

The Polyplacophora (Mollusca) of the Langhian (Lower Badenian) of the Molasse Zone and the northern Vienna Basin (Austria)

by Andreas KROH¹

(With 1 textfigure and 2 plates)

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Zusammenfassung

Diese Arbeit faßt den aktuellen Wissensstand über die Polyplacophorenfauna des Untersten Badenium (Langhium) der Molassezone und des Nördlichen Wiener Becken zusammen. Insgesamt konnten an den Lokalitäten Grund, Niederleis und Nodendorf, Niederösterreich acht Polyplacophorenarten nachgewiesen werden, deren paläoökologische und biostratigraphische Bedeutung kurz diskutiert wird.

Schlüsselwörter: Polyplacophora, Unteres Badenium, Mittelmiozän, Österreich, Zentrale Paratethys

Abstract

This paper summarises the current knowledge of the polyplacophoran fauna from the Lowermost Badenian (Langhian) of the Molasse zone and the northern Vienna basin. Eight species are reported from the localities Grund, Niederleis and Nodendorf (all in Lower Austria) and their palaeoecological and biostratigraphical value is investigated.

Keywords: Polyplacophora, Lower Badenian, Middle Miocene, Austria, Central Paratethys

Introduction

Although Middle Miocene mollusc communities of Austria are very diverse and generally well studied, polyplacophorans are rather rare and poorly documented. Apart from an early paper by REUSS (1860), in which only few polyplacophorans are described and the monographic compilation of ŠULC (1934), these molluscs have only been briefly mentioned (e.g. VETTERS 1910; SIEBER 1953, 1956, 1958, 1959). In other parts of the Central Paratethys, however, polyplacophorans are far better known: The Badenian of Poland, for example, yielded several polyplacophoran faunas, including the diverse fauna of the Korytnica clays (BALUK 1965, 1971, 1984; MACIOSZCZYK 1988; STUDENCKA & STUDENCKI 1988). Recently DULAI (2001) reported a Middle Miocene polyplacophoran fauna from northern Hungary, including a new species. In light of these new data and the advances in taxonomy of this small group of Molluscs, the current knowledge of chitons from the Lower Badenian (Langhian) time slice of the Molasse zone and the northern Vienna basin is summarised.

¹ Institut für Geologie und Paläontologie, Karl-Franzens-Universität Graz, Heinrichstraße 26, 8010 Graz, Österreich. – e-mail: discometra@gmx.at

