acta geologica polonica

Vol. 39, No. 1-4 Warszawa 1989

JERZY TRAMMER

# Middle to Upper Oxfordian sponges of the Polish Jura

ABSTRACT: Oxfordian strata of the Polish Jura make part of the sponge megafacies in Europe and contain sponges within bedded rocks as well as in bioherms. The latter structures include "loose" bioherms, which owe their origin solely to the abundant occurrence of sponges, and "rigid" bioherms having an early-diagenetic framework. The Oxfordian sponge-bearing rocks have been deposited in open-shelf environments, generally below the storm wave base. For taxonomical purposes 68 species have been recognized in the sponge assemblage; 47 species of the class Hyalospongea, 16 of the Demospongea (primarily Lithistida), 4 of the Calcispongea, and 1 of the Sclerospongea. No more than 11 species are common in the assemblage; they account for 74% of the total number of specimens. A peculiar trend is discernible in this Oxfordian sponge assemblage: lithistids dominated at the beginning of the Oxfordian, but hyalosponges gradually increased in abundance through time and achieved pronounced dominance at the end of the Oxfordian. Recurrent changes in relative abundance of hexactinellid and lithistid sponges have in fact been recorded in the Middle and Upper Jurassic of Europe. The systematic part of the paper includes descriptions of all the collected species.

## INTRODUCTION

The Polish Jura is among those areas of Europe where the Upper Jurassic sedimentary rocks contain diverse sponge-bearing bodies (= *Malm reef belt* of WILSON 1975; = *sponge megafacies* of MATYJA 1976). The sponge megafacies varies in its stratigraphic age. In Germany, for example, it ranges from the Oxfordian through the Tithonian. In the Polish Jura, however, it is confined to the Oxfordian. This paper is devoted to description and analysis of the sponge fauna in this area. The sponge fauna has in fact been widely known for over a century, and a history of its investigations is given in an earlier paper (TRAMMER 1982), where Lower and low-Middle Oxfordian sponges and their environment were described. In the course of the present study sponges have been collected in 15 geological sections (*see* Text-figs 1—3) representing the higher Middle and the Upper Oxfordian. The results of the former paper (TRAMMER 1982) and the present study are synthesized here for general conclusions concerning the sponge taxonomy, the development of bioherms, and the evolution of sponge assemblages.

## SPONGE-BEARING LITHOLOGICAL UNITS

In the Polish Jura, the Oxfordian strata are variable in lithology. The majority of lithological units contain a rich sponge fauna (Text-fig. 2). The sponges discussed in this paper come from the units which are briefly described below.

### PLATY LIMESTONES

Platy limestones (= *Zawodzie Beds* of RÓŻYCKI 1953; = *Zawodzie Platy Limestones* of KUTEK & *al.* 1977) are well and evenly bedded, often with bedding accentuated by marly intercalations (Pl. 1, Fig. 1). These are micritic limestones with pelloids (Pl. 5, Fig. 1), often with cherts and tuberoids. They first appear in the Tenuicostatum Subzone of the Plicatilis Zone and range up to the Hypselum Subzone of the Bimammatum Zone (Text-fig. 3; *see also* BROCHWICZ-LEWIŃSKI 1976, Fig. 1). For more details on the lithology and fossils of platy limestones see the papers by BROCHWICZ-LEWIŃSKI (1970, 1976). This lithological unit occurs in the sections at Prędziszów, Mirów, Wysoka, Niegowonice, Zawodzie, Dymnik, and Birów (Text-figs 1—3); sponges have been collected at Zawodzie (Text-fig. 4), Dymnik and Birów (Text-fig. 10).

Generally, sponges are not particularly abundant in the platy limestones (Text-figs 4 and 7), though they are locally quite common. The variety rich in sponges occurs in places where platy limestones laterally contact sponge bioherms or biostromes, as for example at Wysoka (Text-fig. 5; Pl. 2, Fig. 2; Pl. 5, Fig. 2).

### SPONGE CRUMPLED LIMESTONES

This lithological variety occurs in the form of a biostrome of somewhat marly rocks within platy limestones at Wysoka (Text-figs 1—3 and 5; Pl. 1, Fig. 2; Pl. 5, Fig. 3). The biostrome contains ammonites typical of the Antecedens Subzone of the Plicatilis Zone (ŁACWIK 1970). The crumpled nature of the rock is probably due to the abundance of sponges, which constitute

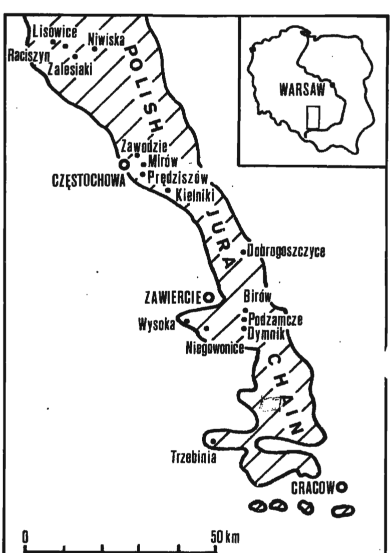



Fig. 1
Investigated exposures of the Oxfordian strata within the occurrence zone (*hachured*) of Upper Jurassic deposits in the Polish Jura; inset shows position of the area in Poland

approximately 15% of the rock volume. The investigated sponges from Wysoka (Text-fig. 10) come all from the sponge crumpled limestones.

SPONGE MARLY LIMESTONES AND MARLS

Such rocks have been found solely in the Transversarium Zone at Trzebinia (Text-figs 1, 3, and 6). They are thin-bedded and contain very abundant sponges (Text-figs 6 and 10), which form up to 28% of the rock volume.

MASSIVE LIMESTONES

This lithological variety includes unbedded to poorly bedded, hard and compact limestones which tend to stand out in topographic relief in the form of crags (Pl. 2, Fig. 1 and Pls 3—4). Generally, they contain no cherts. The massive limestones form rock bodies highly variable in size (Text-fig. 2). They first appear in the Tenuicostatum Subzone of the Plicatilis Zone and persist to the end of the Oxfordian in the area (Text-fig 2—3). Sponges from this lithological unit (*cf.*

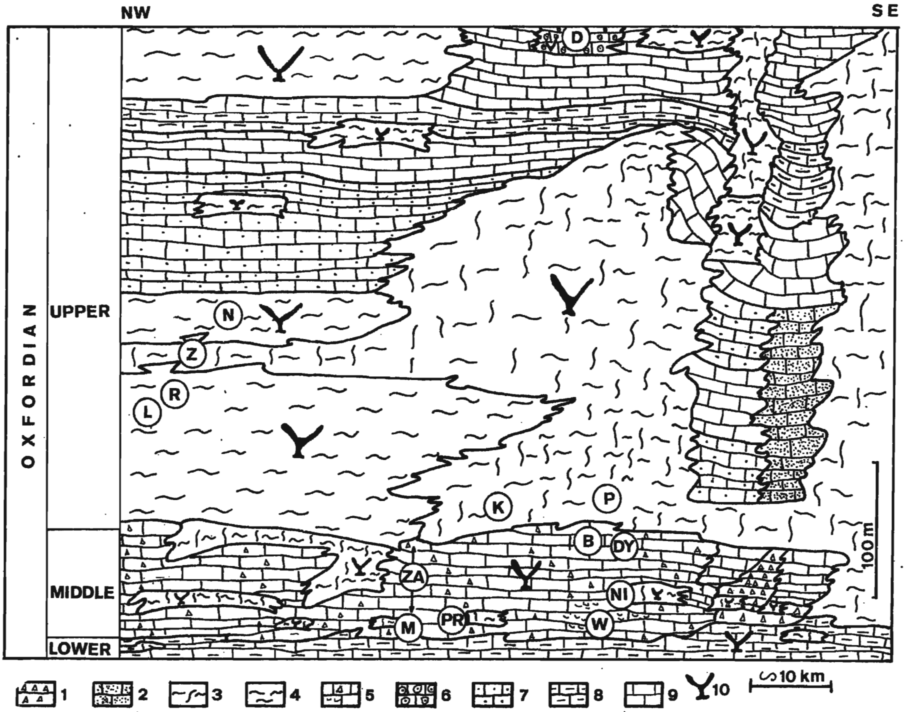



Fig. 2. Lithologic units of the Oxfordian in the Polish Jura (*see* TRAMMER 1982, Fig. 2), to show the range of the sponge-bearing units

*1* detrital limestones, *2* non-detrital grained limestones, *3* sponge or algal-sponge massive limestones, *4* chalky limestones, *5* platy limestones with sponges and tuberoliths, locally also sponge-bearing crumpled limestones, *6* crinoid limestones with corals, *7* friable micritic limestones, *8* marls and marly limestones, *9* micritic limestones, *10* idealized sponge, to denote the sponge-bearing lithologic units

Localities studied: **M** — Mirów, **PR** — Prędziszów, **W** — Wysoka, **NI** — Niegowonice, **ZA** — Zawodzie, **DY** — Dymnik, **B** — Birów, **K** — Kielniki, **P** — Podzamcze, **L** — Lisowice, **R** — Raciszyn, **Z** — Zalesiaki, **N** — Niwiska, **D** — Dobrogoszczyce

Scheme based on the data presented by KUTEK & *al.* (1977) and BRUNSZ (1987)

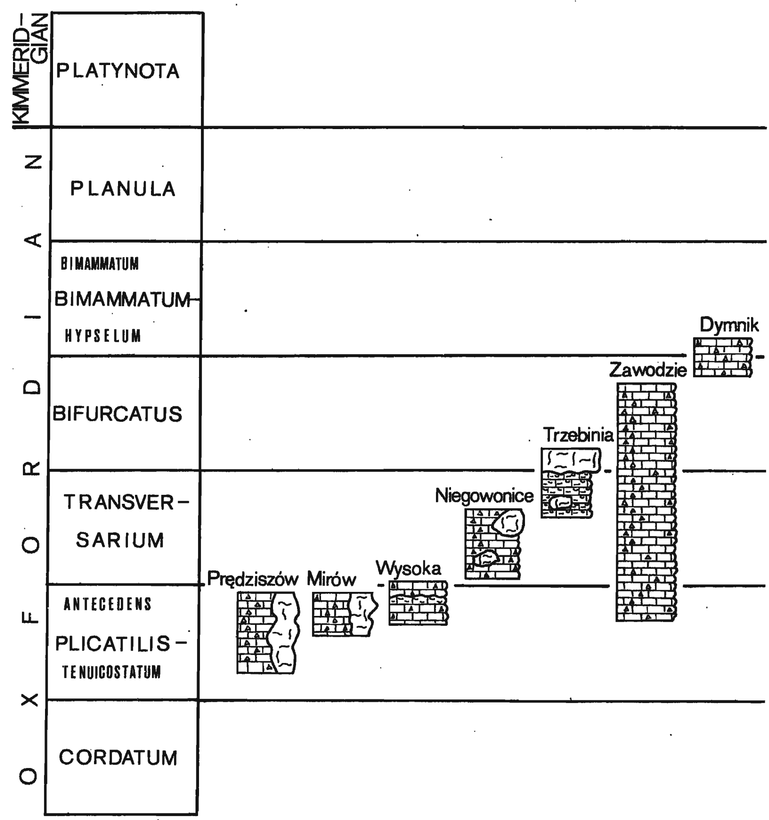
Text-figs 1—3) have been collected in the sections at Trzebinia (Text-fig. 6), Mirów, Niegowonice (Text-fig. 7), Prędziszów (Text-fig. 8), Kielniki (Text-fig. 9), Podzamcze, and Zalesiaki. The massive limestones are quite variable in microfacies (Pl. 5, Figs 4—6; Pl. 6); sometimes these are micritic limestones (Pl. 6, Figs 5—6), but they are detrital in other cases, as for example at Trzebinia (Pl. 6, Fig. 3). At Niegowonice, internal sediments occur within the massive limestones (Text-fig. 7; Pl. 6, Fig. 2), as well as cavities encrusted by epifauna. At Kielniki (Text-fig. 9), two varieties can be recognized which pass laterally into each other; one variety contains uniformly distributed sponges (Pl. 6, Fig. 5), while the other has sponge horizons (Pl. 6, Fig. 6).

The masssive limestones vary also in sponge abundance. Sponge fossils constitute only 1—3% of the rock volume at Trzebinia (Text-fig. 6), but 9% at Niegowonice (Text-fig. 7), and as much as 20% at Kielniki (Text-fig. 9). Sometimes these rocks contain also brachiopods and small ammonites (Text-fig. 8), though in some instances their fauna consists exclusively of sponges (Text-fig. 9). Small stromatolites are almost ubiquitous, however (Text-figs 6 and 8; Pl. 5, Figs 5—6; Pl. 6, Fig. 1).

For more detail on the lithology and fauna of the massive limestones *see* Dżułyński (1952).

CHALKY LIMESTONES

The chalky limestones are unbedded or medium- to thick-bedded; they are white, usually soft, friable, and microporous, often with cherts (Wierzbowski 1978). Sponges have been collected from



this lithological variety at Lisowice, Raciszyn, and Niwiska (Text-figs 1—3), where the chalky limestones range from the uppermost part of the Bimammatum Zone to the Planula Zone (WIERZBOWSKI 1978; WIERZBOWSKI, MATYJA & ŚLUSARCZYK-RADWAN 1983).

### CRINOID LIMESTONES WITH CORALS

These are thick-bedded limestones, extremely rich in crinoid stem fragments and with abundant and diverse assemblage of solitary and colonial corals (BRUNSZ 1987). They occur at Dobrogoszczyce (Text-figs 1—3), where they belong to the uppermost Oxfordian or lowermost Kimmeridgian (BRUNSZ 1987).

## SPONGES AND SPONGE BIOHERMS

There is a large literature on sponge bioherms. Their geological history in the Phanerozoic has been presented by RIGBY (1976), whereas sponge bioherms in *statu nascendi* has been described by WIEDENMAYER (1978, 1979). Upper Jurassic sponge bioherms have been described and discussed by DORN (1932),

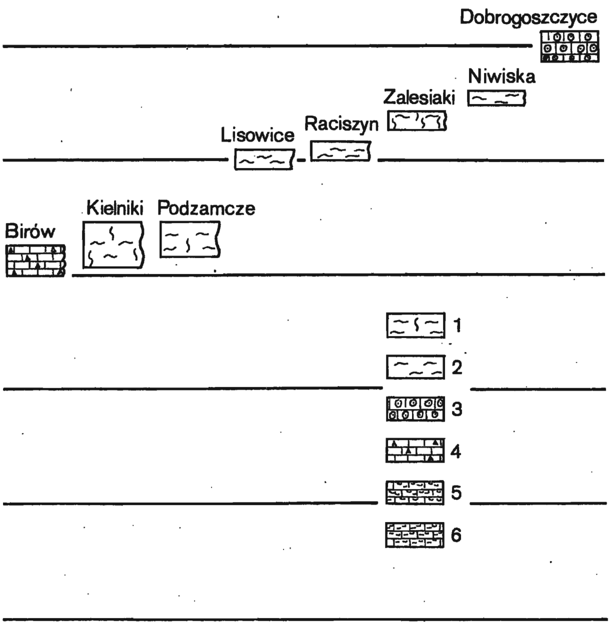



Fig. 3. Stratigraphical position of the investigated exposures
*1* algal-sponge massive limestones, *2* chalky limestones, *3* crinoid limestones with corals, *4* platy limestones with sponges and tuberoliths, *5* sponge-bearing crumpled limestones, *6* sponge-bearing marly limestones and marls
Scheme based on the referenced data (ŁACWIK 1970, BEDNAREK 1974, BROCHWICZ-LEWIŃSKI 1976, WIERZBOWSKI 1978, WIERZBOWSKI & *al.* 1983, BRUNSZ 1987, and IRMIŃSKI 1987)

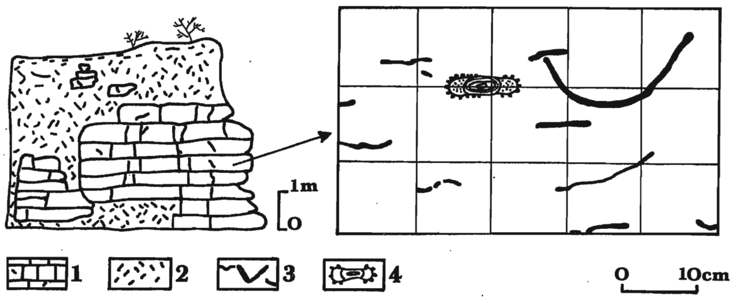



Fig. 4. Lithology and fauna of the strata exposed at Zawodzie
*1* platy limestones, *2* waste, *3* sponges, *4* ammonites

ROLL (1934), DŻUŁYŃSKI (1952), FRITZ (1958), HUMMEL (1960), HILLER (1964), PAULSEN (1964), WAGENPLAST (1972), GAILLARD (1971, 1983), NITZOPOULOS (1974), MATYJA (1976), GWINNER (1976), ZIEGLER (1977), FLÜGEL & STEIGER (1981), WIERZBOWSKI, MATYJA & ŚLUSARCZYK-RADWAN (1983), MEYER & SCHMIDT-KALER (1983), CREVELLO & HARRIS (1984), SCHORR & KOCH (1985), GYGI & PERSOZ (1986), WIRSING & KOCH (1986), BRACHERT (1986), MEYER, MÜLLER & ÜBELACKER (1987), and others. The sponge bioherms discussed by these authors occur in various countries (primarily Germany, Switzerland, and France) but they are very similar to those investigated presently in the Polish Jura. The latter bioherms are therefore only shortly commented upon herein.

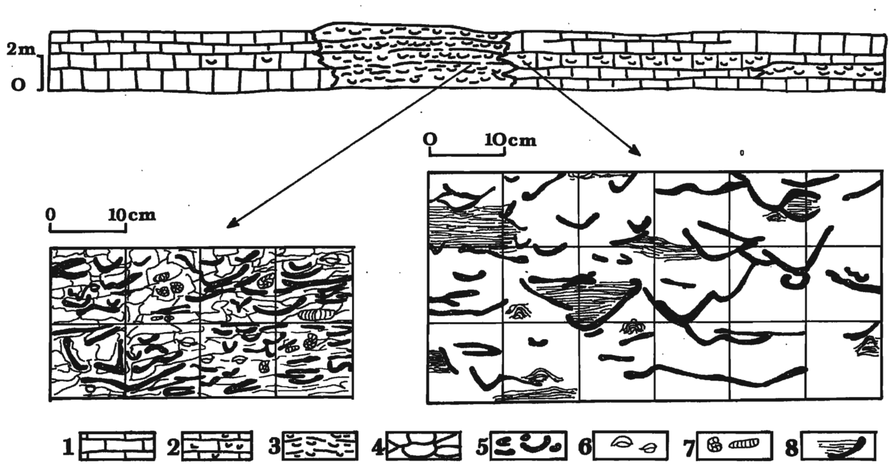
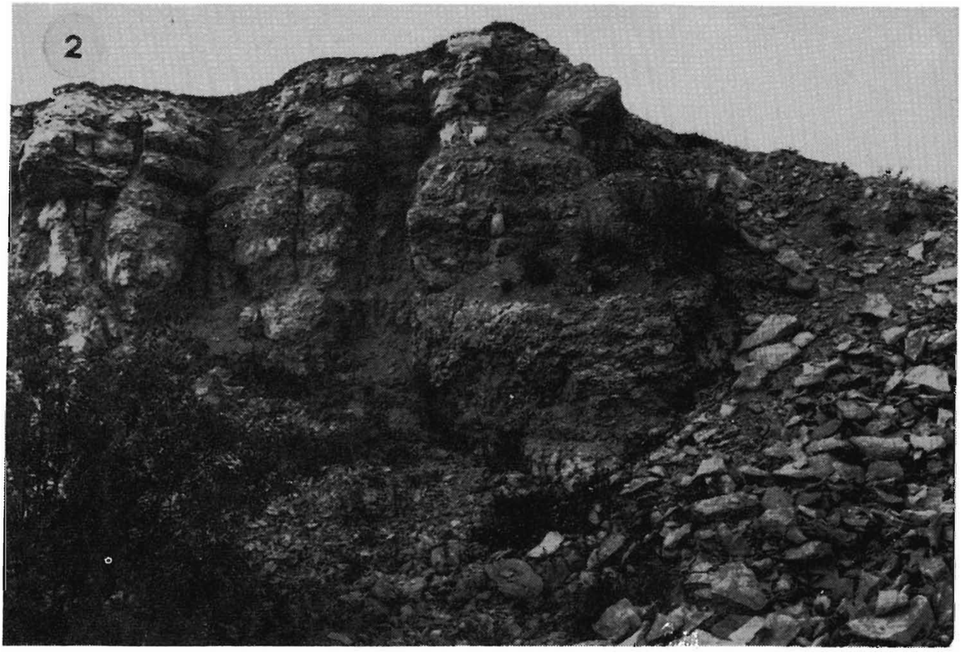
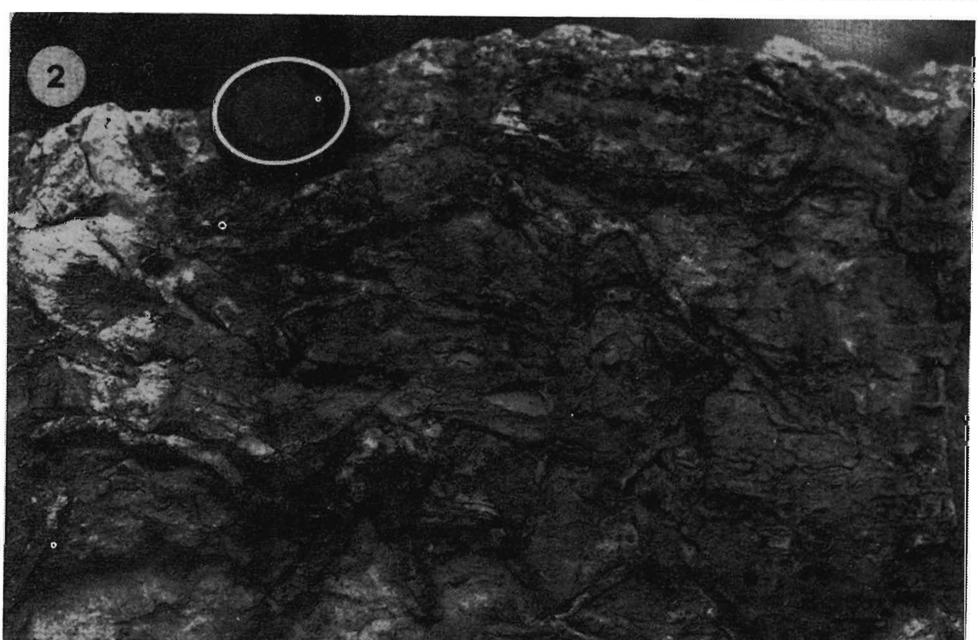



Fig. 5. Lithology and fauna of the strata exposed at Wysoka
*1* platy limestones, *2* platy limestones rich in sponges, *3–4* sponge-bearing crumpled limestones, *5* sponges, *6* brachiopods, *7* ammonites, *8* stromatolites

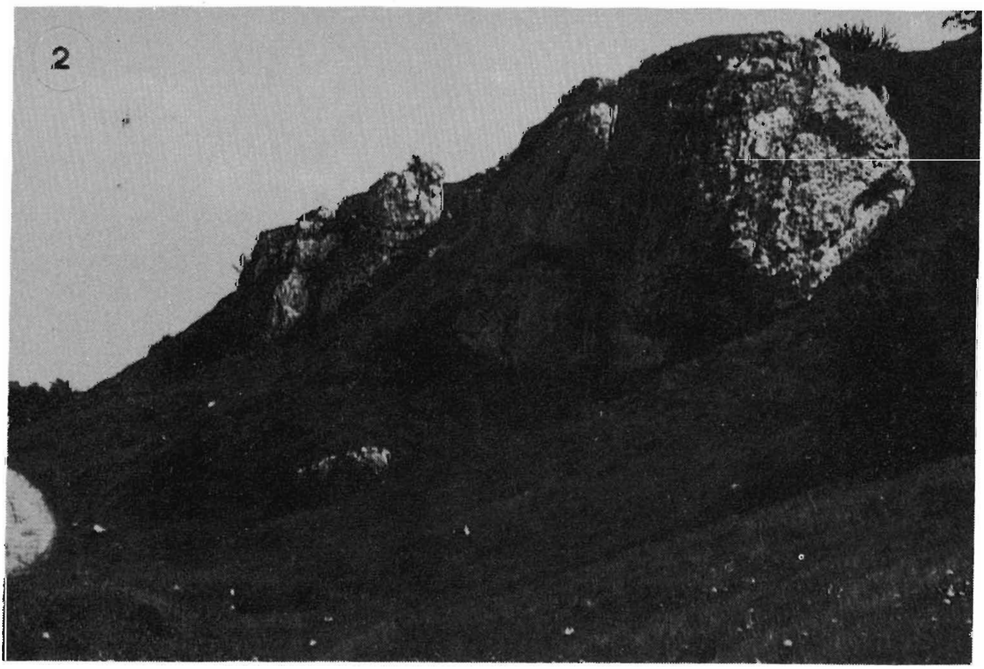




**1** – Platy limestones exposed in the quarry at Zawodzie
**2** – Sponge crumpled limestones exposed in the quarry at Wysoka



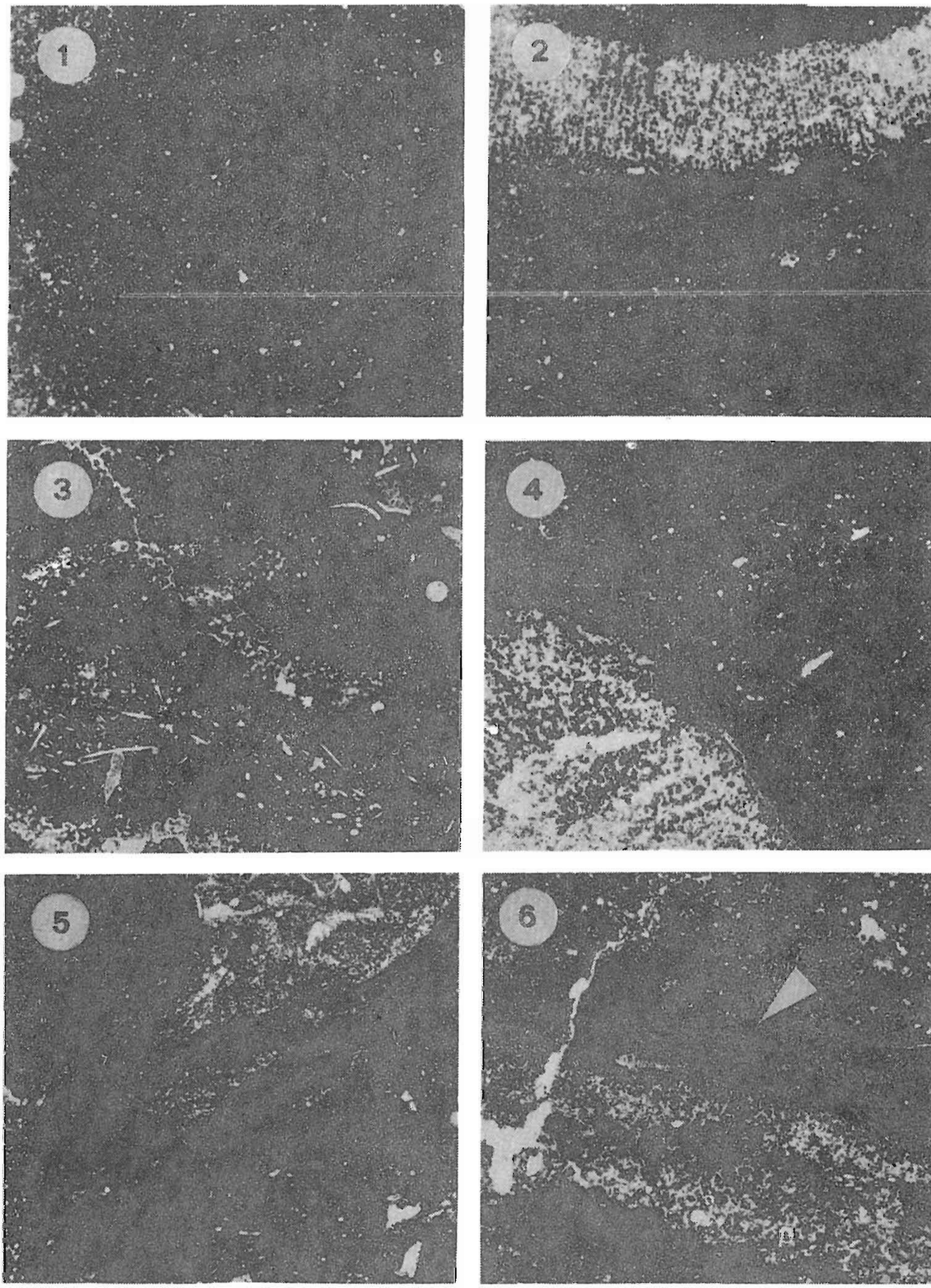
**1** — Transition between platy and massive limestones (*at left*) visible in the quarry at Niegowonice

