26. JURASSIC FORAMINIFERS FROM THE MAZAGAN PLATEAU, DEEP SEA DRILLING PROJECT SITE 547, LEG 79, OFF MOROCCO[1]

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ABSTRACT

The first marine incursion of the incipient North Atlantic Ocean is recorded in the uppermost Triassic to Lower Jurassic sequence of DSDP Site 547 off central Morocco. A lithologic change from continental red beds below to slope breccias and hemipelagic carbonates above indicates that a carbonate ramp was probably established by Sinemurian time along the Moroccan continental margin and that subsidence in the adjacent basin was rapid in the early phases of continental rift. Foraminifers recovered from the Liassic (Sinemurian–Pliensbachian) basinal deposits are diverse and well preserved. The faunas are compositionally similar to contemporaneous neritic assemblages of Europe and the Grand Banks of Newfoundland. The Middle Jurassic in Hole 547B is characterized by regressive deposits that are poor in foraminifers. The major Late Jurassic "Atlantic" transgression is again represented by basinal deposits consisting of limestone breccias and pelagic carbonates. Foraminifers recovered from this interval are transitional between Late Jurassic assemblages reported from deep-sea deposits in the North Atlantic and typical Late Jurassic neritic assemblages of Europe. The Late Jurassic assemblages of Hole 547B are primarily dominated by nodosariids and spirillinids with moderate abundances of simple arenaceous forms. Nonreticulate epistominids occur very rarely in the Upper Jurassic of Hole 547B. It is tentatively suggested that these represent upper bathyal assemblages.

INTRODUCTION

An undeformed sequence of Jurassic carbonates and carbonate breccias with lesser amounts of interbedded shales was drilled at Site 547 from the area of the distal continental margin off Morocco (Fig. 1). The Jurassic section at Hole 547B is relatively thin (154 m) and contains stratigraphic gaps, particularly between the Lias (Lower Jurassic) and Dogger (Middle Jurassic). Although this part of the Northwest African continental margin was essentially sediment-starved during the Jurassic, the vertical lithologic changes compare favorably with deep-water Tethyan sections from around the Mediterranean (Bernoulli and Kälin, this volume) and the central North Atlantic (Jansa et al., this volume). Transgressive/regressive phases inferred from the stratigraphic record of Site 547 generally parallel those interpreted from Moroccan epicontinental sections (Ager, 1974; Jansa and Wiedmann, 1982).

The Jurassic carbonate section of Site 547 (Unit VI) overlies (?)Rhaetian–Hettangian (uppermost Triassic–Lower Jurassic) continental red beds (Fenton, this volume). This site records the first marine incursion of the incipient central North Atlantic Ocean. The underlying continental deposits change rapidly upward to hemipelagic and mass-flow deposits of the slope environment. The Lower Jurassic (Core 547B-24 to Section 547B-14-2) consists of limestone breccias overlain by redeposited(?) nodular limestones with minor black shales (Fig. 2). By Sinemurian time a carbonate ramp was probably already established along the adjacent Moroccan margin and was a source of the redeposited sediment.

Section 547B-14-2 through Sample 547B-11,CC contain limestone breccias. The core-catcher sample from Core 11 contains a rich foraminiferal fauna indicating a late Pliensbachian age, but a Middle Jurassic age is suggested from lithostratigraphic considerations (Steiger and Jansa, this volume; ?regressive Bajocian, Jansa et al., this volume). The Middle and Upper Jurassic section of Hole 547B consists of hardground cycles in Core 11 (Steiger and Jansa, this volume; Jansa et al., this volume) followed by limestone breccias and pelagic carbonates with intervals of turbidites in Core 547B-10 through Section 547B-6-2.

For detailed lithologic descriptions and interpretations of the upper Triassic–Jurassic sequence, we refer the reader to the site chapter, to chapters by Jansa et al., Bernoulli and Kälin, Steiger and Jansa, to the Leg 79 synthesis by Hinz and Winterer (this volume) and to Gradstein et al., 1975.

In this contribution we describe Jurassic foraminifers and other associated microbiota found in washed residues from Hole 547B. Figure 3 summarizes the distribution of the various foraminiferal superfamilies through the section. Figure 4 shows the distribution of the foraminiferal species recorded at Site 547B and their relative abundances, and Figure 5 the distribution and relative abundances of other microbiota encountered. For detailed biostratigraphic discussions of other fossil groups, the reader is referred to chapters by Azéma and Jaffrezo

[1] Hinz, K., Winterer, E. L., et al., *Init. Repts. DSDP*, 79: Washington (U.S. Govt. Printing Office).

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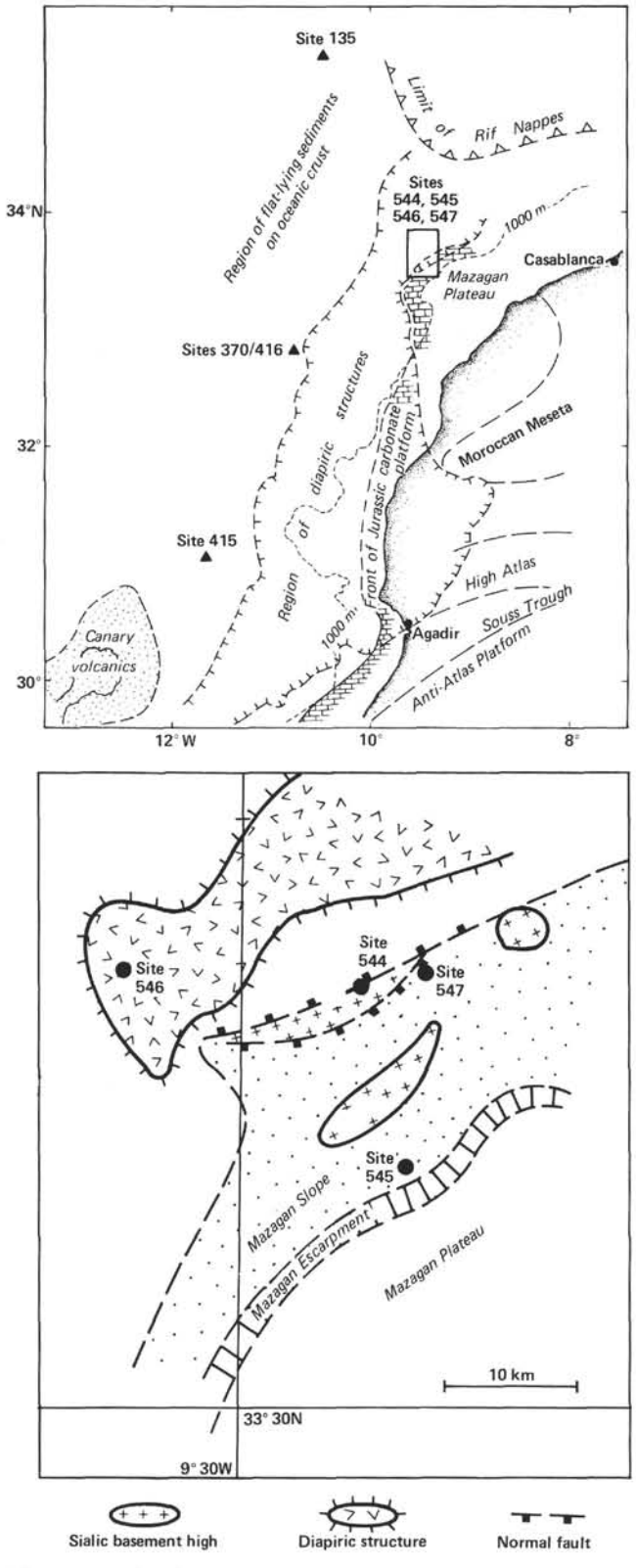


Figure 1. Regional setting of the Mazagan Plateau and sites drilled during Leg 79.

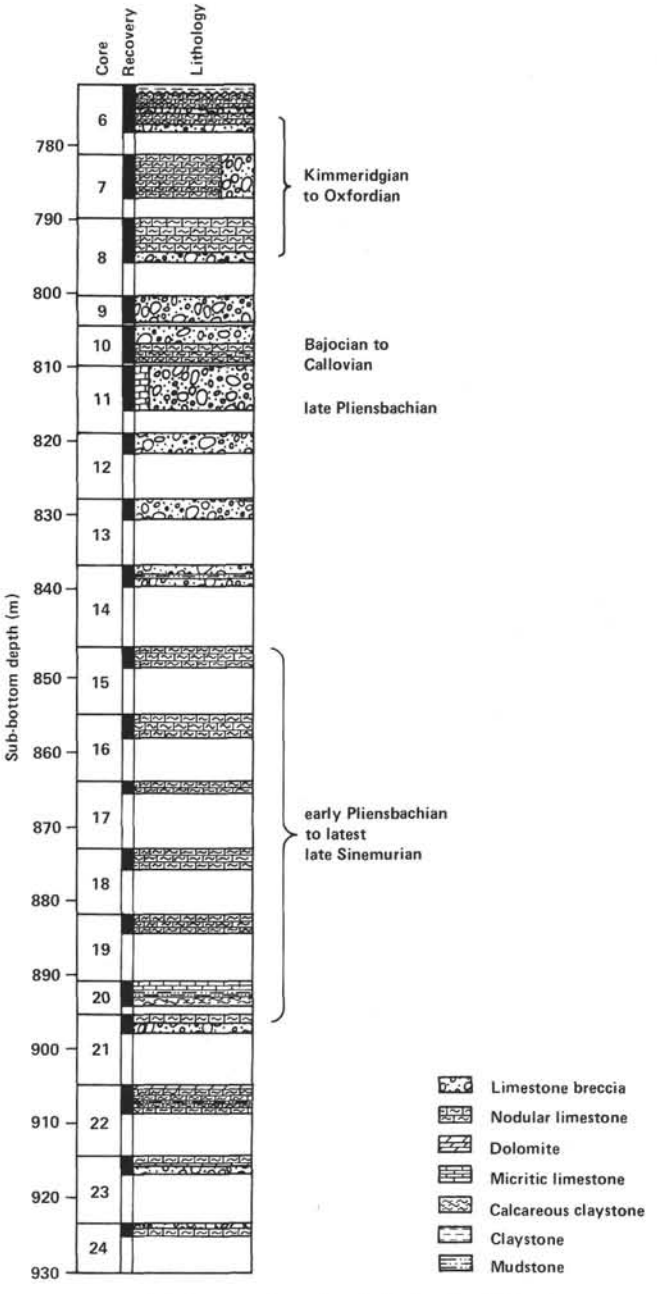


Figure 2. Detail of the Jurassic section drilled at Site 547 and summary of foraminiferal age assignments for Hole 547B (after Bernoulli and Kälin, this volume).

(calpionellids); Bate et al. (ostracodes); Fenton (palynology); Kälin and Bernoulli (*Schizosphaerella*); Renz (ammonites/aptychi); and Wiegand (nannofossils).

The taxonomy of Jurassic foraminifers and their stratigraphic significance are still very much open to contradictory interpretations. Some authors (e.g., Barteinstein and Brand, 1937) attribute a wide range of intraspecific variability to some groups of Jurassic foraminifers, especially to the representatives of such genera as *Nodosaria, Dentalina, Lenticulina, Pseudonodosaria, Lingulina*, and others. We may be accused of doing the contrary. However, we hope that the illustrations of the faunas will allow readers to reach their own conclusions on tax-

European stage	Core-Section (interval in cm)	Preservation	Assemblage dominated by	Textularina	Miliolacea	Nodosariacea	Buliminacea (*Brizalina*)	Spirillinacea (*Spirillina, Patellinella*)	Cassidulinacea (*Trocholina*)	Robertinacea (*Epistomina*)	Number of foraminifer specimens
Oxfordian–Kimmeridgian	6-4, 49–51	Very bad	Nodosariids	9 (13%)	1 (1%)	47 (68%)		11 (16%)		1 (1%)	69
	7-2, 35–36	Bad	Spirillinids	26 (14%)		14 (8%)		142 (78%)			182
	7-4, 135–137	Bad	Spirillinids, Nodosariids	16 (9%)	9 (5%)	76 (41%)		80 (43%)		5 (3%)	186
	7,CC	Bad	Nodosariids (spirillinids)	37 (11%)	2 (1%)	175 (53%)		118 (35%)		1 (1%)	333
	8-1, 4–6	Bad	Arenaceous (nodosariids)	74 (63%)		42 (35%)		2 (2%)			118
	8-1, 7–9	Bad	(Nodosariids)	1 (8%)		9 (75%)		2 (17%)			12
Baj.–Callov.	10-3, 125–128	Bad	Nodosariids	1 (1%)	1 (1%)	125 (82%)		25 (16%)			152
?Dogger	11-1, 147–150										
late Pliens.?	11,CC	Bad	Nodosariids	7 (2%)	7 (2%)	254 (90%)	2 (1%)	11 (4%)	1 (1%)		282
Sinemurian–Pliensbachian	14,CC										
	15-1, 0–4	Good	Nodosariids	1 (2%)		39 (93%)		2 (5%)	1 (2%)		43
	17,CC	Good	Nodosariids			50 (98%)			1 (2%)		51
	18-1, 22–24	Good	Nodosariids			54 (96%)		2 (4%)			56
	18-2, 5–7	Very good	Nodosariids	2 (1%)		225 (97%)		4 (2%)	2 (1%)		233
	20-1, 126–129	Very good	Nodosariids	20 (8%)		214 (92%)					234
	20-2, 59–61	Very good	Nodosariids (arenaceous)	34 (40%)		50 (59%)		1 (1%)			85
	21,CC										
	22-1, 95–98	Very good	(Nodosariids)			22 (100%)					22
	22-2, 55–57	Very good	Nodosariids (arenac., milio.)	35 (20%)	36 (20%)	105 (60%)					176
?Hettangian	24-1, 139–141	Bad	(only Ostracodes)		?1						?1
	24,CC, 10–12	Good	(only Ostracodes)								
	24,CC	Bad	(only Ostracodes)								
	25,CC										
	26,CC										

Figure 3. Foraminiferal assemblages recovered from Hole 547B. Note the good to excellent preservation of the Liassic faunas with nodosariids typically representing >90% of the assemblages. The Late Jurassic assemblages are characterized by poor preservation; spirillinids and nodosariids dominate.

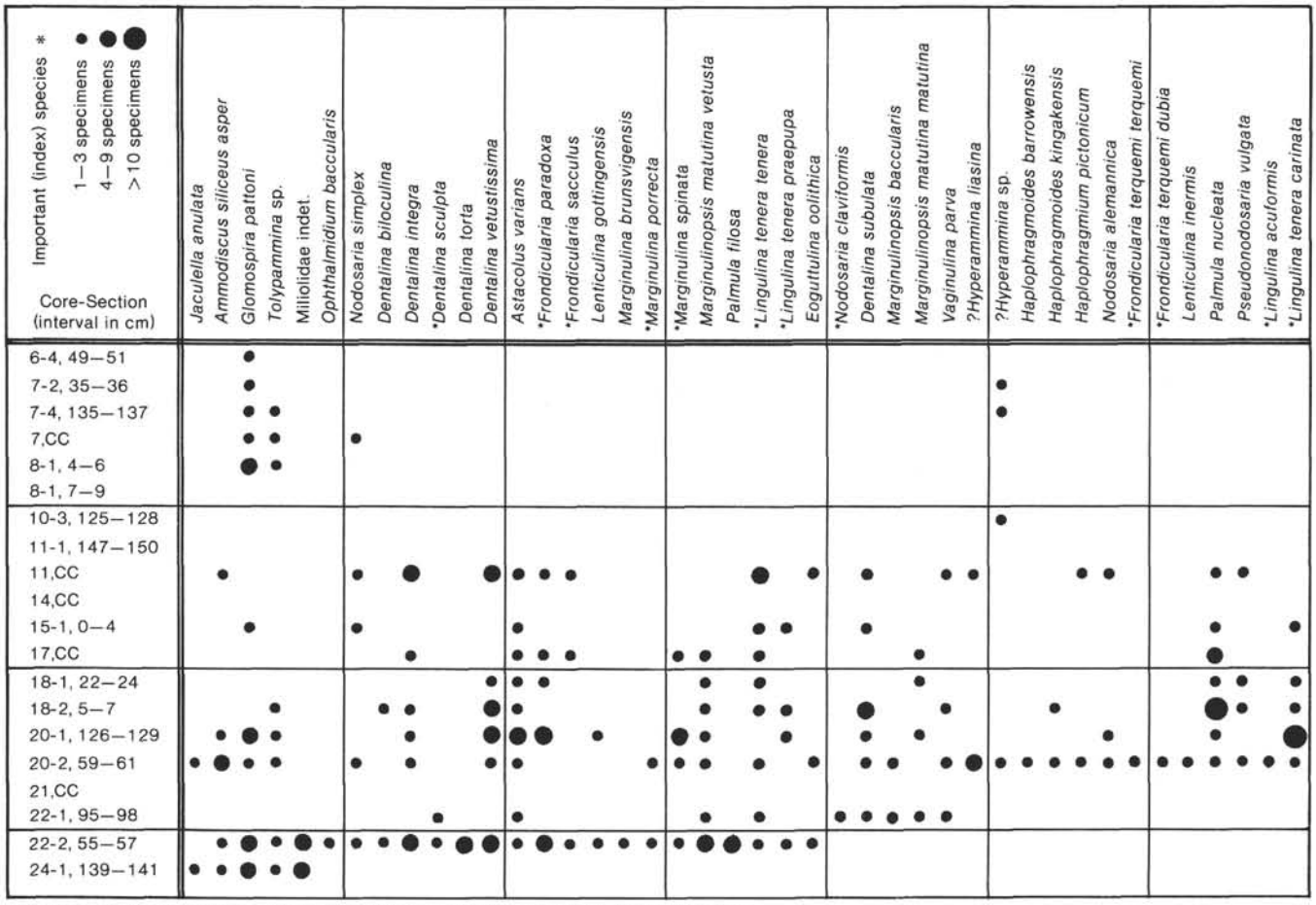
onomy as well as stratigraphic and paleoenvironmental significance. The senior authors (W.R. and H.L.) are responsible for the detailed taxonomy and distribution tables. R.M.L. is responsible for the paleoenvironmental assessment of the Jurassic assemblages.

DISCUSSION OF THE MICROFAUNAS IN HOLE 547B

Core 24: The washed residues from Core 24 contain only ostracodes and several, mostly indeterminate, miliolids and primitive arenaceous foraminifers which cannot be used for an age determination.

Core 23: No samples were examined from Core 23.

Core 22: The oldest well-preserved microfaunas are from Core 22. In addition to echinoid spines and holothurian remains, the two samples from this core contain well-preserved foraminiferal assemblages composed of primitive arenaceous foraminifers, miliolids and nodosariids. The assemblages are attributed a latest late Sinemurian to early Pliensbachian age since they are in good



Note: Samples 547B-24,CC (10–12 cm), 547B-25,CC, and 547B-26,CC barren of benthic foraminifers

Figure 4. Distribution and relative abundances of the benthic foraminifers recovered from the Jurassic section of Hole 547B (identifications by W. R. and H. L.).

agreement with microfaunas of this age from central and western Europe.

Core 21: The core-catcher sample from Core 21 is barren.

Core 20: The two samples available from Core 20 contain a well-preserved and rich microfauna with a diversified foraminiferal assemblage dominated by nodosariids. The assemblages are similar to those from age-equivalent shale beds of western Europe, but their size is smaller. The early Pliensbachian age attributed to these assemblages is based on the presence of *Frondicularia paradoxa, F. terquemi terquemi, F. terquemi dubia, F. squamosa, Lingulina tenera tenera, L. tenera praepupa, L. tenera carinata*, and *Marginulina spinata* (Copestake and Johnson, in press).

Core 19: No samples available.

Core 18: The sample from 547B-18-2, 5–7 cm is similar to Core 20 in composition and preservation. The assemblage from Section 547B-18-1 is considerably lower in diversity, but the composition is essentially the same as in Core 20.

Core 17: The poor but well-preserved autochthonous foraminiferal assemblage is similar in composition to those of Cores 18 and 20.

Core 16: No samples available.

Core 15: The only sample examined from this core is rather poor. It contains representatives of the same nodosariid species already recorded from Cores 18 and 20 and is probably still of early Pliensbachian age.

Core 14: The core-catcher sample is barren.

Core 13 and 12: No samples available.

Core 11: Only the core-catcher sample yielded a fairly rich but poorly preserved foraminiferal assemblage. It differs from the underlying Liassic assemblages in its poor preservation and in being dominated by ostracodes that indicate a Pliensbachian age; most of these are not recorded from the older samples. Also, the foraminiferal fauna contains some species which are not recorded in the underlying samples (e.g., *Brizalina liasica, Dentalina gyrosa, Palmula primaria, Lingulina dentaliniformis*, and *L. gottingensis*). The assemblage is still Early Jurassic in age, probably late Pliensbachian since there are no diagnostic Toarcian elements present. Noteworthy however is the dominance of *Eoguttulina liassica* and *Ophthalmidium liasicum* in 547B-11,CC. Exton and Gradstein (in press) have noted that these two species sometimes dominate the foraminiferal assemblage of the Portuguese early Toarcian (Falciferum and Bifrons zones).

The faunal change probably reflects the accompanying vertical increase in calcium carbonate content of the

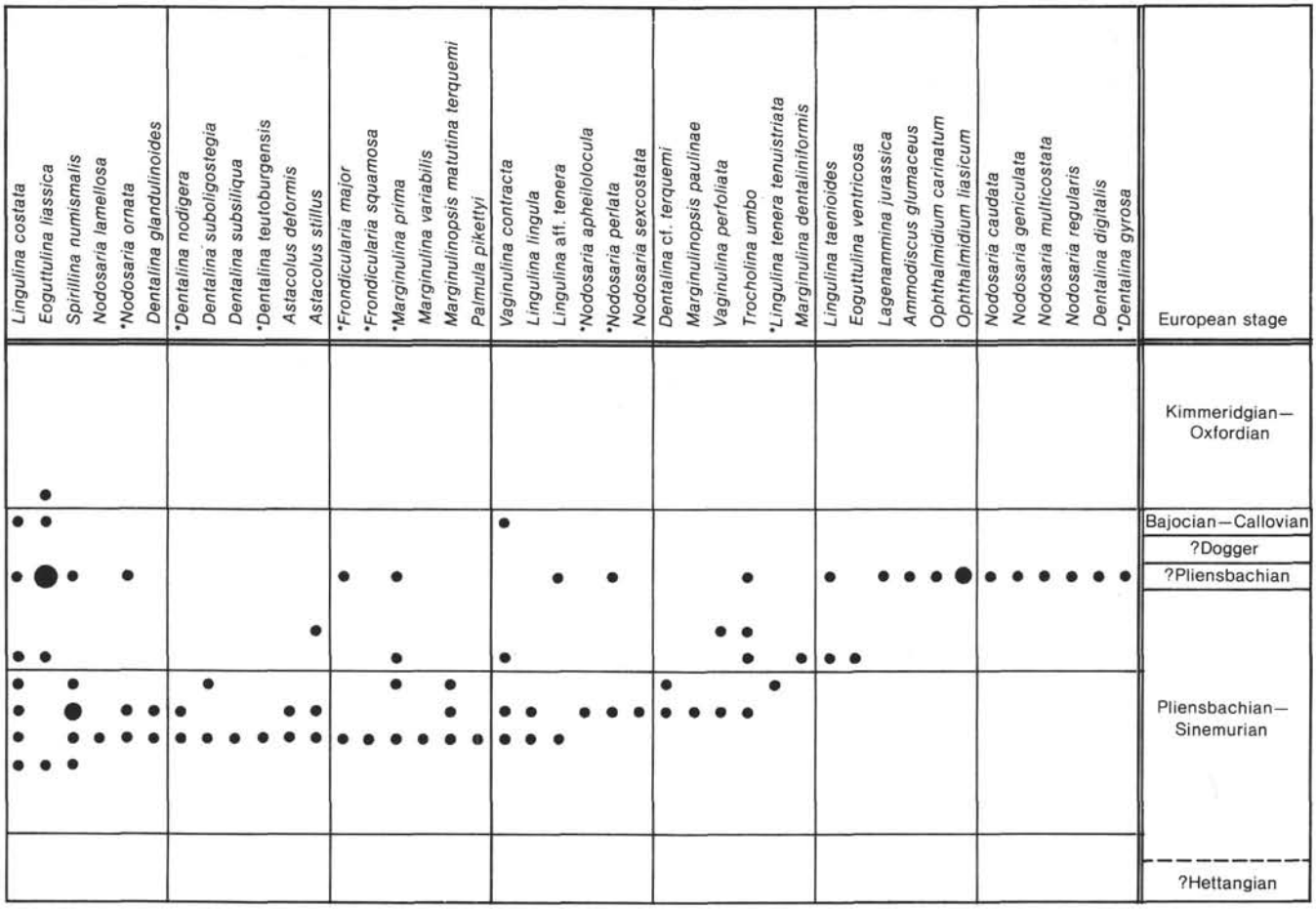


Figure 4. (Continued).

strata. In southwest Germany, microfaunas from shales poor in $CaCO_3$ are generally rich in *Dentalina, Frondicularia, Astacolus, Marginulina*, ornamented *Lingulina*, and species of *Diademopsis* (echinoid), whereas those from calcareous marls are generally dominated by ostracodes and smooth species of *Lingulina* comparable to those from Core 11. These vertical changes may indicate that the assemblage thrived in a shallower carbonate-rich environment.

