian, for the presence of *Moncharmontia apenninica*, *Sgrossoella parthenopeia*, *Cuneolina* sp., *Accordiella conica* and *Rotorbinella scarsellai* (De Castro, 1991; Chiocchini *et al.*, 1994). The contemporaneous presence of forms with a Paleocenic affinity (*Spirolina* sp.) in some horizons of the basal part of the examined sequence and the following return of clearly Cretaceous forms (*Moncharmontia apenninica* with big-sized specimens, *Moncharmontia compressa* and *Sgrossoella parthenopeia*, in the sample VES.3) indicate that the presence of *Spirolina* sp. doesn't necessarily imply a Paleocenic age for these layers. Its presence, as already pointed out by Sgrosso (1968) and suggested by De Castro (pers. rem.), may be related to the particular depositional environment of the Plattenkalk. Therefore the Plattenkalk may be dated back to the Upper Cretaceous and very probably to the Campanian-Maastrichtian. This ascription is based on the above-mentioned observations and on the observations by Sgrosso (1968), who reconstructed its heteropy with Senonian layers. Moreover the geological survey carried out by one of us (Sergio Bravi) in the entire area of the border-

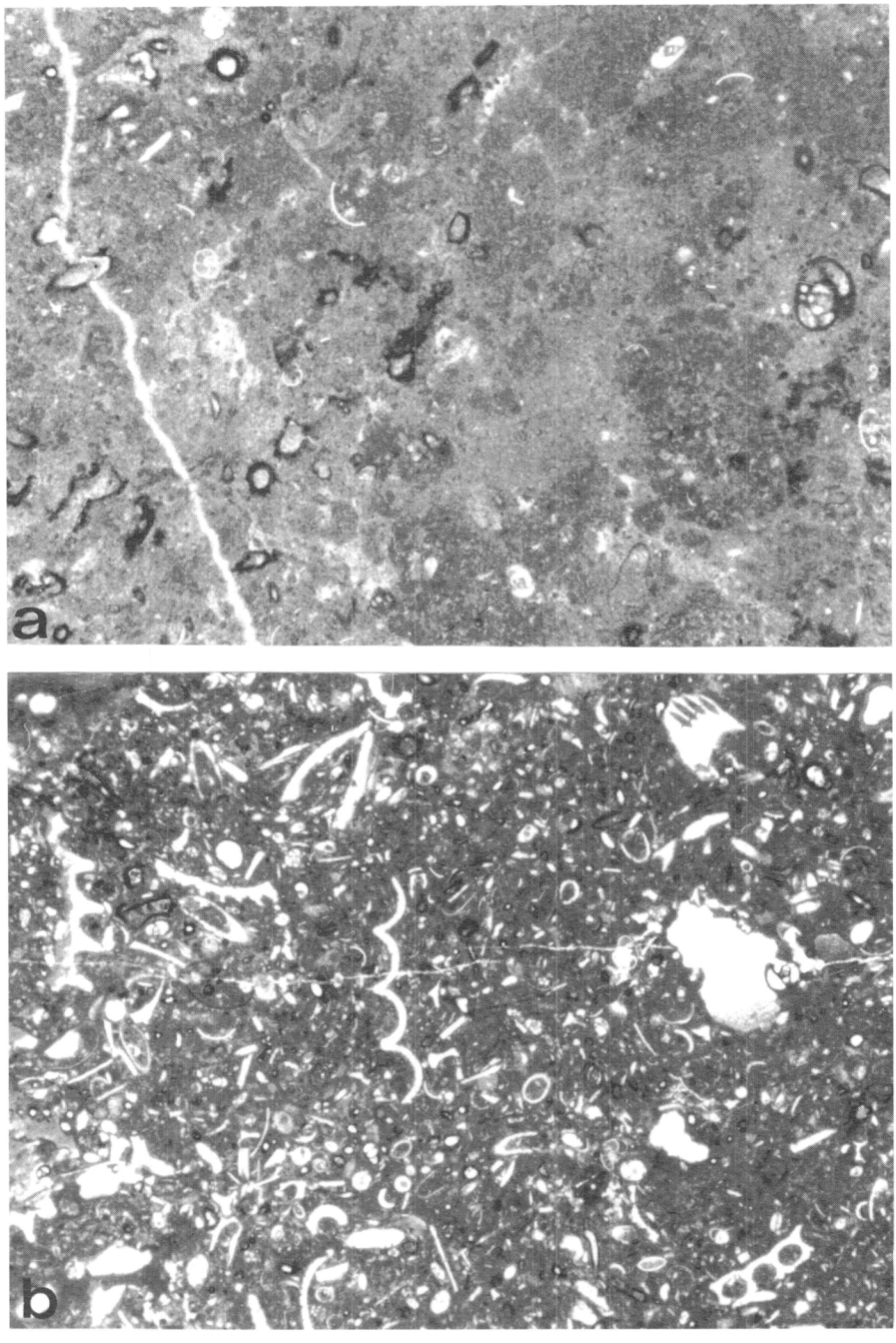

Fig. 4 - a) Wackestone-Packstone with *Moncharmontia apenninica* (De Castro), *Sgrossoella parthenopeia* De Castro, small Miliolids, ostracods, Textulariids, *Aeolisaccus* sp., small *Thaumatoporella* sp. and *Clypeina*-like Dasycladaceans (b). Thin sections: VES.1 (4a) about 30x; VES.1a (4b) about 16x. For both the figures - Age: Upper Cretaceous (Campanian-Maastrichtian). Horizon and locality: Vesole Mount, strata immediately below the Plattenkalk with decapod crustaceans.

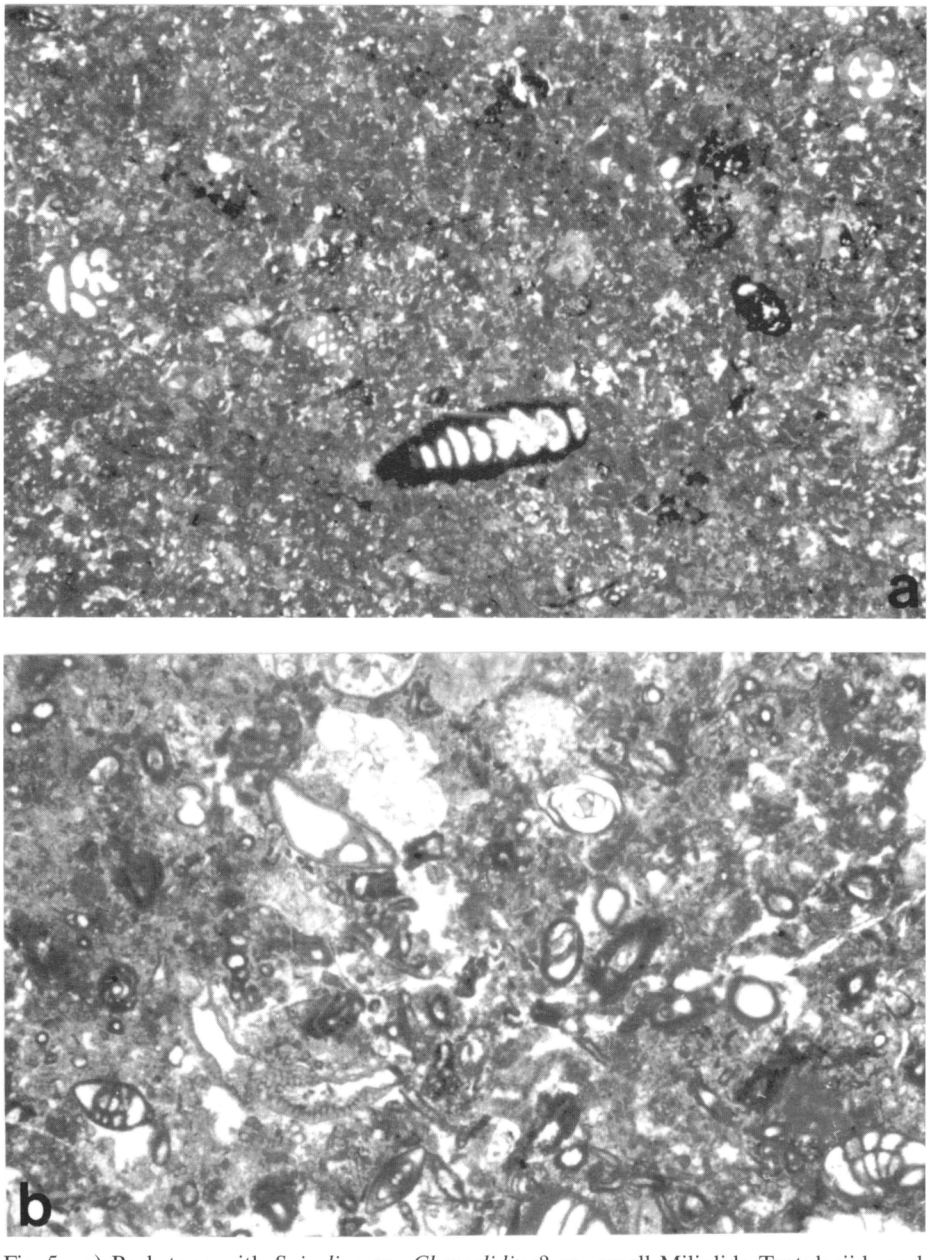

Fig. 5 - a) Packstone with *Spirolina* sp., *Chrysalidina*? sp., small Miliolids, Textulariids and ostracods. Thin sections: VES.2 about 15x. b) Packstone with *Moncharmontia apenninica* (De Castro), *Moncharmontia compressa* (De Castro), *Sgrossoella parthenopeia* De Castro, *Aeolisaccus* sp., *Thaumatoporella* sp., Miliolids and Textulariids. Thin sections: VES.3 about 25x. For both the figures - Age: Upper Cretaceous (Campanian-Maastrichtian). Horizon and locality: Vesole Mount, strata immediately below the Plattenkalk with decapod crustaceans.

