Geologia Croatica	54/1	1 - 13	2 Figs.	1 Tab.	3 Pls.	ZAGREB 2001

Benthic Foraminifera of the Upper Jurassic Platform Carbonate Sequence in the Aydıncık (İçel) Area, Central Taurides, S Turkey

Kemal **TASLI**

Key words: Benthic foraminifera, Carbonate platform, Upper Jurassic, Central Taurides, Turkey.

Abstract

The Upper Jurassic sequence of the Aydıncık (İçel) area consists of platform limestones which were deposited in a subtidal, restricted lagoon environment. Stratigraphic distribution of benthic foraminifera and calcareous algae, examined in thin-sections, is shown in a range-chart. The microfossil assemblage indicates the *Salpingoporella sellii* subzone of the *Kurnubia palastiniensis* cenozone, corresponding approximately to the lower part of the Malm. Some benthic foraminifera with considerable stratigraphic value within the Mesozoic Tethys are described. Among the benthic foraminifera, taxa of the family Pfenderinidae, especially the subfamily Kurnubiinae, are dominant and frequent throughout the sequence. The planispirally coiled taxa are represented by the families Nautiloculinidae, Charentiidae and Cyclamminidae (subfamily Bucciccrenatinae).

1. INTRODUCTION

In the Aydıncık area an autochtonous sequence of platform carbonate rocks was deposited, ranging in age from the Liassic to the Aptian. The sequence conformably overlies Upper Triassic basal conglomerates, interbedded with mudstones and sandstones (DEMİRTAŞLI, 1984), and is unconformably overlain by Upper Campanian fore-reef carbonate breccia and limestone (TASLI & EREN, 1999).

The biostratigraphy of Jurassic-Cretaceous carbonate sequences of the Central Taurides has been studied by the author since 1997. The present work on the Aydıncık profile forms part of the ongoing studies, such as TASLI (2000). The Late Jurassic section is particularly rich in benthic foraminifera belonging to the families Pfenderinidae (Kurnubiinae) and Valvulinidae. This association corresponds to that of coeval facies of the Mediterranean realm (HENSON, 1948b; SARTONI & CRESCENTI, 1962; HOTTINGER, 1967; GUŠIĆ, 1969; NIKLER & SOKAČ, 1968; VELIĆ, 1977; SEPTFONTAINE, 1980) and is linked with shallow-water, protected lagoon carbonates. Jurassic benthic foraminifera from the Taurus Mountains were reported from north of Isparta (GUTNIC & MOULLADE, 1967), north and northwest of Antalya (BASSOULLET & POISSON, 1975), east of Kayseri (ALTINER & SEPTFONTAINE, 1979) and Munzur Dağ (BASSOULLET & BERGOUGNAN, 1981).

The aim of this paper is to describe some important species of benthic foraminifera. For the present study, approximately eighty random thin-sections from twenty-five fossiliferous samples within the measured stratigraphic section were studied. Micropalaeontological determinations are based on the study of these random thin-sections and a large number of successive acetate peels and polished samples.

2. LOCATION AND FIELD DESCRIPTION OF THE AYDINCIK PROFILE

The Aydıncık Upper Jurassic profile is located about 2 km along the road to Karaseki village west of Aydıncık (İçel) town (Fig. 1). It continuously overlies an alternation of dolomite and limestone of late Dogger age (TASLI, 2000) and is about 50 m thick. Its upper limit is marked by the reappearance of entirely dolomitic beds representing the transition between the Jurassic and the Cretaceous, which is easily recognizable in the field because of its morphological difference.

The analyzed section consists of light brown, predominantly thick-bedded limestones. *Cladocoropsis mirabilis* FELIX, although occuring sporadically in the underlying beds (i.e. in the Upper Dogger), is so frequent and abundant that it seems to be lithologically dependent.

3. BIOSTRATIGRAPHY

Stratigraphic distribution of the benthic foraminifera and calcareous algae is shown in Fig. 2. The analyzed

Mersin Üniversitesi Jeoloji Mühendisliği Bölümü, TR-33342 İçel, Türkiye.
e-mail: ktasli@mersin.edu.tr