Core 10: Only one sample was examined from Core 10. It contains a fairly rich, but poorly preserved foraminiferal assemblage. The presence of *Citharina colliezi* and *C. inconstans* together with *L. nodosaria* point to a Bajocian to Callovian age. Ostracodes also indicate a Middle Jurassic age for this interval (Bajocian–Bathonian; Bate and Lord, this volume). Radiolarians are common.

Core 9: No samples available.

Core 8: The two poorly preserved foraminiferal assemblages examined from Core 8 are composed mainly of agglutinating species (*Glomospira* sp., *Haplophragmoides globigerinoides*, and *Bigenerina arcuata*) and a few nodosariids (including *Lenticulina quenstedti*). This assemblage is comparable to those which are described from DSDP Legs 11, 41, 44, and 76, and which are considered to be of Oxfordian to Kimmeridgian age.

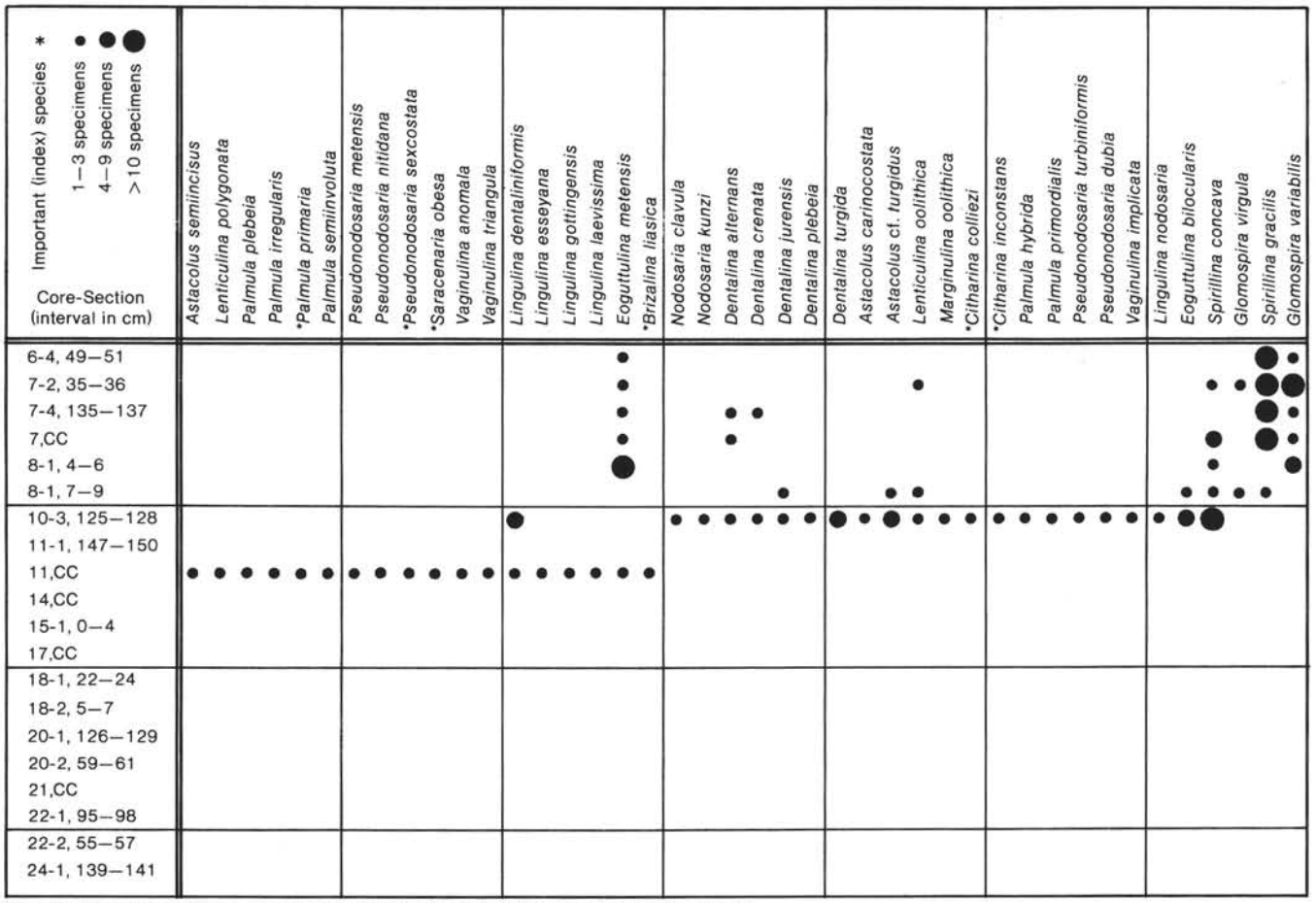
Core 7: The three samples from Core 7 are rich in *Spirillina* spp. and in a form determined as *"Patelinella" poddari*, which needs further study to determine its taxonomic position. The stratigraphically important species are *Ophthalmidium strumosum*, *L. quenstedti*, and *Lingulina franconica*. Section 547B-7-2 includes strongly corroded tests of *Lenticulina*, which could be allochthonous. The foraminiferal assemblages are similar to those described from Oxfordian–Kimmeridgian deposits from Legs 11 and 41. Radiolarians are more frequent than in the sample from Section 547B-10-3.

Core 6: The single assemblage seen from Core 6 is rich, but its preservation is so bad that most forms are indeterminable. The general aspect indicates that it is not significantly younger than the assemblages from Core 7. Index species are absent.

FORAMINIFERAL BIOSTRATIGRAPHY AND PALEOENVIRONMENTAL ANALYSIS

Lower Jurassic (Core 22 through Section 547B-14-2)

The Lower Jurassic (upper Sinemurian–Pliensbachian) of Hole 547B correlates, in part, with the *Involutina liassica* Zone of the Grand Banks area (Gradstein, 1976), the *Frondicularia terquemi* Zone of the Lusitanian Basin, Portugal (Exton and Gradstein, in press) and the



Note: Samples 547B-24,CC (10–12 cm), 547B-25,CC, and 547B-26,CC barren of benthic foraminifers

Figure 4. (Continued).

Marginulina prima plexus *interrupta* Zone of Copestake and Johnson's comprehensive Early Jurassic foraminiferal zonation (in press). This correlation is based primarily on the presence of *M. prima, F. terquemi*, and *Lingulina tenera* in the late Sinemurian–Pliensbachian of the Grand Banks, Lusitanian Basin, and offshore Morocco. In addition, the association of *M. spinata, Dentalina sculpta, Marginulinopsis matutina*, and *F. squamosa* support a latest Sinemurian–early Pliensbachian age (Copestake, pers. comm., 1983).

The faunas from Core 22 through Section 547B-14-2 show close compositional similarities with their counterparts of Europe and the Grand Banks. Like their northern relatives, the assemblages of Hole 547B are dominated by nodosariids, but the specimens tend to be smaller than those of Europe. The assemblages of this interval are best classified as Type A-1 shelf assemblages of Gordon (1970). However, lithologic evidence indicates that the hemipelagic ?redeposited nodular limestones with minor, thin black shales represent basinal deposits near the base of the carbonate slope (Jansa et al., this volume). The well-preserved, diverse foraminiferal faunas from the rare clayey intervals suggest that these assemblages are truly autochthonous and flourished in this deeper marine environment. The Early Jurassic assemblages of Hole 547B may represent outer shelf/upper bathyal depths, but the homogeneous nature of Early Jurassic foraminiferal faunas prevents paleobathymetric distinction from other "shelf" (Type A) assemblages.

Lower or Middle Jurassic? (Sections 547B-14-2 to 547B-11,CC)

Biostratigraphic control in this interval of sandy limestone breccias is limited. A poorly preserved but fairly rich foraminiferal fauna indicating a late Pliensbachian age was identified from Core 547B-11,CC. Pliensbachian ostracodes (Bate et al., this volume) and calcareous nannofossils (Wiegand, this volume) were also recovered from this interval. However, lithostratigraphic considerations suggest a Middle Jurassic age for the limestone breccias (Jansa et al., this volume; Steiger and Jansa, this volume).

The foraminiferal assemblage contrasts markedly with the excellent preservation observed in the late Sinemurian–Pliensbachian assemblages below. The lithology and fauna from 547B-11,CC indicate a different depositional environment than the underlying Lower Jurassic strata. The abundance of *Ophthalmidium* spp. suggests a shallow environment (Shipp and Murray, 1981).

Three possibilities exist to explain the occurrence of the limestone breccias. First, they may represent slope talus generated by regional shallowing or tectonic movements (subsidence) in the mid to late Early Jurassic. In this case the foraminiferal assemblage of Sample 547B-

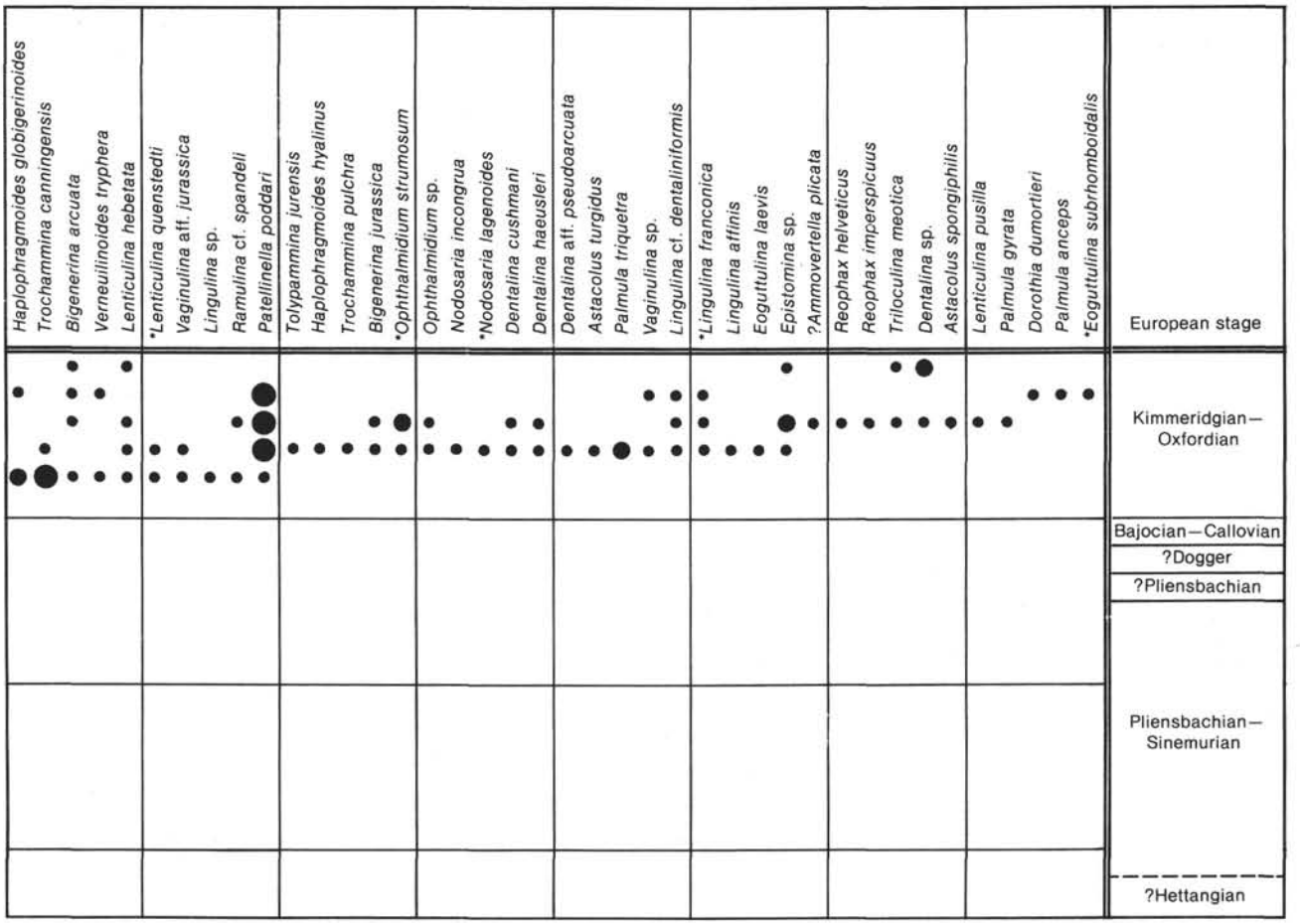


Figure 4. (Continued).

11,CC could be autochthonous or penecontemporaneously reworked from shallower deposits and the poor preservation of the assemblage may have resulted from a harsh preservational environment, diagenetic effects, or transport. A second possibility is that the limestone breccias were shed into the young Moroccan offshore basin during the Toarcian (late Early Jurassic) when tectonic events affected the adjacent Moroccan Meseta (see discussion by Lancelot and Winterer, 1980). In this case, the slightly older, Pliensbachian neritic assemblage was redeposited downslope. A third explanation is that the limestone breccias were deposited during the major Middle Jurassic (Bajocian ?) regression recorded around the North Atlantic (Ager, 1974; Jansa and Wiedmann, 1982). Again, in this case, the fauna of Sample 547B-11,CC was recycled from older deposits, though from a different (shallower ?) facies than the Sinemurian–Pliensbachian assemblages. Because no Middle Jurassic taxa were recovered from this interval, the latter two explanations are doubtful interpretations.

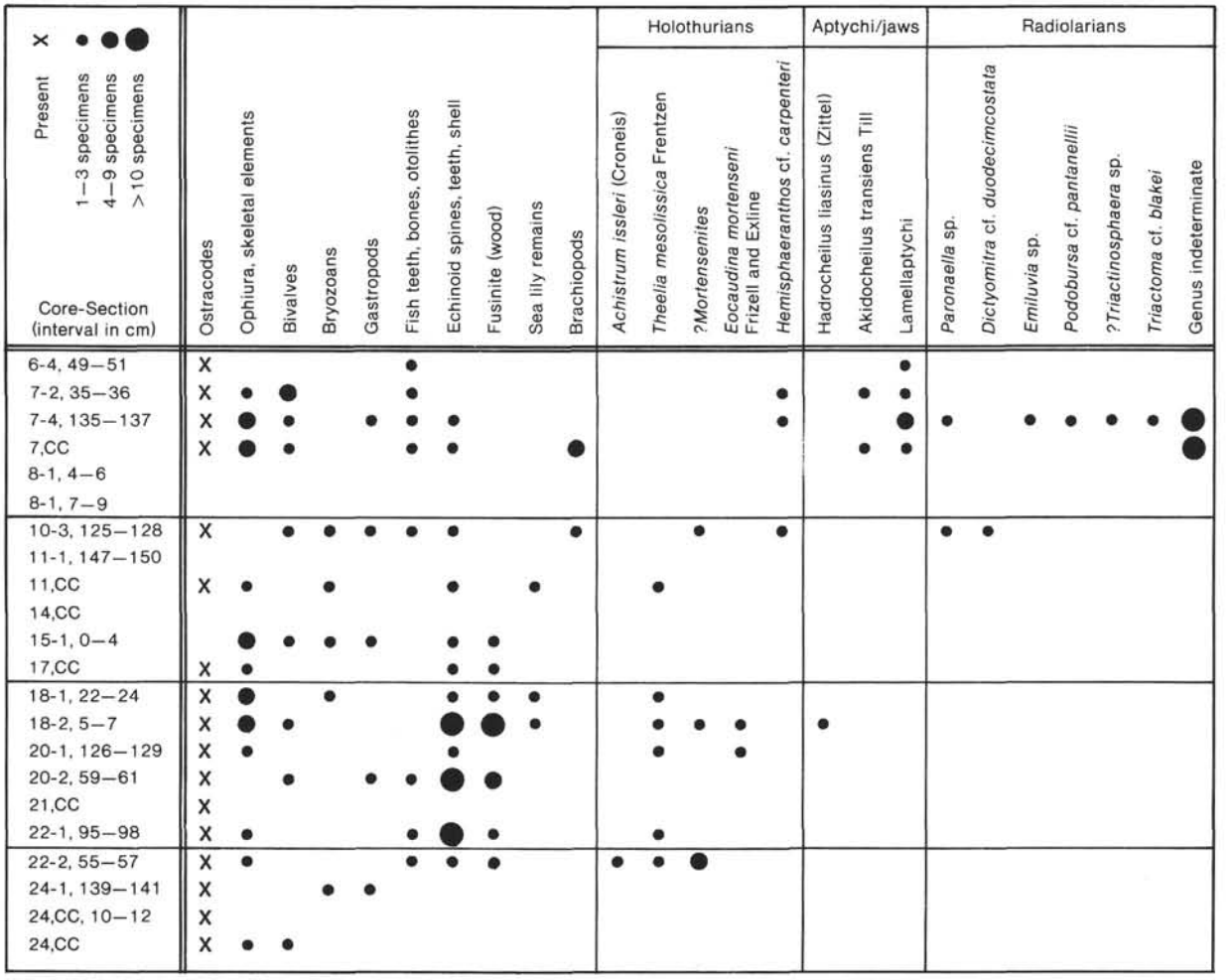
Middle and Upper Jurassic (Sections 547B-11-4 through 547B-6-2)

Core 11 contains 12 hardground cycles which are interpreted by Jansa et al. (this volume) to represent Middle Jurassic transgressive deposits characterized by very low sedimentation rates. Our sample from the upper part of Core 11 is barren of microfauna.

The nodular limestones from Section 547B-10-3 yielded a fairly rich foraminiferal assemblage indicating a Bajocian to Callovian age. Correlation with a specific foraminiferal zone of the once contiguous Grand Banks area (Gradstein, 1976) cannot be established. The sample lacks such neritic(?) genera as *Epistomina, Reinholdella*, and *Garantella*, which are important elements of the Grand Banks Middle Jurassic assemblages.

No shales are present in the interval of limestone breccias in Sections 547B-10-2 through 547B-8-4.

The widespread Late Jurassic "Atlantic" transgression is recorded in Sections 547B-8-3 through 547B-6-2. The succession is characterized by pelagic bivalve-bearing limestones, *Saccocoma*-bearing limestones, and calpionellid-bearing limestones, respectively, with interbedded turbidite layers. This implies that the carbonate slope had become more stable and permitted deposition of pelagic facies. The succession of pelagic facies represents deposition from Oxfordian through Tithonian times (Bernoulli and Kälin, this volume). Seafloor spreading during the Middle and Late Jurassic and different depositional settings have rendered correlation between Site 547 and the Grand Banks area tenuous. The Oxfordian–Kimmeridgian interval of the Grand Banks corresponds



Note: 547B-25,CC and 547B-26,CC barren of such remains

Figure 5. Distribution and relative abundances of other microbiota recovered from the Jurassic section of Hole 547B (compiled by W. R. and H. L.). Ostracodes are treated separately by Bate et al. (this volume).

with the *Epistomina mosquensis* Zone of Gradstein (1976).

The Late Jurassic assemblages of Hole 547B are generally characterized by a codominance of nodosariids and spirillinids with moderate abundances of simple arenaceous forms (Fig. 4). Small, reticulate or smooth species of *Epistomina*, which are widely recorded in great abundances in certain intervals of Middle and Upper Jurassic neritic sequences (Gordon, 1970), are conspicuously lacking at Site 547. This may be an artifact of the poor preservation in this part of the section and the few shale samples that could be collected, or could be the result of environmental exclusion.

The faunas described from this part of the section are somewhat transitional in nature between Late Jurassic North Atlantic deep-sea assemblages (Luterbacher, 1972; Kuznetsova and Seibold, 1977; Gradstein, 1983) and "typical" neritic assemblages (Type A-1 shelf assemblages; Gordon, 1970). An upper bathyal environment is tentatively suggested for the Late Jurassic assemblages of Hole 547B. Although Jurassic spirillinids have been considered indicative of shallow-water conditions by some authors (e.g., Shipp and Murray, 1981), Luterbacher (1972) and Kuznetsova and Seibold (1977) report a great abundance of *"Spirillina"* from bathyal deposits of the North Atlantic. Additional evidence in support of a bathyal environment for the Late Jurassic of Hole 547B is the lack of such predominantly neritic, open-shelf genera as *Reinholdella, Conorboides*, and *Garantella*. The epistominids that are present more closely resemble the deep-water, unornamented forms described by Luterbacher (1972) and Gradstein (1983).

TAXONOMIC REMARKS

Bryozoans. (Pl. 3, Fig. 96.) Some forklike branches have been found in some samples.

Echinoids. (Pl. 3, Fig. 101.) Most of the Liassic spines and teeth belong to *Diademopsis* or related genera.

Ophiuroids. (Pl. 3, Figs. 103, 106, 107.) Most the Liassic remains are vertebrae of *Ophiomusium*. Figure 104 on Plate 3 seems also to be ophiuroid.

Holothurian sclerites. (Pl. 3, Figs. 97–100, 102, 105.)

Achistrum issleri (Croneis *in* Croneis and McCormack, 1932, p. 128, pl. 18, figs. 50–51; Sinemurian and Pliensbachian (Rioult, 1961, table 1).

Eocaudina mortenseni Frizzell and Exline (1955, p. 88, pl. 3, fig. 10); Sinemurian of France (Rioult, 1961, table 1), southwest and north Germany.

Theelia mesoliassica (Frentzen, 1964, p. 44, pl. 4, figs. 20–32); Sinemurian to lower Toarcian (southwest Germany). It has 6 to 12 spokes.

Hemisphaeranthos cf. *carpenteri* (Moore, 1873) (Frizzell and Exline, 1955, p. 130, pl. 7, fig. 16) has 15 spokes and internal teeth. Our illustrated specimen has 30 teeth; the holotype shows only 26.

Mortensenites? sp. are small, calcitic, irregular polygonal white plates with a dotted surface.

Cephalopods. (Pl. 1, Figs. 108-109.) In Upper Jurassic samples, lamellaptychi of perisphinctid ammonites are common.

Hadrocheilus liasinus (Zizzel, 1869), described as Rhynchoteuthis liasina Zittel (1869, p. 120, pl. 13, fig. 6) and as Hadrocheilus regularis Bessler, 1938 (p. 71, text.-fig. 2) occurs only at the base of the upper Pliensbachian (SW Germany, England, Italy). It probably belongs to the dibranchiate (coleoid) genus Chitinoteuthis Müller-Stoll, 1936, of the same stratigraphic age.

Akidocheilus transiens Till, 1907 (p. 637, pl. 13, fig. 26) is found in some Upper Jurassic samples. In length it reaches 8 mm.

Foraminifera

Note that + identifies the species holotype

***Hyperammina? liasina* (Frentzen, 1941)**
(Pl. 4, Fig. 110)

+1941 *Psammophax liasina* Frentzen, p. 300, pl. 1, fig. 1.
1961 *Hyperammina odiosa* Gerke and Sossipatrova *in* Gerke, p. 103, pl. 7, figs. 3–6.

Remarks. A very coarsely agglutinated species, which was originally described from the Pliensbachian.

***Hyperammina?* sp.**
(Pl. 4, Fig. 113)

Remarks. Slender tubes, less coarsely agglutinated than *Hyperammina? liasina* (Frentzen). Possible fragments of *Rhizammina* Brady, 1879.

