UPPER JURASSIC AND LOWER CRETACEOUS MICROFOSSILS FROM THE HAUTES-ALPES

by JUDITH TURNER

ABSTRACT. Common pelagic (Tethyan) microfossils from the Upper Jurassic and Berriasian rocks of La Faurie, Hautes-Alpes, France, are described and illustrated, and their stratigraphical distribution compared with that of similar assemblages elsewhere. The fossils include crinoids, tintinnids, radiolarians, and *incertae sedis* such as *Globochaete*, *Cadosina*, and *Stomiosphaera*. *Lombardia* Brönnimann is considered to be a synonym of *Saccocoma* Agassiz.

IN the department of the Hautes-Alpes, in south-eastern France, near the village of La Faurie, the Kimmeridgian, Tithonian and Berriasian stages are represented by fine-grained calcareous rocks varying from pure limestones to marls (text-fig. 1). Coccoliths may form a large part of the ground-mass of the rock. In the Kimmeridgian the *pseudomutabilis* Zone and the basal part of the *beckeri* Zone consist of dark marls up to 200 m. thick. Above are up to 100 m. of marly limestone and limestones, with occasional chert nodules, forming the main part of the *beckeri* Zone and of the Tithonian. Conglomerates, probably originating as the result of movement of unconsolidated sediments in mud-flows, are common in the Lower Tithonian, and are of extremely variable thickness; they usually give rise to prominent topographic features. The Berriasian is formed of alternating marls and marly limestones.

The beds are sporadically rich in ammonites, including aptychi, and belemnites and brachiopods may occur. The marls below the marly limestones of the *beckeri* Zone and the Lower Tithonian are particularly poor in macrofossils. Microfossils, however, are common in most beds, and various assemblages occur which can be used for correlation locally and which may eventually prove to be useful over a wide area of Southern Europe. References to the forms which occur are widely scattered and illustrations sometimes inadequate so that it has been thought useful to bring them together in one article.

The commonest microfossils are: plates of small crinoids of the family Saccocomidae recovered from washings from marls of the Kimmeridgian and, seen in thin section only, tintinnids such as *Calpionella* and *Tintinnopsella*, radiolarians, and various *incertae sedis* such as *Globochaete*, *Cadosina*, and *Stomiosphaera*.

The specimens figured are deposited in the Hunterian Museum, Glasgow.

Phylum ECHINODERMATA
Class CRINOIDEA
Order ROVEACRINIDA Sieverts-Doreck 1953
Family SACCOCOMIDAE d'Orbigny 1852
Genus SACCOCOMA Agassiz 1835 [= *Lombardia* Brönnimann 1955]

Description. Angular, usually bilaterally symmetrical shapes between 50 μ and 150 μ in length and formed of a single calcite crystal, occur in large numbers in thin sections of the Kimmeridgian and the lowermost Tithonian (Pl. 51, fig. 2). There is now no doubt,

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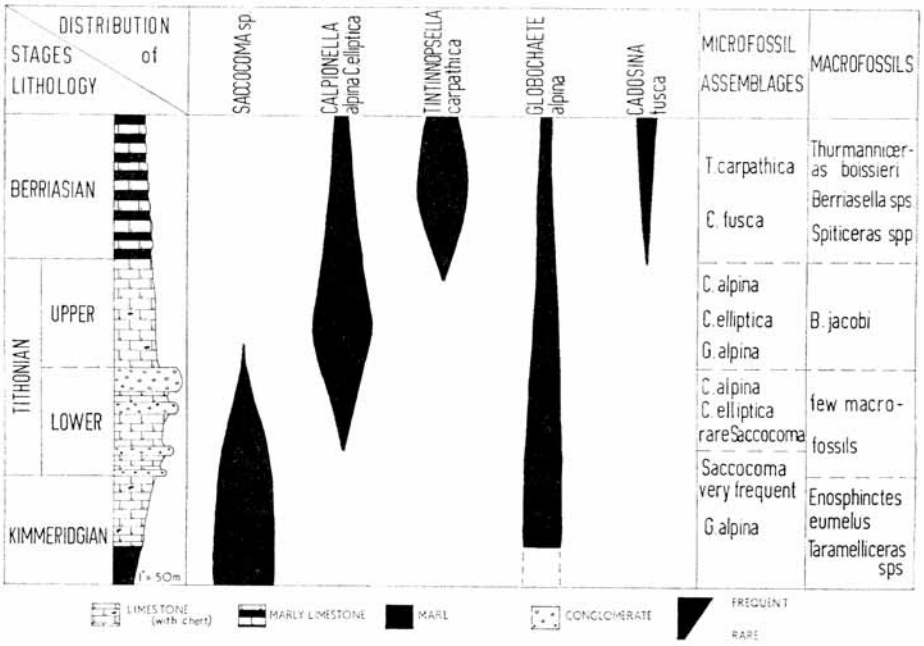
since the work of Verniory (1954, p. 327), that these are random sections through the brachial plates of small, pelagic crinoids of the family Saccocomidae, although they have been described as various other echinoderm fragments, algae or sponge spicules (Lombard 1938, 1945; Brönnimann 1955). Various types of brachial plates are found in washings of the Kimmeridgian marls which correspond exactly to the description of *Saccocoma* given by Jaekel (1892).