**2** — Platy limestones replete with sponges, exposed at Wysoka

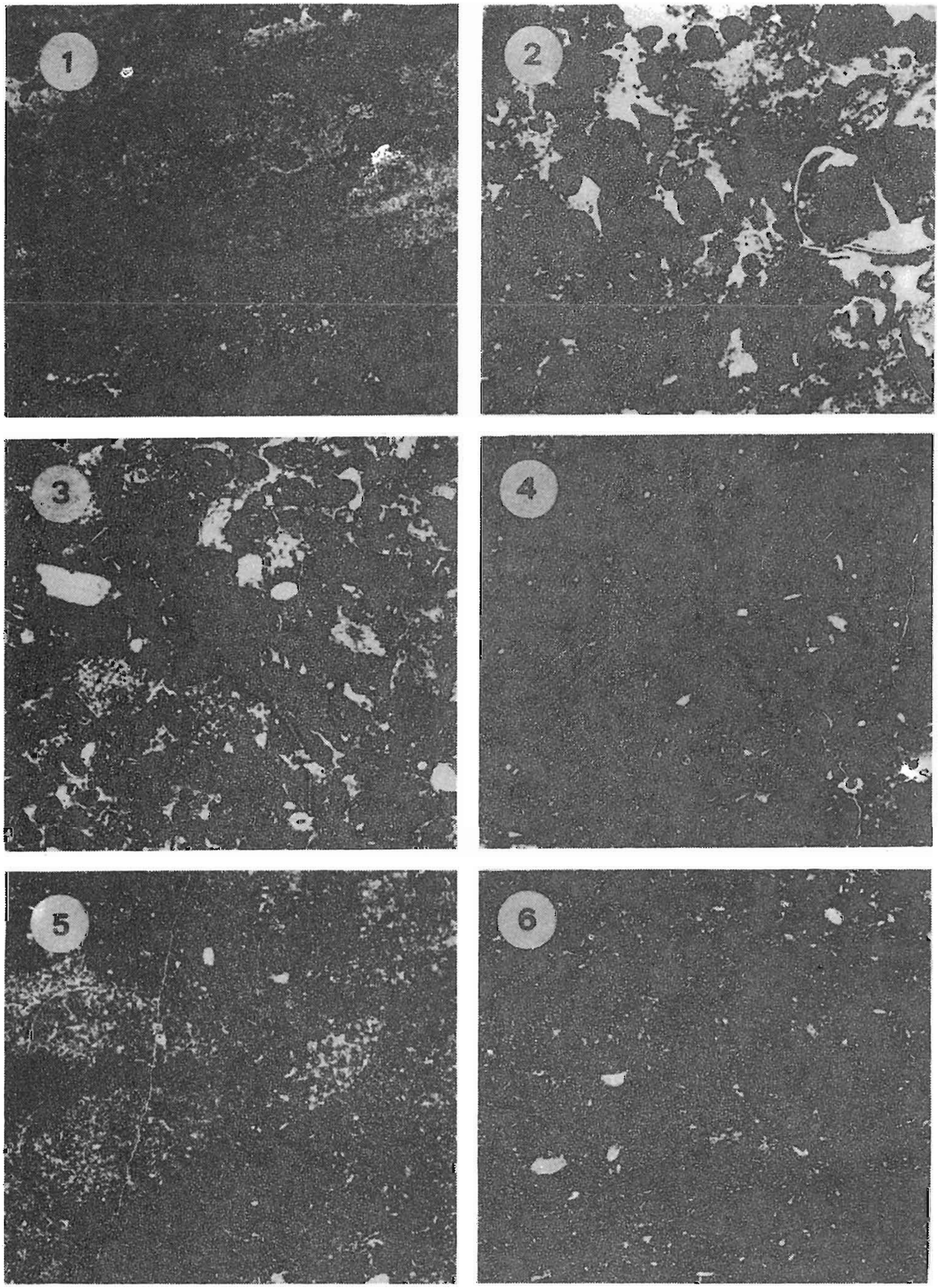


**1-2** — Massive limestones forming natural rocky bluffs at Mirów

Massive limestones from Zalesiaki (polished section); sponge sections are dominantly of the genera *Platychonia*, *Tremadictyon* and *Xenoschrammenum*



**1** — Micritic limestone with pellets and shell detritus; Zawodzie, platy limestones; **2** — Micritic limestone with pellets, shell detritus and sponges; Wysoka, platy limestones rich in sponges; **3** — Micritic limestones with pellets, sponge spicules and sponges; Wysoka, sponge crumpled limestones; **4** — Micritic limestone with pellets, sponge spicules and sponges; Prędziszów, massive limestones; **5** — Small stromatolite; Prędziszów, massive limestones; **6** — Pelletal micritic limestone, with a small stromatolite growing on a sponge (*arrowed*); Prędziszów, massive limestones. All figures × 5



1 — Laminated pelletal micritic limestone; Niegowonice, massive limestones; 2 — Internal sediment developed as detrital limestone composed of rounded intraclasts and grains; Niegowonice, massive limestones; 3 — Limestone composed of microonkolites, grains and intraclasts; Trzebinia, massive limestones; 4 — Micritic limestone with grains and shell detritus; Trzebinia, massive limestones; 5-6 — Pelletal micritic limestones; Kielniki, massive limestones. All figures × 5

## SPONGES AND BEDDING

In the Polish Jura, sponges occur in well bedded rocks as well as in those without or with merely indistinct bedding. Examples of well bedded rocks rich in sponges are provided by the Jasna Góra Beds (TRAMMER 1982), Platy Limestones (Text-fig. 5), and Sponge Marly Limestones (Text-fig. 6). The latter are in fact richer in sponges (which constitute at Trzebinia 28% of the rock volume) than any other lithological unit in the Polish Jura, and yet no bioherms developed in this lithofacies.

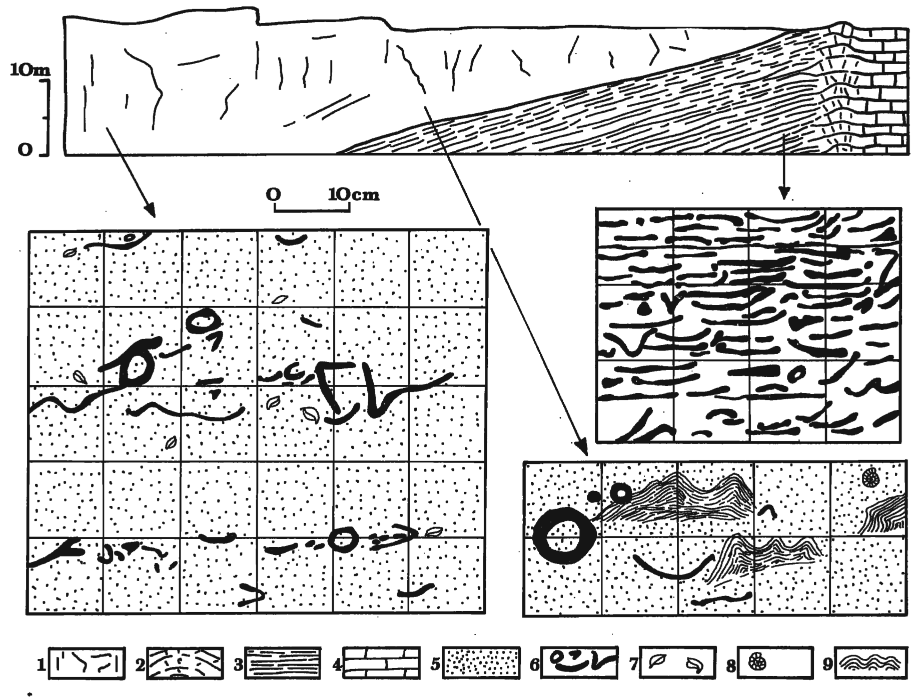



Fig. 6. Lithology and fauna of the strata exposed at Trzebinia
*1—2* massive limestones, *3* sponge-bearing marly limestones, *4* platy limestones, *5* grained limestones, *6* sponges, *7* brachiopods, *8* ammonites, *9* stromatolites

On the other hand, unbedded and biohermal massive limestones contain sometimes very few sponges. At Trzebinia (Text-fig. 6), sponge fossils constitute merely 1—3% of the rock volume. In the massive limestones northeast of Zawiercie (Text-fig. 1), BRUNSZ (1987) found sponges to represent 0—7% of the rock volume.

These figures indicate that the presence of sponges *per se* was not a sufficient condition for bioherm development.

## BIOHERM VARIETIES

### "Loose" bioherms

Sponge fossils are embedded in marly martix in bioherms of this type. Such bioherms developed solely by abundant accumulation of sponges, more aboundant than in the surrounding rocks (*see* TRAMMER 1982: Fig. 4; and Text-fig. 5 herein). There was no rigid framework in these bioherms. The sponges are not fused together, and the majority of them presumably lived with their lower part within the sediment (TRAMMER 1982, p. 14). Nor did the marly deposit cement the sponge skeletons into a rigid structure, as the considerable proportion of clay made a rapid early lithification impossible (*cf.* SHINN 1969, ZANKL 1969).

Such "loose" bioherms are exemplified by a variety of bioherms in the Jasna Góra Beds (TRAMMER 1982, 1985) and by a biostrome at Wysoka (Text-fig. 5). They occur solely in the lower part of the Oxfordian, in the Cordatum and the Plicatilis Zone. They are generally small, no more than a few dozens of meters in lateral extent.

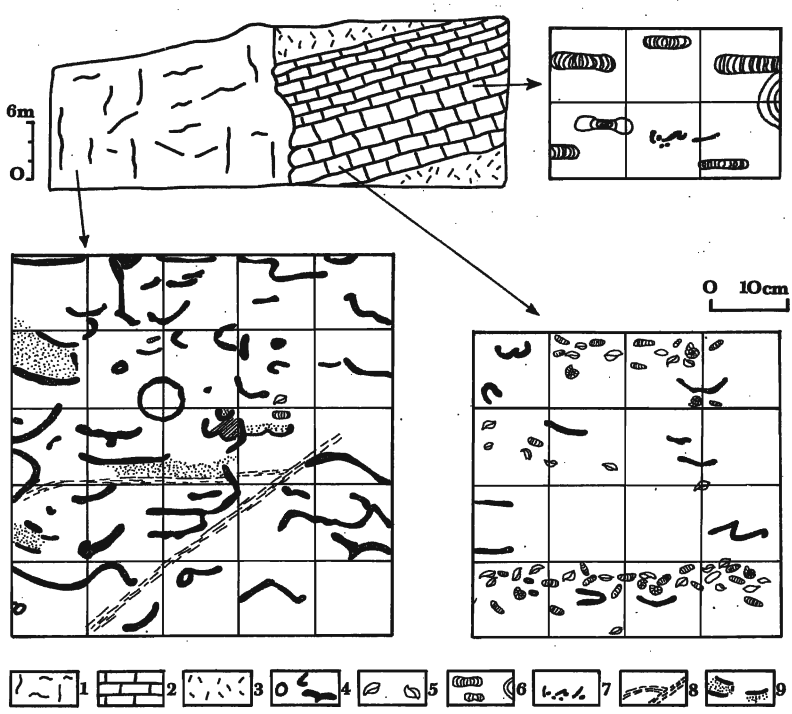



Fig. 7. Lithology and fauna of the strata exposed at Niegowonice
*1* massive limestones, *2* platy limestones, *3* waste, *4* sponges, *5* brachiopods, *6* ammonites, *7* burrows, *8* marly streaks, *9* internal sediments

**"Rigid" bioherms**

Such bioherms are formed by massive limestones (Text-figs 6–9; Pl. 4). In addition to sponges, which account for 1–20% of the rock volume, these bioherms contain also stromatolites (Text-figs 6–9; Pl. 5, Figs 5–6; Pl. 6, Fig. 1), which account for 0–70% of the rock volume as observed by BRUNSZ (1987) northeast of Zawiercie (Text-fig. 1). In turn, unlaminated calcareous (algal?) crusts, which are ubiquitous in the sponge megafacies in Germany (*e. g.*, HILLER 1964, Fig. 26; ZIEGLER 1977, Fig. 24), occur only exceptionally in the Oxfordian sponge-bearing rocks in the Polish Jura. The bioherms ranging in age from the Plicatilis to the Bifurcatus Zone (Text-figs 6–8) contain also brachiopods, bivalves, and small ammonites (*cf.* MATYJA 1984); the stratigraphically younger bioherms, however, have virtually no associated fauna.

The bioherms formed by massive limestones had a rigid framework, as indicated by the presence of internal sediments and pores with walls covered by epifauna. Such structures are particularly common at Niegowonice.

Neither the stromatolite-forming algae, nor the siliceous sponges had massive skeletons, however. The biohermal rigid framework, therefore, must have been due to very early (eogenetic) diagenesis, as it is indeed the case with Recent sponge bioherms, both in shallow-water (WIEDENMAYER 1978) and in

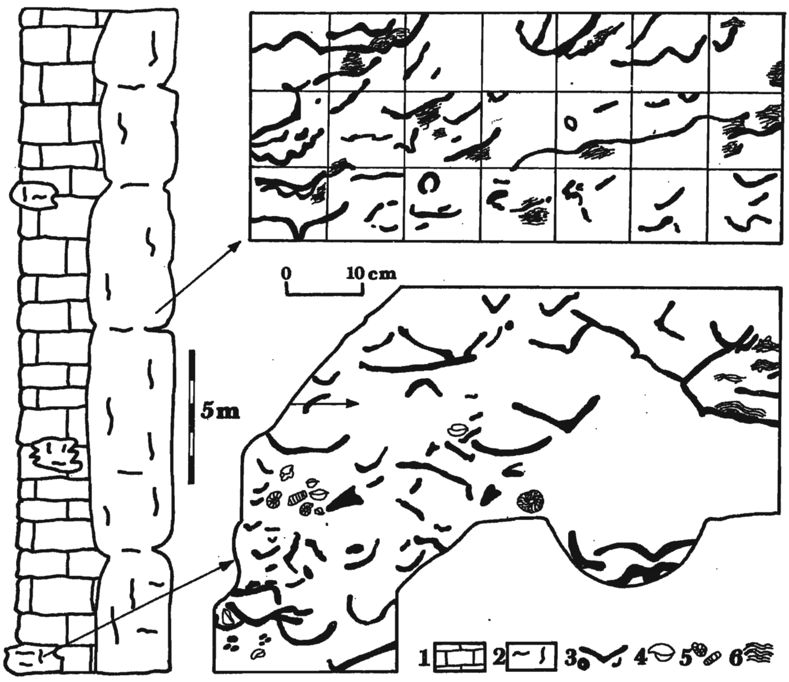



Fig. 8. Lithology and fauna of the strata exposed at Prędziszów
*1* platy limestones, *2* massive limestones, *3* sponges, *4* brachiopods, *5* ammonites, *6* stromatolites

deep-water environments (NEUMANN, KOFOED & KELLER, 1977). Thus, the sponge-algal "rigid" biohermal structures represent diagenetic bioherms.

"Rigid" bioherms clearly differed from their surroundings in substrate nature and fauna. At Niegowonice, where a contact between massive and platy limestones is clearly visible (Text-fig. 7), the former rocks contain, besides sponges, brachiopods and small ammonites, whereas the latter yield large-sized ammonites. Moreover, the massive limestones bear internal sediments and pores, whereas burrows occurring in the platy limestones are indicative of a soft substrate.

In the Polish Jura, "rigid" bioherms range from the Plicatilis Zone until the end of the Oxfordian (Text-figs 2—3). In the Plicatilis to the Bifurcatus Zones, these are small- and medium-sized structures (Text-figs 7—8); from the Bimammatum Zone upwards, however, massive limestones form large biohermal complexes (Text-fig. 9) extending over several tens of kilometers (*see* Text-fig. 2).

#### Chalky limestones

Chalky limestones also form (Text-fig. 2) large biohermal complexes, which contain abundant and diverse fauna associated with sponges (WIERZBOWSKI 1978; WIERZBOWSKI, MATYJA & ŚLUSARCZYK-RADWAN 1983). In contrast to massive limestones, however, they are soft, microporous, and rich in cherts.

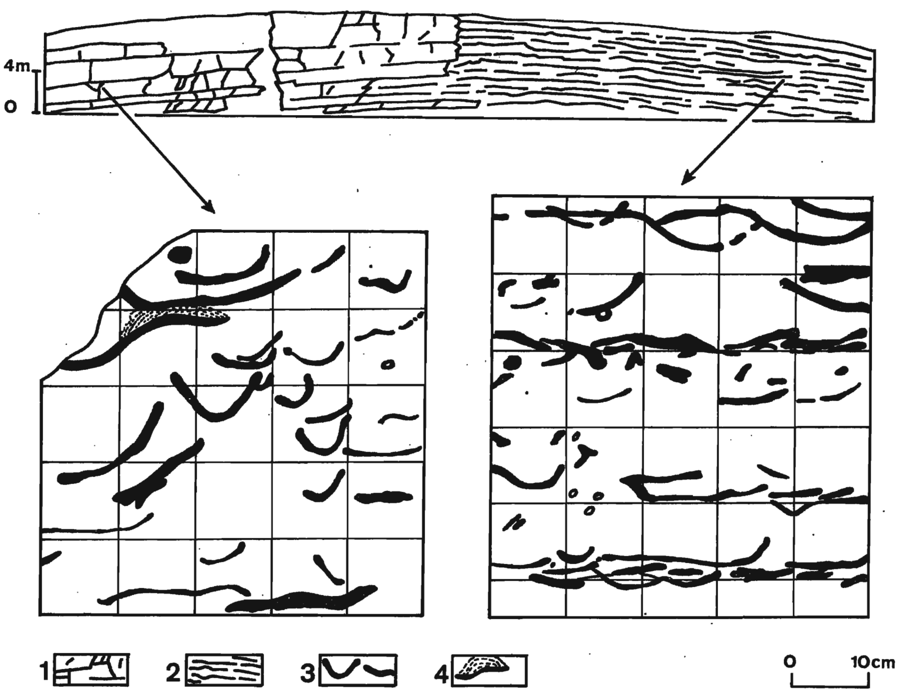



Fig. 9. Lithology and fauna of the strata exposed at Kielniki
*1* massive limestones with uniformly distributed sponges, *2* massive limestones with sponges enplaced horizontally, *3* sponges, *4* stromatolites

Since diagenesis of chalky limestones has thus far remained largely unknown and no clearcut evidence has been found for early diagensis of these rocks, the biohermal complexes formed by chalky limestones are tentatively kept apart from, both "loose" and "rigid" bioherms.

## BATHYMETRY OF THE SPONGE MEGAFACIES

Except for some clearly shallow-water rocks of the Oxfordian/Kimmeridgian transition, the Oxfordian sponge-bearing rocks of the Polish Jura are considered to have originated in outer-shelf environments (KUTEK, MATYJA & WIERZBOWSKI 1984, Fig. 1), generally below the storm wave base. This is suggested by the absence of sedimentary structures indicative of wave action and by the fauna typical of deeper-shelf habitats. There are no corals; gastropods and calcareous sponges (Text-figs 10 and 12) are very rare; the ammonite assemblage is dominated by the Perisphinctacea and Haploceratacea (KUTEK, MATYJA & WIERZBOWSKI 1984, Fig. 2), which according to ZIEGLER (1967) is suggestive of water depth of some 100–200 meters. Moreover, the striking long-term stability of the Polish Oxfordian sponge assemblage (Text-fig. 13) could only develop in a rather deep-water environment.

Shallow-water rocks appear only at the Oxfordian/Kimmeridgian transition and in the Lower Kimmeridgian (WIERZBOWSKI, MATYJA & ŚLUSARCZYK-RADWAN 1983). Among the rocks considered in the present study, it is only the coral-bearing crinoid limestones from Dobrogoszczyce (Text-figs 1–3) that belong to shallow-water facies. BRUNSZ (1987) found there an abundant and diverse coral assemblage (15 genera), with colonies ranging up to 15 cm in diameter; in addition, these limestones contain also abundant crinoids, gastropods, and *Solenopora*-type algae. The sponge assemblage is dominated by Calcispongea (Text-figs 10 and 12).

Depositional depth similar to the figures given above for the Oxfordian sponge-bearing rocks of the Polish Jura has also been generally accepted for the Oxfordian to Kimmeridgian sponge facies of Swabia and Franconia (WAGENPLAST 1972, GWINNER 1976, ZIEGLER 1977, GYGI & PERSOZ 1987, and others). For example, ZIEGLER (1977, p. 46) writes that, "the depth of the sea appears to have never been less than about 70 to 100 m even on the summits of the bioherms". Rich coral assemblages and other shallow-water fossils (*i.a.*, large numbers of calcisponges – MÜLLER 1984) appear in Germany only in the Upper Kimmeridgian and Tithonian.

In Switzerland, where paleoslope could be recognized within Upper Jurassic strata (BOLLIGER & BURI 1970, GYGI & PERSOZ 1986), the deeper-water, basinal sponge facies ("Argovian") is distinguished from the shallow-water, platform coral facies ("Rauracian"). The former bears primarily siliceous sponges, while calcisponges occur abundantly in the latter where they accompany corals and other shallow-water fossils (OPPLIGER 1929).

SCHORR & KOCH (1985), WIRSING & KOCH (1986), BRACHERT (1986), and especially KOCH & SCHORR (1986) propose, after a petrologic analysis of carbonate cements, that some Kimmeridgian bioherms in Germany developed in extremely shallow marine environments, sometimes under the conditions of repeated intermittent subaerial exposure. KOCH & SCHORR (1986) and BRACHERT (1986) extrapolate then this conclusion over the entire sponge facies in the Upper Jurassic of Germany. The problem certainly calls for further studies, as this conclusion based on cement analysis runs counter to the conclusions derived from analysis of sedimentary structures and fossil assemblages (ZIEGLER 1977, GYGI & PERSOZ 1987). It should also be noted that some cements presented, for instance, by WIRSING & KOCH (1986) warrant also a different interpretation than given by these authors.

## GENERAL CHARACTERISTICS OF THE SPONGE ASSEMBLAGE

Totally, 1235 sponge specimens have been collected in the investigated localities (Text-figs 1–3). Out of this number, 1133 specimens (91%) have been identified to the species level, and thus 68 species have been recognized (Text-fig. 10). The majority of these species belong to the class Hyalospongea (47 spp.), 16 species to the class Demospongea (primarily Lithistida), 4 to the Calcispongea, and 1 to the Sclerospongea. As many as 102 poorly preserved sponge specimens could not be precisely identified and are here assigned to the ordinal or subordinal rank (e.g., Dictyida gen. et sp. indet.; *see* Text-fig. 10).

No more than 11 species can be regarded as common in the analyzed sponge assemblage. They account jointly for 74% of the total number of specimens and represent the genera *Platychonia, Cnemidiastrum, Hyalotragos, Cylindrophyma, Craticularia, Tremadictyon, Xenoschrammenum, Ordinatus*, and *Cypellia* (Text-fig. 10).

# SYSTEMATIC ACCOUNT

## Class **Demospongea** SOLLAS, 1875

### Order **Choristida** SOLLAS, 1888

### Genus *Ophiodesia* SCHRAMMEN, 1937

### *Ophiodesia* sp.

MATERIAL: One fragment.

DESCRIPTION: Specimen in the form of a bended plate, 5–7 mm in thickness, with small pores (0.5 mm in diameter) at a distance of 2–3 mm from one another. The pores arranged in indistinct rowes. The nature of canal system cannot be recognized. Spicules are typical ophirhabds *sensu* SCHRAMMEN (1937).

REMARKS: The specimen resembles *Ophiodesia solivaga* SCHRAMMEN, 1937, but the poor preservation state of both the Polish and SCHRAMMEN's specimens makes a more detailed comparison impossible.

