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Artikel: A Middle Jurassic-Early Cretaceous low-latitude radiolarian zonation based on unitary associations and age of Tethyan radiolarites

Kapitel: Systematic paleontology

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Fig. 1), owing to the fact that only a few sections cover each time interval. More work is required to test reproducibility within and beyond the studied realms.

The process of further refinement of radiolarian biochronology is twofold:

1. The morphologic units (“morphotypes”, “species” or “subspecies”) used to establish a range need to be redefined as accurately as possible in terms of vertical morphologic successions (i.e. vertical character change) interpreted as evolutionary lineages. The presented coarse biochronologic framework is the necessary base for this process to ascertain regional correlation and to eliminate local effects of dissolution.

2. More species (drawn from an already existing database of approx. 300 morphotypes) need to be included in order to refine the zonation and to allow better correlation with other zonations.

4.4.2 Extension through the Middle and Early Jurassic

Extending radiolarian biostratigraphy further down into the lower Middle and Early Jurassic in the Tethyan area is mainly a preservational problem. Pelagic limestones in a “starved” continental margin environment have thus far shown a low preservation potential for radiolarians. Much of the replacement chert present in these sequences seems to originate from displaced sponge spicules rather than from radiolarians, but more work is required. Key sections for an Early–Middle Jurassic radiolarian record may be found in basins which inherited pelagic conditions from Triassic times (Lagonegro, Pindos, Asklipion/Othris [internal Hellenides], Antalya, Oman, etc.). These basins were already in the Early Jurassic deep enough to preserve a moderately siliceous sedimentary record, which became entirely siliceous in the Middle Jurassic.

4.4.3 Diachronism of onset of Tethyan radiolarite deposition

A systematic diachronism of the onset of radiolarite deposition, which spans at least the Bathonian to Oxfordian, is documented. The age of the oldest radiolarite clearly relates to the subsidence and bathymetric history of its depositional site expressed by the age of the first pelagic sediment (limestone) underlying the radiolarites. More data, especially from the Umbrian realm, are in preparation to substantiate this relationship. A further step will be the modelling of the Jurassic CCD by means of subsidence curves of individual blocks. However, more direct information on the timing and intensity of synsedimentary block faulting is required to determine the times of rejuvenation of subsidence.

5. Systematic Paleontology

Explanatory remarks

Purpose. – The purpose of the following alphabetic listing of genera and species is twofold:

- a) To define as clearly and concisely as possible the morphologic limits of each taxon as they were used in establishing the database and the resulting zonation. Where it seemed practical for routine determination, these morphologic limits were set rather large to deliberately include two or more morphotypes. In other cases, where an increase of vertical stratigraphic resolution was expected, the morphologic limits are defined by differential

diagnostic criteria as narrow as possible. A near-to-complete but critical synonymy should provide reference to morphologic variability (illustrations) and stratigraphic occurrences other than the ones included in the database.

b) To describe new taxa and redefine some of the described ones under the light of supposed evolutionary relationships on a generic level. Suprageneric relationships and classification will be discussed in a later stage of work.

Criteria for introducing new taxa and for taxonomic ranking. – a) Subspecies: A subspecies level is assigned to some taxa hitherto treated as species and to some newly introduced ones in the following cases: If two or more taxa merely represent the end members of a highly variable group of morphotypes, these end members are treated as subspecies and the group is treated as species (e.g. *Emiluvia sedecimporata*). If two or more morphotypes constitute an apparent evolutionary lineage expressed as gradual or small successive morphologic changes in vertical sequences, morphotypic limits have to be set rather arbitrarily and the used rank is subspecific (e.g. subspecies of *Mirifusus mediodilatatus*). Much of the future increase of vertical resolution may be achieved by quantifying this type of “intraspecific” or “character” evolution (cf. SACHS & FAIRBANKS 1979).

b) Species: New species are introduced where morphotypes or groups of morphotypes are clearly definable, have a proven wide geographic distribution (hence are useful for correlation) and where sufficient well preserved type material is available.

c) Genera: New genera are introduced if the following criteria coincide: 1. The species obviously bear no resemblance to the type species of the genus to which they are presently assigned. 2. Two or several described or yet undescribed species form a morphologic entity or vertical succession strongly suggesting an evolutionary relationship. The criteria for the emendation of existing genera are analogous.

Species numbers. – Owing to data processing several numbering systems had to be used for the studied species: The *data* numbers refer to the species numbers used in the database (appendix and BAUMGARTNER 1984). The *range* numbers are sequential numbers in Plate 11 which enable to quickly locate a species in the range chart. The *pob* numbers are the original numbers assigned to 300 morphotypes in the database of the author (cited here for future reference). The *rk* numbers are the species numbers of KOCHER (1981).

Definition and repository of types. – Holotypes and paratypes are defined in the plates (see plate explanations). Type material, measured type series and all other illustrated material will be deposited under the indicated C-numbers at the *Naturhistorisches Museum, Basel, Switzerland*. Type localities and type levels are described in chapter 6: locality descriptions and indicated on Plate 12.

Alphabetic listing of genera and species

Genus *Acaeniotyle* FOREMAN

Acaeniotyle FOREMAN 1973, p. 258.

Type species: Xiphosphaera umbilicata RÜST 1898.

Acaeniotyle diaphorogona FOREMAN, s.l.

Data 59, range 77, pob 90, rk –, Pl. 1, Fig. 1–2

Acaeniotyle diaphorogona FOREMAN 1973, p. 258, Pl. 2, Fig. 2–5. FOREMAN 1975, Pl. 2F, Fig. 1–3 (not 4, 5), Pl. 3, Fig. 1–2.

Acaeniotyle sp. aff. *A. diaphorogona* FOREMAN 1973, Pl. 2, Fig. 6, 7, Pl. 16, Fig. 16. FOREMAN 1975, p. 607, Pl. 1F, Fig. 1. YAO 1984, Pl. 3, Fig. 24.

Tripocyclia sp. aff. *T. trigonum* RÜST, PESSAGNO 1977a, p. 80, Pl. 7, Fig. 8–9.

Acaeniotyle diaphorogona FOREMAN, MUZAVOR 1977, p. 34, Pl. 1, Fig. 1. MIZUTANI 1981, p. 175, Pl. 61, Fig. 1–2. DE WEYER & THIÉBAULT 1981, p. 582, Pl. 2, Fig. 7. KANIE et al. 1981, Pl. 1, Fig. 1. AOKI 1982, Pl. 1, Fig. 1.

Remarks. – Included are all forms having 3 primary spines and a central spherical nodose shell with fine pores, typical for *Acaeniotyle*. Jurassic forms may have spines shorter than the diameter of the shell.

Acaeniotyle diaphorogona dentata BAUMGARTNER n. subsp.

Data 94, range 99, pob 281, rk -, Pl. 1, Fig. 3-4

Acaeniotyle diaphorogona FOREMAN 1975, p. 607, Pl. 2F, Fig. 5 (only). SCHAAF 1981, p. 431, Pl. 15, Fig. 2. ?NAKASEKO et al. 1979, Pl. 4, Fig. 9. ?NAKASEKO & NISHIMURA 1981, Pl. 1, Fig. 12.

Description. – Central spherical nodose shell as with species, spines generally equal or longer than diameter of shell, bearing 3 broad blades with one to several teeth on distal half of spines.

Remarks. – This form is separated from the bulk of *A. diaphorogona* on the basis of the teeth present on the spines, a character which occurs in the Cretaceous only.

Etymology. – *dentatus*, -a, -um (Latin): equipped with teeth.

Measurements (in μ)

	Holotype	Average of 12 spec.	min.	max.
Diameter of central shell:	187	188	149	238
Average length of 3 spines:	195	188	153	213
Number of teeth on spines:	5-6	4.2	3	6

Type locality. – Locality no. 23 of locality descriptions.

Acaeniotyle umbilicata (RÜST)

Data 80, range 88, pob 92, rk 18, Pl. 1, Fig. 5

Xiphosphaera umbilicata RÜST 1898, p. 7, Pl. 1, Fig. 9. RENZ 1974, p. 799, Pl. 2, Fig. 9-12, Fig. 21.

Acaeniotyle umbilicata (RÜST), FOREMAN 1973, p. 258, Pl. 1, Fig. 12-14, 16. FOREMAN 1975, p. 607, Pl. 2E, Fig. 14-17, Pl. 3, Fig. 3. MUZAVOR 1977, p. 26, Pl. 1, Fig. 3. BAUMGARTNER et al. 1980, Pl. 2, Fig. 8. SCHAAF 1981, p. 431, Pl. 6, Fig. 11, Pl. 15, Fig. 2. NAKASEKO & NISHIMURA 1981, p. 141, Pl. 1, Fig. 7, Pl. 14, Fig. 2. KANIE et al. 1981, Pl. 1, Fig. 2.

Genus *Acanthocircus* SQUINABOL, emend. DONOFRIO & MOSTLER

Acanthocircus SQUINABOL, 1903, p. 124, emend. DONOFRIO & MOSTLER 1978, p. 22.

Type species: *Acanthocircus irregularis* SQUINABOL 1903.

Acanthocircus dicranacanthos (SQUINABOL)

Data 82, range 86, pob 87, rk 17, Pl. 1, Fig. 7.

Saturnalis dicranacanthos SQUINABOL 1914 (pars), p. 289, Pl. 20, Fig. 1, Pl. 22, Fig. 1, Pl. 22, Fig. 4, 6 (not 5, 7), Pl. 23, Fig. 7.

Acanthocircus dizoni(?) (RÜST) FOREMAN 1973, p. 260, Pl. 4, Fig. 4, 5. RIEDEL & SANFILIPPO 1974, p. 775, Pl. 2, Fig. 4, 5 (not 3).

Acanthocircus dicranacanthos (SQUINABOL) emend. FOREMAN, 1975, p. 610, Pl. 2D, Fig. 5-6. Emend. PESSAGNO 1977a, p. 73, Pl. 3, Fig. 5. MUZAVOR 1977, p. 37, Pl. 4, Fig. 4. Emend. DONOFRIO & MOSTLER 1978, p. 28, Pl. 2, Fig. 3, Pl. 4, Fig. 4, 7-9, Pl. 5, Fig. 10-11. NAKASEKO et al. 1979, Pl. 2, Fig. 7. BAUMGARTNER et al. 1980, p. 49, Pl. 1, Fig. 11. OKAMURA 1980, Pl. 19, Fig. 8. SCHAAF 1981, p. 431, Pl. 7, Fig. 1, Pl. 16, Fig. 3. KOCHER 1981, p. 51, Pl. 12, Fig. 3. NAKASEKO & NISHIMURA 1981, p. 141, Pl. 1, Fig. 6. KANIE et al. 1981, Pl. 1, Fig. 3. AOKI 1982, Pl. 1, Fig. 3. OKAMURA & UTO 1982, Pl. 4, Fig. 12-14, Pl. 5, Fig. 17.

Acanthocircus suboblongus (YAO)

Data 24, range 30, pob 85, rk 41, Pl. 1, Fig. 6

Spongosaturnalis (?) *suboblongus* YAO, 1972, p. 29, Pl. 3, Fig. 1–6, Pl. 10, Fig. 3a–c.*Acanthocircus variabilis* (SQUINABOL), PESSAGNO 1977a, p. 74, Pl. 3, Fig. 6.*Acanthocircus* sp. cf. *S.* (?) *suboblongus* YAO, FOREMAN 1978, p. 744, Pl. 1, Fig. 8. KOCHER 1981, p. 52, Pl. 12, Fig. 4–5.Genus *Alievum* PESSAGNO*Alievum* PESSAGNO 1972, p. 297. FOREMAN 1973, p. 262.Type species: *Theodiscus superbus* SQUINABOL 1914.*Alievum helenae* SCHAAF

Data 104, range 103, pob 228, rk 20, Pl. 1, Fig. 8–10.

Alievum sp. FOREMAN 1973, p. 262, Pl. 9, Fig. 1–2. NAKASEKO et al. 1979, Pl. 2, Fig. 4. MATSUYAMA et al. 1982, Pl. 1, Fig. 8. OKAMURA & UTO 1982, Pl. 6, Fig. 13, 16.*Alievum* spp. FOREMAN 1975, p. 613, Pl. 2D, Fig. 7–8, Pl. 5, Fig. 14.*Alievum* sp. A PESSAGNO 1977b, p. 29, Pl. 3, Fig. 10, 18.*Alievum helenae* SCHAAF in BAUMGARTNER et al. 1980, p. 49, Pl. 1, Fig. 8. SCHAAF 1981, p. 431, Pl. 7, Fig. 9, Pl. 10, Fig. 2a, b. KANIE et al. 1981, Pl. 1, Fig. 4. AOKI 1982, Pl. 2, Fig. 3. OKAMURA & UTO 1982, Pl. 4, Fig. 7, Pl. 5, Fig. 20.*Alievum* sp. cf. *A. helenae* FOREMAN, NAKASEKO & NISHIMURA 1981, Pl. 2, Fig. 1.*Praeconocaryomma regularis* WU HAO-RUO & LI HONG-SHENG 1982, Pl. 1, Fig. 2–3.*Praeconocaryomma regularis spinosa* WU HAO-RUO & LI HONG-SHENG 1982, Pl. 1, Fig. 4.

Actinommid, gen. et sp. indet. AOKI 1982, Pl. 1, Fig. 2.

Pseudoaulophacidae gen. et sp. indet. AOKI 1982, Pl. 1, Fig. 4.

Genus *Andromeda* BAUMGARTNER*Andromeda* BAUMGARTNER in BAUMGARTNER et al. 1980.Type species: *Andromeda crassa* BAUMGARTNER in BAUMGARTNER et al. 1980.*Andromeda podbielensis* (OZVOLDOVA)

Data 16, range 43, pob 8, rk 87, Pl. 1, Fig. 11–12.

Anthocorys podbielensis OZVOLDOVA, 1979, p. 257, Pl. 4, Fig. 1–3.*Andromeda violae* BAUMGARTNER in BAUMGARTNER et al. 1980, p. 50, Pl. 4, Fig. 10–14 Pl. 6, Fig. 11. SATO et al. 1982, Pl. 4, Fig. 9. NISHIZONO et al. 1982, Pl. 2, Fig. 15.*Acanthocorys podbielensis* OZVOLDOVA, STEIGER 1981, Pl. 14, Fig. 9 (incorrect secondary spelling IRZN Art. 33b.).*Andromeda praecrassa* BAUMGARTNER n. sp.

Data 10, range 5, pob 7, rk –, Pl. 1. Fig. 16–18.

Description. – Inflated conical form of 7 segments. Cephalis with short slender horn. Cephalis and thorax together conical, externally smooth, thorax with a single row of pores distally. Abdomen cylindrical with small pores in irregular vertical rows. Postabdominal segments rapidly growing in width and height, inflated cylindrical, tyre-

shaped. Last segment only slightly higher than second last, tyre-shaped, with few, slender outwards directed spines on basal edge. Basal surface concave, with large aperture.

Remarks. – This species differs from *A. crassa*, which may be its descendant, in including only thorax and abdomen in the proximal smooth portion of the test. It furthermore differs in having a last segment which is only slightly larger than the second last.

Etymology. – *prae-* (Latin): before, to indicate the probable phyletic relationship to *A. crassa*.

Measurements (in μ)

	Holotype	Average of 5 spec.	min.	max.
Height of cephalis, thorax and abdomen:	–	72	64	87
Width of abdomen:	60	70	56	99
Height/width of 4th segment:	32/102	35/122	32/102	38/150
Height/width of 5th segment:	34/150	47/196	34/150	57/246
Height/width of 6th segment:	52/192	63/263	52/192	78/320
Height/width of 7th segment:	86/330	90/330	85/305	100/355
Width of basal aperture:	–	180	–	–

Type locality. – Locality no. 19 of locality descriptions.