TEXT-FIG. 1. Stratigraphical distribution of microfossils in the Upper Jurassic and Lower Cretaceous of the Hautes-Alpes, France. Specimen numbers refer to catalogue of the Hunterian Museum, Glasgow.

These plates include the first primibrachial, identified by its horizontal proximal facet and strongly oblique distal facet (Pl. 52, figs. 16, 17). This distal facet is joined to the oblique proximal facet of the first secundibrachial, an axillary brachial easily identified by its double distal surfaces (Pl. 52, figs. 20–23). Other plates include unbranched secundibrachials with or without large, delicate, wing-like extensions (Pl. 52, fig. 18). Distal, unwinged brachials of the arms and pinnuli also occur in large numbers (Pl. 52, figs. 24, 25). It is possible to distinguish on some of the brachials the lateral facet from which branched the pinnuli (Pl. 52, figs. 26, 27). Some spined fragments also occur (Pl. 52, fig. 19) very similar to parts of radial plates as described by Verniory (1961, p. 316). All the specimens show a ventral canal and a coarsely reticulate surface.

In 1955 Brönnimann erected the genus *Lombardia*, with three 'species', *arachnoidea*,

perplexa, and *angulata*, for various forms found in thin sections in Cuban material. These three 'species' are, as Verniory (1956*a*, p. 86, see also Dufaure 1958, pl. 6, figs. 1–6) has shown, winged brachials of *Saccocoma* viewed obliquely (Pl. 52, figs. 3, 9) and vertically (Pl. 52, fig. 10) and distal (non-winged) brachials viewed vertically (Pl. 52, figs. 1, 2). *Lombardia* is, therefore, a junior synonym of *Saccocoma*.

Sieverts-Doreck subdivided *Saccocoma* into three morphological groups (1955, p. 119) without giving any new specific names. These groups were characterized by having I. Unspined radial plates, calyx margin straight, proximal brachials without extensions for muscle attachment. II. Spined radial plates, calyx margin straight, with dense or sieve-like plates for muscle attachment. III. Unspined radial plates, calyx margin incurved to cover part of the oral cavity, including *S. tenella* from the upper part of the Upper Jurassic.

She then says that the new species will be described at a later date, but this description does not yet seem to have appeared. Verniory, however, has described one of the forms, with a diagnosis communicated verbally to him by Sieverts-Doreck. He presumably uses the abbreviation *in coll.* (= *in colloquio*) to mean 'in verbal communication'. *S. quenstedti* Sieverts-Doreck *in* Verniory, 1961, is a spined form and thus belongs to Group II. It may be noted here that Verniory's drawing (pl. 1, fig. 7) described as a secundibrachial, is in reality a 1st primibrachial. He also mentions (1962*a*, p. 390; 1962*b*, p. 394) a 'groupe *S. schattenbergi* Sieverts-Doreck (*in coll.*)' presumably to include Group I of Sieverts-Doreck, many of the specimens of which are found in the Schattenberg collection, and a *S. feifeli* Sieverts-Doreck (*in coll.*). Characters are given to differentiate these forms from *S. quenstedti*. ICZN Article 13 (p. 13) states that for a name to be available it must be 'accompanied by a statement that purports to give characters differentiating the taxon'. The names *S. schattenbergi* and *S. feifeli* therefore appear to be available, *S. schattenbergi* for a form with thicker radials with long oral projections and *S. feifeli* for a small form with its calyx very flattened axially. It is to be hoped that Sieverts-Doreck's further paper mentioned on p. 119 in her 1955 article will expand these diagnoses and compare these species with other ones previously described.