***Jaculella anulata* Barbieri, 1964**
(Pl. 4, Figs. 111–112)

+1964 *Jaculella anulata* Barbieri, p. 744, pl. 56, fig. 1.
1968 *Jaculella liassica* Brand. Welzel, p. 4, pl. 1, fig. 2.

Remarks. Differs from *Jaculella liassica* Brand, 1937, in possessing concentric thickenings and an irregular outline. Pliensbachian (Italy, Franconia).

***Lagenammina jurassica* (Barnard, 1959)**
(Pl. 1, Fig. 7)

1936 *Proteonina ampullacea* (Brady). Franke, p. 13, pl. 1, fig. 7.
1937 *Proteonina difflugiformis* (Brady). Bartenstein and Brand, p. 128, pl. 1A, fig. 1; pl. 1B, figs. 1–2; pl. 2A, fig. 1; pl. 2B, fig. 3; pl. 3, fig. 1; pl. 4, fig. 1; pl. 5, fig. 1; pl. 8, fig. 1; pl. 10, fig. 1; pl. 11, fig. 1.
+1959 *Proteonina jurassica* Barnard, p. 134, pl. 11, figs. 6–8.
1968 *Reophax difflugiformis* (Brady). Welzel, p. 6, pl. 1, fig. 4.

Remarks. A widespread species, which ranges from Hettangian to the upper Middle Jurassic. It is finely to coarsely agglutinated and often compressed. The flask-shaped outline of this species is distinctive.

***Ammodiscus glumaceus* Gerke and Sossipatrova, 1961**
(Pl. 1, Fig. 8)

+1961 *Ammodiscus glumaceus* Gerke and Sossipatrova in Gerke, p. 128, pl. 12, figs. 2–6; pl. 13, fig. 15.

Remarks. A small *Ammodiscus* with fewer whorls and of more irregular growth than *A. siliceus* (Terquem).

***Ammodiscus siliceus asper* (Terquem, 1863)**
(Pl. 4, Figs. 114, 117)

+1863 *Involutina aspera* Terquem, p. 221, pl. 10, fig. 21.
1936 *Ammodiscus infimus* (Strickland). Franke, p. 15, pl. 1, fig. 14.
1937 *Ammodiscus incertus* d'Orbigny. Bartenstein and Brand, p. 130, pl. 3, fig. 5; pl. 4, fig. 4; pl. 5, fig. 5.
1960 *Involutina aspera* Terquem. Bizon, p. 4, pl. 1, fig. 1.
1969 *Ammodiscus asper* (Terquem). Brouwer, p. 24, pl. 1, fig. 6.

Remarks. This subspecies is somewhat more coarsely agglutinated than *A. siliceus siliceus* (Terquem, 1863), but there are no other significant differences. The subspecies *asper* is common in the Sinemurian of France, England, and Germany, and also common in the late Pliensbachian and late Toarcian of eastern England and the North Sea (Copestake, unpubl. data).

***Glomospira pattoni* Tappan, 1955**
(Pl. 4, Figs. 115–116)

+1955 *Glomospira pattoni* Tappan, p. 40, pl. 8, figs. 15–17.

Remarks. A long-ranging species, occurring from Lower to Upper Jurassic.

***Glomospira variabilis* (Kübler and Zwingli, 1870)**
(Pl. 8, Figs. 184–186)

1865 *Spirillina.* Schwager, pl. 7, fig. 21.
+1870 *Cornuspira variabilis* Kübler and Zwingli, p. 33, pl. 4, fig. 4.
1886 *Ammodiscus gordialis* Parker and Jones. Haeusler, p. 24, pl. 3, figs. 11–12, 18–20, 22.
1890 *Ammodiscus charoides* Jones and Parker. Haeusler, p. 60, pl. 9, figs. 22–25.
1890 *Ammodiscus gordialis* Jones and Parker. Haeusler, p. 59, pl. 9, figs. 26–38; pl. 10, fig. 1.
1941 *Glomospira gordialis* Jones and Parker. Frentzen, 307, pl. 1, figs. 15–17.
1960 *Glomospira variabilis* (Kübler and Zwingli). Seibold and Seibold, p. 324, text-fig. 2q–s.
1968 *Glomospira variabilis* (Kübler and Zwingli). Oesterle, p. 711, figs. 8–9, 10a–d.
1972 *Glomospira pattoni* Tappan. Dain, pl. 1, fig. 9.
1972 *Glomospira variabilis* (Kübler and Zwingli). Luterbacher, pl. 2, figs. 4–6.
1974 *Glomospira charoides* (Jones and Parker). Bartenstein, p. 686, pl. 2, figs. 45–50.
1978 *Glomospira variabilis* (Kübler and Zwingli). Kuznetsova and Seibold, pl. 1, figs. 11–13; pl. 3, fig. 12.
1980 *Glomospira variabilis* (Kübler and Zwingli). Sliter, pl. 1, figs. 9–10.

Remarks. The species occurs from the Oxfordian to Tithonian (Lower Cretaceous?). It is very frequent in the Oxfordian of Switzerland and southwest Germany (sponge–algae bioherms). Typical color is yellow. Surface very finely agglutinated.

***Glomospira virgula* (Kosyreva, 1972)**
(Pl. 8, Figs. 187–188)

+1972 *Tolypammina virgula* Kosyreva *in* Dain, p. 31, pl. 1, figs. 2–5.
1972 *Glomospira* sp. Luterbacher, pl. 2, fig. 7.
1974 *Glomospira gordialis* (Jones and Parker). Bartenstein, p. 686, pl. 2, figs. 51–54; pl. 3, figs. 1–3.

Remarks. More irregularly and more coarse agglutinated than *G. variabilis* (Kübler and Zwingli).

***Ammovertella? plicata* (Terquem, 1886)**
(Pl. 8, Fig. 183)

+1886 *Ammodiscus plicatus* Terquem, p. 9, pl. 1, figs. 16–17.
1941 *Ammovertella plicata* (Terquem). Frentzen, p. 303, pl. 1, figs. 8–9.

Distribution. Upper Middle Jurassic (France, southwest Germany).

***Tolypammina jurensis* Franke, 1936**
(Pl. 2, Fig. 55)

+1936 *Tolypammina jurensis* Franke, p. 15, pl. 1, fig. 11.

***?Tolypammina* sp.**
(Pl. 1, Fig. 9)

1936 *Hyperammina* sp. Franke, p. 14, pl. 1, fig. 10.

***?Tolypammina* sp.**
(Pl. 4, Fig. 118)

1936 *Astrorhiza cretacea* Franke, Franke, p. 10, pl. 1, fig. 1.

***?Tolypammina* sp.**
(Pl. 4, Fig. 120)

Remarks. It is unclear whether this specimen is a *Tolypammina* or coiled and belonging to another genus.

***Reophax helveticus* (Haeusler, 1881)**
(Pl. 8, Fig. 196)

+1881 *Dentalina helvetica* Haeusler, p. 34, pl. 2, fig. 45.
1890 *Reophax helvetica* Haeusler, p. 28, pl. 3, figs. 15–17.
1944 *Reophax scorpiurus* Montfort. Frentzen, p. 329, pl. 18, figs. 6–8.
1968 *Reophax helveticus* (Haeusler). Oesterle, p. 715, text-figs. 13, 14b–c, 15k–p.
1972 *Reophax multilocularis* Haeusler. Luterbacher, pl. 1, fig. 4.
1980 *Reophax helveticus* (Haeusler). Sliter, pl. 1, figs. 15–16.
Remarks. Abundant in the North Sea late Oxfordian (Copestake, unpubl. data).

***Reophax imperspicuus* Seibold and Seibold, 1960**
(Pl. 8, Fig. 193)

+1960 *Reophax imperspicuus* Seibold and Seibold, p. 319, pl. 7, fig. 6, text-figs. 2c–e.
1960 *Reophax variabilis* Haeusler. Seibold and Seibold, p. 40, text-fig. 5.1.
Remarks. A very irregularly shaped *Reophax* characteristic of the Oxfordian and lower Kimmeridgian of southwest Germany. Chambers not visible, wall coarsely to finely agglutinated, in general rather robust.

***Haplophragmoides barrowensis* Tappan, 1951**
(Pl. 1, Fig. 11)

+1951 *Haplophragmoides barrowensis* Tappan, p. 1, pl. 1, fig. 5.
Remarks. Has more chambers and a larger umbilicus than *Haplophragmoides kingakensis* Tappan.

***Haplophragmoides kingakensis* Tappan, 1955**
(Pl. 1, Fig. 10)

+1955 *Haplophragmoides kingakensis* Tappan, p. 43, pl. 10, figs. 1–6.
Remarks. Found throughout the Jurassic.

***Haplophragmoides globigerinoides* (Haeusler, 1882)**
(Pl. 8, Fig. 190)

+1882 *Trochammina globigerinoides* Haeusler, p. 352, pl. 15, figs. 8–9.
1890 *Trochammina globigerinoides* Haeusler, p. 66, pl. 10, figs. 20–23.
1960 *Haplophragmoides globigerinoides* (Haeusler). Seibold and Seibold, p. 326, text-fig. 5f.
1968 *Haplophragmoides globigerinoides* (Haeusler). Oesterle, p. 727, text-figs. 23–24, 28b.
Remarks. This species is more coarsely agglutinated and has higher chambers than *Haplophragmoides hyalinus* (Haeusler).

***Haplophragmoides hyalinus* (Haeusler, 1886)**
(Pl. 8, Fig. 191)

+1886 *Trochammina hyalina* Haeusler, pp. 3, 5, 27.
1890 *Trochammina trulissata* Brady?. Haeusler, p. 64, pl. 10, fig. 9.
1968 *Haplophragmoides hyalinus* (Haeusler). Oesterle, p. 729, text-figs. 25b, 26, 28c.
Remarks. Differs from all other *Haplophragmoides* species of the Jurassic in having a smooth, finely agglutinated surface and low chambers.

***Haplophragmium pictonicum* Berthelin, 1879**
(Pl. 1, Fig. 12)

+1879 *Haplophragmium pictonicum* Berthelin, p. 26, pl. 1, figs 1–2.
Remarks. A coarsely agglutinated species, distributed from the Hettangian (southwest-Germany) to the upper Pliensbachian (France, southwest Germany).

***Dorothia dumortieri* (Schwager, 1866)**
(Pl. 8, Fig. 195)

+1866 *Textularia dumortieri* Schwager *in* Oppel, p. 309, text-fig. 14.
1944 *Textularia* aff. *conica* d'Orbigny. Ströbel, pl. 12, figs. 16–17.

***Bigenerina arcuata* Haeusler, 1890**
(Pl. 2, Figs. 57–58)

+1890 *Bigenerina arcuata* Haeusler, p. 73, pl. 11, fig. 39; pl. 12, figs. 5–7.
1941 *Bigenerina deceptoria* Haeusler. Frentzen, p. 361, pl. 6, figs. 17–21.
1944 *Bigenerina arcuata* Haeusler. Frentzen, p. 335, pl. 18, fig. 24, 26, 28.
1960 *Gaudryinella deceptoria* (Haeusler). Seibold and Seibold, p. 335, text-fig. 4d, o; pl. 8, fig. 12.
1961 *Bigenerina* cf. *nodosaria* d'Orbigny. Gordon, p. 524, text-fig. 1(5).
1968 *Bigenerina arcuata* Haeusler. Oesterle, p. 742, text-figs. 37–39.
1972 *Bigenerina arcuata* Haeusler. Luterbacher, pl. 1, fig. 11.
Remarks. The specimens of Pl. 2, Figs. 57–58, are badly preserved and compressed in the biserial part or damaged.

***Bigenerina jurassica* (Haeusler, 1890)**
(Pl. 2, Fig. 59)

+1890 *Pleurostomella jurassica* Haeusler, p. 77, pl. 12, figs. 14–22.
1944 *Bigenerina arcuata* Haeusler. Frentzen, p. 335, pl. 18, figs. 25, 27.
1968 *Bigenerina jurassica* (Haeusler). Oesterle, p. 745, text-figs. 40–42.
1972 *Bigenerina jurassica* Haeusler. Luterbacher, pl. 1, fig. 12.
Remarks. Differs from *Bigenerina arcuata* Haeusler in having a longer biserial stage and a finer agglutinated surface.

***Trochammina canningensis* Tappan, 1955**
(Pl. 8, Figs. 189, 192)

1886 *Trochammina inflata* Montfort. Haeusler, p. 28, pl. 3, fig. 28.
+1955 *Trochammina canningensis* Tappan, p. 48, pl. 14, figs. 15–19.
1959 *Trochammina globigeriniformis* (Parker and Jones). Lloyd, p. 317, pl. 5, fig. 31, text-fig. 5c.
1972 *Haplophragmoides(?)* sp. Luterbacher, pl. 1, figs. 13–15.
Remarks. The illustrated specimen has more chambers in the final whorl and appears higher spired than is usual for the species.

***Trochammina pulchra* Ziegler, 1959**
(Pl. 2, Fig. 56)

1924 *Haplophragmium canariense* d'Orbigny. Klähn, p. 460, pl. 22, fig. 9.
+1959 *Trochammina pulchra* Ziegler, p. 94, pl. 2, figs. 6–8.
Remarks. This species has a flattened ventral side. The dorsal side is rounded, the chambers are very high, the umbilicus very narrow. Known from the Callovian of south Germany.

***Verneuilinoides tryphera* Loeblich and Tappan, 1950**
(Pl. 2, Figs. 60–61)

+1950 *Verneuilinoides tryphera* Loeblich and Tappan, p. 42, pl. 11, fig. 16.
1974 *Verneuilinoides neocomiensis* (Mjatliuk). Kuznetsova, pl. 1, fig. 6.
1978 *Verneuilinoides tryphera* Loeblich and Tappan. Bhalla and Abbas, p. 172, pl. 2, fig. 3.
Remarks. Both specimens figured here are compressed: Fig. 60 in its longitudinal axis, Fig. 61 in the early chambers. They are triserial in their entire length, and the chambers are rounded in outline.

***Ophthalmidium baccularis* Issler, 1908**
(Pl. 4, Fig. 119)

+1908 *Ophthalmidium baccularis* Issler, p. 44, pl. 1, fig. 25.
Remarks. An *Ophthalmidium* of the upper Sinemurian of Southwest Germany. Chambers not visible externally in outline.

***Ophthalmidium carinatum* (Kübler and Zwingli, 1866)**
(Pl. 1, Fig. 14)

+1866 *Oculina carinata* Kübler and Zwingli, p. 14, pl. 2, fig. 19.
1875 *Spiroloculina concentrica* Terquem and Berthelin, p. 80, pl. 7, figs. 1–4.
1936 *Spirophthalmidium concentricum* (Terquem and Berthelin). Franke, p. 123, pl. 12, fig. 17.

1937 *Spirophthalmidium concentricum* (Terquem and Berthelin). Bartenstein and Brand, p. 181, pl. 2B, figs. 37–38; pl. 4, fig. 16; pl. 5, fig. 71; pl. 8, fig. 36; pl. 13, fig. 21; pl. 15A, fig. 39.
1941 *Ophthalmidium carinatum* (Kübler and Zwingli). Macfadyen, p. 23, pl. 1, fig. 12.
1968 *Ophthalmidium carinatum* (Kübler and Zwingli). Welzel, p. 9, pl. 3, fig. 1.
1969 *Ophthalmidium carinatum* (Kübler and Zwingli). Brouwer, p. 26, pl. 2, fig. 8.

Distribution. Lower Sinemurian to Oxfordian.

Ophthalmidium liasicum (Kübler and Zwingli, 1866)
(Pl. 1, Fig. 13)

+1866 *Oculina liasica* Kübler and Zwingli, p. 11, pl. 1, fig. 24.
1870 *Ophthalmidium liasicum* Kübler and Zwingli, Kübler and Zwingli, p. 11, pl. 1, fig. 11.
1886 *Ophthalmidium orbiculare* Burbach (1886b), p. 499, pl. 5, figs. 3–6.
1886 *Ophthalmidium ovale* Burbach (1886b), p. 499, pl. 5, figs. 7–12.
1936 *Ophthalmidium orbiculare* Burbach. Franke, p. 122, pl. 12, fig. 12.
1936 *Ophthalmidium ovale* Burbach. Franke, p. 123, pl. 12, fig. 13.
1937 *Ophthalmidium ovale* Burbach. Bartenstein and Brand, p. 181, pl. 4, fig. 18.
1937 *Ophthalmidium orbiculare* Burbach. Bartenstein and Brand, p. 181, pl. 2A, fig. 22; pl. 4, fig. 17.
1968 *Ophthalmidium orbiculare* Burbach. Welzel; p. 8, pl. 3, fig. 2.
1968 *Ophthalmidium ovale* Burbach. Welzel, p. 8, pl. 3, fig. 3.
1968 *Ophthalmidium nubeculariformis* Haeusler. Welzel, p. 9, pl. 3, fig. 4.
1969 *Ophthalmidium orbiculare* Burbach. Brouwer, p. 27, pl. 2, figs. 9–10.

Distribution. Hettangian to lowermost Toarcian.

Ophthalmidium strumosum (Gümbel, 1862)
(Pl. 8, Figs. 194, 197)

+1862 *Guttulina strumosa* Gümbel, 227, pl. 4, figs. 13–14.
1865 *Guttulina strumosa* Gümbel. Schwager, p. 137, pl. 7, fig. 9.
1917 *Ophthalmidium birmenstorfenis* Kübler and Zwingli. Paalzow, p. 220, pl. 41, figs. 17–19.
1932 *Spirophthalmidium carinatum* Kübler and Zwingli. Paalzow, p. 99, pl. 5, figs. 7–10.
1955 *Ophthalmidium strumosum* (Gümbel). Seibold and Seibold, p. 102, text-fig. 3h, i.
1962 *Spirophthalmidium strumosum* (Gümbel). Bastien and Sigal, p. 92, pl. 5, figs. 22–23.

Distribution. Oxfordian (France, Switzerland, South Germany).

Ophthalmidium sp.
(Pl. 2, Fig. 62)

Remarks. An *Ophthalmidium* which resembles *Ophthalmidium rotula* Lalicker, 1956, but shows no chamber externally.

Triloculina meotica Loeblich and Tappan, 1946
(Pl. 2, Figs. 63–64)

+1946 *Triloculina meotica* Loeblich and Tappan, p. 247, pl. 3, figs. 1–3.
1978 *Quinqueloculina* sp. C. Bhalla and Abbas, p. 173, pl. 4, fig. 3.
1980 *Triloculina meotica* Loeblich and Tappan. Sliter, pl. 5, fig. 16.

Remarks. This lower Cretaceous species shows no sculpture and considerable variability.

Nodosaria alemannica Frentzen, 1941
(Pl. 5, Fig. 125)

+1941 *Nodosaria alemmanica* Frentzen, p. 315, pl. 2, fig. 7.
1967 *Nodosaria* cf. *columnaris* Franke. Ruget and Sigal, p. 62, pl. 8, fig. 5.

Nodosaria apheilolocula Tappan, 1955
(Pl. 5, Fig. 130)

+1875 *Nodosaria incerta* Terquem and Berthelin, p. 18, pl. 1, fig. 15.
1937 *Nodosaria hirsuta* d'Orbigny. Bartenstein and Brand, p. 145, pl. 4, fig. 39.
1941 *Nodosaria hispida* Reuss. Macfadyen, p. 63, pl. 4, fig. 64.
1955 *Nodosaria apheilolocula* Tappan, p. 68, pl. 24, figs. 6–7.

Remarks. This species is very small and has little spines on the chamber surfaces which cannot be seen in Fig. 130 because they are recrystallized. Sinemurian to lowermost Toarcian.

Nodosaria caudata Frentzen, 1941
(Pl. 1, Fig. 15)

1936 *Nodosaria hybrida* (Terquem and Berthelin). Franke, p. 42, pl. 4, fig. 2.
+1941 *Nodosaria caudata* Frentzen, p. 317, pl. 2, fig. 32.
1968 *Nodosaria regularis candela* Franke. Welzel, p. 11, pl. 1, fig. 18.

Nodosaria claviformis Terquem, 1866
(Pl. 5, Fig. 127)

+1866 *Nodosaria claviformis* Terquem, p. 477, pl. 19, figs. 17–18.
1960 *Nodosaria claviformis* Terquem. Bizon, p. 9, pl. 3, fig. 5; pl. 4, fig. 12.

Nodosaria clavula (Terquem, 1870)
(Pl. 8, Fig. 201)

+1870 *Dentalina clavula* Terquem (1870b), p. 264, pl. 28, fig. 4.

Nodosaria geniculata (Terquem and Berthelin, 1875)
(Pl. 4, Fig. 121)

+1875 *Dentalina geniculata* Terquem and Berthelin, p. 32, pl. 2, fig. 22.
1957 *Nodosaria dispar* Franke. Nørvang, p. 356, fig. 80.

Nodosaria incongrua Kübler and Zwingli, 1866
(Pl. 8, Fig. 199)

?1865 *Nodosaria manubrium* Schwager, p. 99, pl. 2, fig. 14.
+1866 *Nodosaria incongrua* Kübler and Zwingli, p. 13, pl. 2, fig. 17.
1870 *Nodosaria incongrua* Kübler and Zwingli, p. 15, pl. 2, fig. 1 (Bajoc.).

Nodosaria kunzi Paalzow, 1917
(Pl. 8, Fig. 200)

+1917 *Nodosaria kunzi* Paalzow, p. 229, pl. 42, fig. 24.
1922 *Nodosaria fontinensis* Terquem. Paalzow, p. 16, pl. 2, fig. 3.
1924 *Nodosaria prima* d'Orbigny. Klähn, p. 457, pl. 23, fig. 15.
1970 *Nodosaria jurassica* Gümbel. Winter, p. 32, pl. 4, fig. 112.
1978 *Nodosaria plicatilis* Wiśniowski. Munk, p. 39, pl. 1, fig. 6.

Remarks. The holotype of this species has more ribs than the specimen of Fig. 200. It resembles *Nodosaria corallina* Gümbel, 1862.

Nodosaria lagenoides Wiśniowski, 1890
(Pl. 8, Fig. 198)

1890 *Lagena sulcata* Walker and Jacob. Haeusler, p. 87, pl. 13, figs. 27–29.
+1890 *Nodosaria lagenoides* Wiśniowski, p. 194, pl. 1, fig. 25.
1960 *Nodosaria nodosaroides* Paalzow. Seibold and Seibold, p. 369, text-fig. 7b.
1978 *Nodosaria lagenoides* Wiśniowski. Munk, p. 39, pl. 1, fig. 7.
1980 *Lagena sulcata* (Walter and Jacob). Sliter, pl. 8, figs. 8–10.

Nodosaria lamellosa (Terquem, 1866)
(Pl. 5, Fig. 126)

+1866 *Dentalina lamellosa* Terquem, p. 410, pl. 15, fig. 16.
1936 *Nodosaria mitis* Terquem and Berthelin. Franke, p. 45, pl. 4, fig. 11a.
1957 *Nodosaria columnaris* Franke. Nørvang, p. 351, figs. 75–76.

Nodosaria multicostata Terquem and Berthelin, 1875
(Pl. 5, Fig. 131)

1875 *Nodosaria variabilis* Terquem and Berthelin, p. 20, pl. 1, fig. 19 (preoccupied).
+1875 *Nodosaria multicostata* Terquem and Berthelin, p. 20, pl. 1, fig. 20.
1937 *Nodosaria mutabilis* Terquem. Bartenstein and Brand, p. 148, pl. 4, fig. 38; pl. 5, fig. 23.

Nodosaria ornata **(Terquem, 1858)**
(Pl. 4, Fig. 122)

+1858 *Dentalina ornata* Terquem, p. 44, pl. 2, fig. 13.

Nodosaria perlata **Frentzen, 1941**
(Pl. 4, Fig. 123)

+1941 *Nodosaria perlata* Frentzen, p. 321, pl. 2, fig. 23.
Remarks. A rare species from the Pliensbachian (Southwest Germany).

Nodosaria regularis **Terquem, 1862**
(Pl. 5, Fig. 129)

+1862 *Nodosaria regularis* Terquem, p. 436, pl. 5, fig. 12.
1936 *Nodosaria regularis* Terquem. Franke, p. 41, pl. 3, fig. 19.
1936 *Nodosaria crispata* Terquem. Franke, p. 41, pl. 3, fig. 20.
1968 *Nodosaria apheilolocula* Tappan. Welzel, p. 11, pl. 1, fig. 25.