OCCURRENCE: Chalky limestones (Planula Zone) — locality Niwiska.

| LOCALITY | PRĘDZISZÓW | | MIRÓW | WYSOKA | NIEGOWONICE | TRZEBINIA | | ZAWODZIE | | | DYMNIK | BIRÓW | KIELNIKI | PODZAMCZE | LISOWICE | RACISZYN | ZALESIAKI | NIWISKA | DOBROGOSZCZYCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ZONE or SUBZONE | TENUI. | ANT. | ANT. | ANT. | TRANS. | TRANS. | BIF. | ANT. | TRANS. | BIF. | BIF. or HYP. | HYP. | HYP. | HYP. | BIM. or PLAN. | PLAN. | PLAN. | PLAN. | PLAN. or PLAT. |
| DEMOSPONGEA /total/ | 93 | 18 | 11 | 94 | 56 | 148 | 8 | 12 | 6 | 12 | 23 | 9 | 14 | 31 | 20 | 23 | 33 | 10 | |
| CHORISTIDA | | | | | | | | | | | | | | | | | | | |
| *Ophiodesia* sp. | | | | | | | | | | | | | | | | | | 1 | |
| LITHISTIDA | | | | | | | | | | | | | | | | | | | |
| R H I Z O M O R I N A | | | | | | | | | | | | | | | | | | | |
| *Platychonia schlotheimi* | 58 | 12 | 7 | 41 | 34 | 35 | 3 | 9 | 6 | 10 | 7 | 7 | 2 | 14 | 7 | 11 | 18 | 4 | |
| *Cnemidiastrum stellatum* | 6 | 3 | | 1 | | 9 | 2 | | | | | | | 1 | | 1 | 2 | 1 | |
| *C. rimulosum* | 11 | | | 37 | 6 | 25 | | | | | 3 | | 1 | 1 | | | 1 | 1 | |
| *Hyalotragos patella* | 3 | 1 | 1 | 5 | 4 | 11 | | 1 | | | 6 | 6 | 4 | 4 | 6 | 2 | 3 | 1 | |
| *H. pezizoides* | 3 | 1 | 2 | 7 | 6 | 49 | 2 | 2 | | 1 | 6 | 5 | 4 | 4 | 2 | 7 | 3 | | |
| *H. radiatum* | 2 | | | | | 2 | | | | | 1 | 1 | 1 | 1 | | | | | |
| *Jereica* sp. | | | | | 2 | | | | | | | | | | | | | | |
| *Leiodorella tubata* | | | | | | | | | | | | | 1 | | | | | | |
| *L.* sp. | | 1 | | 1 | | | | | | | | | | | | | | 1 | |
| *Hyalospongia rugosa* | | | | | | | | | | | | | | | | 1 | | | |
| *Bothrolemma osculifera* | | | | | 1 | | | | | 1 | | | | | | | | | |
| *Reiswigia ramosa* | 10 | | | | | | | | | | | | | | | | | | |
| Rhizomorina gen. et sp. indet. | | | | | 2 | | | | | | | | | | | | 6 | | |
| A N O M O C L A D I N A | | | | | | | | | | | | | | | | | | | |
| *Cylindrophyma milleporata* | | | 1 | 2 | 1 | 16 | 1 | | | | | | 1 | 6 | 4 | 1 | | 1 | |
| *Melonella radiata* | | | | | | | | | | | | | | | 1 | | | | |
| *Lecanella* sp. | | | | | | 1 | | | | | | | | | | | | | |
| HYALOSPONGEA /total/ | 10 | 11 | 18 | 20 | 41 | 73 | 4 | 3 | 11 | 7 | 21 | 13 | 99 | 34 | 44 | 50 | 58 | 41 | 2 |
| LYSSAKIDA | | | | | | | | | | | | | | | | | | | |
| *Stauractinella jurassica* | | | | | | 1 | | | | 2 | | | | | | | | 2 | |
| DICTYIDA | | | | | | | | | | | | | | | | | | | |
| *Craticularia paralella* | 4 | 1 | | | 9 | 16 | | | | | 3 | 1 | 9 | | | 6 | 2 | 5 | |
| *C. paradoxa* | | 1 | | | 5 | 4 | | | | | | | | | | | 1 | 1 | |
| *C. clathrata* | | | | | | | | | | | 1 | 1 | 3 | 1 | | | | | |
| *Paracraticularia tubifera* | | | | | | | | | | | | | | | 1 | | | | |
| *P. procumbens* | | | | | | | | | | | | | 3 | | | | | | |
| *Thyroidium schweiggeri* | | | | | | | | | | | | | 3 | 1 | | 1 | | 1 | |
| *T. lineatum* | | | | | | 1 | | | | | | | 7 | 2 | | 2 | | | |
| *Pycnocalyptra* aff. *calyx* | | | | 1 | | | | | | | | | | | | | | | |
| *Pachyascus punctatus* | | | | | | 1 | | | | | | | | | | | | | |
| *Psephosyllogus* sp. | | | | | | | | | | | | | | | 1 | | | | |
| *Tremadictyon reticulatum* | 1 | 2 | 2 | | 2 | 12 | 1 | | | | 9 | | 45 | 19 | 7 | 6 | 13 | 4 | 1 |
| *T. radiatum* | | | 3 | 4 | 4 | | | | | | | | | | | | | | |
| *T. rugatum* | | | | | | | | | | | | | | | 4 | 1 | 2 | 2 | |
| *T.* sp. | | | 4 | 3 | | | | 2 | 1 | 1 | | 2 | | | | | | | |
| *Stauroderma lochense* | | | | | 1 | | | | | | 1 | | 2 | 1 | 1 | 3 | | 1 | |
| *Xenoschrammenum alternans* | | | | | | 1 | | | | | | 3 | 6 | 2 | | 1 | 15 | 4 | |
| *X. punctatum* | | | 1 | | | 1 | | | 1 | | | | 2 | | | | 3 | | |
| *Walcotella pertusa* | 1 | | | 1 | | 5 | | | | | 1 | 1 | 3 | | | | | | |
| *Ordinatus texturatus* | 1 | 3 | 2 | | 7 | 7 | | 1 | | | | | 2 | 7 | 3 | 2 | 6 | | |
| *Erineum minutum* | | | | | | 1 | | | | | | | | | | | | | |
| *Feifelia favositides* | | | | | | 1 | | | | | | | | | | | | | |
| *Casearia* sp. | | | | | | 1 | | | | | | | | | | | | | |
| *Porospongia marginata* | | | | | | | | | | | 1 | | | | 4 | | | | |
| *Multiloqua fungiformis* | | | | | | | 1 | | | | | | | | | | | | |
| *Linonema calyx* | | | | | | | | | | | | | | | | 1 | | | |
| *Ramispongia ramosa* | | | | 1 | | | | | | | | 1 | 1 | | 1 | 1 | | 1 | |
| *Verrucocoelia gregaria* | | | | | | | | | 1 | | | | | | | 3 | | | |
| *Dactylocalyx* sp. | 1 | | | | | | | | | | | | | | | | | | |
| *Polygonatium sphaeroides* | | | | | | 2 | | | | | | | | | | | | | |
| *Polygonatium* sp. | | | | | | 1 | | | | | | | | | | | | | |
| Dictyida gen. et sp. indet. | | | 6 | 2 | 6 | 3 | 2 | | 7 | 3 | | 1 | | | 10 | 6 | 11 | 10 | 1 |
| LYCHNISKIDA | | | | | | | | | | | | | | | | | | | |
| *Cypellia rugosa* | 2 | 1 | | 5 | 3 | 14 | | | 2 | 1 | 5 | 3 | 5 | | 8 | 11 | 2 | 6 | |
| *C. inberbis* | | | | | | | | | | | | | | | 1 | | | | |
| *C. trabeculata* | | | | | | | | | | | | | | | 1 | 1 | 1 | | |
| *Paracypellia prolifera* | | 1 | | | 2 | | | | 1 | | | | 1 | | | | | 1 | |
| *Placotelia marcoui* | | 1 | | | | | | | | | | | | | 1 | | | | |
| *P. rugatum* | | | | | 1 | | | | | | | | | | | | | | |
| *P.* sp. | | | | | | | | | | | | | | | | | | 2 | |
| *Sporadopyge speciosa* | | | | | | | | | | | | | | | 1 | | | | |
| *Coscinaulus* aff. *micropora* | | | | 1 | | | | | | | | | | | | | | | |
| *Sporadopyle obliqua* | | 1 | | | | | | | | | | | 1 | | | 1 | | | |
| *Pachyteichisma lamellosa* | | | | | | | | | | | | | 4 | | | | 1 | | |
| *P. gresslyi* | | | | | | | | | | | | | 1 | | | | | | |
| *Trochobolus dentatus* | | | | | | | | | | | | | 1 | | | | | | |
| *T. texatus* | | | | | 1 | 1 | | | | | | | | | | | | | |
| *Pachyrhachis* sp. | | | | | | | | | | | | | | 1 | | | | | |
| Lychniskida gen. et sp. indet. | | | | 2 | | | | | | | | | | | | 4 | 1 | | |
| DEMOSPONGEA or HYALOSPONGEA Gen. et sp. indet. | | | | | | | | | | | | | 1 | | | | | | |
| CALCISPONGEA /total/ | | | | | | | | | | | | | | | 3 | 3 | | | 22 |
| PHARETRONIDA | | | | | | | | | | | | | | | | | | | |
| *Blastinia costata* | | | | | | | | | | | | | | | 1 | | | | |
| *Corynella quenstedti* | | | | | | | | | | | | | | | 1 | | | | |
| *Peronidella cylindrica* | | | | | | | | | | | | | | | 1 | 1 | | 1 | 4 |
| *Radicispongia radiciformis* | | | | | | | | | | | | | | | | 1 | | | |
| Pharetronida gen. et sp. indet. | | | | | | | | | | | | | | | | 1 | | | 18 |
| SCLEROSPONGEA /total/ | | | | | | | | | | | | | | | 1 | 2 | 9 | | |
| *Neuropora* sp. | | | | | | | | | | | | | | | 1 | 2 | 9 | | |
| Total sponges | 103 | 29 | 29 | 114 | 97 | 221 | 12 | 15 | 19 | 19 | 44 | 32 | 114 | 65 | 68 | 78 | 100 | 52 | 24 |

Fig. 10. Distribution and frequency of sponges in the investigated sections (*cf.* Text-figs 1–3)

## Order **Lithistida** SCHMIDT, 1870
## Suborder **Rhizomorina** ZITTEL, 1878
## Genus *Platychonia* ZITTEL, 1878
## *Platychonia schlotheimi* (MÜNSTER *in* GOLDFUSS, 1833)

1972. *Platychonia auriformis* (QUENSTEDT, 1878); C. GAILLARD, p. 132, Pl. 3, Fig. 9.
1972. *Platychonia argoviana* OPPLIGER, 1915; C. GAILLARD, p. 132, Pl. 3, Fig. 8.
1982. *Platychonia schlotheimi* (MÜNSTER *in* GOLDFUSS, 1833); J. TRAMMER, p. 23, Pl. 6, Figs 1–2 and Pl. 7, Figs 1–6 (*cum syn.*).

MATERIAL: 285 specimens.

REMARKS: *See* TRAMMER (1982).

OCCURRENCE: Jasna Góra Beds (Cordatum and Plicatilis Zones) (TRAMMER 1982); massive limestones (Plicatilis to Planula Zones) — localities Prędziszów, Mirów, Niegowonice, Trzebinia, Kielniki, Podzamcze, Zalesiaki; sponge crumples limestones (Antecedens Subzone) — Wysoka; sponge marly limestones (Transversarium Zone) — Trzebinia; platy limestones (Plicatilis to Bimammatum Zones) — Zawodzie, Dymnik, Birów; chalky limestones (Bimammatum to Planula Zones) — Lisowice, Raciszyn, Niwiska. Middle Oxfordian to Tithonian of Germany (SCHRAMMEN 1937); Middle Oxfordian to Kimmeridgian of the Swiss and French Jura (OPPLIGER 1926).

## Genus *Cnemidiastrum* ZITTEL, 1878
## *Cnemidiastrum stellatum* (GOLDFUSS, 1833)

1928. *Cnemidiastrum stellatum* GOLDF. sp.; L. MORET, p. 133, Pl. 8, Figs 5–6.
1982. *Cnemidiastrum stellatum* (GOLDFUSS, 1833); J. TRAMMER, p. 18, Pl. 3 and Pl. 5, Fig. 4 (*cum syn.*).
1987. *Cnemidiastrum stellatum* (GOLDFUSS); W. MÜLLER, p. 14, Pl. 4, Figs 1–3 and Pl. 8, Fig. 1.
1987. *Cnemidiastrum hoheneggeri* ZITTEL; W. MÜLLER, p. 16, Pl. 4, Fig. 4.
1987. *Cnemidiastrum stellatum* (GOLDF.); R. MEYER, W. MÜLLER & L. ÜBELACKER, p. 69, Pl. 2, Fig. 4.
1987. *Cnemidiastrum hoheneggeri* ZITTEL; R. MEYER, W. MÜLLER & L. ÜBELACKER, p. 69, Pl. 3, Figs 6–7.

MATERIAL: 26 specimens.

REMARKS: It is to disagree with MÜLLER's (1987) opinion that *C. hoheneggeri* ZITTEL is a distinct species, rather than a junior synonym of *C. stellatum* as argued formerly (TRAMMER 1982), for there are specimens that show diagnostic features of *C. stellatum* in one part of the skeleton and features of "*C. hoheneggeri*" in another one (TRAMMER 1982, Pl. 3, Fig. 12). Biometric investigations performed by MÜLLER (1987, Text-fig. 7) on *C. stellatum* and *C. goldfussi* (QUENSTEDT) suggest these two forms represent two distinct species in the Kimmeridgian of Germany. In the Oxfordian of the Polish Jura, however, the morphotype *C. goldfussi* sensu MÜLLER (1987) occurs, albeit rarely, alongside the morphotype *C. stellatum* sensu MÜLLER (1987) and biometrical analysis shows they are linked by a continuous morphological intergradation. There is thus no reason to distinguish them as true species in the Oxfordian of Poland.

OCCURRENCE: Jasna Góra Beds (Cordatum and Plicatilis Zones) (TRAMMER 1982); massive limestones (Plicatilis to Planula Zones) — localities Prędziszów, Trzebinia, Podzamcze, Zalesiaki; sponge crumpled limestones (Antecedens Subzone) — Wysoka; sponge marly limestones (Transversarium Zone) — Trzebinia; chalky limestones (Planula Zone) — Raciszyn and Niwiska. Oxfordian to Tithonian of Swabia and Franconia (SCHRAMMEN 1937; MEYER, MÜLLER & ÜBELACKER 1987); Middle Oxfordian to Kimmeridgian of the Swiss Jura (OPPLIGER 1926); Callovian to Tithonian of France (MORET 1928, LAGNEAU-HERENGER 1951); Middle Oxfordian of Dobruja (BARBULESCU 1974).

## *Cnemidiastrum rimulosum* (GOLDFUSS, 1833)

1982. *Cnemidiastrum rimulosum* (GOLDFUSS, 1833); J. TRAMMER, p. 21, Pl. 4, Figs 1–5 and Pl. 5, Figs 1–3 (*cum syn.*).
1987. *Cnemidiastrum rimulosum* (GOLDFUSS); W. MÜLLER, p. 7, Pl. 1 Figs 1–5; Pl. 8, Fig. 4 and Pl. 10, Fig. 3.

MATERIAL: 86 specimens.

OCCURRENCE: Jasna Góra Beds (Cordatum and Plicatilis Zones) (TRAMMER 1982); massive limestones (Tenuicostatum Subzone, Transversarium Zone, and Bimammatum to Planulaa Zones) – localities Prędziszów, Kielniki, Niegowonice, Podzamcze, Zalesiaki; sponge crumpled limestones (Antecedens Subzone) – Wysoka; sponge marly limestones (Transversarium Zone) – Trzebinia; platy limestones (Bifurcatus or Bimammatum Zone) – Dymnik; chalky limestones (Planula Zone) – Niwiska. Oxfordian to Kimmeridgian of the Swiss Jura, Swabia, Franconia, and France (OPPLIGER 1926, SCHRAMMEN 1937, LAGNEAU-HERENGER 1951); perhaps also Middle Oxfordian of Spain (BEHMEL 1970).

## Genus *Hyalotragos* ZITTEL, 1878
## *Hyalotragos patella* (GOLDFUSS, 1833)

1929. *Hyalotragos patella* (GOLDF.); C. S. ANTONESCU, p. 4
1982. *Hyalotragos patella* (GOLDFUSS, 1833); J. TRAMMER, p. 24, Pl. 8, Figs 11–13 and Pl. 9, Fig 5 (*cum syn.*).
1988. *Hyalotragos patella* (GOLDFUSS); W. MÜLER, p. 4, Pl. 1, Fig. 2; Pl. 2, Fig. 4; Pl. 4, Figs 3–5; Pl. 5, Figs 1–2 and Text – figs 1–3 and 5.
1988. *Hyalotragos patelloides* SIEMIRADZKI; W. MÜLLER, p. 7, Pl. 1, Fig. 1 and Text-figs 2–3 and 5.

MATERIAL: 54 specimens.

REMARKS: Contrary to MÜLLER's (1988) opinion, *H. patelloides* SIEMIRADZKI seems to be a junior synonym of *H. patella*, rather than a distinct species, for the two morphotypes are linked by a continuous morphological intergradation.

OCCURRENCE: Jasna Góra Beds (Cordatum and Plicatilis Zones) (TRAMMER 1982); massive limestones (Plicatilis to Planula Zones) – localities Prędziszów, Mirów, Niegowonice, Kielniki, Podzamcze, Zalesiaki; sponge crumpled limestones (Antecedens Subzone) – Wysoka; sponge marly limestones (Transversarium Zone) – Trzebinia; platy limestones (Antecedens and Hypselum Subzones) – Zawodzie, Dymnik, Birów; chalky limestones (Bimammatum to Planula Zones) – Lisowice, Raciszyn, Niwiska. Middle Oxfordian and Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937) and the Swiss Jura (OPPLIGER 1926); Oxfordian of Dobruja (ANTONESCU 1929).

## *Hyalotragos pezizoides* (GOLDFUSS, 1833)

1929. *Hyalotragos pezizoides* (GOLDF.); C. S. ANTONESCU, p. 4.
1982. *Hyalotragos pezizoides* (GOLDFUSS, 1833); J. TRAMMER, p. 24, Pl. 8, Figs 11–13 and Pl. 9, Fig. 5 (*cum syn.*).
1988. *Hyalotragos pezizoides* (GOLDFUSS); W. MÜLLER, p. 7, Pl. 2, Figs 2–3 and 6; Pl. 3, Fig. 6; and Text-figs 2–3 and 5.

MATERIAL: 104 specimens.

OCCURRENCE: Jasna Góra Beds (Cordatum and Plicatilis Zones) (TRAMMER 1982); massive limestones (Plicatilis to Planula Zones) – localities Prędziszów, Mirów, Niegowonice, Kielniki, Trzebinia, Podzamcze, Zalesiaki; sponge crumpled limestones (Antecedens Subzone) – Wysoka; sponge marly limestones (Transversarium Zone) – Trzebinia; platy limestones (Antecedens to Hypselum Subzones) – Zawodzie, Dymnik, Birków; chalky limestones (Bimammatum to Planula Zones) – Lisowice, Raciszyn. Middle Oxfordian to Tithonian of Swabia and Franconia (SCHRAMMEN 1937; MEYER, MÜLLER & ÜBELACKER 1987); Oxfordian to Kimmeridgian of the Swiss Jura (OPPLIGER 1926); Middle Oxfordian of Dobruja (BARBULESCU 1974).

## *Hyalotragos radiatum* (MÜNSTER *in* GOLDFUSS, 1833) (PL. 7, Fig. 2)

1988. *Hyalotragos radiatum* (MÜNSTER *in* GOLDFUSS); W. MÜLLER, p. 9, Pl. 1, Figs 3, 5 and Pl. 22, Fig. 5 (*cum syn.*).

MATERIAL: 8 specimens.

OCCURRENCE: Massive limestones (Tenuicostatum and Hypselum Subzones) — localities Prędziszów, Kielniki, Podzamcze; sponge marly limestones (Transversarium Zone) — Trzebinia; platy limestones (Hypselum Subzone) — Dymnik and Birów. Kimmeridgian of Swabia (KOLB 1910); Middle Oxfordian of the Swiss Jura (OPPLIGER 1915).

## Genus *Jereica* ZITTEL, 1878
## *Jereica* sp.

1982. *Jereica* sp.; J. TRAMMER, p. 22, Pl. 6, Fig. 3 and Pl. 7, Figs 7—9.

MATERIAL: Two specimens.

OCCURRENCE: Jasna Góra Beds (Cordatum and Plicatilis Zones) (TRAMMER 1982); massive limestones (Transversarium Zone) — locality Niegowonice.

## Genus *Leiodorella* ZITTEL, 1878
## *Leiodorella tubata* (QUENSTEDT, 1878)

1878. *Tragos tubatum*; F. A. QUENSTEDT, p. 295, Pl. 129, Fig. 19.
1910. *Leiodorella tubata* QUENST. sp.; R. KOLB, p. 235.
1926. *Leiodorella tubata* QU. sp.; F. OPPLIGER, p. 60.
1937. *Leiodorella tubata* QUENST. sp.; A. SCHRAMMEN, p. 100, Pl. 22, Fig. 1.

MATERIAL: One specimen.

REMARKS: The specimen resembles those presented by QUENSTEDT (1878) but its oscula are a bit larger (some 3 mm in diameter) and the crater-like rises at which the oscula are located are a bit higher (3—4 mm).

OCCURRENCE: Massive limestones (Hypselum Subzone) — locality Kielniki. Upper Kimmeridgian of Swabia (SCHRAMMEN 1937); Kimmeridgian of the Swiss Jura (OPPLIGER 1926).

## *Leiodorella* sp.

MATERIAL: Three fragments.

REMARKS: These are only small pieces but they show the features diagnostic of the genus, that is, both their surfaces bear a smooth cortex and numerous small oscula located each at a crater-like rise.

OCCURRENCE: Massive limestones (Antecedens Subzone) — locality Prędziszów; sponge crumpled limestones (Antecedens Subzone) — Wysoka; chalky limestones (Planula Zone) — Niwiska.

## Genus *Hyalospongia* SIEMIRADZKI, 1913
## *Hyalospongia rugosa* (MÜNSTER *in* GOLDFUSS, 1833)

1982. *Hyalospongia rugosa* (MÜNSTER *in* GOLDFUSS, 1833); J. TRAMMER, p. 26, Pl. 10, Fig. 3 (*cum syn.*).
1988. *Hyalotragos rugosus* (MÜNSTER *in* GOLDFUSS); W. MÜLLER, p. 10, P. 2, Fig. 1.

MATERIAL: One specimen.

REMARKS: Contrary to MÜLLER (1988), this species is assigned to the genus *Hyalospongia* SIEMIRADZKI, because the species *rugosa* shows at its upper surface oscula located each at a rise delimited by a sharp edge, which feature does not occur in the genus *Hyalotragos.*

OCCURRENCE: Jasna Góra Beds (Cordatum or Plicatilis Zone) (TRAMMER 1982); chalky limestones (Planula Zone) – locality Raciszyn. Middle Oxfordian and Kimmeridgian of the Swiss Jura (OPPLIGER 1926); Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937).

## Genus *Bothrolemma* SCHRAMMEN, 1937
## *Bothrolemma osculifera* (KOLB, 1910)
## (Pl. 7, Fig. 1)

1910. (?) *Platychonia osculifera* n. sp.; R. KOLB, p. 240, Pl. 16, Figs 14–18 and Pl. 20, Fig. 24.
1937. *Bothrolemma osculifera* KOLB sp.; A. SCHRAMMEN, p. 99, Pl. 22, Figs 12–13.

MATERIAL: Two specimens.

REMARKS: According to SCHRAMMEN (1937), this species includes three morphotypes: flat, encrusting, and clod-like. Both the Polish specimens represent the latter variety.

OCCURRENCE: Massive limestones (Transversarium Zone) – locality Niegowonice; platy limestones (Bifurcatus Zone) – Zawodzie. Upper Kimmeridgian to Tithonian of Swabia (SCHRAMMEN 1937).

## Genus *Reiswigia* TRAMMER, 1979
## *Reiswigia ramosa* TRAMMER, 1979

1979. *Reiswigia ramosa* sp. n.; J. TRAMMER, p. 41, Pls 1–3 and Text-fig. 2.
1982. *Reiswigia ramosa* TRAMMER, 1979; J. TRAMMER, p. 27.

MATERIAL: 10 fragments.

OCCURRENCE: Jasna Góra Beds (Cordatum Zone and Tenuicostatum Subzone) (TRAMMER 1982); massive limestones (Tenuicostatum Subzone) – locality Prędziszów.

## Rhizomorina, gen. et sp. indet.

MATERIAL: 8 fragments.

REMARKS: These specimens are very poorly preserved, but their spicules of rhizoclone type allow for identification to the subordinal rank.

OCCURRENCE: *See* Text-fig. 10.

## Suborder **Anomocladina** ZITTEL, 1878
## Genus *Cylindrophyma* ZITTEL, 1878
## *Cylindrophyma milleporata* (GOLDFUSS, 1833)

1929. *Cylindrophyma milleporata* (GOLDF.); C. S. ANTONESCU, p. 3.
1982. *Cylindrophyma milleporata* (GOLDFUSS, 1833); J. TRAMMER, p. 27, Pl. 10, Figs 4–5 (*cum syn.*).

MATERIAL: 34 specimens.

OCCURRENCE: Jasna Góra Beds (Cordatum and Plicatilis Zones) (TRAMMER 1982); massive limestones (Antecedens Subzone to Bimammatum Zone) — localities Mirów, Niegowonice, Trzebinia, Kielniki, Podzamcze; sponge crumpled limestones (Antecedens Subzone) — Wysoka; sponge marly limestones (Transversarium Zone) — Trzebinia; chalky limestones (Bimammatum to Planula Zones) — Lisowice and Niwiska. Middle Oxfordian to Tithonian of Swabia and Franconia (SCHRAMMEN 1937); Middle Oxfordian to Kimmeridgian of the Swiss Jura (OPPLIGER 1926); Middle Oxfordian of Dobruja (ANTONESCU 1929).

## Genus *Melonella* ZITTEL, 1878
## *Melonella radiata* (QUENSTEDT, 1878)

1926. *Melonella radiata* QU. sp.; F. OPPLIGER, p. 44 (*cum syn.*).
1937. *Melonella radiata* QUENST. sp.; A. SCHRAMMEN, p. 104.

MATERIAL: One specimen.

OCCURRENCE: Middle Oxfordian of the Polish Jura (SIEMIRĄDZKI 1913). Chalky limestones (Bimammatum or Planula Zone) — locality Lisowice. Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937); Oxfordian to Kimmeridgian of the Swiss Jura (OPPLIGER 1926).

## Genus *Lecanella* ZITTEL, 1878
## *Lecanella* sp.
## (Pl. 7, Fig. 5)

MATERIAL: One fragment with well preserved desmas.

REMARKS: The specimen has large spicules of anomoclone sensu SCHRAMMEN (1937) type. These spicules are indicative of the genera *Lecanella* and *Sphaeropegma* SCHRAMMEN, 1937. Individuals of the latter genus are spheroidal in shape, whereas individuals of *Lecanella* are flat or bowl-like. Since the considered specimen is flat, it is here attributed to *Lecanella*. Only one species of this genus has thus far been described, *L. pateraeformis* ZITTEL, 1878. Unfortunately, the poor preservation state of the Polish specimen makes its comparison to *L. pateraeformis* impossible.

OCCURRENCE. Sponge marly limestones (Transversarium Zone) — locality Trzebinia.

# Class **Hyalospongea** VOSMAER, 1886
## Order **Lyssakida** ZITTEL, 1877
## Genus *Stauractinella* ZITTEL, 1877
### *Stauractinella jurassica* ZITTEL, 1877
### (Pl. 7, Fig. 4)

1877. *Stauractinella jurassica* ZITT.; K. A. ZITTEL, p. 60.
1878. *Baccispongia anaglyptica*; F. A. QUENSTEDT, p. 315, Pl. 130, Fig. 17.
1878. *Baccispongia cidariformis*; F. A. QUENSTEDT, p. 316, Pl. 130, Fig. 18.
1910. *Stauractinella jurassica* ZITTEL; R. KOLB, p. 153, Pl. 11, Figs 1–2.
1937. *Stauractinella jurassica* ZITTEL; A. SCHRAMMEN, p. 2.
1972. *Baccispongia cidariformis* QUENSTEDT, 1878; C. GAILLARD, p. 132, Pl. 3, Figs 1–4.
1983. *Baccispongia cidariformis* QUENSTEDT, 1878; C. GAILLARD, p. 194, Pl. 9, Fig. 4.

MATERIAL: 5 specimens.

OCCURRENCE: Sponge marly limestones (Transversarium Zone) — locality Trzebinia; platy limestones (Bifurcatus Zone) — Zawodzie; chalky limestones (Planula Zone) — Niwiska. Oxfordian to Lower Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937); Upper Oxfordian of France (GAILLARD 1972).