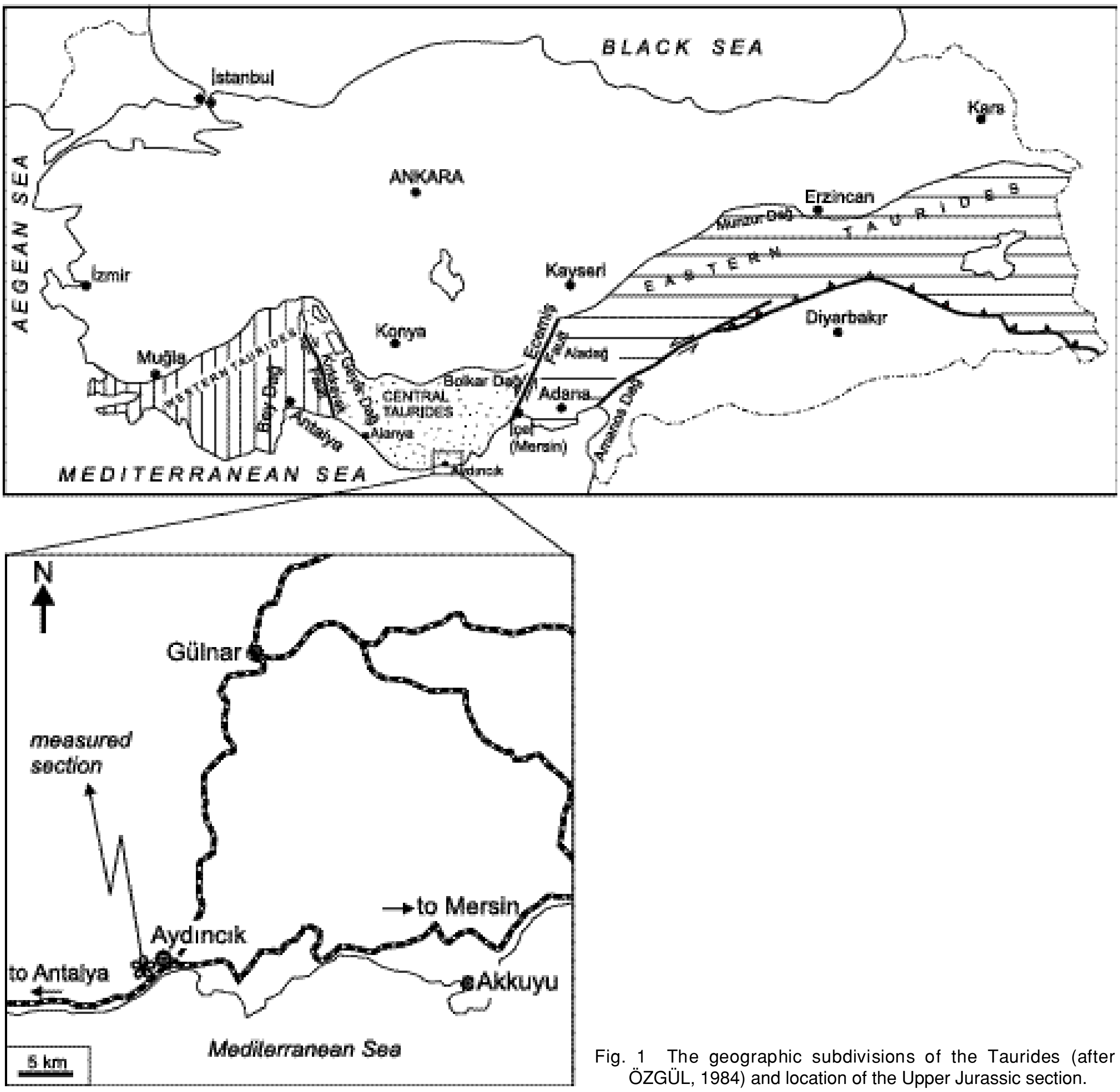


Fig. 1 The geographic subdivisions of the Taurides (after ÖZGÜL, 1984) and location of the Upper Jurassic section.

limestones continuously overlie limestones and dolomites corresponding the underlying biostratigraphic unit, *Paleopfenderina salernitana* cenozone of SARTONI & CRESCENTI (1962) (TASLI, 2000). *Kurnubia palastiniensis* HENSON, an index species of the cenozone established by SARTONI & CRESCENTI (1962) in the Apennines, is frequent and locally abundant throughout the sequence. This species is known to occur through the whole Malm of the Mediterranean realm (e.g. VELIĆ, 1977; SEPTFONTAINE, 1980). The presence of *Salpingoporella sellii* (CRESCENTI) (Pl. III, Fig. 10), a dasycladacean alga used as an index species in the Apennines (SARTONI & CRESCENTI (1962) and Dinarides (NIKLER & SOKAČ, 1968; GUŠIĆ et al., 1971; VELIĆ, 1977), indicates the *S. sellii* subzone which corresponds approximately to the lower part of the Malm.

4. MICROFACIES DEVELOPMENT AND PALAEOENVIRONMENTAL SETTING

The limestones consist mainly of fossiliferous wackestones and biopeloidal grainstones, with oncoids. Intraclastic grainstones with *Favreina* sp. only occur in the uppermost part of the sequence. The presence of abundant, well preserved *Cladocoropsis mirabilis* FELIX, centimetre-sized oncoids and benthic foraminifera are characteristic for these limestones. Benthic foraminifera are most abundant regarding both the number of species and individuals, whereas calcareous algae are subordinate. Dasycladacean algae are represented by *Salpingoporella annulata* CAROZZI (Pl. III, Fig. 11), which is locally common, and rarely by *Salpingoporella sellii* (CRESCENTI). *Thaumatoporella parvovesiculifera* (RAINERI) (Pl. III, Fig. 12) is frequent, but not abun-

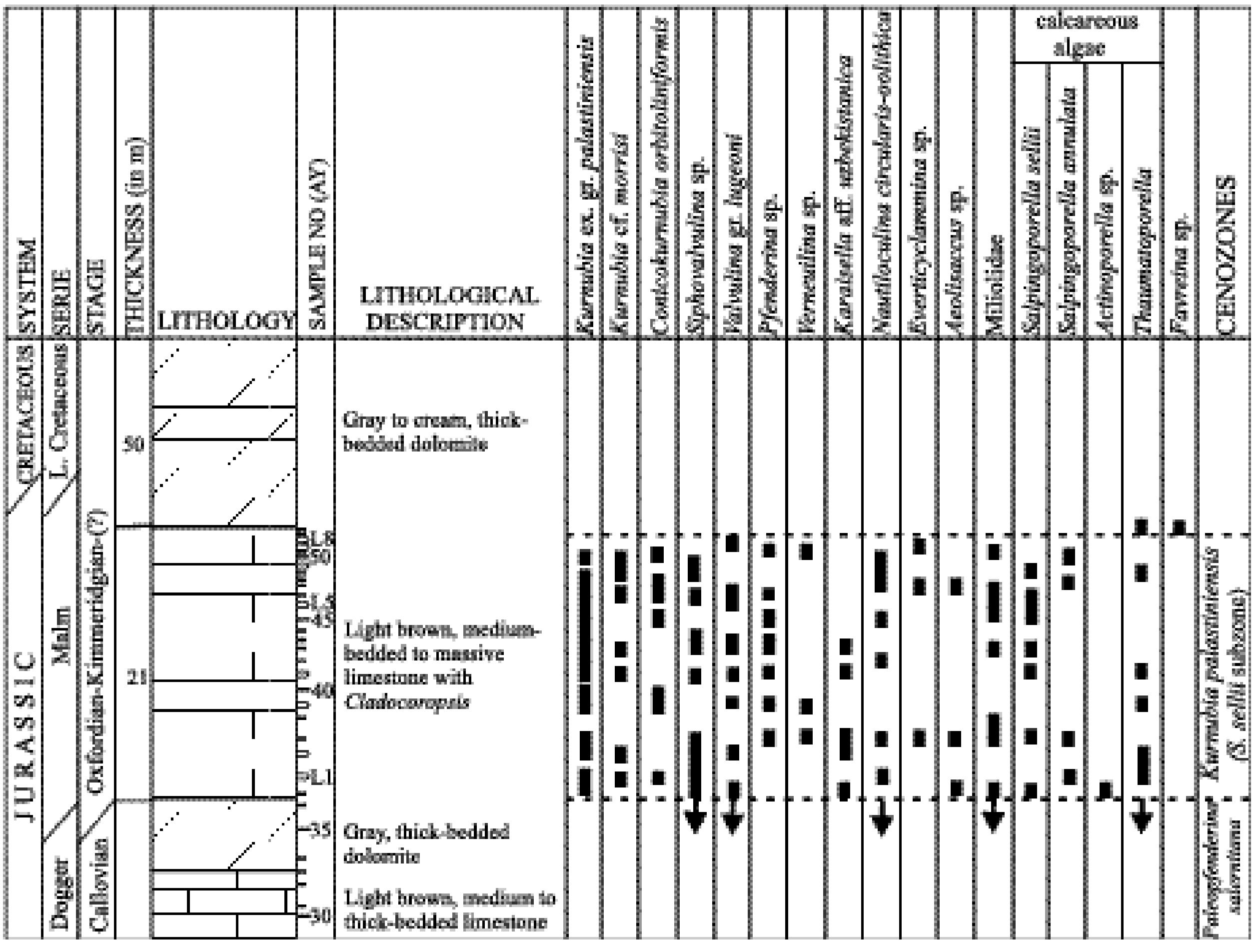


Fig. 2 Stratigraphic column of the Aydıncık Upper Jurassic section and distribution of benthic foraminifera and other microorganisms.

dant. Bioclastic fraction is mainly composed of fragments of *Cladocoropsis*, pelecypods and subordinately brachiopods (punctate), ostracods and echinoids. Calcareous sponge spicules are locally abundant. Siliciclastic material is totally absent.

