

DAGMARITA SHAHREZAENSIS N. SP. GLOBIVALVULINID FORAMINIFER (WUCHIAPINGIAN, LATE PERMIAN, CENTRAL IRAN)

PARVIN MOHTAT-AGHAI* & DANIEL VACHARD**

Received March 8, 2002; accepted 21 October, 2002

Key words: Micropaleontology, Phylogeny, Foraminifera, New species, Wuchiapingian, Dzhulfian, Permian, Iran.

Abstract. In the course of an investigation on the major mass extinction event near the P/T boundary, in the vicinity of Shahreza (South Isfahan) in Iran, a stratigraphically significant new species of foraminifera (*Dagmarita shahrezaensis* n. sp.) has been discovered in the Wuchiapingian/Dzhulfian (Late Permian) of central Iran (Hambast Formation). This new species is described and emplaced in the phylogeny of the globivalvulinid foraminifera, which evolved rapidly during the Middle/Late Permian.

Riassunto. Durante le ricerche sugli eventi di estinzione in massa in prossimità del limite Permiano/Triassico, è stata rinvenuta una nuova specie di foraminifero (*Dagmarita shahrezaensis* n. sp.), che si ritiene di significato stratigrafico. La località di rinvenimento è presso Shareza (a Sud di Isfahan, Iran) entro la Formazione Hambast. La nuova specie viene qui descritta e si propone una filogenesi dei foraminiferi globivalvulinidi, che si devolteranno rapidamente durante il Permiano Medio e Superiore.

Introduction

The Permian-Triassic boundary is exposed through the almost continuous and complete sedimentary sequences, from northwest Iran (Julfa area) to central Iran (Hambast Range, Abadeh).

The Permo-Triassic sequence of the Shahreza region of central Iran (South Isfahan) displays remarkable similarities both in lithology and in faunal composition to that of the Julfa and Abadeh areas, due to the well known horst-graben system developed since the Infracambrian in NW and central Iran. The Permian transgressions, which started from the Artinskian (late Early Permian), resulted in open neritic to basinal environments in the Shahreza region. Then, the gradual shallowing of the sea proceeded with some fluctuations from basinal to lagoonal through open neritic conditions (Iranian-Japanese Research

Group 1976).

The micropaleontological components of the late Permian (Wuchiapingian/Dzhulfian, Changhsingian/Dorashamian), P/T boundary and early Triassic deposits of the central Iranian province must be re-examined for providing supplementary data for the interpretation of the P/T extinction patterns (Mohtat-Aghai, work in progress).

Preliminary micropaleontological studies of several sections reveal a new and distinct evolutionary trend in the late Permian deposits of central Iran (Hambast Formation) as indicated by the preservation of the family of Biseriamminidae (Dagmaritinae), a very important group for the biostratigraphy of this epoch (Altiner 1997, 1999; Altiner & Özkan-Altiner 2001).

Geological setting

The type-locality of the new species belongs to the continuous Permian-Triassic section of Shahreza, situated about 70 km south of Isfahan, in Central Iranian province. The coordinates of this type locality are: lat. 32°10' N and long. 51°50' E, along the main road from Isfahan to Shiraz (Fig. 1).

The section described here is located in a NW-trending range, about 15 km long, northeast of Shahreza about 4 km east of Shahzadeh Ali Akbar village. They comprise steeply dipping (60-85°) dark-grey dolomite and grey dolomitic shallow marine (infratidal to intertidal) limestone (Capitanian/Wuchiapingian; locally denominated Abadehian/Dzhulfian, in reference to Iranian stratotypes and the Tethyan scale) and contain mainly fusulinids, and other small foraminifers, ostracods, brachiopods, coral, bryozoans and algae. Seven lithological units (1-7) are recognized in the Permian section (Taraz

* Institut für Geologie & Paleontologie, Innsbruck Universität, Innrain 52, 6020 Innsbruck, Austria. E-mail: Mohtat-Aghai@uibk.ac.at

** UFR des Sciences de la Terre, UMR 8014 du CNRS, Université des Sciences et technologies de Lille, 59655 Villeneuve d'Ascq cédex, France. E-mail: Daniel.Vachard@univ-lille1.fr