Andromeda praepodbielensis BAUMGARTNER n. sp.

Data 3, range 2, pob 6, rk –, Pl. 1, Fig. 13–15

Description. – Test composed of 7 or 8 segments forming a regular stepped cone. Cephalis, thorax and abdomen very similar to *A. podbielensis* with sparse, irregular pores. Postabdominal segments gradually growing in width and height, with vertical rows of pores. Last segment nearly two times as high as second last, bell-shaped, wedging outwards to basal edge which is fringed with numerous spines or teeth. Basal surface planar or concave.

Remarks. – This species differs from *A. podbielensis*, which may be its descendant, by having one or two more segments and by having a planar to concave, rather than convex basal surface. It seems as if the last and second last segment would become the last segment of *A. podbielensis*.

Etymology. – *prae-* (Latin): before, to indicate the probable phyletic relationship to *A. podbielensis*.

Measurements (in μ)

	Holotype	Average of 5 spec.	min.	max.
Height of cephalis, thorax and abdomen:	72	70	52	85
Width of abdomen:	66	60	49	69
Height/width of 4th segment:	36/96	24/87	20/70	36/96
Height/width of 5th segment:	39/123	31/117	25/94	39/146
Height/width of 6th segment:	39/168	40/173	31/146	45/209
Height/width of 7th segment:	48/240	49/246	42/209	60/267
Height/width of 8th segment:	90/387	88/348	63/313	104/387
Width of basal aperture:	–	237	198	288

Type locality. – Locality no. 19 of locality descriptions.

Genus *Angulobracchia* BAUMGARTNER

Angulobracchia BAUMGARTNER 1980, p. 310.

Type species: *Paronaella* (?) *purisimaensis* PESSAGNO 1977a.

Angulobracchia (?) *portmanni* BAUMGARTNER n. sp.

Data 98, range 97, pob 285, rk –, Pl. 2, Fig. 1–3

Hagiastriids gen. et sp. indet. FOREMAN 1973, Pl. 7, Fig. 1, 3, 5, not: 2, 4, 6, 7.

Paronaella sp. SCHAAF 1981, p. 436, Pl. 8, Fig. 7.

Description. – Three-rayed patulibracchiid with an axially raised central area. Central area in lateral view almost spherical, with roughly horizontal rows of small pores (corresponding to layers of internal spongy meshwork), in vertical view with convex outlines between rays, equipped with coarse irregular nodes and small pores. Rays in lateral view rapidly wedging out from central area to tip, in vertical view proximally constricted, with club-shaped ray tip. Ray tip may bear cylindrical extensions and some short lateral spines. Nodes on rays sometimes finer than on central area, in roughly parallel rows which lead to beams of the cylindrical extensions. These may be as broad as ray tip or thinner, more fragile.

Remarks. – This species differs from *A. digitata* BAUMGARTNER which has similar cylindrical extensions, by a highly raised central area and flattened, club-shaped ray tips. It is questionably assigned to *Angulobracchia* because of the thickened central area and the lack of distinct lateral external beams.

Etymology. – Named in honour of Adolf Portmann (1897–1982), biologist and philosopher from Basel, Switzerland, for his support during my first scientific essays.

Measurements (in μ)

	Holotype	Average of 8 spec.	min.	max.
Length of rays:	AX: 169 BX: 135 CX: 185	190	135	284
Width of rays:	41	42	35	49
Width of ray tip:	63	78	60	92
Width of extensions:	36	69	36	121
Max. length of extension:	65	121	65	177

Type locality. – Locality no. 24 of locality descriptions.

Angulobracchia purisimaensis (PESSAGNO)

Data 67, range 57, pob 144, rk 42, Pl. 2, Fig. 4

Paronaella (?) *purisimaensis* PESSAGNO 1977a, p. 71, Pl. 2, Fig. 4–6.

Angulobracchia purisimanensis (PESSAGNO) BAUMGARTNER 1980, p. 312, Pl. 1, Fig. 14, Pl. 10, Fig. 11–14, Pl. 12, Fig. 9–10. KOCHER 1981, p. 55, Pl. 12, Fig. 12.

Angulobracchia sp. C. BAUMGARTNER 1980, p. 314, Pl. 10, Fig. 16–17. ISHIDA 1983, Pl. 10, Fig. 11.

Angulobracchia sp. SATO et al. 1982, Pl. 3, Fig. 9.

Genus *Archaeodictyomitra* PESSAGNO

Archaeodictyomitra PESSAGNO 1976, p. 49, emend. PESSAGNO 1977b, p. 41.

Type species: Archaeodictyomitra squinaboli PESSAGNO 1976.

Archaeodictyomitra apiaria (RÜST)

Data 75, range 82, pob 263, rk 14, Pl. 2, Fig. 5–6

Lithocampe apiarium RÜST 1885, p. 314, Pl. 39 (14), Fig. 8.

Dictyomitra apiarium (RÜST), RÜST 1898, p. 58. FOREMAN 1975, p. 613, Pl. 2G, Fig. 7–8.

Dictyomitra excellens (TAN SIN HOK), BAUMGARTNER & BERNOULLI 1976, p. 615, Fig. 12k.

Archaeodictyomitra apiara (RÜST), PESSAGNO 1977b, p. 41, Pl. 6, Fig. 6, 14.

Dictyomitra apiarium (RÜST), NAKASEKO et al. 1979, Pl. 3, Fig. 4, not 3.

Archaeodictyomitra apiarium (RÜST), KOCHER 1981, p. 56, Pl. 12, Fig. 13.

Archaeodictyomitra apiara (RÜST), NAKASEKO & NISHIMURA 1981, p. 145, Pl. 6, Fig. 2–4, not 1, Pl. 15, Fig. 2, 6.

WU HAO-RUO & LI HONG-SHENG 1982, Pl. 1, Fig. 15–16. MATSUYAMA et al. 1982, Pl. 1, Fig. 1. OKAMURA & UTO 1982, Pl. 5, Fig. 2.

not: *Lithomitra excellens* TAN SIN HOK 1927, p. 56, Pl. 11, Fig. 85.

Archaeodictyomitra sp. E. NISHIZONO & MURATA 1983, Pl. 3, Fig. 17.

Remarks. – Included are only the short forms with a proximal dome-shaped part, a short distal cylindrical part and a final segment which is less wide than the second last.

Archaeodictyomitra excellens (TAN SIN HOK)

Data 100, range 102, pob 287, rk –, Pl. 2, Fig. 7–8

Lithomitra excellens TAN SIN HOK 1927, p. 56, Pl. 11, Fig. 85. MOORE 1973, p. 827, Pl. 4, Fig. 3–4.

Dictyomitra excellens (TAN SIN HOK), RENZ 1974, Pl. 8, Fig. 8 (not 7), Pl. 11, Fig. 35.

Dictyomitra apiarium (RÜST), NAKASEKO et al. 1979, Pl. 3, Fig. 3, not 4.

Archaeodictyomitra apiara (RÜST), SCHAAF 1981, p. 432, Pl. 18, Fig. 2a, b. NAKASEKO & NISHIMURA 1981, p. 145, Pl. 6, Fig. 1, not 3–4. KANIE et al. 1981, Pl. 1, Fig. 8. OKAMURA & UTO 1982, Pl. 2, Fig. 1–2.

Remarks. – Included under this name are forms with a dome-shaped proximal portion followed by a slender, often slightly constricted, cylindrical central portion and terminating in a stout second last and a less wide last segment. The separation of this form from *A. apiaria* (see above) seems useful, as *A. excellens* is restricted to Berriasian and younger strata.

Genus *Archaeohagiastrum* BAUMGARTNER n. gen.

Type species: Archaeohagiastrum munitum BAUMGARTNER n. sp.

Description. – Test composed of four rays, placed at right angles and of about equal length. The rays are formed of a primary beam, three primary canals and six external beams.

Remarks. – The rays of *Archaeohagiastrum* correspond to the medullary rays of the more evolved hagiastrins and represent the simplest possible hagiastrid structure. It was referred to as ancestor of *Hagiastrum* in BAUMGARTNER (1980, Textfig. 7 and p. 284). *Tetraporobracchia* KOZUR & MOSTLER 1979 has the same ray structure but rays are arranged along tetraedric or cubic axes. *Archaeotriastrum* DE WEVER 1981 has a similar ray structure but has three rays.

Because of its simple ray structure this genus is tentatively included with the hagiastriids. It should, together with *Archaeotriastrum*, be assigned to a new subfamily ancestral to the Hagiastriinae.

Etymology. – *achaeo-*: ancient (Greek), ancestral form to *Hagiastrum*.

Range. – Sinemurian or older to Callovian.

Archaeohagiastrum munitum BAUMGARTNER n. sp.

Data 92, range 40, pob 271, rk –, Pl. 2, Fig. 9–13

Crucella sp. A. SASHIDA et al. 1982, Pl. 1, Fig. 9.

Tetratrabs sp. B. WAKITA 1982, Pl. 5, Fig. 4.

Description. – Small form with four smooth to nodose rays of about equal length constructed as with genus. Central area small, occupied by four to five broad, highly raised, connected nodes, which alternate with four pores placed at the proximal termination of the median beams. The fifth node is central or slightly excentric and fused to one of the corner nodes. A nearly centrally placed pore often occurs. Lateral beams are continuous around the central area.

The external beams of rays are slightly to strongly nodose, nodes increase in size towards central area and are sometimes connected by a blade-like ridge. Ray tip blunt or with short central spine of round cross section.

Remarks. – *A. munitum* differs from other yet undescribed species of this genus by being distinctly smaller and by having a strongly nodose test.

Etymology. – *munitum*: fortified, protected (Latin), referring to the nodose surface of test and central area.

Measurements (in μ)

	Holotype	Average of 7 spec.	min.	max.
Length of rays:	AX: 114 BX: 120 CX: 108 DX: 111			
Width of rays:	51	42	35	51
Max. length of spines:	66	48	28	66
Width of central nodose area:	65	60	47	76

Type locality. – Locality no. 30 of locality descriptions.

Genus *Bernoullius* BAUMGARTNER n. gen.

Type species: *Eucyrtis* (?) *dicera* BAUMGARTNER 1980.

Description. – Spongodiscid spumellarian with distinct bilateral symmetry: A delicate, finely spongy main body of flattened egg-shape carries on the narrow end two symmetric, strongly developed, usually triradiate lateral spines and sometimes one central spine.

Remarks. – Because of the clear bilateral symmetry, the spines were interpreted as cephalic horns of a nassellarian by BAUMGARTNER in BAUMGARTNER et al. (1980). Well preserved specimens from DSDP Site 534A show that the spines are attached to a

finely spongy body lacking any resemblance to nassellarian morphology. For most specimens, the spongy body is not or poorly preserved as spongy round mass at the base of the spines.

KOZUR & MOSTLER (1979, Pl. 21, Fig. 2) illustrated a Triassic form which possibly belongs to this genus.

Etymology. – Dedicated to Daniel Bernoulli, Basel, Switzerland, in honour of his contribution to the understanding of ancient passive continental margins in the Alpine–Mediterranean realm.

Range. – ?Triassic to Late Jurassic.

Bernoullius cristatus BAUMGARTNER n. sp.

Data 39, range 39, pob 221, rk 109, Pl. 2, Fig. 14–15

Eucyrtis (?) *dicera* BAUMGARTNER in BAUMGARTNER et al. 1980, Pl. 6, Fig. 6.

Eucyrtis (?) sp. A, KOCHER 1981, p. 68, Pl. 13, Fig. 19–20.

Description. – Form with two stout triradiate spines, which touch each other at the base and stand at an angle of 90 to 120 degrees. Proximal portion of spines straight or slightly outwardly curved, short distal portion kinked to a horizontal or downward position. The upwards directed ridge of the spines becomes bladelike near the kink and forms one or two characteristic teeth pointing upwards. Sometimes additional small teeth arise from the lateral ridges of the spines.

Remarks. – This form differs from *B. dicera* by the presence of teeth and a kinked distal portion of the two spines. Stratigraphic data suggest that this form is ancestral to *B. dicera*.

Etymology. – *cristatus*: equipped with teeth (Latin).

Measurements (in μ)

	Holotype	Average of 8 spec.	min.	max.
Width between ends of two spines:	315	318	250	405
Width of spines at base:	50	42	33	67
Observed length of spongy portion:	135	106	56	158

Type locality. – Locality no. 30 of locality descriptions.

Bernoullius dicera (BAUMGARTNER)

Data 35, range 56, pob 223, rk 69, Pl. 2, Fig. 16

Lophophaena sp., OZVOLDOVA 1979, p. 259, Pl. 4, Fig. 4–5.

Eucyrtis (?) *dicera* BAUMGARTNER in BAUMGARTNER et al. 1980, p. 54, Pl. 3, Fig. 16, Pl. 6, Fig. 10, not Fig. 6. KOCHER 1981, p. 68, Pl. 13, Fig. 17–18. DE WEVER & CABY 1981, Pl. 2, Fig. 21.

Genus *Cecrops* PESSAGNO

Cecrops PESSAGNO 1977b, p. 32.

Type species: *Staurosphaera septemporata* PARONA 1890.

Cecrops septemporatus (PARONA)

Data 110, range 108, pob 229, rk 24, Pl. 2, Fig. 17–18

Staurosphaera septemporata PARONA, p. 151, Pl. 2, Fig. 4–5. CITA & PASQUARE 1959, p. 398, Fig. 3, no. 7. MOORE 1973, p. 824, Pl. 2, Fig. 2. FOREMAN 1973, p. 259, Pl. 3, Fig. 4. RIEDEL & SANFILIPPO 1974, p. 780, Pl. 1, Fig. 6–8. FOREMAN 1975, p. 609, Pl. 2E, Fig. 7, Pl. 3, Fig. 6. MUZAVOR 1977, p. 53, Pl. 1, Fig. 9–10. SCHAAF 1981, p. 439, Pl. 7, Fig. 8a, b, Pl. 16, Fig. 10a, b. NAKASEKO et al. 1979, Pl. 2, Fig. 5–6. NAKASEKO & NISHIMURA 1981, p. 161, Pl. 1, Fig. 2. KANIE et al. 1981, Pl. 1, Fig. 5.

Cecrops septemporatus (PARONA), PESSAGNO 1977b, p. 33, Pl. 3, Fig. 11. BAUMGARTNER et al. 1980, p. 51, Pl. 2, Fig. 7. OKAMURA & UTO 1982, Pl. 7, Fig. 19.

Genus *Diacanthocapsa* SQUINABOL, emend. DUMITRICA

Diacanthocapsa SQUINABOL, emend. DUMITRICA 1970.

Type species: *Dicolocapsa euganea* SQUINABOL 1903.

Diacanthocapsa normalis YAO

Data 34, range 10, pob 54, rk –, Pl. 2, Fig. 20

Diacanthocapsa normalis YAO 1979, p. 28, Pl. 2, Fig. 1–15. YAO et al. 1982, Pl. 3, Fig. 9.

Genus *Diboloachras* FOREMAN

Diboloachras FOREMAN 1973, p. 265.

Type species: *Diboloachras tythopora* FOREMAN 1973.

Diboloachras chandrika KOCHER

Data 55, range 75, pob 265, rk 43, Pl. 2, Fig. 19

Diboloachras chandrika KOCHER 1981, p. 61, Pl. 13, Fig. 1–2.

Genus *Ditrabs* BAUMGARTNER

Ditrabs BAUMGARTNER 1980, p. 293.

Type species: *Amphibracchium sansalvadorensis* PESSAGNO 1971.

Ditrabs sansalvadorensis (PESSAGNO)

Data 103, range 96, pob 227, rk 21, Pl. 2, Fig. 21

Amphibracchium sansalvadorensis PESSAGNO 1971, p. 21, Pl. 19, Fig. 9–10.