Predominantly dense micrites and abundant oncoids indicate low energy in a sheltered environment and shallow-water conditions. Intraclastic grainstones with *Favreina* sp. in the uppermost part of the sequence indicate high energy conditions, resulting in the development of a regressive facies.

5. SYSTEMATIC DESCRIPTIONS

Family Nautiloculinidae LOEBLICH & TAPPAN, 1985

Genus *Nautiloculina* MOHLER, 1938; emend. BRÖNNIMANN, 1967

Type-species: *Nautiloculina oolithica* MOHLER, 1938

***Nautiloculina circularis* (SAID & BARAKAT), 1959 (Pl. I, Fig. 1)**

1966 *Nautiloculina circularis* (SAID & BARAKAT).- DERIN & REISS, Photo Nos. 70, 71, 83, 254, 263, 264, 271, 280, 283, 286-289, 309.

1968 *Nautiloculina circularis* (SAID & BARAKAT).- BRÖNNIMANN, p. 64, fig. 3, pl. 1, figs. 1-8, pl. 2, figs. 1-6.

1977 *Nautiloculina oolithica* MOHLER.- VELIĆ, pl. VIII, figs. 7, 8.

1985 *Nautiloculina circularis* (SAID & BARAKAT).- FOURCADE, ARAFA & SIGAL, pl. 3, fig. 4.

Material : Twelve random thin-sections with approximately eighty specimens.

Description and remarks : This form with lenticular-shaped, involute-planispirally coiled test shows the umbilical fillings and axial depressions. BRÖNNIMANN (1968) distinguishes *N. circularis* from *N. oolithica* MOHLER by the marked subacute periphery, axial depressions, and by the larger size and larger numbers of the whorls in the former. ARNAUD-VANNEAU & PEYBERNÈS (1978) give a comparison table of the principal characters of the four species of *Nautiloculina* (including the two Cretaceous species). In our material there are specimens which are assignable to the species *N. circularis* and *N. oolithica* (Pl. 1, Fig. 2), with the dominance of the former.

Dimensions: The measurements are from axial sections only (12 specimens). Equatorial and axial diameters vary between 0.55-0.80 mm, and 0.30-0.48 mm, respectively. The ratio of equatorial/axial diameter oscillates around 1.8:1. The inner diameter of proloculus ranges from 0.03 mm to 0.05 mm.

Family Charentiidae LOEBLICH & TAPPAN, 1985

Genus *Karaisella* KURBATOV, 1971

Type-species: *Karaisella uzbekistanica* KURBATOV, 1971

***Karaisella* aff. *uzbekistanica* KURBATOV, 1971 (Pl. I, Figs. 3-13)**

?1958 *Haplophragmium* aff. *suprajurassicum* SCHWAGER.- DUFAURE, pl. 1, figs. 21-22.

?1968 *Haplophragmium* cf. *suprajurassicum* SCHWAGER.- NIKLER & SOKAČ, pl. IX, fig. 7.

Material : Fifteen random thin-sections and ten succesive acetate peels with approximately ninety specimens.

Description : Test is free, lenticular shaped, thickened towards the poles, with small axial depressions. Peripheral margin is rounded to subrounded. Septal sutures, observed in equatorial sections (Pl. I, Figs. 6, 7), are slightly depressed. Coiling is planispiral, occasionally streptospiral, and involute, with a tendency to become uncoiled in the later stage (Pl. I, Fig. 12). There are two or at maximum three and a half whorls. The number of chambers in the last whorl is nine to twelve. Chamber interiors are simple. Septa are curved and inclined in the direction of coiling, in continuity with the outer wall. The base of the septum against the previous whorl is thickened and chomata-like (Pl. I, Figs. 8-10). Septal spacing (= height of chamber) and height of the whorls slightly increase during the ontogeny. Megalosphere is simple, spherical or slightly ovoid. Aperture is simple and central (Pl. I, Figs. 6, 7). Wall is calcareous microgranular (= finely agglutinated) with a keriothecal structure, occasionally visible only in the last whorl of large specimens (Pl. 1, Fig. 11).

Dimensions: Dimensions (in mm) are shown in Table 1.

Remarks : Because of its streptospiral coiling, single areal aperture, and the presence of chomata-like thickening at the base of the septa (Pl. I, Fig. 5), this form is herein assigned to the genus *Karaisella* KURBATOV, 1971 (in LOEBLICH & TAPPAN, 1988). *Karaisella* aff. *uzbekistanica* is a close homeomorph of the Cretaceous genus *Charentia* NEUMANN, 1965, except its streptospiral coiling. The genus *Karaisella* was placed in the family Charentidae by LOEBLICH & TAPPAN (1988) although they note that it did not show a canaliculate wall structure (keriothecal structure of HOTTINGER, 1967). Specimens in the Aydıncık material do not show a sharp change in the plane of coiling from early to later whorls and subacute periphery as in the type species.

This form is similar to the genera *Bulbobaculites* MAYNC, 1952 and *Haplophragmium* REUSS, 1860 in areal aperture and the streptospiral nature of coiling. However, the wall is distinctly agglutinated and simple in the former genus, and alveolar in the latter. More-

Sample No. (AY)	Specimens	Greater equatorial diameter	Axial diameter	Inner diameter of proloculus
38-1	1 (Pl.1, Fig. 4)	0.85	0.45	0.05-0.06
38-1	2	0.63	0.30	not observed
38-1	3	0.55	-	0.04
38-3	4	0.70	-	0.06
38-3	5	0.65	-	not observed
38-3	6 (Pl.1, Fig. 10)	0.80	-	not observed
38-3	7	0.85	-	0.12
38-4	8	0.72	-	not observed
38-5	9	0.70	-	0.05
38-6	10 (Pl.1, Fig. 6)	0.48	0.30	0.06
38-6	11 (Pl.1, Fig. 11)	0.90	-	not observed
38-6	12 (Pl.1, Fig. 9)	0.65	-	0.06
38-6	13	0.66	-	0.11
38-8	14 (Pl.1, Fig.6)	0.70	-	0.10
38-8	15	0.75	0.40	0.05
38-10	16	0.47	-	0.06
38-10	17	0.70	-	0.13-0.15
38-13	18 (Pl. I, Fig.7)	0.46	-	0.06
38-14	19	0.50	-	0.07

Table 1 Dimensions of *Karaisella* aff. *uzbekistanica* (in mm).

over, both genera have a marked rectilinear uniserial stage which is only occasionally developed in our specimens. *Karaisella* aff. *uzbekistanica* differs from another Upper Jurassic species, *Mesoendothyra izjumiana* DAIN, 1958 (with its wall consisting of large pores, DAIN in BYKOVA et al., 1958), by the central position of the aperture, the presence of chomata-like thickenings in the base of the septum and by a lacking of distinct streptospiral coiling.