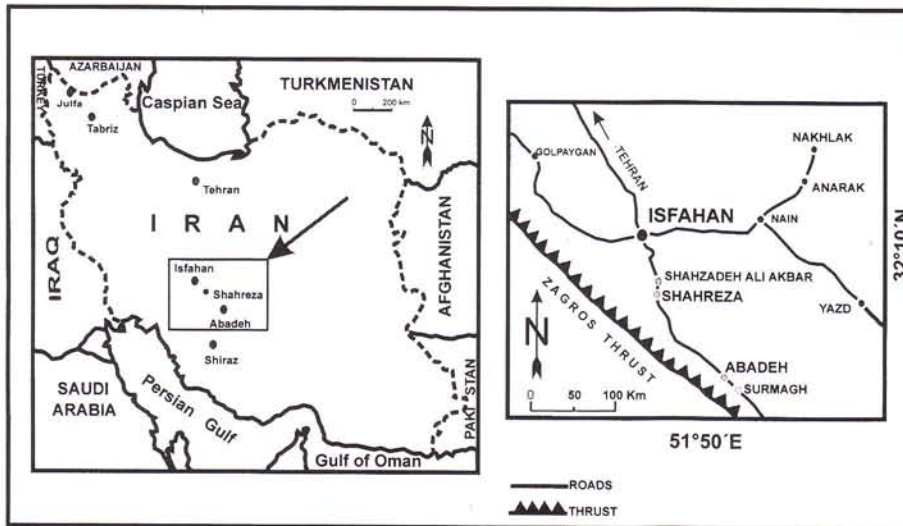


Fig. 1 - Locality map of Shahreza (Isfahan, Iran).

1969, 1971, 1973, 1999; Iranian-Japanese Research Group 1976; Iranian-Chinese Research Group 1995), but only units 5-7 were studied during this investigation.

The upper contact is transitional; the grey Permian limestones are gradually overlain by 20 m reddish nodular ammonite-bearing (*Paratirolites*) deep-water limestone of the Dorashamian. Triassic rocks are well exposed in this area (units A-E). Only the early Triassic unit A (90 m) crops out in Shahreza (Fig. 2).

Among the smaller foraminifera of the Late Permian, an apparently characteristic of the late Wuchiapingian/Dzhulfian species has been discovered: *Dagmarita shahrezaensis* n. sp.

Systematic Paleontology

Class **Foraminifera** d'Orbigny, 1826 nomen transl.
Lee, 1990

Order **Fusulinida** von Moeller, 1878 nomen transl.
Fursenko, 1958

Family **Biseriamminidae** Chernysheva, 1941
Subfamily **Dagmaritinae** Bozorgnia, 1973

Remark: The systematic of the Biseriamminids (the name is classical, but Globivalvulinids is perhaps better, concerning the Permian taxa), was changed recently (Altiner, 1997, 1999; Altiner & Özkan-Altiner, 2001: with complete bibliography). However, these subdivisions need a revision, because they are independently based on two criteria, no really opposite, but difficult to correlate exactly: (a) the morphology; (b) the structure of the wall. Moreover the material is generally poor in specimens, therefore the biodiversity of the globivalvulinids is poorly known. Among the multiple evolutionary trends occurring in the middle/late Permian, we have discovered a species, which constitutes another hypothetical evolutionary trend between the *Dagmarita* (middle-late Permian) to the *Paradagmarita* (Changxingian/Dorashamian),

and this new species is actually found in the Wuchiapingian/Dzhulfian (Fig. 4).

Genus *Dagmarita* Reitlinger, 1965

Type species: *Dagmarita chanakchiensis* Reitlinger, 1965

Dagmarita shahrezaensis n.sp.

Pl. 1, fig.1-13, 14?