Amphibracchium ossiforme MUZAVOR 1977, p. 59, Pl. 2, Fig. 6.

Ditrabs sansalvadorensis (PESSAGNO), BAUMGARTNER et al. 1980, p. 52, Pl. 2, Fig. 9.

Genus *Emiluvia* FOREMAN

Emiluvia FOREMAN 1973, p. 262, emend. 1975, p. 612.

Type species: *Emiluvia chica* FOREMAN 1973.

Emiluvia hopsoni PESSAGNO

Data 74, range 69, pob 225, rk 29, Pl. 3, Fig. 1

Emiluvia hopsoni PESSAGNO 1977a, p. 76, Pl. 4, Fig. 14–16, Pl. 5, Fig. 1–7, Pl. 12, Fig. 15–16. BAUMGARTNER et al. 1980, Pl. 1, Fig. 9. KOCHER 1981, p. 64, Pl. 13, Fig. 6–7.

Emiluvia orea BAUMGARTNER

Data 60, range 81, pob 224, rk 63, Pl. 3, Fig. 5.

Emiluvia orea BAUMGARTNER in BAUMGARTNER et al. 1980, p. 52, Pl. 1, Fig. 1–7. KOCHER 1981, p. 64, Pl. 13, Fig. 6–7.

Emiluvia (?) sp. P.

Data 41, range 59, pob 219, rk 90, Pl. 3, Fig. 10
Gen. et sp. indet. KOCHER 1981, p. 69, Pl. 14, Fig. 2.

Remarks. – This form is doubtfully assigned to *Emiluvia* because of the presence of a patagium-like spongy meshwork extended between the four spines in the equatorial plane.

Emiluvia pessagnoii FOREMAN s.l.

Data 71, range 71, pob 226, rk 36, Pl. 3, Fig. 3

Emiluvia pessagnoii FOREMAN 1973, p. 262, Pl. 8, Fig. 6. FOREMAN 1975, p. 612. PESSAGNO 1977a, p. 76, Pl. 5, Fig. 8. FOREMAN 1978, p. 744, Pl. 1, Fig. 1–2. BAUMGARTNER et al. 1980, p. 53, Pl. 1, Fig. 10.

Remarks. – Included under this name are all forms with a fine regular meshwork and variably developed nodes. The Early Cretaceous forms included herein have very small nodes and thus differ from the original species definition.

Emiluvia premyogii BAUMGARTNER n. sp.

Data 19, range 14, pob 210, rk 88, Pl. 3, Fig. 6, 8–9, 11–12

Emiluvia (?) sp. B. KOCHER 1981, p. 66, Pl. 13, Fig. 12.
? *Emiluvia salensis* PESSAGNO, ISHIDA 1983, Pl. 11, Fig. 5–6.
? *Emiluvia chica* FOREMAN, SATO et al. 1982, Pl. 3, Fig. 14.

Description. – Small *Emiluvia* with the 4 spines at right or slightly oblique angle (X-shaped). Opposed spines generally of unequal, adjacent spines of similar length. Nodes of central body placed on bars distinctly aligned with spines, forming 2 rows that meet in the center to form a cross. About 6 pairs of nodes between opposed spines. Center of cross forms a raised polygonal structure often with a central node. 4 large pores are placed around center, between the branches of cross. Additional lateral meshwork without significant nodes.

Remarks. – This species differs from other *Emiluvia* by having nodes distinctly aligned in the shape of a cross. *Emiluvia* sp. A of KOCHER 1981 (p. 65, Pl. 13, Fig. 11) is not included, as it lacks the regular cross-shape of the central area.

Etymology. – Named in honour of Swami Prem Yogi alias Rudolph Kocher, for his contribution to Jurassic radiolarian stratigraphy.

<i>Measurements</i> (in μ)				
	Holotype	Average of 8 spec.	min.	max.
Length of long spines:	AX: 130 } BX: 127 }	148	95	218
Length of short spines:	CX: 120 } DX: - }	129	92	165
Width of central area:				
Between base of spines:	95	114	95	139
Between concave sides:	77	83	71	111
Width of base of spines:	36	36	30	47

Type locality. – Locality no. 30 of locality descriptions.

Emiluvia sedecimporata salensis PESSAGNO

Data 33, range 50, pob 215, rk 44 & 45, Pl. 3, Fig. 4, 7

Emiluvia salensis PESSAGNO 1977a, p. 76, Pl. 5, Fig. 9–11. KOCHER 1981, p. 65, Pl. 13, Fig. 10.

?*Staurosphaera antiqua* PARONA, MUZAVOR 1979, p. 52, Pl. 1, Fig. 8.

Emiluvia sp. A. KOCHER 1981, p. 65, Pl. 13, Fig. 11.

Remarks. – The group of *Emiluvias* with slender central bodies with concave sides between adjacent spines include various morphotypes and intermediate forms which are included here under the species *E. sedecimporata* (RÜST) 1885. *E. salensis* is considered to be one of these morphotypes and thus acquires a subspecific level.

Emiluvia sedecimporata elegans (WISNIOWSKI).

Data 40, range 18, pob 216, rk –, Pl. 3, Fig. 2

Staurosphaera sedecimporata RÜST var. *elegans* WISNIOWSKI 1889, p. 683, Pl. 13, Fig. 48. Not KOCHER 1981, p. 65, rk 68.

Remarks. – This name is used to denominate forms with a clearly square pore pattern of 16 similar pores as illustrated by RÜST (1885) and WISNIOWSKI (1889). Nodes on quadruple junctions are moderately developed, a pair of nodes sits at the base of each spine.

Eucyrtid gen. et sp. indet.

Data 63, range 7, pob 74, rk –, Pl. 3, Fig. 13–16

Description. – Large, spindle-shaped multicyrtid nassellarian. Proximal portion long, slender conical, including cephalis, thorax, abdomen and several (6–10?) postabdominal segments. Segmentation externally not or very poorly visible. Cephalis seems to bear a horn, internal structure unknown. Closely spaced costae, separated by one row of pores, originate on proximal portion. Pore frames roughly rectangular, sometimes marked by faint horizontal ridges. Distal portion inflated spindle-shaped, consisting of numerous (at least 10) segments. The costae which are continuous from proximal portion are more widely spaced and seem to be an outer layer placed over a system of transverse ridges delimitating a rectangular pore pattern with two, sometimes three

rows of pores between adjacent costae. Additional costae may originate on spindle-shaped portion and others may merge on its distal constricted end.

Remarks. – Shape and wall structure of this form are very distinct and even fragments of the spindle-shaped part can be identified.

Genus *Eucyrtidiellum* BAUMGARTNER n. gen.

Type species: Eucyrtidium (?) *unumaensis* YAO 1979.

Description. – Test composed of four segments. Cephalis small, spherical, poreless with variably developed straight or slightly oblique apical horn, rare forms with apical and vertical horn. A sutural pore is present at collar stricture or on proximal portion of thorax. Thorax dome-shaped, poreless, with irregular ornamentation consisting of ridges and nodes leaving depressions (“closed pores” of some authors) or with plicae. One or two rows of pores may occur at stricture between thorax and abdomen. Abdomen inflated annular to hemispherical, poreless, except for the distal quarter, where one or two irregular rows of pores may occur. Ornamentation of abdomen varying with species. One row of large pores marks the joint with fourth segment. Fourth segment delicate, mostly cylindrical, covered with circular pores in loose diagonal rows, with a distal poreless constriction.

Remarks. – The Mesozoic species hitherto questionably assigned to *Eucyrtidium* are assigned to this new genus, because they bear no resemblance to the type species *E. acuminatum* (EHRENBERG).

Range. – Late Triassic to Late Jurassic (Tithonian).

Eucyrtidiellum ptyctum (RIEDEL & SANFILIPPO)

Data 56, range 66, pob 17, rk 46 (pars), Pl. 4, Fig. 1–3

Eucyrtidium (?) *ptyctum* RIEDEL & SANFILIPPO 1974, p. 778, Pl. 5, Fig. 7, Pl. 12, Fig. 14, not Fig. 15. BAUMGARTNER & BERNOULLI 1976, p. 617, Fig. 11e, g not f. PESSAGNO 1977a, p. 94, Pl. 12, Fig. 7. BAUMGARTNER et al. 1980, p. 53, Pl. 3, Fig. 13. OKAMURA 1980, Pl. 20, Fig. 10. MIZUTANI 1981, p. 182, Pl. 64, Fig. 1a–b, 2. AOKI & TASHIRO 1982, Pl. 3, Fig. 1–3, Pl. 4, Fig. 10. OKAMURA & UTO 1982, Pl. 6, Fig. 18. ADACHI 1982, Pl. 3, Fig. 7–8. AITA 1982, Pl. 2, Fig. 8, 9a–b, not 10. NISHIZONO et al. 1982, Pl. 2, Fig. 12, not 11. MIZUTANI et al. 1982, p. 57, Pl. 4, Fig. 5. ISHIDA 1983, Pl. 9, Fig. 4. YAO 1984, Pl. 2, Fig. 30.

Remarks. – Under this name are included only forms with tiny, short horn (if preserved) and abdomen with regular, well developed broad vertical plicae (about 7 to 12 visible per half circumference), which tend to terminate near the irregular row of pores at the base of abdomen. KOCHER (1981), instead, included also forms with less distinct plicae (transitional forms to *E. unumaensis*) and forms with plicae originating on thorax possibly belonging to another genus (undescribed species pob 238).

This narrower definition explains the later first occurrence of *E. ptyctum* in this paper, compared to KOCHER’s (1981) data.

Eucyrtidiellum pustulatum BAUMGARTNER n. sp.

Data 91, range 44, pob 13, rk –, Plate 4, Fig. 4–5

?SHASHIDA et al. 1982, Pl. 1, Fig. 3.

Description. – Cephalis covered with small nodes and variably developed horn. Thorax distinctly nodose and proximal portion of abdomen with irregular coalescent nodes (short ridges) and pustules. Distal portion of abdomen smooth, with few very small pores placed in an irregular row.

Remarks. – This species differs from *E. unumaensis* by having an irregularly nodose abdomen.

Etymology. – *pustulatum*: pustulate (Latin).

Measurements (in μ)

	Holotype	Average of 7 spec.	min.	max.
Height/width of cephalis:	18/24	18/23	16/21	21/25
Height/width of thorax:	25/44	25/45	25/43	26/48
Height/width of abdomen:	54/80	63/86	54/80	68/92
Height of 4th segment:	63	61	58	63
Length of apical horn:	16	18	12	27

Type locality. – Locality no. 30 of locality descriptions.

Eucyrtidiellum unumaensis (YAO)

Data 17, range 12, pob 12, rk 89, Pl. 4, Fig. 6

Eucyrtidium (?) *ptyctum* RIEDEL & SANFILIPPO 1974, p. 778, Pl. 12, Fig. 15. BAUMGARTNER & BERNOULLI 1976, Fig. 11f.

Eucyrtidium (?) *unumaensis* YAO 1979, p. 39, Pl. 9, Fig. 1–11. KOCHER 1981, p. 67, Pl. 13, Fig. 15. YAO et al. 1982, Pl. 3, Fig. 7. SASHIDA et al. 1982, Pl. 2, Fig. 3. KOJIMA 1982, Pl. 1, Fig. 11. WAKITA 1982, Pl. 3, Fig. 1. MATSUOKA 1982, Pl. 1, Fig. 15. WAKITA & OKAMURA 1982, Pl. 8, Fig. 7. SAKA 1983, Pl. 5, Fig. 6–7.

Genus *Foremanella* MUZAVOR

Foremanella MUZAVOR 1977, p. 67.

Type species: *Foremanella alpina* MUZAVOR 1977.

Foremanella diamphidia (FOREMAN)

Data 79, range 85, pob 112, rk 13, Pl. 6, Fig. 18

Paronaella (?) *diamphidia* FOREMAN 1973, p. 262, Pl. 8, Fig. 3–4. FOREMAN 1975, p. 612, Pl. 5, Fig. 4–5. RIEDEL & SANFILIPPO 1974, Pl. 12, Fig. 4. FOREMAN 1978, p. 744, Pl. 1, Fig. 5–6. BAUMGARTNER 1980, p. 302, Pl. 4, Fig. 4. *Foremanella alpina* MUZAVOR 1977, p. 67, Pl. 3, Fig. 8.

Paronaella (?) sp. YAO 1984, Pl. 3, Fig. 25.

Foremanella hipposidericus (FOREMAN)

Data 78, range 83, pob 111, rk 12, Pl. 6, Fig. 19

Paronaella (?) *hipposidericus* FOREMAN 1975, p. 612, Pl. 2E, Fig. 1–2, Pl. 5, Fig. 3, 7, 10. BAUMGARTNER 1980, p. 302, Pl. 4, Fig. 1–3. BAUMGARTNER et al. 1980, p. 57, Pl. 2, Fig. 4.

Genus *Gorgansium* PESSAGNO & BLOME

Gorgansium PESSAGNO & BLOME 1980, p. 234.

Type species: Gorgansium silviesense PESSAGNO & BLOME 1980.

Gorgansium pulchrum (KOCHER)

Data 11, range 28, pob 76, rk 105, Pl. 4, Fig. 7

Trilonche pulchra KOCHER 1981, p. 104, Pl. 17, Fig. 16–17.

Gorgansium sp. A, AITA 1982, Pl. 3, Fig. 20–21.

Remarks. – This species differs from other species of this genus illustrated by PESSAGNO & BLOME (1980) in having pore frames with broad ridges and knobs at their junctions. Instead of 4-bladed, as indicated by KOCHER (1981), the spines rather seem to be 3-bladed.

Genus *Guexella* BAUMGARTNER n. gen.

Type species: Lithocampe nudata KOCHER 1980.

Description. – Test ellipsoidal or spindle-shaped, composed of 2 or more (usually 4) segments. Cephalis hemispherical, poreless or with few basal pores, internally smooth with wide, undivided basal aperture to thorax. No cephalic spines have been observed. Thorax and postthoracic segments form together a thinwalled body without external strictures, covered with small circular pores. Thorax at least 2 times as wide as cephalis, trapezoidal, with a sharp proximal edge. Variable ornamentation (spines, ridges) may cover the planiform top of thorax and completely obscure the cephalis. The last segment (usually 4th) delicate, cup-shaped or constricted, with small basal aperture without tubular extension.

Remarks. – This genus differs from *Theocapsomma* HAECKEL, emend. FOREMAN 1968, from *Novodiacanthocapsa* EMPSON-MORIN 1981 and from *Gongylothorax* FOREMAN 1968, emend. DUMITRICA 1970, by a cephalis which is not partly immersed in the thorax and by the peculiar sharp-edged thorax. This genus is erected to include several forms related to *G. nudata* now used in biostratigraphy of the Jurassic (e.g. *Lithocampe* (?) sp. aff., *L. nudata* KOCHER, MATSUOKA 1983, p. 27, Pl. 4, Fig. 12–13, Pl. 9, Fig. 15.).

Etymology. – Dedicated to Jean Guex, Lausanne, in honour of his contribution to the fundamentals of biostratigraphy.

Range. – Middle Jurassic or older to Late Jurassic.

Guexella nudata KOCHER

Data 7, range 27, pob 61, rk 106, Pl. 5, Fig. 5–7

Lithocampe nudata KOCHER in BAUMGARTNER et al. 1980, p. 55, Pl. 6, Fig. 3. KOCHER 1981, p. 75, Pl. 14, Fig. 18–19.

Lithocampe (?) *nudata* KOCHER, YAO et al. 1982, Pl. 4, Fig. 1–2. MATSUOKA 1982, Pl. 2, Fig. 1–2. AITA 1982, Pl. 1, Fig. 19a–c. MATSUOKA 1983, p. 27, Pl. 9, Fig. 12–14. YAO 1984, Pl. 2, Fig. 1.

