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Ostracoda from the Gaindorf Formation (Middle Miocene, Lower Badenian) of Mühlbach (Molasse Basin, Lower Austria)

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(With 2 figs.)

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Abstract

From the Gaindorf Formation (Middle Miocene, Badenian) of Mühlbach am Manhartsberg (Molasse Basin, Lower Austria), the following marine ostracods are recorded: *Callistocythere canaliculata* (REUSS, 1850), *Cytheridea paracuminata* KOLLMANN, 1960, *Parakrithe* sp., *Acanthocythereis hystrix* (REUSS, 1850), *Olimfalunia plicatula* (REUSS, 1850), *O. spinulosa* (REUSS, 1850), *Pterygocythereis fimbriata* (MÜNSTER, 1830), *Aurila cicatricosa* (REUSS, 1850), *A. albicans* (RUGGIERI, 1958), *A. punctata* (REUSS, 1850), *Senesia* ex gr. *vadaszi* (ZALÁNYI, 1913), *Loxoconcha punctatella* (REUSS, 1850), *Sagmatocythere* sp., *Konarocythere inflata* (SCHNEIDER, 1949), *Cytheropteron* sp. and *Xestoleberis tumida* (REUSS, 1850).

In addition, information is provided on further ostracod faunas from the Gaindorf Formation and the coeval Grund Formation. The occurrence of *Acanthocythereis hystrix* (REUSS, 1850) suggests an Early Badenian age for the Gaindorf Formation. Paleoecologically, the ostracod fauna of Mühlbach contains elements of the lower infralittoral to the circalittoral. Several taxa (*Callistocythere*, *Cytheretta*, *Neomonoceratina, Acanthocythereis hystrix)* from the Gaindorf Formation are indicative of a warm-temperate sea.

Key words: Ostracoda, Miocene, Badenian, Gaindorf Formation, Central Paratethys, Mühlbach (Lower Austria), paleoecology, biostratigraphy

Zusammenfassung

In der Gaindorf-Formation (Mittel-Miozän, Badenium) von Mühlbach am Manhartsberg (Molassezone, Niederösterreich) wurden folgende marine Ostracoden gefunden: *Callistocythere canaliculata* (REUSS, 1850), *Cytheridea paracuminata* KOLLMANN, 1960, *Parakrithe* sp., *Acanthocythereis hystrix* (REUSS, 1850), *Olimfalunia plicatula* (REUSS, 1850), *O. spinulosa* (REUSS, 1850), *Pterygocythereis fimbriata* (MÜNSTER, 1830), *Aurila cicatricosa* (REUSS, 1850), *A. albicans* (RUGGIERI, 1958), *A. punctata* (REUSS, 1850), *Senesia* ex gr. *vadaszi* (ZALÁNYI, 1913), *Loxoconcha punctatella* (REUSS, 1850), *Sagmatocythere* sp., *Konarocythere inflata* (SCHNEIDER, 1949), *Cytheropteron* sp. und *Xestoleberis tumida* (REUSS, 1850).

Zusätzlich werden Informationen über weitere Ostracodenfaunen der Gaindorf-Formation und der zeitgleich abgelagerten Grund-Formation gegeben. Das Vorkommen von *Acanthocythereis hystrix* (REUSS, 1850) legt ein frühbadenisches Alter für die Gaindorf-Formation nahe. Die paläoökologische Auswertung der Ostracodenfauna von Mühlbach ergab Elemente des äußeren Infralitorals bis Zirkalitorals. Einige Taxa (*Callistocythere*, *Cytheretta*, *Neomonoceratina, Acanthocythereis hystrix)* der Gaindorf-Formation belegen ein warm-gemäßigtes Meer.

Schlüsselworte: Ostracoda, Miozän, Badenium, Gaindorf-Formation, Zentrale Paratethys, Mühlbach (Niederösterreich), Paläoökologie, Biostratigraphie

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1. Introduction

The present study is part of a joint investigation on the rich fossil assemblage of Mühlbach which contains terrestrial and marine faunal elements. Mühlbach am Manhartsberg is located in the Molasse Basin of Lower Austria near the south-eastern margin of the Bohemian Massif. For localisation see figure 1.

