

An ostracod marker for the Upper Badenian (Miocene) of the Central Paratethys

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ABSTRACT – *Carinocythereis galilea* Ruggieri jiriceki n. ssp. is described from the Upper Badenian of Węglin, Roztocze Region, Southern Poland. Specimens belonging to the new subspecies, in previous literature have been commonly assigned to *Carinocythereis carinata* (Roemer, 1838). *Carinocythereis galilea jiriceki* n. ssp. is an important marker for the Upper Badenian shallow water marine sediments of the Central Paratethys.

RIASSUNTO – [Un ostracode marker del Badeniano Superiore della Paratetide Centrale] – Viene descritta *Carinocythereis galilea* Ruggieri jiriceki n. ssp. proveniente da sabbie siltose del Badeniano Superiore di Węglin, regione di Roztocze, Polonia meridionale. A causa della variabilità dell'ornamentazione evidenziata da alcune specie del genere *Carinocythereis* Ruggieri, 1956, i criteri di attribuzione specifica utilizzati in letteratura risultano piuttosto diversificati. Gli esemplari appartenenti alla nuova sottospecie, che ha mostrato una notevole costanza nei caratteri fondamentali, sono stati in precedenza erroneamente attribuiti da vari autori a *Carinocythereis carinata* (Roemer, 1838), interpretazione che ne ha finora sminuito il valore di marker del Badeniano Superiore della Paratetide Centrale in sedimenti di ambiente costiero.

INTRODUCTION

The distinction among the different species of the genus *Carinocythereis* Ruggieri, 1956, is particularly complex due to the variability of the development of the carinae that represent the main feature upon which this group's systematics is based.

This has lead, on one side, to an excessive proliferation of species and, on the other side, to the same naming of different 'forms'. *C. carinata* (Roemer, 1838), *C. antiquata* (Baird, 1850), *C. whitei* (Baird, 1850), *C. bairdii* Uliczny, 1969, *C. galilea* Ruggieri, 1972, *C. florealis* Ruggieri, 1992 are some of the species, with clear morphological affinities, that have been distinguished within a group of *Carinocythereis* of the European Neogene.

Two different interpretative approaches have been used by authors in dealing with the problem of the distinction among these species. The first approach, of the French school, considers that the wide variability of the development of the carinae can be demonstrated; consequently, it tends to account the different 'species' as morphotypes of a single 'specific group', that is *C. carinata*, or *C. antiquata* / *carinata* group (e.g. Carbonel & Moyes, 1971; Carbonel, 1977). The second approach, which could be named of the Italian-British school, acknowledges a certain degree of intra-specific variability, but considers that the features of the ornamentation are constant enough to distinguish at least three species, that is *C. carinata*, *C. whitei* and *C. galilea* (Ruggieri,

1972; Ruggieri & Russo, 1980; Athersuch *et al.*, 1989, with literature). In a previous paper, in order to evidence the relationship of the Central Paratethys with the Mediterranean area, one of us (Szczechura, 1997) adopted the first methodology. The specimens studied in the present paper, from the Upper Badenian of southern Poland, show such a little variability as to convince us, also by means of a survey of the previous literature's iconography, to prefer the second methodology.

In 1980, Ruggieri & Russo designated a neotype of *C. carinata* allowing Athersuch & Whittaker (1987a; 1987b) to operate a clear distinction between *C. carinata* and *C. whitei*, by using the development of the main carinae as the most important feature. As summarised by Athersuch *et al.* (1989), in *C. carinata* the "short ventromedian carina does not reach anterior margin" while in *C. whitei* the "ventromedian carina extends to run concentric to the anterior margin". Along the same line of interpretation, Ruggieri (1972) described, from the upper Miocene, *C. galilea*, whose fundamental characteristic is the angular bending of the median carina.

The specimens figured from the Central Paratethys and assigned by various authors to *C. carinata*, pertain to the new subspecies of *C. galilea* herein described.

This study utilizes samples belonging to the silty sands of Węglin, Fore-Carpathian Depression, Southern Poland, previously studied by Szczechura (1982; 1996; 1997) and Szczechura & Pisera (1986). The age of the sediments, deposited in a shallow

upper neritic coastal environment, is Upper Badenian (Szczechura, 1982). One figured specimen has been collected from an Upper Badenian sample recovered in the borehole G-21, Gliwice, southern Poland (Alexandrowicz, 1997; Aiello & Szczechura, in press).

The specimens studied in the present paper are housed in the Institute of Paleobiology, Polish Academy of Sciences, Warsaw (ZPAL).