Karaisella aff. *uzbekistanica* closely resembles the genus *Bosniella* GUŠIĆ, 1977 by its keriothecal wall structure and growth pattern, but differs from it in the absence of a peneropline stage with cribrate aperture and in having only a central aperture. In the latter, the aperture is at first basal, then central and finally cribrate as in "*Mesoendothyra*" *croatica* GUŠIĆ (GUŠIĆ, 1969; FURRER & SEPTFONTAINE, 1977). The genus *Bosniella* is represented by two species: *B. oenensis* from the Lower Jurassic of NW Bosnia (GUŠIĆ, 1977) and *B. fontainei* from the Middle Jurassic of Thaïland (BASSOULLET, 1994). It is considered as a junior synonym of *Mesoendothyra* DAIN (SEPTFONTAINE, 1988). Alternatively, BASSOULLET (1994) removed "*Mesoendothyra*" *croatica* GUŠIĆ from the genus *Mesoendothyra* DAIN, because of its keriothecal wall structure, and assigned it to the genus *Bosniella* GUŠIĆ, 1977.

Occurence : It is abundant in biopeloidal grainstones with oncoids, in association with *Nautiloculina circularis* and *Kurnubia* ex. gr. *palastiniensis*, whereas it is missing or rare in fossiliferous wackestones.

Family Pfenderinidae SMOUT & SUGDEN, 1962
Subfamily Kurnubiinae REDMOND, 1964
Genus *Kurnubia* HENSON, 1948
Type species: *Kurnubia palastiniensis* HENSON, 1948

After SMOUT & SUGDEN (1962), who assigned HENSON's (1948b) species *Valvulinella jurassica* and *V. wellingsi* to the genus *Kurnubia* HENSON and after SARTONI & CRESCENTI (1962), who considered the species *K. jurassica* synonymous with *Kurnubia palastiniensis*, REDMOND (1964) described, from isolated specimens only, three new species of *Kurnubia*: *K. variabilis*, *K. bramkampi* and *K. morrisi*. MAYNC (1965) included all these species in *Kurnubia* gr. *palastiniensis* HENSON, except *K. morrisi*, considering the existence of intermediate forms. GUŠIĆ (1969) adopted MAYNC's (1965) opinion and considered the three infrasubspecific taxa as "forms" *jurassica*, *palastiniensis* and *wellingsi.* HOTTINGER (1967) redescribed *K. palastiniensis* in detail, including *K. jurassica*, and retained the three REDMOND's (1964) species of *Kurnubia*. Later, this common Late Jurassic genus has been recorded mostly under the name *Kurnubia palastiniensis* HENSON in many studies (e.g. BASSOULLET & POISSON, 1975; AZÉMA et al., 1977; VELIĆ, 1977; FOURCADE et al., 1985; LUPERTO-SINNI & MASSE, 1994). In general, REDMOND's (1964) species seem not to be accepted, probably owing to difficulties in comparing with isolated specimens.

The aim of the following descriptions is to contribute more data to the existing knowledge on the subfamily Kurnubiinae, avoiding the creation of new taxa.

Kurnubia ex. gr. *palastiniensis* HENSON, 1948b
(Pl. II, Figs. 1-7)

Description : See description in HOTTINGER (1967).

Remarks : Our specimens display wide morphologic variations and considerable differences in size. They vary from those smaller in size, only trochospirally, having a weakly developed central column and possessing a hypodermic network (SEPTFONTAINE, 1988) with first order partitions (Pl. II, Figs. 1, 2, 5), to those having a larger test with a marked central column, a more or less developed uniserial stage, and possessing a complete hypodermic network (Pl. II, Figs. 4, 6). The former have a simple, ovoid proloculus, measuring about 0.04 mm (inner diameter) and representing the megalospheric generation. They are included in this group due to the presence of the transitional forms. In the latter forms, the proloculus is not visible. The central column seems to be weakly developed in highly conical specimens (Pl. II, Fig. 6), whereas it is well developed in specimens having a relatively larger basal diameter (Pl. II, Figs. 3, 4).

Kurnubia cf. *morrisi* REDMOND, 1964
(Pl. II, Figs. 8-12, 14)

?1964 *Kurnubia morrisi* new species.- REDMOND, p. 253, pl. 1, fig. 4.

1967 *Kurnubia* cf. *morrisi* REDMOND.- HOTTINGER, p. 93, pl. 19, figs. 35-37.

Description : Test is fusiform, trochospirally coiled throughout the ontogeny. Early chambers are not visible. Spiral sutures are depressed, at about 30°to the axis of coiling. Septal sutures are obscure. The wall is calcareous, microgranular without agglutinated grains, possessing a complete hypodermic network. The primary aperture is set in the inner margin of the peripheral zone where the septa do not meet the central column (Pl. 2, Fig. 11). It probably represents "intercameral foramina" (SMOUT & SUGDEN, 1962). Prolongations of the adjacent first order vertical partitions projecting inward from the epidermis adjoin to each other and coalesce with the interseptal pillars (Pl. II, Fig. 10). The second order vertical partitions are restricted only to the marginal zone of the chambers. The central zone has a trochoidally laminated appearance (Pl. 2, Fig. 14) which recalls the apertural plates intergrown with pillars in the Pfenderinidae. The base of the test is strongly convex in the centre and very obliquely set to the axis of coiling.

Dimensions: Axial length varies from 2.1-2.5 mm, measured in nearly axial sections. Basal diameter is ≥ 0.8 mm and exceeds up to 1.0 mm. The ratio of length/diameter oscillates around 2.5:1. The width of the peripheral zone surrounding the central zone is nearly constant throughout the adult stage, measuring 0.20-0.22 mm. The central column increases progressively in diameter, up to 0.5 mm.

Remarks : *K.* cf. *morrisi* has a larger test and central column, and a wider peripheral zone than all other described species of *Kurnubia* and a complete hypodermic network consisting of two generations of partitions in the adult stage. Furthermore, specimens of *Kurnubia* ex. gr. *palastiniensis* do not exceed 0.7 mm in basal diameter. Purely because of the trochospiral coiling, this form is not considered as *K. wellingsi* (HENSON). Six to eight tiers of chamberlets per chamber, mentioned by REDMOND (1964, p. 253), are not accountable in random thin sections.