The investigated samples were taken in an artificial outcrop by R. Roetzel (Geological Survey of Austria, Vienna) and G. Daxner-Höck (Museum of Natural History, Vienna). The outcrop provided a composite section of 4,8 m thickness. Under a cover of anthropogene debris neogene sediments of 3.8 m thickness are deposited. Lithostratigraphically the upper part of the investigated section belongs to the Gaindorf Formation (Lower Badenian), which is built up by sandy pelites of 1.9 m thickness. The following samples from the Gaindorf Formation of Mühlbach were analysed and yielded ostracods: leg. R. Roetzel (sample M 1, M 2, M 4 [= same horizon as M 2], M 5, M 6), leg. G. Daxner-Höck (sample Mü 2 [correlates with sample M 2 and M 4 from R. Roetzel]). Samples M 3, M 7 and M 8 come from clayey pelites of the basal part of the section. They probably belong to the Zellerndorf Formation of the Ottnangium and lack ostracods.

For extended geological and lithological information on the Mühlbach section, the reader is referred to ROETZEL (2003, this volume). First results on the ostracod fauna were published in ZORN (1999). The ostracods discussed in this paper are housed in the collections of the Geological Survey of Austria in Vienna. They are registered under the collection number 2002/23.

2. The ostracod fauna from Mühlbach and its paleoecological interpretation

The ostracod fauna of the Gaindorf Formation at Mühlbach am Manhartsberg consists of 16 species belonging to the Cytheracea BAIRD, 1850. Most abundant are *Cytheridea paracuminata* KOLLMANN, 1960, *Olimfalunia plicatula* (REUSS, 1850), *O. spinulosa* (REUSS, 1850) and *Senesia* ex gr. *vadaszi* (ZALÁNYI, 1913). Furthermore, *Callistocythere canaliculata* (REUSS, 1850), *Acanthocythereis hystrix* (REUSS, 1850), *Parakrithe* sp., *Pterygocythereis fimbriata* (MÜNSTER, 1830), *Aurila cicatricosa* (REUSS, 1850), *A. albicans* (RUGGIERI, 1958), *A. punctata* (MÜNSTER, 1830), *Loxoconcha punctatella* (REUSS, 1850), *Sagmatocythere* sp., *Cytheropteron* sp., *Konarocythere inflata* (SCHNEIDER, 1949) and *Xestoleberis tumida* (REUSS, 1850) are recorded.

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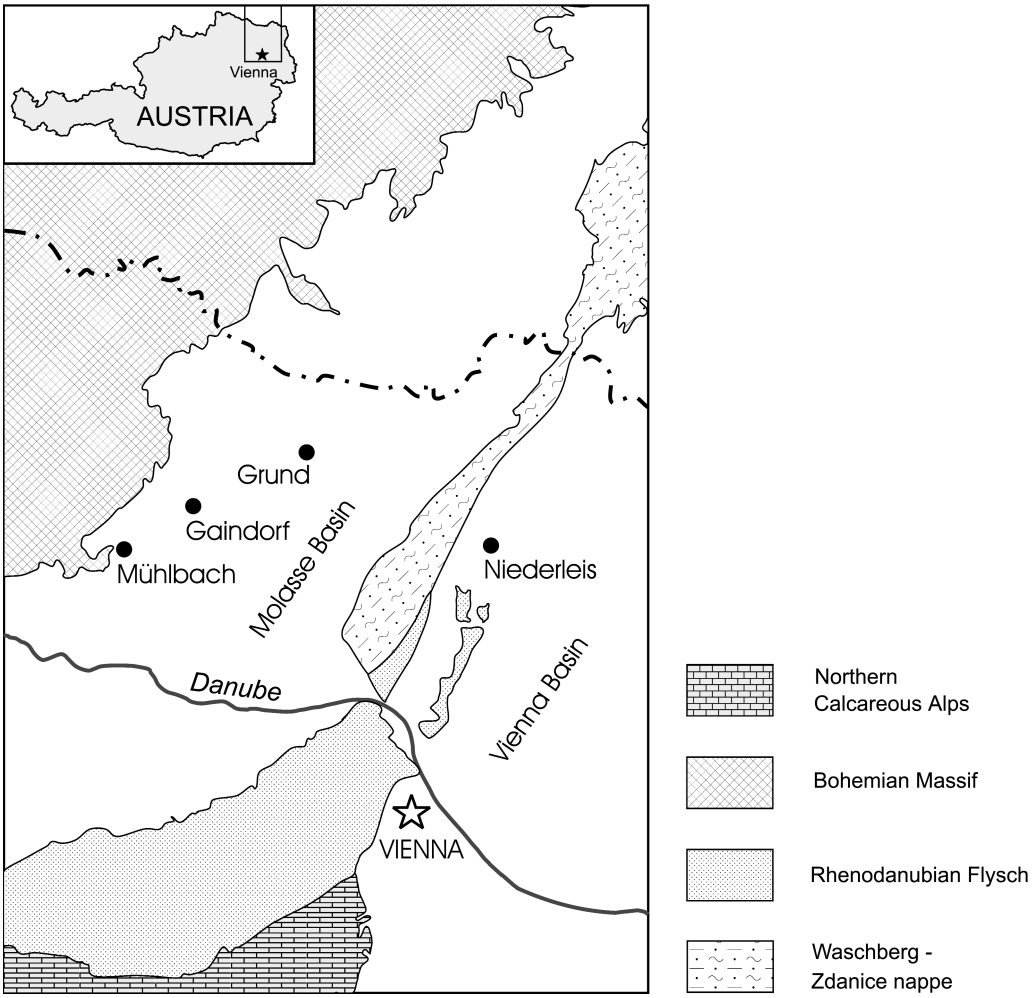