- ? 1980 *Dagmarita chanakchiensis* - Lys in Lys et al., p. 86, pl. 3, fig. 11-12.
 - ? 1984 *Dagmarita chanakchiensis* - Kotlyar et al., pl. 1, fig. 7.
 - ? 1990 *Dagmarita elongata* - Lin, Li & Sun, p. 122-123, pl. 2, fig. 24 (only).
 - ? 1994 *Dagmarita chanakchiensis* - Fontaine et al., pl. 3, fig. 6.
- Derivation of name.** According to the name of the main town of the investigated area.
- Holotype.** Pl. 1, Fig.1 (a complete longitudinal section).
- Paratypoids.** Pl. 1, fig. 2-13, 14? (sublongitudinal and oblique sections).
- Type locality.** Shahreza area (Central Iran).
- Type level.** Hambast Formation, Late Permian (late Wuchiapingian/Dzhulfian).
- Paratypes and repository.** 14 specimens (all illustrated herein) from three thin sections. Collection Mohtat-Aghai, S 08, Department of Geology and Paleontology, Innsbruck University, Austria.
- Diagnosis.** A rather large *Dagmarita*, characterized by its rounded chambers, and their absence of marginal thornlike expansions.

Description. Test small, compressed, consisting of 4 or 5 pairs of chambers biserially arranged. Proloculus very small, spherical, slightly protruding. Chambers increasing slowly in width and height, round, without carina nor endoskeleton. Septa gently curved, with a small thickening at the apertural extremity. Globivalvulinoid aperture. Wall secreted, microgranular, often unilayered, but sometimes slightly differentiated (Pl. 1, fig. 5). Among the different taxa of globivalvulinoids, this unilayered, relatively primitive wall is regarded as specific character (*Paradagmarita monodi* Lys, *Globivalvulina kantherensis* Reichel), or generic (*Biseriella* Mamet). As the *Dagmarita* type of