Remarks. – Well preserved material shows a complex spiny ornamentation placed on the hemispherical cephalis. Characteristic is the dense, regular arrangement of small circular pores.

Hagiastrid sp. A.

Data 8, range 41, pob 153, rk 107 & 108, Pl. 4, Fig. 8–9

Hagiastrid sp. cf. *Tetrarabs bulbosa* BAUMGARTNER, KOCHER 1981, p. 69, Pl. 14, Fig. 3.

Hagiastrid sp. cf. *Tetrarabs zealis* (OZVOLDOVA), KOCHER 1981, p. 70, Pl. 14, Fig. 5–6.

Remarks. – Only fragments of this form are preserved. It consists of a very long (more than 650–700 microns), thin (35–40 microns) hollow tube (?) made of 6 external beams with a single row of pores between each adjacent beam. One end of the tube has a bulbous tip, the other bears a short, blunt triradiate spine. KOCHER (1981) assigned the two ends to different taxa.

Genus *Haliodictya* HOJNOS

Haliodictya HOJNOS 1916, p. 349.

Type species: Haliodictya loerentheyi HOJNOS 1916.

Haliodictya (?) *hojnosi* RIEDEL & SANFILIPPO

Data 86, range –, pob 254, rk 3, Pl. 4, Fig. 10–11

Haliodictya hojnosi RIEDEL & SANFILIPPO 1974, p. 779, Pl. 2, Fig. 6, Pl. 12, Fig. 2, not 3. KOCHER 1981, p. 70, Pl. 14, Fig. 7. AITA 1982, Pl. 3, Fig. 13.

Remarks. – RIEDEL & SANFILIPPO (1974) illustrated several morphotypes under this name. The forms included herein lack a preserved spongy meshwork and have, like the holotype, well-defined, solid spines at the corners of the square central body. These forms have been recorded throughout the studied interval, thus the name does not appear in the range chart.

Genus *Higumastra* BAUMGARTNER

Higumastra BAUMGARTNER 1980, p. 290.

Type species: Higumastra inflata BAUMGARTNER 1980.

Higumastra imbricata (OZVOLDOVA)

Data 13, range 29, pob 110, rk 92, Pl. 4, Fig. 13

Crucella (?) *imbricata* OZVOLDOVA 1979, p. 254, Pl. 3 Fig. 1, 4. KOCHER 1981, p. 71, Pl. 14, Fig. 8.

Higumastra sp., SATO et al. 1982, Pl. 3, Fig. 11.

Remarks. – Relatively large form with broadly based, porous, spined lateral protrusions at ray tips which often leave a semicircular space between adjacent rays.

Higumastra sp. aff. *H. inflata* BAUMGARTNER

Data 66, range 15, pob 107, rk 47, Pl. 4, Fig. 12

Higumastra sp. aff. *H. inflata* BAUMGARTNER 1980, p. 290, Pl. 3, Fig. 4. KOCHER 1981, p. 71, Pl. 14, Fig. 9.*Remarks.* – Small form often with preserved spongy meshwork between rays.Genus *Holocryptocanium* DUMITRICA*Holocryptocanium* DUMITRICA 1970, p. 31, 75.*Type species: Holocryptocanium tuberculatum* DUMITRICA 1970.*Holocryptocanium barbui* DUMITRICA

Data 108, range 106, pob 292, rk –, Pl. 4, Fig. 14

Holocryptocanium barbui DUMITRICA 1970, p. 76, Pl. 17, Fig. 105–108a, b, Pl. 21, Fig. 136. SCHAAF 1981, p. 435, Pl. 2, Fig. 1a, b, Pl. 10, Fig. 6a, b. YAO 1984, Pl. 5, Fig. 1.*Holocryptocanium japonicum* NAKASEKO et al. 1979, Pl. 5, Fig. 8, 10. OKAMURA 1980, Pl. 21, Fig. 5.*Holocryptocanium barbui japonicum* NAKASEKO & NISHIMURA 1981, p. 154, Pl. 3, Fig. 5a–b, 6, 7a–b, Pl. 14, Fig. 8.*Remarks.* – The forms with smooth abdominal surface lacking pore frames assigned to *Holocryptocanium barbui barbui* by NAKASEKO & NISHIMUARA (1981, p. 152, Pl. 3, Fig. 1–4) should be assigned to another name, since the holotype of *H. barbui* has pore frames. The smooth morphotype has not been observed in the Neocomian.Genus *Homoeoparonaella* BAUMGARTNER*Homoeoparonaella* BAUMGARTNER 1980, p. 288.*Type species: Paronaella elegans* PESSAGNO 1977a.*Homoeoparonaella argolidensis* BAUMGARTNER

Data 43, range 37, pob 103, rk 30, Pl. 4, Fig. 15

Hagiastrid cf. *Amphibracchium* sp. BAUMGARTNER & BERNOULLI 1976, Fig. 10h.*Homoeoparonaella argolidensis* BAUMGARTNER 1980, p. 288, Pl. 2, Fig. 1, 8–12, Pl. 11, Fig. 4. KOCHER 1981, p. 71, Pl. 14, Fig. 10.*Homoeoparonaella elegans* (PESSAGNO)

Data 65, range 63, pob 104, rk 48, Pl. 4, Fig. 16

Paronaella elegans PESSAGNO 1977a, p. 70, Pl. 1, Fig. 10–11.*Homoeoparonaella elegans* (PESSAGNO), BAUMGARTNER 1980, p. 289, Pl. 2, Fig. 2–6, Pl. 11, Fig. 6. KOCHER 1981, p. 72, Pl. 14, Fig. 11.*Homoeoparonaella gigantea* BAUMGARTNER

Data 70, range 68, pob 105, rk 37, Pl. 4, Fig. 17

Homoeoparonaella gigantea BAUMGARTNER 1980, p. 289, Pl. 2, Fig. 13–16, Pl. 11, Fig. 5. KOCHER 1981, p. 72, Pl. 14, Fig. 12.

Genus *Hsuum* PESSAGNO

Hsuum PESSAGNO 1977a, p. 81.

Type species: *Hsuum cuestaensis* PESSAGNO 1977a.

Hsuum brevicostatum (OZVOLDOVA)

Data 23, range 23, pob 181, rk 49, Pl. 5, Fig. 1–2

Dictyomitra sp. D. BAUMGARTNER & BERNOULLI 1976, p. 617, Fig. 12j.

Lithostrobos brevicostatus Ozvoldova 1975, p. 84, Pl. 102, Fig. 1. OZVOLDOVA 1979, p. 259, Pl. 5, Fig. 2.

Hsuum brevicostatum (OZVOLDOVA), KOCHER 1981, p. 73, Pl. 14, Fig. 13.

Hsuum maxwelli PESSAGNO, MIZUTANI 1981, p. 176, Pl. 59, Fig. 5.

?*Hsuum* cfr. *maxwelli* PESSAGNO, SASHIDA et al. 1982, Pl. 2, Fig. 7.

Remarks. – Under this name are included forms with slender conical, lobate outline (well visible segmental divisions) with discontinuous costae limited to one segment and irregular horizontal bars connecting costae at their highest bulge. Two vertical rows of pores between costae.

Hsuum maxwelli PESSAGNO group

Data 47, range 42, pob 180, rk 93, Pl. 5, Fig. 3–4

Hsuum maxwelli PESSAGNO 1977a, p. 81, Pl. 7, Fig. 14–16. KOCHER 1981, p. 73, Pl. 14, Fig. 14. AOKI & TASHIRO 1982, Pl. 1, Fig. 14–17. SAKA 1983, Pl. 4, Fig. 10.

Hsuum sp. aff. *H. maxwelli* PESSAGNO 1977a, p. 82, Pl. 8, Fig. 1–2.

Remarks. – The studied material contains a number of morphotypes which come close to the cited forms in having a bluntly conical, smooth outline, often with a moderate distal constriction and poorly or undefined segmental divisions. Costae are discontinuous, merging, reach over 1–3 segments. One or two irregular rows of pores between costae.

Genus *Mirifusus* PESSAGNO, emend.

Mirifusus PESSAGNO 1977a, p. 83.

Type species: *Mirifusus guadalupensis* PESSAGNO 1977a.

Emended definition. – General shape of test as given by PESSAGNO (1977a). Proportions and shape of conical proximal and inflated median portion of test may vary intraspecifically and are often distorted by diagenetic flattening of the large test. Test wall consisting of two layers: Inner layer formed by regular circular to triangular pore frames with two to five transverse rows of pores per segment. Outer layer consisting of regular to irregular diagonal or vertical bars extending over each segment and joining at nodes on circumferential ridges. Outer layer may be variably developed: Early forms may have a poorly developed outer layer on the median portion, whereas later forms tend to have a strongly developed outer layer which may coalesce on the conical proximal portion of test. Late species may show spines extending from nodes and cephalis.

Remarks. – The genus is emended to include *Lithocampe chenodes* RENZ and early forms like *M. fragilis* n.sp.

Mirifusus chenodes (RENZ)

Data 77, range 80, pob 162, rk –, Pl. 5, Fig. 9, 15

Lithocampe chenodes RENZ 1974, p. 793, Pl. 7, Fig. 30, Pl. 12, Fig. 14a–d. RIEDEL & SANFILIPPO 1974, p. 779, Pl. 6, Fig. 5–7, Pl. 13, Fig. 1. SCHAAF 1981, p. 435, Pl. 5, Fig. 2, Pl. 25, Fig. 5a–b, 7. KOCHER 1981, p. 74, Pl. 14, Fig. 17.

Remarks. – The entire test of this species is generally smaller compared to other species of *Mirifusus*. The inner layer has 3–5 rows of pores per segment. The outer layer is constructed of very irregular, branched diagonal bars that join at moderate circumferential ridges. Stout spines may arise from nodes on inflated median portion. The crown-like spine on the cephalis of some specimens may also originate from the outer layer.

Mirifusus fragilis BAUMGARTNER n. sp.

Data 14, range 9, pob 159, rk –, Pl. 5, Fig. 12, 16–17, 20–21

?*Mirifusus* (?) sp. aff. *M.* (?) *mediodilatata* RÜST, PESSAGNO 1977a, p. 84, Pl. 11, Fig. 3.

Mirifusus aff. *guadalupensis* PESSAGNO, YAO et al. 1982, Pl. 4, Fig. 24. YAO 1983, Fig. 3, 8.

?*Mirifusus* sp. A, KIDO et al. 1982, Pl. 3, Fig. 1–2, 4. AITA 1982, Pl. 2, 13.

Description. – Test fragile, fusiform as with genus, composed of 20 or more segments. Cephalis hemispherical, poreless or sparsely porous (ditrema and apical pore), often covered with small spinelets. Thorax inflated trapezoidal poreless or with sparse, irregular pores, covered with spinelets. Abdomen and following 7 to 9 postabdominal segments form together a slender conical portion of the test with an inner layer of 3 rows of pores per segment in hexagonal arrangement and a weakly developed outer layer of diagonal bars forming triangular frames in which the inner layer is usually exposed, except for the abdomen and the first postabdominal chambers, where the outer layer may form irregular nodes which obscure the regular pore structure of the inner layer. The following about 10 segments form a variably inflated median portion of the test with the same pore structure as the proximal conical part of the test. The outer layer is weakly developed or may be almost absent. Circumferential ridges of outer layer are narrow, of round cross section and bear small vertically elongated nodes at junctions with diagonal bars.

Remarks. – Successions of well-preserved samples in the Blake-Bahama Basin (DSDP Site 534), Lombardy (Breggia) as well as the published Japanese material (edited by NAKASEKO 1982) show that this species is the immediate ancestor of *M. guadalupensis* and is partly coexisting with it. *M. fragilis* differs from *M. guadalupensis* by being generally smaller, more fragile and having a weakly developed (late forms) to almost lacking (early forms) outer layer of mostly triangular pore frames which always allow to see the hexagonal pore arrangement of the inner layer, whereas with *M. guadalupensis* it tends to be obscured by the thick, more irregular outer layer. *M. fragilis* has thin, round circumferential ridges, whereas *M. guadalupensis* has broad circumferential ridges with flat outer surface. There are transitional forms.

Etymology. – *fragilis*, fragile (Latin), referring to the thin fragile test wall.

<i>Measurements</i> (in μ)	Holotype	Average of 8 spec.	min.	max.
Proximal conical portion				
Width:	126	134	114	156
Height:	192	209	192	227
Number of segments:	9–11	9.5	9	11
Inflated median portion				
Width:	249	277	249	312
Height:	279	311	279	334
Width between circumferential ridges:	21	27	21	32

Type Locality. – Locality no. 40 of locality descriptions.

Mirifusus guadalupensis PESSAGNO

Data 37, range 55, pob 160, rk 50, Pl. 5, Fig. 8, 22

Mirifusus guadalupensis PESSAGNO 1977a, p. 83, Pl. 10, Fig. 9–14. BAUMGARTNER et al. 1980, p. 55, Pl. 5, Fig. 12–14. ISHIDA 1983, Pl. 5, Fig. 6a–b. YAO 1984, Pl. 2, Fig. 29.

Lithocampe mediodilatata RÜST, OZVOLDOVA 1979, p. 258, Pl. 5, Fig. 3.

Remarks. – This species seems to evolve from *M. fragilis* n. sp. The two species are compared under the latter.

Mirifusus mediodilatatus (RÜST) s.l.

Data 76, range 67, pob 161, rk 4 (pars)

Remarks. – Under this name are included all synonymies listed under the two subspecies *M. mediodilatatus baileyi* and *M. mediodilatatus mediodilatatus*.

In BAUMGARTNER et al. (1980) we synonymized *M. baileyi* with *M. mediodilatatus* based on the fact, that both show two staggered rows of pores per segment and that in poorly preserved material it is impossible to decide, whether the pore frames are triangular or circular. We do, however, agree that there are two distinct Late Jurassic morphotypes and that *M. baileyi* may have a later first appearance than *M. mediodilatatus*. It seems more practical to deal with these two morphotypes as subspecies, since an assignation to either one is impossible for transitional forms as well as for poorly preserved material.

During the Tithonian *M. baileyi* seems to gradually reduce the number of segments included in the conical proximal portion, to become *M. mediodilatatus minor* n. subsp. (see below).

The database has been established based on the concept of BAUMGARTNER et al. (1980) excluding *M. m. minor* n. subsp.

Mirifusus mediodilatatus baileyi PESSAGNO

Pl. 5, Fig. 10, 18

Lithocampe mediodilatata RÜST, RIEDEL & SANFILIPPO 1974, p. 779, Pl. 7, Fig. 3, not Fig. 1–2, 4.

Mirifusus baileyi PESSAGNO 1977a, p. 83, Pl. 10, Fig. 6–8, Pl. 11, Fig. 9–11. PESSAGNO 1977b, p. 48, Pl. 8, Fig. 1, 26, not 8–9. MIZUTANI 1981, p. 177, Pl. 60, Fig. 1. ADACHI 1982, Pl. 1, Fig. 1.4. OKAMURA & UTO 1982, Pl. 7, Fig. 3. ?ISHIDA 1983, Pl. 5, Fig. 7.

Mirifusus mediodilatatus (RÜST), BAUMGARTNER et al. 1980, p.56, Pl.5, Fig.9–10, not 11. NAKASEKO & NISHIMURA 1981, p.155, Pl.8, Fig.15. YAO et al. 1982, Pl.4, Fig.30. MURATA et al. 1982, Pl.1, Fig.11, 14. AOKI & TASHIRO 1982, Pl.4, Fig.8. YAO 1984, Pl.3, Fig.22.