Fig. 1: Generalized tectonic map with the position of the localities Mühlbach, Gaindorf and Grund.

The preservation of the specimens is quite good and for several species larval stages are also documented. From this point of view the fauna seems to be largely authochthonous (see below). The sample Mü 2 was washed with the smallest mesh size of 0.5 mm in order to concentrate the vertebrate fauna (see DAXNER-HÖCK 2003). This could explain why the most diverse association contains larval stages of only few species. Perhaps small species are also mostly missing because of the washing procedure. The distribution of the species within the samples is shown in figure 2.

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Additional species found in the Gaindorf Formation NNW Gaindorf and/or at the type locality SE Gaindorf (see ROETZEL 2003, this volume) are *Cnestocythere lamellicosta* TRIEBEL, 1950, *Neomonoceratina* ex gr. *helvetica* OERTLI, 1958, *Cytheridea acuminata* BOSQUET, 1852, *Cyamocytheridea derii* (ZÁLANYI, 1913), *Cytheretta ornata* (HÉJJAS, 1894), *Paracytheridea triquetra* (REUSS, 1850) and *Graptocythere polyptycha* (REUSS, 1850) as well as representatives of the taxa *Costa*, Cytheruridae and *Xestoleberis* div. sp.

Paleoecologically the marine ostracod fauna from Mühlbach consists of elements of the upper infralittoral (0–40 m, after BREMAN 1975) to the circalittoral (80–250 m, after BREMAN 1975). Characteristic for the upper infralittoral of the Mediterranean Sea (BREMAN 1975) and the epineritic facies (after LIEBAU 1980), respectively, are *Callistocythere, Cytheridea, Aurila*, *Loxoconcha* and *Xestoleberis* (see MORKHOVEN 1963, BREMAN 1975). Representatives of the genus *Callistocythere* are mainly recorded from shallow water and warm environments (MORKHOVEN 1963). The species *Callistocythere canaliculata* is assigned to the infralittoral by MCKENZIE et al. (1979) and DUCASSE & CAHUZAC (1996). In the Adriatic Sea, *Callistocythere flavidofusca* (RUGGIERI, 1950), which is most similar to *C. canaliculata,* does not exceed 119 m and is very abundant at a depth of 70 m (BONADUCE et al. 1976). Other shallow and warm water genera (see KEEN 1972, SZCZECHURA 1987) are *Cytheretta* and *Neomonoceratina*. The first is recorded from NNW of Gaindorf and the second from SE of Gaindorf.