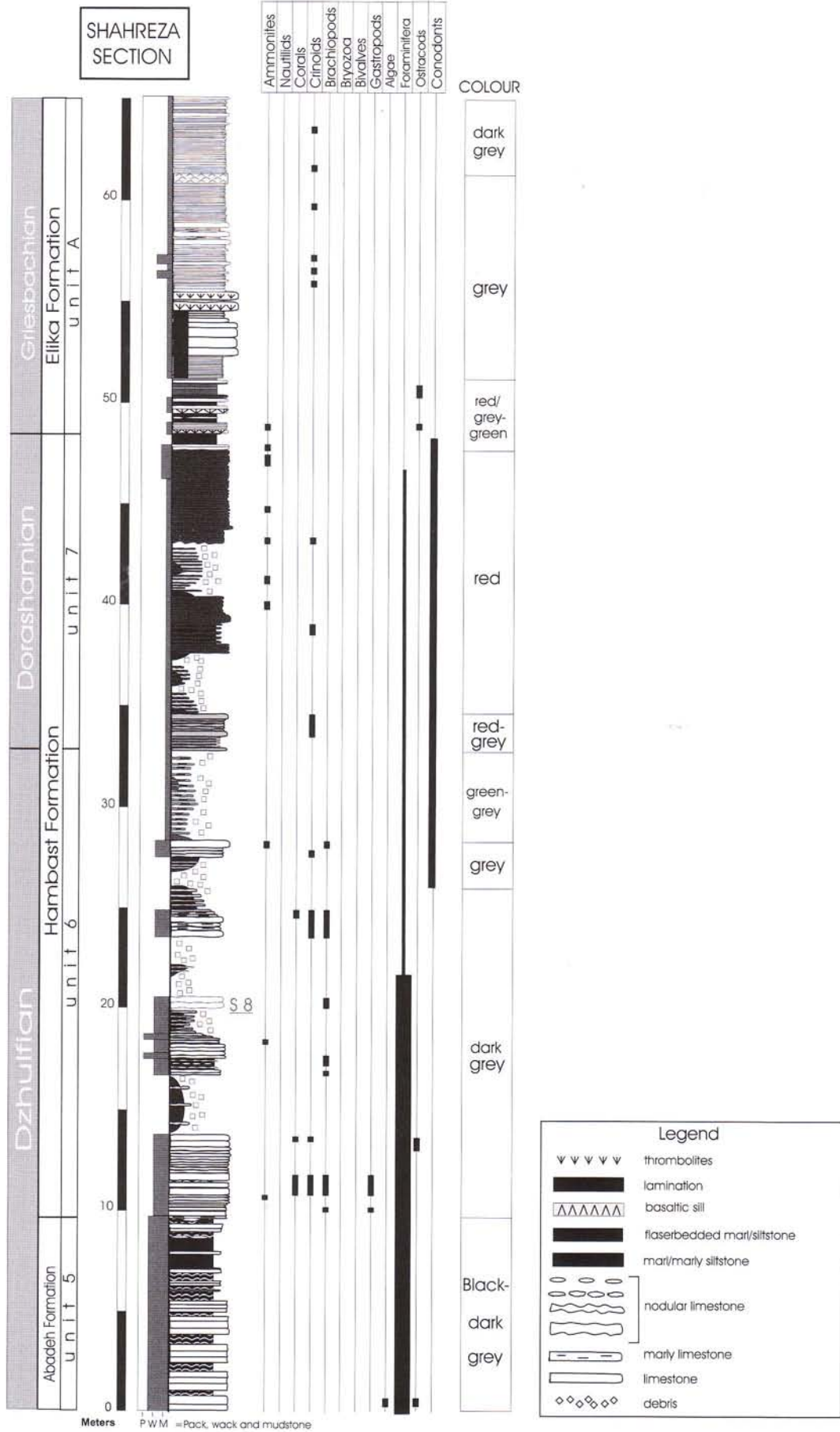


Fig. 2 - Stratigraphic column with location of *D. shahrezaensis* n. sp. in S8, and location of the Permian/Triassic boundary in S70.

	Length	Width	Number of pairs of chambers	Diameter of the proloculus	Wall thickness
<i>D. altis</i> WANG, 1981	390	400	6-7	-	-
<i>D. caucasica</i> VUKS, 1984	310-370	260-300	6	70 x 110	5
<i>D. chanakchiensis</i> REITLINGER, 1965	700	430	7-9	4	15
<i>D. cuneata</i> SOSNINA, 1977	460-510	320-460	7	-	10-12
<i>D. elegans</i> SOSNINA, 1977	490-500	260	6-7	-	19-20
<i>D. elongata</i> LIN et al., 1990	420-630	210-290	6-7	130	-
<i>D. exilis</i> SOSNINA, 1977	680	340	7-8	-	10-12
<i>D. liantanensis</i> LIN et al., 1990	430-710	290-370	7-9	-	-
<i>D. minuscula</i> WANG, 1981	430	350	-	-	20
<i>D. oblonga</i> SOSNINA, 1977	700	480	6-7	-	15
<i>D. simplex</i> WANG, 1981	500	370	3	120	15
<i>D. shahrezaensis</i> n. sp.	420-870	190-500	4-5	50-60	7-15

Fig. 3 - Comparative table of measurements of several species of *Dagmarita* (for Vuks see Kotlyar et al., 1984, for Sosnina, see Sosnina & Nikitina, 1977).

wall is controversial, generally three-layered, sometimes unilayered, according to the literature, we attribute the new species to a true *Dagmarita*, but another opinion is possible, i. e. *Dagmarita* (?).

Comparisons. The new species differs from *Dagmarita chanakchiensis* (Pl. 1, 16-21) by the small number of the chambers, the shape of the chambers, the absence of thornlike lateral expansions, and the generally unilayered wall. It differs from the other species of the genus described by Sosnina in Sosnina & Nikitina (1977): *D. elegans*, *D. cuneata*, *D. exilis*, *D. oblonga*, by the characters listed here (Fig. 3). Moreover, all these species of Sosnina can be synonym of *D. chanakchiensis*, according to Altiner (1981) and Jenny-Deshusses (1983). Finally the new species can be distinguished from some small paleotextulariids also represented in the microfacies (Pl. 1, fig. 15) by the nature of wall (unilayered microgranular, and not bilayered, i.e. pseudofibrous and microgranular with car-