Genus *Conicokurnubia* SEPTFONTAINE, 1988

Type species *Conicokurnubia orbitoliniformis* SEPTFONTAINE, 1988

***Conicokurnubia orbitoliniformis* SEPTFONTAINE, 1988**
(Pl. II, Figs. 13, 15, 16)

Description : Test is sharply conical (Pl. II, fig. 13), where chambers do not increase in diameter as added, and broadly conical where chambers increase slowly in diameter. The base is slightly to strongly convex in the centre, with a narrow imperforate rim. The cone side is straight. Proloculus is not visible. The trochospiral arrangement of the early chambers is suggested by traces of the spiral suture. Later and remaining larger portion of the test consists of a co-axial series of ten to seventeen very low chambers which increase slightly in height as added. Septal sutures are distinct and depressed. Each chamber has a peripheral zone with a complete hypodermic network. Each septum is inwardly thickened and then adjoins with the adjacent septum, forming buttress-like interseptal pillars (Pl. II, Fig. 15). The first order vertical partitions form a "reticulate zone" (HENSON, 1948a) in the centre of the test as seen in transverse sections (Pl. II, Fig. 16). Apertural pores are not observable. The primary aperture consists of an opening near the margin of the central zone (Pl. II, Fig. 15).

Dimensions: The broadly conical specimens have a basal diameter of 1.25-1.50 mm and a height of 1.75-1.85 mm, measured in nearly axial sections. The sharply conical specimens have a basal diameter of 0.50-0.70 mm and a height of 1.25-2.0 mm, measured in nearly axial sections. The height of the last chamber, for both forms, is ≤ 0.1 mm. The width of the peripheral zone surrounding the central column is 0.10-0.12 mm.

Remarks : Specimens of this species from Aydıncık are closely comparable with SEPTFONTAINE's (1988) figures (pl. II, figs. 12, 13) from the Oxfordian (?) to Kimmeridgian of Western Taurus, Turkey. However, the available axial and transverse sections are insufficient for a complete description of the species.

Conicokurnubia orbitoliniformis occurs throughout the Aydıncık Upper Jurassic section, in association with *Kurnubia* ex gr. *palastiniensis*. In the random thin-sections, specimens with a marked uniserial stage of the latter might be confused with sharply conical specimens of *C. orbitoliniformis*. The width of the peripheral zone seems to be narrower than in *Kurnubia palastiniensis* and *Kurnubia* aff. *morrisi*.

6. BIOSTRATIGRAPHIC REVIEW AND CONCLUSIONS

The characteristics of the Upper Jurassic limestone section from the Aydıncık (İçel) area are the presence of *Cladocoropsis*, benthic foraminifera, calcareous algae and the dominance of mudstones which indicate a subtidal, protected lagoon environment.

Stratigraphic distribution of the benthic foraminifera and calcareous algae is shown in a range-chart. Microfossil assemblage corresponds to the *Salpingoporella sellii* subzone of *Kurnubia palastiniensis* cenozone, established by SARTONI & CRESCENTI (1962).

Ten species of benthic foraminifera are identified and figured. Those of considerable stratigraphic value within the Mesozoic Tethys are described.

7. REFERENCES

ALTINER, D. & SEPTFONTAINE, M. (1979): Micropaléontologie, stratigraphie et environnement de déposition d'une série jurassique a facies de plate-forme de la région de Pınarbaşı (Taurus oriental, Turquie).- Rev. Micropaléont., 22/1, 3-18.

ARNAUD-VANNEAU, A. & PEYBERNÈS, B. (1978): Les représentants Éocrétacés du genre *Nautiloculina* MOHLER, 1938 (Foraminifera, Fam. Lituolidae?) dans les chaines Subalpines septentrionales (Vercors) et les Pyrénées Franco-Espagnoles. Revision de *Nautiloculina cretacea* PEYBERNÈS, 1976 et description de *Nautiloculina bronnimanni* n. sp.- Geobios, 11/1, 67-81.

AZÉMA J., CHABRIER, G., FOURCADE, E. & JAFFREZO, M. (1977): Nouvelles données micropaléontologiques, stratigraphiques et paléogéographiques sur le Portlandien et le Néocomien de Sardaigne.- Rev. Micropaléont., 20/3, 125-139.

BASSOULLET, J.-P. & POISSON, A. (1975): Microfacies du Jurassique de la région d'Antalya (secteurs N et NW), Taurus Lycien (Turquie).- Rev. Micropaléont., 18/1, 3-14.

BASSOULLET, J.-P. (1994): *Bosniella fontainei* nov. sp. (Foraminifère, Biokovinidae) du Jurassique Moyen de Thaïlande.- Geobios, 27/4, 403-411.

BASSOULLET, J.-P. & BERGOUGNAN, H. (1981): Faune et facies typiques du domaine sud-tethysien: le Lias du Munzur Dağ (Anatolie orientale).- Bull. Soc. géol. France, 7/XXIII-1, 83-93.

BRÖNNIMANN, P. (1968): Re-examination of the morphology of *Nautiloculina circularis* (SAID & BARAKAT), 1959, from the Upper Jurassic of Egypt and Israel.- C.R. Séances, SPHN 2/1, 62-73.

BYKOVA, N.K., BALAKHMATOVA, Y.T., VASSILENKO, V.P., VOLOSHINOVA, N.A., GRIGELIS, A., DAIN, L.G., NANOVA, L.V., KUZINA, V.I., KUZNETSOVA, Z.V., KOZYREVA, V.F., MOROZOVA, V.G., MYATLYUK, E.V. & SUBBOTINA, N.N. (1958): New genera and species of foraminifers.- Vsenoyuznyi nefteni nauchnoissledovatelskii geologii zazved institut, Trudy, 115, Microfaune d'URSS, 9, 4-81 (in Russian).

DEMİRTAŞLI, E. (1984): Stratigraphy and tectonics of the area between Silifke and Anamur, Central Taurus Mountains.- In: TEKELİ, O. & GÖNCÜOĞLU, M.C. (eds.): Int. Symposium on the Geology of the Taurus Belt, 1983, Proceedings, MTA Spec. Pub., 101-118.

DERIN, B. & REISS, Z. (1966): Jurassic microfacies of Israel.- Spec. Publ. Inst. Petr., 1-43.

DUFAURE, Ph. (1958): Contribution à l'étude stratigraphique et micropaléontologique du Jurassique et du Néocomien de l'Aquitaine à la Provence.- Rev. Micropaléont., 1/2, 87-115.

FOURCADE, E., ARAFA, A.A. & SIGAL, J. (1985): Description d'une nouvelle espèce de foraminifère du Malm du Proche-Orient: *Mangashtia*? *egyptiensis* n.sp.- Rev. Micropaléont., 27, 21-29.

