

# Late Wuchiapingian (Late Dzhulfian, early Late Permian) limestone olistolites within the Tertiary flysch of Glypia Unit (Mount Parnon, central–eastern Peloponnesus, Greece)

Emmanuel Skourtsos<sup>a</sup>, Daniel Vachard<sup>b,\*</sup>, Alexandra Zambetakis-Lekkas<sup>a</sup>, Rossana Martini<sup>c</sup>,  
Louisette Zaninetti<sup>c</sup>

<sup>a</sup> Department of historical geology-palaeontology, national university of Athens, Athens, Greece

<sup>b</sup> UFR des sciences de la Terre, Upresa 8014 du CNRS, université des sciences et technologies de Lille,  
59655 Villeneuve d'Ascq cedex, France

<sup>c</sup> Département de géologie et paléontologie, université de Genève, 13 rue des Maraîchers, 1211 Genève, Switzerland

Received 21 January 2002; accepted 5 August 2002

Communicated by Jean Dercourt

---

**Abstract** – Some olistolites reworked in a Tertiary flysch of Mount Parnon (Peloponnesus, Greece) exhibit a Late Permian assemblage, dominated by *Paradunbarula (Shindella) shindensis*, *Hemigordiopsis* cf. *luquensis* and *Colaniella* aff. *minima*. This association corresponds to the Late Wuchiapingian (= Late Dzhulfian), a substage whose algae and foraminifera are generally little known. Contemporaneous limestones crop out in the middle part of the Episkopi Formation in Hydra, but they are rather commonly reworked in Mesozoic and Cainozoic sequences. The palaeobiogeographical affinities shared by the foraminiferal markers of Greece, southeastern Pamir, and southern China, are very strong (up to the specific level), and are congruent with the Pangea B reconstructions. **To cite this article:** *E. Skourtsos et al., C. R. Geoscience 334 (2002) 925–931.*  
© 2002 Académie des sciences / Éditions scientifiques et médicales Elsevier SAS

Permian / Wuchiapingian / Dzhulfian / biostratigraphy / foraminifera / algae / palaeogeography / Greece

**Résumé** – Les olistolithes calcaires d'un flysch tertiaire du mont Parnon (Péloponnèse, Grèce) révèlent des associations du Wuchiapingien supérieur (= Djouffien supérieur; Permien supérieur). L'une d'elles, caractérisée par *Paradunbarula (Shindella) shindensis*, *Hemigordiopsis* cf. *luquensis* et *Colaniella* aff. *minima*, permet d'aborder une discussion biostratigraphique sur les algues et foraminifères de ce sous-étage. Ces calcaires, généralement remaniés dans les diverses séries du Cénozoïque et du Mésozoïque, sont l'équivalent d'une partie de la formation d'Episkopi à Hydra. L'association confirme la grande identité des microfossiles de la Grèce, du Pamir du Sud-Est et de la Chine du Sud, au cours du Permien supérieur. Elle renforce les reconstitutions de type Pangée B. **Pour citer cet article :** *E. Skourtsos et al., C. R. Geoscience 334 (2002) 925–931.*  
© 2002 Académie des sciences / Éditions scientifiques et médicales Elsevier SAS

Permien / Wuchiapingien / biostratigraphie / foraminifères / paléogéographie / Grèce

---

## Version abrégée

Une nouvelle campagne de cartographie du mont Parnon (Péloponnèse centro-oriental, Grèce) a montré qu'une épaisse série de type flysch, appelée unité de Glypia [21],

surmonte les unités alpines de Tripolis et du Pinde. Ce flysch est principalement composé d'alternances de pélites, de grès grossiers et d'intercalations de calcaires marneux ou microbréchiques. Quelques fossiles ont prouvé qu'il s'agissait de dépôts du Tertiaire.

---

\* Correspondence and reprints.

E-mail address: Daniel.Vachard@univ-lille1.fr (D. Vachard).

Des blocs exotiques se rencontrent fréquemment dans la matrice de l'unité de Glypia. Ils appartiennent généralement au Crétacé supérieur et ont une lithologie variée : calcaires aussi bien néritiques que pélagiques, brèches dolomitiques, radiolarites ou laves basaltiques. Quelques blocs de Permien fossilifère, qui mesurent jusqu'à 1,5 m<sup>3</sup>, sont également présents. Le microfaciès décrit ici a fourni une quarantaine d'espèces différentes d'algues, pseudo-algues, petits foraminifères et fusulines.

L'association est caractérisée par trois taxons (Fig. 2) : *Paradunbarula* (*Shindella*) *shindensis*, *Hemigordopsis* cf. *luquensis* et *Colaniella* aff. *minima*. La microflore algale correspond à celle du niveau d'Argolide [25] et à celle des calcaires à Bellerophon de l'Italie ou de l'ex-Yougoslavie, du Montenegro notamment [14]. Parmi les pseudo-algues, les *Tubiphytes* observés affirment leurs affinités avec des foraminifères porcelanés.