Phylum PROTOZOA
Class CILIATA
Order SPIROTRICHIDA Bütschli 1889
Suborder TINTINNINA Claparède and Lachmann 1858

Description. The essential details of the structure and stratigraphical distribution of the tintinnids of the Upper Jurassic and the Cretaceous remain as they were described by Colom (1948, p. 251).

In the La Faurie region *Calpionella alpina* Lorenz and *C. elliptica* Cadisch (Pl. 52, figs. 5, 7) appear in the Lower Tithonian, in beds still containing fragments of *Saccocoma*. They do not, however, become very abundant until the upper part of the Tithonian, where they occur in swarms. The two species continue, with decreasing numbers, into the Berriasian, where they are accompanied by numerous *Tintinnopsella carpathica* Murgeanu and Filipescu (Pl. 52, figs. 4, 8). This form is now known to occur in uppermost Tithonian beds (Colom *et al.* 1954), though its presence in large numbers is usually regarded as diagnostic of the Lower Cretaceous.

Other tintinnids also occur, some of which are of stratigraphical importance, like *Stenosemellopsis hispanica* (Colom) which is frequent, although not confined to the Berriasian, but most of them are rare and therefore of less general use for stratigraphical purposes.

Class ACTINOPODA
Subclass RADIOLARIA

Large numbers of radiolaria occur at all horizons. The silica of which they were originally formed has very largely been replaced by calcite, but many still retain the form of the porous skeleton and delicate spines of the original structure (Pl. 52, figs. 13, 14, 15).

INCERTAE SEDIS
Genus GLOBOCHAETE Lombard 1945
Globochaete alpina Lombard 1945

Discussion. Globochaete alpina (the 'organisme D' of Joukowsky and Favre 1913) is a

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EXPLANATION OF PLATE 51

Thin sections photographed in ordinary light.

Fig. 1. *Calpionella* limestone, with *C. alpina* Lorenz (*a*), *C. elliptica* Cadisch (*b*); Uppermost Lower Tithonian, Veynes; ×60.

Fig. 2. Limestone with *Saccocoma*: sections through winged secundibrachial (*c*) and distal (unwinged) brachials (*d*); Lower Tithonian, La Faurie; ×60.

Fig. 3. Limestone with *Cadosina fusca* (*e*) and *Tintinnopsella sp.* (*f*); Berriasian, La Faurie; ×120.

Fig. 4. *Stomiosphaera minutissima* (Colom); Upper Tithonian, St. Julien, X308; ×750.

Fig. 5. *Cadosina fusca* Wanner; Berriasian, Veynes, X309; ×750.

EXPLANATION OF PLATE 52

Figs. 1, 2, 3, 9, 10. *Saccocoma sp.*, ×150. 1–2, Vertical sections through distal brachials, '*Lombardia angulata*' Brönnimann; E3657/1, 2. 3, 9, Horizontal sections through winged brachials, fig. 3 showing the central canal, '*L. arachnoidea*' Brönnimann; E3657/3, 4. 10, Vertical section through winged brachial, '*L. perplexa*' Brönnimann; Lower Tithonian, E3657/5. (Figs. 1, 3, 9, 10, La Faurie, fig. 2, St. Julien).

Figs. 4, 8. *Tintinnopsella carpathica* Murgeanu and Filipescu; Berriasian, La Faurie, P409/1, 2. ×300. 4, showing caudal elongation.

Fig. 5. *Calpionella alpina* Lorenz; Upper Tithonian, La Faurie, P410; ×300.