The SEM micrographs were realized in the Electronic Microscopy Laboratory of the Institute of Paleobiology of the Polish Academy of Sciences.

SYSTEMATICS DESCRIPTION

Class OSTRACODA Latreille, 1806

Order PODOCOPIDA Müller, 1894

Suborder PODOCOPINA Sars, 1866

Superfamily CYTHERACEA Baird, 1850

Family TRACHYLEBERIDIDAE Sylvester-Bradley, 1948

Genus CARINOCYTHEREIS Ruggieri, 1956

CARINOCYTHEREIS GALILEA Ruggieri, 1972

JIRICEKI n. ssp.

Pl. 1, figs. 1-11

?1965 *Carinocythereis carinata* (Roemer) – TZANKOV *et al.*, pl. 149, fig. 10.

1978 *Carinocythereis carinata* (Roemer) – BRESTENSKÁ & JIRÍČEK, pl. 4, figs. 8-9.

1991 *Carinocythereis carinata* (Roemer) – JIRÍČEK & ŘÍHA, pl. 3, fig. 5.

1996 *Carinocythereis carinata* (Roemer) – SZCZUCHURA, pl. 1, figs. 14-16.

1996 *Carinocythereis carinata* (Roemer) – PARUCH-KULCZYCKA, pp. 732-733, pl. 228, figs. 6-7.

1997 *Carinocythereis carinata* (Roemer) – SZCZUCHURA, pp. 4-5, pl. 1, figs. 9-10.

Derivation of name – In honour of Dr. Rudolf Jiríček, who studied the stratigraphical distribution of a large number of ostracod species in the Paratethys.

Material – 20 valves, 2 carapaces.

Types – Holotype, ZPAL 0.48/10, Paratypes, ZPAL 0.48/11-17, ZPAL 0.XL/9-10, ZPAL 0.XXXV/294-296.

Type level – Upper Badenian.

Type locality – Łychów, Węglin, Roztocze Region, Fore-Carpathian Depression, SE Poland.

Distribution – Upper Badenian of the Central Paratethys: Mikulov, Southern Moravia (Brestenská & Jiríček, 1978); Kuzmice, Slovakia (Jiríček & Říha, 1991); Węglin, Poland (Paruch-Kulczycka, 1996; Szczechura, 1996; 1997; this paper); Gliwice 21 borehole, Poland, as shallow water contaminant (Szczechura, 1997; this paper).

Dimensions – Holotype specimen ZPAL 0.48/10, CC, L = 0.86 mm, H = 0.41 mm. (Pl. 1, fig. 1).

Diagnosis – A subspecies of *Carinocythereis galilea* Ruggieri, 1972, with not ponticulate carinae. Anterior marginal carina continuous with the ventral marginal carina. Median carina continuous, in some specimens interrupted in correspondence of the muscle scars area; in the anterior part it shows the angular bending with upward apex distinctive of *C. galilea*. Median and ventromedian carinae produced anteriorly, not connected in adult specimens; in the juveniles the median and the ventromedian carinae are joined together (Pl. 1, fig. 10).

Remarks – The specimen figured by Jiríček & Říha (1991) is a juvenile. The left valve figured by Tzankov *et al.* (1965) from the Badenian (reported as Tortonian in the paper) of Bulgaria seems to show the typical features of *C. galilea jiriceki* n. ssp. but the poor quality of the plate does not allow a certain specific attribution.

EXPLANATION OF PLATE 1

Figs. 1-11 - *Carinocythereis galilea* Ruggieri, 1972 *jiriceki* n. ssp.

1) Holotype, LV, female, Łychów, Węglin, Poland, upper Badenian, ZPAL 0.48/10, (× 68).

2) Paratype, RV, female, ZPAL 0.48/11, (× 70).

3) Paratype, LV, female, ZPAL 0.48/12, (× 65).

4) Paratype, RV, male, ZPAL 0.48/13, (× 63).

5) Paratype, LV, male, ZPAL 0.48/14, (× 63).

6) Paratype, CC in dorsal view, female, ZPAL 0.48/15, (× 65).

7) LV of a CC, same specimen as in fig. 6, (× 65).