Emended definition. – Cephalis, thorax and abdomen and sometimes first postabdominal segments externally smooth, poreless or sparsely porous. Remaining postabdominal segments (5–7) of conical proximal portion of test with well developed outer layer of irregular vertical and diagonal bars joining at circumferential ridges in broad nodes; outer layer mostly obscuring inner layer of two rows of pores. Segments of inflated median portion of test with inner layer of two rows of alternating triangular pores per segment. Outer layer becoming regular triangular and congruent with inner layer at top of or in upper part of the inflated median portion of test. Circumferential ridges of outer layer broad, with flat outer surface interrupted by flat nodes at junction of diagonal bars. Distal cylindrical portion delicate, without circumferential ridges (without segments?), with more or less regular transverse rows of pores.

Remarks. – Instead of a three-layered structure as proposed by PESSAGNO (1977a) for *M. baileyi*, we can only observe a two-layered structure, where the outer layer becomes completely congruent with the inner layer on the median part of the test.

Mirifusus mediodilatatus mediodilatatus (RÜST)

Pl. 5, Fig. 13, 19

Lithocampe mediodilatata RÜST 1885, p.316, Pl.40, Fig.9. RIEDEL & SANFILIPPO 1974, p.779, Pl.7, Fig.2, ?Fig.4, not Fig.1, 3.

Mirifusus (?) *mediodilatata* (RÜST), PESSAGNO 1977a, p.84, Pl.11, Fig.1–2.

Mirifusus mediodilatatus (RÜST), BAUMGARTNER et al. 1980, p.56, Pl.5, Fig.11. NISHIZONO et al. 1982, Pl.3, Fig.10.

Mirifusus baileyi PESSAGNO, ISHIDA 1983, Pl.5, Fig.8a–b, not 7.

Remarks. – This subspecies differs from *M. m. baileyi* in having two staggered rows of rounded triangular to circular pores per segment, relatively narrow, slightly nodose circumferential ridges and an outer layer which seems to terminate on upper median inflated portion of the test. There are intermediate forms between the two subspecies.

Mirifusus mediodilatatus minor BAUMGARTNER n. subsp.

Data 99, range 90, pob 286, rk 4 (pars), Pl. 5, Fig. 11–14

Lithocampe mediodilatata RÜST, ?PESSAGNO 1969, p.610, Pl.4, Fig. G, H. MOORE 1973, p.828, Pl.2, Fig.5, 6. Theoperid gen. et sp. indet. FOREMAN 1973, Pl.12, Fig.2.

Lithocampe mediodilatata RÜST, RIEDEL & SANFILIPPO 1974, Pl.7, Fig.1 only. FOREMAN 1975, p.616, Pl.2K, Fig.2, ?Pl.6, Fig.17.

Mirifusus mediodilatatus (RÜST), FOREMAN 1978, Pl.2, Fig.3. STEIGER 1981, Pl.14, Fig.4. KANIE et al. 1981, Pl.1, Fig.14.

Mirifusus baileyi (PESSAGNO), OKAMURA 1980, Pl.20, Fig.4.

Description. – Proximal conical portion composed of spherical cephalis, inflated thorax and abdomen and one to at most three postabdominal segments. Entire conical portion externally smooth, sparsely porous, or with irregular, vertically elongated slots formed by the coalescent outer layer. Transverse rows of pores and circumferential

ridges delimiting segments appear at the base of the conical portion of test. Inflated median and conical distal portion of test identical as for *M. mediodilatatus baileyi*.

Remarks. – *M. m. minor* differs from *M. m. baileyi* as defined in this chapter by including only 4–6 segments in the proximal conical portion instead of 8–10. As a consequence, almost the entire conical portion is externally smooth. *M. m. minor* seems to evolve from *M. m. baileyi* during the Tithonian by a gradual decrease of the number of segments included in the conical portion (retardation). No forms assignable to *M. m. baileyi* have been found in the Neocomian.

Etymology. – *minor* = younger (Latin), referring to its descendance from *M. m. baileyi*.

<i>Measurements</i> (in μ)				
	Holotype	Average of 7 spec.	min.	max.
Proximal conical portion				
Height:	138	136	106	184
Width:	123	133	89	156
Number of segments:	5?	6	4?	7?
Inflated median portion				
Height:	444	385	319	444
Width:	356	320	277	405

Type locality. – Locality no. 23 of locality descriptions.

Genus *Monotrabs* BAUMGARTNER n. gen.

Type species: *Monotrabs plenoides* BAUMGARTNER n. sp.

Description. – Form consisting of one hagiastrid-like (tritrabin?) ray, with two rows of alternating pores in depression between adjacent external longitudinal beams. No central area can be observed. One end tapering to a structure of triangular cross section made of three beams, the other end blunt, bearing spines.

Remarks. – Fragments of forms belonging to this genus mimic hagiastrid rays belonging to the Tritrabinae BAUMGARTNER 1980. Because of the absence of a central area and the peculiar tapering of one end, this form can only doubtfully be included with the hagiastrids.

Monotrabs plenoides BAUMGARTNER n. sp.

Data 42, range 54, pob 152, rk 91, Pl. 6, Fig. 1–2, 5

Hagiastrid sp. cf. *Tetraditryma pseudoplena* BAUMGARTNER, KOCHER 1981, p. 70, Pl. 14, Fig. 4.

Description. – Hagiastrid-like ray with two stout, triradiate lateral spines at one end, which stand at right angle to the axis of ray as with *Tetraditryma pseudoplena*. Ray structure rather tritrabin: 3–5 longitudinal, slightly nodose external beams visible per half circumference are separated by a depression with two rows of alternating pores. The opposite end tapers into an extension consisting of three beams connected by bars forming longitudinal rows of pores. The external beams may bear long secondary lateral spines.

Remarks. – Fragments of this species can be distinguished from fragments of *Tetraditryma pseudoplena* by having a tritribin, rather than a tetraditrymin ray structure.

Etymology. – *plenoides*: In allusion to the lateral spines of *Tetraditryma pseudoplena*.

Measurements (in μ)

	Holotype	Average of 4 spec.	min.	max.
Length of ray:	216	333	216	450
Width of ray:	50	51	44	60
Length of lateral spines:	31	62	31	100
Length of extension:	77	–	–	–

Type locality. – Locality no. 30 of locality descriptions.

Genus *Napora* PESSAGNO

Napora PESSAGNO 1977a, p. 94.

Type species: *Napora bukryi* PESSAGNO 1977a.

Napora bukryi PESSAGNO

Data 73, range 61, pob 34, rk 31, Pl. 6, Fig. 4

Napora bukryi PESSAGNO 1977a, p. 94, Pl. 12, Fig. 8. KOCHER 1981, p. 77, Pl. 14, Fig. 31.

Napora lospensis DE WEVER & CABY 1981, Pl. 2, Fig. 2K.

Remarks. – Included are small *Napora* with a clearly visible cephalis with a short triradiate horn with a central and three lateral points. Cephalis offset from thorax by a stricture, thorax rounded, almost hemispherical and thin curved feet.

Napora deweveri BAUMGARTNER

Data 46, range 62, pob 35, rk 95, Pl. 6, Fig. 3

Napora deweveri BAUMGARTNER, BAUMGARTNER et al. 1980, p. 56, Pl. 3, Fig. 1–3, 5, Pl. 6, Fig. 9. KOCHER 1981, p. 78, Pl. 14, Fig. 24.

Not: *Napora* aff. *deweveri* BAUMGARTNER, ISHIDA 1983, Pl. 9, Fig. 5 (too small).

Napora lospensis PESSAGNO

Data 72, range 76, pob 36, rk 32, Pl. 6, Fig. 6

Napora lospensis PESSAGNO 1977a, p. 96, Pl. 12, Fig. 9–10.

?BAUMGARTNER et al. 1980, p. 57, Pl. 3, Fig. 4.

Not: DE WEVER & CABY 1981, Pl. 2, Fig. 2K.

Remarks. – Under this name we include large *Napora* with a small triradiate horn sitting on a broad cephalis, which is separated by a stricture from an inflated annular thorax. Some included forms may have a different pore structure than the holotype.

Napora pyramidalis BAUMGARTNER n. sp.

Data 12, range 11, pob 33, rk 104, Pl. 6, Fig. 11–12

Napora sp. A, BAUMGARTNER et al. 1980, p. 57, Pl. 3, Fig. 6–7. KOCHER 1981, p. 78, Pl. 15, Fig. 1–3.
Not: ISHIDA 1983, Pl. 9, Fig. 6 (too large).

Description. – Very small *Napora* with distinctly pyramidal overall shape. Cephalis completely hidden under a sharp apical horn bearing six ridges separated by six deep groves which originate on top of thorax. Three lateral points may sit on three of the ridges. Thorax pyramidal, with round pores in horizontal rows. The outer ridge of the feet originate on the edges of thorax. Basal aperture triangular, large. Feet triradiate almost in a straight line with edges of thorax, or slightly curved inward, equal or shorter than height of thorax.

Remarks. – This species differs from other *Napora* by its small size, its triangular-pyramidal shape, the sharp ridges completely hiding the cephalis and short, almost straight feet.

Etymology. – *pyramidalis* = like a pyramide (Latin).

Measurements (in μ , including data by KOCHER 1981).

	Holotype	Average of 22 spec.	min.	max.
Cephalis and horn				
Height:	52	61	41	79
Width:	29	33	28	43
Thorax				
Height:	54	66	54	78
Width between feet:	80	88	69	107
Length of feet:	38	67	38	86

Type locality. – Locality no. 30 of locality descriptions.

Genus *Obesacapsula* PESSAGNO

Obesacapsula PESSAGNO 1977a, p. 87.

Type species: *Obesacapsula morroensis* PESSAGNO 1977a.

Obesacapsula rotunda (HINDE)

Data 83, range 95, pob 202, rk 16, Pl. 6, Fig. 13

Stichocapsa rotunda HINDE 1900, p. 41, Pl. 3, Fig. 24. MUZAVOR 1977, p. 122, Pl. 5, Fig. 11–12. OZVOLDOVA 1979, p. 257, Pl. 5, Fig. 5–6.

Stichocapsa (?) *rotunda* HINDE, FOREMAN 1973, p. 265, Pl. 11, Fig. 2, Pl. 16, Fig. 20. FOREMAN 1975, p. 616, Pl. 2J, Fig. 6, Pl. 7, Fig. 5.

Obesacapsula rotunda (HINDE), PESSAGNO 1977b, p. 53, Pl. 9, Fig. 4, 12, 18. NAKASEKO et al. 1979, Pl. 2, Fig. 11a–b. NAKASEKO & ISHIMURA 1981, p. 156, Pl. 11, Fig. 12.

Syringocapsa rotunda (HINDE), FOREMAN 1978, p. 749, Pl. 2, Fig. 2. BAUMGARTNER et al. 1980, p. 62, Pl. 3, Fig. 12. KOCHER 1981, p. 97, Pl. 16, Fig. 30.

Obesacapsula rusconensis BAUMGARTNER n. sp.

Data 95, range 100, pob 282, rk-, Pl. 6, Fig. 7-9

Description. – Cephalis, thorax and abdomen together smooth, conical, almost without stricture to first postabdominal segment. First, second and third postabdominal segment cylindrical, growing gradually in width and little in height. Fourth postabdominal/final segment inflated annular to spherical, about half the height of entire test, with long tubular extension (where preserved as long as height of entire test) of about the width of third postabdominal segment. Postabdominal segments densely porous, final segment with a ornamentation of rounded irregular, sometimes spiny ridges which enclose areas of a few pores.

Remarks. – This species differs from *O. morroensis* which may be its ancestor, in having a final postabdominal segment which is less inflated and includes only about half of the test height instead of three quarters. It is further differentiated by the peculiar ornamentation on the final segment.

Etymology. – Referring to the type locality *Cava Rusconi* in Lombardy (northern Italy, see locality descriptions).

<i>Measurements</i> (in μ)	Holotype	Average of 5 spec.	min.	max.
Cephalis, thorax and abdomen				
Width:	65	56	50	67
Height:	68	62	57	68
4th segment				
Width:	96	84	78	96
Height:	36	29	25	36
5th segment				
Width:	165	144	121	165
Height:	60	48	32	64
6th segment				
Width:	234	209	170	234
Height:	63	58	43	64
7th, last segment				
Width:	330	316	305	330
Height:	206	245	206	284
Tubular extension				
Width:	245	218	185	245
Length:	275	245	213	284

Type locality. – Locality no. 23. of locality descriptions.

Genus *Pantanellium* PESSAGNO

Pantanellium PESSAGNO 1977a, p. 78.

Type species: *Pantanellium riedeli* PESSAGNO 1977a.

Pantanellium (?) *berriasianum* BAUMGARTNER n. sp.

Data 93, range 92, pob 280, rk -, Pl. 6, Fig. 14-15

Description. – Ellipsoidal to spherical cortical shell with massive bipolar spines and one to several triradiate secondary spines placed on some nodal points of the pentago-

nal to hexagonal pore frames. The secondary spines are short, tapering into a sharp point, and seem to be randomly placed both in equatorial and peripolar position. Their number varies from one (usually in peripolar position) to six or eight. The remaining triple-junctions of the pore frames are slightly raised and bear moderate nodes.

Remarks. – This species differs from all other species included with *Pantanellium* and *Pachyoncus* PESSAGNO & BLOME 1980, in having short, sharp secondary spines placed randomly on some nodal points of the pore frames. The species is doubtfully included with *Pantanellium* as its definition (PESSAGNO 1977a) does not include such secondary spines. It is not included with *Pachyoncus* because the secondary spines of this genus are different and occur at most nodal points.

Etymology. – Referring to the first occurrence of this species in the Berriasian.

Measurements (in μ)

	Holotype	Average of 7 spec.	min.	max.
Cortical shell				
Polar diameter:	132	104	78	132
Equatorial diameter:	135	102	78	135
Polar spines				
Length, short:	78	65	51	78
Length, long:	117	89	64	117
Width at base:	52	33	23	52
Secondary spines				
Length:	36	38	23	64
Width at base:	27	23	18	27

Type locality. – Locality no. 23 of locality descriptions.

Genus *Paronaella* PESSAGNO

Paronaella PESSAGNO 1971, emend. BAUMGARTNER 1980.

Type species: *Paronaella solanoensis* PESSAGNO 1971.

Paronaella bandyi PESSAGNO

Data 58, range 21, pob 135, rk 51, Pl. 6, Fig. 16

Paronaella bandyi PESSAGNO 1977a, p. 69, Pl. 1, Fig. 1–3. BAUMGARTNER 1980, p. 300, Pl. 9, Fig. 4.

?*Paronaella mulleri* PESSAGNO, ISHIDA 1983, Pl. 10, Fig. 4.

Paronaella broennimanni PESSAGNO

Data 53, range 73, pob 137, rk 71, Pl. 6, Fig. 17

Paronaella broennimanni PESSAGNO 1977a, p. 69, Pl. 1, Fig. 4–5. BAUMGARTNER 1980, p. 300, Pl. 9, Fig. 6.

KOCHER 1981, p. 80, Pl. 15, Fig. 5.

Paronaella kotura BAUMGARTNER

Data 48, range 64, pob 140, rk 85, Pl. 6, Fig. 20

Paronaella kotura BAUMGARTNER 1980, p. 302, Pl. 9, Fig. 15–19, Pl. 12, Fig. 8. KOCHER 1981, p. 80, Pl. 15, Fig. 7.

Paronaella sp. cf. *P. kotura* BAUMGARTNER, SATO et al. 1982, Pl. 3, Fig. 1.

Paronaella mulleri PESSAGNO

Data 38, range 32, pob 139, rk 96, Pl. 6, Fig. 21

Paronaella mulleri PESSAGNO 1977a, p. 71, Pl. 2, Fig. 2–3. BAUMGARTNER 1980, p. 304, Pl. 9, Fig. 8.Genus *Parvicingula* PESSAGNO*Parvicingula* PESSAGNO 1977a, p. 84.Type species: *Parvicingula santabarbarensis*.