L'application des anciens critères biostratigraphiques des auteurs russes [3, 9–11, 15, 16] conduirait à conclure à un niveau du Midien terminal (= Capitanien terminal des nouvelles échelles). Nous préférons toutefois suivre l'avis de Davydov et al. [5] et attribuer l'association au Djoulfien supérieur (ou, selon la terminologie actuelle, au Wuchiapingien supérieur). En conséquence, dans les stratotypes de Transcaucasie, contrairement aux anciennes propositions [10], ce serait la zone IX, du Djoulfien supérieur, qui serait l'équivalent de la biozone à *Shindella*, plutôt que la zone VII du Midien terminal.

Deux arguments, tirés des séries de Grèce, confirment cette attribution. D'abord, la nouvelle association

s'avère un peu plus évoluée que celle que nous avons datée du Djoulfien inférieur en Argolide [25], puisque des *Colaniella* remplacent les *Pseudowanganella*, et que des *Shindella* et des *Nanlingella* primitives prennent la place des *Pseudodunbarula* (Fig. 3). Ensuite, la formation d'Episcopi, à Hydra, contient des conodontes du Wuchiapingien supérieur [6, 13]. Cependant, pour préciser les corrélations, les foraminifères de cette Formation devront être révisés, car ils forment pour l'instant un continuum daté du Capitanien/Midien au Changxingien/Dorashamien, dans lequel les « *Palaeofusulinae* » des auteurs [2, 6] désignent sans doute plusieurs taxons différents de *Palaeofusulinae*, dont *Shindella* et *Nanlingella*.

L'origine des olistolithes calcaires de l'unité de Glypia est à rechercher dans la nappe de l'unité Subpélagonienne : sur l'île d'Hydra [2, 6, 13, 18, 19], sur les îlots de Karavia [22, 23] ou en Argolide [25]. Si les affleurements de ces calcaires semblent si réduits en Grèce, c'est peut-être parce qu'ils ont été activement démantelés et remaniés dans différentes séries du Mésozoïque et du Cénozoïque.

Enfin, les affinités paléobiogéographiques des marqueurs, notamment celles de la fusuline *Paradunbarula* (*Shindella*), sont très étroites (jusqu'au niveau spécifique) avec le Pamir du Sud-Est et la Chine du Sud. De telles relations, difficilement compatibles avec de trop larges océans téthysiens, sont plus aisément explicables par des reconstitutions de type Pangée B [4].

## 1. Introduction

The discovery of reworked Late Permian olistolithes on Mount Parnon (Peloponnesus, Greece) has three main implications: (i) they confirm the frequent reworking of the limestones of this age in Mesozoic and Cainozoic Formations of Greece, (ii) they document a little known substage of the Late Permian: the Late Wuchiapingian/Dzhulfian, (iii) they constitute a new evidence for the strong affinities of the Greek microfaunas with those of eastern Tethys, such as Pamir and southern China.