Figs. 6, 11, 12. *Globochaete alpina* Lombard; Tithonian, La Faurie; X300. 6, irregular form, X310. 11, quadrilobate form, (*a*) ordinary light, (*b*) under crossed nicols to show extinction cross, X311. 12, bilobate form, X312.

Fig. 7. *Calpionella elliptica* Cadisch; Upper Tithonian, La Faurie, P411; ×300.

Figs. 13–15. Radiolaria; Berriasian, La Faurie, P1101–3; ×150.

Figs. 16–27. *Saccocoma spp.*; Kimmeridgian, *beckeri* Zone, Vaunièrette, St. Julien; ×50. 16–17, *Saccocoma sp.*, primibrachials. 16, ventral surface showing ventral canal and horizontal proximal facet where the brachial joined the radial plate, E3654/1. 17, oblique view of dorsal surface showing oblique distal facet, E3654/2. 18, *Saccocoma sp.*, secundibrachial, ventral view with broken bases of wing-like extensions, E3654/3. 19, *Saccocoma quenstedti* Sieverts-Doreck *in* Verniory, spined fragment of radial, E3655. 20–21. *Saccocoma sp.*, axillary secundibrachials. 20, dorsal view showing coarse reticulate surface and double distal facets, E3654/4. 21, ventral view showing oblique proximal facet and double distal facets, E3654/5. 22–23. *Saccocoma tenella* (Goldfuss), axillary brachials showing wing-like, reticulate extensions. 22, dorsal surface E3656/1. 23, ventral surface E3656/2. 24–27, *Saccocoma sp.*, distal brachials. 24, dorsal view, E3654/6. 25, ventral view with ventral canal E3654/7. 26, dorsal view of brachial with base for pinnule, E3654/8. 27, ventral view of brachial with base for pinnule, E3654/9.

spherical, bi- or quadri-lobate organism 50 μ to 80 μ in diameter, formed of radial fibrous calcite (Pl. 52, figs. 6, 11, 12). It may occur at all horizons but is more common in the Jurassic (Durand-Delga 1956, pp. 143–53).

The systematic position of this organism is not known, although it has been suggested (Lombard 1945, pp. 167–8) that it is the zoospore of a calcareous alga.

Genus CADOSINA Wanner 1940
Cadosina fusca Wanner 1940

Description. Cadosina fusca is a small (50 μ) spherical body of light-brown porcellaneous calcite, with a wall 10 μ to 15μ thick around a centre of fine calcite (Pl. 51, fig. 5). In the La Faurie area it is confined to the Cretaceous where it may occur in large numbers, often associated with *Tintinnopsella*.

Genus STOMIOSPHAERA Wanner 1940
Stomiosphaera minutissima (Colom) 1935

Discussion. The spherical body 50 μ in diameter, referred to by Colom as a fibrosphere but shown by Durand-Delga (1957) to be of different although unknown systematic position, occurs fairly frequently at all horizons. It shows two distinct layers—an outer layer of calcite 10 μ to 12 μ thick, composed of radiating fibres, and an inner, structureless opaque layer (5 μ). The centre is filled by fine-grained calcite similar to the enclosing sediment (Pl. 51, fig. 4).

STRATIGRAPHICAL DISTRIBUTION

The forms described occur in successive assemblages of local stratigraphical significance. Their distribution is shown in text-fig. 1, from which it can be seen that the Kimmeridgian is characterized by numerous crinoid fragments and *Globochaeta alpina* and by the absence of tintinnids. A typical limestone is shown in Pl. 51, fig. 2. The lowest Tithonian contains a mixture of *Saccocoma*, *Globochaete alpina*, and calpionellids, and the Upper Lower Tithonian and the Upper Tithonian contain large numbers of *Calpionella alpina* and *C. elliptica* but are without crinoid fragments (Pl. 51, fig. 1). The Berriasian is distinguished by the incoming of large numbers of *Cadosina fusca* and *Tintinnopsella carpathica* (Pl. 51, fig. 3). This distribution compares closely with that described by Charollais and Rigassi-Studer from Châtel-Saint-Denis, in the Pre-Alps of Switzerland (1961, pp. 267, 272), where abundant *Calpionella alpina* and *C. elliptica* with rare *T. carpathica* characterize the Portlandian (= Upper Tithonian) and where this latter species only becomes frequent in the Berriasian. Similarly crinoid fragments do not occur above the Kimmeridgian (the upper part of this stage at this locality probably being equivalent to part of the Lower Tithonian). Comparable distributions occur over a wide area of the Tethyan province including North Africa (Colom *et al.* 1954), Spain and Mallorca (Colom 1948, 1955), Italy (Zia 1955), and elsewhere.