FURRER, V. & SEPTFONTAINE, M. (1977): Nouvelles données biostratigraphiques (à l'aide des foraminiferès) dans le Dogger à faciès briançonnais des Préalpes médianes romandes (Suisse).-Eclogae geol. Helv., 70/3, 717-737.

GUŠIĆ, I. (1969): Some new and inadequately known Jurassic foraminifers from central Croatia.- Geol. vjesn., 22, 55-88.

GUŠIĆ, I. (1977): A new foraminiferal family, Biokovinidae, from the Jurassic of the Dinarids and its phyllogenetic relationships.- Palaeontologia Jugoslavica, 18, 3-31, Zagreb.

GUŠIĆ, I., NIKLER, L. & SOKAČ, B. (1971): The Jurassic in the Dinaric Mountains of Croatia and the problems of its subdivision.- Ann. Inst. Geol. Pub. Hungarici, LIV (2), 165-183.

GUTNIC, M. & MOULLADE, M. (1967): New data on the Jurassic-Lower Cretaceous of Barla Mountain in south of Senirkent.- MTA Bull., 69, 58-78.

HENSON, F.R.S. (1948a): Larger imperforate foraminifera of South Western Asia.- Brit. Mus. Nat. Hist., 1-127.

HENSON, F.R.S. (1948b): New Trochamminidae and Verneuilinidae from the Middle East.- Ann. & Mag. Nat. Hist., (11) 14, 605-630.

HOTTINGER, L. (1967): Foraminifères imperforés du Mésozoique Marocain.- Notes Mem. Serv. geol. Maroc, 209, 1-168.

LOEBLICH, A.R.Jr. & TAPPAN, H. (1988): Foraminiferal genera and their classification.- Van Nostrand Reinhold Co., New York, 1127 p.

LUPERTO-SINNI, E. & MASSE, J.P. (1994): Precisazioni micropaleontologiche sulle formazioni di Piattaforma carbonatica del Giurassica Superiore e del Cretaceo basale del massiccio del Gargano (Italia Meridionale) e implicazioni stratigrafiche.- Palaeopelagos, 4, 243-266.

MAYNC, W. (1965): Some comments on D.C. Redmond's new lituolid Foraminifera from Saudi Arabia.- Rev. Micropaléont., 8/1, 37-40.

NIKLER, L. & SOKAČ, B. (1968): Biostratigraphy of the Jurassic of Velebit (Croatia).- Geol. vjesn., 21, 161-176.

ÖZGÜL, N. (1984): Stratigraphic and tectonic evolution of the Central Taurides.- In: TEKELİ, O. & GÖNCÜOĞLU, M. C. (eds.): Int. Symposium on the Geology of the Taurus Belt, 1983, Proceedings, MTA Spec. Pub., 77-90.

REDMOND, C.D. (1964): The foraminiferal family Pfenderinidae in the Jurassic of Saudi Arabia.- Micropaleontology, 10/2, 251-263.

SARTONI, S. & CRESCENTI, U. (1962): Ricerche biostratigrafiche nel Mesozoico dell'Appennino meridionale.- Giorn. Geol. (Ann. Museo Geol. Bologna), 2/29, 162-302.

SEPTFONTAINE, M. (1980): Les Foraminifères imperforés des milieux de plate-forme au Mésozoique: détermination pratique, interprétation phylogénétique et utilisation biostratigraphique.- Rev. Micropaléont., 23/3-4, 169-203.

SEPTFONTAINE, M. (1988): Vers une classification évolutive des lituolidés (Foraminifères) jurassiques en milieu de plate-forme carbonatée.- Rev. Paléobiol., Vol. spec. 2, Benthos '86, 229-256.

SMOUT, A.H. & SUGDEN, W. (1962): New information on the foraminiferal genus *Pfenderina*.- Paleontology, 4/4, 581-591.

TASLI, K. (2000): *Kilianina blanchetiformis* n. sp. and benthic foraminifers of the Dogger carbonate sequence in the Aydıncık (İçel) area, Central Taurides, S Turkey.- Revue de Paleobiol., 19/1, 165-177.

TASLI, K. & EREN, M. (1999): Stratigraphic and sedimentologic aproach to the Aptian-Campanian erosional unconformity in the Aydıncık (İçel) area, Central Taurides, S Turkey.- Geosound, 34, 1-17.

VELIĆ, I. (1977): Jurassic and Lower Cretaceous assemblage zones in Mt. Velika Kapela, Central Croatia.- Acta Geol., 9/2, 16-32, Zagreb.

Manuscript received August 24, 2000.

Revised manuscript accepted April 23, 2001.

PLATE I

scale bar: 0.2 mm

Fig. 1 *Nautiloculina circularis* (SAID & BARAKAT)
Axial section showing the acute periphery through the ontogeny, sample AY 38-9.

Fig. 2 *Nautiloculina oolithica* MOHLER
Axial section showing the rounded periphery, sample AY 38-9.

Figs. 3-13 *Karaisella* aff. *uzbekistanica* KURBATOV
3: axial section showing streptospiral coiling in the two early whorls, sample AY 38-8; 4: oblique axial section showing spherical proloculus, sample AY 38-1; 5: subaxial section, sample AY 38-4; 6: axial (megalospheric specimen) and oblique subequatorial sections, sample AY38-6; 7: equatorial section of a megalospheric specimen, sample AY 38-13; 8: equatorial section showing the chomata-like thickenings in the base of the septa, as the genus *Charentia* NEUMANN, sample AY 38-8; 9: equatorial section offset by a fracture, showing thinning of the septa towards the apertural area, sample AY 38-6; 10: oblique subequatorial section, sample AY 38-3; 11: oblique equatorial section of a probable microspheric specimen revealing the keriothecal wall structure in the last whorl (arrow), sample AY 38-6; 12: oblique section of a probable microspheric specimen revealing terminally uncoiled chambers, sample AY 38-14; 13: subaxial section, sample AY 38-5.