The Recent *Cytheridea neapolitana* KOLLMANN, 1960 inhabits the Mediterranean Sea between 10 and 90 m water depth (MONTENEGRO et al. 1998). The Recent *Aurila convexa* (BAIRD, 1850) is most similar to *Aurila punctata*. It was observed in the Adriatic Sea at depths down to 122 m and is most abundant between 50 and 70 m (BONADUCE et al. 1976). *Loxoconcha punctatella* from the Aquitainian Basin is reported for the infra- and circalittoral by MCKENZIE et al. (1979). The recent species *Loxoconcha rhomboidea* (FISCHER, 1855) is similar to *L. punctatella* and lives in the Mediterranean from 1–57 m water depth (MONTENEGRO et al. 1998). *Xestoleberis* dwells on and between algae (MORKHOVEN 1963). In the Adriatic Sea it does not exceed depths of 70 m (BONADUCE et al. 1976).

Genera and species which are more characteristic for deeper environments than the infralittoral are the following. *Cytheropteron* is an eurybathic genus. In the Mediterranean Sea most of the species inhabit the circalittoral (BREMAN 1975). *Parakrithe,* which was found in one sample (Mü 2), is an infraneritic to bathyal genus. *Acanthocythereis hystrix* is recorded from four samples (M 1, M 4, M 5, Mü 2). It is extant in the Mediterranean Sea. After BONADUCE et al. (1976) its distribution in the Adriatic Sea varies between 125 and 170 m on fine sand and very sandy pelite. MONTENEGRO et al. (1998) report a depth of 70 m in the Gulf of Noto and 57–107 m in the Gulf of Taranto (Ionian Sea), which corresponds with the inner circalittoral. They found this species indicative of a warm-temperate environment. The specimens in ATHERSUCH (1979) from Cyprus derive from a water depth of 69 m and 75 m. It also lives in the circalittoral zone of the Gulf of Gascogne (MCKENZIE et al. 1979). CARBONEL (1985) indicated *Olimfalunia plicatula* to be an eurybathic species known from the littoral to the epibathyal but especially abundant in the infralittoral. *Pterygocythereis fimbriata* is very similar to the Recent species *P. jonesi* (BAIRD, 1850). In the Mediterranean Sea, *P. jonesi* lives between 30 and 240 m (MONTENEGRO et al. 1998). BONADUCE et al. (1976) report an optimum depth between 80 and 170 m. *Pterygocythereis* avoids high-energy environments (LIEBAU 1980).

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OSTRACODE SPECIES	SAMPLES														
	M 1		M 2		M 3	M 4		M 5		M 6		M 7	M 8	Mü 2	
Callistocythere canaliculata (Reuss, 1850)			x		no ostracodes							no ostracodes	no ostracodes	x	*
Cytheridea paracuminata Kollmann, 1960	x					x		x						x	
Parakrithe sp.														x	*
Acanthocythereis hystrix (Reuss, 1850)	x					x			*					x	*
Olimfalunia plicatula (Reuss, 1850)		*	x	*			*	x	*					x	*
Olimfalunia spinulosa (Reuss, 1850)														x	?
Pterygocythereis fimbriata (Münster, 1830)														x	
Aurila cicatricosa (Reuss, 1850)														x	
Aurila albicans (Ruggieri, 1958)										x				x	*
Aurila punctata (Münster, 1830)														x	
Senesia ex gr. *vadaszi* (Zálanyi, 1913)	x	*	x					x	*					x	
Loxoconcha punctatella (Reuss, 1850)	x		x											x	*
Sagmatocythere sp.														x	
Konarocythere inflata (Schneider, 1949)														x	
Cytheropteron sp.			x											x	
Xestoleberis tumida (Reuss, 1850)														x	*

Fig. 2: Distribution of the ostracod species within the samples; X = adult specimens, * = juvenile specimens.

Assuming that the ostracod fauna from Mühlbach is authochthon (see above), it indicates a lower infralittoral to upper circalittoral environment of a warm-temperate sea. RÖGL & SPEZZAFERRI (2003, this volume) suggest cool bottom waters and a water depth of about 200 m based on the foraminifera fauna. This leads to the consideration that most of the ostracod specimens must have been transported and only few species and specimens are authochthonous, like *Pterygocythereis, Parakrithe* and *Cytheropteron*. HARZHAUSER et al. (2003, this volume) suggest a very steep coast for the area of Mühlbach which is responsible for the extreme mixing of the marine fauna and also explains the terrestrial faunal elements at the sampling locality.