Nodosaria sexcostata **Terquem, 1858**
(Pl. 4, Fig. 124)

+1858 *Nodosaria sexcostata* Terquem, p. 28, pl. 1, fig. 5.
1866 *Dentalina paucicosta* Terquem, p. 483, pl. 19, fig. 22.
1866 *Dentalina radiata* Terquem, p. 490, pl. 20, fig. 5.
1875 *Dentalina mitis* Terquem and Berthelin, p. 28, pl. 2, fig. 9.
1875 *Dentalina demissa* Terquem and Berthelin, p. 28, pl. 2, fig. 10.
1875 *Dentalina oculina* Terquem and Berthelin, p. 31, pl. 2, fig. 20.
1936 *Nodosaria oculina* (Terquem and Berthelin). Franke, p. 49, pl. 4, fig. 21.
1936 *Nodosaria oculina* (Terquem and Berthelin) f. *vermicularis* Franke, p. 449, pl. 4, fig. 22.
1937 *Nodosaria mitis* (Terquem and Berthelin). Bartenstein and Brand, p. 145, pl. 3, fig. 18; pl. 5, fig. 24.
1937 *Nodosaria oculina* (Terquem and Berthelin). Bartenstein and Brand, p. 147, pl. 5, fig. 25.
1968 *Nodosaria sexcostata sexcostata* Terquem. Welzel, p. 14, pl. 1, fig. 30.
1968 *Nodosaria sexcostata radiata* (Terquem). Welzel, p. 14, pl. 1, fig. 31.
1968 *Nodosaria sexcostata mitis* (Terquem and Berthelin). Welzel, p. 15, pl. 1, fig. 32.
1968 *Nodosaria sexcostata oculina* (Terquem and Berthelin). Welzel, p. 15, pl. 1, figs. 33–34.
Remarks. A frequent species in the Lias of Europe, which ranges from Hettangian to lowermost Toarcian.

Nodosaria simplex **(Terquem, 1858)**
(Pl. 5, Fig 128)

+1858 *Dentalina simplex* Terquem, p. 39, pl. 2, fig. 5.
1936 *Nodosaria simplex* (Terquem). Franke, p. 44, pl. 4, fig. 6.
1968 *Nodosaria simplex simplex* (Terquem). Welzel, p. 12, pl. 1, fig. 21.
1968 *Nodosaria simplex tenuissima* Franke. Welzel, p. 13, pl. 1, fig. 22.
Remarks. *A slender, simple, smooth Nodosaria,* that ranges from Lower to Upper Jurassic.

Dentalina alternans **Terquem, 1870**
(Pl. 9, Fig. 204)

+1870 *Dentalina alternans* Terquem (1870b), p. 261, pl. 27, figs. 23–25.

Dentalina biloculina **(Franke, 1936)**
(Pl. 5, Fig. 134)

+1936 *Nodosaria biloculina* Franke, p. 42, pl. 3, fig. 23.
Remarks. Because of its asymmetrical chambers, this species belongs to the genus *Dentalina.*

Dentalina crenata **Schwager, 1865**
(Pl. 2, Fig. 65)

+1865 *Dentalina crenata* Schwager, P. 109, pl. 3, figs. 19, 25.
1932 *Dentalina oligostegia* Reuss. Paalzow, p. 113, pl. 7, fig. 23.
1960 *Dentalina crenata* Schwager. Seibold and Seibold, p. 59, pl. 5, fig. 14.

Dentalina cushmani **Paalzow, 1932**
(Pl. 9, Fig. 202)

+1932 *Dentalina cushmani* Paalzow, p. 112, pl. 7, figs. 18, 22.

Dentalina digitalis **Franke, 1936**
(Pl. 5, Fig. 142)

+1936 *Dentalina digitalis* Franke, p. 32, pl. 2, fig. 26.

Dentalina glandulinoides **Franke, 1936**
(Pl. 5, Fig. 141)

+1936 *Dentalina glandulinoides* Franke, p. 28, pl. 2, fig. 14.

Dentalina gyrosa **Terquem, 1866**
(Pl. 1, Fig. 17)

+1866 *Dentalina gyrosa* Terquem, p. 407, pl. 15, fig. 10.
Remarks. This species probably belongs to the group of *dentalina matutina.* d'Orbigny, 1850.

Dentalina haeusleri **Paalzow, 1917**
(Pl. 9, Fig. 203)

+1917 *Dentalina häusleri* Paalzow, p. 232, pl. 43, figs. 12–13.

Dentalina integra **(Kübler and Zwingli, 1866)**
(Pl. 5, Figs. 136–137)

+1866 *Vaginulina integra* Kübler and Zwingli, p. 8, pl. 1, fig. 2.
1870 *Vaginulina integra* Kübler and Zwingli, p. 5, pl. 1, fig. 5.
1968 *Dentalina integra* (Kübler and Zwingli). Welzel, p. 27, pl. 1, fig. 57.

Dentalina jurensis **(Gümbel, 1862)**
(Pl. 2, Fig. 153)

+1862 *Vaginulina jurensis* Gümbel, p. 220, pl. 3, fig. 14.
1865 *Dentalina mutabilis* Schwager, p. 103, pl. 2, fig. 24.
1870 *Dentalina intorta* Terquem (1870b), p. 262, pl. 27, figs. 26–34.
1932 *Dentalina peracuta* Reuss. Paalzow, p. 113, pl. 7, fig. 19.
1955 *Dentalina jurensis* (Gümbel). Seibold and Seibold, p. 112, pl. 13, fig. 9.
1960 *Dentalina peracuta* Reuss. Seibold and Seibold, p. 60, pl. 4, fig. 14.

Dentalina nodigera **Terquem and Berthelin, 1875**
(Pl. 5, Fig. 135)

+1875 *Dentalina nodigera* Terquem and Berthelin, p. 25, pl. 1, fig. 31.
1936 *Dentalina nodigera* Terquem and Berthelin. Franke, p. 26, pl. 2, fig. 7.
1968 *Dentalina varians* Terquem. Welzel, p. 24, pl. 3, figs. 17–18.
Remarks. An inflated *Dentalina,* which ranges from lower Pliensbachian to lowermost Toarcian (Germany, France).

Dentalina plebeia **Terquem, 1870**
(Pl. 2, Fig. 67)

+1870 *Dentalina plebeia* Terquem (1870b), p. 267, pl. 29, figs. 3–11.

Dentalina **aff.** *pseudoarcuata* **E. and I. Seibold, 1960**
(Pl. 2, Fig. 68)

aff. 1960 *Dentalina pseudoarcuata* E. and I. Seibold, p. 360, text-fig. 60.
1967 *Dentalina* aff. *incerta* Terquem. Groiss, p. 14, pl. 1, fig. 35.
Remarks. Differs from *Dentalina pseudoarcuata* E. and I. Seibold in not having oblique sutures.

Dentalina sculpta **Terquem, 1866**
(Pl. 5, Fig. 133)

+1866 *Dentalina sculpta* Terquem, p. 484, pl. 19, fig. 24.
1936 *Dentalina tenuistriata* Terquem. Franke, p. 35, pl. 3, fig. 7c.
1968 *Dentalina tenuistriata tenuistriata* Terquem. Welzel, p. 29, pl. 3, fig. 21.

Dentalina suboligostegia **Franke, 1936**
(Pl. 5, Fig. 139)

+1936 *Dentalina suboligostegia* Franke, p. 25, pl. 2, fig. 1.
1936 *Dentalina tortilis* Franke, p. 29, pl. 2, fig. 19.
1968 *Dentalina submucronata* Franke. Welzel, p. 22, pl. 1, figs. 52–53.

Dentalina subsiliqua **Franke, 1936**
(Pl. 5, Fig. 138)

+1936 *Dentalina subsiliqua* Franke, p. 30, pl. 2, fig. 21.

Dentalina subulata **Franke, 1936**
(Pl. 5, Figs. 147–148)

+1936 *Dentalina subulata* Franke, p. 27, pl. 2, fig. 11.
1968 *Dentalina subulata* Franke. Welzel, p. 21, pl. 1, fig. 51.

Dentalina **cf.** *terquemi* **d'Orbigny, 1849**
(Pl. 5, Fig. 140)

cf. 1850 *Dentalina terquemi* d'Orbigny, p. 242.
cf. 1936 *Dentalina terquemi* d'Orbigny. Macfadyen, p. 149, pl. 1, fig. 257.
Remarks. The specimen described here has a nearly circular section and no chamber incisions like *Dentalina terquemi* d'Orbigny.

Dentalina teutoburgensis **Franke, 1936**
(Pl. 1, Fig. 16; Pl. 5, Fig. 132)

+1936 *Dentalina teutoburgensis* Franke, p. 33, pl. 3, fig. 3.
1968 *Dentalina matutina funiculosa* Terquem. Welzel, p. 28, pl. 2, fig. 6 (7?).

Dentalina torta **Terquem, 1858**
(Pl. 5, Fig. 143)

+1858 *Dentalina torta* Terquem, p. 39, pl. 2, fig. 6.
1936 *Dentalina pseudocommunis* Franke, p. 30, pl. 2, fig. 20.
1968 *Dentalina torta* Terquem. Welzel, p. 22, pl. 1, fig. 49.

Dentalina turgida **Schwager, 1865**
(Pl. 2, Fig. 69)

+1865 *Dentalina turgida* Schwager, p. 100, pl. 2, fig. 19; pl. 3, figs. 6, 11, 20.
1890 *Nodosaria (Dentalina) mucronata* Neugebohren. Haeusler, p. 100, pl. 13, fig. 102.
1932 *Marginulina apiculata* Reuss. Paalzow, p. 106, pl. 7, figs. 1–2.
1956 *Dentalina turgida* Schwager. Seibold and Seibold, p. 135, text-fig. 4r.

Dentalina vetustissima **d'Orbigny, 1850**
(Pl. 5, Figs. 144–146)

+1850 *Dentalina vetustissima* d'Orbigny, p. 242.
1936 *Dentalina vetustissima* d'Orbigny. Macfadyen, p. 150, pl. 1, fig. 261.
1936 *Dentalina exilis* Franke, p. 31, pl. 2, fig. 25.
Remarks. An elongated *Dentalina* with straight, but weak chamber incisions.

Dentalina **sp.**
(Pl. 2, Fig. 70)

Remarks. A smooth *Dentalina* without any constrictions or visible sutures.

Dentalina **sp. A**
(Pl. 2, Fig. 71)

Remarks. A very slender, smooth *Dentalina,* without constrictions.

Astacolus carinocostata **(Deecke, 1884)**
(Pl. 2, Fig. 73)

+1884 *Cristellaria carinocostata* Deecke, p. 43, pl. 2, figs. 5–5a.
1978 *Lenticulina (Astacolus) interrumpa* (Blank). Munk, p. 45, pl. 3, fig. 8.
Remarks. This species shows broad constrictions of the chambers and a keel.

Astacolus deformis **(Bornemann, 1854)**
(Pl. 6, Fig. 155)

+1854 *Cristellaria deformis* Bornemann, p. 41, pl. 4, fig. 35.

Astacolus semiincisus **(Terquem and Berthelin, 1875)**
(Pl. 1, Fig. 18; Pl. 6, Fig. 156)

+1875 *Cristellaria semi-incisa* Terquem and Berthelin, p. 48, pl. 4, fig. 9.
1969 *Astacolus primus* (d'Orbigny). Brouwer, p. 30, pl. 6, fig. 6.

Astacolus spongiphilus **(Gümbel, 1862)**
(Pl. 2, Fig. 72)

+1862 *Cristellaria spongiphila* Gümbel, p. 225, pl. 3, fig. 26.
1955 *Lenticulina (Astacolus) prima franconica* (Gümbel). Seibold and Seibold, p. 109, text-fig. 3k, 1; pl. 13, fig. 6.
1956 *Lenticulina (Astacolus) fraasi* (Schwager). Seibold and Seibold, p. 116, text-fig. 5m, n.
1967 *Astacolus primus franconicus* (Gümbel). Groiss, p. 28, pl. 3, fig. 91.
1970 *Astacolus primus franconicus* (Gümbel). Winter, p. 16, pl. 2, fig. 60.

Astacolus stillus **(Terquem, 1866)**
(Pl. 6, Fig. 157)

+1866 *Cristellaria stilla* Terquem, p. 517, pl. 22, fig. 7.
1941 *Cristellaria similis* Terquem. Macfadyen, p. 34, pl. 2, fig. 26.

Astacolus turgidus **(Schwager, 1865)**
(Pl. 2, Fig. 74)

+1865 *Cristellaria turgida* Schwager, p. 127, pl. 6, fig. 4.
1865 *Cristellaria informis* Schwager, p. 128, pl. 6, fig. 8.
1890 *Cristellaria cultrata* Monfort. Haeusler, p. 114, pl. 15, figs. 4–5.
1956 *Lenticulina (Astacolus) matutina informis* (Schwager). Seibold and Seibold, p. 119, pl. 7, fig. 13, text-fig. 4e–g.
1972 *Lenticulina involvens* Wiśniowski). Luterbacher, pl. 3, figs. 7–8.

Astacolus **cf.** *turgidus* **(Schwager, 1865)**
(Pl. 2, Fig. 75)

Remarks. Differs from *Astacolus turgidus* (Schwager) in having lower chambers and stronger constrictions at the sutures.

Astacolus varians **(Bornemann, 1854)**
(Pl. 6, Fig. 149)

+1854 *Cristellaria varians* Bornemann, p. 41, pl. 4, figs. 32–34.
1936 *Cristellaria (Lenticulina) varians* Bornemann, var. *suturalis-costata* Franke, p. 113, pl. 11, fig. 13.
1937 *Cristellaria varians* Bornemann. Bartenstein and Brand, p. 176, pl. 2B, fig. 32.
1963 *Lenticulina (Astacolus) varians* (Bornemann). Rabitz, p. 203, pl. 16, figs. 2, 3, 6.
1975 *Lenticulina varians* (Bornemann). Jendryka-Fuglewitz, p. 136, pl. 2, figs. 1–2.
Remarks. A very common species in the Lias and rather variable, often with a keel and weak constrictions at the sutures.

Citharina colliezi **(Terquem, 1866)**
(Pl. 2, Fig. 76)

+1866 *Marginulina colliezi* Terquem, p. 430, pl. 17, fig. 10.
1868 *Marginulina flabelloides* Terquem, p. 102, pl. 6, figs. 1–30.
1917 *Vaginulina flabelloides* Terquem. Paalzow, p. 238, pl. 45, figs. 8–9.
1924 *Vaginulina flabelloides* Terquem. Klähn, p. 29. pl. 1, fig. 16.
1962 *Citharina flabelloides* (Terquem). Cordey, p. 385, pl. 47, fig. 17.
1971 *Citharina colliezi* (Terquem). Wernli, p. 316, pl. 2, figs. 13–17; pl. 3, figs. 1–2.
1971 *Citharina "colliezi-heteropleura"*. Wernli, p. 317, pl. 2, figs. 23–26.
1978 *Vaginulina flabelloides* (Terquem). Munk, p. 49, pl. 2, fig. 1.
Distribution. The species is found from lower Toarcian to Oxfordian.

Citharina inconstans **(Terquem, 1868)**
(pl. 2, Fig. 77)

+1868 *Marginulina inconstans* Terquem, p. 66, pl. 2, figs. 1–12.

Remarks. The species belongs to the group of *Citharina colliezi* (Terquem) but differs in having coarser, more irregular ribs.

Frondicularia major **Bornemann, 1854**
(Pl. 1, Fig. 21)

+1854 *Frondicularia major* Bornemann, p. 36, pl. 3, fig. 21.
?1854 *Frondicularia intumescens* Bornemann, p. 36, pl. 3, fig. 19.
1886 *Frondicularia carinata* Burbach (1886a), p. 47, pl. 12, figs. 17–20, 29.
1886 *Frondicularia elliptica* Burbach (1886a), p. 48, pl. 1, figs. 21–26; pl. 2, fig. 37.
1886 *Frondicularia lata* Burbach (1886a), p. 48, pl. 1, figs. 27–28, 30; pl. 2, figs. 31–32.
1936 *Frondicularia major* Bornemann. Franke, p. 68, pl. 7, fig. 2.
1937 *Frondicularia major* Bornemann. Bartenstein and Brand, p. 155, pl. 5, fig. 68.
1963 *Frondicularia major* Bornemann. Rabitz, p. 208, pl. 17, figs. 18–20.
1968 *Frondicularia major* Bornemann. Welzel, p. 37, pl. 2, fig. 20.
1968 *Lingulina sacculus* (Terquem). Welzel, p. 35, pl. 3, fig. 38.

Distribution. In Germany and France the species seems to be restricted to the lower Pliensbachian and the lowermost Toarcian.

Frondicularia paradoxa **Berthelin, 1879**
(Pl. 6, Figs. 150–151)

+1879 *Frondicularia paradoxa* Berthelin, p. 33, pl. 1, figs. 12–15, 15bis, 16–17.
1936 *Flabellina paradoxa* Berthelin. Franke, p. 91, pl. 9, figs. 10–11.
1936 *Falsopalmula kuhni* Franke, p. 92, pl. 9, fig. 14.
1937 *Flabellina paradoxa* (Berthelin). Bartenstein and Brand, p. 168, pl. 4, fig. 63.
1957 *Flabellina paradoxa* Berthelin. Barnard, p. 173, text-fig. 2G–J.
1970 *Berthelinella paradoxa* (Berthelin). Fuchs, p. 110, pl. 8, fig. 7.
?1970 *Sieberina virgata* Fuchs, p. 107, pl. 8, figs. 11, 14; pl. 10, figs. A–D.
?1970 *Sieberina sagitta* Fuchs, p. 107, pl. 8, fig. 18.

Distribution. This species occurs in North and South Germany only in the lower Pliensbachian, in Austria in the ?Sinemurian (Fuchs, 1970), and in Britain in the Sinemurian–Toarcian (Copestake and Johnson, 1981).

Frondicularia sacculus **Terquem, 1866**
(Pl. 2, Fig. 22)

+1866 *Frondicularia sacculus* Terquem, p. 482, pl. 19, fig. 20.
1936 *Frondicularia sacculus* Terquem. Franke, p. 68, pl. 7, fig. 4.
1937 *Frondicularia sacculus* Terquem. Bartenstein and Brand, p. 154, pl. 4, fig. 46.
1967 *Frondicularia major* Bornemann. Ruget and Sigal, p. 48, pl. 4, fig. 14.
1967 *Frondicularia nitida* Terquem. Ruget and Sigal, p. 49, pl. 4, fig. 12.
1967 *Frondicularia* cf. *intumescens* Bornemann. Ruget and Sigal, p. 49, pl. 4, fig. 13.
1967 *Frondicularia* cf. *nitida* Terquem. Ruget and Sigal, p. 49, pl. 4, fig. 16.

Remarks. A smooth *Frondicularia,* related to *F. major* Bornemann, which occurs from the Sinemurian to the upper Pliensbachian.

Frondicularia squamosa **Terquem and Berthelin, 1875**
(Pl. 6, Fig. 154)

+1875 *Frondicularia squamosa* Terquem and Berthelin, p. 37, pl. 3, fig. 3.
1937 *Frondicularia mesoliassica* Brand in Bartenstein and Brand, p. 158, pl. 4, fig. 66, text-fig. 16.
1941 *Frondicularia sulcata* var. *squamosa* Terquem and Berthelin. Macfadyen, p. 61, pl. 4, fig. 61.
1968 *Frondicularia squamosa* (Terquem and Berthelin). Welzel, p. 40, pl. 3, fig. 34.
1969 *Frondicularia bicostata* d'Orbigny. Brouwer, p. 35, pl. 5, fig. 7.
1970 *Frondicularia muelensis* Mouterde and Ruget, p. 92, pl. 3, figs. 19–32; pl. 4, figs. 1–6.
1981 *Ichthyolaria squamosa.* Hohenegger, pl. 2, table 5, text-fig. 8.

Remarks. *Frondicularia squamosa* Terquem and Berthelin has somewhat finer ribs and is more slender than *Frondicularia terquemi* d'Orbigny.

Frondicularia terquemi terquemi **d'Orbigny, 1850**
(Pl. 6, Fig. 152)

+1850 *Frondicularia terquemi* d'Orbigny, p. 241.
1850 *Frondicularia bicostata* d'Orbigny, p. 242.
1876 *Frondicularia terquemi* d'Orbigny. Blake *in* Tate and Blake, p. 468, pl. 19, fig. 22.
1936 *Frondicularia terquemi* d'Orbigny. Macfadyen, p. 149, pl. 1, fig. 255.
1936 *Frondicularia bicostata* d'Orbigny. Macfadyen, p. 149, pl. 1, fig. 256.
1936 *Frondicularia bicostata* d'Orbigny. Franke, p. 70, pl. 7, fig. 9.
1936 *Frondicularia baueri* Burbach. Franke, p. 70, pl. 7, fig. 10.
1936 *Frondicularia terquemi* d'Orbigny. Franke, p. 69, pl. 7, fig. 11.
1937 *Frondicularia bicostata* d'Orbigny. Bartenstein and Brand, p. 158, pl. 3, fig. 35; pl. 4, fig. 48.
1968 *Frondicularia terquemi bicostata* d'Orbigny. Bartenstein and Brand, p. 158, pl. 3, fig. 35; pl. 4, fig. 48.
1981 *Ichthyolaria terquemi* (d'Orbigny). Hohenegger, pl. 2, table 5, text-fig. 8.

Remarks. A species common in the upper Sinemurian and the Pliensbachian.

Frondicularia terquemi dubia **Bornemann, 1854**
(Pl. 6, Fig. 153)

+1854 *Frondicularia dubia* Bornemann, p. 37, pl. 3, fig. 23.
1936 *Frondicularia dubia* Bornemann. Franke, p. 72, pl. 7, fig. 6.
1937 *Frondicularia dubia* Bornemann. Bartenstein and Brand, p. 158, pl. 3, fig. 41.
1957 *Spandelina terquemi dubia* (Bornemann). Nørvang, p. 344, figs. 60–61.
1957 *Frondicularia sulcata plexus,* form E. Barnard, p. 175, pl. 1, fig. E; pl. 2, Figs. 10, 22.
1968 *Frondicularia terquemi dubia* Bornemann. Welzel, p. 26, pl. 2, fig. 26.
1969 *Frondicularia bicostata* d'Orbigny. Brouwer, p. 35, pl. 58, figs. 3, 22.
1970 *Frondicularia dubia* Bornemann. Mouterde and Ruget, p. 90, pl. 2, figs. 27–28.
1970 *Frondicularia* gr. *dubia* Bornemann. Mouterde and Ruget, p. 90, pl. 2, figs. 29–30.
1981 *Ichthyolaria terquemi.* Hohenegger, pl. 2, table 5, text-fig. 8.

Lenticulina gottingensis **(Bornemann, 1854)**
(Pl. 6, Fig. 159)

+1854 *Robulina gottingensis* Bornemann, p. 43, pl. 4, figs. 40–41.
1936 *Cristellaria (Lenticulina) gottingensis* Bornemann. Franke, p. 116, pl. 11, fig. 22.
1957 *Lenticulina gottingensis* (Bornemann). Nørvang, p. 382, fig. 168.
1963 *Lenticulina gottingensis* (Bornemann). Rabitz, p. 202, pl. 16, fig. 4.

Remarks. A thick, smooth *Lenticulina* without keel, typical for lower Pliensbachian to lowermost Toarcian.

Lenticulina hebetata **(Schwager, 1865)**
(Pl. 9, Figs. 207, 209)

+1865 *Cristellaria hebetata* Schwager, p. 134, pl. 7, fig. 2.
1953 *Lenticulina (Lenticulina) muensteri* (Roemer). Seibold and Seibold, p. 49, pl. 4, fig. 8.
1955 *Lenticulina (Lenticulina) muensteri* (Roemer). Seibold and Seibold, p. 104, text-fig. 4a–c.
1956 *Lenticulina meunsteri hebetata* (Schwager). Seibold and Seibold, p. 122, text-fig. 4-k, l.
1962 *Lenticulina muensteri* (Roemer). Cordey, p. 378, pl. 46, fig. 1.
1970 *Lenticulina muensteri* (Roemer). Winter, p. 25, pl. 3, fig. 93.
1972 *Lenticulina muensteri* (Roemer). Luterbacher, pl. 3, figs. 11–12.