## 2. Geological setting

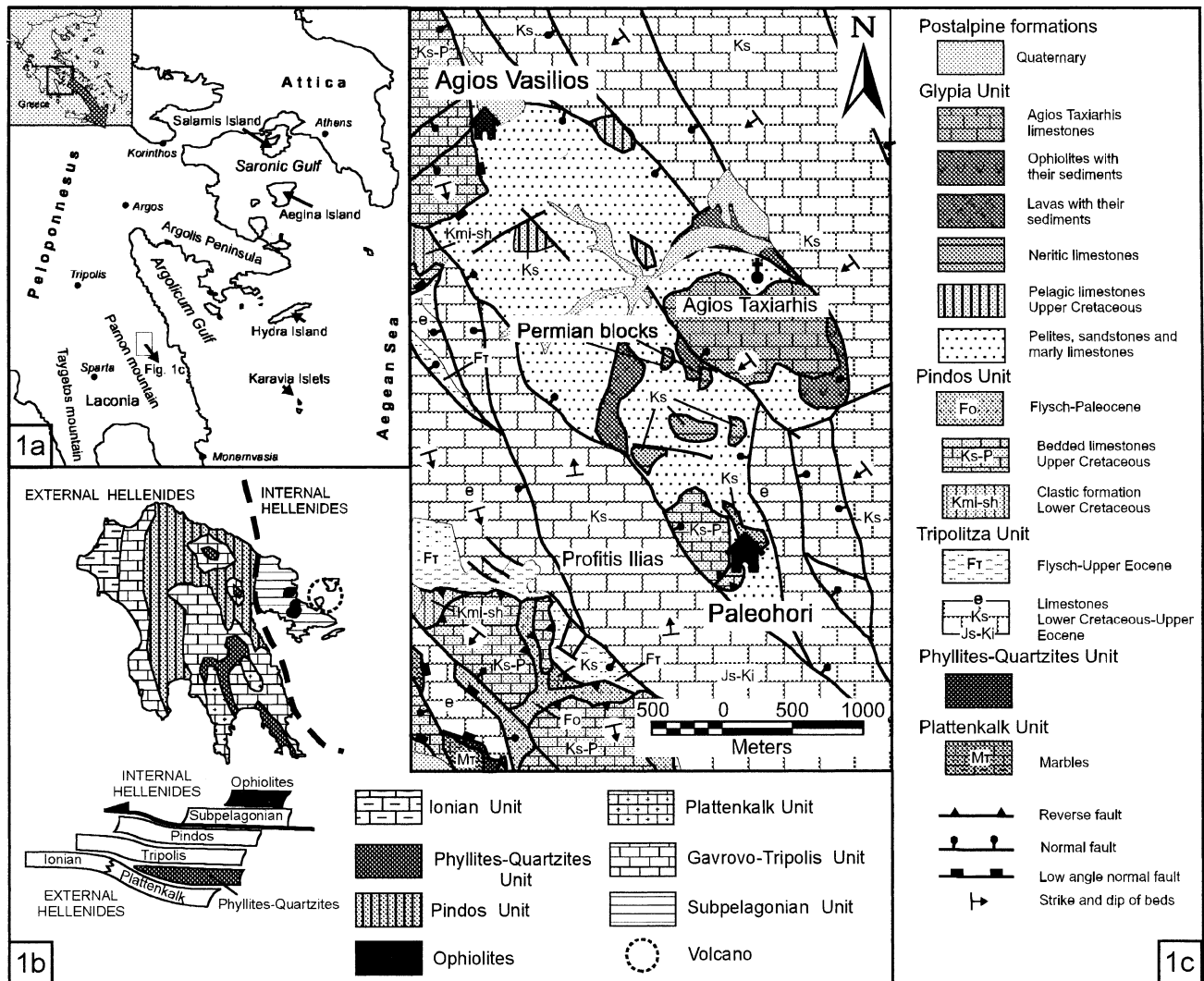
New investigations in the Mount Parnon range (central eastern Peloponnesus, Greece) revealed the existence of a clastic flysch-type formation over the alpine units of Tripolis and Pindos, named Glypia unit [21]. This Glypia flysch is composed of alternations of pelitic horizons, coarse-grained sandstones and marly or microbrecciated limestones. Fossils found in some marly limestone intercalations were identified to be of Tertiary age [21].

The occurrence of exotic blocks floating within the matrix of Glypia unit is relatively common (Fig. 1). These blocks may belong to carbonate formations of Late Cretaceous age of either pelagic or neritic character, dolomitic breccias, radiolarites, basaltic lavas accompanied by pelites and microbrecciated limestones of Late Cretaceous age and serpentinites along with greenish pelites, sandstones and microbrecciated limestones of unknown age.

Late Permian blocks up to 1.5 m<sup>3</sup> occur also. They consist of grey to whitish, richly fossiliferous limestones. This paper describes the most interesting microfacies, and analyses the biostratigraphic and palaeogeographic consequences of this discovery.

## 3. Previous work

Middle and Late Permian of Greece are rather poorly known and poorly illustrated, except for the Wordian, i.e. Murgabian [2, 6, 22, 23, 26, with bibliography], although the major part of this stage is probably more accurately Capitanian/Midian in age, according to the subsequent criteria of Leven [11]. The presence of Midian is mentioned in Hydra in the lower



**Figure 1.** Location sketch maps of the Mount Parnon Range (Peloponnese, Greece). **a:** Location in Greece. **b:** Geological and structural interpretations. **c:** Stratigraphic and structural column.

**Figure 1.** Cartes géologiques schématiques du mont Parnon (Péloponnèse, Grèce). **a :** Localisation en Grèce. **b :** Interprétations géologiques et structurales. **c :** Colonne stratigraphique et structurale.

part of the Episkopi Formation [2, 6], and may be also supposed in Laconia [24, re-interpreted]. The Wuchiapingian constitutes the middle part of the Episkopi Formation [2, 6, 13], where it is subdivided into Early and Late Wuchiapingian by conodonts [6, 13]. The Early Wuchiapingian/Dzhulfian is also dated by foraminifera, reworked within Jurassic breccias in Argolis [25]. Finally, the Changxingian/Dorashamian is characterised by various foraminifera: *Palaeofusulina*, *Globivalvulinoides*, *Baudiella*, *Paradoxiella*, *Colaniella* in Attica [1, 27], and in the upper part of the Episkopi Fm. [2, 6], which contains true *Palaeofusulina* [6].

We document and illustrate the first regional Late Wuchiapingian association of foraminifera, algae, and pseudo-algae.