The coeval Grund Formation interfingers with the Gaindorf Formation (see ROETZEL et al. 1999). The following species have been reported up to now by the author (ZORN 1999): *Cnestocythere lamellicosta* TRIEBEL, 1950, *Cytheridea paracuminata* KOLLMANN, 1960, *Cyamocytheridea derii* (ZALÁNYI, 1913), *Acanthocythereis hystrix* (REUSS, 1850), *Aurila angulata* (REUSS, 1850), *Aurila galeata* (REUSS, 1850), *Senesia* ex gr. *vadaszi* (ZALÁNYI, 1913), *Urocythereis kostelensis* (REUSS, 1850), *Graptocythere ungeri* (REUSS, 1850), *Pokornyella deformis* (REUSS, 1850), *Heliocythere vejhonensis* (PROCHÁZKA, 1893) and *Tenedocythere sulcatopunctata* (REUSS, 1850). In comparison with the Gaindorf Formation the Hemicytheridae are much more diverse. The research on the ostracods of the Grund Formation is still ongoing. The results will be presented in ZORN (in prep.).

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3. Biostratigraphic results

The following biostratigraphic remarks are related to the Paratethys chronostratigraphy. Most of the ostracod species from Mühlbach are recorded from the Badenian (Middle Miocene) and older strata, like *Callistocythere canaliculata*, *Cytheridea paracuminata*, *Olimfalunia plicatula*, *Aurila cicatricosa*, *Cytheretta ornata Loxoconcha punctatella*, *Konarocythere inflata* and *Xestoleberis tumida*. *Senesia* ex gr. *vadaszi* is known from the Badenian and Sarmatian. Other species are present only in the Badenian, such as *Acanthocythereis hystrix*, *Olimfalunia spinulosa* and *Aurila albicans* (see BRESTENSKÁ & JIRICEK 1978, ZORN 1998, PARUCH-KULCZYCKA 1992). The species *Cnestocythere lamellicosta*, *Cytheridea acuminata*, *Aurila punctata*, and *Graptocythere polyptycha,* which have been found in other outcrops of the Gaindorf Formation, also indicate a Badenian age.

JIRICEK (1975) established ostracod biozones for the Neogene of the Central Paratethys and published, in 1983, a "Redefinition of the Oligocene and Neogene ostracod zonation of the Paratethys". The base of his Ostracod Biozone NO-7 is marked by the first appearance of *Acanthocythereis hystrix,* a species which he stated to be restricted to the Early Badenian (see also BRESTENSKÁ & JIRICEK 1978). SZCZECHURA (1987) and PARUCH-KULCZYCKA & SZCZECHURA (1996) found *A. hystrix* in Early and Middle Badenian deposits of the Korytnica Basin in Poland, which have been analysed for their nannoplankton contents. The latter authors also report it from the Late Badenian of the region of Lublin.

Besides its occurrence in the Early Badenian Grund and Gaindorf Formations (see ZORN 1999), *Acanthocythereis hystrix* is known in Austria from the Upper Lagenid Zone of the Early Badenian at Furth near Göttweig in the Molasse Basin (TOLLMANN & KRISTAN-TOLLMANN 1992) and in the Mühldorfer Schichten of the Lavanttal in Carinthia (BECK-MANNAGETTA 1952, HUBER-MAHDI 1986, WANK 1987). The author's own observations in several samples from the Badenian stratotype Baden-Sooss (Vienna Basin), which is also assigned to the Upper Lagenid Zone, did not bring this species to light. In unpublished material of the REUSS-collection at the Museum of Natural History in Vienna, however the author was able to find *A. hystrix* in a sample from an old claypit at Baden. TRIEBEL (1941) already figured a specimen from Baden. The deposits from the old claypits are partly believed to belong to the Lower Lagenid Zone (pers. comm. by F. RÖGL).

The presence of *Konarocythere inflata* and *Olimfalunia spinulosa* would assign the deposits of Mühlbach to the Ostracod Biozone NO-8 (Middle Badenian) after JIRICEK (1983). ZORN (1998) found *Konarocythere inflata* in the Karpatian of the Korneuburg Basin in Lower Austria. This all demonstrates that the zonations must be treated with caution because new results in ostracod research have enlarged the stratigraphic distribution of several species.