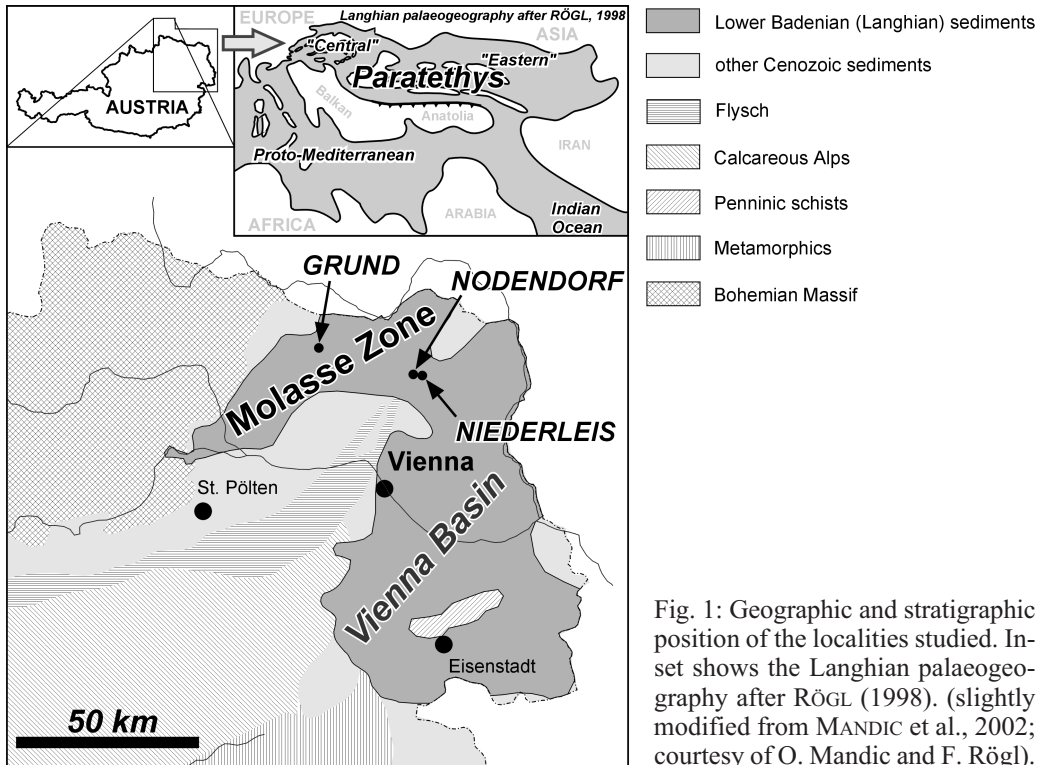


Fig. 1: Geographic and stratigraphic position of the localities studied. Inset shows the Langhian palaeogeography after RÖGL (1998). (slightly modified from MANDIC et al., 2002; courtesy of O. Mandic and F. Rögl).

Study Area

The studied polyplacophorans derive from the Lower Badenian (Langhian) sediments of the Molasse zone and the northern Vienna basin. Three outcrops preserving marine sediments of this time slice were studied: Niederleis, Grund and Nodendorf, all in Lower Austria. For a short summary on the geographic position, biostratigraphy and sedimentology of Niederleis and Grund see KROH (this volume). Nodendorf lies about 1 km west of Niederleis and represents a historical locality, no longer exposed, there about 3 metres sand with pelitic intercalations and thin shell beds were overlain by an approximately 5 metres thick accumulation of *Crassostrea gryphoides* (VETTERS 1910). The sediments are time-equivalent with those of Niederleis, but represent a more littoral environment (MANDIC et al., 2002).

Material and Methods

The material used for this study is derived from the collections of the Vienna Natural History Museum (NHMW) and the Institute of Palaeontology, University Vienna (IPUW). Additional material was recovered from bulk samples of excavations made in 2000 by Harzhauser, Mandic and Zuschin (MANDIC et al., 2002) and is deposited at the Natural History Museum Vienna. The abbreviation NÖ used in this study stands for Niederösterreich (Lower Austria).

Systematics

The systematic follows VAN BELLE (1983).

Class Polyplacophora DE BLAINVILLE, 1816

Order Neoloricata BERGENHAYN, 1955

Suborder Lepidopleurina THIELE, 1910

Family Leptochitonidae DALL, 1889

Genus *Lepidopleurus* LEACH in RISSO, 1826

Lepidopleurus cajetanus (POLI, 1791) (pl. 1, fig. 1; pl. 2, figs. 2-3)

- . 1860 *Chiton decoratus* m. n. sp. – REUSS: 53; pl. 8, fig. 7.
- . 1883 *Lepidopleurus decoratus*. – ROCHEBRUNE: 62-63.
- . 1883 *Lepidopleurus Cajetanus*, POLI. – ROCHEBRUNE: 72.
- . 1897 *Lepidopleurus cajetanus* (POLI). – SACCO: 90; pl. 7, figs. 26-31.
- .v 1910 *Chiton* sp. – VETTERS: 157.
- .vpars 1934 *Lepidopleurus (Lepidopleurus) decoratus* Rss. 1860. – ŠULC: 3-4.
- . 1958 *Lepidopleurus (L.) decoratus* Rss. – SIEBER: 143.
- . 1959 *Lepidopleurus (L.) decoratus* Rss. – SIEBER: 275.
- . 1962 *Lepidopleurus (L.) cajetanus* (POLI, 1791) – MALATESTA: 146-147; fig. 1.
- . 1964 *Lepidopleurus (L) cajetanus* (POLI) – MARINESCU: 180; pl. 1, figs. 1-3.
- . 1965 *Lepidopleurus decoratus* (REUSS, 1860) – BAŁUK: 366-368; pl. 1, figs. 1-4.
- . 1971 *Lepidopleurus decoratus* (REUSS, 1860) – BAŁUK: 453-454; pl. 1, figs. 1-4.
- . 1977 *Lepidopleurus cajetanus* (POLI, 1791) – LAGHI: 95-98; fig.3; pl. 1, figs. 13-20.
- . 1984 *Lepidopleurus cajetanus* (POLI, 1791) – FERRERO MORTARA et al.: 299-300.
- . 1984 *Lepidopleurus cajetanus* (POLI, 1791) – BAŁUK: 284-285; pl. 4, figs. 1-2.
- . 1988 *Lepidopleurus cajetanus* (POLI, 1791) – MACIOSZCZYK: 50; pl. 1, figs. 1-5.
- . 1988 *Lepidopleurus cajetanus* (POLI, 1791) – STUDENCKA & STUDENCKI: 39; pl. 1, figs. 1-3.