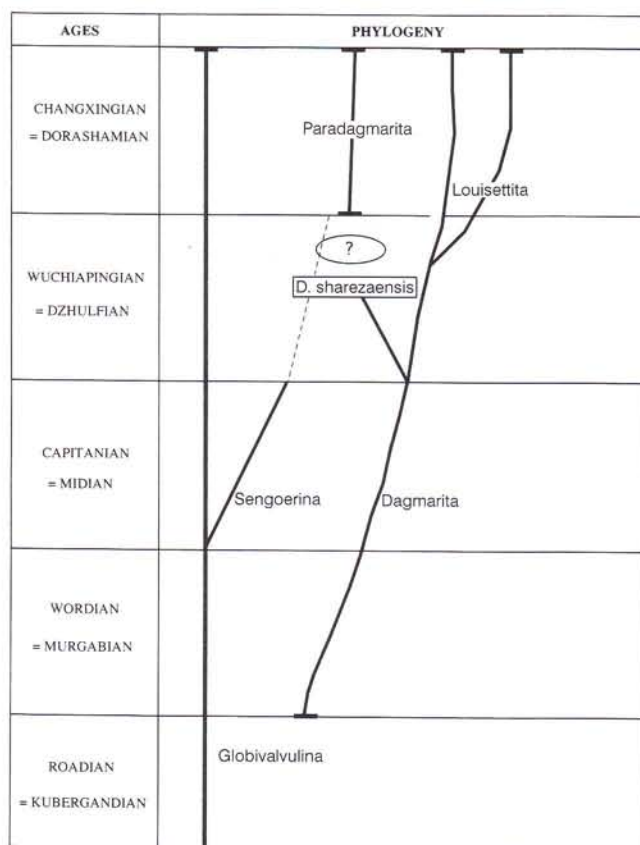


Fig. 4 - Hypothetical location of *Dagmarita shahrezaensis* n. sp. in the phylogeny of some globivalvulinids, during the middle and late Permian.

bonate agglutinate) and the globivalvulinoid and not paleotextularioid organization of the apertures.

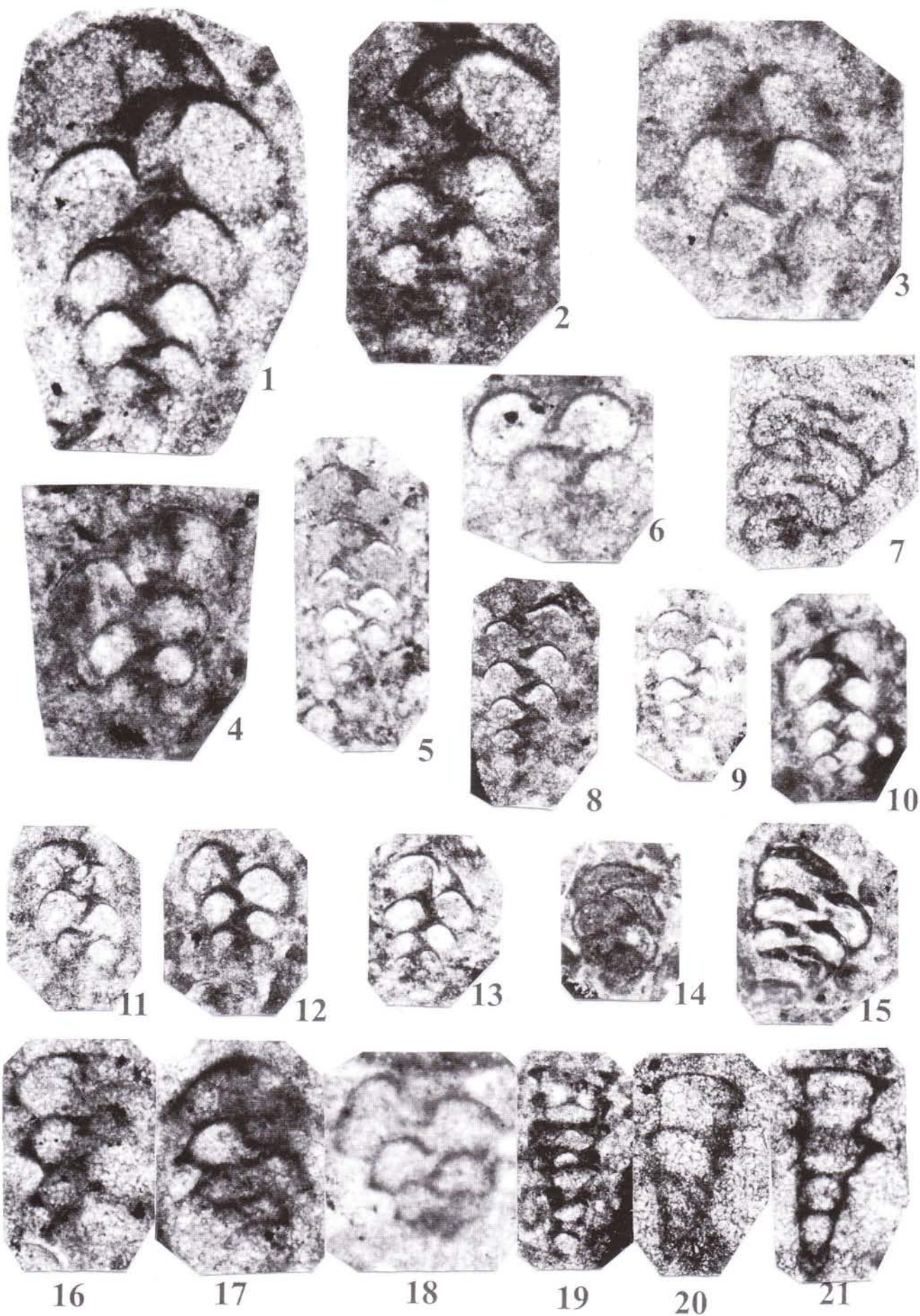
Measurements. Length of test (L): 0.42-0.87 mm; maximum width of test (w): 0.19-0.50 mm; ratio L/w: 1.70-1.90 (rarely 2.30); number of pairs of chambers: 4-5; proloculus diameter: 0.05-0.06 mm; height of the last chamber: 0.10-0.15 mm; wall thickness: 0.01-0.02 mm.