## Order **Dictyida** ZITTEL, 1877
## Genus *Craticularia* ZITTEL, 1877; *emend.* SCHRAMMEN, 1937
### *Craticularia parallela* (GOLDFUSS, 1833)
### (Pl. 8, Fig. 3 and Pl. 9, Fig. 6)

1833. *Scyphia parallela* nobis; A. GOLDFUSS, p. 8, Pl. 3, Fig. 3.
1878. *Textispongia introtexta*; F. A. QUENSTEDT, p. 58, Pl. 116, Fig. 15.
1878. *Spongites clavitextus*; F. A. QUENSTEDT, p. 59, Pl. 116, Fig. 19.
1878. *Textispongia coarctata*; F. A. QUENSTEDT, p. 60, Pl. 116, Fig. 20.
1897. *Craticularia parallela* GOLDF. sp.; F. OPPLIGER, p. 22.
1910. *Craticularia parallela* GOLDF. sp.; R. KOLB, p. 159.
1913. *Craticularia parallela* GF.; J. SIEMIRADZKI, p. 20, Pl. 7, Fig. 89.
1915. *Craticularia parallela* GOLDF. sp.; F. OPPLIGER, p. 11.
1915. *Craticularia Rollieri* spez. nov.; F. OPPLIGER, p. 14, Pl. 1, Fig. 3.
1915. *Craticularia cuspidata* spez. nov.; F. OPPLIGER, p. 14, Pl. 1, Fig. 4.
1926. *Craticularia parallela* GOLDF. sp.; F. OPPLIGER, p. 6.
1928. *Craticularia parallela* GOLDF. sp.; L. MORET, p. 125, Pl. 6, Figs 1–3, 8 and Pl. 9, Figs 3–4.
1929. *Craticularia parallela* (GOLDF.); C. S. ANTONESCU, p. 7.
1937. *Craticularia parallela* GOLDF. sp.; A. SCHRAMMEN, p. 28, Pl. 3, Figs 4, 6 and Pl. 13, Fig. 1.
1973. *Craticularia parallela* (GOLDF.); Z. FIBICH, p. 50, Pl. 8, Figs 3–4.
1983. *Craticularia parallela* (GOLDFUSS, 1833); C. GAILLARD, p. 182, Pl. 8, Fig. 2.
1983. *Craticularia rollieri* (OPPLIGER, 1915); C. GAILLARD, p. 182, Pl. 8, Fig. 5.
1987. *Craticularia parallela* (GOLDF.); R. MEYER, W. MÜLLER & L. ÜBELACKER, p. 68, Pl. 2, Fig. 5.

MATERIAL: 56 specimens.

REMARKS: According to SCHRAMMEN (1937), representatives of this species are no more than 10 cm in length and 1 cm in wall thickness. Some Polish specimens are longer than 10 cm, but they are linked by a continuous morphological intergradation with shorter specimens. They should therefore be assigned to *C. parallela*. Consequently, the forms "*C. rollieri* OPPLIGER" and "*C. cuspidata* OPPLIGER" should also be attributed to *C. parallela*, as they differ from *C. parallela* sensu SCHRAMMEN (1937) solely in their length.

OCCURRENCE: Jasna Góra Beds (Cordatum Zone) (FIBICH 1973); massive limestones (Plicatilis to Planula Zones) — localities Prędziszów, Niegowonice, Kielniki, Zalesiaki; sponge marly limestones (Transversarium Zone) — Trzebinia; platy limestones (Bifurcatus to Bimammatum Zones) — Dymnik and Birów; chalky limestones (Planula Zone) — Raciszyn and Niwiska. Oxfordian to Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937) and the Swiss Jura (OPPLIGER 1926); Callovian and Middle Oxfordian of France (MORET 1928, GAILLARD 1983); Oxfordian of Dobruja (ANTONESCU 1929).

## *Craticularia paradoxa* (MÜNSTER *in* GOLDFUSS, 1833) (Pl. 8, Fig. 2; Pl. 9, Fig. 4 and Pl. 18, Figs 4–5)

1833. *Scyphia paradoxa* MÜNSTER; A. GOLDFUSS, p. 86, Pl. 31, Fig. 6.
1878. *Clathrispongia introcyclica*; F. A. QUENSTEDT, p. 78, Pl. 116, Fig. 5.
1878. *Clathrispongia perlata*; F. A. QUENSTEDT, p. 80, Pl. 116, Figs 6–7.
1897. *Craticularia paradoxa* MÜNST. sp.; F. OPPLIGER, p. 27, Pl. 4, Fig. 1.
1910. *Craticularia paradoxa* MÜNST. sp.; R. KOLB, p. 159.
1913. *Craticularia paradoxa* GF.; J. SIEMIRADZKI, p. 21.
1915. *Craticularia paradoxa* MÜNST. sp.; F. OPPLIGER, p. 11.
1926. *Craticularia paradoxa* MÜNST. sp.; F. OPPLIGER, p. 6.
1929. *Craticularia paradoxa* (MÜNST.); C. S. ANTONESCU, p. 7.
1937. *Craticularia paradoxa* GOLDF. sp.; A. SCHRAMMEN, p. 27, Pl. 3, Fig. 5 and Pl. 4, Fig. 4.
1941. *Craticularia paradoxa* MÜNST. sp.; L. HERENGER, p. 11, Text-fig. 1.
1963. *Craticularia paradoxa* (MÜNSTER); W. WAGNER, p. 8.

MATERIAL: 12 specimens.

OCCURRENCE: Massive limestones (Antecedens Subzone, Transversarium and Planula Zones) — localities Prędziszów, Niegowonice, Zalesiaki; sponge marly limestones (Transversarium Zone) — Trzebinia; chalky limestones (Planula Zone) — Niwiska. Oxfordian to Tithonian of Swabia and Franconia (SCHRAMMEN 1937, WAGNER 1963); Oxfordian to Kimmeridgian of the Swiss Jura (OPPLIGER 1926); Oxfordian of Dobruja (ANTONESCU 1929); Upper Jurassic of Spain (HERENGER 1941).

## *Craticularia clathrata* (GOLDFUSS, 1833) (Pl. 8, Fig. 1; Pl. 9, Fig. 1 and Pl. 18, Fig. 6)

1833. *Scyphia clathrata* nobis; A. GOLDFUSS, p. 8, Pl. 3, Fig. 1.
1878. *Scyphia clathrata*; F. A. QUENSTEDT, p. 74, Pl. 117, Figs 23–24.
1878. *Spongites clathratus semiglobosus*; F. A. QUENSTEDT, p. 74, Pl. 117, Fig. 25.
1897. *Craticularia clathrata* GOLDF. sp.; F. OPPLIGER, p. 27.
1910. *Craticularia clathrata* GOLDF. sp.; R. KOLB, p. 158.
1913. *Craticularia clathrata* GF.; J. SIEMIRADZKI, p. 22.
1929. *Craticularia clathrata* (GOLDF.); C. S. ANTONESCU, p. 6.
1937. *Craticularia clathrata* GOLDF. sp.; A. SCHRAMMEN, p. 26.

MATERIAL: 6 specimens.

OCCURRENCE: Massive limestones (Hypselum Subzone) — localities Kielniki and Podzamcze; platy limestones (Hypselum Subzone) — Dymnik, Birów. Oxfordian to Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937); Kimmeridgian of the Swiss Jura (OPPLIGER 1926); Oxfordian of Dobruja (ANTONESCU 1929).

## Genus *Paracraticularia* SCHRAMMEN, 1937
## *Paracraticularia tubifera* SCHRAMMEN, 1937
## (Pl. 9, Fig. 7)

1937. *Paracraticularia tubifera* n. sp.; A. SCHRAMMEN, p. 20, Pl. 1, Fig. 8; Pl. 3, Fig. 3 and Pl. 15, Fig. 3.

MATERIAL: One fragment.

OCCURRENCE: Chalky limestones (Bimammatum or Planula Zone) — locality Lisowice. Kimmeridgian of Swabia (SCHRAMMEN 1937).

## *Paracraticularia procumbens* (GOLDFUSS, 1833)
## (Pl. 9, Fig. 5)

1883. *Scyphia procumbens* nobis; A. GOLDFUSS, p. 11, Pl. 4, Fig. 3.
1878. *Scyphia procumbens*; F. A. QUENSTEDT, p. 70, Pl. 117, Figs 18–19.
1878. *Spongites cylindritextus familiaris*; F. A. QUENSTEDT, p. 71, Pl. 117, Fig. 20.
1897. *Craticularia procumbens* GOLDF. sp.; F. OPPLIGER, p. 23.
1910. *Craticularia procumbens* GOLDF. sp.; R. KOLB, p. 161.
1913. *Craticularia procumbens* GF.; J. SIEMIRADZKI, p. 22.
1915. *Craticularia procumbens* GOLDF. sp.; F. OPPLIGER, p. 15.
1926. *Craticularia procumbens* GOLDF. sp.; F. OPPLIGER, p. 7.
1929. *Craticularia procumbens* (GOLDF.); C. S. ANTONESCU, p. 7.
1937. *Paracraticularia procumbens* GOLDF. sp.; A. SCHRAMMEN, p. 28.

MATERIAL: One fragment.

OCCURRENCE: Massive limestones (Hypselum Subzone) — locality Kielniki. Oxfordian to Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937) and the Swiss Jura (OPPLIGER 1926); Oxfordian of Dobruja (ANTONESCU 1929).

## Genus *Thyroidium* de LAUBENFELS, 1955
## *Thyroidium schweiggeri* (GOLDFUSS, 1833)
## (Pl. 10, Figs 3–4)

1972. *Craticularia schweiggeri* (GOLDFUSS, 1833); C. GAILLARD, p. 118, Pl. 1, Figs 4–5.
1982. *Thyroidium schweiggeri* (GOLDFUSS, 1833); J. TRAMMER, p. 30, Pl. 11, Fig. 10 (*cum syn.*).
1983. *Craticularia schweiggeri* (GOLDFUSS, 1833); C. GAILLARD, p. 182.

MATERIAL: 5 specimens.

OCCURRENCE: Jasna Góra Beds (Plicatilis Zone) TRAMMER 1982); massive limestones (Hypselum Subzone) — localities Kielniki and Podzamcze; chalky limestones (Planula Zone) — Raciszyn, Niwiska. Middle Oxfordian to Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937); Middle Oxfordian and Kimmeridgian of the Swiss Jura (OPPLIGER 1926); Upper Oxfordian of France (GAILLARD 1983).

## *Thyroidium lineatum* (SCHRAMMEN, 1937)
## (Pl. 10, Figs 1–2 and 5)

1878. *Scyphia Schweiggeri*; F. A. QUENSTTEDT, p. 63, Pl 117, Fig. 4.
1937. *Thyroidium lineatum* n. sp.; A. SCHRAMMEN, p. 31, Pl. 9, Figs 5–6 and Pl. 16, Fig. 5.

MATERIAL: 12 specimens.

OCCURRENCE: Massive limestoness (Hypselum Subzone) — localities Kielniki and Podzamcze; sponge marly limestones (Transversarium Zone) — Trzebinia; chalky limestones (Planula Zone) — Raciszyn. Kimmeridgian to Tithonian of Swabia and Franconia (SCHRAMMEN 1937).

## Genus *Pycnocalyptra* SCHRAMMEN, 1937
## *Pycnocalyptra* aff. *calyx* SCHRAMMEN, 1937
## (Pl. 10, Fig. 8)

MATERIAL: One specimen.

REMARKS: The specimen resembles *P. calyx* SCHRAMMEN, 1937, from which it differs, however, in a smaller diameter of, and in larger distances between, its ostia. It is moreover an euryproct *sensu* de LAUBENFELS (1955, p. *E*25) sponge, while *P. calyx* is of amblyproct type.

OCCURRENCE: Sponge crumpled limestones (Antecedens Subzone) — locality Wysoka.

## Genus *Pachyascus* SCHRAMMEN, 1937
## *Pachyascus punctatus* SCHRAMMEN, 1937
## (Pl. 10, Fig. 6)

1937. *Pachyascus punctatus* n. sp.; A. SCHRAMMEN, p. 36, Pl. 17, Fig. 4.

MATERIAL: One specimen.

OCCURRENCE: Sponge marly limestones (Transversarium Zone) — locality Trzebinia. Lower Kimmeridgian of Swabia (SCHRAMMEN 1937).

## Genus *Psephosyllogus* SCHRAMMEN, 1937
## *Psephosyllogus* sp.
## (Pl. 10, Fig. 7)

MATERIAL: One specimen.

REMARKS: The specimen is close to *P. dilligens* SCHRAMMEN, 1937, but its ostia are a bit larger and less regularly arranged.

OCCURRENCE: Chalky limestones (Bimammatum or Planula Zone) — locality Lisowice.

## Genus *Tremadictyon* ZITTEL, 1877
## *Tremadictyon reticulatum* (GOLDFUSS, 1833)
## (Pl. 11 and Pl. 14, Figs 5—7)

1913. *Tremadictyon reticulatum* GF.; J. SIEMIRADZKI, p. 20.
1926. *Tremadictyon reticulatum* GOLDF. sp.; F. OPPLIGER, p. 4 (*cum syn.*).
1928. *Tremadictyon reticulatum* GOLDF. sp.; L. MORET, p. 124, Pl. 7, Fig. 2; Pl. 8, Figs 11—13 and Pl. 9, Fig. 2.
1929. *Tremadictyon reticulatum* (GOLDF.); C. S. ANTONESCU, p. 5.
1937. *Tremadictyon reticulatum* GOLDF. sp.; A. SCHRAMMEN, p. 23.
1963. *Tremadictyon reticulatum* (GOLDFUSS); W. WAGNER, p. 5, Pl. 2, Figs 1 and 4.
1972. *Tremadictyon reticulatum* (GOLDFUSS); C. GAILLARD, p. 118, Pl. 1, Fig. 6 and Pl. 2, Fig. 7

1973. *Tremadictyon reticulatum* (GOLDF.); Z. FIBICH, p. 49, Pl. 9, Fig. 3.
non 1982. *Tremadictyon reticulatum* (GOLDFUSS, 1833); J. TRAMMER, Pl. 11, Fig. 5 and Pl. 12, Fig. 7 [= *Cypellia trabeculata* (QUENSTEDT, 1878)].
1983. *Tremadictyon reticulatum* (GOLDFUSS, 1833); C. GAILLARD, p. 183, Pl. 7, Fig. 5.

MATERIAL: 124 specimens.

REMARKS: The species is highly variable in its shape as well as in the form, size, and distance between ostia. There is nonethelss a continuous intergradation of the particular morphotypes.

OCCURRENCE: Jasna Góra Beds (Cordatum Zone) (FIBICH 1973); massive limestones (Plicatilis to Planula Zones) — localities Prędziszów, Mirów, Niegowonice, Trzebinia, Kielniki, Podzamcze, Zalesiaki; sponge crumpled limestones (Transversarium Zone) — Trzebinia; platy limestones (Bifurcatus Zone or Hypselum Subzone) — Dymnik; chalky limestones (Planula zone) — Lisowice, Raciszyn, Niwiska; crinoid limestones with corals (Planula or Platynota Zone) — Dobrogoszczyce. Middle Oxfordian to Lower Kimmeridgian (SCHRAMMEN 1937) and Tithonian (WAGNER 1963) of Swabia and Franconia; Middle Oxfordian to Kimmeridgian of the Swiss Jura (OPPLIGER 1926); Callovian (MORET 1928) and Oxfordian (GAILLARD 1983) of France; Lower to Middle Oxfordian of Spain (BEHMEL 1970); Oxfordian of Dobruja (ANTONESCU 1929).

## *Tremadictyon radicatum* (QUENSTEDT, 1878)

1878. *Scyphia reticulata radicata*; F. A. QUENSTEDT, p. 33, Pl. 115, Fig. 12.
1878. *Retispongia radicata*; F. A. QUENSTEDT, p. 38, Pl. 115, Fig. 20.
1910. *Tremadictyon radicatum* QUENST. sp.; R. KOLB, p. 115.
1928. *Tremadictyon reticulatum* GOLDF. sp.; L. MORET, p. 124, Pl. 9, Fig. 1.
1937. *Tremadictyon radicatum* QUENST. sp.; A. SCHRAMMEN, p. 24, Pl. 3, Fig. 2 and Pl. 4, Fig. 1.

MATERIAL: 11 specimens.

OCCURRENCE: Massive limestones (Antecedens Subzone and Transversarium Zone) — localities Mirów and Niegowonice; songe crumpled limestones (Antecedens Subzone) — Wysoka. Oxfordian to Tithonian of Swabia and Franconia (SCHRAMMEN 1937; MEYER, MÜLLER & ÜBELACKER 1987); Callovian of France (MORET 1928).

## *Tremadictyon rugatum* (QUENSTEDT, 1878) (Pl. 12, Fig. 8)

1878. *Retispongia rugata*; F. A. QUENSTEDT, p. 47, Pl. 116, Figs 4–5.
1910. *Tremadictyon rugatum* QUENST. sp.; R. KOLB, p. 156.
1915. *Tremadictyon rugatum* QUENST. sp.; F. OPPLIGER, p. 11.
1926. *Tremadictyon rugatum* QUENST. sp.; F. OPPLIGER, p. 5

MATERIAL: 9 specimens.

OCCURRENCE: Massive limestones (Planula Zone) — locality Zalesiaki; chalky limestones (Planula Zone) — Lisowice, Raciszyn, Niwiska. Uppermost Oxfordian of Swabia (KOLB 1910); Oxfordian to Kimmeridgian of the Swiss Jura (OPPLIGER 1926).

## *Tremadictyon* sp.

MATERIAL: 13 fragments.

REMARKS: These specimens include small fragments of sponges which show the skeleton structure and ostia arrangement characteristic of the *Tremadictyon* (*cf.* ZITTEL 1877, SCHRAMMEN 1937).

OCCURRENCE: *See* Text-fig. 10.

## Genus *Stauroderma* ZITTEL, 1877
## *Stauroderma lochense* (QUENSTEDT, 1858)
## (Pl. 12, Fig. 9)

1929. *Stauroderma disciformis* (QUENST.); C. S. ANTONESCU, p. 9.
1982. *Stauroderma lochense* (QUENSTEDT, 1858); J. TRAMMER, p. 28, Pl. 11, Fig. 9 and Pl. 12, Fig. 3 (*cum syn.*).

MATERIAL: 10 specimens.

OCCURRENCE: Jasna Góra Beds (Plicatilis Zone) (TRAMMER 1982); massive limestones (Transversarium and Bimammatum Zones) — localities Niegowonice, Kielniki, Podzamcze; platy limestones (Bifurcatus Zone or Hypselum Subzone) — Dymnik; chalky limestones (Bimammatum to Planula Zones) — Lisowice, Raciszyn, Niwiska. Oxfordian to Lower Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937; MEYER, MÜLLER & ÜBELACKER 1987) and Tithonian of Franconia (WAGNER 1963); Middle Oxfordian to Kimmeridgian of the Swiss Jura (OPPLIGER 1926); Middle Oxfordian of France (LAGNEAU-HERENGER 1951); Oxfordian of Dobruja (ANTONESCU 1929); perhaps also Middle Oxfordian of Spain (BEHMEL 1970).

## Genus *Xenoschrammenum* de LAUBENFELS, 1955
## *Xenoschrammenum alternans* (SCHRAMMEN, 1937)
## (Pl. 12, Fig. 6)

1982. *Xenoschrammenum alternans* (SCHRAMMEN, 1937); J. TRAMMER, p. 28, Pl. 11, Fig. 7 (*cum syn.*).

MATERIAL: 32 specimens.

REMARKS: The forms *Xenoschrammenum farrei* (FROMENTEL, 1859) and *X. tenuis* (OPPLIGER, 1926), which OPPLIGER (1907: p. 7; 1915: p. 26) attributed to the genus *Sporadopyle* ZITTEL, are strikingly close in their morphology to *X. alternans*. Te former differs from *X. alternans* in that it bears a longitudinal striae at one of its surfaces, whereas the latter differs from *X. alternans* in its concentrical constrictions. It is nevertheless quite possible that all three forms are ecophenotypic variants of the some species.

OCCURRENCE: Jasna Góra Beds (Cordatum and Plicatilis Zones) (TRAMMER 1982); massive limestones (Bimammatum to Planula Zones) — localities Kielniki, Podzamcze, Zalesiaki; platy limestones (Hypselum Subzone) — Birów; chalky limestones (Planula Zone) — Raciszyn, Niwiska. Upper Kimmeridgian to Tithonian of Swabia and Franconia (SCHRAMMEN 1937, WAGNER 1963); perhaps also Middle Oxfordian of the Swiss Jura (OPPLIGER1926) and Spain (BEHMEL 1970).

## *Xenoschrammenum punctatum* (SCHRAMMEN, 1937)
## (Pl. 12, Figs 4—5)

1982. *Xenoschrammenum punctatum* (SCHRAMMEN, 1937); J. TRAMMER, p. 28, Pl. 11, Fig. 8 (*cum syn.*).

MATERIAL: 8 specimens.

OCCURRENCE: Jasna Góra Beds (Plicatilis Zone) (TRAMMER 1982); massive limestones (Antecedens and Hypselum Subzones, Planula Zone) — localities Mirów, Podzamcze, Zalesiaki; sponge marly limestones (Transversarium Zone) — Trzebinia; platy limestones (Transversarium Zone) — Zawodzie. Middle Oxfordian to Upper Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937).

## Genus *Walcotella* de LAUBENFELS, 1955
## *Walcotella pertusa* (GOLDFUSS, 1833)
## (Pl. 12, Fig. 7)

1929. *Sporadopyle pertusa* (GOLDF.); C. S. ANTONESCU, p. 8
1982. *Walcotella pertusa* (GOLDFUSS, 1833); J. TRAMMER, pl. 31, Pl. 11, Figs 1–2 and Pl. 12, Fig. 2 (*cum syn.*).

MATERIAL: 12 specimens.

OCCURRENCE: Jasna Góra Beds (Cordatum and Plicatilis Zones) (TRAMMER 1982); massive limestones (Tenuicostatum and Hypselum Subzones) — localities Prędziszów, Kielniki; sponge crumpled limestones (Antecedens Subzone) — Wysoka; sponge marly limestones (Transversarium Zone) — Trzebinia; platy limestones (Bifurcatus Zone and Hypselum Subzone) — Dymnik, Birów. Oxfordian to Lower Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937; MEYER, MÜLLER & ÜBELACKER 1987); Middle Oxfordian and Kimmeridgian of the Swiss Jura (OPPLIGER 1926); Oxfordian of Dobruja (ANTONESCU 1929).

## Genus *Ordinatus* de LAUBENFELS, 1955
## *Ordinatus texturatus* (v. SCHLOTHEIM, 1820)
## (Pl. 12, Figs 1–3)

1982. *Walcotella texturata* (v. SCHLOTHEIM, 1820); J. TRAMMER, p. 31, Pl. 11, Fig. 3 and Pl. 12, Figs 4–5 (*cum syn.*).

MATERIAL: 40 specimens.

REMARKS: It was considered previously (TRAMMER 1982) the generic name *Ordinatus* as a junior synonym of *Walcotella.* Having now numerous and well preserved specimens of *O. texturatus*, which is the type species of the genus, it is believed that *Ordinatus* de LAUBENFELS should be regarded as a distinct genus. In *O. texturatus*, the ostia are arrenged into very regular, obliquely running rows (Pl. 12, Figs 1a and 2a), and the skeleton has a very regular structure (Pl. 12, Fig. 2c). These are clear differences from *Walcotella.* Furthermore, the skeletal network of *O. texturatus* is covered with tiny spines, which are absent in *Walcotella.*

OCCURRENCE: Jasna Góra Beds (Plicatilis Zone) (TRAMMER 1982); massive limestones (Plicatilis, Transversarium, Binammatum, and Planula Zones) — localities Prędziszów, Mirków, Niegowonice, Kielniki, Podzamcze, Zalesiaki; sponge marly limestones (Transversarium Zone) — Trzebinia; platy limestones (Antecedens Subzone) — Zawodzie; chalky limestoness (Planula Zone) — Lisowice, Raciszyn. Middle Oxfordian to Lower Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937); Middle Oxfordian of the Swiss Jura (OPPLIGER 1926).

## Genus *Erineum* SCHRAMMEN, 1937
## *Erineum minutum* SCHRAMMEN, 1937
## (Pl. 7, Fig. 6)

1937. *Erineum minutum* n. sp.; A. SCHRAMMEN, p. 39, Pl. 10, Fig. 6.

MATERIAL: One specimen.

OCCURRENCE: Sponge marly limestones (Transversarium Zone) — locality Trzebinia. Middle Oxfordian of Swabia (SCHRAMMEN 1937).

## Genus *Feifelia* SCHRAMMEN, 1937
## *Feifelia favositides* SCHRAMMEN, 1937

1937. *Feifelia favositides* n. sp.; A. SCHRAMMEN, p. 53, Pl. 5, Fig. 4 and Pl. 11, Fig. 10.

MATERIAL: One specimen.

OCCURRENCE: Sponge marly limestones (Transversarium Zone) — locality Trzebinia. Upper Kimmeridgian of Swabia (SCHRAMMEN 1937).

## Genus *Casearia* QUENSTEDT, 1858
## *Casearia* sp.
## (Pl. 13, Fig. 6)

MATERIAL: One fragment, broken off in the field from a large (approximately 1 m in diameter) specimen fragment.

REMARKS: The considered form exhibits the main features of the genus *Casearia* (see MÜLLER 1974): the annnular constrictions (Pl. 13, Fig. 6a—b) and the characteristic structure of dermal skeleton (Pl. 13, Fig. 6c—d). It clearly differs from the known species of *Casearia*, however. A common species, *Casearia articulata* (SCHMIDEL, 1780) is small-sized, cylindrical, and thick-walled, whereas *Casearia* sp. is very large-sized and thin-walled, and it may be either plate- or barrrel-like in shape. The other two species, *Casearia depressa* KOLB, 1910, and *C. eurygaster* ZITTEL, 1877, also are much smaller-sized and thicker-walled. MÜLLER's collection in the *Staatliches Museum für Naturkunde*, Stuttgart, includes a thin-walled fragment of a *Casearia* specimen, but it represents only the initial part of a sponge and cannot be compared in detail.

OCCURRENCE: Sponge marly limestones (Transversarium Zone) — locality Trzebinia.

## Genus *Porospongia* d'ORBIGNY, 1849; *emend.* ZITTEL, 1877
## *Porospongia marginata* (MÜNSTER *in* GOLDFUSS, 1833)
## (Pl. 7, Fig. 3)

1833. *Manon marginatum* MÜNSTER; A. GOLDFUSS, p. 94, Pl. 34, Fig. 9d—h.
1833. *Manon impressum* MÜNSTER; A. GOLDFUSS, p. 95, Pl. 34, Fig. 10.
1878. *Porospongia marginata*; F. A. QUENSTEDT, p. 99, Pl. 119, Figs 10—12.
1897. *Porospongia marginata* MÜNST. sp.; F. OPPLIGER, p. 38.
1910. *Porospongia marginata* MÜNST. sp.; R. KOLB, p. 190.
1910. *Porospongia impressa* MÜNST. sp.; R. KOLB, pp. 191.
1913. *Porospongia marginata* GF.; J. SIEMIRADZKI, p. 28.
1915. *Porospongia marginata* MÜNST. sp.; F. OPPLIGER, p. 47.
1915. *Porospongia impressa* MÜNST. sp.; F. OPPLIGER, p. 48.
1937. *Porospongia marginata* MÜNST. sp.; A. SCHRAMMEN, p. 46, Pl. 2, Fig. 13.
1983. *Porospongia marginata* (MÜNSTER); C. GAILLARD, p. 184, Pl. 7, Fig. 6.