Remarks. Cross section thicker than that of *Lenticulina gottingensis*. Surface smooth, without any constrictions, no keel.

***Lenticulina inermis* (Terquem, 1862)**
(Pl. 6, Fig. 158)

+1862 *Cristellaria inermis* Terquem, p. 447, pl. 6, fig. 5.

***Lenticulina oolithica* (Terquem, 1876)**
(Pl. 9, Figs. 206, 211)

+1876 *Robulina oolithica* Terquem, p. 496, pl. 17, fig. 10.
1954 *Lenticulina muensteri* (Roemer). Bielecka and Pozaryski, p. 33, pl. 4, fig. 12.
1971 *Lenticulina muensteri* (Roemer). Wernli, p. 321, pl. 4, fig. 21.
Remarks. Chamber sutures visible, with a keel, not so thick as *Lenticulina hebetata* (Schwager).

***Lenticulina polygonata* (Franke, 1936)**
(Pl. 1, Fig. 23)

+1936 *Cristellaria (Lenticulina) polygonata* Franke, p. 118, pl. 12, figs. 1–2.
1968 *Lenticulina muensteri polygonata* (Franke). Welzel, p. 42, pl. 2, fig. 38.
1975 *Lenticulina polygonata* (Franke). Jendryka-Fuglewitz, p. 137, pl. 2, figs. 7–8.
Remarks. Faint to distinct polygonal outline, sutures visible, straight. A typical species of Pliensbachian to Toarcian age.

***Lenticulina? pusilla* (Schwager, 1865)**
(Pl. 9, Fig. 208)

+1865 *Rotalia pusilla* Schwager, p. 141, pl. 7, fig. 20.
1953 *Gyroidina?* sp. E. and I. Seibold, p. 70, pl. 6, fig. 10.
1956 *Rotalia pusilla* Schwager. Seibold and Seibold, p. 104.
Remarks. A symmetrical *?Lenticulina* with distinct, broad constrictions in its outline, chamber sutures visible.

***Lenticulina quenstedti* (Gümbel, 1862)**
(Pl. 9, Fig. 205)

+1862 *Cristellaria quenstedti* Gümbel, p. 226, pl. 4, fig. 2.
1932 *Lenticulina quenstedti* Gümbel. Paalzow, p. 102, pl. 6, figs. 3–5.
1953 *Lenticulina quenstedti* (Gümbel). Seibold and Seibold, p. 49, pl. 4, fig. 4.
1955 *Lenticulina quenstedti* (Gümbel). Seibold and Seibold, p. 105, pl. 13, fig. 3.
1962 *Lenticulina plexus-quenstedti* (Gümbel). Bastien and Sigal, p. 98, pl. 6, figs. 15–20, pl. 7, figs. 1–3.
1970 *Lenticulina quenstedti* (Gümbel). Winter, p. 26, pl. 3, fig. 92.
1971 *Lenticulina quenstedti* (Gümbel), forma A–C. Wernli, p. 322, pl. 4, figs. 14, 21, 23, 25, 27–28; pl. 10, fig. 1.
1972 *Lenticulina quenstedti* (Gümbel). Luterbacher, pl. 3, fig. 1.
1978 *Lenticulina (Lenticulina) quenstedti* (Gümbel). Munk, p. 43, pl. 3, fig. 1.
1978 *Lenticulina (Astacolus) volubilis* Dain. Munk, p. 45, pl. 3, figs. 2, 9; pl. 4, figs. 7, 10.
1978 *Lenticulina (Lenticulina)* sp. Munk, p. 43, pl. 3, fig. 7.
1978 *Lenticulina quenstedti* (Gümbel). Kuznetsova and Seibold, pl. 2, fig. 10.
?1980 *Lenticulina ouachensis ouachensis* (Sigal). Sliter, pl. 9, figs. 11–16; pl. 10, figs. 1–4.
Remarks. A *Lenticulina* with strong, very characteristic sutural ribs, fusing with a circular rib around the umbilical area. Toarcian to Tithonian (?Lower Cretaceous).

***Marginulina brunsvigensis* Franke, 1936**
(Pl. 1, Fig. 25)

+1936 *Marginulina brunsvigensis* Franke, p. 75, pl. 7, fig. 26.
1969 *Vaginulina listi* Bornemann. Brouwer, p. 40, pl. 3, fig. 24.

***Marginulina dentaliniformis* (Terquem and Berthelin, 1875)**
(Pl. 1, Fig. 26)

+1875 *Cristellaria dentaliniformis* Terquem and Berthelin, p. 43, pl. 3, fig. 19.
1936 *Marginulina simplex* (Terquem). Franke, p. 75, pl. 7, figs. 23–24.
1937 *Marginulina simplex* (Terquem). Bartenstein and Brand, p. 159, pl. 1A, fig. 14; pl. 3, fig. 37; pl. 4, fig. 57.

***Marginulina oolithica* (Terquem, 1870)**
(Pl. 2, Fig. 78)

+1870 *Dentalina oolithica* Terquem (1870b), p. 28, figs. 5–15.
1941 *Marginulina oolithica* (Terquem). Frentzen, p. 336, pl. 3, figs. 26–29.

***Marginulina porrecta* Terquem, 1866**
(Pl. 6, Fig. 161)

+1866 *Marginulina porrecta* Terquem, p. 501, pl. 21, figs. 19–21.
1936 *Marginulina porrecta* Terquem. Franke, p. 79, pl. 8, figs. 13–14.
1960 *Marginulina porrecta* Terquem. Bizon, p. 7, pl. 2, fig. 6; pl. 4, fig. 8.
Remarks. This elongate *Marginulina* with strong ribs is slightly asymmetrical. Sinemurian to upper Pliensbachian (Germany, France, England).

***Marginulina prima* d'Orbigny, 1850**
(Pl. 6, figs. 162–163)

+1850 *Marginulina prima* d'Orbigny, p. 242.
1936 *Marginulina prima* d'Orbigny. Franke, pp. 76–78, pl. 8, figs. 1–7.
1936 *Marginulina prima* d'Orbigny. Macfadyen, p. 151, pl. 1, fig. 262.
1937 *Marginulina prima* d'Orbigny. Bartenstein and Brand, p. 161, pl. 2B, fig. 26; pl. 3, fig. 39; fig. 60; pl. 5, fig. 46.
1941 *Marginulina prima* d'Orbigny. Macfadyen, p. 38, pl. 2, fig. 32.
1957 *Marginulina prima prima* d'Orbigny. Nørvang, p. 367, figs. 98, 99, 103–104.
1968 *Marginulina prima prima* d'Orbigny. Welzel, p. 32, pl. 2, figs. 10–12.
1969 *Marginulina prima* (d'Orbigny). Brouwer, p. 38, pl. 56, figs. 8, 10, 13, 14, *non* figs. 9, 11, 12, 15.
Remarks. A common species in the Lias, but rather variable. Known from Hettangian to lowermost Toarcian (Germany, France, England, and Denmark).

***Marginulina spinata* Terquem, 1858**
(Pl. 6, Fig. 160)

+1858 *Marginulina spinata* Terquem, p. 55, pl. 3, fig. 8.
1936 *Marginulina interrupta* Terquem, f. *spinata* Terquem. Franke, p. 79, pl. 8, fig. 10.
1937 *Marginulina spinata spinata* Terquem. Bartenstein and Brand, p. 161, pl. 4, fig. 61; pl. 5, fig. 47.
1941 *Marginulina spinata* Terquem. Macfadyen, p. 39, pl. 2, fig. 33.
1968 *Marginulina prima spinata* Terquem. Welzel, p. 33, pl. 2, fig. 22.
Distribution: In Denmark, index-species for lower Pliensbachian. Occurs in Germany from lower Pliensbachian to lowermost Toarcian and in Britain ranges from the latest Sinemurian to early Toarcian (Copestake and Johnson, 1981).

***Marginulina variabilis* Terquem. 1863**
(Pl. 6, Fig. 164)

+1863 *Marginulina variabilis* Terquem, p. 199, pl. 9, figs. 6–8.
1941*Marginulina lamellosa* Terquem and Berthelin. Macfadyen, p. 37, pl. 2, fig. 30.
Remarks. A rare, small *Marginulina*. Pliensbachian (France, England) and lowermost Toarcian (Southwest Germany).

***Marginulinopsis baccularis* (Terquem, 1866)**
(Pl. 7, Fig. 165)

+1866 *Cristellaria baccularis* Terquem, p. 514, pl. 22, figs. 2–3.

***Marginulinopsis matutina matutina* (d'Orbigny, 1850)**
(Pl. 7, Figs. 167–168)

+1850 *Cristellaria matutina* d'Orbigny, p. 242.
1936 *Cristellaria matutina* d'Orbigny. Macfadyen, p. 151, pl. 1, fig. 264.
1936 *Cristellaria (Astacolus) antiquata* d'Orbigny. Franke, p. 105, pl. 10, fig. 14.
1937 *Cristellaria (Astacolus) vetusta* d'Orbigny. Bartenstein and Brand, p. 172, pl. 6, fig. 31.

1937 *Cristellaria (Astacolus) rectalonga* Brand *in* Bartenstein and Brand, p. 172, pl. 4, fig. 80.

***Marginulinopsis matutina terquemi* (d'Orbigny, 1850)**
(Pl. 7, Fig. 169)

+1850 *Cristellaria terquemi* d'Orbigny, p. 242.
1936 *Cristellaria terquemi* d'Orbigny. Macfadyen, p. 152, pl. 1, fig. 269.
1967 *Marginulinopsis* gr. *vetusta* (d'Orbigny), forma *vetusta*. Forme B. Ruget and Sigal, p. 36, pl. 2, fig. 1.
1967 *Marginulinopsis* sp. 1. Forme B. Ruget and Sigal, p. 37, pl. 1, fig. 6.
1967 *Marginulinopsis* gr. *polygonata* (Franke). Ruget and Sigal, p. 38, pl. 1, figs. 11–12.
1968 *Astacolus primus* d'Orbigny. Welzel, p. 44, pl. 2, fig. 42.

***Marginulinopsis pauliniae* (Terquem, 1866)**
(Pl. 7, Fig. 166)

+1866 *Marginulina pauliniae* Terquem, p. 427, pl. 17, fig. 5.
1875 *Marginulina constricta* Terquem and Berthelin, p. 58, pl. 5, fig. 3.
1936 *Marginulina simplex* (Terquem). Franke, p. 75, pl. 7, fig. 22.
1937 *Marginulina oolithica* (Terquem). Bartenstein and Brand, p. 160, pl. 2A, fig. 11; pl. 2B, fig. 37; pl. 3, fig. 38.

***Palmula anceps* (Terquem, 1870)**
(Pl. 2, Fig. 81)

+1870 *Cristellaria anceps* Terquem, p. 428, pl. 9, figs. 11–21.
1932 *Planularia semiinvoluta* Terquem. Paalzow, p. 105, pl. 6, figs. 13–14, 20–21.
1962 *Cristellaria plexus-treptensis* Bastien and Sigal, p. 99, pl. 7, figs. 4–15.

***Palmula filosa* (Terquem, 1866)**
(Pl. 1, Fig. 29)

+1866 *Cristellaria filosa* Terquem, p. 517, pl. 22, fig. 8.
1936 *Cristellaria (Planularia) filosa* Terquem. Franke, p. 95, pl. 9, fig. 25.

***Palmula gyrata* (Terquem, 1870)**
(Pl. 2, Fig. 79)

+1870 *Flabellina gyrata* Terquem, p. 220, pl. 23, fig. 17.

***Palmula hybrida* (Terquem, 1870)**
(Pl. 2. Fig. 80)

+1870 *Flabellina hybrida* Terquem (1870b), p. 229, pl. 24, fig. 16.
1932 *Flabellina deslongchampsi* Terquem. Paalzow, p. 132, pl. 9, fig. 26.
1953 *Falsopalmula deslongchampsi* (Terquem). Seibold and Seibold, p. 58, pl. 4, fig. 20.
1960 *Falsopalmual deslongchampsi* (Terquem). Seibold and Seibold, p. 369, text-fig. 6k–l.
1960 *Falsopalmula deslongchampsi* (Terquem). Lutze, p. 464, pl. 32, fig. 15.

***Palmula irregularis* (Terquem 1862)**
(Pl. 1, Fig. 28)

+1862 *Cristellaria irregularis* Terquem, p. 445, pl. 6, fig. 2.
1936 *Cristellaria (Planularia) cordiformis* Terquem. Franke, p. 95, pl.9, fig. 21.

***Palmula nucleata* (Terquem, 1863)**
(Pl. 1, Fig. 27)

+1863 *Cristellaria nucleata* Terquem, p. 205, pl. 9, fig. 19.
1936 *Cristellaria (Planularia) crepidula* (Fichtel and Moll). Franke, p. 95, pl. 9, fig. 22.
1957 *Planularia pseudocrepidula* Adams, p. 208, text-fig. 1–5.
1968 *Planularia pseudocrepidula* Adams. Welzel, p. 47, pl. 2, figs. 40–41.

Remarks. A variable and common, but small species. The cross section is flattened, the surface smooth. Sutures hardly visible. Equitant chambers can be observed in the adult stage of some specimens.

***Palmula plebeia* (Terquem and Berthelin, 1875)**
(Pl. 1, Fig. 104)

+1875 *Cristellaria plebeia* Terquem and Berthelin, p. 44, pl. 3, fig. 22; pl. 4, fig. 1.

***Palmula pikettyi* (Terquem, 1866)**
(Pl. 7, Fig. 171)

+1866 *Cristellaria pikettyi* Terquem, p. 511, pl. 21, figs. 31–32.

***Palmula primaria* (Franke, 1936)**
(Pl. 1, Fig. 30)

+1936 *Flabellina primaria* Franke, p. 93, pl. 9, fig. 15.

Remarks. The type level given by Franke is of early Sinemurian age. The specimen of Fig. 30 differs from the holotype in having stronger ribs in the juvenile stage.

***Palmula primordialis* (Terquem, 1870)**
(Pl. 2, Fig. 82)

+1870 *Cristellaria primordialis* Terquem (1870b), p. 428, pl. 9, figs. 1–10.
1962 *Planularia* sp. 13A. Bastien and Sigal, p. 102, pl. 7, fig. 18.

***Palmula semiinvoluta* (Terquem, 1870)**
(Pl. 1, Fig. 26)

+1870 *Cristellaria semi-involuta* Terquem (1870b), p. 437, pl. 11, figs. 1–30; pl. 12, figs. 1–20; 25–38, 30; pl. 13, figs. 1–3, 4–13, 15–21, 24; *non* pl. 12, figs. 21–24, 29; pl. 13, figs. 3, 14, 22–23.

***Palmula triquetra* (Terquem, 1870)**
(Pl. 9, Fig. 210)

+1870 *Flabellina triquetra* Terquem (1870b), p. 225, pl. 23, figs. 26–28.
1870 *Flabellina semi-involuta* Tertquem (1870b), p. 225, pl. 23, figs. 29–30; pl. 24, figs. 1–10.

***Pseudonodosaria dubia* (Terquem, 1870)**
(Pl. 2, Fig. 83)

+1870 *Glandulina dubia* Terquem (1870b), p. 240, pl. 25, figs. 10–11.

***Pseudonodosaria metensis* (Terquem, 1862)**
(Pl. 1, Fig. 33–34)

+1861 *Glandulina metensis* Terquem, p. 435, pl. 5, fig. 9.
1866 *Glandulina pygmaea* Terquem, p. 478, pl. 19, fig. 6.

***Pseudonodosaria nitidana* (Brand, 1937)**
(Pl. 1, Fig. 36)

+1858 *Nodosaria nitida* Terquem, p. 30, pl. 1, fig. 7 (preoccupied).
1862 *Marginulina pupoides* Terquem, p. 443, pl. 5, fig. 20.
1863 *Dentalina strangulata* Terquem, p. 172, pl. 7, fig. 7.
1866 *Nodosaria primitiva* Kübler and Zwingli, p. 7, pl. 1, fig. 16.
1870 *Nodosaria primitiva* Kübler and Zwingli, p. 5, pl. 1, fig. 1.
1936 *Nodosaria nitida* Terquem. Franke, p. 44, pl. 3, fig. 22.
1937 *Nodosaria nitidana* Brand *in* Bartenstein and Brand, p. 143, pl. 2B, fig. 22; pl. 4, fig. 32; pl. 5, fig. 27.

***Pseudonodosaria sexcostata* (Bornemann, 1854)**
(Pl. 1, Fig. 32)

+1854 *Glandulina sexcostata* Bornemann, p. 32, pl. 2, fig. 7.
1936 *Glandulina sexcostata* Bornemann. Franke, p. 58, pl. 6, fig. 2.

Remarks. The figured specimen is deformed by injury and therefore asymmetrical.

***Pseudonodosaria turbiniformis* (Terquem, 1870)**
(Pl. 2, Fig. 84)

+1870 *Glandulina turbiniformus* Terquem (1870b), p. 240, pl. 25, fig. 9.
1941 *Pseudoglandulina pupoides* (Bornemann). Frentzen, p. 328, pl. 3, fig. 5.

***Pseudonodosaria vulgata* (Bornemann, 1854)**
(Pl. 1, Fig. 35)

+1854 *Glandulina vulgata* Bornemann, p. 31, pl. 2, figs. 1–2.
1854 *Glandulina tenuis* Bornemann, p. 31, pl. 2, fig. 3.
1863 *Glandulina oviformis* Terquem, p. 168, pl. 7, fig. 4.
1936 *Glandulina vulgata* Bornemann. Franke, p. 54, pl. 5, fig. 9.
1936 *Glandulina pygmaea* Franke, p. 55, pl. 5, fig. 10.
1936 *Glandulina tenuis* Bornemann. Franke, p. 55, pl. 5, fig. 13.

***Saracenaria obesa* (Terquem, 1866)**
(Pl. 1, Fig. 37)

+1866 *Cristellaria obesa* Terquem, p 436, pl. 18, fig. 3.
1968 *Saracenaria* aff. *hannoverana* (Franke). Welzel, p. 49, pl. 2, fig. 50.
Remarks. A *Saracenaria* with rounded triangular cross section, without any keel and with strong chamber incisions. Seems to be restricted to the Pliensbachian and the lowermost Toarcian.

***Vaginulina anomala* Blake, 1876**
(Pl. 1, Fig. 38)

+1876 *Vaginulina anomala* Blake *in* Tate and Blake, p. 464, pl. 17, fig 23.
1968 *Citharina frankei* Tappan. Welzel, p. 34, pl. 2, fig. 32.

***Vaginulina contracta* (Terquem, 1868)**
(Pl. 7, Fig. 178)

+1868 *Marginulina contracta* Terquem, p. 125, pl. 8, figs. 13–24.

***Vaginulina implicata* (Schwager, 1865)**
(Pl. 2, Fig. 85)

+1865 *Cristellaria implicata* Schwager, p. 127, pl. 6, fig. 5.
1932 *Vaginulina flabellata* Gümbel. Paalzow, p. 129, pl. 9, fig. 17.
1932 *Vaginulina implicata* Schwager. Paalzow, p. 129, pl. 9, fig. 19.
1954 *Vaginulina zaglobensis* var. *parallela* Bielecka and Pożaryski, p. 45, pl. 6, fig. 27.
1956 *Citharina implicata* (Schwager). Seibold and Seibold, p. 141, text-fig. 5i, k (l?); pl. 7, fig. 8

***Vaginulina* aff. *jurassica* (Gümbel, 1862)**
(Pl.2, Fig. 86)

aff. 1862 *Marginulina jurassica* Gümbel, p. 222, pl. 3, fig. 21.
?1865 *Cristellaria parallela* Schwager, p. 121, pl. 5, fig. 5.
aff. 1955 *Vaginulina jurassica* (Gümbel). Seibold and Seibold, p. 120, pl. 13, fig. 15, text-fig. 5d, e.
?1956 *Lenticulina (Planularia) pseudoparallela* Seibold and Seibold, p. 114, text-fig. 3m–n.
1960 *Dentalina bicornis* Terquem. Seibold and Seibold, p. 358, text-fig. 6q.
Remarks. The specimen of Fig. 87 is more slender than the holotype described by Gümbel (1862).

***Vaginulina parva* Franke, 1936**
(Pl. 1, Figs. 39–40)

+1936 *Vaginulina parva* Franke, p. 83, pl. 8, fig. 23.
1936 *Vaginulina constricta* (Terquem and Berthelin). Franke, p. 83, pl. 8, fig. 24.
1937 *Vaginulina constricta* (Terquem and Berthelin). Bartenstein and Brand, p. 163, pl. 1A, fig. 16; pl. 2B, fig. 28; pl. 3, fig. 23; pl. 4, fig. 65.

***Vaginulina perfoliata* (Kübler and Zwingli, 1866)**
(Pl. 1, Fig. 42)

+1866 *Dentalina perfoliata* Kübler and Zwingli, p. 8, pl. 1, fig. 11.
1870 *Dentalina perfoliata* Kübler and Zwingli, p. 6, pl. 1, fig. 6.

***Vaginulina triangula* Frentzen, 1941**
(Pl. 1, Fig. 41)

+1941 *Vaginulina triangula* Frentzen, p. 340, pl. 4, fig. 8.
Distribution. Found only in the upper Pliesbachian and lowermost Toarcian of Southwest Germany.

***Vaginulina* sp.**
(Pl. 2, Fig. 87)

1890 *Cristellaria pauperata* Parker and Jones. Haeusler, p. 109, pl. 14, fig. 53.

***Lingulina acuformis* (Terquem, 1866)**
(Pl. 7, Fig. 179)

+1866 *Frondicularia acuformis* Terquem, p. 479, pl. 19, fig. 8.
1937 *Frondicularia tenera prismatica* Brand *in* Bartenstein and Brand, p. 156, pl. 3, fig. 34, text-fig. 15.
Remarks. A very slender, only slightly depressed *Lingulina* with 6 strong ribs and a subrectangular cross section. Found only in the upper Sinemurian and lower Pliensbachian of France and Germany. A good index-species.

***Lingulina affinis* (Terquem, 1870)**
(Pl. 9, Fig. 217)

+1870 *Dentalina affinis* Terquem (1870b), p. 261, pl. 27, figs. 17–22.
1870 *Frondicularia pyrus* Kübler and Zwingli, p. 24, pl. 3, fig. 4.

***Lingulina costata* (Kübler and Zwingli, 1866)**
(Pl. 1, Fig. 47; pl. 7, Fig. 172)

+1866 *Frondicularia costata* Kübler and Zwingli, p. 8, pl. 1, fig. 1.
1870 *Frondicularia longiscata* Terquem (1870b), p. 216, pl. 22, figs. 23–24.
1870 *Frondicularia nodosaria* Terquem (1870b), p. 217; pl. 22, fig. 25–30.
1870 *Frondicularia costata* Kübler and Zwingli, p. 6, pl. 1, fig. 11.
1884 *Frondicularia inaequalis* Deecke, p. 27, pl. 1, fig. 24.
1886 *Frondicularia spatulata* Terquem, p. 42, pl. 10, figs. 31–32.
1937 *Frondicularia nodosaria* Terquem. Bartenstein and Brand, p. 155, pl. 12A, fig. 6; pl. 13, fig. 14; pl. 15A, fig. 21.
1941 *Lingularia nodosaria* Terquem. Frentzen, p. 332, pl. 3, figs. 15–17.
1956 *Lingularia nodosaria* (Terquem). Barnard, p. 274, pl. 1, figs. 7–8.
1957 *Lingularia longiscata* var. *alpha* Adams, p. 224, text-figs. 116, 25–26.
1960 *Frondicularia nodosaria* (Terquem). Lutze, p. 468, pl. 32, fig. 13.
1968 *Lingulina nodosaria* Terquem. Welzel, p. 36, pl. 3, fig. 41.
1968 *Frondicularia hauffi* Franke. Welzel, p. 41, pl. 3, fig. 40.
1971 *Lingulina nodosaria* (Terquem). Wernli, p. 326, pl. 6, fig. 1–8.
Distribution. In many varieties from Sinemurian to Callovian.