Range. Early Late Permian (Wuchiapingian/Dzhulfian) of Shahreza and probably coeval with the questionable forms indicated above in the synonymy list: from Himalayas (Lys et al. 1980), Transcaucasia (Kotlyar et al. 1984), South China (Lin et al. 1990) and Malaysia (Fontaine et al. 1994).

PLATE 1

All specimens are from the late Wuchiapingian/Dzhulfian of the Hambast Formation along the Shahreza section (sample S 8), excepted fig. 4 from Abadeh section (sample A22).

Fig. 1-13, 14? *Dagmarita shahrezaensis* n. sp. Fig. 1 - Holotype. Longitudinal section. x 84. Fig. 2 - Paratype. Sublongitudinal section. x 88. Fig. 3 - Paratype. Sublongitudinal section. x 88. Fig. 4 - Paratype. Sublongitudinal section. x 88. Fig. 5 - Paratype. Sublongitudinal section relatively compressed and with a slightly differentiated wall. x 88. Fig. 6 - Paratype. Oblique section. x 88. Fig. 7 - Paratype. Oblique section. x 88. Fig. 8 - Paratype. Sublongitudinal section. x 36. Fig. 9 - Paratype. Sublongitudinal section. x 34. Fig. 10 - Paratype. Oblique section. x 36. Fig. 11 - Paratype. Oblique section. x 36. Fig. 12 - Paratype. Oblique section. x 36. Fig. 13 - Paratype. Oblique section. x 36. Fig. 14? - Paratype? Atypical oblique section. x 36. Fig. 15. - *Palaeotextularia* sp. Sublongitudinal section to compare with *D. shahrezaensis* n. sp. x 36. Fig. 16-21 - *Dagmarita* ex gr. *chanakchiensis* Reitlinger, 1965. Fig. 16 - Oblique section. x 88. Fig. 17 - Sublongitudinal section. x 88. Fig. 18 - Oblique section. x 88. Fig. 19 - Lateral section. x 88. Fig. 20 - Lateral section. x 88. Fig. 21 - Lateral section. x 88.



Discussion

By the lack of thornlike expansion, *Dagmarita shabrezaensis* is therefore more similar to a palaeotextulariid than to a *Dagmarita chanakchiensis* (compare Pl. 1, fig. 6, 15 and 18). The microstructure of the wall is nevertheless entirely different and cannot be confused with a *Palaeotextularia* Schubert, with a calcareous-agglutinated wall (rarely siliceous-agglutinated wall; it is the difference with the true *Textularia* DeFrance). The wall of a *Dagmarita* is secreted and microgranular, sometimes and sporadically differentiated in three layers.