#### 4. Microfacies analysis

The most interesting microfacies of Late Permian olistolites is a bioclastic grainstone with two generations of cements (palissadic and coarsely granular). The assemblage is rich in algae, corresponding to an agitated environment in the photic zone, probably at a depth of 5–10 m, in a tropical carbonate ramp. The microfossils are composed of:

- metazoan remains: gastropods (including *Bellerophontoidea*), bivalves, crinoids, bryozoa, calcisponges;
- algae: *Parachaetetes* sp., *Permocalculus* sp., *Gymnocodium bellerophontis* (Rothpletz) Pia, *Eugonophyllum* sp., *Mizzia* cf. *yabei* (Karpinsky), *Macroporella apachena* Johnson, *Salopekiella* sp., *Likanella* (?) sp., *Atractyliopsis lastensis* Accordi;

- pseudo-algae: *Tubiphytes obscurus* Maslov (morphotypes similar to the foraminifer *Nodophthalmidium*; Fig. 2.5), *Claracrusta calamistrata* Vachard, *Eflugelia johnsoni* (Flügel) Massa and Vachard, *Ungdarella* (?) sp.;
- smaller foraminifera: *Spireitlina conspecta* (Reitlinger), *Neoendothyra* sp., *Tetrataxis conica* (Ehrenberg), *Abadehella* sp., *Palaeotextularia* sp., *Climacammina* cf. *valvulinoides* Lange, *Cribrogenerina* sp., *Globivalvulina graeca* Reichel, *G. vonderschmitti* Reichel, *Sengoerina* cf. *argandi* Altiner, *Pseudovermiporella* ex gr. *nipponica* (Endo in Endo and Kanuma), *Neodiscus* sp., *Multidiscus* ex gr. *padangensis* (Lange), *Hemigordiopsis* cf. *luquensis* (Wang and Sun) (Fig. 2.1), *Agathammina* sp., *Calvezina* (?) sp., *Pachyphloia* sp., *Nodosaria* (?) sp., *Colaniella* aff. *minima* Wang (Figs. 2.3 and 2.4).
- fusulinids: *Sphaerulina zisonzhengensis* Sheng, *Reichelina* sp., *Schubertella* sp., *Codonofusiella* sp., *Paradunbarula* (*Shindella*) *shindensis* Chediya in Kotlyar et al. (Figs. 2.1 and 2.2), *Nanlingella* (?) sp., abraded *Neoschwagerina* sp.

## 5. Origin of olistolites

The origin of these Late Wuchiapingian olistolites must be sought within the nappe of Subpelagionian unit where relatively similar assemblages have been described within its Permian–Triassic basal successions in Hydra island [2, 6, 13, 18, 19] and Karavia islets [22, 23], as well as within Jurassic breccias in Argolis [25]. The foraminiferal and algal composition of the middle part of the Episkopi Formation in Hydra, previously listed [2, 6], might be interpreted as nearly identical. *Colaniella* ex gr. *minima* is mentioned, the group of ‘*Hemigordiopsis renzi*’ contains probably some *H.* cf. *luquensis*, and ‘*Palaeofusulina* sp.’ of the Episkopi Fm. might correspond partially to *Paradunbarula* (*Shindella*). Compare, for instance, our *Shindella* (Fig. 2.2) with *Palaeofusulina nana* Likharev, recently re-figured [16, pl. 7, Fig. 11]. Only the septal folding is stronger in this primitive *Palaeofusulina* of the Changxingian, finally very similar to the advanced *Shindella* of the Glypia unit.

## 6. Biostratigraphic importance

Three markers generally isolated are here associated: *Paradunbarula* (*Shindella*) *shindensis*, *Hemigordiopsis* cf. *luquensis* and *Colaniella* aff. *minima*. According to the classical Russian criteria [3, 9–11, 15, 16], generally adopted in western Europe [2, 6–8] age could be supposed to be Late Capitanian/Midian. Nevertheless, a Late Dzhulfian dating is more justified