***Lingulina dentaliniformis* (Terquem, 1870)**
(Pl. 1, Fig. 48; Pl. 9, Fig. 216)

+1870 *Frondicularia dentaliniformis* Terquem (1870b), p. 217, pl. 23, figs. 1–8.
1870 *Lingulina dentaliniformis* Terquem (1870b), p. 237, pl. 225, figs. 1–3 (obj.)
1936 *Lingulina laevissima* (Terquem). Franke, p. 62, pl. 6, fig. 11.
1971 *Lingulina dentaliniformis* (Terquem). Wernli, p. 327, pl. 6, figs. 12–16.

***Lingulina* cf. *dentaliniformis* (Terquem, 1870)**
(Pl. 9, Fig. 220)

Remarks. Differs from the latter species in having more constricted, more rounded chambers.

***Lingulina esseyana* Deecke, 1886**
(Pl. 1, Fig. 49)

+1875 *Lingulina ovalis* Terquem and Berthelin, p. 23, pl. 1, fig. 27 (preoccupied).
1886 *Lingulina esseyana* Deecke, p. 312.
1936 *Lingulina ovalis* Terquem. Franke, p. 63, pl. 6, fig. 13.
1956 *Lingulina esseyana* Deecke. Barnard, p. 271, pl. 1, figs. 3–4.
1968 *Lingulina esseyana* Deecke. Welzel, p. 35, pl. 2, fig. 18.

***Lingulina franconica* (Gümbel, 1862)**
(Pl. 9, Figs. 218–219)

+1862 *Frondicularia franconica* Gümbel, p. 219, pl. 3, fig. 13.
1870 *Frondicularia oolithica* Terquem, p. 213, pl. 22, figs. 1–9.

1890 *Lingulina carinata* d'Orbigny. Haeusler, p. 104, pl. 14, figs. 27–34.
1955 *Lingulina franconica* (Gümbel). Seibold and Seibold, p. 119, text-fig. 3e.
1965 *Lingulina nodosaria* Reuss. Gordon, p. 851, text-fig. 7/32–34.
1970 *Frondicularia franconica franconica* Gümbel. Winter, p. 24, pl. 3, fig. 87.

Distribution. The species is reported from the upper Middle Jurassic to lower Kimmeridgian of France and South Germany.

Lingulina gottingensis Franke, 1936
(Pl. 1, Fig. 45)

+1936 *Lingulina gottingensis* Franke, p. 62, pl. 6, figs. 14–15.

Distribution. Ranges from the early Pliensbachian to earliest Toarcian (Copestake and Johnson, 1981).

Lingulina laevissima (Terquem, 1866)
(Pl. 1, Fig. 50)

+1866 *Frondicularia laevissima* Terquem, p. 481, pl. 19, fig. 19.
1956 *Lingulina laevissima* (Terquem). Barnard, p. 272, pl. 1, fig. 5.
1968 *Lingulina cernua* (Berthelin). Welzel, p. 34, pl. 2, fig. 16.
1970 *Lingulina* sp. Mouterde and Ruget, p. 95, pl. 4, figs. 21–22.

Lingulina lingula (Terquem, 1862)
(Pl. 1, Fig. 44)

+1862 *Frondicularia lingula* Terquem, p. 437, pl. 5, fig. 8.
1866 *Frondicularia excavata* Terquem, p. 403, pl. 15, fig. 4.

Lingulina nodosaria (Kübler and Zwingli, 1866)
(Pl. 9, Fig. 213)

+1866 *Frondicularia nodosaria* Kübler and Zwingli, p. 10, pl. 2, fig. 1.
1870 *Frondicularia nodosaria* Kübler and Zwingli, p. 10, pl. 1, fig. 2.

Lingulina taenoides Franke, 1936
(Pl. 1, Fig. 43)

+1936 *Lingulina taenoides* Franke, p. 62, pl. 6, fig. 12.

Lingulina tenera tenera Bornemann, 1854
(Pl. 7, Figs. 174–175)

+1854 *Lingulina tenera* Bornemann, p. 38, pl. 3, fig. 24.
1936 *Lingulina tenera* Bornemann. Franke, p. 64, pl. 6, fig. 18.
1956 *Lingulina tenera* Bornemann. Barnard, p. 274, pl. 1, figs. 1–2, 9–10.
1968 *Lingulina tenera* Bornemann. Welzel, p. 36, pl. 2, fig. 19.

Remarks. A variable species but one of the most characteristic species of the Lower Jurassic worldwide. Ranges from Hettangain to lowermost Toarcian. Reports from the Middle and Upper Jurassic are probably misidentified.

Lingulina tenera carinata (Nørvang, 1957)
(Pl. 7, Fig. 180)

+1957 *Geinitzina tenera carinata* Nørvang, p. 62, figs. 46–55.

Distribution. Upper Sinemurian to lower Pliensbachian (Germany, Denmark).

Lingulina tenera praepupa (Nørvang, 1957)
(Pl. 7, Fig. 173)

+1957 *Geinitzina tenera praepupa* Nørvang, p. 60; figs. 30–31.

Distribution. Upper Sinemurian to lower Pliensbachian of Europe.

Lingulina tenera tenuistriata (Nørvang, 1957)
(Pl. 7, Fig. 176)

+1957 *Geinitzina tenera tenuistriata* Nørvang, p. 56, figs. 13, 16, 17, 24.

Distribution. Hettangian to upper Sinemurian of Europe.

Lingulina aff. *tenera* Bornemann, 1854
(Pl. 1, Fig. 46)

Remarks. The ribs start as in *Lingulina tenera tenera* Bornemann, but end in the juvenile stage. Only chamber incisions are visible in the following stage. An identical form has been found in the early Toarcian (*Tenuicostatum* Zone, *semicelatum* Subzone) of Lincoln, eastern England (Copestake, pers. comm., 1984).

Lingulina sp.
(Pl. 9, Fig. 212)

Remarks. A small *Lingulina*, similar to *Lingulina dentaliniformis* (Terquem).

Eoguttulina bilocularis (Terquem, 1864)
(Pl. 2, Fig. 88)

+1864 *Polymorphina bilocularis* Terquem, p. 293, pl. 11, figs. 9–32.
1865 *Globulina laevis* Schwager, p. 137, pl. 7, fig. 6; *non* Figs. 5, 7.
1956 *Eoguttulina bilocularis* (Terquem). Seibold and Seibold, p. 143, text-fig. 6c.
1962 *Eoguttulina oolithica* (Terquem). Cordey, p. 392, pl. 48, fig. 36.

Remarks. This *Eoguttulina* has a rounded cross section and a distinct subdivision between the final two chambers.

Eoguttulina laevis (Schwager, 1865)
(Pl. 2, Fig. 89)

+1865 *Globulina laevis* Schwager, p. 137, pl. 7, fig. 7; *non* Figs. 5–6.

Remarks. The two visible chambers are separated by a deep incision. Cross section ovate.

Eoguttulina liassica (Strickland, 1846)
(Pl. 1, Fig. 51)

+1846 *Polymorphina liassica* Strickland, p. 31, text-fig. b.

Remarks. Outline ovate, cross section compressed, incision weak.

Eoguttulina metensis (Terquem, 1864)
(Pl. 1, Fig. 53; Pl. 2, Fig. 90)

+1864 *Polymorphina metensis* Terquem, p. 301, pl. 13, fig. 38.
1865 *Globulina laevis* Schwager, p. 137, pl. 7, fig. 5; *non* Figs. 6–7.
1968 *Eoguttulina liassica liassica* (Strickland). Welzel, p. 51, pl. 3, fig. 36.

Remarks. An elongated, nearly rounded *Eoguttulina* without incisions.

Eoguttulina oolithica (Terquem, 1876)
(Pl. 1, Fig. 54)

+1876 *Globulina oolithica* Terquem, p. 497, pl. 17, fig. 12.

Remarks. A short *Eoguttulina*, nearly circular in cross section, no incisions.

Eoguttulina subrhomboidalis (Schwager, 1865)
(Pl. 9, Fig. 214)

+1865 *Vulvulina subrhomboidalis* Schwager, p. 140, pl. 7, fig. 17.
1956 *Guttulina subrhomboidalis* (Schwager). Seibold and Seibold, p. 148, text-fig. 6k.
1960 *Palaeopolymorphina* sp. E. and I. Seibold, p. 370, text-fig. 7c.

Distribution. Known only from the Oxfordian of south Germany.

Eoguttulina ventricosa (Terquem, 1864)
(Pl. 1, Fig. 52)

+1864 *Polymorphina ventricosa* Terquem, p. 302, pl. 13, fig. 42.
1936 *Polymorphina kuhni* Franke, p. 120, pl. 12, fig. 7.

Remarks. A flattened *Eoguttulina* with weak incisions or without visible sutures and an ovate outline.

Ramulina cf. *spandelia* Paalzow, 1917
(Pl. 9, Fig. 215)

1890 *Lagena hispida* Reuss. Haeusler, p. 88, pl. 123, figs. 21–24.
1890 *Lagena aspera* Reuss. Haeusler, p. 89, pl. 13, figs. 25–26.
1890 *Nodosaria hispida* d'Orbigny. Haeusler, p. 103, pl. 15, fig. 40.
cf. 1917 *Ramulina spandeli* Paalzow, p. 246, pl. 47, fig. 15.
1960 *Ramulina spandeli* Paalzow. Seibold and Seibold, p. 372, text-fig. 71.
1962 *Ramulina* cf. *spandeli* Paalzow. Cordey, p. 392, pl. 47, fig. 31.
1970 *Ramulina fusiformis* Khan. Winter, p. 41, pl. 4, fig. 140.
1972 *Ramulina nodosarioides* Deain. Luterbacher, pl. 2, fig. 21.

Remarks. Fig. 215 differs from the holotype in having more inflated chambers.

***Brizalina liasica* (Terquem, 1858)**
(Pl. 1, Figs. 19–20)

+1858 *Textularia liasica* Terquem, p. 75, pl. 4, fig. 12.
1858 *Textularia metensis* Terquem, p. 75, pl. 4, fig. 13.
1870 *Textularia prodromus* Kübler and Zwingli, p. 7, pl. 1, fig. 17.
1875 *Textularia limbata* Terquem and Berthelin, p. 63, pl. 5, fig. 9.
1875 *Textularia vicinalis* Terquem and Berthelin, p. 63, pl. 5, fig. 10.
1936 *Textularia pikettyi* Terquem. Franke, p. 125, pl. 12, fig. 19.
1936 *Bolivina rhumbleri* Franke, p. 126, pl. 12, fig. 21.
1937 *Bolivina rhumbleri rhumbleri* Franke. Bartenstein and Brand, p. 184, pl. 4, fig. 73; pl. 5, fig. 72.
1937 *Bolivina rhumbleri amalthea* Brand *in* Bartenstein and Brand, p. 185, pl. 7, fig. 1.
1957 *Bolivina liasica* (Terquem). Nørvang, p. 387, fig. 182.
1960 *Bolivina liasica* (Terquem). Bizon, p. 14, pl. 3, fig. 7; pl. 4, fig. 6.
1965 *Bolivina liasica liasica* (Terquem). Witthuhn, p. 69, pl. 1, figs. 3–4.
1965 *Bolivina liasica amalthea* Brand. Witthuhn, p. 73, pl. 1, figs. 5–6.
1968 *Brizalina? liasica liasica* (Terquem). Welzel, p. 52, pl. 3, fig. 43.
1969 *Brizalina liasica* (Terquem). Brouwer, p. 41, pl. 7, fig. 20–27.

Distribution. Upper Sinemurian (Switzerland), lower Pliensbachian to lowermost Toarcian (Germany, France).

***Spirillina concava* (Terquem, 1870)**
(Pl. 2, Fig. 91)

+1870 *Cornuspira concava* Terquem (1870b), p. 244, pl. 25, fig. 16.

Remarks. More numerous and more slender whorls than *Spirillina gracilis* Terquem.

***Spirillina gracilis* Terquem, 1886**
(Pl. 2, Fig. 92)

+1886 *Spirillina gracilis* Terquem, p. 8, pl. 1, fig. 12.

***Spirillina numismalis* Terquem and Berthelin, 1875**
(Pl. 7, Fig. 177)

+1875 *Spirillina numismalis* Terquem and Berthelin, p. 17, pl. 1, fig. 13.
1968 *Spirillina polygyrate* Gümbel. Welzel, p. 52, pl. 3, fig. 6.

***Trocholina umbo* Frentzen, 1941**
(Pl. 7, Figs. 181–182)

+1941 *Trocholina umbo* Frentzen, p. 306, pl. 1, fig. 12.
?1941 *Trocholina intermedia* Frentzen, p. 305, pl. 1, fig. 10.
?1941 *Ammodiscoides clypeiformis* Frentzen, p. 302, pl. 1, fig. 6.
1952 *Trocholina intermedia* Frentzen. Wicher, p. 262.

Distribution. Known only from the Sinemurian of southwest Germany.

***"Patellinella" poddari* Subbotina and Srivastava, 1960**
(Pl. 10, Figs. 222–224)

+1960 *Patellinella poddari* Subbotina and Srivastava in Subbotina et al., p. 43, pl. 4, fig. 7
?1960 *Paalzowella feifeli seiboldi* Lutze, p. 486, pl. 33, fig. 12.
1978 *Patellinella poddari* Subbotina and Srivastava. Bhalla and Abbas, p. 188, pl. 13, fig. 1–2.

Remarks. Described from the Callovian of India.

***Epistomina* sp.**
(Pl. 2, Figs. 93–95; Pl. 9, Fig. 221)

Remarks. Asymmetrical trochoid tests with light constrictions on the margin of the dorsal side and flattened ventral side. The bad preservation does not allow a more precise determination. Ribs could not be observed.

Radiolarians (Pl. 10, Figs. 225–234)

Remarks. All radiolarians are internal calcitic moulds and therefore very difficult to determine. Some species could be identified after Foreman (1978) (see Fig. 5).

Note on the Plates. The illustrated specimens are assigned numbers (5373–5410, 5506–5628, 5801–5900, and 6034) which correspond to negative and specimen I.D. numbers at the Geologisch-Paläontologisches Institut, Universität Tübingen, West Germany.

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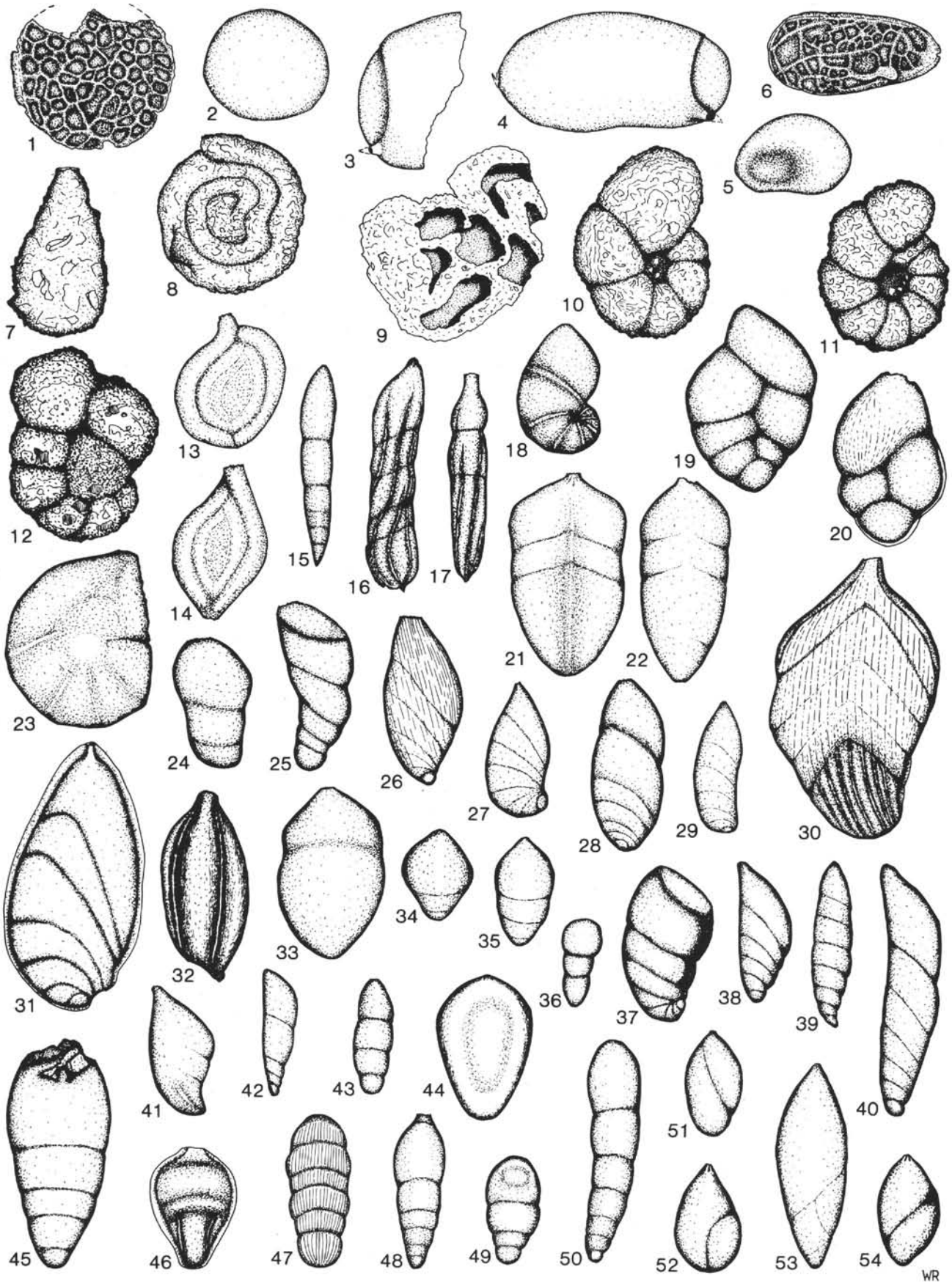
Date of Acceptance: February 3, 1984

Plate 1. Jurassic ostracodes and Liassic foraminifers. (Specimens are from Sample 547B-11,CC and figures are magnified ×38 unless otherwise indicated.) **1.** *Polycope* cf. *cerasia*, 547B-18-2, 5–7 cm, No. 5379, ×50. **2.** *Polycope pelta*, No. 5409, ×50. **3–4.***Ledahia septenaria*, (3) No. 5397, ×50, (4) No. 5398, ×50. **5–6.** Gen. et sp. indet., (5) 547B-18-2, 5–7 cm, No. 5375, ×50, (6) 547B-7-2, 35–36 cm, No 5802, ×50. **7.** *Lagenammina jurassica*, No. 5516, ×50. **8.** *Ammodiscus glumaceus*, No. 5519, ×50. **9.** *?Tolypammina* sp., 547B-20-2, 59–61 cm, No. 5528; view from below to the internal structure, ×50. **10.** *Haplophragmoides kingakensis*, 547B-18-2, 5–7 cm, No. 5525, ×100. **11.** *Haplophragmoides barrowensis*, 547B-20-2, 59–61 cm, No. 5524, ×50. **12.** *Haplophragmium pictonicum*, No. 5529. **13.** *Ophthalmidium liasicum*, No. 5532, ×50. **14.** *Ophthalmidium carinatum* No. 5531, ×50. **15.** *Nodosaria caudata*, No. 5534, ×25. **16.** *Dentalina teutoburgensis*, 547B-20-1, 126–129 cm, No. 5559. **17.** *Dentalina gyrosa*, No. 5548. **18.** *Astacolus semiincisus*, No. 5565, ×38. **19–20.** *Brizalina liasica*, (19) No. 5568, (20) No. 5569, ×75. **21.** *Frondicularia major*, No. 5608. **22.** *Frondicularia sacculus*, No. 5613. **23.** *Lenticulina polygonata*, No. 5577. **24.** *Marginulina brunsvigensis*, 547B-22-2, 55–57 cm, No. 5585. **25.** *Marginulina dentaliniformis*, 547B-17,CC, No. 5579. **26.** *Palmula semiinvoluta*, No. 5591. **27.** *Palmula nucleata*, 547B-18-2, 5–7 cm, No. 5594. **28.** *Palmula irregularis*, No. 5604. **29.** *Palmula filosa*, 547B-22-2, 55–57 cm, No. 5592. **30.** *Palmula primaria*, No. 5593. **31.** *Palmula plebeia*, No. 5566. **32.** *Pseudonodosaria sexcostata*, misshapen. No. 5599. **33–34.***Pseudonodosaria metensis*, (33) 547B-20-1, 126–129 cm, No. 5597, (34) No. 5600 b. **35.** *Pseudonodosaria vulgata* No. 5600 a. **36.** *Pseudonodosaria nitidana* No. 5596. **37.** *Saracenaria obesa*, No. 5620 b. **38.** *Vaginulina anomala*, No. 5603 a. **39–40.***Vaginulina parva*, (39) 547B-22-1, 95–98 cm, No. 5603 b, (40) No. 5601. **41.** *Vaginulina triangula*, No. 5602 a. **42.** *Vaginulina perfoliata*, 547B-18-2, 5–7 cm, No. 5602 b. **43.** *Lingulina taenioides*, No. 5614. **44.** *Lingulina lingula*, 547B-20-1, 126–129, No. 5615. **45.** *Lingulina gottingensis*, No. 5607. **46.** *Lingulina* aff. *tenera* Bornemann, No. 5620 a. **47.** *Lingulina costata*, No. 5612. **48.** *Lingulina dentaliniformis*, No. 5610. **49.** *Lingulina esseyana*, No. 5611. **50.** *Lingulina laevissima*, No. 5609. **51.** *Eoguttulina liassica*, 547B-20-2, 59–61 cm, No. 5621 a. **52.** *Eoguttulina ventricosa*, 547B-17,CC, No. 5623. **53.** *Eoguttulina metensis*, No. 5622. **54.** *Eoguttulina oolithica*, 547B-20-2, 55–57 cm, No. 5621 b.