The lack of thornlike expansion can be also interpreted as an intermediate character between *Dagmarita* and the true *Paradagmarita* Lys, or as a primitive globivalvulinid character that has reappeared in *Dagmarita shabrezaensis* n. sp. (with the preponderance of the type of wall, upon the morphology). According to this hypothesis, in the stage of development of *Dagmarita shabrezaensis* n. sp., the thornlike projections of the chambers disappear, and after, the growth becomes again coiled (and biserial) as in *Globivalvulina* (Fig. 4).

Altiner (1999) postulated another phylogeny of the Dagmaritids and Globivalvulinids, during the middle/late Permian, from Roadian/Kubergandian to Changhsingian/Dorashamian. Evidently, *Dagmarita* and *Louisettita* are closely related, but the links are less justified between coiled *Dagmarita* and uncoiled *Paradagmarita*.

Finally we cannot agree with the proposed relationships of *Sengoerina* and *Dagmarita*, because *Dagmarita chanakchiensis* appears relatively early in the middle Permian (early Murgabian/Wordian; biozone with *Neoschwagerina simplex*: Vachard 1980; Vachard & Montenat 1981; or middle Murgabian: Altiner, 1981), whereas *Sengoerina* is younger and appears in the Capitanian/Midian. Therefore *Sengoerina* cannot be the ancestor of *Dagmarita*. On the other hand, Vachard et al. (2002) indicate the presence of a *Sengoerina* in the late Dzhulfian of Greece. This taxon is relatively similar to the Dorashamian *Paradagmarita* ex gr. *flabelliformis* Zaninetti et al. A relation between *Sengoerina* and *Paradagmarita* can be suggested.

The relationships between *Sengoerina*, *Dagmarita* and *Paradagmarita* must be studied more accurately, during the Wuchiapingian/Dzhulfian (Fig. 4).

Acknowledgments. The Geological Survey of Iran, and especially Dir. Dr. M. Ghoreschi, Dr. B. Hamdi and Dr. T. Mohtat, provided extensive and exhaustive assistance in the field. We are grateful for the helpful comments of Prof. Dr. K. Krainer (Univ. Innsbruck). The authors would also like to thank the reviewers Prof. Dr. D. Altiner (Univ. Ankara) and Dr. R. Rettori (Univ. Perugia) for their critical reviews and suggestions that improved the manuscript. This research was supported by the Austrian Science Foundation (FWF-Project p14490-Geo).