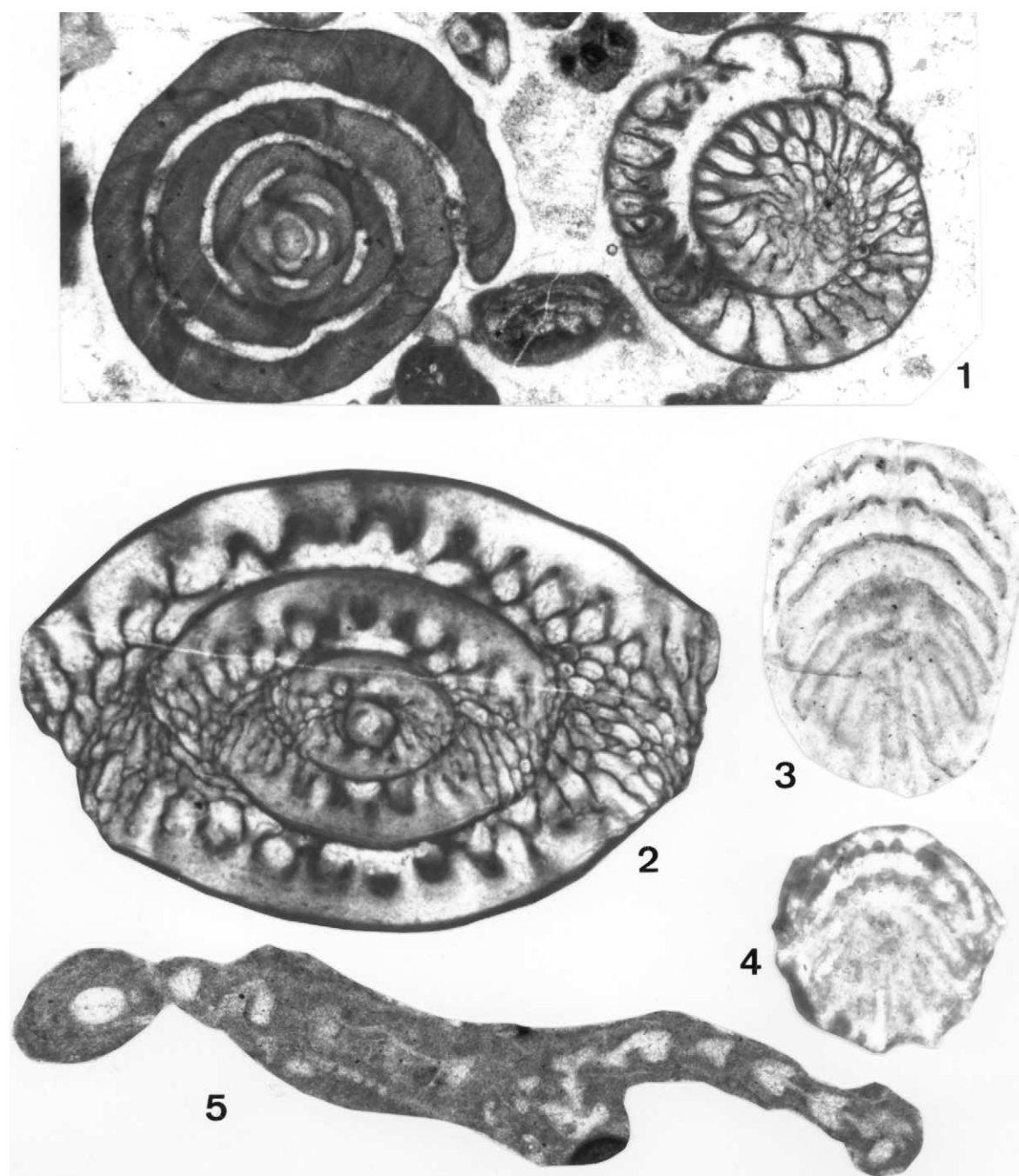
for five reasons: (a) the *Shindella* zone is placed in the Late Dzhulfian by Davydov et al. [5]; (b) the beds containing *Shindella* in Pamir [9] are located between Early Midian and Early Triassic deposits, and are not typically Late Midian; (c) in Greece, a relatively similar assemblage, dated Early Dzhulfian [25], is actually more primitive because it includes *Pseudodunbarula* and *Pseudowanganella* and not *Paradunbarula* (*Shindella*) and *Colaniella*, more advanced phylogenetically (Fig. 3); (d) Late Wuchiapingian conodonts are known in the middle part of the carbonate Episkopi Formation in Hydra [6, 13]; (e) two taxa of our assemblage correspond respectively to atypical forms of *Nanlingella*, and to a *Sengoerina* relatively similar by its wall structure to *Paradagmarita flabelliformis* Zaninetti et al., even if true *Nanlingella* and *Paradagmarita* are considered as Changxingian microfossils.

Compared to different data of Tethyan foraminifera (Vachard et al., work in progress), this Late Wuchiapingian assemblage suggests six preliminary biostratigraphic remarks: (a) the *Shindella* biozone is definitely Late Wuchiapingian in age, from Greece to China; (b) among the subdivisions of the stratotypic Dzhulfian in Transcaucasia, in the absence of *Shindella*, the *Shindella* biozone can probably be correlated with the zone IX (Late Dzhulfian) and not with the zone VII (Latest Midian), as proposed [10]; (c) the genus *Hemigordiopsis* is present in the Late Dzhulfian, contrary to the opinion of Pronina [16]; many of these Dzhulfian *Hemigordiopsis* are probably erroneously identified with *Neodiscus*, *Kamurana* or *Pseudobaisalina*; (d) the first appearance of *Colaniella* is in the Late Dzhulfian, contrary to previous proposals [4, 7, 12]; this fact confirms entirely the reworking reported from Italy [8]: *Colaniella* cannot biologically coexist with *Afghanella*, which disappears in the Earliest Capitanian/Midian (Fig. 3), similarly the unique abraded section of *Neoschwagerinid* observed in our material is reworked (Fig. 3); (e) although ancestor of *Shanita*, *Hemigordiopsis* can survive this latter (Fig. 3); (f) *Graecodiscus*, although absent of the investigated material, is known from the Early Dzhulfian [25] (Fig. 3) to the Late Dorashamian [17].