Material: Niederleis, NÖ: 2 tail valves (NHMW 1863.XV.860).- Grund, NÖ: 1 head valve (NHMW 1859.XXXVIII.Anfang)

Remarks: The studied specimens fully correspond to the descriptions of this common species (BAŁUK 1971, 1984; LAGHI 1977). LAGHI (1977) synonymised *L. decoratus* (REUSS, 1860) with *L. cajetanus*. ŠULC (1934) included also very large specimens from Pötzleinsdorf and Northern Italy into this species. These specimens, however belong to *L. subcajetanus* (d'ORBIGNY, 1852) according to LAGHI (1977).

Distribution: This species is one of the most common chitons of the Central Paratethys. It was reported from the Badenian (Langhian-Serravallian, Middle Miocene) of Austria (Speising, Steinabrunn: ŠULC 1934; Drasenhofen: SIEBER 1958), Czech Republic (REUSS 1860; Rudelsdorf: DE ROCHEBRUNE 1883; Borač, Knínice, Rudoltice: ŠULC 1934), France (Perpignan: ŠULC 1934), Poland (Niskowa: BAŁUK 1965; Korytnica: BAŁUK 1971, 1984; Łychów, Węglin and Węglinek: MACIOSZCZYK 1988; Rybnica: STUDENCKA & STUDENCKI 1988) and Romania (Dacian Basin: MARINESCU 1964; Kostej: ŠULC 1934). Pliocene (Zinola: SACCO 1897; FERRERO MORTARA et al. 1984) and Pleistocene (Sicily: GRECO & LIMA 1974) records are known from Italy. Extant representatives of this species are known from Northern Spain, Portugal, south to the Canaries in the Atlantic Ocean and in the northern and western Mediterranean Sea, probably absent from the far eastern part (POPPE & GOTO 1991).

E c o l o g y : Lives on hard substrates from the littoral zone down to about 40 m water depth (POPPE & GOTO 1991).

***Lepidopleurus subcajetanus* (SACCO, 1897) (pl. 2, fig. 1)**

- 1852 *Chiton subcajetanus*, POLI. – D'ORBIGNY: 94 [*nomen nudum*].
 ? 1883 *Gymnoplax Orbignyi*. – ROCHEBRUNE: 65; pl. 1, fig. 7.
 1897 *Middendorffia subcajetana* (D'ORB.) – SACCO: 90; pl. 7, figs. 21-25.
 v pars 1934 *Lepidopleurus (Lepidopleurus) decoratus* RSS. 1860. – ŠULC: 3-4.
 1953 *Lepidopleurus decoratus* (RSS.) – SIEBER: 184.
 1977 *Lepidopleurus subcajetanus* (D'ORBIGNY, 1852) – LAGHI: 99; pl. 1, fig. 21.
 1984 *Middendorffia subcajetana* SACCO, 1897 – FERRERO MORTARA et al.: 299; pl. 55, fig. 6.

M a t e r i a l : Niederleis, NÖ: 1 tail valve (IPUW 3123).

R e m a r k s : This species was synonymised with *L. decoratus* by ŠULC (1934), who stated that the name *Lepidopleurus subcajetanus* (D'ORBIGNY, 1852) is a *nomen nudum* and who considered the specimens reported under this name as very large forms of *L. decoratus*. LAGHI (1977), however, rejected this statement and considered these specimens as distinct species, since the tail valves of *L. subcajetanus* reach a width of up to 18 mm, whereas the largest *L. cajetanus* (both extant and fossil) reach a maximum width of around 8 mm. Apart from size, both species are very similar and it remains to be demonstrated whether or not the two species are distinct. With the studied material, however, the question cannot be solved, since only a single tail valve is available, which is moreover heavily abraded.

D i s t r i b u t i o n : This species was reported from the Badenian (Langhian-Serravallian) of Austria (Pötzleinsdorf: ŠULC 1934) and the Burdigalian of Italy (Coli Torinesi: SACCO 1897; LAGHI 1977; FERRERO MORTARA et al. 1984).