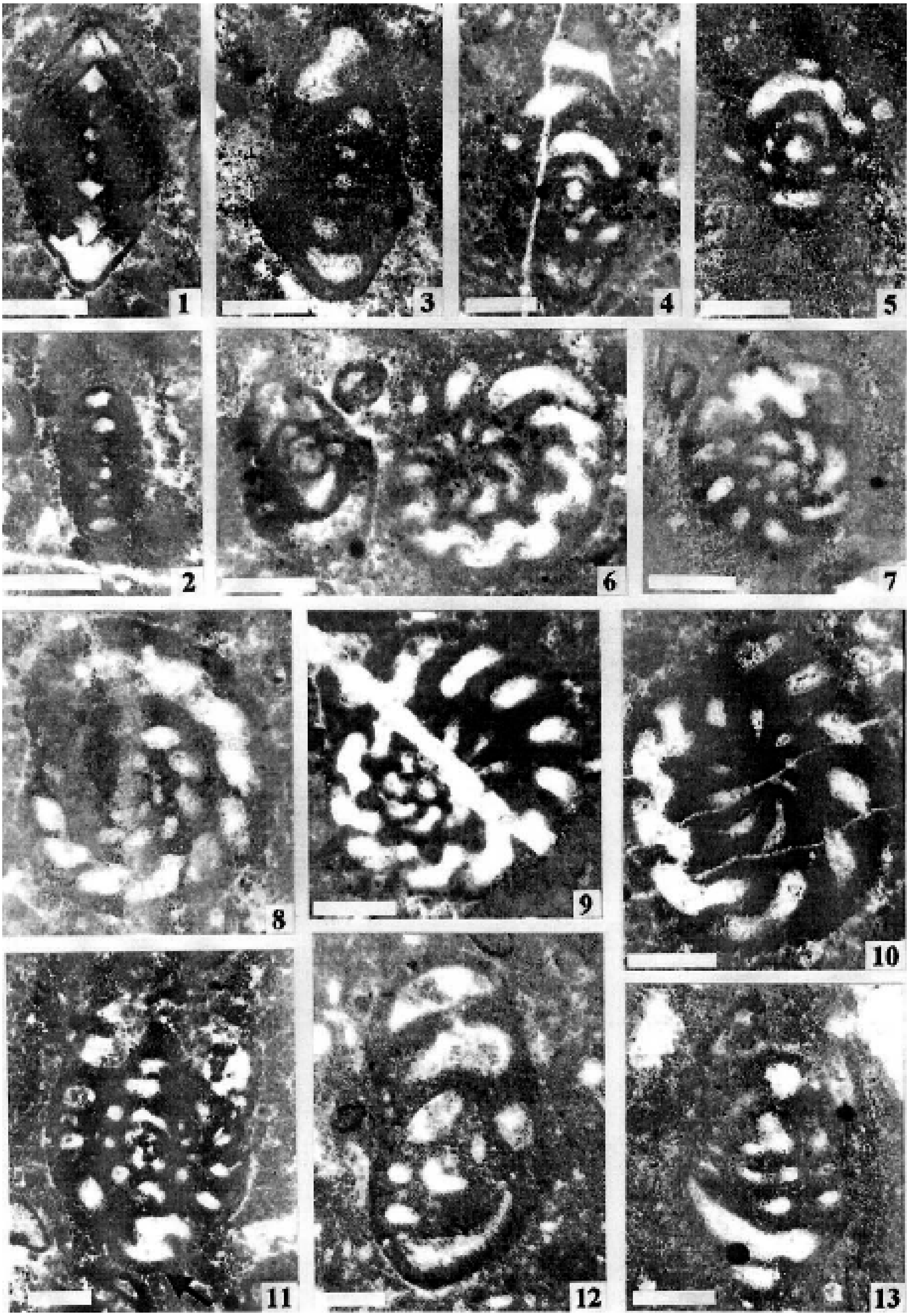

1
3
4
5
2
6
7
8
9
10
11
12
13

PLATE II

scale bar: 0.2 mm

Figs. 1-7 *Kurnubia* ex. gr. *palastiniensis* HENSON

1: axial section of a megalospheric specimen revealing an ovoid proloculus, sample AY 50; 2: axial section showing the first order horizontal partitions only and a weakly developed central column, sample L 4-3; 3: subaxial section, sample AY 38-12; 4: subaxial section, sample AY 50; 5: oblique axial section, sample L 4-1; 6: nearly axial section of a highly conical specimen, sample AY 40; 7: oblique transverse section, sample L 3-2.

Figs. 8-12, 14 *Kurnubia* cf. *morrisi* REDMOND

8: oblique axial section, sample L 4-2; 9: oblique transverse-tangential section, sample L 1; 10: transverse section showing the first and second order vertical partitions in the peripheral zone, sample L 7; 11: oblique axial section showing the second order partitions which are missing in the deeper part of the peripheral zone. Note that the septa do not meet the central column, leaving an opening near the margin of the central column, sample AY 50; 12: oblique transverse section resembling Fig. 7, included in this species because of its larger diameter, sample AY 49; 14: subaxial section showing curved thin plates in the central column, sample AY 42.

Figs. 13, 15, 16 *Conicokurnubia orbitoliniformis* SEPTFONTAINE

13: subaxial section of a highly conical specimen revealing strongly convex base in the centre, sample AY 45; 15: subaxial section showing labyrinthian appearance of the central zone occupied by interseptal pillars. Note the early portion of the cone recalling trochospiral coiling during the early ontogeny, sample L 3; 16: transverse section passed through the adult stage of a large conical specimen, sample AY 41.