Remarks. – Included with this genus are also forms without or with weakly developed horn, which otherwise fit to PESSAGNO's (1977a) definition. *Ristola* PESSAGNO & WHALEN 1982, which has been erected to include these forms, is herein emended to include only the very long cylindrical parvicingulid species (see remarks under that genus).

Parvicingula cosmoconica (FOREMAN)

Data 102, range 94, pob 255, rk 22, Pl. 7, Fig. 1

Dictyomitra cosmoconica FOREMAN 1973, p. 263, Pl. 9, Fig. 11, Pl. 16, Fig. 3. FOREMAN 1975, p. 614, Pl. 1G, Fig. 5–6.
Parvicingula cosmoconica (FOREMAN), BAUMGARTNER et al. 1980, p. 58, Pl. 5, Fig. 16, Pl. 6, Fig. 7.

Parvicingula dhimenaensis BAUMGARTNER n.sp.

Data 90, range 33, pob 197, rk –, Pl. 7, Fig. 2–4

Amphipyndax sp. BAUMGARTNER & BERNOULLI 1976, p. 611, Fig. 12e, i, m.*Parvicingula boesii* (PARONA) KOCHER 1981, p. 81, Pl. 15, Fig. 11, not 10. DE WEVER & CABY 1981, Pl. 2, Fig. 2C.*Parvicingula* sp. C, AITA 1982, Pl. 1, Fig. 13–14.*Amphipyndax*? sp. NISHIZONO et al. 1982, Pl. 3, Fig. 16.

Unnamed Nassellaria, WAKITA & OKAMURA 1982, Pl. 7, Fig. 7.

Description. – Slender conical to spindle-shaped parvicingulid. Cephalis hemispherical without or with a weakly developed horn, externally smooth, with a few small pores at base (ditrema). Thorax and abdomen trapezoidal, with irregular pores in roughly horizontal rows. All postabdominal segments with three rows of pores per segment in a uniform hexagonal arrangement. Circumferential ridges at segmental divisions bear nodes or small spines which are regularly spaced between every second adjacent pore. Diagonal bars may connect between nodes of circumferential ridges and form triangular frames which always enclose three pores. Last segment bears a tubular extension with closely spaced pores but without nodes or bars.

Remarks. – This species differs from other *Parvicingulas* in having circumferential ridges with regularly spaced nodes and diagonal bars connecting between nodes. At least two morphotypes are included with this species; they may be separated in a later stage of work. Some workers have included these forms with *Parvicingula boesii* (PARONA) 1890. This species differs from *P. dhimenaensis* by being broadly spindle-shaped, and having pronounced circumferential ridges without any nodes nor diagonal bars (see PARONA 1890, Pl. 6, Fig. 9!).

Etymology. – Named after a locality in the Argolis Peninsula (Peloponnesus, Greece), where this species abundantly occurs.

Measurements (in μ)

	Holotype	Average of 7 spec.	min.	max.
Total height of test:	270	255	230	300
Max. width of test:	113	117	105	135
Width of last segment:	80	91	80	109

Type locality. – Locality no. 5 of locality descriptions.

Genus *Perispyridium* DUMITRICA

Perispyridium DUMITRICA 1978, p. 9 35.

Type species: *Trilonche (?) ordinaria* PESSAGNO 1977a.

Perispyridium ordinarium (PESSAGNO)

Data 31, range 48, pob 100, rk 53, Pl. 7, Fig. 5–6

Trilonche (?) ordinaria PESSAGNO 1977a, p. 79, Pl. 6, Fig. 14.

Perispyridium ordinarium (PESSAGNO), DUMITRICA 1978, p. 9, 35, Pl. 3, Fig. 1, 2, 5, Pl. 4, Fig. 9. KOCHER 1981, p. 83, Pl. 15, Fig. 15. PESSAGNO & BLOME 1982, p. 294, Pl. 6, Fig. 4, 12, 15. NISHIZONO et al. 1982, Pl. 2, Fig. 9. AITA 1982, Pl. 3, Fig. 23.

Trigonocyclus sp. OZVOLDOVA 1979, p. 253, Pl. 3, Fig. 2.

?*Perispyridium (?) ordinarium* (PESSAGNO), DE WEVER & CABY 1981, Pl. 2, Fig. 2A.

Genus *Podobursa* WISNIEWSKI, emend. FOREMAN

Podobursa WISNIEWSKI 1889, p. 686, emend. FOREMAN 1973, p. 266.

Type species: *Podobursa dunikowskii* WISNIEWSKI 1889.

Podobursa helvetica (RÜST)

Data 18, range 13, pob 169, rk 98, Pl. 7, Fig. 7

Theosyringium helveticum RÜST 1885, p. 309, Pl. 27, Fig. 14.

Podobursa helvetica (RÜST), BAUMGARTNER et al. 1980, p. 60, Pl. 3, Fig. 11. KOCHER 1981, p. 84, Pl. 15, Fig. 17. DE WEVER & CABY 1981, Pl. 2, Fig. 20.

Podobursa spinosa (OZVOLDOVA)

Data 64, range 78, pob 230, rk 54, Pl. 7, Fig. 8

Indeterminatum in HEITZER 1930, p. 387, Pl. 27, Fig. 7.

Podobursa pantanellii (PARONA), RIEDEL & SANFILIPPO 1974, p. 779, Pl. 8, Fig. 5, Pl. 13, Fig. 6.

Heitzeria spinosa OZVOLDOVA 1975, p. 78, Pl. 101, Fig. 2.

Podobursa berggreni PESSAGNO 1977a, p. 90, Pl. 12, Fig. 1–5.

Podobursa spinosa (OZVOLDOVA), OZVOLDOVA 1979, p. 256, Pl. 2, Fig. 4, BAUMGARTNER et al. 1980, p. 60, Pl. 3, Fig. 10. KOCHER 1981, p. 85, Pl. 15, Fig. 18.

Not *Podocapsa pantanellii* PARONA 1890, p. 164, Pl. 5, Fig. 8.

Remark. – See remarks in BAUMGARTNER et al. (1980).

Genus *Podocapsa* RÜST, emend. FOREMAN

Podocapsa RÜST 1885, p. 304, emend. FOREMAN 1973, p. 267.

Type species: *Podocapsa guembeli* RÜST 1885.

Podocapsa amphitreptera FOREMAN

Data 69, range 84, pob 171, rk 38, Pl. 7, Fig. 9–10

Podocapsa amphitreptera FOREMAN 1973, p. 267, Pl. 13, Fig. 11. FOREMAN 1975, p. 617, Pl. 6, Fig. 15. MUZAVOR 1977, p. 112, Pl. 7, Fig. 4. FOREMAN 1978, p. 749, Pl. 1, Fig. 16. BAUMGARTNER et al. 1980, p. 61, Pl. 3, Fig. 8–9. KOCHER 1981, p. 86, Pl. 15, Fig. 20. ?DE WEVER & CABY 1981, Pl. 2, Fig. 2M. YAO et al. 1982, Pl. 4, Fig. 29. YAO 1984, Pl. 3, Fig. 14.

Nassellaria gen. et sp. indet. NAKASEKO & NISHIMURA 1981, Pl. 8, Fig. 12a–b.

Genus *Praeconocaryomma* PESSAGNO

Praeconocaryomma PESSAGNO 1976, p. 40.

Type species: *Praeconocaryomma universa* PESSAGNO 1976.

Praeconocaryomma (?) *hexacubica* BAUMGARTNER n. sp.

Data 87, range 31, pob 244, rk –, Pl. 7, Fig. 11–14

Description. – Cortical shell is a sphere or a rounded cube with eight stout, triradiate primary radial spines extending from the corners of the cube. These spines may be reduced or absent. Surface of cortical shell bears a meshwork of bars forming equilateral triangles which join to form regular hexagones centered around a raised knob with a central pore. Each triangle of bars encloses three pores which results in a perfectly hexagonal pore arrangement of the inner side of cortical shell, visible in fragments or broken up specimens. The central pore of the outer bar hexagones is the depressed central, seventh pore of the internal, concave pore hexagones which are delimited by moderate rounded ridges (see Pl. 7, Fig. 13). First medullary shell smooth, spherical, with circular pores in pentagonal to hexagonal arrangement, connected to cortical shell by six triradiate radial beams which reach to the center of the square sides of cortical shell. No second medullary shell has been observed.

Remarks. – This form is distinguished even in small fragments by its very characteristic wall structure of the cortical shell, which somehow resembles the mammary pore frames described for *Praeconocaryomma media* by PESSAGNO & POISSON (1981). However, this species is doubtfully included with *Praeconocaryomma* as instead of a radial spine there is a pore in the center of each bar hexagone. Besides that, this species may have stout primary radial spines which do not connect inwards to the first medullary shell, which is instead connected by beams centered between the outer spines. Only one, instead of three medullary shells has been observed.

Etymology. – *hexa*: referring to the hexagonal pore frames; *cubica*: referring to the shape of the cortical shell.

Measurements (in μ)

	Holotype	Average of 8 spec.	min.	max.
Diameter of cortical shell between sides:	195	198	172	225
Diameter of first medullary shell:	–	50	45	55
Diameter of bar hexagones:	55	58	52	65
Length of external spines.	75	60	20	76

Type locality. – Locality no. 30 of locality descriptions.

Genus *Protunuma* ICHIKAWA & YAO

Protunuma ICHIKAWA & YAO 1976, p. 114.

Type species: *Protunuma fusiformis* ICHIKAWA & YAO 1976.

Protunuma costata (HEITZER)

Data 21, range 35, pob 232 and 233, rk 62 and 67, Pl. 7, Fig. 15

?*Cenellepsis costata* HEITZER 1930, p. 388, Pl. 17, Fig. 12. MUZAVOR 1977, p. 71, Pl. 4, Fig. 7.

Protunuma sp. aff. *Cenellepsis costata* HEITZER, KOCHER 1981, p. 86, Pl. 15, Fig. 21.

?*Cenellepsis multicostata* HEITZER 1930, p. 388, Pl. 17, Fig. 13. MUZAVOR 1977, p. 70, Pl. 4, Fig. 8.

Protunuma sp. aff. *Cenellepsis multicostata* HEITZER, KOCHER 1981, p. 87, Pl. 15, Fig. 22.

Protunuma sp. D, YAO et al. 1982, Pl. 4, Fig. 24. YAO 1984, Pl. 3, Fig. 12, 17.

Remarks. – This name is used to include fusiform *Protunumas* without externally individualized cephalis nor with a terminal extension, with plicae that run from cephalis to base of test and two to five longitudinal rows of circular uniform pores between them. It includes two or more morphotypes which are difficult to separate in routine radiolarian work.

Genus *Pseudocrucella* BAUMGARTNER

Pseudocrucella BAUMGARTNER 1980, p. 291.

Type species: *Crucella sanfilippae* PESSAGNO 1977a.

Pseudocrucella adriani BAUMGARTNER

Data 52, range 34, pob 129, rk 72, Pl. 7, Fig. 16

Pseudocrucella adriani BAUMGARTNER 1980, p. 291, Pl. 8, Fig. 4, 8, 12, 15, 16. KOCHER 1981, p. 88, Pl. 15, Fig. 23.

Pseudocrucella sanfilippae (PESSAGNO)

Data 51, range 58, pob 126, rk 73, Pl. 7, Fig. 17

Crucella sanfilippae PESSAGNO 1977a, p. 72, Pl. 2, Fig. 15–16. AITA 1982, Pl. 3, Fig. 9.

Pseudocrucella sanfilippae (PESSAGNO), BAUMGARTNER 1980, p. 291, Pl. 8, Fig. 1, 23, 24. KOCHER 1981, p. 88, Pl. 16, Fig. 1. Not: DE WEVER & CABY 1981, Pl. 2, Fig. 2J.

Genus *Pseudodictyomitra* PESSAGNO

Pseudodictyomitra PESSAGNO 1977b, p. 50.

Type species: *Pseudodictyomitra pentacolaensis* PESSAGNO 1977b.

Pseudodictyomitra carpatica (LOZNYAK)

Data 107, range 105, pob 293, rk -, Pl. 8, Fig. 1

Dictyomitra carpatica LOZNYAK 1969, p. 38, Pl. 2, Fig. 11–12. FOREMAN 1973, p. 263, Pl. 10, Fig. 1–3, Pl. 16, Fig. 5. FOREMAN 1975, p. 614, Pl. 2G, Fig. 12–14, not 11, Pl. 7, Fig. 7 not 6.

Pseudodictyomitra carpatica (LOZNYAK), SCHAAF 1981, p. 436, Pl. 3, Fig. 1a–c, 2, Pl. 20, Fig. 4a–b. NAKASEKO & NISHIMURA 1981, p. 158, Pl. 9, Fig. 6, 11. DE WEVER & THIÉBAULT 1981, p. 590, Pl. 2, Fig. 2. MATSUYAMA et al. 1982, Pl. 1, Fig. 7. YAO 1984, Pl. 4, Fig. 18.

Pseudodictyomitra sp. cf. *P. carpatica* (LOZNYAK), NISHIZONO et al. 1982, Pl. 3, Fig. 9.

Pseudodictyomitra sp. KANIE et al. 1984, Pl. 4, Fig. 14.

Pseudodictyomitra depressa BAUMGARTNER n. sp.

Data 97, range 101, pob 284, rk -, Pl. 8, Fig. 2, 7–8, 11

Pseudodictyomitra sp. OKAMURA 1980, Pl. 20, Fig. 6, 11.

Unnamed nasselliariid F, WU HAO-RUO & LI HONG-SHENG 1982, Pl. 2, Fig. 19.

Archaeodictyomitra carpatica (LOZNYAK). OKAMURA & UTO 1982, Pl. 2, Fig. 3 (only).

Pseudodictyomitra carpatica (LOZNYAK). OKAMURA & UTO 1982, Pl. 8, Fig. 7a–b.

Description. – Overall shape of test broadly conical proximally and slightly constricted distally, the widest segments being the 7th to 9th segment. Cephalis, thorax and abdomen together smooth, conical, without external strictures. Thorax and abdomen with one horizontal row of pores at base. First postabdominal segment cylindrical, with weak ornamentation and one row of pores at base. Following five to six postabdominal segments cylindrical, with very pronounced circumferential ridges separated by deeply depressed grooves at segmental divisions in which one or two rows of pores are visible. The circumferential ridges are of round cross section and bear costae (about 12 visible per half circumference) which are regularly spaced between the pores. Well preserved specimens show faint horizontal ribs between costae. Last postabdominal segment clearly narrower than second last, with two well exposed, staggered rows of pores and less pronounced circumferential ridge and costae at base.

Remarks. – This species differs from other *Pseudodictyomitra* by having deeply depressed segmental divisions and a distally constricted overall shape.

Etymology. – *depressa*: referring to the depressed segmental divisions (Latin).

Measurements (in μ)

	Holotype	Average of 6 spec.	min.	max.
Cephalis, thorax and abdomen				
Height:	51	53	51	55
Width:	48	53	48	60
Width of widest segment:	140	130	110	147
Width of last segment:	123	113	97	123
Total length of test:	239	245	202	306

Type locality. – Locality no. 16 of locality descriptions.

Genus *Ristola* PESSAGNO & WHALEN, emend.

Ristola PESSAGNO & WHALEN 1982, p. 148, emend.

Type species: *Parvingingula* (?) *procera* PESSAGNO 1977a.

Emendation. – PESSAGNO & WHALEN (1982) erected this genus to include all forms questionably assigned to *Parvingingula* lacking a horn. It is herein emended to include only species which have a conical proximal portion, a very long cylindrical portion with several tenths of postabdominal segments and in addition have an outer layer, which, similar as with *Mirifusus*, tends to obscure the regular hexagonal pore frames of the inner layer in the proximal portion of the test (see Pl. 8, Fig. 3, 9, 10). Conical forms, lacking this outer layer are included with *Parvingingula*, whether they have a horn or not.