Suborder Chitonina THIELE, 1910

Family Ischnochitonidae DALL, 1889

Genus *Ischnochiton* GRAY, 1847

***Ischnochiton rissoi* (PAYRADEAU, 1826) (pl. 1, fig. 5)**

- . 1934 *Ischnochiton rudolticensis* n. sp. – ŠULC: 23-24; pl. 2, figs. 41-43.
 1962 *Ischnochiton (I.) rissoi* (PAYRADEAU, 1826) – MALATESTA: 160-161; fig. 16.
 non 1965 *Ischnochiton rudolticensis* ŠULC, 1934 – BALUK: 369-370; pl. 1, fig. 7.
 . 1971 *Ischnochiton rudolticensis* ŠULC, 1934 – BALUK: 458; pl. 3, figs. 1-4.
 . 1977 *Ischnochiton (Simplischnochiton) rissoi* (PAYRADEAU, 1826) – LAGHI: 104; pl. 1, figs. 4-9.
 . 1984 *Ischnochiton rissoi* (PAYRADEAU, 1826) – BALUK: 287-288; pl. 6, figs. 2a-2b.

M a t e r i a l : Grund, NÖ: 1 tail valve (NHMW 1868.I.281)

R e m a r k s : LAGHI (1977) placed *I. rudolticensis* ŠULC, 1934 into the synonymy of *I. rissoi* (PAYRADEAU, 1826) on account of the high similarity between those two forms already noted also by ŠULC (1934). The present specimen, labeled by ŠULC as *I. rudolticensis* lacks the typical "wrinkled" ornamentation on the postmucronal area of the tail valve. This might be, however, caused by the abrasion to which the specimen was obviously subject.

D i s t r i b u t i o n : This species was reported from the Miocene of the Czech Republic (Knínice, Rudoltice: ŠULC 1934), Italy (Apennines: LAGHI 1977), and Poland (Korytnica: BAŁUK 1971, 1984). It is also known from the Pliocene of Italy (Apennines: LAGHI 1977) and the Pleistocene of Sicily (GRECO & LIMA 1974). Today this species is found in the whole Mediterranean Sea (POPPE & GOTO 1991).

E c o l o g y : Extant representatives of this species are locally very common under smooth stones on clean sand bottoms (POPPE & GOTO 1991) and in crevices in shallow coastal areas (RIEDL 1983).

Family Chitonidae RAFINESQUE, 1815

Genus *Chiton* LINNÉ, 1758

***Chiton corallinus* (Risso, 1826) (pl. 1, fig. 2-3)**

- 1860 *Chiton denudatus* m. n. sp. – REUSS: 55; pl. 8, figs. 14-15.
- 1897 *Chiton olivaceous* var. *plioarva* SACC. – SACCO: 89; pl. 7, figs. 1-5.
- . 1934 *Chiton (Clathrolepura) corallinus denudatus* RSS. – ŠULC: 24-25; pl. 2, figs. 44-45.
- . 1958 *Chiton (Clathrolepura) corallinus denudatus* RSS. – SIEBER: 144.
- . 1959 *Ch. (C.) corallinus denudatus* RSS. – SIEBER: 275.
- 1962 *Chiton (Chiton) corallinus* (Risso, 1826) – MALATESTA: 163-164; fig. 20.
- . 1971 *Chiton denudatus* REUSS, 1860 – BAŁUK: 462-463; pl. 5, figs. 9-11.
- . 1977 *Chiton corallinus* (Risso, 1826) – LAGHI: 109; pl. 2, figs. 9-12.
- . 1984 *Chiton corallinus* (Risso, 1826) – BAŁUK: 290-291.
- 1984 *Chiton olivaceous* var. *plioarva* SACCO, 1897 – FERRERO MORTARA et al.: 299.
- . 1988 *Chiton corallinus* (Risso, 1826) – STUDENCKA & STUDENCKI: 41; pl. 3, figs. 1-4.
- . 1988 *Chiton corallinus* (Risso, 1826) – MACIOSZCZYK: 54; pl. 3, figs. 1-3.

M a t e r i a l : Grund, NÖ: 3 intermediate valves (IPUW 3124-3126)

R e m a r k s : LAGHI (1977) placed *C. denudatus* REUSS, 1860 into the synonymy of *C. corallinus* (Risso, 1826) on account of the high similarity between those two forms already noted also by ŠULC (1934), who regarded *C. denudatus* as subspecies of *C. corallinus*.