Plate 2. Middle and Upper Jurassic foraminifers. (Magnification ×38 unless otherwise indicated.) **55.** *Tolypammina jurensis*, on test of a *Lenticulina*, 547B-7,CC, No. 5804. **56.** *Trochammina pulchra*, 547B-7,CC, No. 5817, ×50. **57–58.** *Bigenerina arcuata*, (57) 547B-7-4, 135–137 cm, No. 5820, (58) 547B-7-2, 35–36 cm, No. 5821, ×50. **59.** *Bigenerina jurassica*, 547B-7,CC, No. 5819. **60–61.** *Verneuilinoides tryphera*, (60) 547B-8-1, 4–6 cm, No. 5824, ×50. (61) 547B-7-4, 135–137 cm, No. 5823, apex compressed. **62.** *Ophthalmidium* sp., 547B-7,CC, No. 5876. **63–64.** *Triloculina meotica*, 547B-7-4, 135–137, (63) No. 5829, (64) No. 5828. **65.** *Dentalina crenata*, 547B-10-3, 125–128 cm, No. 5835. **66.** *Dentalina jurensis*, 547B-10-3, 125–128 cm, No. 5837, ×75. **67.** *Dentalina plebeia*, 547B-10-3, 125–128 cm, No. 5836, ×75. **68.** *Dentalina* aff. *pseudoarcuata*, 547B-7,CC, No. 5839. **69.** *Dentalina turgida*, 547B-10-3, 125–128 cm, No. 5838. **70.** *Dentalina* sp., 547B-7-4, 135–137 cm, No. 5842. **71.** *Dentalina* sp. A., 547B-6-4, 49–51 cm, No. 5843. **72.** *Astacolus spongiphilus*, 547B-7-4, 135–137 cm, No. 5848. **73.** *Astacolus carinocostata*, 547B-10-3, 125–128 cm, No. 5844. **74.** *Astacolus turgidus*, 547B-7,CC, No. 5847, ×25. **75.** *Astacolus* cf. *turgidus*, 547B-10-3, 125–128 cm, No. 5845. **76.** *Citharina colliezi*, 547B-10-3, 125–128 cm, No. 5849, ×25. **77.** *Citharina inconstans*, 547B-10-3, 125–128 cm, No. 5868, ×25. **78.** *Marginulina oolithica*, 547B-10-3, 125–128 cm, No. 5856. **79.** *Palmula gyrata*, 547B-7-4, 135–137 cm, No. 5863, ×25. **80.** *Palmula hybrida*, 547B-10-3, 125–128 cm, No. 5859, ×25. **81.** *Palmula anceps*, 547B-7-2, 35–36 cm, No. 5862. **82.** *Palmula primordialis*, 547B-10-3, 125–128 cm, No. 5860, ×50. **83.** *Pseudonodosaria dubia*, 547B-10-3, 125–128 cm, No. 5865. **84.** *Pseudonodosaria turbiniformis*, 547B-10-3, 125–128 cm, No. 5864. **85.** *Vaginulina implicata*, 547B-10-3, 125–128 cm, No. 5864. **86.** *Vaginulina* aff. *jurassica*, 547B-7,CC, No. 5857, ×25. **87.** *Vaginulina* sp., 547B-7,CC, No. 5850, ×50. **88.** *Eoguttulina bilocularis*, 547B-10-3, 125–128 cm, No. 5877. **89.** *Eoguttulina laevis*, 547B-7,CC, No. 5879. **90.** *Eoguttulina metensis*, 547B-8-1, 4–6 cm, No. 5878. **91.** *Spirillina concava*, 547B-10-3, 125–128 cm, No. 5883. **92.** *Spirillina gracilis*, 547B-7-2, 35–36 cm, No. 5882. **93–94.** *Epistomina* sp., 547B-7-4, 135–137 cm (93) No. 5887, (94) umbilical side, No. 5886, ×25. **95.** *Epistomina* sp. A, 547B-7-4, 135–137 cm, No. 5885.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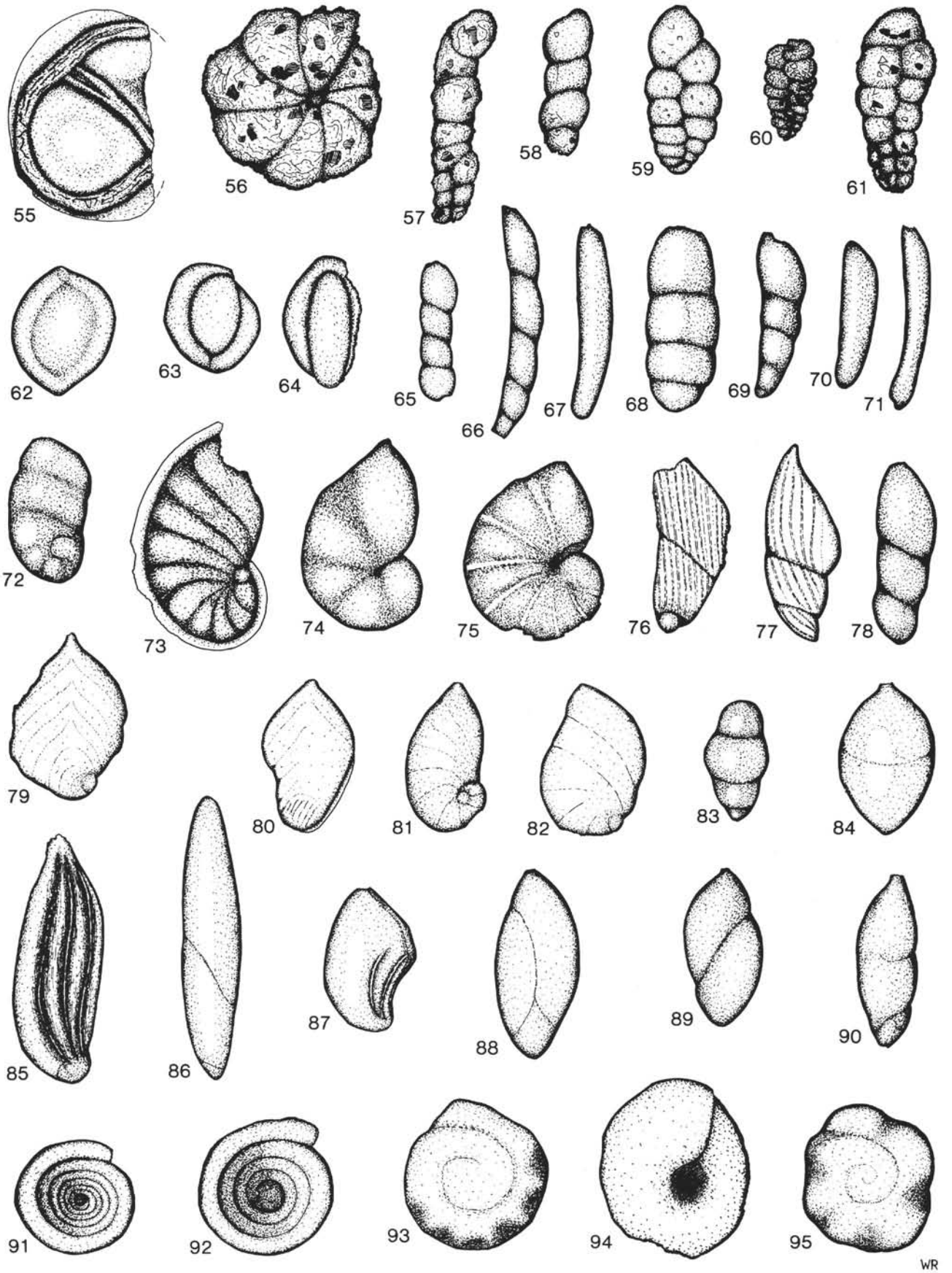
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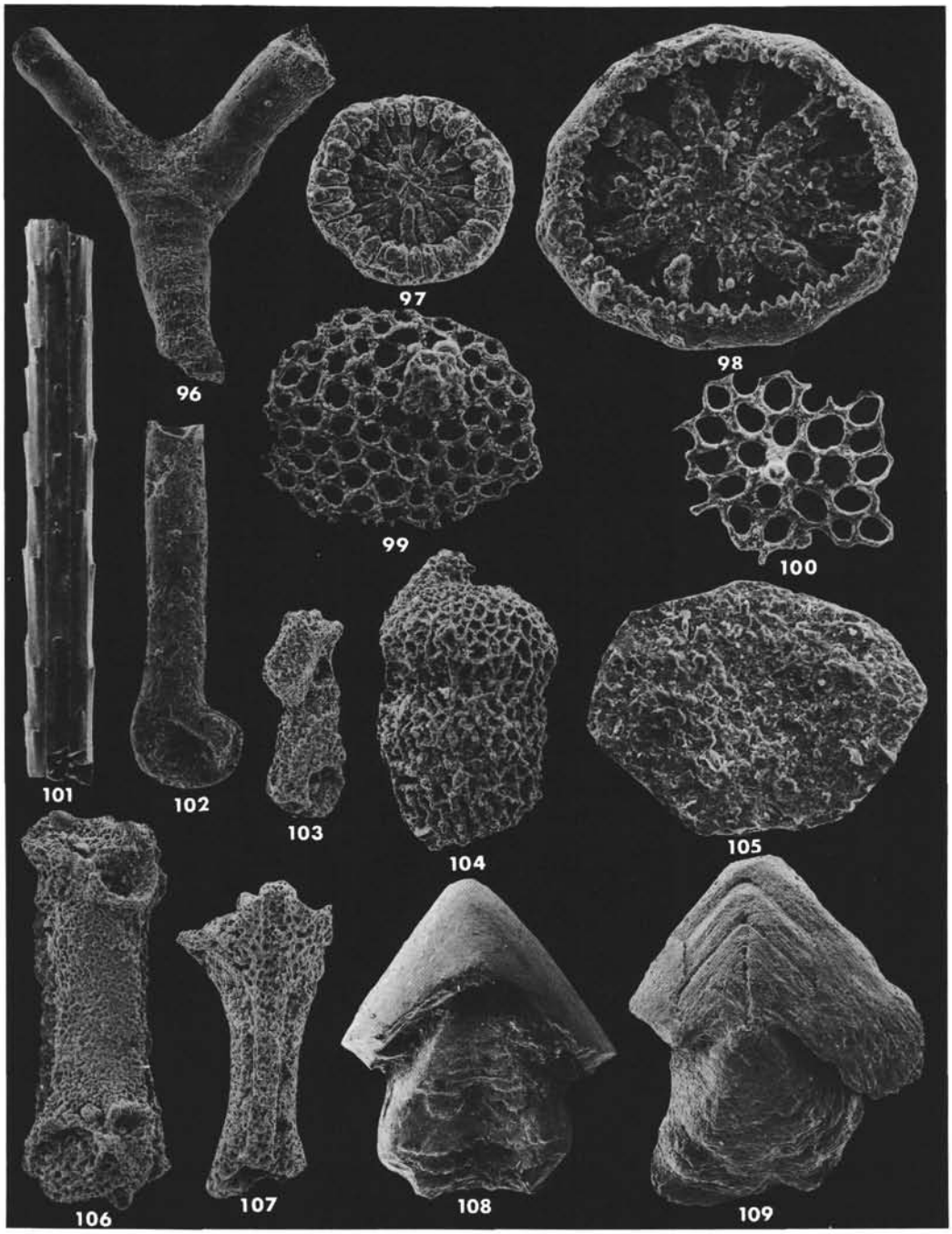

Plate 3. Echinodermata remains, bryozoans, cephalopod jaws. **96.** Bryozoan indet., 547B-18-1, 22–24 cm, No. 5512, ×118. **97.** *Hemisphaeranthos* cf. *carpenteri*, 547B-7-2, 35–36 cm, No. 5803, ×158. **98.** *Theelia mesoliassica*, 547B-18-2, 5–7 cm, No. 5506, ×316. **99–100.** *Eocaudina mortenseni*, ×237, (99) 547B-18-2, 5–7 cm, No. 5627, (100) 547B-20-1, 126–129 cm, No. 5628. **101.** *Diademopsis* spine, 547B-20-2, 59–61 cm, No. 5511, ×79. **102.** *Achistrum issleri*, 547B-22-2, 55–57 cm, ×158. **103.** *Ophiomusium* vertebra, 547B-22-2, 55–57 cm, No. 5510, ×79. **104.** Echinoderm remains, 547B-8-1, 4–6 cm, No. 5858, ×158. **105.** *Mortensenites?*, 547B-22-2, 55–57 cm, No. 5626, ×237. **106–107.** *Ophiomusium* vertebra, 547B-22-2, 55–57 cm, ×79, (106) No. 5508, (107) No. 5509. **108.** *Hadrocheilus liasinus* (Zittel), 547B-18-2, 5–7 cm, No. 6034, ×70. **109.** *Akidocheilus transiens* Till, 547B-7-2, 35–36 cm, ×32.

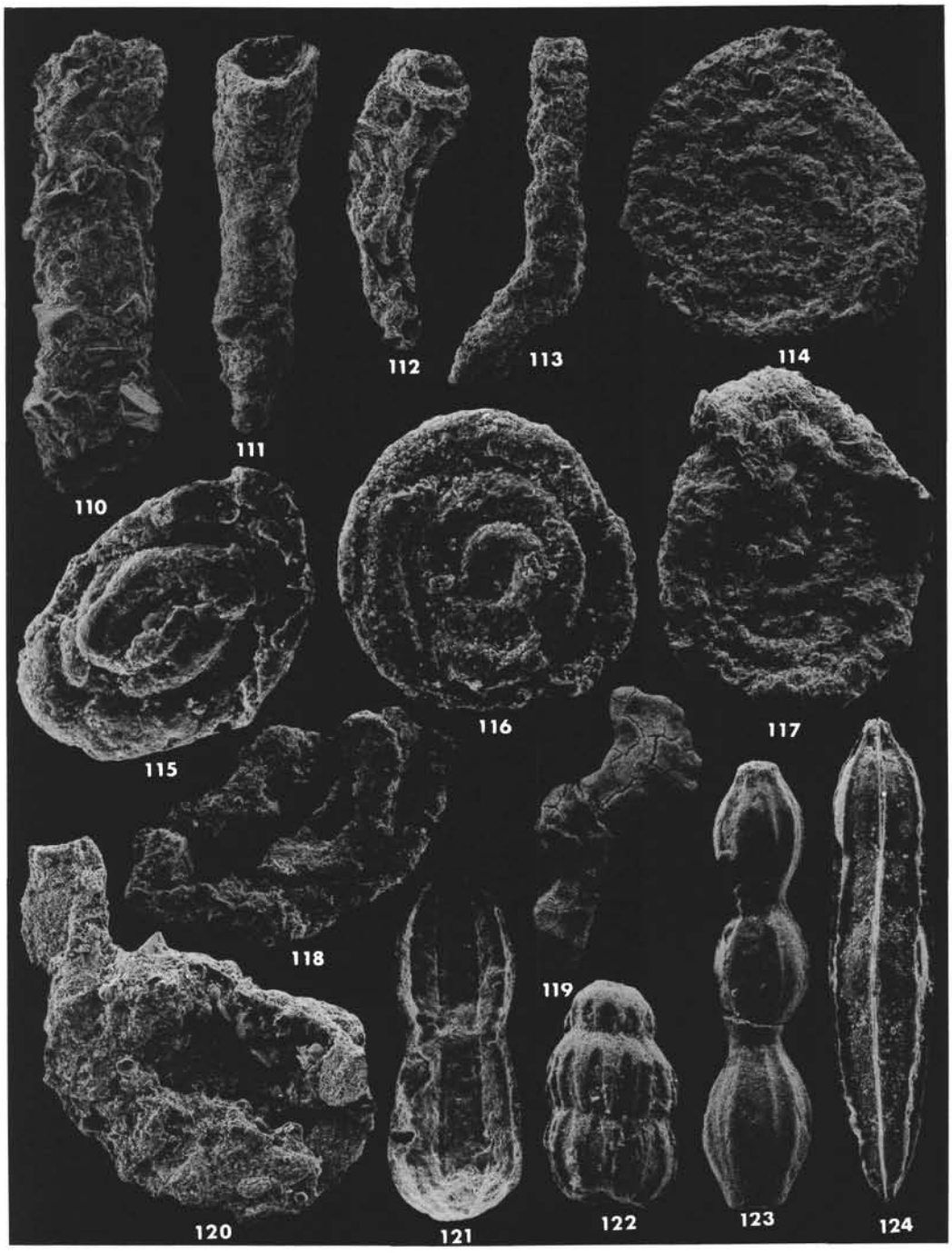

Plate 4. Liassic foraminifers: agglutinating species, miliolids, *Nodosaria*. **110.** *Hyperammina? liasina*, 547B-20-2, 59–61 cm, No. 5513, ×79. **111–112.** *Jaculella anulata* Barbieri, 547B-20-2, 59–61 cm, ×118, (111) No. 5514, (112) No. 5515. **113.** *Hyperammina?* sp., 547B-20-2, 59–61 cm, No. 5522, ×118. **114.** *Ammodiscus siliceus asper*, 547B-22-2, 55–57 cm, No. 5517, ×79. **115–116.** *Glomospira pattoni* Tappan, 547B-22-2, 55–57 cm, ×237, (115) No. 5520, (116) No. 5521. **117.** *Ammodiscus siliceus asper*, 547B-20-2, 59–61 cm, No. 5518, ×79. **118.** *?Tolypammina* sp., 547B-22-2, 55–57 cm, No. 5523. ×158. **119.** *Ophthalmidium baccularis* Issler, 547B-22-2, 55–57 cm, No. 5527, ×79; cracks caused by preparation. **120.** *?Tolypammina* sp., 547B-22-2, 55–57 cm, No. 5530, ×118. **121.** *Nodosaria geniculata*, 547B-11,CC, No. 5535, ×158. **122.** *Nodosaria ornata*, 547B-20-1, 126–129 cm, No. 5538, ×158. **123.** *Nodosaria perlata*, 547B-18-2, 5–7 cm, No. 5539, ×158. **124.** *Nodosaria sexcostata*, 547B-18-2, 5–7 cm, No. 5541, ×158.

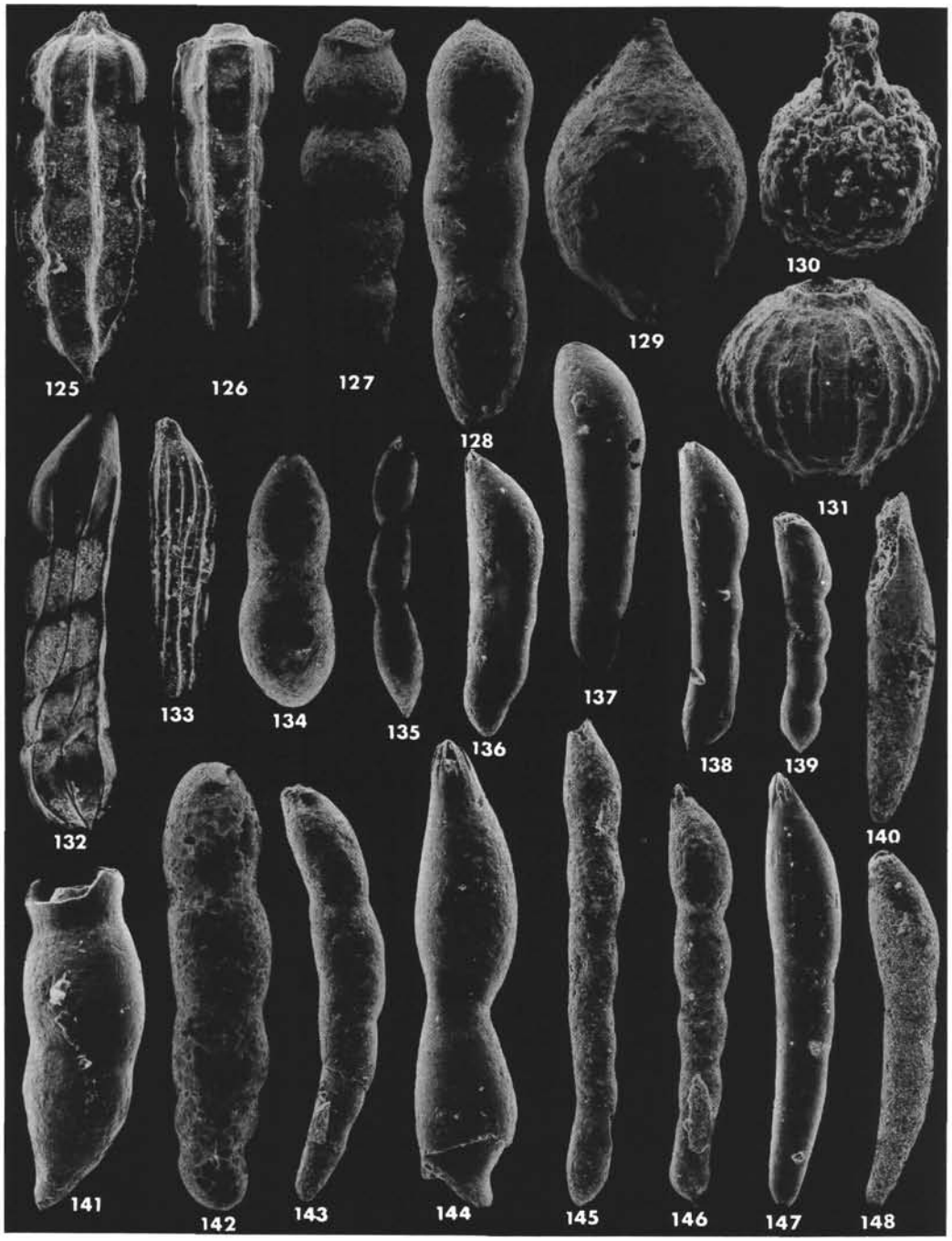

Plate 5. Liassic foraminifers: *Nodosaria, Dentalina.* (Magnification ×118 unless otherwise indicated.) **125.** *Nodosaria alemannica*, 547B-11,CC, No. 5598, ×158. **126.** *Nodosaria lamellosa*, 547B-20-1, 126–129 cm, No. 5537, ×158. **127.** *Nodosaria claviformis*, 547B-22-1, 95–98 cm, No. 5536, ×158. **128.** *Nodosaria simplex*, 547B-22-2, 55–57 cm, No. 5542, ×158. **129.** *Nodosaria regularis*, 547B-11,CC, No. 55540, ×158. **130.** *Nodosaria apheilolocula*, 547B-18-2, 5–7 cm, No. 5533, ×316; spines recrystallized. **131.** *Nodosaria multicostata*, 547B-11,CC, No. 5543, ×158. **132.** *Dentalina teutoburgensis*, 547B-20-1, 126–129 cm, No. 5559. **133.** *Dentalina sculpta*, 547B-22-2, 55–57 cm, No. 5557. **134.** *Dentalina biloculina*, 547B-22-2, 55–57 cm, No. 5554. **135.** *Dentalina nodigera*, 547B-20-1, 126–129 cm, No. 5547. **136.** *Dentalina integra*, 547B-20-1, 126–129 cm, No. 5578. **137.** *Dentalina integra*, 547B-20-1, 126–129 cm, No. 5555. **138.** *Dentalina subsiliqua*, 547B-20-1, 126–129 cm, No. 5550. **139.** *Dentalina suboligostegia*, 547B-20-1, 126–129 cm, No. 5561. **140.** *Dentalina* cf. *terquemi*, 547B-18-1, 22–24 cm, No. 5558. **141.** *Dentalina glandulinoides*, 547B-20-1, 126–129 cm, No. 5544. **142.** *Dentalina digitalis*, 547B-11,CC, No. 5553. **143.** *Dentalina torta*, 547B-22-2, 55–57 cm, No. 5546. **144–146.** *Dentalina vetustissima*, (144) 547B-20-2, 59–61 cm, No. 5549, (145–146) 547B-22-2, 55–57 cm, Nos. 5562 and 5552. **147–148.** *Dentalina subulata*, (147) 547B-20-1, 126–129 cm, No. 5551, (148) 547B-18-2, 5–7 cm, No. 5560.

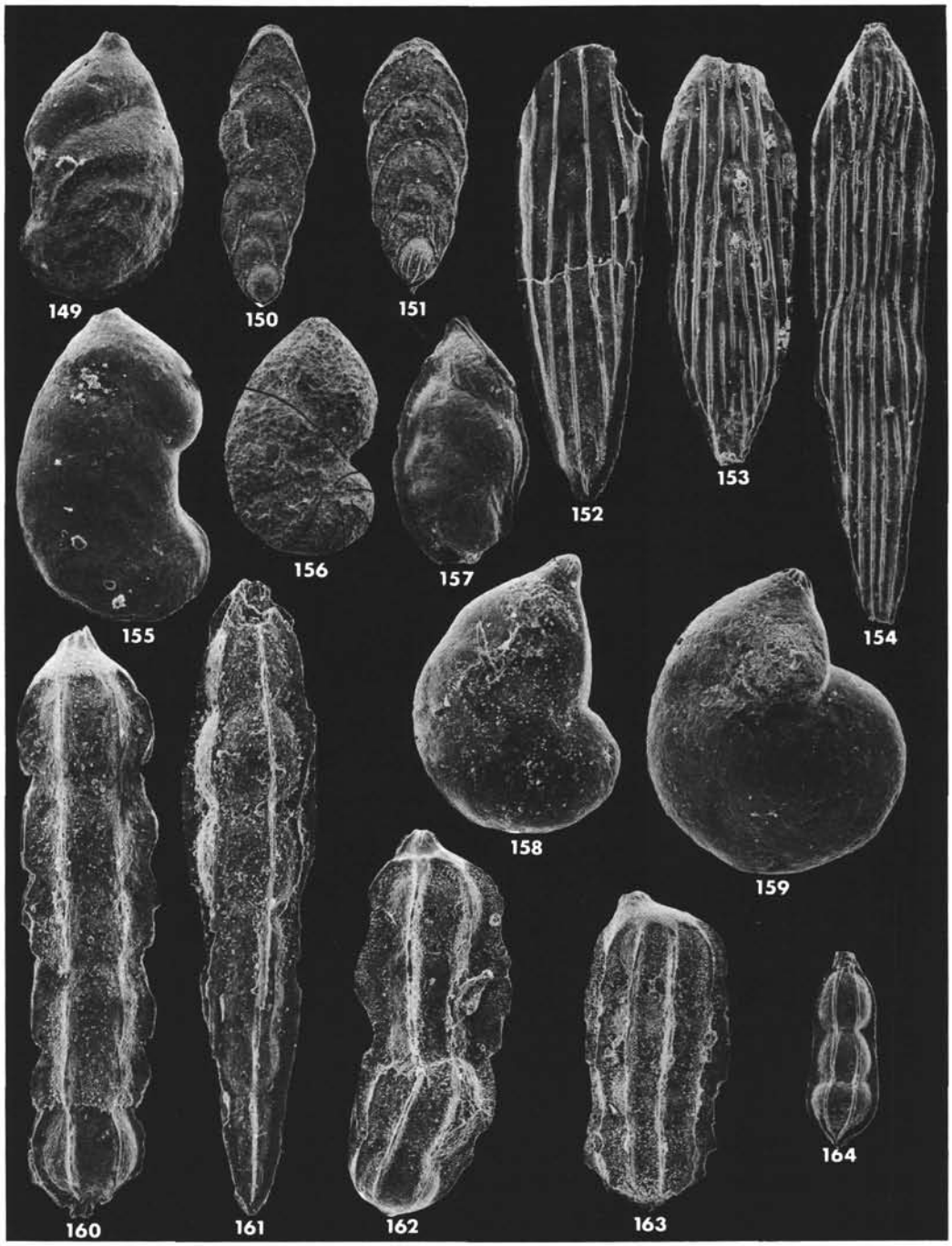

Plate 6. Liassic foraminifers: *Astacolus, Frondicularia, Lenticulina*, and *Marginulina*. (Magnification ×118 unless otherwise indicated.) **149.** *Astacolus varians*, 547B-20-1, 126–129 cm, No. 5567. **150–151.** *Frondicularia paradoxa* Berthelin, 547B-22-2, 55–57 cm, (150) No. 5571, (151) No. 5570. **152.** *Frondicularia terquemi terquemi*, 547B-20-2, 59–61 cm, No. 5574. **153.** *Frondicularia terquemi dubia*, 547B-20-2, 59–61 cm, No. 5573. **154.** *Frondicularia squamosa*, 547B-20-1, 126–129 cm, No. 5572. **155.** *Astacolus deformis*, 547B-20-1, 126–129 cm, No. 5589. **156.** *Astacolus semiincisus*, 547B-11,CC, No. 5565. **157.** *Astacolus stillus*, 547B-20-1, 126–129 cm, No. 5564. **158.** *Lenticulina inermis*, 547B-20-2, 59–61 cm, No. 5576. **159.** *Lenticulina gottingensis*, 547B-20-1, 126–129 cm, No. 5575. **160.** *Marginulina spinata*, 547B-20-1, 126–129 cm, No. 5582. **161.** *Marginulina porrecta*, 547B-22-2, 55–57 cm, No. 5581. **162.** *Marginulina prima*, 547B-20-1, 126–129 cm, No. 5584. **163.** *Marginulina prima*, 547B-20-1, 126–129 cm, No. 5583. **164.** *Marginulina variabilis*, 547B-20-1, 126–129 cm, No. 5586 a.