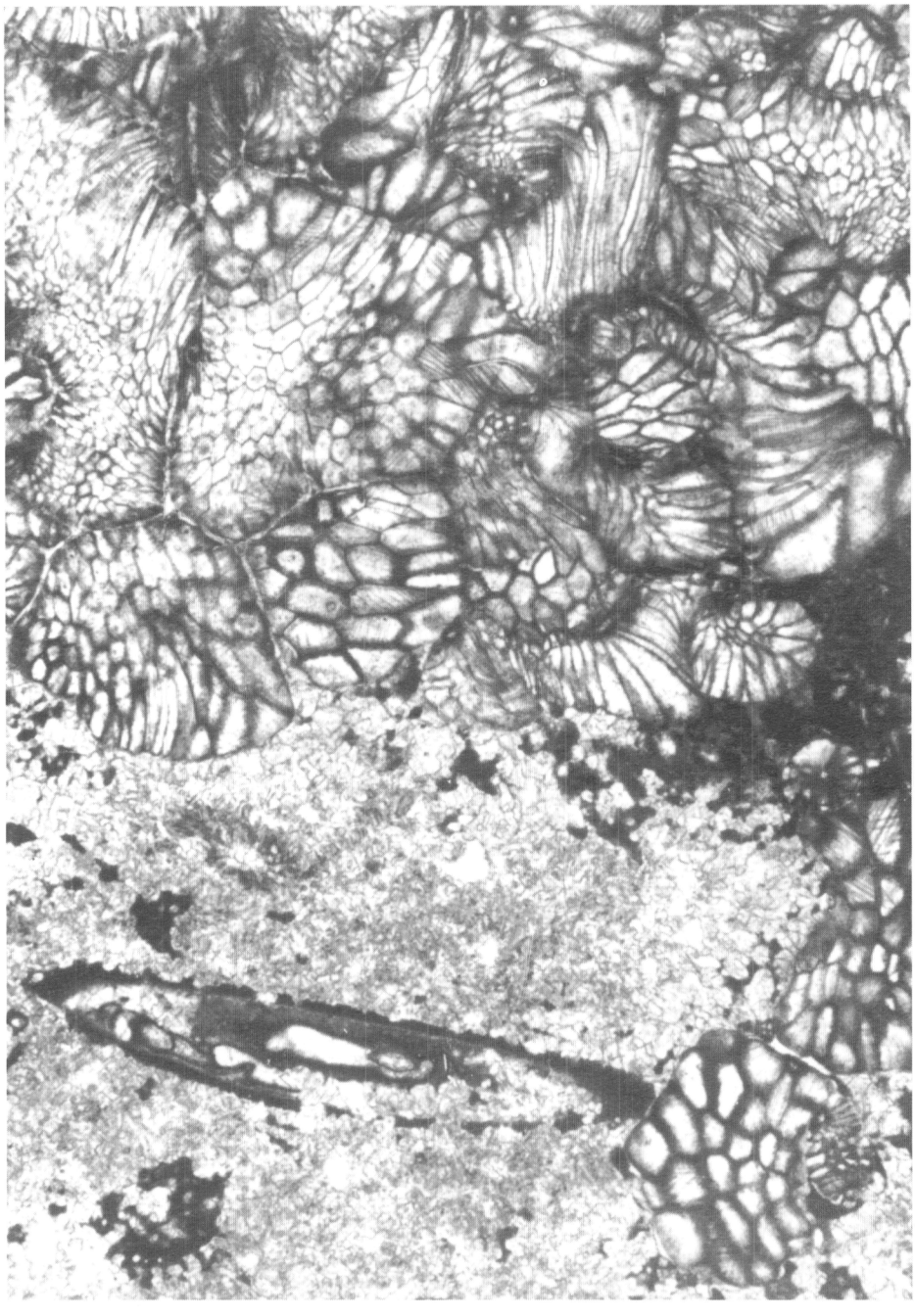

Fig. 6 - Microfacies with *Microcodium* sp. and *Thaumatoporella* sp.. The colonies of *Microcodium* have bioeroded the original microfossiliferous limestone, leaving unchanged just small areas between the algal colonies. The unchanged areas contain the microfauna described in Fig. 5b. This *Microcodium* horizon constitutes the stratum that lies just below the first laminated layers with decapod crustaceans. Thin sections: VES.3 about 25x. Age: Upper Cretaceous (Campanian-Maastrichtian). Horizon and locality: Vesole Mount, strata immediately below the Plattenkalk with decapod crustaceans.