REFERENCES

- Altiner D. (1981) - Recherches stratigraphiques et micropaléontologiques dans le Taurus Oriental au NW de Pinarbasi (Turquie). *Thèse Université de Genève*, n° 2005. V. of 450 pp., Genève (unpublished).
- Altiner D. (1997) - Origin, morphologic variation and evolution of Dagmaritid-type Biseriamminid stock in late Permian. In Ross C.A., Ross J.R.P. & Brenckle P.L. (Eds.) - Late Paleozoic Foraminifera; their biostratigraphy, evolution, and paleoecology; and the Mid-Carboniferous boundary. *Cushman Found. Foramin. Res., Spec. Publ.*, 36: 1-4, Cambridge, MA.
- Altiner D. (1999) - *Sengoerina argandi*, n. gen., n. sp., and its position in the evolution of late Permian biseriamminid foraminifers. *Micropaleontology*, 45, 2: 215-220, New-York.
- Altiner D. & Özkan-Altiner S. (2001) - *Charliella rossae* n. gen., n. sp., from the Tethyan realm: remarks on the evolution of late Permian biseriamminids. *Journal Foramin. Res.*, 31, 4: 309-314, Fredericksburg.
- Fontaine H., Ibrahim, B.A., Khoo H.P., Nguyen D.T. & Vachard D. (1994) - The *Neoschwagerina* and *Yabeina-Lepidolina* zones in Peninsular Malaysia, and Dzhulfian and Dorashamian in Peninsular Malaysia, the transition to the Triassic. *Geol. Surv. Malaysia, Geol. Papers*, 4: 1-175, Ipoh.
- Iranian-Chinese Research Group (1995) - Field work on the Lopingian stratigraphy in Iran. *Permophiles*, 27: 5-6, Boise.
- Iranian-Japanese Research Group (1976) - The Permian and the Lower Triassic Systems in Abadeh region, Central Iran. *Mem. Fac. Sci. Kyoto Univ., ser. geol. min.*, 47 (2): 60-132, Kyoto.
- Jenny-Deshusses C. (1983) - Le Permien de l'Elbourz Central et Oriental (Iran); stratigraphie et micropaléontologie (foraminifères et algues). *Thèse Université de Genève*, n° 2103. V. of 214 pp., Genève (unpublished).
- Kotlyar G.V., Zakharov Y.D., Koczyrkevich B.V., Kropatcheva G.S., Rostovcev K.O., Chedija I.O., Vuks G.P. & Guseva E.A. (1984) - Pozneperskii etap evoliutsii organicheskogo mira, Dzhulfinskii i Dorashamskii yarusy SSSR (Evolution of the latest Permian biota, Dzhulfian and Dorashamian regional stages in the USSR). V. of 200 pp., Leningrad "Nauka", Leningradskoe Otdelenie, Leningrad (in Russian).
- Lin J., Li J. & Sun Q. (1990) - Late Paleozoic foraminifers in South China. V. of 297 pp., Science Publication House, Beijing.
- Lys M., Colchen M., Bassoullet J.P., Marcoux J. & Mascle G. (1980) - La biozone à *Colaniella parva* du Permien supérieur et sa microfaune dans le bloc calcaire exotique

- de Lamayuru, Himalaya du Ladakh. *Rev. Micropal.*, 23 (2): 76-108, Paris.
- Reitlinger E.A. (1965) - Razvitie foraminifer v pozdnepermskyu rannetriasovuyu epokhi na territorii Zakavkazya (Foraminiferal development in the late Permian and early Triassic epochs in the territory of Transcaucasia). *Voprosy Mikropaleontologii*, 9: 45-70, Moscow (in Russian).
- Sosnina M.I. & Nikitina A.P. (1977) - Melkie foraminifery verkhnei pezrmi Yuzhnogo Primoriya (Smaller foraminifers of the Upper Permian of south Primorie). In - Iskolaemaya flora i fauna Dalnego Vostoka i voprosy stratigrafii Fanerozoia (Fossil flora and fauna of Far East and problems of stratigraphy of Phanerozoic). *Akademiya Nauk SSSR, Dalnevostochnyi Nauchnyi Tsentr, Dal. Geol. Inst.*: 27-52, Moscow (in Russian).
- Taraz H. (1969) - Permo-Triassic section in Central Iran. *Am. Ass. Petr. Geol. Bull.*, 53 (3): 688-693, Tulsa.
- Taraz H. (1971) - Uppermost Permian and Permo-Triassic transition beds in Central Iran. *Am. Ass. Petr. Geol. Bull.*, 55 (8): 1280-1294, Tulsa.
- Taraz H. (1973) - Correlation of uppermost Permian in Iran, Central Asia and South China. *Am. Ass. Petr. Geol. Bull.*, 57 (6): 1117-1133, Tulsa.
- Taraz H. (1999) - A serious question for the voting members of SPS. *Permophiles*, 34: 31-32, Calgary.
- Vachard D. (1980) - Téthys et Gondwana au Paléozoïque supérieur. Les données afghanes: biostratigraphie, micropaléontologie, paléogéographie. *Documents et Travaux IGAL*, 2: 1-463, Paris.
- Vachard, D. & Montenat, C. (1981) - Biostratigraphie, micropaléontologie et paléogéographie du Permien de la région de Tezak (Montagnes Centrales d'Afghanistan). *Paleontographica*, B, 178 (1-3): 1-88, Stuttgart.
- Vachard D., Zambettakis-Lekkas A., Skourtsos E., Martini M. & Zaninetti L. (submitted) - Foraminifers, algae and carbonate microproblematica from the late Wuchiapingian (late Dzhulfian, early late Permian) of Peloponnesus (Greece). *Riv. It. Pal. Strat., PaleoForams* 2001, Milano.