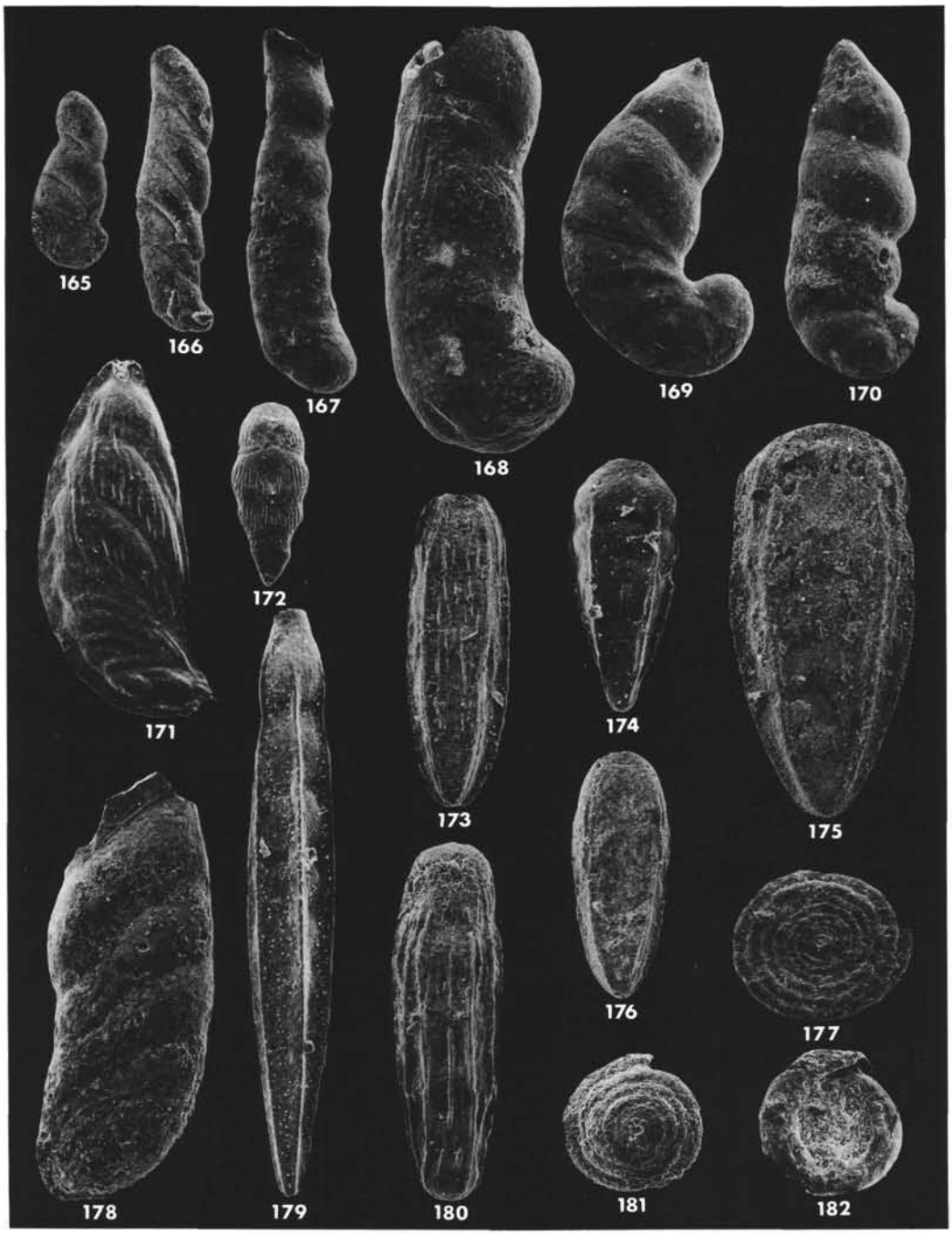

Plate 7. Liassic foraminifers: *Marginulinopsis, Palmula, Lingulina, Vaginulina, Spirillina*, and *Trocholina*. (Magnification ×118, unless otherwise indicated.) **165.** *Marginulinopsis baccularis*, 547B-22-1, 95–98 cm, No. 5586. **166.** *Marginulinopsis pauliniae*, 547B-18-2, 5–7 cm, No. 5580. **167–168.** *Marginulinopsis matutina matutina*, 547B-20-1, 126–129 cm, (167) No. 5591 a, (168) No. 5588. **169.** *Marginulinopsis matutina terquemi*, 547B-20-1, 126–129 cm, No. 5587. **170.** *Marginulinopsis matutina vetusta*, 547B-20-1, 126–129 cm, No. 5590. **171.** *Palmula pikettyi*, 547B-20-1, 126–129 cm, No. 5595. **172.** *Lingulina costata*, 547B-20-1, 126–129 cm, No. 5606. **173.** *Lingulina tenera praepupa*, 547B-22-2, 55–57 cm, No. 5617. **174–175.** *Lingulina tenera tenera*, (174) 547B-20-2, 59–61 cm, No. 5619 b, (175) 547B-11,CC, No. 5618. **176.** *Lingulina tenera tenuistriata*, 547B-18-1, 22–24 cm, No. 5619 a. **177.** *Spirillina numismalis*, 547B-18-2, 5–7 cm, No. 5624. **178.** *Vaginulina contracta*, 547B-20-1, 126–129 cm, No. 5563. **179.** *Lingulina acuformis*, 547B-20-2, 59–61 cm, No. 5605. **180.** *Lingulina tenera carinata*, 547B-20-1, 126–129 cm, No. 5616. **181–182.** *Trocholina umbo*, 547B-18-2, 5–7 cm, (181) No. 5625; dorsal. (182) No. 5625; ventral (umbilical side).

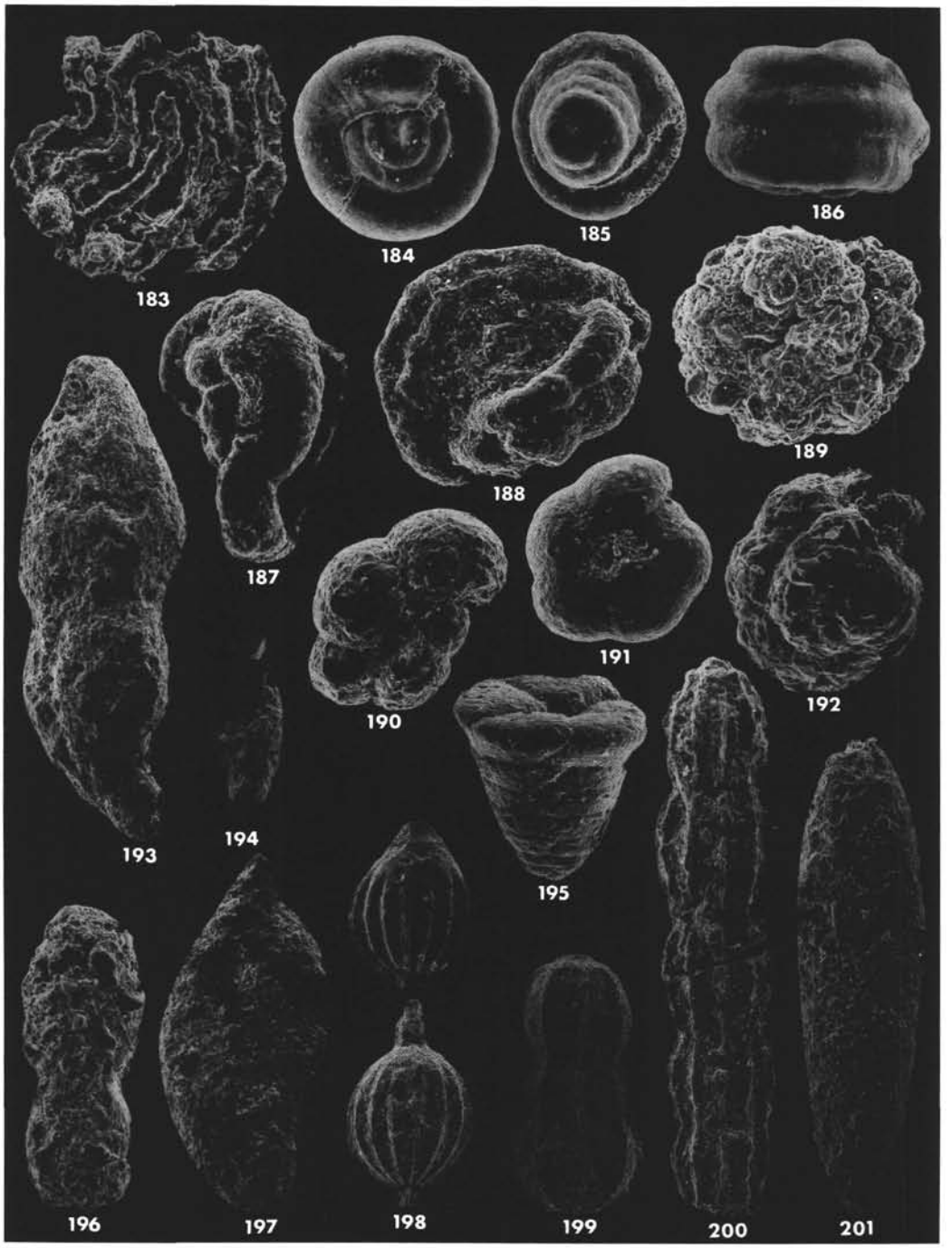

Plate 8. Middle and Upper Jurassic foraminifers: Agglutinating species, miliolids, *Nodosaria*. (Magnification ×158 unless otherwise indicated.) **183.** *Ammovertella? plicata*, 547B-7-4, 135–137 cm, No. 5805. **184–186.** *Glomospira variabilis*, 547B-8-1, 4–6 cm, No. 5807, (185) *Glomospira variabilis*, No. 5808, (186) No. 5806. **187–188.** *Glomospira virgula* 547B-8-1, 4–6 cm, (187) No. 5809, (188) No. 5810. **189.** *Trochammina canningensis*, 547B-8-1, 4–6 cm, No. 5815. **190.** *Haplophragmoides globigerinoides*, 547B-7-2, 35–36 cm, No. 5811. **191.** *Haplophragmoides hyalinus*, 547B-7,CC, No. 5812. **192.** *Trochammina canningensis*, 547B-7,CC, No. 5818. **193.** *Reophax imperspicuus*, 547B-7-4, 135–137 cm, No. 5814, ×79. **194.** *Ophthalmidium strumosum*, 547B-7-4, 135–137 cm, No. 5827, ×118. **195.** *Dorothia dumortieri*, 547B-7-2, 35–36 cm, No. 5822. **196.** *Reophax helveticus*, 547B-7-4, 135–137 cm, No. 5813, ×118. **197.** *Ophthalmidium strumosum*, 547B-7-4, 135–137 cm, No. 5825, ×118. **198.** *Nodosaria lagenoides*, 547B-7,CC, No. 5832; two fragments, ×79. **199.** *Nodosaria incongrua*, 547B-7,CC, No. 5833, ×118. **200.** *Nodosaria kunzi*, 547B-10-3, 125–128 cm, No. 5830, ×118. **201.** *Nodosaria clavula*, 547B-10-3, 125–128 cm, No. 5831, ×118.

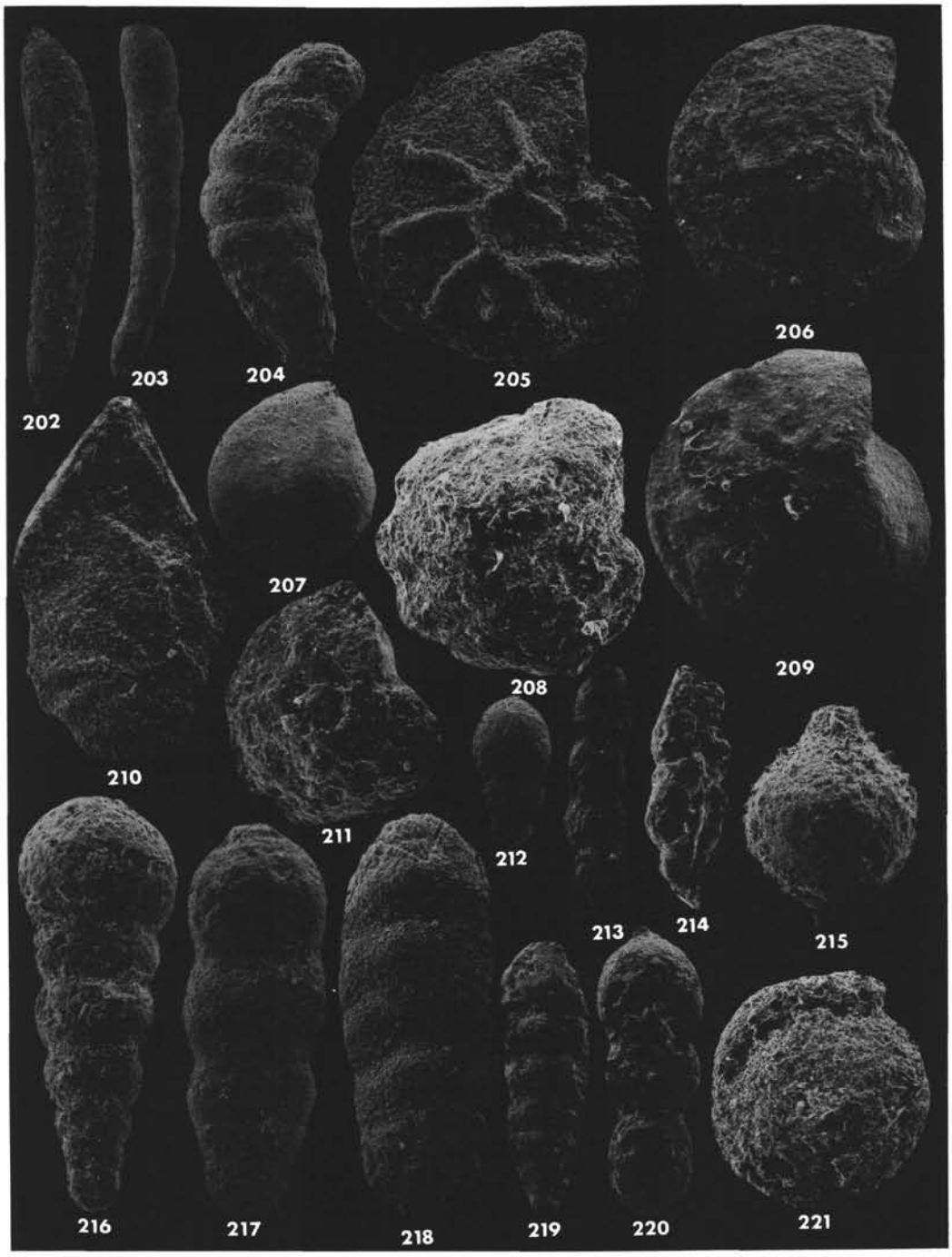

Plate 9. Middle and Upper Jurassic foraminifers: *Dentalina, Lenticulina, Palmula, Lingulina, Eoguttulina, Ramulina*, and *Epistomina*. (Magnification ×118 unless otherwise indicated.) **202.** *Dentalina cushmani*, 547B-7,CC, No. 5841. ×79. **203.** *Dentalina haeusleri*, 547B-7,CC, No. 5840. **204.** *Dentalina alternans*, 547B-10-3, 125–128 cm, No. 5834. **205.** *Lenticulina quenstedti*, 547B-8-1, 4–6 cm, No. 5853. **206.** *Lenticulina oolithica*, 547B-10-3, 125–128 cm, No. 5852, ×79. **207.** *Lenticulina hebetata*, 547B-7,CC, No. 5855. ×40. **208.** *Lenticulina? pusilla*, 547B-7-4, 135–137 cm, No. 5881. **209.** *Lenticulina hebetata*, 547B-7,CC, No. 5843. ×40. **210.** *Palmula triquetra*, 547B-7,CC, No. 5861. **211.** *Lenticulina oolithica*, 547B-10-3, 125–128 cm, No. 5851. **212.** *Lingulina* sp., 547B-8-1, 4–6 cm, No. 5871. **213.** *Lingulina nodosaria*, 547B-10-3, 125–128 cm, No. 5870. **214.** *Eoguttulina subrhomboidalis*, 547B-7-2, 35–36 cm, No. 5866. **215.** *Ramulina* cf. *spandeli*, 547B-8-1, 4–6 cm, No. 5880. **216.** *Lingulina dentaliniformis*, 547B-10-3, 125–128 cm. **217.** *Lingulina affinis*, 547B-7,CC, No. 5873. **218.** *Lingulina franconica*, 547B-7,CC, No. 5875. **219.** *Lingulina franconica*, 547B-7,CC, No. 5872. **220.** *Lingulina* cf. *dentaliniformis*, 547B-7-4, 135–137 cm, No. 5874. **221.** *Epistomina?* sp., 547B-7,CC. No. 5884.

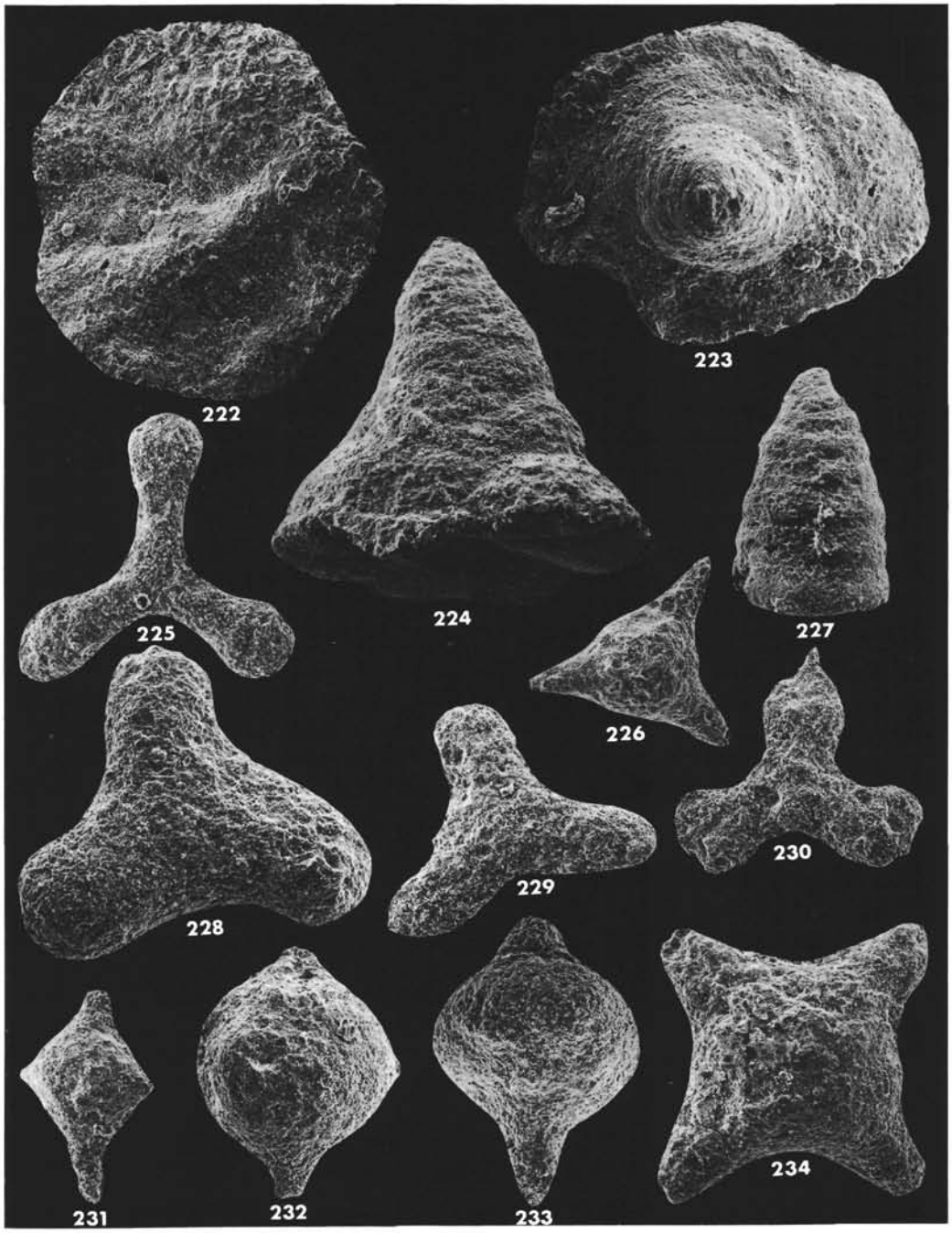

Plate 10. Upper Jurassic foraminifers: *"Patellinella";* Middle and Upper Jurassic radiolarians. (Magnification ×118 unless otherwise indicated.) **222–224.** *"Patellinella" poddari*, 547B-7-4, 135–137 cm, ×79, (222) No. 5891; ventral (umbilical side), (223) No. 5890; dorsal, (224) No. 5889; lateral. **225.** *Paronaella* sp., 547B-7-4, 135–137 cm, No. 5894. **226.** *Triactoma* cf. *blakei* (Pessagno), 547B-7-4, 135–137 cm, No. 5896. **227.** *Dictyomitra* cf. *duodecimcostata* (Squinabol), 547B-10-3, 125–128 cm, No. 5893. **228–229.** *Paronaella?* sp., (228) 547B-7-4, 135–137 cm, No. 5895, (229) 547B-10-3, 125–128 cm, No. 5892. **230.** *Triactinosphaera?* sp., 547B-7-4, 135–137 cm, No. 5895. **231.** *Podobursa* cf. *pantanellii* (Parona), 547B-7-4, 135–137 cm, No. 5900. **232–233.** Gen. indet., 547B-7-4, 135–137 cm, (232) No. 5899, (233) No. 5897. **234.** *Emiluvia* sp., 547B-7-4, 135–137 cm., No. 5898.