MATERIAL: 5 specimens.

REMARKS: There is a continuous morphological intergradation between the forms with numerous and small oscula (= *Porospongia impressa* MÜNSTER) and those with less numerous but larger oscula (= *P. marginata* MÜNSTER). Therefore, these forms are considered as representatives of a single species.

OCCURRENCE: Lower Kimmeridgian of the Polish Jura Chain (SIEMIRADZKI 1913). Platy limestones (Bifurcatus Zone or Hypselum Subzone) – locality Dymnik; chalky limestones (Bimammatum or Planula Zone) – Lisowice. Oxfordian to Lower Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937); Oxfordian and Kimmeridgian of the Swiss Jura (OPPLIGER 1926); Oxfordian of France (GAILLARD 1983).

## Genus *Multiloqua* de LAUBENFELS, 1955 (= *Polyphemus* SCHRAMMEN, 1937)

REMARK: The name *Polyphemus* has turned out to be a homonym; hence, de LAUBENFELS (1955, p. *E*82) replaced it with *Multiloqua*.

### *Multiloqua fungiformis* (GOLDFUSS, 1833) (Pl. 9, Fig. 2)

1833. *Manon marginatum* MÜNSTER var. *fungiformis*; A. GOLDFUSS, p. 94, Pl. 34, Fig. 9a–c.
1878. *Porospongia solitaria*; F. A. QUENSTEDT, p. 103, Pl. 120, Figs 1–5.
1910. *Porospongia fungiformis* (GOLDF.) ZITTEL sp.; R. KOLB, p. 190.
1915. *Porospongia fungiformis* (GOLDF.) ZITTEL sp.; F. OPPLIGER, p. 47.
1928. *Porospongia fungiformis* GOLDF. sp.; L. MORET, p. 131, Text-fig. 27.
1937. *Polyphemus fungiformis* (GOLDF.) ZITTEL sp.; A. SCHRAMMEN, p. 47, Pl. 1, Fig. 6 and Pl. 2, Fig. 14.

MATERIAL: One specimen.

OCCURRENCE: Massive limestones (Bifurcatus Zone) – locality Trzebinia. Oxfordian to Lower Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937); Middle Oxfordian of the Swiss Jura (OPPLIGER 1926); Callovian (MORET 1928) and Middle Oxfordian of France (LAGNEAU-HERENGER 1951).

## Genus *Linonema* de LAUBENFELS, 1955 (= *Linosoma* SCHRAMMEN, 1937)

REMARK: The name *Linosoma* has turned out to be a homonym; hence, de LAUBENFELS (1955, p. *E*83) replaced it with *Linonema*.

### *Linonema calyx* (SCHRAMMEN, 1937) (Pl. 16, Fig. 3)

1937. *Linosoma calyx* n. sp.; A. SCHRAMMEN, p. 55, Pl. 6, Fig. 3 and Pl. 15, Fig. 2.

MATERIAL: One specimen.

REMARKS: The Polish specimen is twice smaller than those described by SCHRAMMEN (1937).

OCCURRENCE: Sponge crumpled limestones, (Antecedens Subzone) – locality Wysoka. Oxfordian to Lower Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937).

## Genus *Ramispongia* QUENSTEDT, 1878; emend. SCHRAMMEN, 1937
## *Ramispongia ramosa* QUENSTEDT, 1878
## (Pl. 13, Figs 1–5)

1878. *Ramispongia ramosa*; F. A. QUENSTEDT, p. 140, Pl. 121, Fig. 11.
1897. *Sporadopyle ramosa* QUENST. sp.; F. OPPLIGER, p. 30.
1910. *Sporadopyle ramosa* QUENST. sp.; R. KOLB, p. 169.
1913. *Sporadopyle ramosa* QU.; J. SIEMIRADZKI, p. 19.
1926. *Sporadopyle ramosa* QUENST. sp.; F. OPPLIGER, p. 12.
1937. *Ramispongia ramosa* QUENST. sp.; A. SCHRAMMEN, p. 41, Pl. 1, Fig. 12; Pl. 3, Figs 14 and 16; Pl. 4, Fig. 6; Pl. 10, Fig. 5 and Pl. 11, Fig. 8.

MATERIAL: 6 fragments.

OCCURRENCE: Jasna Góra Beds (Cordatum Zone) — locality Wrzosowa; massive limestones (Hypselum Subzone) — Kielniki; sponge crumpled limestones (Antecedens Subzone) — Wysoka; platy limestones (Hypselum Subzone) — Birów; chalky limestones (Planula Zone) — Lisowice, Raciszyn, Niwiska. Oxfordian and Kimmeridgian of Swabia and Franconian (SCHRAMMEN 1937) and the Swiss Jura (OPPLIGER 1926).

## Genus *Verrucocoelia* ÉTALLON, 1859
## *Verrucocoelia gregaria* (QUENSTEDT, 1878)
## (Pl. 14, Fig. 4)

1833. *Scyphia verrucosa* nobis; A. GOLDFUSS, p. 51, Pl. 33, Fig. 8c (only).
1878. *Mastospongia gregaria*; F. A. QUENSTEDT, p. 148, Pl. 122, Figs 8–10.
1897. *Verrucocoelia gregaria* QUENST. sp.; F. OPPLIGER, p. 31.
1910. *Verrucocoelia gregaria* QUENST. sp.; R. KOLB, p. 175.
1913. *Verrucocoelia gregaria* QUENSTEDT; J. SIEMIRADZKI, p. 22.
1915. *Verrucocoelia gregaria* QUENST. sp.; F. OPPLIGER, p. 28.
1937. *Verrucocoelia gregaria* QUENST. sp.; A. SCHRAMMEN, p. 43.
1983. *Verrucocoelia gregaria* (QUENSTEDT, 1858); C. GAILLARD, p. 184.

MATERIAL: 4 specimens.

OCCURRENCE: Platy limestones (Transversarium Zone) — locality Zawodzie; chalky limestones (Planula Zone) — Raciszyn. Oxfordian and Lower Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937); Oxfordian of the Swiss Jura (OPPLIGER 1926) and France (GAILLARD 1983).

## Genus *Dactylocalyx* STUTCHBURY, 1841

## *Dactylocalyx* sp.
## (Pl. 9, Fig. 3)

MATERIAL: One specimen.

REMARKS: The specimen is composed of interlaced fine tubes (less than 2 mm in diameter), which is diagnostic of the genus *Dactylocalyx*.

OCCURRENCE: Massive limestones (Tenuicostatum Subzone) — locality Prędziszów. This is the first Jurassic record of this genus which has thus far been known to range from the Tertiary to the Recent.

## Genus *Polygonatium* SCHRAMMEN, 1937
## *Polygonatium sphaeroides* SCHRAMMEN, 1937
## (Pl. 14, Figs 1–2)

1937. *Polygonatium sphaeroides* n. sp.; A. SCHRAMMEN, p. 56, Pl. 13, Figs 6–7.

MATERIAL: Two specimens.

REMARKS: SCHRAMMEN's (1937) specimen is spherical in shape whereas both the Polish specimens are pear-like.

OCCURRENCE: Sponge marly limestones (Transversarium Zone) – locality Trzebinia. Middle and perhaps also lower Upper Oxfordian of Swabia (SCHRAMMEN 1937).

## *Polygonatium* sp.
## (Pl. 14, Fig. 3)

MATERIAL: One fragment.

REMARKS: The species *Polygonatium sphaeroides* is sphericall or pear-like in shape. The studied specimen is, in contrast, conical or barrel-like. It is moreover a dozen times larger in size than *P. sphaeroides*, and its paragaster also is larger, accordingly.

OCCURRENCE: Sponge marly limestones (Transversarium Zone) – locality Trzebinia.

## Dictyida, gen. et sp. indet.

MATERIAL: 68 fragments.

REMARKS: These specimens are very poorly preserved, but they all show triaxons linked into a dictyid network.

OCCURRENCE: *See* Text-fig. 10.

## Order **Lychniskida** SCHRAMMEN, 1902
## Genus *Cypellia* POMEL, 1872
## *Cypellia rugosa* (GOLDFUSS, 1833)
## (Pl. 15, Figs 4–8)

1929. *Cypellia rugosa* (GOLDFUSS); C. S. ANTONESCU, p. 8.
1972. *Cypellia rugosa* (GOLDFUSS, 1833); C. GAILLARD, p. 122, Pl. 2, Figs 15–16.
1982. *Cypellia rugosa* (GOLDFUSS, 1833); J. TRAMMER, p. 33, Pl. 15 (*cum syn.*).
1983. *Cypellia rugosa* (GOLDFUSS, 1833); C. GAILLARD, p. 187, Pl. 8, Fig. 6.

MATERIAL: 69 specimens.

OCCURRENCE: Jasna Góra Beds (Cordatum or Plicatilis Zone) (TRAMMER 1982); massive limestones (Plicatilis to Planula Zones) – localities Prędziszów, Niegowonice, Kielniki, Zalesiaki;

sponge crumpled limestones (Antecedens Subzone) – Wysoka; sponge marly limestones (Transversarium Zone) – Trzebinia; platy limestones (Transversarium Zone to Hypselum Subzone) – Zawodzie, Dymnik, Birów; chalky limestones (Planula Zone) – Lisowice, Raciszyn, Niwiska. Middle Oxfordian to Lower Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937); Upper Oxfordian to Kimmeridgian of the Swiss Jura (OPPLIGER 1926); Oxfordian of France (GAILLARD 1983) and Dobruja (ANTONESCU 1929).

## *Cypellia inberbis* (QUENSTEDT, 1878)

1878. *Scyphia inberbis*; F. A. QUENSTEDT, p. 125, Pl. 120, Fig. 59.
1910. *Cypellia inberbis* QUENST. sp.; R. KOLB, p. 181.
1926. *Cypellia inberbis* QU. sp.; F. OPPLIGER, p. 20.
1937. *Cryptichoderma inberbis* QUENST. sp.; A. SCHRAMMEN, p. 14, Pl. 4, Fig. 8.

MATERIAL: One specimen.

OCCURRENCE: Chalky limestones (Bimammatum or Planula Zone) – locality Lisowice. Oxfordian to Lower Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937); Kimmeridgian of the Swiss Jura (OPPLIGER 1926).

## *Cypellia trabeculata* (QUENSTEDT, 1878)

1878. *Scyphia trabeculata*; F. A. QUENSTEDT, p. 136, Pl. 121, Fig. 8.
1910. *Cypellia trabeculata* QUENST. sp.; R. KOLB, p. 182.
1937. *Cryptichoderma trabeculata* QUENST. sp.; A. SCHRAMMEN, p. 15, Pl. 1, Fig. 4 and Pl. 4, Fig. 9.
1982. *Tremadictyon reticulatum* (GOLDFUSS, 1833); J. TRAMMER, p. 29, Pl. 11, Fig. 5 and Pl. 12, Fig. 7.

MATERIAL: 3 specimens.

OCCURRENCE: Jasna Góra Beds (Cordatum Zone) (TRAMMER 1982); massive limestones (Planula Zone) – locality Zalesiaki; chalky limestones (Planula Zone) – Lisowice and Raciszyn. Oxfordian/Kimmeridgian transition of Swabia and Franconia (SCHRAMMEN 1937).

## Genus *Paracypellia* SCHRAMMEN, 1937
## *Paracypellia prolifera* (ZITTEL, 1878)
## (Pl. 15, Fig. 1)

1878. *Nexispongia libera*; F. A. QUENSTEDT, p. 162, Pl. 123, Fig. 1.
1878. *Cypellia prolifera* ZITT.; K. ZITTEL, p. 62.
1910. *Cypellia prolifera* ZITT. sp.; R. KOLB, p. 182.
1915. *Cypellia prolifera* ZITT. sp.; F. OPPLIGER, p. 36.
1937. *Paracypellia prolifera* ZITT. sp.; A. SCHRAMMEN, p. 13, Pl. 1, Fig. 1; Pl. 2, Fig. 7 and Pl. 10, Fig. 7.
1972. *Cypellia prolifera* ZITTEL; C. GAILLARD, p. 123, Pl. 2, Figs 1–3.
1983. *Cypellia prolifera* ZITTEL, 1878; C. GAILLARD, p. 187, Pl. 9, Fig. 9.

MATERIAL: 6 specimens.

OCCURRENCE: Massive limestones (Antecedens Subzone, Transversarium Zone, and Hypselum Subzone) – localities Prędziszów, Niegowonice, Kielniki; platy limestones (Transversarium Zone) – Zawodzie; chalky limestones (Planula Zone) – Niwiska. Oxfordian to Lower Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937); Middle Oxfordian to Kimmeridgian of the Swiss Jura (OPPLIGER 1926); Oxfordian of France (GAILLARD 1983).

## Genus *Placotelia* OPPLIGER, 1907

REMARK: For dicussion of the systematic position of the genera *Placotelia* and *Discophyma* see TRAMMER (1982, p. 34).

### *Placotelia marcoui* (FROMENTEL, 1859) (Pl. 15, Fig. 2)

1982. *Placotelia marcoui* (FROMENTEL, 1859); J. TRAMMER, p. 34, Pl. 16 (*cum syn.*).

MATERIAL: Two specimens.

OCCURRENCE: Jasna Góra Beds (Cordatum and Plicatilis Zones) (TRAMMER 1982); massive limestones (Antecedens Subzone) — locality Prędziszów; chalky limestones (Bimammatum or Planula Zone) — Lisowice. Middle Oxfordian of the Swiss Jura (OPPLIGER 1926); Oxfordian of France (GAILLARD 1983); perhaps also Middle Oxfordian of Spain (BEHMEL 1970).

### *Placotelia rugatum* (OPPLIGER, 1915) (Pl. 16, Fig. 2)

1915. *Discophyma rugatum* spez. nov.; F. OPPLIGER, p. 44, Pl. 6, Fig. 2 and Pl. 7, Fig. 1.
1926. *Discophyma rugatum* OPPL.; F. OPPLIGER, p. 23.

MATERIAL: One specimen.

OCCURRENCE: Massive limestones (Transversarium Zone) — locality Niegowonice. Strata of the Transversarium Zone in the Swiss Jura (OPPLIGER 1926) and France (LAGNEAU-HERENGER 1951).

### *Placotelia* sp.

MATERIAL: Two fragments.

REMARKS: Two small specimens exhibiting the following characters diagnostic of *Placotelia*: flat shape, dermal stauracts embedded within a continuous envelope, and large concentrically arranged openings at the upper surface.

OCCURRENCE: Chalky limestones (Planula Zone) — locality Niwiska.

## Genus *Sporadopyge* SCHRAMMEN, 1937

### *Sporadopyge speciosa* SCHRAMMEN, 1937 (Pl. 18, Fig. 7)

1937. *Sporadopyge speciosa* n. sp.; A. SCHRAMMEN, p. 16, Pl. 6, Fig. 2.

MATERIAL: One fragment.

REMARKS: The specimen bears all the features mentioned by SCHRAMMEN (1937) as diagnostic of *S. speciosa*, but its surface shows also concentrical annular constrictions.

OCCURRENCE: Chalky limestones (Bimammatum or Planula Zone) — localiity Lisowice. Oxfordian and perhaps also Lower Kimmeridgian of Swabia (SCHRAMMEN 1937)

## Genus *Coscinaulus* SCHRAMMEN, 1937
## *Coscinaulus* aff. micropora SCHRAMMEN, 1937
## (Pl. 17, Fig. 2)

MATERIAL: One specimen.

REMARKS: The specimen shows the features which, according to SCHRAMMEN (1937), are characteristic of *C. micropora*, but it is much larger and thicker-walled.

OCCURRENCE: Sponge crumpled limestones (Antecedens Subzone) — locality Wysoka.

## Genus *Sporadopyle* ZITTEL, 1877
## *Sporadopyle obliqua* (GOLDFUSS, 1833)

1928. *Sporadopyle obliqua* GOLDF. sp.; L. MORET, p. 126, Pl. 8, Figs 14—17.
1982. *Sporadopyle obliqua* (GOLDFUSS, 1833); J. TRAMMER, p. 32, Pl. 14 (*cum syn.*).
1983. *Sporadopyle obliqua* (GOLDFUSS, 1833); C. GAILLARD, p. 183, Pl. 9, Fig. 5.

MATERIAL: 3 specimens.

OCCURRENCE: Jasna Góra Beds (Cordatum and Plicatilis Zones) (TRAMMER 1982); massive limestones (Antecedens and Hypselum Subzones) — localities Prędziszów and Kielniki; chalky limestones (Planula Zone) — Raciszyn. Middle Oxfordian to Middle Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937); Middle Oxfordian and Kimmeridgian of the Swiss Jura (OPPLIGER 1926); Callovian, Oxfordian, and Tithonian of France (MORET 1928, LAGNEAU-HERENGER 1951); Jurassic of Timor (GERTH 1931).

## Genus *Pachyteichisma* ZITTEL, 1877
## *Pachyteichisma lamellosa* (GOLDFUSS, 1833)
## (Pl. 16, Fig. 1)

1972. *Pachyteichisma lamellosa* (GOLDF.); W. MÜLLER, p. 3, Pls 1—3 (*cum syn.*).

MATERIAL: 5 specimens.

OCCURRENCE: Massive limestones (Hypselum Subzone and Planula Zone) — localities Kielniki and Zalesiaki. Upper Oxfordian to Lower Kimmeridgian of Swabia (MÜLLER 1972); Middle Oxfordian to Kimmeridgian of the Swiss Jura (OPPLIGER 1926).

## *Pachyteichisma gresslyi* (ETALLON, 1858)

1983. *Pachyteichisma gresslyi* (ETALLON, 1858); C. GAILLARD, p. 188, Pl. 9, Figs 1—2 (*cum syn.*).

MATERIAL: One specimen.

OCCURRENCE: Massive limestones (Hypselum Subzone) — locality Kielniki. Middle Oxfordian of the Swiss Jura (OPPLIGER 1926); Oxfordian of France (GAILLARD 1983); Lower Kimmeridgian of Swabia (MÜLLER 1972: p. 8).

## Genus *Trochobolus* ZITTEL, 1877
## *Trochobolus dentatus* KOLB, 1910

1910. *Trochobolus dentatus* n. sp.; R. KOLB, p. 202, Pl. 20, Figs 3–4.
1915. *Trochobolus dentatus* KOLB sp.; F. OPPLIGER, p. 50, Pl. 8, Fig. 3.
1926. *Trochobolus dentatus* KOLB sp.; F. OPPLIGER, p. 34.
1937. *Trochobolus dentatus* KOLB; A. SCHRAMMEN, p. 9, Pl. 12, Figs 1–2.
1972. *Trochobolus dentatus* KOLB, 1910; C. GAILLARD, p. 129, Pl. 3, Figs 6–7.
1983. *Trochobolus dentatus* KOLB, 1910; C. GAILLARD, p. 189, Pl. 9, Fig. 6.

MATERIAL: One specimen.

OCCURRENCE: Massive limestones (Hypselum Subzone) — locality Kielniki. Kimmeridgian to Tithonian of Swabia and Franconia (SCHRAMMEN 1937); Middle Oxfordian of the Swiss Jura (OPPLIGER 1926); Oxfordian of France (GAILLARD 1983).

## *Trochobolus texatus* (GOLDFUSS, 1833)
## (Pl. 15, Fig. 3 and Pl. 17, Fig. 3)

1833. *Scyphia texata* nobis; A. GOLDFUSS, pp. 7 and 88, Pl. 2, Fig. 12 and Pl. 32, Fig. 4.
1878. *Scyphia barbata*; F. A. QUENSTEDT, p. 124, Pl. 120, Figs 55 and 57–58.
1878. *Scyphia meandrina*; F. A. QUENSTEDT, p. 297, Pl. 129, Fig. 21.
1878. *Scyphia montosa*; F. A. QUENSTEDT, p. 258, Pl. 129, Figs 23–24.
1897. *Trochobolus texata* GOLDF. sp.; F. OPPLIGER, p. 18.
1910. *Trochobolus texatus* GOLDF. sp.; R. KOLB, p. 201.
1913. *Trochobolus texatus* GF.; J. SIEMIRADZKI, p. 24.
1915. *Trochobolus texatus* GOLDF. sp.; F. OPPLIGER, p. 52.
1926. *Trochobolus texatus* GOLDF. sp.; F. OPPLIGER, p. 33.
1937. *Trochobolus texatus* GOLDF. sp.; A. SCHRAMMEN, p. 8. Pl. 2, Fig. 3; Pl. 10, Figs 8–9; Pl. 12, Fig. 3 and Pl. 15, Figs 5–6.

MATERIAL: Two specimens.

REMARKS: The sculpture typical of the genus *Trochobolus* is less distinct in the Polish specimens than in those illustrated by QUENSTEDT (1878) and SCHRAMMEN (1937).

OCCURRENCE: Massive limestones (Transversarium Zone) — locality Niegowonice; sponge marly limestones (Transversarium Zone) — Trzebinia. Middle Oxfordian to Lower Kimmeridgian of Swabia and Franconia (SCHRAMMEN 1937); Middle Oxfordian to Kimmeridgian of the Swiss Jura (OPPLIGER 1926).

## Genus *Pachyrhachis* SCHRAMMEN, 1937
## *Pachyrhachis* sp.
## (Pl. 18, Fig. 8)

MATERIAL: One fragment.

DESCRIPTION: A pear-like form, 6 cm in height, 9.5 cm in width near the osculum, 6 cm in width at the bottom. Wall thickness 1.5–2 cm. Osculum diameter approximates 8 cm. Paragaster large, narrowing downwards. Outer surface covered with irregular elevations and depressions inbetween. Skeleton of dictyid type, with lichnisks.

REMARKS: The specimen resembles *P. labirynthic* SCHRAMMEN, but its paragaster is much wider.

OCCURRENCE: Massive limestones (Hypselum Subzone) — locality Podzamcze.

## Lychniskida, gen. et sp. indet.

MATERIAL: 7 specimens.

REMARKS: These are poorly preserved sponge fragments including a dictyid skeleton with lichnisks.

OCCURRENCE: *See* Text-fig. 10.

## Demospongea or Hyalospongea, gen. et sp. indet.
## (Pl. 17, Fig. 1)

MATERIAL: One specimen.

DESCRIPTION: A pear-like form, more than 16 cm in height (the specimen is incomplete), 11 cm in maximum diameter, with paragaster approximating 3 cm in diameter. The outer (inhalant) surface covered with numerous (15 to 20 persq cm), irregularly arranged pores; they are 1 mm in diameter and approximately 1 mm from one another. Paragaster (exhalant) surface covered with wider (2 mm in diameter) pores regularly arranged in longitudinal and transversal rows. Water system canals cut the whole wall; they are slightly twisting both horizontally and vertically; their number decreases from the outer surface inwards, since numerous and narrow canals fuse to form wider ones. Skeleton in not preserved.

OCCURRENCE: Massive limestones (Hypselum Subzone) — locality Kielniki.

## Class **Calcipongea** de BLAINVILLE, 1834
## Order **Pharetronida** ZITTEL, 1878
## Suborder **Inozoa** STEINMANN, 1882
## Genus *Blastinia* ZITTEL, 1878
## *Blastinia costata* (MÜNSTER *in* GOLDFUSS, 1833)
## (Pl. 18, Fig. 2)

1984. *Blastinia costata* (MÜNSTER *in* GOLDFUSS); W. MÜLLER, p. 30, Pl. 20, Figs 1–5 (*cum syn.*).

MATERIAL: One specimen.

OCCURRENCE: Chalky limestones (Bimammatum or Planula Zone) — locality Lisowice.

## Genus *Corynella* ZITTEL, 1878
## *Corynella quenstedti* ZITTEL, 1878

1984. *Corynella quenstedti* ZITTEL; W. MÜLLER, p. 18, Pl. 11, Figs 1–6; Pl. 18, Fig. 1 and Pl. 24, Fig. 4 (*cum syn.*).

MATERIAL: One specimen.

OCCURRENCE: Chalky limestones (Bimammatum or Planula Zone) — locality Lisowice.

### Genus *Peronidella* HINDE, 1853
### *Peronidella cylindrica* (GOLDFUSS, 1833)
### (Pl. 18, Fig. 1)

1984. *Peronidella cylindrica* (GOLDFUSS); W. MÜLLER, p. 24, Pl. 19, Figs 1—2 (*cum syn.*).

MATERIAL: 7 specimens.

OCCURRENCE: Chalky limestones (Planula and perhaps also Bimammatum Zones) — localities Lisowice, Raciszyn, Niwiska; crinoid limestones with corals (Planula or Platynota Zone) — Dobrogoszczyce.

### Genus *Radicispongia* QUENSTEDT, 1877
### *Radicispongia radiciformis* (GOLDFUSS, 1833)
### (Pl. 18, Fig. 3)

1984. *Radicispongia radiciformis* (GOLDFUSS); W. MÜLLER, p. 25, Pl. 19, Figs 3—4 and Pl. 24, Fig. 1 (*cum syn.*).

MATERIAL: One specimen.

OCCURRENCE: Chalky limestones (Planula Zone) — locality Raciszyn.

### Pharetronida, gen. et sp. indet.

MATERIAL: 19 specimens.

REMARKS: These specimens have a poorly preserved surface but their skeleton is typically inozoan, composed of calcareous fibers.

OCCURRENCE: *See* Text-fig. 10.

## Class **Sclerospongiae** HARTMAN & GOREAU, 1970
### Order **Ceratoporellida** HARTMAN & GOREAU, 1970
### Genus *Neuropora* BRONN, 1825
### *Neuropora* sp.
### (Text-fig. 11)

MATERIAL: 12 specimens.

DESCRIPTION: Claviform calcareous skeletons, circular to oval in cross-section, 4—10 mm in height and 1—2 mm in maximum diameter, with a flat attachment scar at the bottom. Skeleton surface pitted with shallow calicles which are circular, oval or irregularly polygonal in cross-section. Calicles separated from one another by walls terminated by knobs at the top. Veinules run from the top to the bottom of each specimen.

REMARKS: The studied specimens resemble *N. pustulosa* (ROEMER) from the Hauterivian of Germany (KAŹMIERCZAK & HILLMER 1974) and *N. spinosa* (LAMOUROUX) from the Upper Bathonian of France (PALMER & FÜRSICH 1981), but these two species never take the form of a club.

OCCURRENCE: Massive limestones (Planula Zone) — locality Zalesiaki; chalky limestones (Planula and perhaps also Bimammatum Zones) — Lisowice, Raciszyn.

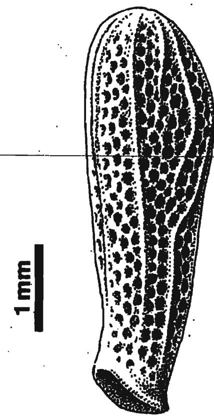



Fig. 11
*Neuropora* sp.: locality Zalesiaki, Planula Zone; drawing taken by Docent J. DZIK

## OXFORDIAN HISTORY OF THE SPONGE ASSEMBLAGE

A peculiar trend is discernible in the Oxfordian sponge assemblage of the Polish Jura (Text-fig. 12). At the beginning of the Oxfordian, the assemblage was dominated by lithistids which accounted for 96% of the total number of specimens. Later on, the share of the Hyalospongea gradually increased at the expense of the Lithistida, and hyalosponges accounted at the end of the Oxfordian for 90% of the total number of specimens.