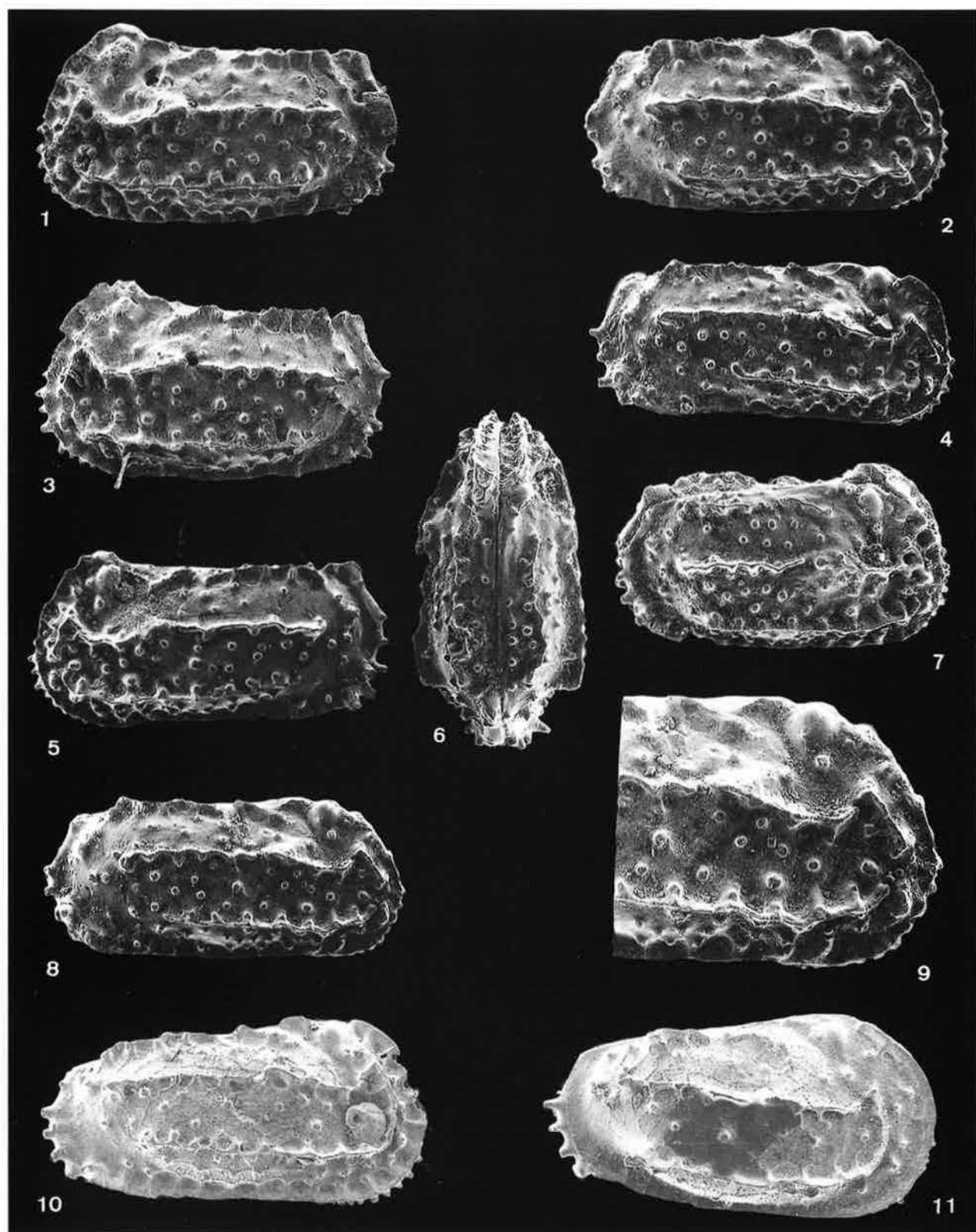
8) Paratype, RV, male, ZPAL 0.48/16, (× 65).

9) Detail of RV, same specimen as in fig. 8 (× 103).

10) Paratype, RV, instar, ZPAL 0.48/17, (× 88).

11) RV, instar, borehole G-21, Stn. 31 m, Gliwice, Poland, upper Badenian, ZPAL 0.48/18, (× 122).

LV = left valve; RV = right valve; CC = complete carapace.



In comparison with some related species of *Carinocythereis*, the new subspecies shows a relative constancy in the ornamentation of the valves, including the development of the carinae.

Ruggieri & Russo (1980) described the genus *Occlusocythereis* from the Italian upper Miocene, which differs from *Carinocythereis* exclusively in the non-ponticulate carinae. Following this point of view, *C. galilea jiriceki* n. ssp. should pertain to *Occlusocythereis*. In our opinion the ponticulation of the carinae is a specific or subspecific, not generic, feature. The clear similarity of *C. galilea galilea* (ponticulate carinae) and *C. galilea jiriceki* n. ssp. (not ponticulate) does not allow to place these forms in two different genera. Consequently *Occlusocythereis*, as previously stated by Mostafawi (1989), should be considered as a synonym of *Carinocythereis*.