## 7. Palaeogeographic consequences

The assemblage is also palaeobiogeographically significant, and it testifies similarities between Greece, southeastern Pamir, and southern China.

*Paradunbarula* has been described in Anatolia (Turkey) [20], the subgenus *Shindella* is identified in southeastern Pamir and southern China [9], but lacks in Transcaucasia [10]. *Hemigordiopsis luquensis* (Wang and Sun) is a species from southern China



**Figure 2.** Main microfossils from the Late Wuchiapingian of Mount Parnon, Greece. **1:** *Hemigordiopsis* cf. *luquensis* (Wang and Sun, 1973), transverse section (left) with *Paradunbarula* (*Shindella*) *shindensis* Chediya in [9], subtransverse section (right) and the general aspect of the microfacies (a bioclastic and peloidal grainstone). Sample Phi 38b.  $\times 30$ ; **2:** *Paradunbarula* (*Shindella*) *shindensis* Chediya in [9], axial section, showing the proloculus, the four whorls, the septal folding and the septal pores. Sample Phi 38b.  $\times 40$ . **3–4:** *Colaniella* aff. *minima* Wang, 1966; **3:** subaxial section, sample Phi 38a.  $\times 75$ ; **4:** oblique section; sample Phi 38a.  $\times 75$ ; **5:** *Tubiphytes obscurus* Maslov, 1956, longitudinal section, with three stages of development – proloculus (right), a relatively regular *Nodophthalmidium*-like (right), and irregular, i.e. typical stage (centre and left). Sample Phi 38b.  $\times 75$ .

**Figure 2.** Principaux microfossiles du Wuchiapingien supérieur du mont Parnon, en Grèce. **1 :** *Hemigordiopsis* cf. *luquensis* (Wang et Sun, 1973), section transverse (à gauche), avec *Paradunbarula* (*Shindella*) *shindensis* Chediya in [9], section subtransverse (à droite) et aspect général du microfaciès (un *grainstone* pelloïdal et bioclastique). Échantillon Phi 38b.  $\times 30$ ; **2 :** *Paradunbarula* (*Shindella*) *shindensis* Chediya in [9], section axiale montrant le proloculus, les quatre tours de spire, les cloisons plissées et les pores septaux. Échantillon Phi 38b.  $\times 40$ . **3–4 :** *Colaniella* aff. *minima* Wang, 1966; **3 :** section subaxiale, échantillon Phi 38a.  $\times 75$ ; **4 :** section oblique, échantillon Phi 38a.  $\times 75$ ; **5 :** *Tubiphytes obscurus* Maslov, 1956, section longitudinale, avec trois stades de développement : proloculus (à droite), suivi d'un stade *Nodophthalmidium* assez régulier (à droite), puis d'un stade irrégulier, c'est-à-dire typique (au centre et à gauche). Échantillon Phi 38b.  $\times 75$ .

CHRONOSTRATIGRAPHY		SMALLER FORAMINIFERS			FUSULINIDS		
		HEMIGORDIIDS	NODOSARIOIDS	SCHUBERTELLOIDS	NEOSCHWAGERINOIDS	SCHWAGERINOIDS	
L A T E P E R M I A N	CHANGXINGIAN / DORASHAMIAN		<i>Pseudomidiella-Graecodiscus</i>	<i>Colaniella lepida</i>	<i>Palaeofusulina-Nanlingella</i>	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">post-keriotheca phase</div>	
	W U C H I A P I N G I A N	Late	<i>Hs. cf. luquensis-Kamurana s.s.</i>	<i>Colaniella aff. minima</i>	<i>Nanlingella (?) - Paradunbarula (Shindella)</i>		
		Early	<i>Graecodiscus</i> <i>Shanita</i>	<i>Pseudowanganelia</i>	<i>Paradunbarula (Paradunbarula)</i> <i>Pseudodunbarula</i>		
M I D D L E P E R M I A N  (partim)	C A P I T A N I A N	Latest		?	Advanced <i>Dunbarula</i>	?	very rare <i>Chusenella</i>
		Late	" <i>Kamurana (?)</i> "- <i>Hs. orientalis</i>	?		<i>Neoschwagerina-Yabeina-Lepidolina-Neosumatrina</i>	<i>Chusenellidae</i>
		Early	<i>Hemigordiopsis renzi</i>		Typical <i>Dunbarula</i>	<i>Yabeina-Neoschwagerina-Sumatrina</i>	<i>Chusenella</i>
		Earliest	<i>Neodiscus spp.</i>	<i>Nodosinelloides (?) spp.</i>	Primitive <i>Dunbarula</i>	<i>Neoschwagerina-Advanced. Afghanella-Sumatrina</i>	<i>Chusenella-</i> last <i>Eopolydiexodina</i>
	WORDIAN/MURGABIAN				<i>Rauserella</i>	Typical <i>Afghanella-Neoschwagerina</i>	<i>Eopolydiexodina</i> <i>Parafusulina</i>

**Figure 3.** Comparative table of the main foraminifers of the Middle–Late Permian in the Tethyan basins from Greece to southern China (compilation of several published and unpublished data, especially from Afghanistan, Tunisia, Oman and Cambodia; Vachard et al., work in progress).