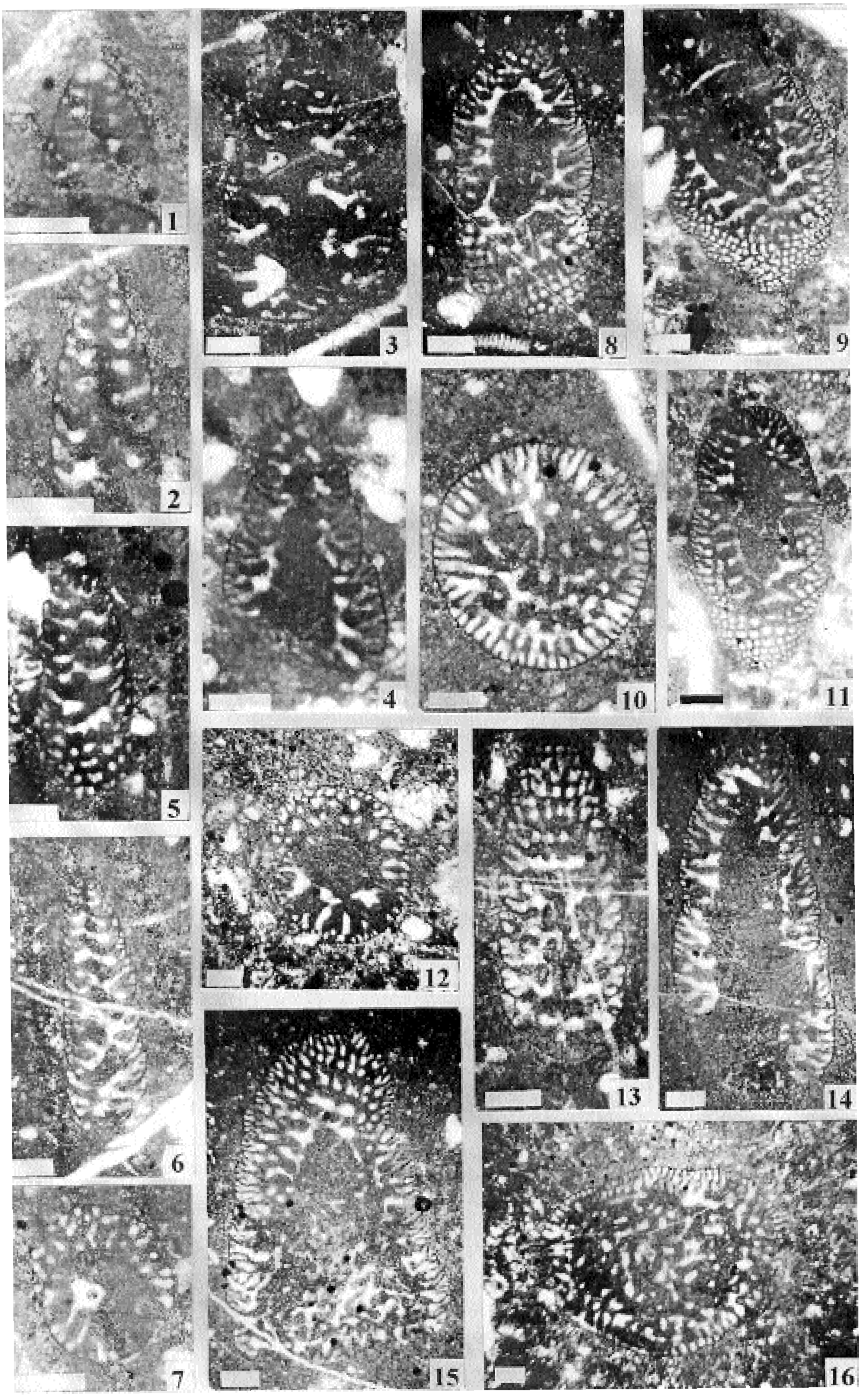

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

PLATE III

scale bar: 0.2 mm

Fig. 1 *Everticyclammina* sp.
Subaxial section showing a broadly rounded periphery which is not known in the other Jurassic species, *E. virguliana* (KOECHLIN), sample AY 47.

Fig. 2 Indet. Lituolidae
Equatorial-longitudinal section, sample L 4-3.

Fig. 3 *Valvulina lugeoni* SEPTFONTAINE
Subaxial section, sample L 7.

Figs. 4, 5 *Pfenderina* sp.
4: axial section of a broken specimen revealing the keriothecal wall structure, sample L 4-3; 5: transverse section, sample AY 45.

Figs. 6, 7 *Verneuilina* sp.
6: subaxial section, sample AY 38-9; 7: transverse section, sample AY 50.

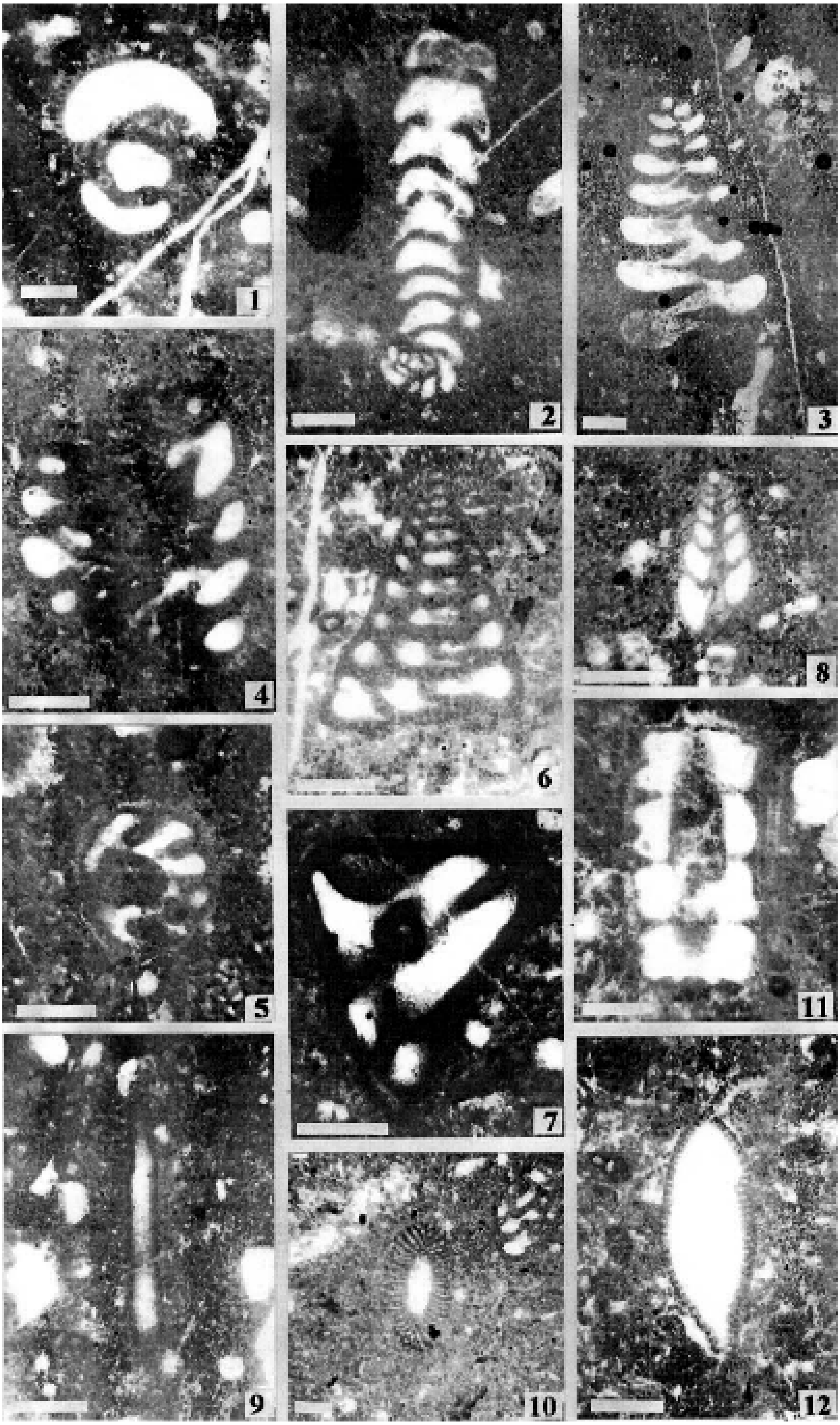
Fig. 8 *Siphovalvulina* sp.
Axial section showing the spheric proloculus and siphonal canal, sample AY 43.

Fig. 9 *Aeolisaccus* sp.
Sample AY 47.

Fig. 10 *Salpingoporella sellii* (CRESCENTI)
Sample L 4-2.

Fig. 11 *Salpingoporella annulata* CAROZZI
Sample AY 38-14.

Fig. 12 *Thaumatoporella parvovesiculifera* (RAINERI)
Sample AY 38-9.


1
2
3
4
5
6
7
8
9
10
11
12