Comparisons – Ruggieri (1972) described *Carinocythereis galilea* from the upper Miocene of S. Giovanni in Galilea, Italy, reporting a wide variability in the development of the carinae and in the shape of the tubercles (for a SEM micrograph see Miculan, 1992, pl. 1, fig. 8). *C. galilea jiriceki* n. ssp. differs from *C. galilea galilea* due to the anterior marginal carina which is continuous and to the non-ponticulate carinae. *C. galilea* s.l. differs from *C. whitei* due to the median carina anteriorly produced and to the ventromedian carina which does not run parallel to the anterior margin.

Carinocythereis antiquata, *C. bairdii* and *C. florealis* are here considered as synonyms of *C. whitei*.

The (probably allochthonous) specimen of *C. carinata* "form très âgée" figured by Carbonel & Moyes (1971, pl. 2, fig. 9) pertains to *C. galilea* s.l., but the state of preservation does not allow a subspecific attribution.

The other known species of *Carinocythereis*, including *C. carinata*, show a very different running of the carinae.

BIOSTRATIGRAPHIC MEANING OF *C. GALILEA JIRICEKI* N. SSP.

Various authors considered "*C. carinata*" as a valid marker for the Middle/Upper Miocene of the "Tethys" (Paleo-Mediterranean) and Paratethys (Carbonel & Jiříček, 1977; Jiříček & Říha, 1991, with literature).

In the most recent zonation (Jiříček & Říha, 1991), the uppermost Badenian/Konkian has been included in the Zone 10 of the Ostracod Zonation of the Paratethys, the *Phlyctenophora farkasi* / *Carinocythereis carinata* zone.

The presence of *C. carinata* (sensu Ruggieri & Russo, 1980) in the European Miocene sediments is not demonstrated. The main part of the findings of *C. carinata* in the Miocene has to be referred to *C.*

whitei, *C. galilea galilea* or to *C. galilea jiriceki*. The three taxa are strictly related, and they could be informally included in a "*C. whitei* group". Unfortunately many recordings of this group are not supported by figures (for a complete bibliography see Szczecura, 1996; 1997; Nascimento & Říha, 1996).

Due to the marked affinities of *C. whitei*, *C. galilea galilea* and *C. galilea jiriceki*, the paleogeographic importance of this "group" of taxa, discussed by Carbonel (1977, as *C. antiquata* / *carinata* group) and by Szczecura (1997; as *C. carinata*), is not questioned in the present paper.

Carinocythereis whitei occurs from the Tortonian of the Paleo-Mediterranean (e. g. Bonaduce *et al.*, 1992, pl. 14, fig. 7) to the Recent of the Atlantic and Mediterranean (Athersuch *et al.*, 1989).

Carinocythereis galilea galilea has been found in the Upper Miocene of the Paleo-Mediterranean (Dieci & Russo, 1965, as *C. carinata*; Ruggieri, 1972; Miculan, 1992); the form reported as *C. galilea* from the upper Miocene of Portugal by Nascimento (1990), an instar, is of doubtful assignment. The presence of *C. galilea* s.l. in the Atlantic Miocene is confirmed by unpublished data of Prof. G. Bonaduce who found some specimens of this species in shallow water Tortonian sediments of Bou Regreg, Morocco (Bonaduce, pers. comm.).

Carinocythereis galilea jiriceki has been found exclusively in the Upper Badenian of the Central Paratethys. Consequently the Ostracod Zone 10 of Jiříček & Říha (1991) should be named *P. farkasi* / *C. galilea jiriceki* zone. According to the recent biostratigraphic correlations the Upper Badenian of the Paratethys corresponds to the middle Serravallian of the Paleo-Mediterranean (Rögl, 1998), therefore the correlation of the *P. farkasi* / *C. galilea jiriceki* zone with the Upper Serravallian/Lower Tortonian of the "Tethys", hypothesised by Jiříček & Říha (1991), should be rejected.

The first occurrence of *Carinocythereis*, as *C. carinata*, is at the Burdigalian/Langhian boundary of Turkey, but the species is not figured (Gökçen, 1984).

Some of the species of *Carinocythereis* reported, also as *Occlusocythereis*, from the Neogene shallow-water sediments of the Paleo-Mediterranean and Paratethys, could demonstrate a remarkable palaeogeographic and biostratigraphic interest, likewise to *C. galilea*.

In this prospect, it is recommended that the records of important ostracod species should be supported in literature with SEM micrographs. As commonly in paleontology, the lack of good quality pictures frequently involves the loss of important data.

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