The species composition of the assemblage, however, remained almost constant throughout the entire Oxfordian (Text-fig. 13). What changed at the species level, is only the dominance hierarchy in the assemblage. Species representative of the Hyalospongea, e.g. *Tremadictyon reticulatum*, were extremely rare at tirst but became more and more common with time. Conversely, such lithistid species as *Cnemidiastrum stellatum* and *Hyalotragos patella* were dominant at first but became rare toward the end of the Oxfordian. Nevertheless, all these species persisted throughout the Oxfordian. Thus, even though the Oxfordian lasted for about 10 Myr (ODIN 1984), the remarkable change in the sponge assemblage was primarily ecological, rather than evolutionary, in nature.

This trend in composition of the sponge assemblage ended at the Oxfordian/Kimmeridgian transition, when shallow-water, coral-bearing, crinoid limestones became dominant and brought also predominance of the Pharetronida among sponges (Text-figs 10 and 12). The clearcut trend (*see* Text-fig. 12) forces to envisage a substantial environmental change during the Oxfordian, which turned a habitat that was initially favorable to lithistids into one that was more suitable for hyalosponges. On the other hand, however, it is also clearly shown (Text-fig. 13) that all the species underwent only a change in abundance but persisted throughout the Oxfordian. Species aboundance changes comparable to those observed over 10 Myr of the Oxfordian occur today, in Recent marine environments, on the scale of a few years and without any major environmental change. The persistence of sponge species composition throughout the Oxfordian forces therefore to envisage a generally stable environmental setting.

The only explanation to account for these seemingly contradictory inferences is that the long-term trend was induced by a very slow and gradual climatic change, which may have no discernible effect on lithology. Other interpretations may potentially be suggested only by further studies on the sponge megafacies in other geographic areas. Only after such studies are accomplished will it be possible to determine whether the driving force of the trend was local or broadly regional.

These results may be interesting not only for students of fossil sponges but also in a more general, ecological perspective. As it turns out, a taxocene may keep a stable taxonomic composition for a very long time. The investigated

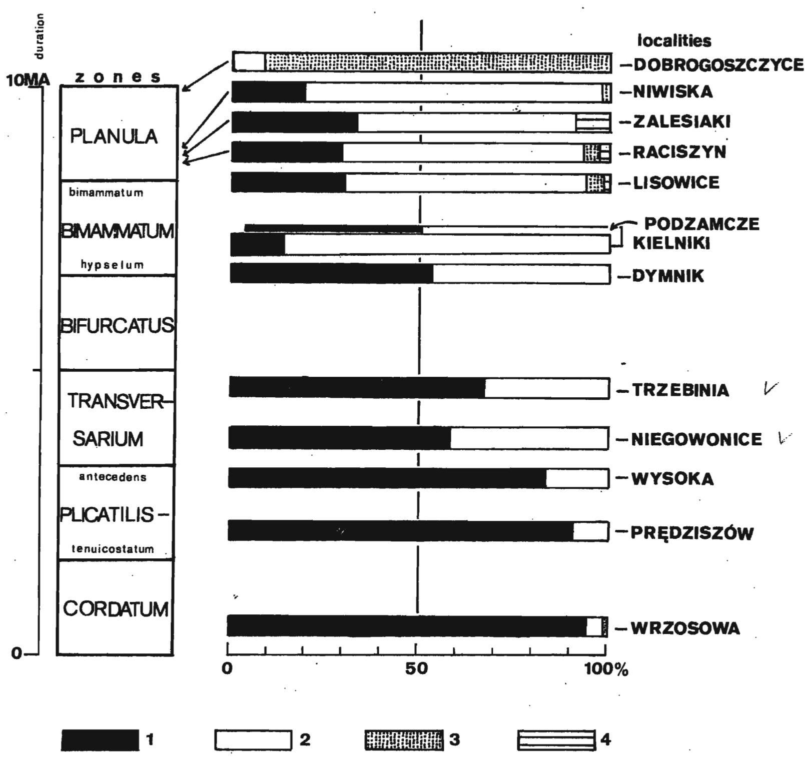



Fig. 12. Changes in frequency distribution of sponge taxa from the Oxfordian of the Polish Jura, based on relative abundance of individuals (in percent)
**1** — Lithistida, **2** — Hyalospongea, **3** — Pharetronida, **4** — Sclerospongiae
Based on data presented *in* Text-fig. 10 and, for the locality Wrzosowa, on the former report (TRAMMER 1982)

sponge assemblage kept almost the same species composition for about 10 Myr und underwent only such fluctuations in species relative abundance as those which commonly occur on the scale of a few years. It seems that we deal here with a pattern which is typically found on the ecological timescale but which is stretched here on the geological timescale (Text-figs 12–13).

The pattern recorded in the Oxfordian of the Polish Jura is extraordinary in that its duration (10 Myr) is a time interval during which more fundamental biological events, such as migrations, speciations, and extinctions, can normally be expected to appear.

## RECURRENT CHANGES IN THE MIDDLE AND UPPER JURASSIC

Based upon the few publications whose authors have given the data on Jurassic sponge frequency distribution in various areas of Europe (MORET 1928, pp. 137–138; OPPLIGER 1926, p. 2; TRAMMER 1982, Fig. 7; GAILLARD

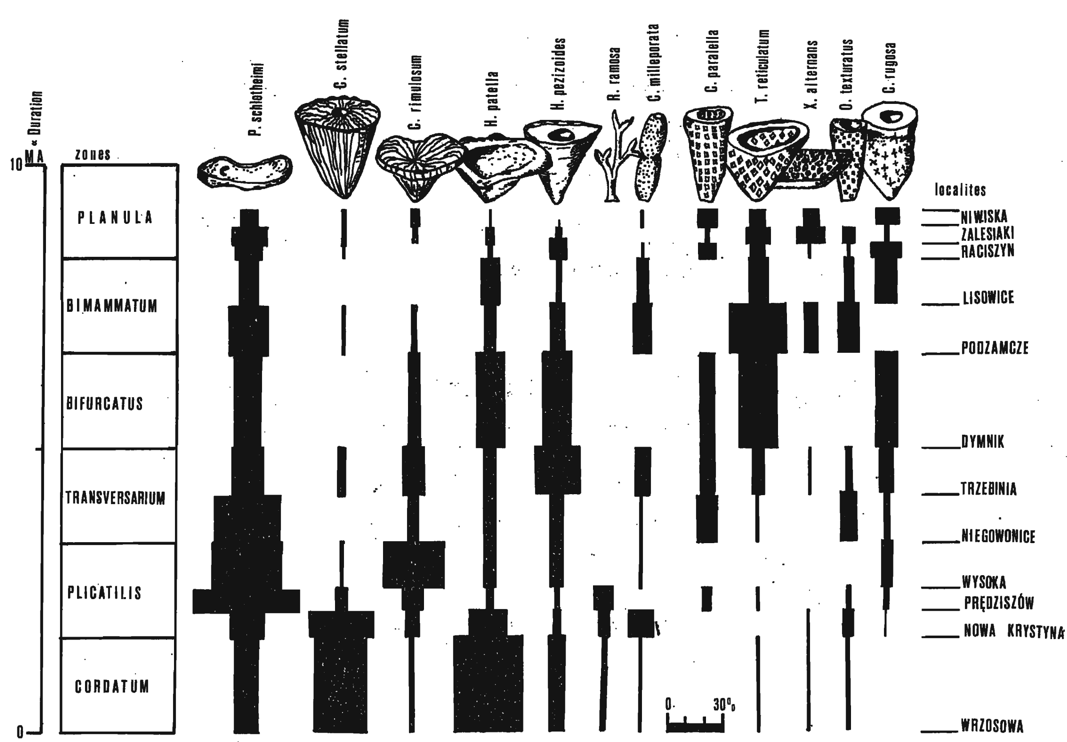



Fig. 13. "Spindle" diagram illustrating the variation in relative abundance of selected sponge species during the Oxfordian of the Polish Jura, to show the trend (*see* Text-fig. 12) concerning a constant group of species

The specimens determined as "Dictyida gen. et sp. indet." etc. and those belonging to very rare species are omitted

Based on data presented *in* Text-fig. 10 and, for the localities Wrzosowa and Nowa Krystyna, on the former report (TRAMMER 1982)

1983, Figs 83—84; SCHEER 1988), recurrent changes are evident in the relative aboundance of hexactinellid and lithistid sponges during the Middle to Late Jurassic (Text — fig. 14). The Hexactinellida preavailed over the Lithistida in some time intervals (Early Bajocian, Middle Callovian, Middle to Late

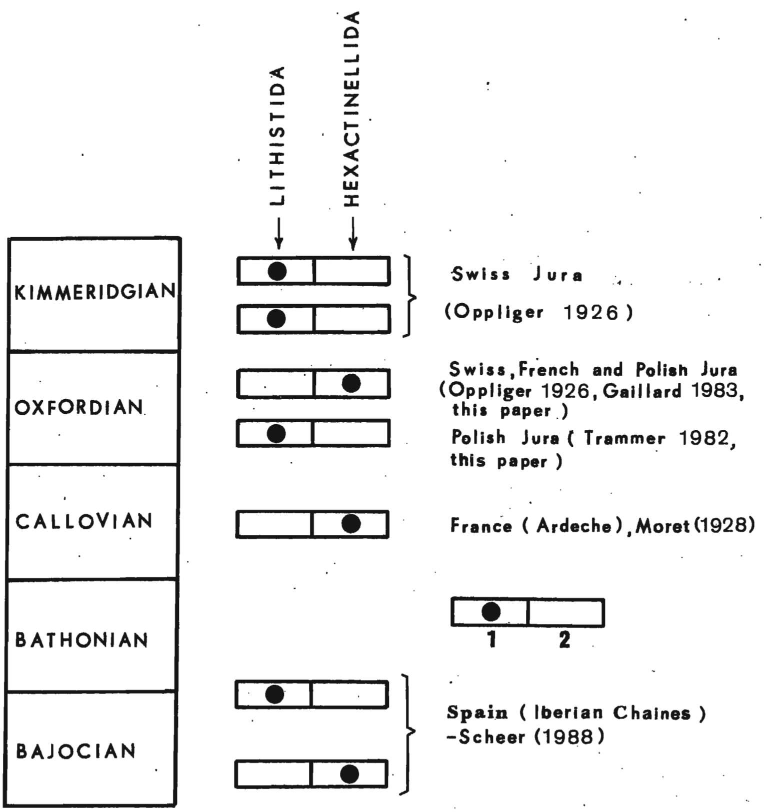



Fig. 14. Recurent changes in relative abundance of lithistid and hexactinellid sponges during the Middle and Late Jurassic
Abundance of Lithistida or Hyalospongea: 1 — dominant, 2 — subordinate

Oxfordian), whereas this relationship was reversed at other times (Late Bajocian to Early Bathonian, Early Oxfordian, and Kimmeridgian). This pattern is there presented only tentatively, as the database consists of a few and geographically scattered local faunules. In order to establish it more firmy, it is necessary to study the relative aboundance of particular sponge taxa in various geographica areas of the European sponge megafacies.

**Acknowledgements**

A grant from the National Geographic Society, offered to J. GHIOLD, enabled the Author to study the fossil sponge collections housed at the *Institut und Museum für Geologie und*

*Paläontologie*, University of Tübingen, and at the *Naturhistorisches Museum* in Basel. The Author is much grateful to all these institutions.

*Institute of Geology*
*of the University of Warsaw,*
*Al. Żwirki i Wigury 93,*
*02-089 Warszawa, Poland*

## REFERENCES

ANTONESCU, C. S. 1929. Spongieri jurasici din Dobrogea. *Acad. Rom. Sect. Stii. Ser. 3*, **5**, 482—490. Bucaresti.

BARBULESCU, A. 1974. Stratigraphie du Jurassique dans la partie Ouest de la Dobrogea Centrale, pp. 1—173. *Editura Academiei*; Bucaresti.

BEDNAREK, J. 1974. Budowa geologiczna strefy wychodni górnojurajskich między Zawierciem, Łazami i Pilicą. *Unpublished Ph. D. thesis*; University of Warsaw.

BEHMEL, H. 1970. Beiträge zur Stratigraphie und Paläontologie des Juras von Ostspanien. *N. Jb. Geol. Paläont. Abh.*, **137** (1), 1—102. Stuttgart.

BOLLIGER, W. & BURRI, P. 1970. Sedimentologie von Schelf-Carbonaten und Beckenablagerungen im Oxfordian des zentralen Schweizer Jura. *Beitr. Geol. Karte Schweiz, N. F.*, **140**, 1—96. Bern.

BRACHERT, T. C. 1986. Kontinuierliche und diskontinuierliche Sedimentation im süddeutschen Oberjura (unteres Kimmeridge; Ludwag/Oberfranken, Nördliche Frankenalb). *Facies*, **15**, 233—284. Erlangen.

BROCHWICZ-LEWIŃSKI, W. 1970. Biostratigraphy of Oxfordian limestones from the Zawodzie quarries in Częstochowa, Polish Jura Chain. *Bull. Acad. Polon. Sci., Sér. Sci. Géol. Géogr.*, **18** (4), 237—243. Warszawa.

— 1976. Oxfordian of the Częstochowa area; *II*, Lithostratigraphy versus biostratigraphy. *Bull. Acad. Polon. Sci., Sér. Sci. Terre*, **24** (1), 47—53. Warszawa.

BRUNSZ, M. 1987. Analiza facjalna i stratygrafia jury górnej pomiędzy Niegową a Dzibicami na Jurze Polskiej. *Unpublished M. Sc. thesis*; University of Warsaw.

CREVELLO, P. D. & HARRIS, P. M. 1984. Depositional models for Jurassic reefal buildups. *GCSSEPM Foundation Third Annual Research Conference Proceedings*, pp. 57—102.

DORN, P. 1932. Untersuchungen über fränkische Schwammriffe. *Abh. Geol. Landesamt. Bayer Oberbergamt*, pp. 13—44. München.

DŻUŁYŃSKI, S. 1952. The origin of the Upper Jurassic limestones in Cracow area. *Ann. Soc. Géol. Pologne*, **21** (2), 9—180. Cracow.

FIBICH, Z. 1973. Upper Jurassic Triaxonia of the Częstochowa region (Central Poland). *Ann. Soc. Géol. Pologne*, **43** (1), 41—58. Cracow.

FLÜGEL, E. & STEIGER, T. 1981. An Upper Jurassic sponge-algal buildup from the Northern Frankenalb, West Germany. *In*: D. F. TOOMEY (*Ed.*), European fossil reef models. *SEPM Spec. Publication*, **30**, 371—397. Tulsa.

FRITZ, G. K. 1958. Schwammstotzen, Tuberolithe und Schuttbreccien im Weissen Jura der Schwäbischen Alb; Eine vergleichende petrogenetische Untersuchung. *Arb. Geol. Pal. Inst. TH Stuttgart, N. F.*, **13**, 1—113. Stuttgart.

GAILLARD, C. 1971. Les Formations à spongiaires des calcaires lités (Oxfordian supérieur du Jura méridional). *Docum. Lab. Géol. Fac. Sci. Lyon*, **45**, 19—130. Lyon.

— 1972. Les éponges siliceuses des calcares lités du Jura méridional (Oxfordien supérieur). *Docum. Lab. Géol. Fac. Sci. Lyon*, **50**, 103—141. Lyon.

— 1983. Les biohermes a spongiaires et leur environment dans l'Oxfordien du Jura méridional. *Docum. Lab. Géol. Fac. Sci. Lyon*, **90**, 1—515. Lyon.

GERTH, H. 1931. Porifera. *In*: Festbundel K. MARTIN. *Leidsche Geol. Med.*, **5**, 115—119. Leiden.

GOLDFUSS, A. 1833. Petrefacta, pp. 1—252. *Arnz*; Düsseldorf.

GWINNER, M. P. 1976. Origin of the Upper Jurassic limestones of the Swabian Alb (Southwest Germany). *Contr. Sedimentology*, **5**, 1—75. Stuttgart.

GYGI, R. A. & PERSOZ, F. 1986. Mineralostratigraphy, litho- and biostratigraphy combined in correlation of the Oxfordian (Late Jurassic) formations of the Swiss Jura range. *Eclogae Geol. Helv.*, **79** (2), 455—491. Basel.

— & — 1987. The epicontinental sea of Swabia (southern Germany) in the Late Jurassic; Factors controlling sedimentation. *N. Jb. Geol. Pälaont. Abh.*, **176** (1), 49—65. Stuttgart.

HÉRENGER, L. 1941. Contribution a l'étude des spongiaires du Jurassique et du Crétecé de Catalogne. *Trav. Lab. Géol. Fac. Sci. Univ. Grenoble*, **28**, 1—51. Grenoble.

HILLER, K. 1964. Über die Bank- und Schwammfazies des Weissen Jura der Schwäbischen Alb (Württemberg). *Arb. Geol. Pal. Inst. TH Stuttgart, N. F.*, **40**, 1—190. Stuttgart.

HUMMEL, P. 1960. Petrographie, Gliederung und Diagenese der Kalke im Oberen Weissen Jura der Schwäbischen Alb. *Arb. Geol. Pal. Inst. TH Stuttgart, N. F.*, **26**, 1—86. Stuttgart.

IRMIŃSKI, W. 1987. Jura górna okolic Niegowonic. *Unpublished M. Sc. thesis*; University of Warsaw.

KAŹMIERCZAK, J. & HILLMER, G. 1974. Sclerosponge nature of the Lower Hauterivian "bryozoan" *Neuropora pustulosa* (Roemer, 1839) from Western Germany. *Acta Palaeontol. Polon.*, **19** (4), 443—453. Warszawa.

KOCH, R. & SCHORR, M. 1986. Diagenesis of Upper Jurassic sponge-algal reefs in SW Germany. *In*: J. H. SCHROEDER & B. H. PURSER (*Eds*), Reef diagenesis, pp. 224—244. *Springer*; Berlin — Heidelberg.

KOLB, R. 1910. Die Kieselspongien des schwäbischen weissen Jura. *Palaeontographica*, **57**, 141—256. Stuttgart.

KUTEK, J., MATYJA, B. A. & WIERZBOWSKI, A. 1984. Late Jurassic biogeography in Poland and its stratigraphical implications. *In*: O. MICHELSEN & A. ZEISS (*Eds*), International Symposium on Jurassic Stratigraphy, pp. 743—754. Copenhagen.

KUTEK, J., WIERZBOWSKI, A., BEDNAREK, J., MATYJA, B. A. & ZAPAŚNIK, T. 1977. Notes on the Upper Jurassic in the Polish Jura Chain. *Przegląd Geol.*, 8/9, 438—445. Warszawa.

LAGNEAU-HÉRENGER, L. 1951. Sur les gisements a spongiares siliceux du Jurassique Supérieur français. *Bull. Soc. Géol. France, Sér. 6*, **1**, 67—74. Paris.

de LAUBENFELS, M. W. 1955. Porifera. *In*: R. C. MOORE (*Ed.*), Treatise on Invertebrate Paleontology, Part E (Archaeocyatha, Porifera), *E21*—*E122*. Lawrence, Kansas.

ŁACWIK, H. 1970. Biostratygrafia i sedymentologia oksfordu ostańca Wysokiej. *Unpublished M. Sc. thesis*; University of Warsaw.

MATYJA, B. A. 1976. Oksford południowo-zachodniego obrzeżenia Gór Świętokrzyskich. *Unpublished Ph. D. thesis*; University of Warsaw.

— 1984. The ammonite distribution within the sponge megafacies, Oxfordian Stage. *In*: O. MICHELSEN & A. ZEISS (*Eds*), International Symposium on Jurassic Stratigraphy, pp. 479—480. Copenhagen.

MEYER, R. K. F., MÜLLER, W. & ÜBELACKER, L. 1987. Die Schwamm- und Begleitfauna eines Schwammriffes des Unteren Malm in der Oberpfalz. *Geol. Bl. NO-Bayern*, **37** (1/2), 63—88. Erlangen.

MEYER, R. & SCHMIDT-KALER, H. 1983. Erdgeschichte sichtbar gemacht; Ein geologischer Führer durch die Altmühlalb, pp. 1—260. *Bayerisches Geologisches Landesamt*; München.

MORET, L. 1928. Les spongiaires siliceux du Callovien de la Voulte-sur-Rhône (Ardeche). *Trav. Lab. Géol. Fac. Sci. Lyon, Fasc. 13*, Mém. 11, 124—139. Lyon.

MÜLLER, W. 1972. Beobachtungen an der hexactinelliden Juraspongie *Pachyteishisma lamellosa* (Goldf.). *Stuttgarter Beitr. Naturk. B*, **2**, 1—10. Stuttgart.

— 1974. Beobachtungen an der hexactinelliden Juraspongie *Casearia articulata* (Schmidel). *Stuttgarter Beitr. Naturk. B*, **12**, 1—19, Stuttgart.

— 1984. Die Kalkschwamme der Unterordnung Inozoa Steinmann aus dem Oberen Jura von Württemberg (SW-Deutschland). *Stuttgarter Beitr. Naturk. B*, **100**, 1—85. Stuttgart.

— 1987. Revision der Gattung *Cnemidiastrum* (Demospongia, Rhizomorina) nach Material aus dem Weissen Jura der Schwäbischen Alb. *Stuttgarter Beitr. Naturk. B*, **129**, 1—31. Stuttgart.

— 1988. Revision der Gattungen *Hyalotragos* und *Pyrgochonia* (Demospongia, Rhizomorina) nach Material aus dem Weissen Jura der Schwäbischen Alb. *Stuttgarter Beitr. Naturk. B*, **143**, 1—31. Stuttgart.

NEUMAN, A. C., KOFOED, J. W. & KELLER, G. H. 1977. Lithoherms in the straits of Florida. *Geology*, **5**, 4—10.

NITZOPOULOS, G. 1974. Faunistisch-ökologische, stratigraphische und sedimentologische Untersuchungen am Schwammstozen-Komplex bei Spielberg am Hahnenkamm (Ob. Oxfordian, Südliche Frankenalb). *Stuttgarter Beitr. Naturk. B*, **16**, 1—143. Stuttgart.

ODIN, G. S. 1984. Geochronology of the Jurassic time: status in 1984. *In*: O. MICHELSEN & A. ZEISS (*Eds*), International Symposium on Jurassic Stratigraphy, pp. 767—776. Copenhagen.

OPPLIGER, F. 1897. Die Juraspongien von Baden. *Abh. Schweiz. Paläont. Ges.*, **24**, 1—58. Zürich.
— 1907. Spongien aus dem Argovien *I* (Birmenstorferschichten) des Department du Jura, Frankreich. *Abh. Schweiz. Paläontol. Ges.*, **34**, 1—19. Zürich.
— 1915. Die Spongien der Birmensdorferschichten des schweizerischen Jura. *Abh. Schweiz. Paläont. Ges.*, **40**, 1—84. Genève.
— 1926. Kieselspongien des schweizerischen weissen Jura. *Abh. Schweiz. Paläontol. Ges.*, **46**, 1—76. Genève.
— Die Kalkschwämme des schweizerischen Jura. *Abh. Schweiz. Paläontol. Ges.*, **48**, 1—31. Basel.
QUENSTEDT, F. A. 1878. Die Schwämme. *In*: Petrefactenkunde Deutschlands, **5**, 1—612. *Fues's Verlag* (*R. Reisland*); Leipzig.
PALMER, T. J. & FÜRSICH, F. T. 1981. Ecology of sponge reefs from the Middle Jurassic of Normandy. *Palaeontology*, **24** (1), 1—23. London.
PAULSEN, S. 1974. Aufbau und Petrographie des Riffkomplexes von Arnegg im hoheren Weissen Jura der Schwabischen Alb (Württemberg). *Arb. Geol. Pal. Inst. TH Stuttgart, N. F.*, **42**, 1—98. Stuttgart.
RIGBY, J. K. 1969. Sponges and reef and related facies through time. *Proc. North Amer. Pal. Convention*, pp. 1374—1388.
ROLL, A. 1934. Form, Bau und Entstehung der Schwammstozen im süddeutschen Malm. *Paläont. Zt.*, **16**, 197—246. Berlin.
RÓŻYCKI, S. Z. 1953. Górny dogger i dolny malm Jury Krakowsko — Częstochowskiej. *Prace Inst. Geol.*, **17**, 1—335. Warszawa.
SCHEER, U. 1988. Influences of the paleogeographic position and sea-level-changes on spongiolitic limestones in the Lower Bajocian (discites — to humphresianum — zone; Middle Jurassic) in Northern Spain. *Berliner Geowiss. Abh. A*, **100**, 36—37. Berlin.
SCHORR, M. & KOCH, R. 1985. Fazieszonierung eines oberjurassischen Algen-Schwamm-Bioherms (Herrlingen, Schwäbische Alb). *Fazies*, **13**, 227—270. Erlangen.
SCHRAMMEN, A. 1937. Die Kieselspongien des Oberen Jura von Süddeutschland; B, Besonderer Teil. *Palaeontographica A*, **85**, 1—114. Stuttgart.
SHINN, E. A. 1969. Submarine lithification of Holocene carbonate sediments in the Persian Gulf. *Sedimentology*, **12** (1/2), 109—144. Amsterdam.
SIEMIRADZKI, J. 1913. Les spongiaires Jurassiques de la Pologne. *Paléntol. Pologne*, **1**, 1—50. Warszawa.
TRAMMER, J. 1979. Some aspects of the biology of fossil solid-branching demosponges, exemplfied by *Reiswigia ramosa* gen. n., sp. n., from the Lower Oxfordian of Poland. *Acta Geol. Polon.*, **29** (1), 39—49. Warszawa.
— 1982. Lower to Middle Oxfordian sponges of the Polish Jura. *Acta Geol. Polon.*, **32** (1/2), 1—39. Warszawa.
— 1985. Sponge bioherms in the Jasna Góra Beds (Oxfordian of the Polish Jura Chain). *Przegląd Geol.*, 2, 78—81. Warszawa.
WAGENPLAST, P. 1972. Ökologische Untersuchung der Fauna aus Bank- und Schwammfazies des Weissen Jura der Schwabischen Alb. *Arb. Inst. Geol. Paläont. Univ. Stuttgart, N. F.*, **67**, 1—99. Stuttgart.
WAGNER, W. 1963. Kieselchwämme und Schwammökologie im Korallenkalk des oberen Malm von Laisacker bei Neuburg an der Donau. *Mitt. Bayer. Staatssamml. Paläont. Hist. Geol.*, **3**, 1—20. München.
WIEDENMAYER, F. 1978. Modern sponge bioherms of the Great Bahama Bank. *Eclogae Geol. Helv.*, **71** (3), 699—744. Basel.
— 1979. Modern sponge bioherms of the Great Bahama Bank and their likely ancient analogues. *Colloques internationaux du C. N. R. S.*, **291** (Biologie des spongiaires), pp. 281—296. Paris.
WIERZBOWSKI, A. 1978. Ammonites and stratigraphy of the Upper Oxfordian of the Wieluń Upland, Central Poland. *Acta Geol. Polon.*, **28** (3), 299—333. Warszawa.
—, MATYJA, B. A. & ŚLUSARCZYK-RADWAN, D. 1983. Nowe dane o górnej jurze Wyżyny Wieluńskiej i okolic Burzenina oraz jej znaczeniu surowcowym. *Kwartalnik Geol.*, **27** (3), 517—533. Warszawa.
WILSON, J. L. 1975. Carbonate facies in geologic history, pp. 1—471. *Springer*; Berlin — Heidelberg — New York.
WIRSING, G. & KOCH, R. 1986. Algen-Schwamm-Bioherme des Flachwasser-Bereiches (Schwäbische Alb, Weissjura Delta 3). *Facies*, **14**, 285—308. Erlangen.