In conclusion the ostracod fauna from Mühlbach and from the Gaindorf Formation respectively stratigraphically only indicate an Early Badenian age.

The Foraminifera fauna (RÖGL & SPEZZAFERRI 2003, this volume) and the vertebrate fauna (DAXNER-HÖCK 2003, this volume) of Mühlbach indicate the upper part of the Lower Lagenid Zone (Planktonic Foraminifera Biozone M6) and the upper part of Mammal Biozone MN5 (=15.1-14.9 Ma) respectively.

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5. References

ATHERSUCH, J. (1979): On *Acanthocythereis hystrix* (Reuss). – Stereo-Atlas of Ostracod Shells, **6**/24: 133–140. – London.

BECK-MANNAGETTA, P. (1952): Zur Geologie und Paläontologie des Tertiärs des unteren Lavanttales. – Jb. Geol. Bundesanstalt, **95**/1: 102 pp. – Wien.

BONADUCE, G., CIAMPO, G. & ASCOLI, M. (1976): Distribution of Ostracoda in the Adriatic Sea. – Pubbl. Staz. Zool. Napoli, **40** Suppl.: 304 pp. – Napoli.

BREMAN, E. (1975): The distribution of ostracodes in the bottom sediments of the Adriatic Sea. – Acad. Proefschr. Vrije Univ. Amsterdam: 1-165, I-XX, A1-A62. – Meppel.

BRESTENSKÁ, E. & JIRICEK, R. (1978): Ostrakoden des Badenien der Zentralen Paratethys. – In: BRESTENSKÁ, E. (ed.): Chronostratigraphie und Neostratotypen, Miozän der zentralen Paratethys, vol. **6**, M4 Badenien (Moravien, Wielicien, Kosovien): 405–439. – Bratislava (Veda Verlag Slowak. Akad. Wiss.).

CARBONEL, P. (1985): Néogène. – In: OERTLI, H. J. (ed.): Atlas des Ostracodes de France (Paléozoique-Actuel). – Bull. Centres Rech. Explor.-Prod. Elf-Aquitaine, Mém. **9**: 313-335. – Pau.

DAXNER-HÖCK, G. (2003): *Cricetodon meini* and other rodents from Mühlbach and Grund, Lower Austria (Middle Miocene, late MN5). – Ann. Naturhist. Mus., **104 A**. – Wien.

DUCASSE, O. & CAHUZAC, B. (1996): Évolution de la faune d´ostracodes dans un cadre paléogéographique et interprétation des paléoenvironnements au Langhien en Aquitaine. – Rev. Micropaléont., **39**/4: 247-260. – Paris.

HARZHAUSER, M., DAXNER-HÖCK, G., BOON-KRISTKOIZ, E., CORIC, S., MANDIC, O., MIKLAS-TEMPFER, P., ROETZEL, R., RÖGL, F., SCHULTZ, O., SPEZZAFERRI, S., ZIEGLER, R. & ZORN, I. (2003): Palaeoecology and biostratigraphy of the section Mühlbach (Gaindorf Formation, lower Middle Miocene, Lower Badenian, Austria). – Ann. Naturhist. Mus., **104 A**. – Wien.

HUBER-MAHDI, T. (1986): Über neogene Ostracoden im Lavanttal, Kärnten. – Unpubl. Rep. Austrian Science Fund, 45 pp. – Wien.

JIRICEK, R. (1975): Ostracod's zones in the Neogene of the Central Paratethys. – In: CICHA, I. (ed.): Biozonal division of the Upper Tertiary basins of the Eastern Alps and West Carpathians. – Proc. VIth Congr. Reg. Comm. Mediter. Neogene Strat., 57–69. – Praha.

—— (1983): Redefinition of the Oligocene and Neogene ostracod zonation of the Paratethys. – Knihovnicka Zemniho plynu a nafty, **4**: 195–236. – Hodonin.

KEEN, M. C. (1972): Mid-Tertiary Cytherettinae of North-West Europe. – Bull. Brit. Mus. (Natur. Hist.), Geol., **21**/6: 259-349. – London.