D i s t r i b u t i o n : This species was reported from the Miocene of Austria (Steinabrunn: ŠULC 1934), Czech Republic (REUSS 1860; Knínice, Rudoltice, Zidlichovice: ŠULC 1934), Italy (Apennines: LAGHI 1977), and Poland (Korytnica: BAŁUK 1971, 1984; Nawodice, Rybnica: STUDENCKA & STUDENCKI 1988; Łychów, Węglin and Węglinek: MACIOSZCZYK 1988). Furthermore, from the Pliocene of Italy (Coli Astesi, Zinola: SACCO 1897; LAGHI 1977; FERRERO MORTARA et al. 1984) and Pleistocene of Italy (MALATESTA 1962). Today this species is found throughout the Mediterranean Sea, where it is especially common in the western part. It also shows an antillesepsian distribution (i.e. the species migrated from the Mediterranean Sea into the Read Sea via the Suez channel; POPPE & GOTO 1991).

E c o l o g y : Lives on various kinds of hard substrates, but is usually found as individual specimens on coralline algal formations between 30 and 100 m water depth (POPPE & GOTO 1991), whereas RIEDL (1983) reports their occurrence from 10 metres downwards.

***Chiton* sp.** (pl. 1, fig. 4)

M a t e r i a l : Nodendorf: 1 tail valve (IPUW 3122)

R e m a r k s : This specimen is poorly preserved and thus, due to the heavy abrasion, cannot be determined to species level. The relatively large size and faint traces of ornamentation on the postmucronal area could be seen as hints that the specimen belongs to *Chiton olivaceous* SPENGLER, 1797, but this would be speculation.

Suborder Acanthochitonina BERGENHAYN, 1930

Family Acanthochitonidae PILSBRY, 1893

Genus *Acanthochitona* GRAY, 1821***Acanthochitona faluniensis* (ROCHEBRUNE, 1883)** (pl. 1, figs. 6-7)

- 1860 *Chiton (Acanthochites) fascicularis* L. var. – REUSS: 56; pl. 8, figs. 4-6.
- * 1883 *Acanthochites Faluniensis*. – ROCHEBRUNE: 60-61.
- v 1910 *Chiton Reussi* ROLLE – VETTERS: 157.
- v 1934 *Acanthochiton faluniensis* ROCHEBRUNE 1883. – ŠULC: 17-18; pl. 1, fig. 29; pl. 2, figs. 30-32.
- . 1959 *A. faluniensis* ROCHEBR. – SIEBER: 275.
- . 1971 *Acanthochitona faluniensis* (ROCHEBRUNE, 1883) – BAŁUK: 463-464; pl. 2, figs. 10-15.
- . 1977 *Acanthochitona faluniensis* (ROCHEBRUNE, 1883) – JAKUBOWSKI & MUSIAL: 78; pl. 3, fig. 3.
- . 1984 *Acanthochitona faluniensis* (ROCHEBRUNE, 1883) – BAŁUK: 291-292; pl. 8, figs. 1-5.
- . 1988 *Acanthochitona faluniensis* (ROCHEBRUNE, 1883) – STUDENCKA & STUDENCKI: 41; pl. 4, figs. 3.
- . 1988 *Acanthochitona faluniensis* (ROCHEBRUNE, 1883) – MACIOSZCZYK: 55; pl. 3, figs. 8-9.
- . 1998 *Acanthochitona fascicularis* (LINNAEUS, 1766) – TOMAŠOVÝCH: 362; pl. 1, figs. 1-6.
- . 2001 *Acanthochitona faluniensis* (ROCHEBRUNE, 1883) – DULAI: 43; pl. 2, figs. 1-3.

M a t e r i a l : Niederleis, NÖ: 1 head valve (NHMW 2002z0088/0001), 1 intermediate valve (NHMW 1863.XV.862/A) and 2 tail valves (NHMW 1863.XV.862/A; NHMW 2002z0087/0001)

R e m a r k s : LAGHI (1977) synonymised this species with *A. communis* (Risso, 1826), but this was rejected by subsequent workers (BAŁUK 1984; STUDENCKA & STUDENCKI 1988; MACIOSZCZYK 1988; DULAI 2001), since the shape of the tegmentum in intermediate and tail valves is different in the extant form. The material described and illustrated by TOMAŠOVÝCH (1998) under the name *Acanthochitona fascicularis* (LINNAEUS, 1766) is certainly *A. faluniensis*, based on the ornamentation of the valves, which does not correspond to that of *A. fascicularis*.