ZANKL, H. 1969. Structural and textural evidence of early lithification in fine-grained carbonate rocks. *Sedimentology*, **12** (3/4), 241—256. Amsterdam.
ZIEGLER, B. 1967. Ammoniten-Ökologie am Beispiel des Oberjura. *Geol. Rundschau*, **56** (2), 439—464. Stuttgart.
— 1977. The "White" (Upper) Jurassic in Southern Germany. *Stuttgarter Beitr. Naturk. B*, **26**, 1—79. Stuttgart.
von ZITTEL, K. A. 1877. Studien über fossile Spongien; *I*, Hexactinellidae. *Abh. K. Bayer. Akad. Wiss., Math.-Phys. Kl.*, **13**, 1—63. München.
— 1878. Studien über fossile Spongien. Zweite Abteilung: Lithistidae. *Abh. K. Bayer. Akad. Wiss., Math.-Phys. Kl.*, **13**, 66—153. München.

---

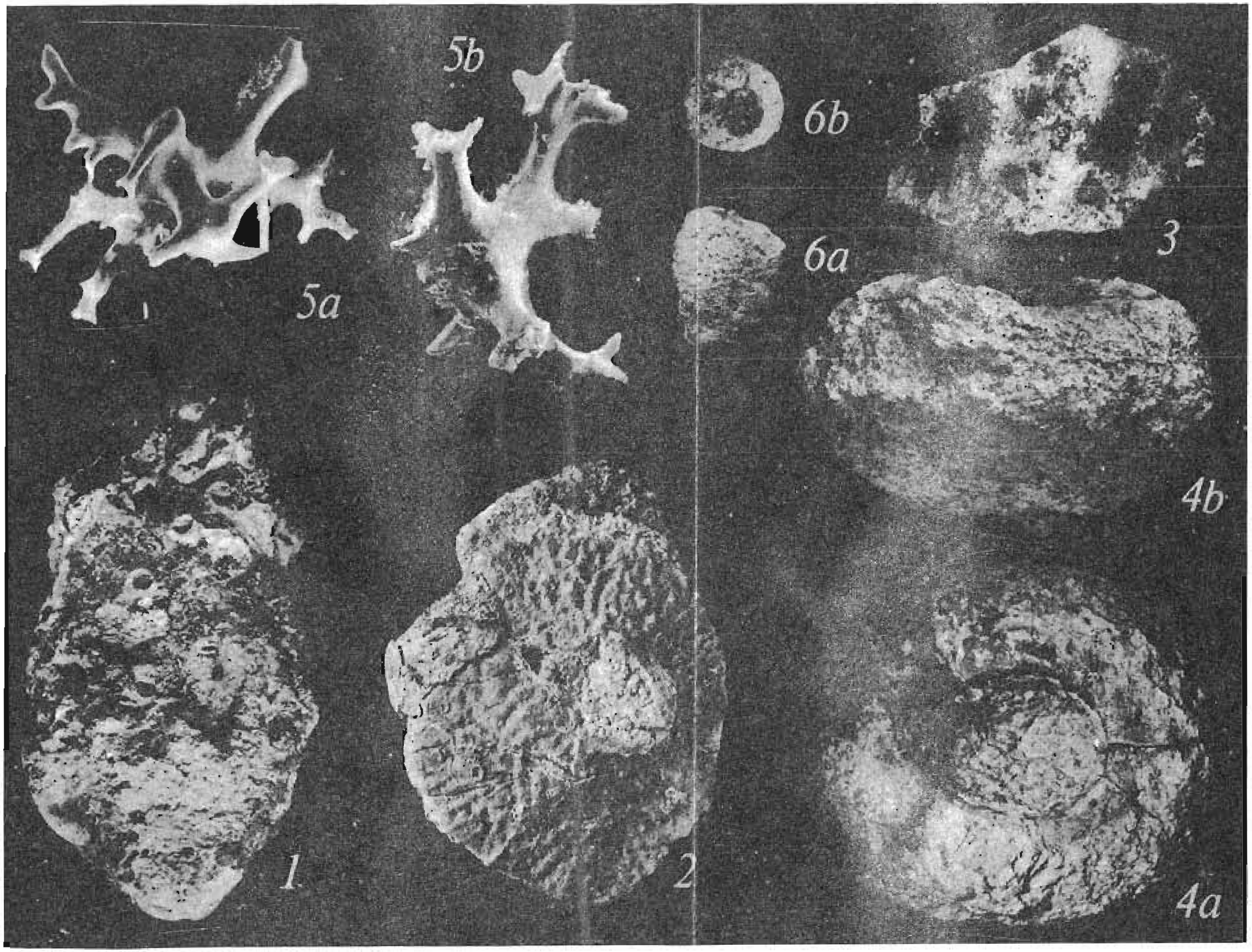
J. TRAMMER

## GĄBKI ŚRODKOWEGO I GÓRNEGO OKSFORDU JURY POLSKIEJ

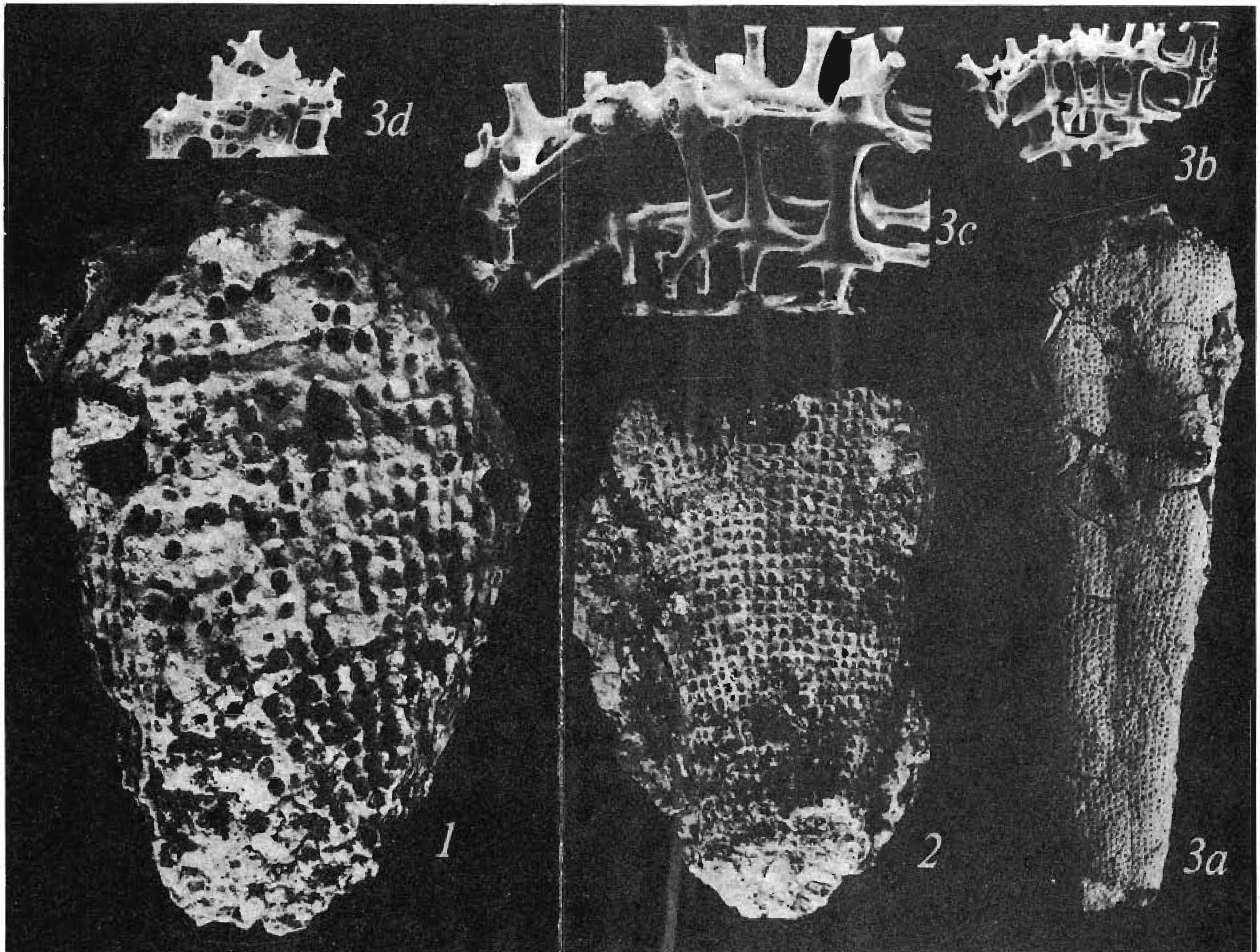
### (Streszczenie)

Przedmiotem pracy są gąbki środkowego i górnego oksfordu Jury Polskiej. Pochodzą one (*patrz* fig. 1—9 oraz pl. 1—6) z wapieni płytowych (kamieniołomy Zawodzie, Dymnik, Biorów), gąbkowych wapieni gruzłowych (Wysoka), gąbkowych wapieni marglistych (Trzebinia), wapieni skalistych (Prędziszów, Mirów, Niegowonice, Trzebinia, Kielniki, Podzamcze, Zalesiaki), wapieni kredowatych (Lisowice, Raciszyn, Niwiska) oraz wapieni krynoidowych z koralowcami (Dobrogoszczyce). Gąbki występują zarówno w obrębie osadów dobrze warstwowanych, jak i w obrębie bioherm. Wśród tych ostatnich wyróżniono biohermy „luźne", które powstały wyłącznie w wyniku obfitego nagromadzenia gąbek, oraz biohermy „sztywne", które podlegały wczesnej diagenezie. Stwierdzono, że osady zawierające masowo występujące gąbki krzemionkowe były osadzane poniżej sztormowej podstawy falowania. W wodach płytszych powstały tylko wapienie krynoidowe z koralowcami, gdzie przeważały gąbki wapiennoszkieletowe. Ogółem znaleziono 1235 okazów, wśród których stwierdzono 68 gatunków (*patrz* fig. 10): 47 gatunków należy do gromady Hyalospongea, 16 do gromady Demospongea (przede wszystkim rzędu Lithistida), 4 do gromady Calcispongea, zaś 1 do gromady Sclerospongea. Okazy należące do 11 powszechnie występujących gatunków stanowią aż 74% wszystkich znalezionych form. Zespół gąbkowy podlegał podczas trwania oksfordu charakterystycznym zmianom (*patrz* fig. 12). Na początku piętra dominowały litistidy, stanowiące 96% wszystkich znalezionych okazów. Następnie udział ich w zespole stopniowo zmniejszał się, a jednocześnie zwiększała się częstość występowania przedstawicieli gromady Hyalospongea, którzy wreszcie przy końcu oksfordu stanowili 90% wszystkich okazów. Opisany trend miał charakter ekologiczny, ponieważ (*patrz* fig. 13) przez cały oksford trwały te same gatunki, a zmianie podlegała tylko hierarchia dominacji w obrębie tworzonego przez nie zespołu. Zwrócono uwagę, że podczas środkowej i górnej jury Europy w pewnych okresach dominowały Hyalospongea, zaś w innych Lithistida, a zmiany te miały charakter periodyczny (*patrz* fig. 14). W systematycznej części pracy opisano wszystkie rozpoznane taksony (*patrz* fig. 11 oraz pl. 7—18).

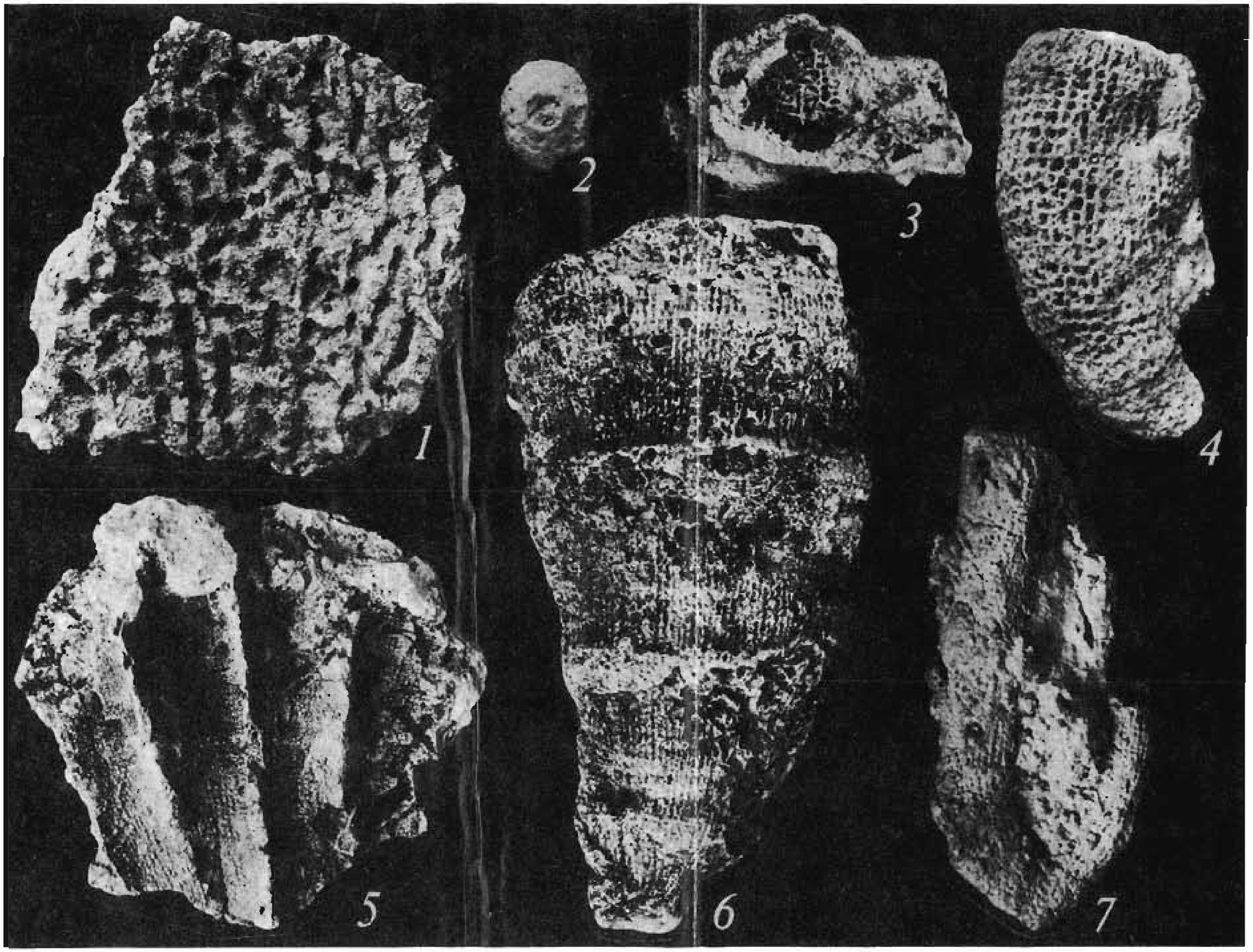
---



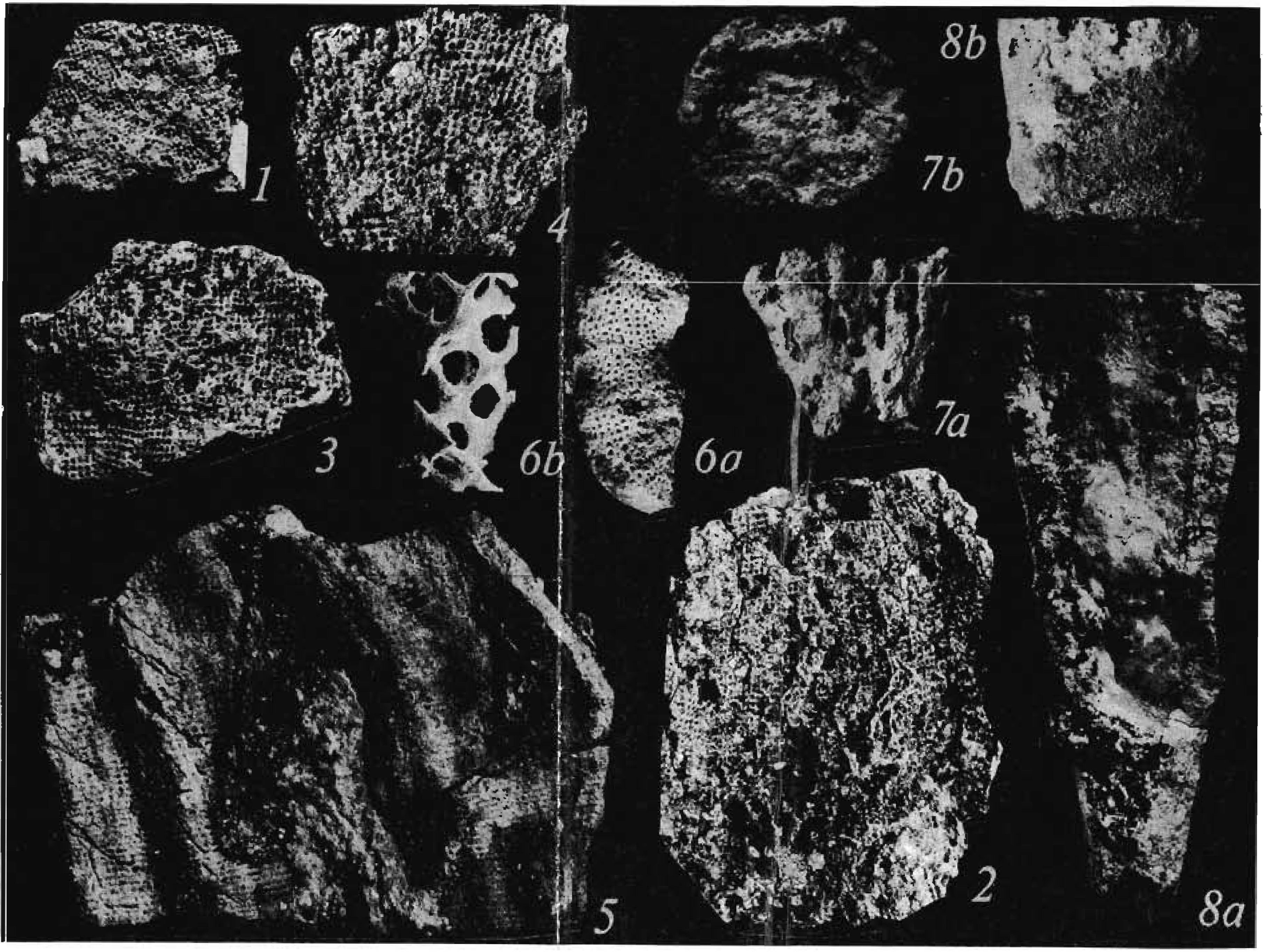

1 — *Bothrolemma osculifera* (KOLB); locality Niegowonice, nat. size; 2 — *Hyalotragos radiatum* (GOLDFUSS); Trzebinia, × 0.5; 3 — *Porospongia marginata* (MÜNSTER *in* GOLDFUSS); Lisowice, nat. size; 4 — *Stauractinella jurassica* ZITTEL; Trzebinia (*4a* top, *4b* side view), × 0.75; 5 — *Lecanella* sp., desmas; Trzebinia, × 50; 6 — *Erineum minutum* SCHRAMMEN; Trzebinia, × 1.5



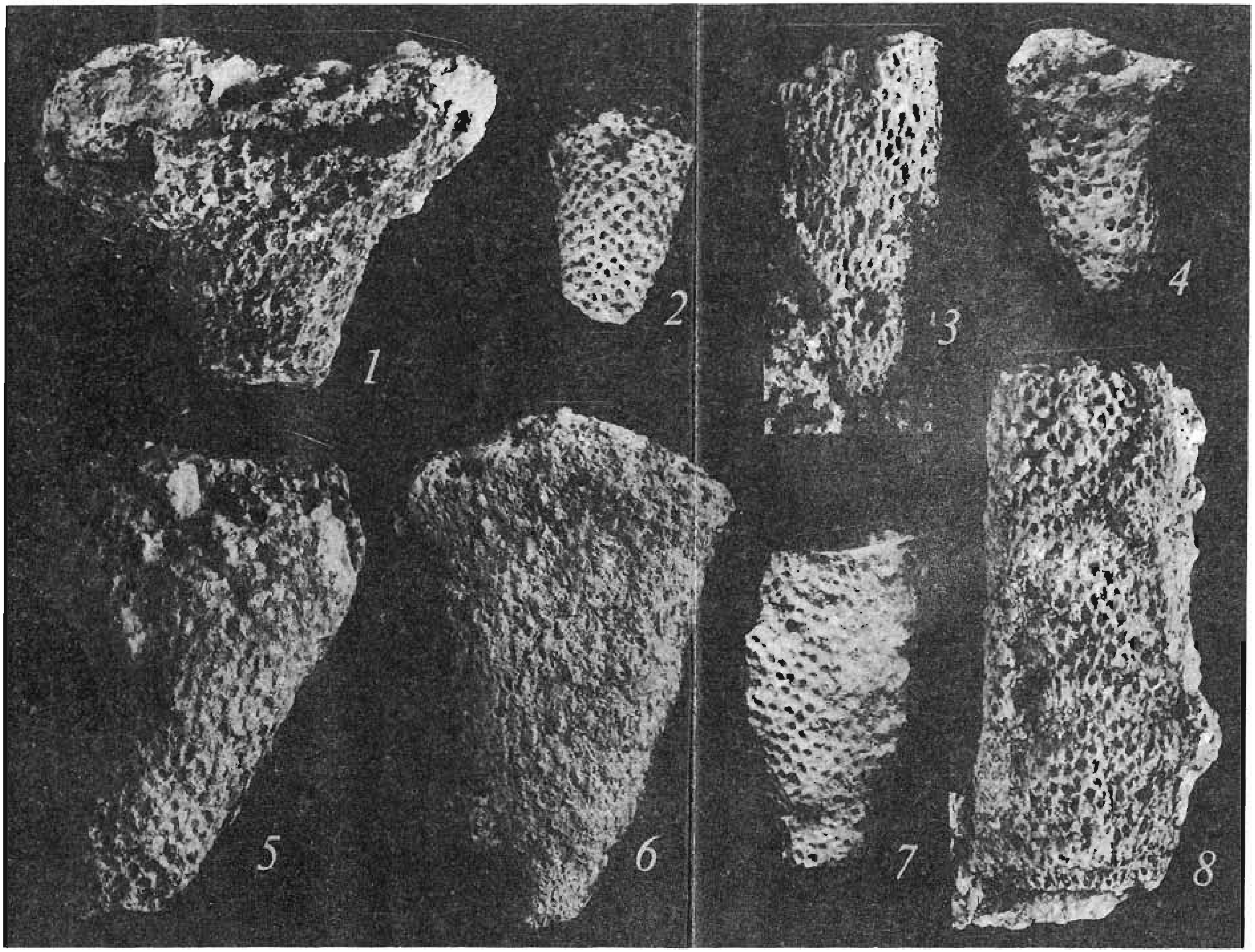

**1** — *Craticularia clathrata* (GOLDFUSS); locality Podzamcze, nat. size; **2** — *Craticularia paradoxa* (GOLDFUSS); Trzebinia, nat. size; **3** — *Craticularia paralella* (GOLDFUSS); Niegowonice (*3a* side view, × 0.75; *3b-3d* various parts of parenchymal skeleton, 10, × 15, × 10)



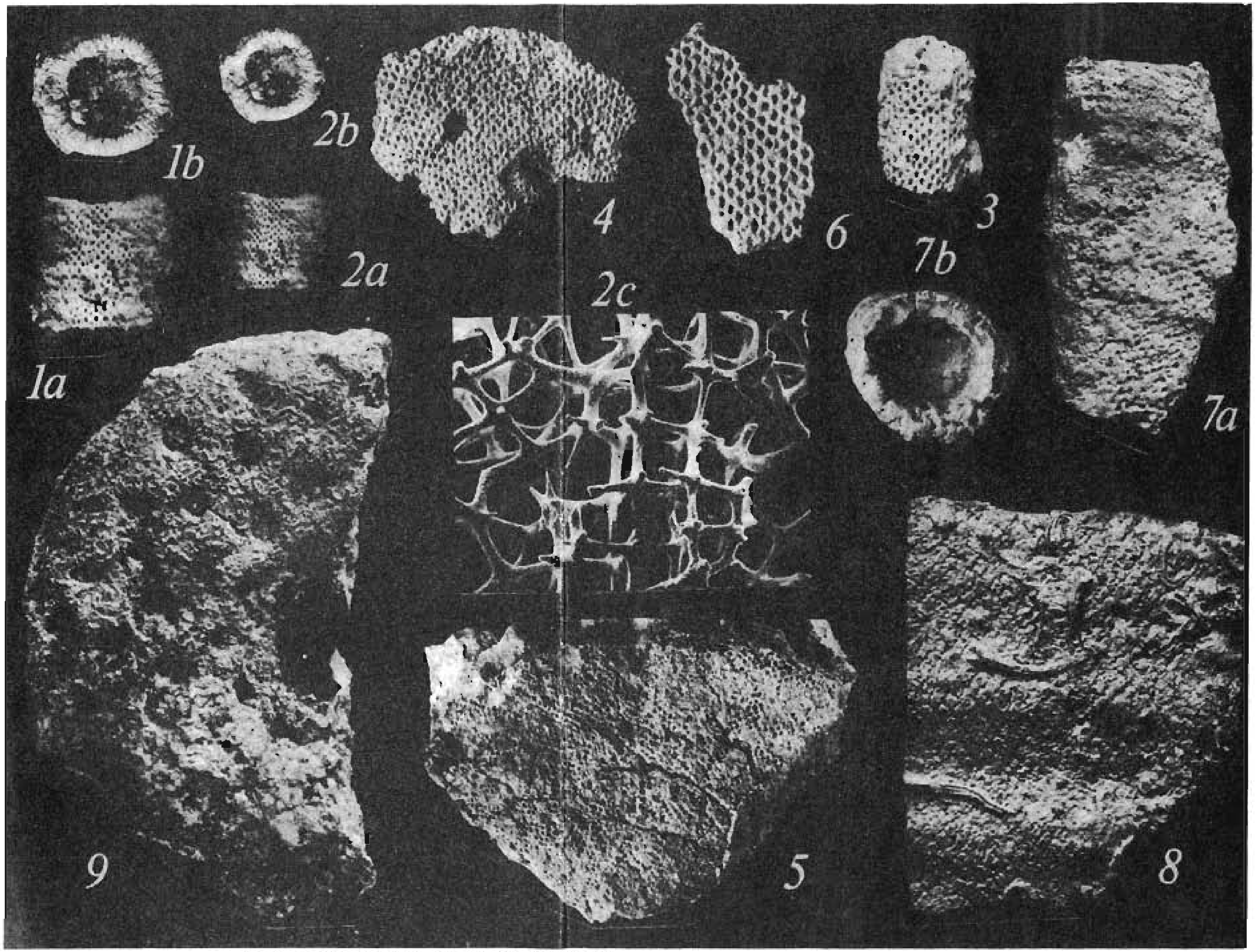

1 — *Craticularia clathrata* (GOLDFUSS); locality Kielniki, × 0.75; 2 — *Multiloqua fungiformis* (GOLDFUSS); Trzebinia (top view), nat. size; 3 — *Dactylocalyx* sp.; Prędziszów, nat. size; 4 — *Craticularia paradoxa* (GOLDFUSS); Trzebinia, nat. size; 5 — *Paracraticularia procumbens* (GOLDFUSS); Kielniki, × 0.75; 6 — *Craticularia paralella* (GOLDFUSS); Niwiska, × 0.75; 7 — *Paracraticularia tubifera* SCHRAMMEN; Lisowice, nat. size