LIEBAU, A. (1980): Paläobathymetrie und Ökofaktoren: Flachmeer-Zonierungen. – N. Jb. Geol. Paläont., Abh. **160**/2: 173-216. – Stuttgart.

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MCKENZIE, K. G., DUCASSE, O., DUFOUR, E. & PEYPOUQUET, J. P. (1979): Monographie bibliographique, stratigraphique et paléoécologique sur les Ostracodes d´Aquitaine et du Golfe de Gascogne. – Bull. Inst. Geol. Bassin Aquitaine, Numero special, 195 pp. – Talence.

MONTENEGRO, M. E., PUGLIESE, N. & BONADUCE, G. (1998): Shelf ostracods distribution in the Italian seas. – What about Ostracoda!, Actes du 3e Congrès Européen des Ostracodologistes, 1996. – Bull. Centre Rech. Elf Explor. Prod., Mém., **20**: 91–101. – Pau.

MORKHOVEN, F. P. C. M. van (1963): Post-Palaeozoic Ostracoda, their morphology, taxonomy, and economic use. – Vol. **2** (Generic descriptions): 478 pp. – Amsterdam.

PARUCH-KULCZYCKA, J. (1992): The Middle Miocene (Badenian) ostracods from Broniszowice borehole (SW Poland) (in Polish with Engl. summary). – Geol. Quart., **36**/2: 259-280. – Warszawa.

—— & SZCZECHURA, J. (1996): Ostracoda. – In: MALINOWSKA, L. & PIWOCKI, M. (Red.): Budowa geologiczna Polski, **3**: 727-742. – Warszawa (Polska Agencja Ekologiczna).

ROETZEL, R. (2003): Zur Geologie der mittelmiozänen Fossilfundstelle Mühlbach am Manhartsberg (Niederösterreich). – Ann. Naturhist. Mus., **104 A**. – Wien.

—— , MANDIC, O. & STEININGER, F. F. (1999): Lithostratigraphie und Chronostratigraphie der tertiären Sedimente im westlichen Weinviertel und angrenzenden Waldviertel. – In: ROETZEL, R. (red.): Arbeitstagung Geologische Bundesanstalt 1999, Retz-Hollabrunn, 38–54. – Wien (Geol. Bundesanstalt).

RÖGL, F. & SPEZZAFERRI, S. (2003): Foraminifera paleoecology and biostratigraphy of the Mühlbach section (Gaindorf Formation, Lower Badenian). – Ann. Naturhist. Mus., **104 A**. – Wien.

SZCZECHURA, J. (1987): A new ostracode species, Neomonoceratina chomentovensis sp. n., from the Korytnica Basin (Middle Miocene; Holy Cross Mountains, Central Poland). – Acta Geol. Pol., **37**/3–4: 105–111. – Warszawa.

TOLLMANN, A. & KRISTAN-TOLLMANN, E. (1991): Führer zu den Exkursionen im Raum Krems-Eggenburg. – 3. Treffen deutschsprachiger Ostracodenforscher, 18 pp. – Albrechtsberg.

TRIEBEL, E. (1941): Zur Morphologie und Ökologie der fossilen Ostracoden. Mit Beschreibung einiger neuer Gattungen und Arten. – Senckenbergiana, **23**/4-6: 294–400. – Frankfurt am Main.

WANK, M. (1987): Uvigerinen-Aufschluß im Mühldorfer Badenien (Kärnten). – Carinthia II, **177**/97. Jg.: 227–230. – Klagenfurt.

ZORN, I. (1998): Ostracoda aus dem Karpat (Unter-Miozän) des Korneuburger Beckens (Niederösterreich). – Beitr. Paläont, **23**: 175–271. – Wien.

—— (1999): Neogene Ostracoden des ÖK50-Blattes 22 (Hollabrunn) und angrenzender Gebiete. – In: ROETZEL, R. (red.): Arbeitstagung Geologische Bundesanstalt 1999, Retz-Hollabrunn, Posterkurzfass., 254–255. – Wien (Geol. Bundesanstalt).

—— (in prep.): Ostracodes from the Early Badenian (Middle Miocene) Grund Formation (Molasse Basin, Lower Austria). – Geologica Carpathia, Bratislava.

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