**Figure 3.** Tableau comparatif des principaux groupes de foraminifères du Permien moyen et supérieur dans les bassins paléotéthysiens de la Grèce à la Chine du Sud (compilation de différentes données publiées ou inédites, provenant en particulier d’Afghanistan, Tunisie, Oman et Cambodge ; Vachard et al., travail en cours).

[28]. Its probable synonym *H. orientalis* (Wang and Sun) [28] is found in southern China and Transcaucasia [10, 15], probably in Early Midian beds [10, 12]. Our material (Fig. 2.1) is relatively atypical, because it displays fewer whorls (4–5 versus 5–7) for the same diameter, but is evidently identical to a taxon described in Montenegro [14, pl. 5, Figs. 1–4]: under the erroneous name of *H. renzi*. The most primitive *Colaniella* were mentioned in Pamir and southern China [3, 7].

Similarly, the recently described Early Changxingian fusulinid genus *Baudiella* [1] is only known from two localities: in Greece (Salamis Island) and southern China (Nanjing area).

Consequently, the similarities between the Greek microfauna with that of southern China and southeastern Pamir confirm palaeogeographic reconstructions that indicate a closer location of these three geographic units. The Palaeotethys of the time was probably narrow and its southern shallow carbonate shelf extended in continuity from Greece to southeastern

Pamir and southern China, via Turkey and southern Iran, and was situated in the same tropical or sub-equatorial latitude. These data are congruent with a Pangea B, similar to that suggested by Crasquin et al. [4].

## 8. Conclusions

The origin of the Late Wuchiapingian (Late Permian) olistolites found in the Glypia Tertiary flysch must be sought in regions located to the east of the Mount Parnon and in units that were more internal to Pindos Unit. The islets of Karavia in the Argolis Gulf, and the Episkopi Formation in the Hydra Island, display the largest outcrops of this age. Permian pebbles described in Jurassic breccias in Potami Formation in Argolicum Peninsula may also be the origin of these blocks.

Three markers generally not co-occurring are locally associated: *Paradunbarula (Shindella) shinden-*

*sis*, *Hemigordiopsis* cf. *luquensis* and *Colaniella* aff. *minima*. Therefore, in the range-biozone of *Shindella*, correctly dated as Late Wuchiapingian/Dzhulfian by Davydov et al. [5], coexist the first *Colaniella* with the last *Hemigordiopsis* (Fig. 3).