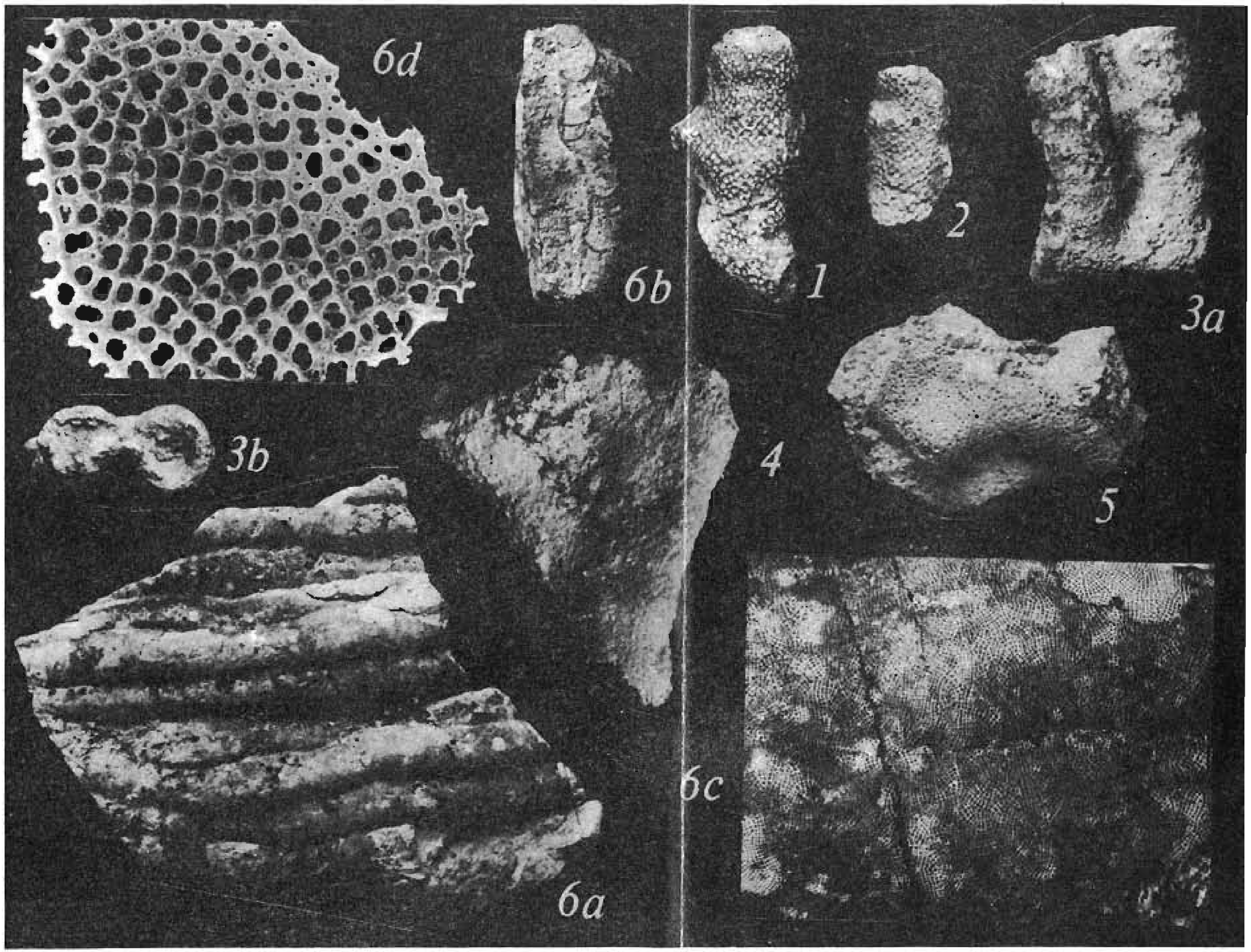

**1-2** — *Thyroidium lineatum* (SCHRAMMEN); locality Kielniki, nat. size (external sides); **3-4** — *Thyroidium schweiggeri* (GOLDFUSS); Kielniki, nat. size; **5** — *Thyroidium lineatum*(SCHRAMMEN); Trzebinia, nat. size (internal side); **6** — *Pachyascus punctatus* SCHRAMMEN; Trzebinia (*6a* side view, nat. size; *6b* part of parenchymal skeleton, × 10); **7** — *Psephosyllogus* sp.; Lisowice, nat. size (*7a* side, *7b* top view); **8** — *Pycnocalyptra* aff. *calyx* SCHRAMMEN; Wysoka (*8a* side view, nat. size; *8b* fragment, × 2 — part of dermal skeleton and pores are visible)



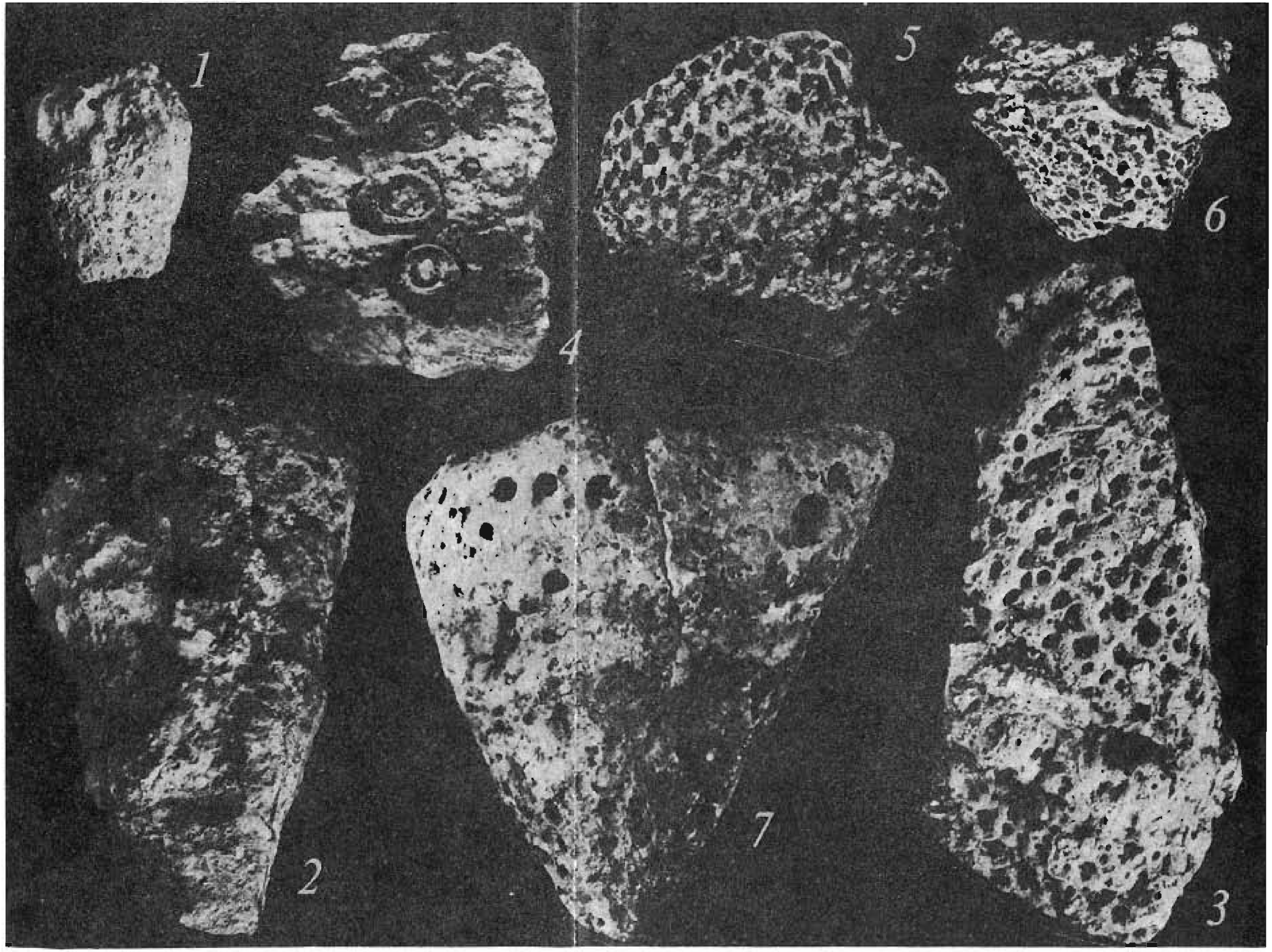

1-8 — *Tremadictyon reticulatum* (GOLDFUSS): 1 and 6 — locality Lisowice; 2 and 7 — Zalesiaki; 3 and 8 — Kielniki; 4 — Podzamcze; 5 — Mirów. All photos in nat. size



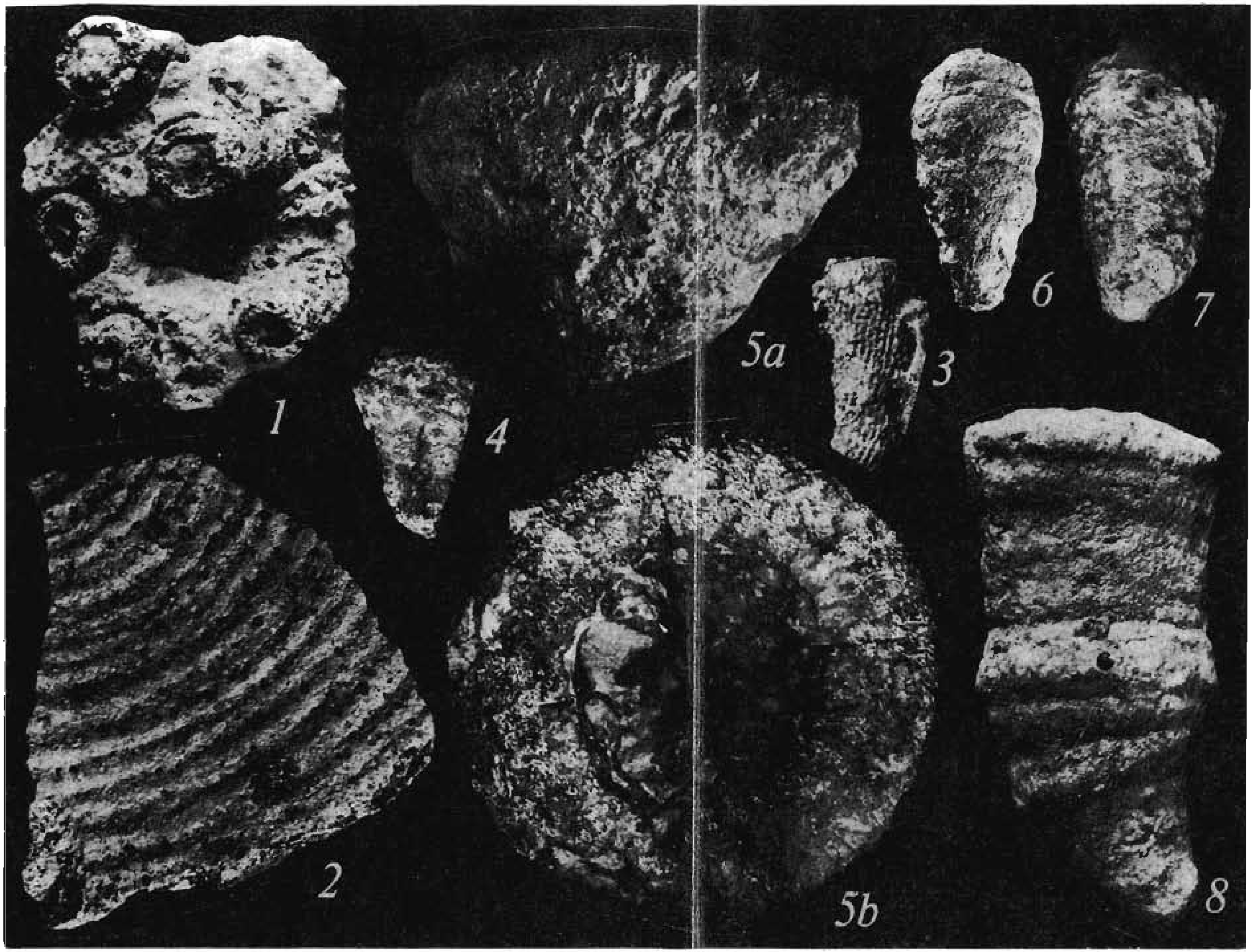

1-3 — *Ordinatus texturatus* (GOLDFUSS); 1 — locality Trzebinia, × 1.5 (*1a* side, *1b* top view), 2 — Trzebinia (*2a* side, *2b* top view in nat. size; *2c* parenchymal skeleton, × 30). 3 — Zalesiaki, nat. size; 4-5 — *Xenoschrammeneum punctatum* (SCHRAMMEN); 4 — Zalesiaki, nat. size; 5 — Kielniki, nat. size; 6 — *Xenoschrammenum alternans* (SCHRAMMEN); Zalesiaki, nat. size; 7 — *Walcotella pertusa* (GOLDFUSS); Trzebinia, nat. size (*7a* side, *7b* top view); 8 — *Tremadictyon rugatum* (QUENSTEDT); Lisowice, nat. size; 9 — *Stauroderma lochense* (QUENSTEDT); Dymnik, nat. size



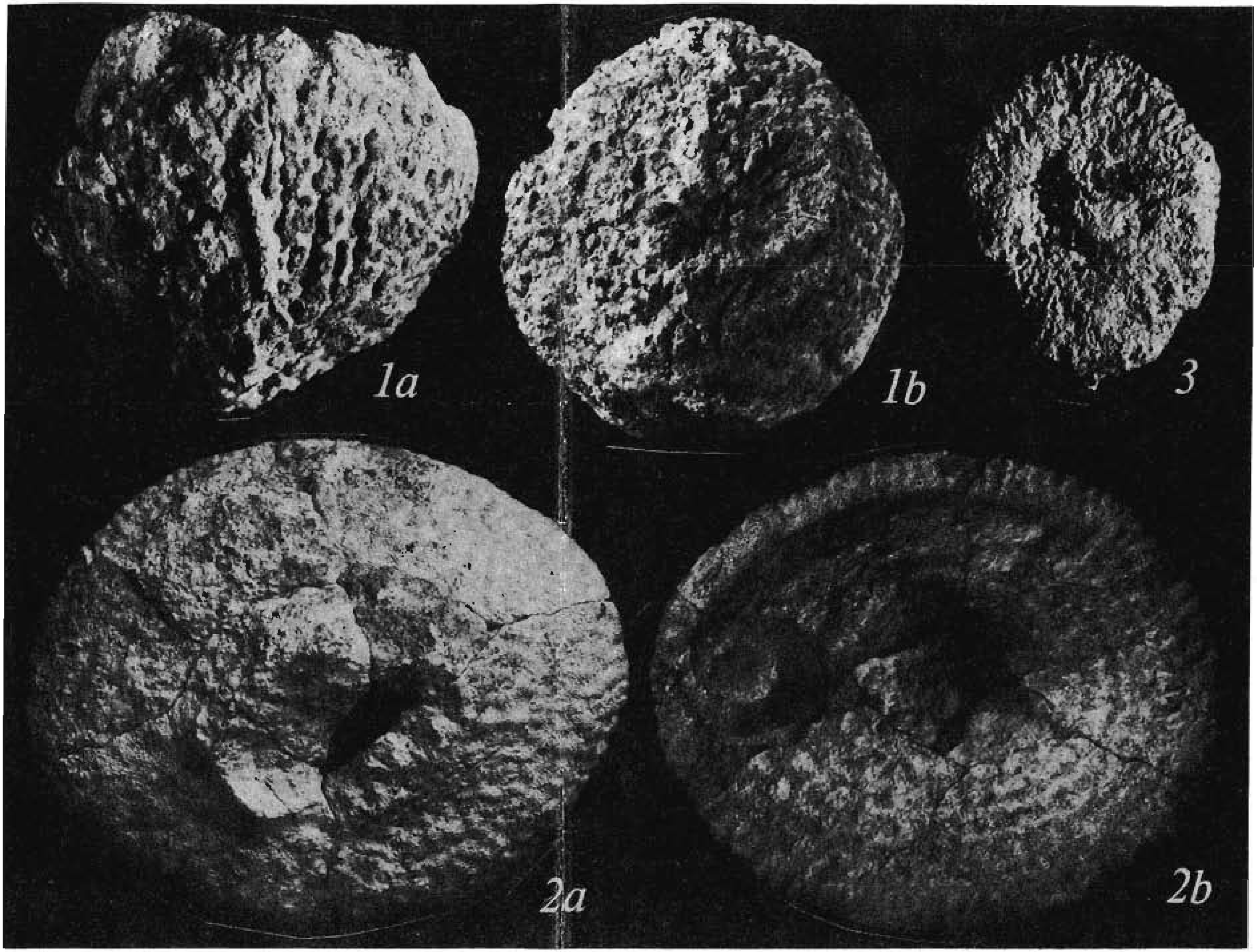

1-5 — *Ramispongia ramosa* (QUENSTEDT): 1-3 — locality Wrzosowa (*see* TRAMMER 1982), nat. size (*3a* side *3b* top view); 4 — Niwiska, nat. size; 5 — Biirów, nat. size; 6 — *Casearia* sp.; Trzebinia (*6a* top view of a fragment, × 0.75; *6b* side view, × 0.75; *6c* dermal skeleton, × 2; *6d* the same, × 20)



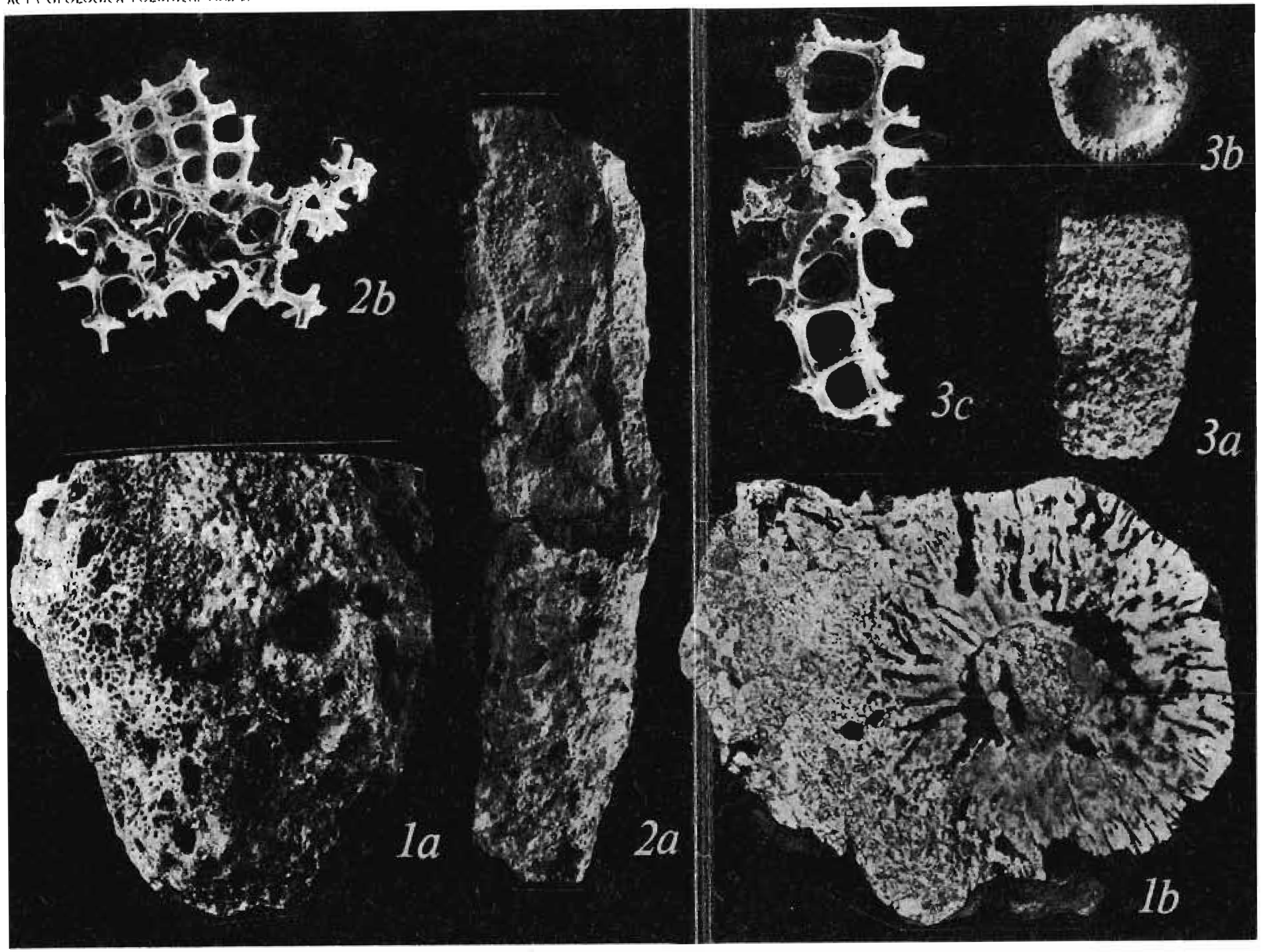

1-2 — *Polygonatium sphaeroides* SCHRAMMEN; locality Trzebinia, nat. size; 3 — *Polygonatium* sp.; Trzebinia, fragment, × 0.75; 4 — *Verrucocoelia gregaria* (QUENSTEDT); Zawodzie, nat. size; 5-7 — *Tremadictyon reticulatum* (GOLDFUSS); 5-6 — Kielniki, nat. size; 7 — Podzamcze, nat. size



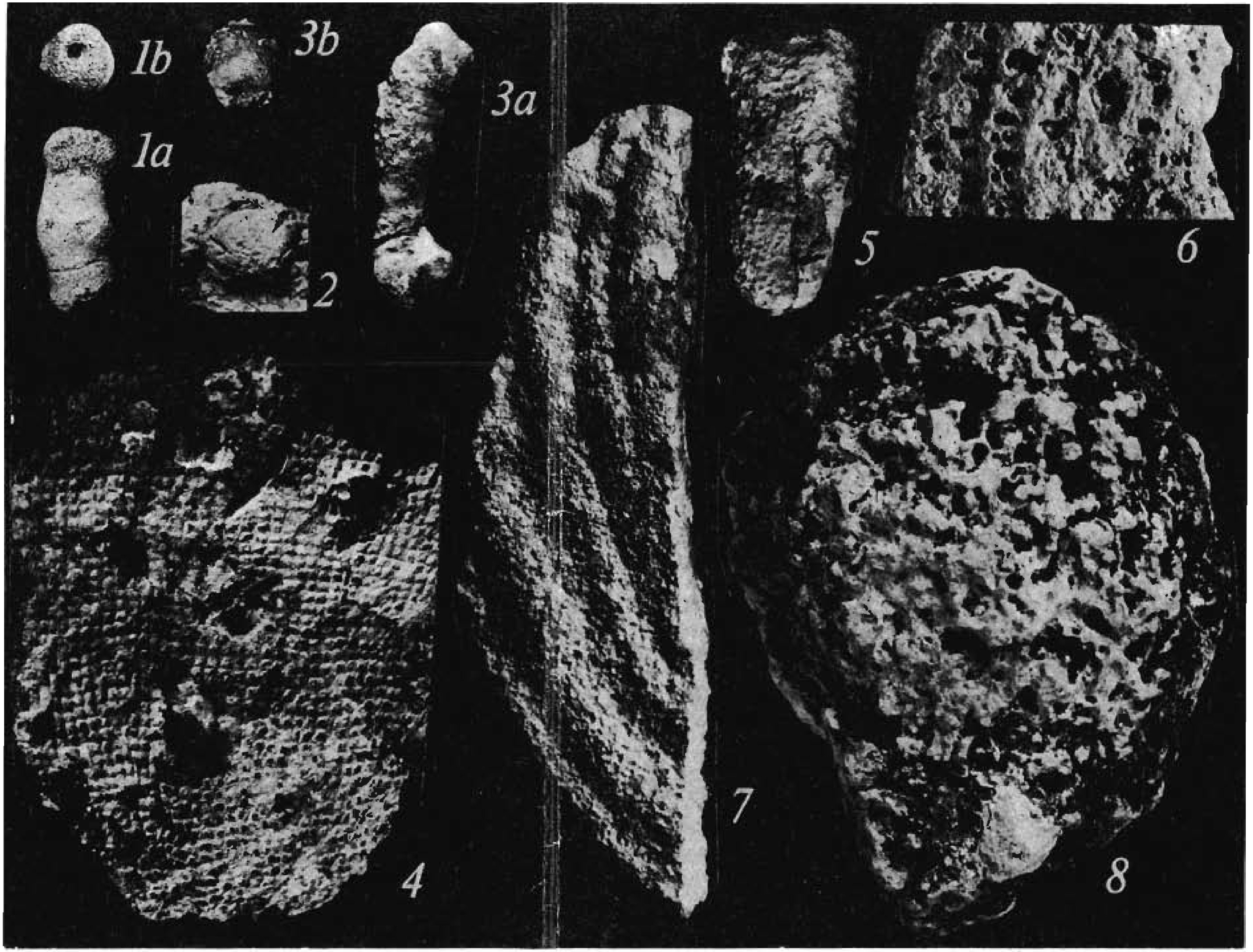

1 – *Paracypellia prolifera* (ZITTEL); locality Zawodzie, nat. size; **2** – *Placotelia marconi* (FROMENTEL); Lisowice, × 0.5 **3** – *Trochobolus texatus* (GOLDFUSS); Niegowonice, nat. size. **4-8** – *Cypellia rugosa* (GOLDFUSS); 4–7 – Trzebinia, nat. size (*5a* side *5b* top view); 8 – Raciszyn, nat. size




1 — *Pachyteischma lamellosa* (GOLDFUSS); locality Zalesiaki, nat. size (*1a* side, *1b* bottom view); 2 — *Placotelia rugatum* OPPLIGER; Niegowonice, nat. size (*2a* bottom, *2b* top view); 3 — *Linonema calyx* (SHRAMMEN); Raciszyn, nat. size




1 — Gen. et sp. indet.; locality Kielniki, × 0.75 (*1a* side, *1b* top view); 2 — *Coscinaulus* aff. *micropora* SCHRAMMEN; Wysoka (*2a* side view, × 0.75; *2b* parenchymal skeleton, × 25); 3 — *Trochobolus texatus* (GOLDFUSS); Trzebinia (*3a* side; *3b* top view, nat. size; *3c* parenchymal skeleton, × 80)




1 — *Peronidella cylindrica* (GOLDFUSS); locality Dobrogoszczyce, nat. size (*1a* side, *1b* top view); 2 — *Blastinia costata* (MÜNSTER in GOLDFUSS); Lisowice, × 1.5; 3 — *Radicispongia radiciformis* (GOLDFUSS); Raciszyn, nat. size (*3a* side, *3b* top view); 4-5 — *Craticularia clathrata* (GOLDFUSS); Dymnik, nat. size; 7 — *Sporadopyge speciosa* SCHRAMMEN; Lisowice, nat. size; 8 — *Pachyrhachis* sp.; Podzamcze, nat. size