Ristola altissima (RÜST)

Data 32, range 47, pob 164, rk 52, Pl. 8, Fig. 3–4, 9

Lithocampe altissima RÜST 1885, p. 315 (45), Pl. 40, Fig. 2. not: MOORE 1973, p. 828, Pl. 3, Fig. 7. OZVOLDOVA 1979, p. 258, Pl. 5, Fig. 1.

Parvingingula altissima (RÜST), PESSAGNO 1977a, p. 85, Pl. 8, Fig. 9–10. ?NAKASEKO et al. 1979, Pl. 1, Fig. 9–10. BAUMGARTNER et al. 1980, p. 58, Pl. 5, Fig. 4–7. ?NAKASEKO & NISHIMURA 1981, Pl. 8, Fig. 14. KOCHER 1981, p. 81, Pl. 15, Fig. 9. YAO et al. 1982, Pl. 4, Fig. 19. ADACHI 1982, Pl. 1, Fig. 8. MURATA et al. 1982, Pl. 1, Fig. 13. YAO 1984, Pl. 2, Fig. 25.

Mirifusus sp., SATO et al. 1982, Pl. 4, Fig. 13.

Theoperid gen. et sp. indet. AOKI & TASHIRO 1982, Pl. 2, Fig. 7.

Ristola cretacea (BAUMGARTNER)

Data 101, range 93, pob 165, rk 23, Pl. 8, Fig. 5, 10

Lithocampe altissima RÜST, MUZAVOR 1977, p. 102, Pl. 8, Fig. 7.

Parvingingula cretacea BAUMGARTNER, BAUMGARTNER et al. 1980, p. 59, Pl. 5, Fig. 1–3, Pl. 6, Fig. 4.

Ristola procera (PESSAGNO)

Data 45, range 72, pob 163, rk 97, Pl. 8, Fig. 6

Parvingingula (?) *procera* PESSAGNO 1977a, p. 86, Pl. 9, Fig. 6–9.

Parvingingula procera PESSAGNO, BAUMGARTNER et al. 1980, p. 60, Pl. 5, Fig. 8. KOCHER 1981, p. 83, Pl. 15, Fig. 14.

Genus *Saitoum* PESSAGNO

Saitoum PESSAGNO 1977a, p. 96.

Type species: *Saitoum pagei* PESSAGNO 1977a.

Saitoum pagei PESSAGNO

Data 88, range 49, pob 20, rk 55, Pl. 8, Fig. 12

Saitoum pagei PESSAGNO 1977a, p. 98, Pl. 12, Fig. 11–14. KOCHER 1981, p. 89, Pl. 16, Fig. 2–3. DE WEVER & CABY 1981, Pl. 2, Fig. 2H. BAUMGARTNER et al. 1981, Fig. 4a–b.

Genus *Sethocapsa* HAECKEL

Sethocapsa HAECKEL 1881, p. 433.

Type species: *Sethocapsa cometa* (PANTANELLI) in RÜST 1885.

Sethocapsa cetia FOREMAN

Data 68, range 87, pob 203, rk 39, Pl. 8, Fig. 13

Sethocapsa cetia FOREMAN 1973, p. 267, Pl. 12, Fig. 1, Pl. 16, Fig. 19. FOREMAN 1975, p. 617, Pl. 2K, Fig. 1, Pl. 6, Fig. 14. MUZAVOR 1977, p. 114, Pl. 5, Fig. 4. FOREMAN 1978, p. 749, Pl. 2, Fig. 1. BAUMGARTNER et al. 1980, p. 61, Pl. 3, Fig. 14. KOCHER 1981, p. 89, Pl. 16, Fig. 4–5.

Sethocapsa cethia STEIGER 1981, Pl. 14, Fig. 6 (incorrect secondary spelling IRZN Art. 33b.).

Not: *Obesacapsula cetia* (FOREMAN), PESSAGNO 1977a, p. 87, Pl. 11, Fig. 4. Not: PESSAGNO 1977b, p. 52, Pl. 9, Fig. 11.

Sethocapsa leiostraca FOREMAN

Data 84, range 51, pob 62, rk 7

Sethocapsa leiostraca FOREMAN 1973, p. 268, Pl. 12, Fig. 5–6. FOREMAN 1975, p. 617, Pl. 2J Fig. 5. KOCHER 1981, p. 89, Pl. 16, Fig. 6.

?*Sethocapsa trachyostraca* FOREMAN, BAUMGARTNER et al. 1980, p. 61, Pl. 6, Fig. 2.

Sethocapsa trachyostraca FOREMAN

pob 63, rk 15, Pl. 8, Fig. 14

Sethocapsa trachyostraca FOREMAN 1973, p. 268, Pl. 12, Fig. 4. FOREMAN 1975, p. 617, Pl. 2J, Fig. 3, 4. MUZAVOR 1977, p. 119, Pl. 6, Fig. 5. FOREMAN 1978, p. 749, Pl. 1, Fig. 18. Not: BAUMGARTNER et al. 1980, Pl. 6, Fig. 2. SCHAAF 1981, p. 437, Pl. 21, Fig. 1a–b. Not: KOCHER 1981, Pl. 16, Fig. 9–10.

Remarks. – Although the illustrated material is insufficient, there is good evidence that forms assignable to both *S. leiostraca* and *S. trachyostraca* do range down to Zone A1 (middle to late Callovian).

Sethocapsa uterculus (PARONA)

Data 111, range 109, pob 297, rk –, Pl. 8, Fig. 15

Theocapsa uterculus PARONA 1890, p. 168, Pl. 5, Fig. 17.

Sethocapsa sp. cf. *Theocapsa uterculus* PARONA, FOREMAN 1975, p. 617, Pl. 21, Fig. 21–22. FOREMAN 1978, p. 749, Pl. 2, Fig. 8. KANIE et al. 1981, Pl. 1, Fig. 12.

Sethocapsa uterculus (PARONA), SCHAAF 1981, p. 437, Pl. 5, Fig. 8a–b, Pl. 26, Fig. 5a–b. OKAMURA & UTO 1982, Pl. 3, Fig. 15. YAO 1983, Pl. 4, Fig. 1–2.

Remarks. – Similar forms not included here, range down to the Berriasian.

Genus *Spongocapsula* PESSAGNO

Spongocapsula PESSAGNO 1977a, p. 88.

Type species: *Spongocapsula palmerae* PESSAGNO 1977a.

Spongocapsula palmerae PESSAGNO

Data 50, range 38, pob 199, rk 76, Pl. 8, Fig. 16

Spongocapsula palmerae PESSAGNO 1977a, p. 88, Pl. 11, Fig. 12–14, 16. KOCHER 1981, p. 93, Pl. 16, Fig. 17.*Spongocapsula perampla* (RÜST)

Dat 85, range –, pob 267, rk 9, Pl. 8, Fig. 17

Lithocampe perampla RÜST 1885, p. 315, Pl. 39, Fig. 11. RIEDEL & SANFILIPPO 1974, p. 779, Pl. 7, Fig. 1–4.*Spongocapsula* sp. aff. *S. perampla* (RÜST), PESSAGNO 1977a, p. 90, Pl. 11, Fig. 15.*Spongocapsula perampla* (RÜST), KOCHER 1981, p. 94, Pl. 16, Fig. 18.

Remarks. – These, possibly several, morphotypes have a very spotty occurrence in the Late Jurassic and Early Cretaceous. Their data has been excluded from treatment for Unitary Association.

Genus *Staurosphaera* HAECKEL*Staurosphaera* HAECKEL 1881, p. 450.*Type species:* *Staurosphaera crassa* DUNIKOWSKI 1882.*Staurosphaera antiqua* RÜST

Data 49, range 60, pob 218, rk 83, Pl. 8, Fig. 18

Staurosphaera antiqua RÜST 1885, p. 289, Pl. 28, Fig. 2.*Emiluvia antiqua* (RÜST), PESSAGNO 1977a, p. 76, Pl. 4, Fig. 9–10. KOCHER 1981, p. 63, Pl. 13, Fig. 4.

Remarks. – This species lacks the typical raised axial outer layer of the central area of *Emiluvia*. It is therefore left with its original generic assignment until more is known about this group.

Genus *Stichocapsa* HAECKEL*Stichocapsa* HAECKEL 1881, p. 1515.*Type species:* *Stichocapsa jaspidea* RÜST 1885.*Stichocapsa convexa* YAO

Data 61, range 16, pob 55, rk 56, Pl. 8, Fig. 19

Stichocapsa convexa YAO 1979, p. 35, Pl. 5, Fig. 14–16, Pl. 6, Fig. 1–7. KOCHER 1981, p. 95, Pl. 16, Fig. 21–22.

WAKITA 1982, Pl. 3, Fig. 7. AITA 1982, Pl. 1, Fig. 6–7b.

Stichocapsa sp. J., AITA 1982, Pl. 1, Fig. 8–9b.*Stichocapsa japonica* YAO

Data 22, range 19, pob 49, rk 74

Stichocapsa japonica YAO 1979, p. 36, Pl. 6, Fig. 9–12, Pl. 7, Fig. 1–15. KOCHER 1981, p. 96, Pl. 16, Fig. 23. YAO et al. 1982, Pl. 3, Fig. 16. KIDO et al. 1982, P. 5, Fig. 8. WAKITA & OKAMURA 1982, Pl. 8, Fig. 4.

Stichocapsa sp. aff. *S. japonica* YAO

Data 4, range 3, pob 48, rk –, Pl. 8, Fig. 20

Remarks. – The included form differs from the type material in having a nodose test surface. This morphotype seems to be limited to Zone A0 (and older) samples.

Genus *Stylocapsa* PRINCIPI*Stylocapsa* PRINCIPI 1909, p. 20. Emend. TAN SIN HOK 1927, p. 32.*Type species: Stylocapsa exagonata* PRINCIPI 1909.*Stylocapsa oblongula* KOCHER

Data 6, range 53, pob 59, rk 111, Pl. 9, Fig. 1–2

Stylocapsa oblongula KOCHER in BAUMGARTNER et al. 1980, p. 62, Pl. 6, Fig. 1. KOCHER 1981, p. 97, Pl. 17, Fig. 27–29. AITA 1982, Pl. 1, Fig. 18a–b. MATSUOKA 1983, p. 19, Pl. 6, Fig. 5–7.

Genus *Syringocapsa* NEVIANI*Syringocapsa* NEVIANI 1900, p. 662.*Type species: Theosyringium robustum* VINASSA 1900, p. 343.*Syringocapsa agolarium* FOREMAN

Data 105, range 104, pob 291, rk –, Pl. 9, Fig. 3–4

Syringocapsa agolarium FOREMAN 1973, p. 268, Pl. 1, Fig. 5, Pl. 16, Fig. 17.*Syringocapsa lucifer* BAUMGARTNER n. sp.

Data 96, range 91, pob 283, rk –, Pl. 9, Fig. 5

Description. – Very large form with spiny spherical postabdominal segment. Cephalis, thorax and abdomen together conical, externally smooth, with small, sparsely distributed pores. Following few (1–3?) postabdominal segments densely porous, forming a conical proximal portion together with the first three segments almost without external segmental strictures. Final postabdominal segment inflated spherical, three times as wide as conical proximal portion and forming more than half of the total height of test; the surface is densely porous, with an irregular system of rounded bars wearing numerous short, sharp spines of rounded cross section. Final segment terminates in a slender, short, imperforate terminal tube.

Remarks. – This species differs from *Syringocapsa limatum* FOREMAN 1973 in having a densely porous, spiny final segment and in having only a thin, short, imperforate terminal extension.

Etymology. – *lucifer* (Latin) refers to a weapon used by the Middle-Age Swiss.

<i>Measurements (in μ)</i>	Holotype	Average of 9 spec.	min.	max.
Proximal conical portion				
Height:	200	173	156	200
Width:	170	151	128	177
Final p.a. segment				
Height:	340	368	334	405
Width:	390	401	362	461
Terminal tube				
Length:	90	104	50	135
Width:	66	67	43	113
Length of spines:	60	69	50	85

Type locality. – Locality no. 23 of locality descriptions.

Genus *Tetraditryma* BAUMGARTNER

Tetraditryma BAUMGARTNER 1980, p. 296.

Type species: *Tetraditryma pseudoplana* BAUMGARTNER 1980.

Tetraditryma corralitosensis (PESSAGNO)

Data 20, range 17, pob 124, rk 58, Pl. 9, Fig. 6–7

Crucella (?) *corralitosensis* PESSAGNO 1977a, p. 72, Pl. 2, Fig. 10–13.

Tetraditryma corralitosensis (PESSAGNO), BAUMGARTNER 1980, p. 296, Pl. 7, Fig. 12–15, Pl. 11, Fig. 13. KOCHER 1981, p. 98. Pl. 16, Fig. 31. DE WEVER & CABY 1981, Pl. 2, Fig. 2G. ISHIDA 1983, Pl. 11, Fig. 8.

Tetraditryma sp. cf. *T. corralitosensis* (PESSAGNO), WAKITA 1982, Pl. 5, Fig. 9–10.

Tetraditryma praeplana BAUMGARTNER n. sp.

Data 5, range 6, pob 125, rk –, Pl. 9, Fig. 8–9, 13–13a

Description. – General construction of test and central area very similar to *T. pseudoplana*. The four rays are of equal length, stand nearly at right angle and end in a ray tip which differs from *T. pseudoplana* in being not thickened, and having two slender, sharp, triradiate lateral spines standing at an angle of 60–70 degrees to the ray axis and several secondary lateral and small central spines. The cortical wall (arrow Pl. 9, Fig. 13a) is very delicate, porous, or may be totally absent.

Remarks. – *T. praeplana* is the immediate ancestor of *T. pseudoplana* and cooccurs with the former in Zones A0–A1. *T. praeplana* differs from *T. pseudoplana* in lacking bulbous ray tips, in having finer lateral spines which stand at an angle of 60–70, instead of 90 degrees to ray axis and in having a delicate instead of a massive imperforate cortical wall.

Etymology. – Referring to the evolutionary relationship with *T. pseudoplana*.

<i>Measurements (in μ)</i>				
	Holotype	Average of 4 spec.	min.	max.
Length of rays				
AX:	246	243	198	277
BX:	246			
CX:	270			
DX:	252			
Width of rays:	54	44	36	54
Length of longest central spine:	42	27	12	42
Length of longest lateral spine:	69	62	69	54

Type locality. – Locality no. 40 of locality descriptions.

Tetraditryma pseudoplena BAUMGARTNER

Data 57, range 34, pob 123, rk 59, Pl. 9, Fig. 12, 14

Hagiastrum plenum (RÜST), PESSAGNO 1977a, p. 72, Pl. 2, Fig. 14.

Tetraditryma pseudoplena BAUMGARTNER 1980, p. 297, Pl. 1, Fig. 9, Pl. 7, Fig. 1–11. BAUMGARTNER et al. 1980, p. 63, Pl. 2, Fig. 1. KOCHER 1981, p. 98, Pl. 16, Fig. 32–33. SATO et al. 1982, Pl. 3, Fig. 7. ISHIDA 1983, Pl. 11, Fig. 7.

Genus *Tetratrabs* BAUMGARTNER

Tetratrabs BAUMGARTNER 1980, p. 294.

Type species: *Tetratrabs gratiosa* BAUMGARTNER 1980.

Tetratrabs bulbosa BAUMGARTNER

Data 62, range 74, pob 122, rk 60, Pl. 9, Fig. 11

Tetratrabs bulbosa BAUMGARTNER 1980, p. 295, Pl. 5, Fig. 1, Pl. 6, Fig. 1–3, 8. KOCHER 1981, p. 99, Pl. 16, Fig. 34.