D i s t r i b u t i o n : This species is well known from the Middle Miocene of the Central Paratethys, it was reported from Austria (Niederleis, Steinabrunn: ŠULC 1934), the Czech Republic (REUSS 1860; Rudelsdorf: DE ROCHEBRUNE 1883; Knínice, Rudoltice, Sudice, Zidlichovice: ŠULC 1934), Hungary (Várpalota: STUDENCKA & STUDENCKI 1988; Szokolya: DULAI 2001), Poland (Korytnica: BAŁUK 1971, 1984; Monastyrz and Miasteczko: JAKUBOWSKI & MUSIAL 1977; Trzęsiny: JAKUBOWSKI & MUSIAL 1979; Nawodice, Rybnica: STUDENCKA & STUDENCKI 1988; Łychów, Węglin and Węglinek: MACIOSZCZYK 1988) and Slovakia (Devínska Nova Ves: TOMAŠOVÝCH 1998).

E c o l o g y : The morphological similar extant species *A. crinita* (PENNANT, 1777) lives between 0 to 3 m water depth under stones on sandy bottoms (POPPE & GOTO 1991), *A. fascicularis*, another extant species of the genus, however, is a rare deep water species (POPPE & GOTO 1991).

Genus *Notoplax* ADAMS, 1861

***Notoplax schafferi* (ŠULC, 1934) (pl. 2, fig. 4)**

v	1910	<i>Chiton fascicularis</i> L. – VETTERS: 157.
v*	1934	<i>Cryptoconchus (Notoplax) schafferi</i> n. sp. – ŠULC: 15; pl. 1, figs. 22-24.
v	1959	<i>C. (N.) schafferi</i> ŠULC – SIEBER: 275.
non	1971	<i>Craspedochiton schafferi</i> ŠULC, 1934 – BALUK: 465; pl. 2, figs. 13-14.
v	1981	<i>Notoplax schafferi</i> ŠULC, 1936 – VAN BELLE: 64.

M a t e r i a l : Niederleis, NÖ: 1 tail valve (holotype, NHMW 1863.XV.861).

R e m a r k s : Material from the Lower Badenian of Korytnica attributed to this species (BALUK 1971) was later revised and placed into the species *Craspedochiton profascicularis* (BOETTGER, 1907) by BALUK (1984). Unfortunately no additional material of *N. schafferi* was found since the description by ŠULC (1934), so the species remains poorly known.

D i s t r i b u t i o n : *N. schafferi* is known from the Badenian (Langhian-Serravallian) of Austria (Niederleis: ŠULC 1934) and the Czech Republic (Knínice: ŠULC 1934).

E c o l o g y : Extant species of the genus *Notoplax* live in association with or within crypts in sponges upon which they feed. Acanthochitonines are especially common in shallow waters and the intertidal zone, some species of *Notoplax*, however, are reported to occur deeper than 500 metres water depth (GOWLETT-HOLMES 1998a).

Family Cryptoplacidae ADAMS, 1858

Genus *Cryptoplax* DE BLAINVILLE, 1818

***Cryptoplax weinlandi* ŠULC, 1934 (pl. 1, figs. 8-12)**

	1902	<i>Cryptoplax weinlandi</i> (ROLLE) – BOETTGER: p. 180.
v*	1934	<i>Cryptoplax weinlandi</i> (ROLLE) ŠULC. – ŠULC: 21-23; pl. 2, figs. 36-40.
.	1934	<i>Cryptoplax weinlandi</i> ŠULC. – ZILCH: 199; pl. 1, figs. 18-22.
.	1956	<i>Cryptoplax weinlandi</i> (ROLLE) ŠC. – SIEBER: 238.
.	1958	<i>Cryptoplax weinlandi</i> (ROLLE) ŠULC. – SIEBER: 144.
.	1959	<i>C. weinlandi</i> (ROLLE) ŠULC – SIEBER: 275.
.	1964	<i>Cryptoplax weinlandi</i> ŠULC, 1934 – MARINESCU: p. 183-184; pl. 4, figs. a-e.
.	1971	<i>Cryptoplax weinlandi</i> ŠULC, 1934 – BALUK: 466; pl. 6, figs. 1-8.
.	1977	<i>Cryptoplax weinlandi</i> ŠULC, 1934 – LAGHI: 114.
.	1984	<i>Cryptoplax weinlandi</i> ŠULC, 1934 – BALUK: 294.
.	2001	<i>Cryptoplax weinlandi</i> ŠULC, 1934 – DULAI: 45; pl. 2, figs. 4-6; pl. 3, figs. 1-6.