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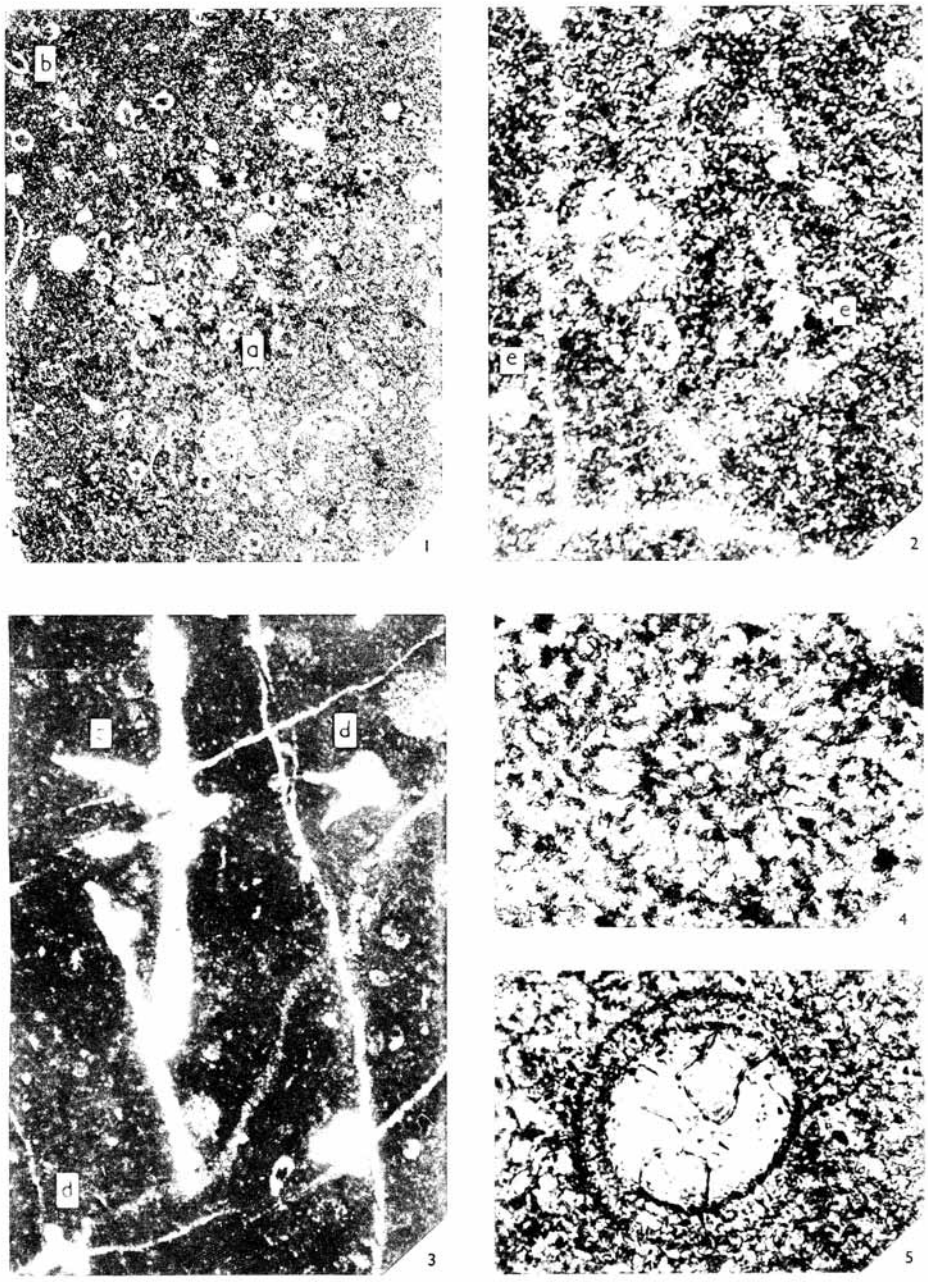
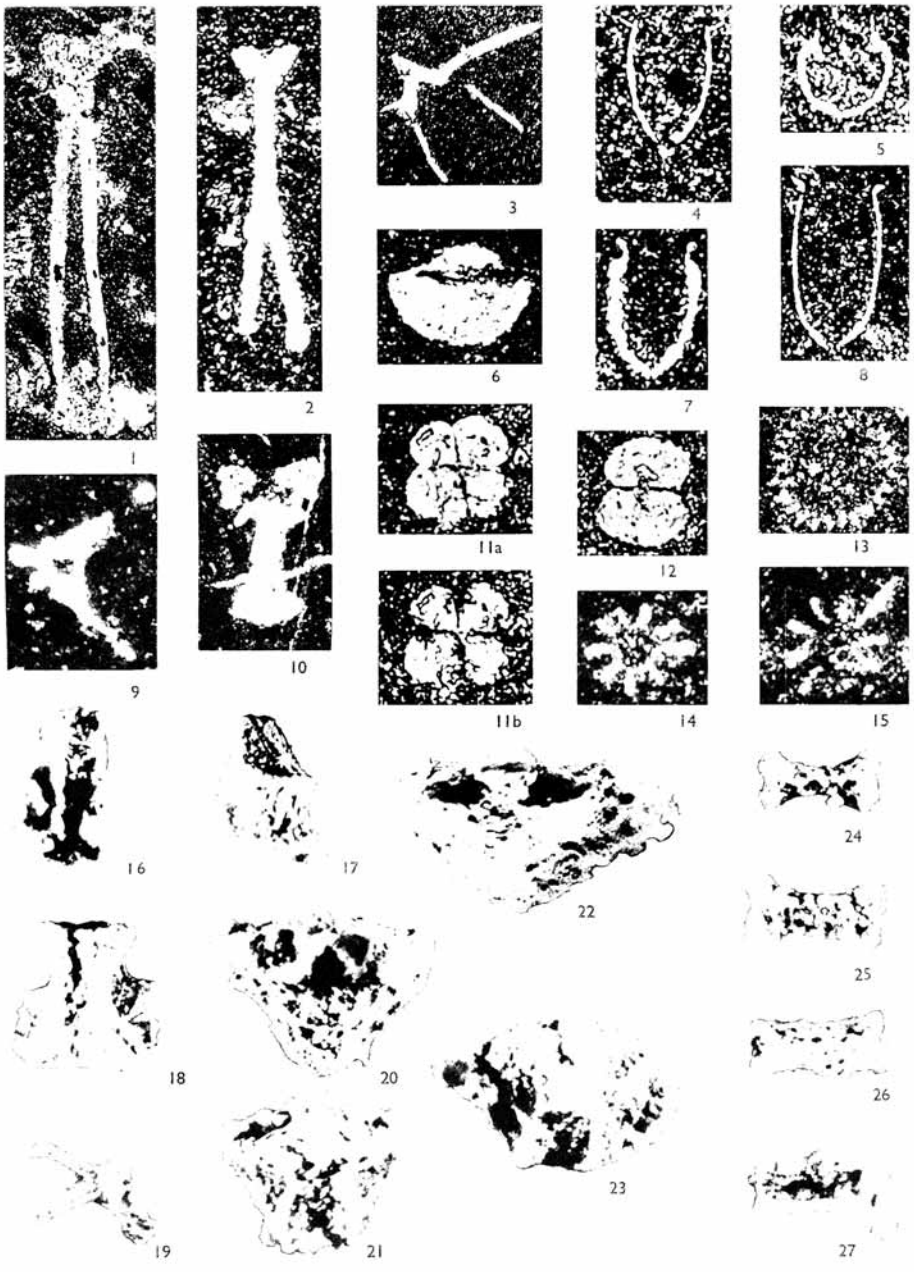


TURNER, Tithonian and Berriasian microfossils



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