## References

- [1] D. Altiner, S. Özkan Altiner, *Baudiella stampflii*, n. gen., n. sp., and its position in the evolution of Late Permian ozawainellid fusulines, *Rev. Paléobiol.* 17 (1) (1998) 163–175.
- [2] A. Baud, C. Jenny, D. Papanikolaou, C. Sideris, G. Stampfli, New observations on Permian stratigraphy in Greece and geodynamic interpretation, *Bull. Geol. Soc. Greece* 25 (1) (1991) 187–206.
- [3] I.O. Chediya, V.I. Davydov, Stratigraphic range of *Colaniellas* (foraminifera), *Doklady Akad. Nauk SSSR* 252 (1982) 55–59 (English translation by Scripta Publ. Co.).
- [4] S. Crasquin-Soleau, J. Broutin, J. Besse, M. Berthelin, Ostracods and paleobotany from the Middle Permian of Oman: implications on Pangaea reconstruction, *Terra Nova* 13 (1) (2001) 38–43.
- [5] V.I. Davydov, P. Belasky, N.I. Karavayena, Permian fusulines from the Koryak terrane, northeastern Russia, and their paleogeographic affinity, *J. Foraminifer. Res.* 26 (3) (1996) 213–243.
- [6] R.E. Grant, M.K. Nestell, A. Baud, C. Jenny, Permian stratigraphy of Hydra Island, Greece, *Palaios* 6 (1991) 479–497.
- [7] C. Jenny-Deshusses, A. Baud, *Colaniella*, foraminifère index du Permien tardif téthysien : propositions pour une taxonomie simplifiée, répartition géographique et environnements, *Ecolgae Geol. Helv.* 82 (3) (1989) 869–901.
- [8] C. Jenny-Deshusses, R. Martini, L. Zaninetti, Découverte de foraminifère *Colaniella* Likharev dans le Permien supérieur de la vallée du Sosio (Sicile), *C. R. Acad. Sci. Paris, Ser. IIA* 330 (2000) 799–804.
- [9] G.V. Kotlyar, Yu.D. Zakharov, B.V. Kochirkevich, G.S. Kropacheva, K.O. Rostovtsev, I.O. Chediya, G.P. Vuks, E.A. Guseva, Pozdnepermiskii etap evolyutsii organicheskogo mira, Dzhulfinskii i Dorashamskii yarusy SSSR (Evolution of the Latest Permian biota, Dzhulfian and Dorashamian stages of the USSR), *Akademiya Nauk SSSR, Dalnevostochnyi Nauchnyi Tsentr, Biologo-Pochvennyi Institut, Leningrad*, 1984, 200 p.
- [10] G.V. Kotlyar, Yu.D. Zakharov, G.S. Kropacheva, G.P. Pronina, I.O. Chediya, V.I. Burago, Pozdnepermiskii etap evolyutsii organicheskogo mira, Midinskii yarus SSSR (Evolution of the Latest Permian biota, Midian stage of the USSR), 'Nauka', Leningr. Otdel, Leningrad, 1989, 177 p.
- [11] E.Y. Leven, Problems of Tethyan Permian stratigraphy, *Int. Geol. Rev.* 34 (10) (1992) 976–985.
- [12] J.X. Lin, J.X. Li, Q.Y. Sun, Late Paleozoic foraminifers in South China, Science Publication House, Beijing, 1990, 297 p. (in Chinese).
- [13] M.K. Nestell, B.R. Wardlaw, Upper Permian conodonts from Hydra, Greece, *J. Paleontol.* 61 (1987) 758–772.
- [14] S. Pantic, Gornjopermski mikrofosili iz anizijskih konglomerata Haj Nehaja, Crna Gora, *Vesnik Zavoda za geol. i geof. istraz.* A 21 (1965) 145–167.
- [15] G.P. Pronina, The Late Permian smaller foraminifers of Transcaucasus, Benthos'86 (volume spécial), *Rev. Paléobiol.* 2 (1988) 89–96.
- [16] G.P. Pronina, Upper Permian small foraminifers zonal standard in the Tethyan realm, in: 13th Int. Congr. Carb.-Perm. (XIII ICC-P), Abstracts, 1995, p. 118.
- [17] G.P. Pronina-Nestell, M.K. Nestell, Late Changhsingian foraminifers of the northwestern Caucasus, *Micropaleontology* 47 (3) (2001) 205–234.
- [18] C. Renz, in: Die Vorneogene Stratigraphie der normal sedimentären Formationen Griechenlands, *Inst. Geol. Subsurf. Research, Athens*, 1955, 672 p.
- [19] H. Römermann, Geologie von Hydra (Griechenland), *Geol. Palaeontol.* 2 (1968) 163–171.
- [20] J.W. Skinner, Permian foraminifera from Turkey, *Univ. Kansas Paleontol. Contrib.* 36 (1969) 1–14.
- [21] E. Skourtsos, A. Zambetakis-Lekkas, A. Alexopoulos, S. Lekkas, The presence of the Internal Hellenides on Mount Parnon range (central eastern Peloponnesus, Greece), 9th Int. Congress Geol. Soc. Greece, *Bull. Geol. Soc. Greece* 34 (1) (2001) 47–54.
- [22] A. Tataris, Geological observations on the islands Diapaximadi–Petalidi (Sea of Crete) and Ananes–Makra–Pacheia–Karavia–Falconera–Velopoula (S. Aegean Sea), *Pract. Acad. Athens* 44 (1969) 58–69.
- [23] A. Tataris, The Paleozoic of the Karavia islets, east of Lakonia (Aegean Sea), *Bull. Geol. Soc. Greece* 20 (2) (1988) 21–38.
- [24] E. Trifonova, Upper Permian foraminifers from south-eastern Lakonia (Peloponnesus, Greece), *Geol. Balc.* 15 (4) (1985) 83–92.
- [25] D. Vachard, P. Clift, D. Decrouez, Une association à *Pseudodunbarula* (fusulinoïde) du Permien supérieur (Djoulfien) remaniée dans le Jurassique d'Argolide (Péloponnèse, Grèce), *Rev. Paléobiol.* 12 (1) (1993) 217–242.
- [26] D. Vachard, R. Martini, L. Zaninetti, Le Murgabien à fusulinoïdes des îles d'Hydra, Crète et Mytilène (Permien supérieur de Grèce), *Géobios* 28 (4) (1995) 395–406.
- [27] D. Vachard, R. Martini, L. Zaninetti, A. Zambetakis-Lekkas, Révision micropaléontologique (foraminifères, algues) du Permien inférieur (Sakmarien) et supérieur (Dorashamien) du mont Beletsi (Attique, Grèce), *Boll. Soc. Pal. Ital.* 32 (1) (1993) 89–112.
- [28] K.L. Wang, X.F. Sun, Carboniferous and Permian foraminifera of the Chiling Range and its geologic significance, *Acta Geol. Sin.* 2 (1973) 137–178.