Tetratrabs zealis (OZVOLDOVA)

Data 36, range 24, pob 121, rk 61, Pl. 9, Fig. 10

Crucella zealis OZVOLDOVA 1979, p. 34, Pl. 2, Fig. 1.

Tetratrabs gratiosa BAUMGARTNER 1980, p. 295, Pl. 1, Fig. 11, Pl. 5, Fig. 2–7, Pl. 6, Fig. 4–7, 9–14, Pl. 11, Fig. 7–9.

BAUMGARTNER et al. 1980, p. 63, Pl. 2, Fig. 6. SATO et al. 1982, Pl. 3, Fig. 8. ISHIDA 1983, Pl. 11, Fig. 9.

Tetratrabs zealis (OZVOLDOVA), KOCHER 1981, p. 99, Pl. 17, Fig. 1.

Genus *Thanarla* PESSAGNO

Thanarla PESSAGNO 1977b, p. 45.

Type species: *Phormocyrtis veneta* SQUINABOL 1903.

Thanarla pulchra (SQUINABOL)

Data 109, range 107, pob 296, rk –, Pl. 9, Fig. 15

Sethamphora pulchra SQUINABOL 1904, p. 213, Pl. 5, Fig. 8. MOORE 1973, p. 826, Pl. 3, Fig. 5, 6, not 4.

Dictyomitra pulchra (SQUINABOL), DUMITRICA 1975, p. 87, Fig. 2.

Lithocampe elegantissima CITA, FOREMAN 1975, p. 616, Pl. 2G, Fig. 3–4. MUZAVOR 1977, p. 100, Pl. 8, Fig. 1.

?NAKASEKO et al. 1979, Pl. 4, Fig. 2. AOKI 1982, Pl. 3, Fig. 11–12.

Thanarla pulchra (SQUINABOL), PESSAGNO 1977b, p. 46, Pl. 7, Fig. 7, 21, 26. SCHAAF 1981, p. 439, Pl. 4, Fig. 10. ? Pl. 19, Fig. 7a–b. Nakaseko & Nishimura 1981, p. 163, Pl. 15, Fig. 11 (not Pl. 7, Fig. 4–5, 7–8, Pl. 15, Fig. 12.). Taketani 1982, p. 59, Pl. 11, Fig. 19.

?*Thanarla pacifica* NAKASEKO & NISHIMURA 1981, p. 163, Pl. 7, Fig. 3a–b, 6 (same specimen as NAKASEKO et al. 1979, Pl. 4, Fig. 2), 9.

Thanarla elegantissima (CITA), MATSUYAMA et al. 1982, Pl. 2, Fig. 2.

Thanarla sp. cf. *T. pulchra* (SQUINABOL), OKAMURA & UTO 1982, Pl. 5, Fig. 6. YAO 1984, Pl. 4, Fig. 10.

Remarks. – Included are the forms with a broadly inflated, distally constricted, distal portion of the test. Transitional forms to *T. elegantissima*, with a more cylindrical distal portion have also been observed in the Neocomian but are here excluded.

Genus *Theocapsomma* HAECKEL, emend. FOREMAN

Theocapsomma HAECKEL 1887, p. 1428, emend. FOREMAN 1968, p. 29.

Type species: *Theocapsa linnaei* HAECKEL 1887.

Theocapsomma cordis KOCHER

Data 15, range 30, pob 227, rk 99, Pl. 8, Fig. 16–17

Theocapsomma cordis KOCHER 1981, p. 100, Pl. 17, Fig. 2–4.

Genus *Triactoma* RÜST

Triactoma RÜST 1885, p. 289.

Type species: *Triactoma tithonianum* RÜST 1885.

Triactoma blakei (PESSAGNO)

Data 25, range 46, pob 95, rk 64, Pl. 10, Fig. 3

Tripocyclia blakei PESSAGNO 1977a, p. 80, Pl. 6, Fig. 15–16. MIZUTANI 1981, p. 175, Pl. 57, Fig. 5–6.

Triactoma foremanae MUZAVOR 1977, p. 55, Pl. 1, Fig. 11.

Triactoma blakei (PESSAGNO), FOREMAN 1978, p. 743, Pl. 1, Fig. 15. KOCHER 1981, p. 101, Pl. 17, Fig. 5, not Fig. 6.

Tripocyclina blakei (PESSAGNO), ISHIDA 1983, Pl. 4, Fig. 15.

Triactoma cornuta BAUMGARTNER

Data 89, range 65, pob 166, rk 78, Pl. 10, Fig. 1

Gen. et sp. indet. OZVOLDOVA 1979, p. 260, Pl. 2, Fig. 3.

Triactoma cornuta BAUMGARTNER, BAUMGARTNER et al. 1980, p. 63, Pl. 2, Fig. 2–3. KOCHER 1981, p. 101, Pl. 17, Fig. 7. DE WEVER & CABY 1981, Pl. 2, Fig. 2F. ISHIDA 1983, Pl. 4, Fig. 12–13.

Triactoma echiodes FOREMAN

Data 81, range 89, pob 94, rk 19, Pl. 10, Fig. 2

Triactoma echiodes FOREMAN 1973, p. 260, Pl. 3, Fig. 1. P. 16, Fig. 21. FOREMAN 1975, p. 609, Pl. 2F, Fig. 9–10. Pl. 3, Fig. 10. BAUMGARTNER et al. 1980, p. 64, Pl. 2, Fig. 10. KOCHER 1981, p. 101, Pl. 17, Fig. 8–9. KANIE et al. 1981, Pl. 1, Fig. 7.

Triactoma jonesi (PESSAGNO)

Data 29, range 25, pob 96, rk 33, Pl. 10, Fig. 4

Tripocyclia jonesi PESSAGNO 1977a, p. 80, Pl. 7, Fig. 1–5.*Tripocyclia trigonum* RÜST, PESSAGNO 1977a, p. 80, Pl. 7, Fig. 6–7. SASHIDA et al. 1982, Pl. 1, Fig. 5.*Triactoma jonesi* (PESSAGNO); ?FOREMAN 1978, p. 743, Pl. 1, Fig. 13–14. KOCHER 1981, p. 102, Pl. 17, Fig. 10.*Triactoma* sp. WAKITA & OKAMURA 1982, Pl. 5, Fig. 11.*Tripocyclia trigonum* RÜST, ISHIDA 1983, Pl. 4, Fig. 14.

Remarks. – In the studied material there are plenty of transitional forms between *T. jonesi* and *T. trigonum*. *T. tithonianum* is separated on the basis of slenderer, longer and more pointed spines (see also remarks in KOCHER 1981).

Triactoma tithonianum RÜST

Data 30, range 52, pob 97, rk 40, Pl. 10, Fig. 5

Triactoma tithonianum RÜST 1885, p. 289, Pl. 28, Fig. 5. FOREMAN 1973, p. 260, Pl. 2, Fig. 1. KOCHER 1981, p. 102, Pl. 17, Fig. 12.Genus *Tricolocapsa* HAECKEL*Tricolocapsa* HAECKEL 1881, p. 436.*Type species: Tricolocapsa theophrasti* HAECKEL 1887.*Tricolocapsa plicarum* YAO

Data 9, range 8, pob 51, rk –, Pl. 10, Fig. 6–7

Tricolocapsa plicarum YAO 1979, p. 32, Pl. 4, Fig. 1–11. YAO et al. 1982, Pl. 3, Fig. 12. SASHIDA et al. 1982, Pl. 2, Fig. 1, not: Pl. 1, Fig. 2. OWADA & SAKA 1982, Pl. 2, Fig. 15. KOJIMA 1982, Pl. 2, Fig. 1. WAKITA 1982, Pl. 3, Fig. 3. KIDO et al. 1982, Pl. 5, Fig. 1. IMOTO et al. 1982, Pl. 2, Fig. 1–2. NISHIZONO et al. 1982, Pl. 2, Fig. 16. WAKITA & OKAMURA 1982, Pl. 7, Fig. 9. ?ISHIDA 1983, Pl. 8, Fig. 9. MATSUOKA 1983, p. 20, Pl. 3, Fig. 1–2. KASHIMA 1983, Pl. 9, Fig. 1. Saka 1983, Pl. 6, Fig. 2–4. YAO 1984, Pl. 1, Fig. 11–12.

Remarks. – There are at least two morphotypes included: One is broadly spindle-shaped and has open plicae, about 17–20 per half circumference. The other is more slenderly spindle-shaped and has narrow plicae, more than 20 per half circumference. Forms with horizontal bars connecting plicae between each pore (e.g. SASHIDA et al. 1982, Pl. 1, Fig. 2) are excluded.

Genus *Trillus* PESSAGNO & BLOME*Trillus* PESSAGNO & BLOME 1980, p. 248.*Type species: Trillus seidersi* PESSAGNO & BLOME 1980.*Trillus* sp. cf. *T. seidersi* PESSAGNO & BLOME

Data 1, range 1, pob 39, rk –, Pl. 10, Fig. 8

Trillus seidersi PESSAGNO & BLOME 1980, p. 249, Pl. 9, Fig. 2–4, 9, 19.*Trillus* sp. A, PESSAGNO & BLOME 1980, p. 248, Pl. 11, Fig. 1. YAO et al. 1982, Pl. 3, Fig. 25. MIZUTANI & KOIKE 1982, Pl. 1, Fig. 5.

Trillus sp. C, HATTORI & YOSHIMURA 1982, Pl. 2, Fig. 3.

Trillus sp. WAKITA 1982, Pl. 7, Fig. 8–9. YAO 1984, Pl. 1, Fig. 22–23.

Remarks. – Under this name are included several morphotypes which may all cooccur in samples not younger than Zone A0. They share stout, coarse pore frames and a pronounced equatorial girdle.

Equally cooccurring in Zone A0 only are one or several morphotypes of *Zartus* PESSAGNO & BLOME 1980.

Genus *Tritrabs* BAUMGARTNER

Tritrabs BAUMGARTNER 1980, p. 293.

Type species: *Paronaella* (?) *casmaliaensis* PESSAGNO 1977a.

Tritrabs casmaliaensis (PESSAGNO)

Data 26, range 45, pob 117, rk 81, Pl. 10, Fig. 9

Paronaella (?) *casmaliaensis* PESSAGNO 1977a, p. 69, Pl. 1, Fig. 6–8.

Tritrabs casmaliaensis (PESSAGNO) BAUMGARTNER 1980, p. 293, Pl. 1, Fig. 10, Pl. 4, Fig. 11, Pl. 11, Fig. 10. KOCHER 1981, p. 105, Pl. 17, Fig. 18. ISHIDA 1983, Pl. 10, Fig. 6.

Tritrabs sp. A, ISHIDA 1983, Pl. 10, Fig. 8.

Tritrabs sp. cf. *T. casmaliaensis* (PESSAGNO) NISHIZONO & MURATA 1983, Pl. 3, Fig. 11.

Tritrabs ewingi (PESSAGNO)

Data 54, range 70, pob 113, rk 34, Pl. 10, Fig. 10

Paronaella (?) *ewingi* PESSAGNO 1971, p. 47, Pl. 19, Fig. 2–5. PESSAGNO 1977a, p. 70, Pl. 1, Fig. 14–15.

Tritrabs ewingi (PESSAGNO), BAUMGARTNER 1980, p. 293, Pl. 4, Fig. 5, 7, 17, 18. Not: KOCHER 1981, Pl. 17, Fig. 19.

Tritrabs exotica (PESSAGNO)

Data 27, range 37, pob 118, rk 35, Pl. 10, Fig. 11.

Paronaella (?) *exotica* PESSAGNO 1977a, p. 70, Pl. 1, Fig. 12–13.

Tritrabs exotica (PESSAGNO), BAUMGARTNER 1980, p. 294, Pl. 4, Fig. 16. ?KOCHER 1981, Pl. 17, Fig. 20.

Tritrabs hayi (PESSAGNO)

Data 28, range 20, pob 116, rk 101, Pl. 10, Fig. 12

Paronaella (?) *hayi* PESSAGNO 1977a, p. 70, Pl. 1, Fig. 16, Pl. 2, Fig. 1.

Tritrabs hayi (PESSAGNO), BAUMGARTNER 1980, p. 294, Pl. 4, Fig. 10, 21–22. KOCHER 1981, p. 106, Pl. 17, Fig. 21. ISHIDA 1983, Pl. 10, Fig. 7.

Tritrabs rhododactylus BAUMGARTNER

Data 27, range 26, pob 118, rk 35, Pl. 10, Fig. 13

Tritrabs rhododactylus BAUMGARTNER 1980, p. 294, Pl. 4, Fig. 12–15, Pl. 11, Fig. 15. ?ISHIDA 1983, Pl. 10, Fig. 10.

Tritrabs rhododactyla BAUMGARTNER, KOCHER 1981, p. 106, Pl. 17, Fig. 22.

Tritrabs sp. cf. *T. casmaliaensis* (PESSAGNO), SATO et al. 1982, Pl. 3, Fig. 5.

Genus *Unuma* ICHIKAWA & YAO

Unuma ICHIKAWA & YAO 1976, p. 111.

Type species: *Unuma typicus* ICHIKAWA & YAO 1976.

Unuma echinatus ICHIKAWA & YAO

Data 2, range 4, pob 231, rk –, Pl. 10, Fig. 14–15

Unuma echinatus ICHIKAWA & YAO 1976, p. 112, Pl. 1, Fig. 5–6, Pl. 2, Fig. 5–7. YAO et al. 1982, Pl. 3, Fig. 5. MIZUTANI & KOIKE 1982, Pl. 2, Fig. 6. WAKITA 1982, pl. 3, Fig. 11–12. MATSUOKA 1982, Pl. 1, Fig. 21. NISHIZONO et al. 1982, Pl. 2, Fig. 19 (not Fig. 20 as indicated in plate caption).

Unuma sp. cf. *U. echinatus* ICHIKAWA & YAO, KIDO et al. 1982, Pl. 3, Fig. 10.

Genus *Xitus* PESSAGNO

Xitus PESSAGNO 1976b, p. 55.

Type species: *Xitus plenus* PESSAGNO 1977b.

Xitus sp. cf. *X. spicularius* (ALIEV)

Data 106, range 98, pob 295, rk –, Pl. 10, Fig. 16–17

?*Dictyomitra spicularia* ALIEV, 1965, Pl. 6, Fig. 9.

Dictyomitra sp. cf. *D. spicularia* ALIEV, FOREMAN 1973, p. 264, Pl. 9, Fig. 8–9. NAKASEKO et al. 1979, Pl. 3, Fig. 5. not: *Xitus spicularius* (ALIEV), PESSAGNO 1977a, p. 56, Pl. 9, Fig. 7, Pl. 10, Fig. 5.

Novixitus normalis WU HAO-RUO & LI HONG-SHENG 1982, Pl. 2, Fig. 5.

Xitus transversus WU HAO-RUO & LI HONG-SHENG 1982, Pl. 2, Fig. 7, not Fig. 8.

Novixitus sp. KANIE et al. 1981, Pl. 1, Fig. 17.

Xitus sp. OKAMURA & UTO 1982, Pl. 5, Fig. 4–5.

Xitus spicularius YAO 1984, Pl. 4, Fig. 17.

Remarks. – The studied form is broader than ALIEV's illustrations and tends to have a constricted last and second last segment.

6. Locality descriptions: topographic, litho- and biostratigraphic data of studied radiolarian localities

6.1 Introduction

In this chapter the data pertaining to the studied radiolarian localities are presented. The localities include primarily own collections and examination of material collected by the workers cited below. A very minor part of the data is taken from the literature. In order to have an idea of the areal extent of the study a geographic/paleogeographic overview is given below grouping the localities in terms of paleogeographic or Alpine tectonic units from west to east, starting in the Atlantic. This overview is followed by a listing of the localities in the same numerical order as they appear in the database (see appendix).