M a t e r i a l : Nodendorf, NÖ: 12 intermediate valves, 5 tail valves (IPUW 3116-3121). – Niederleis, NÖ: 1 tail valve (NHMW 1863.LVIII.33), 10 intermediate and 11 tail valves (NHMW 1866.I.977).

R e m a r k s : Contrary to BOETTGER (1902) ROLLE did never publish the name *Chitonellus weinlandi* and therefore ŠULC (1934) has to be regarded as author of this species (ZILCH 1934: p. 199). The only other species of the genus *Cryptoplax* known from the Miocene of the Paratethys is *C. margitae* DULAI, 2001. It differs from *C. weinlandi* by its granulated ribs on the lateral areas and by the oval outline of the pores on the ventral side of the valves (DULAI 2001).

E c o l o g y : Extant *Cryptoplax* species are known from tropical and temperate Indian and central western Pacific Oceans and the Red Sea (GOWLETT-HOLMES 1998b). The extant southern Australian species *C. striata* was recorded as an opportunistic grazing omnivore, feeding on encrusting algae, drift sea grass and encrusting sponges (KANGAS & SHEPHERD 1984).

D i s t r i b u t i o n : This species is one of the most common chitons within the Central Paratethys during the Middle Miocene. It was reported from the Badenian (Langhian-Serravallian) of Austria (Forchtenau, Niederleis and Steinabrunn: ŠULC 1934; ZILCH 1934; Forchtenau: SIEBER 1956), the Czech Republic (Borač, Knínice, Lysice, Porztech, Rudoltice, Sudice and Židlochovice: ŠULC 1934; ZILCH 1934), Hungary (Szokolya: DULAI 2001), Poland (Korytnica: BAŁUK 1971, 1984) and Romania (Bujtur, Kostej, Lapugy, Orsova: ŠULC 1934; ZILCH 1934; Dacian Basin: MARINESCU 1964). In the Mediterranean area this species was only reported from the Tortonian of the Apennines (Montegibbio and Montebanzone: LAGHI 1977).

Biostratigraphy and Palaeoecology

Due to the fact, that three of the considered taxa are still extant their biostratigraphical value is limited. However, it enables us to use the data on the ecological requirements of their recent representatives in palaeo-environmental reconstructions.

Of the eight species considered, three are still extant, one is restricted to the Burdigalian to Serravallian (*L. subcajetanus*) and three are restricted to the Badenian, although for one of those (*N. schafferi*) that might be an artefact due to its scarcity (known only from 3 specimens of two localities). *Cryptoplax weinlandi* is known from the Early to Late Badenian, however, whereas it is widespread and abundant in the Early Badenian ranging from Romania in the south to Poland in the north of the central Paratethys, it is reported only from the southern part of the Paratethys in the Late Badenian (from Buituri in Romania; ŠULC 1934; ZILCH 1934; STUDENCKA & STUDENCKI 1988). This pattern could indicate a decline in sea surface temperature from the Early to Late Badenian and a north-south temperature gradient in the Late Badenian Central Paratethys as supposed for gastropods (M. HARZHAUSER, pers. comm. 08.07.2002). Extant Cryptoplacidae are restricted to the tropical and temperate Indian Ocean, central western Pacific Ocean and the Red Sea (GOWLETT-HOLMES 1998b).

The polyplacophorans of Grund indicate shallow sublittoral conditions, down to approximately 20 metres water depth and the presence of primary or secondary hardgrounds. Care must be taken, however, since this is a transported assemblage (HARZHAUSER et al. 1999) and could easily show some degree of faunal mixing.

A similar situation is found in Niederleis and Nodendorf: here also shell beds with shallow water faunas are found within deeper water sediments (MANDIC et al., 2002).

Lepidopleurus cajetanus, *Cryptoplax weinlandi* and probably also *Acanthochitona faluniensis* are shallow water taxa, whereas *Notoplax schafferi* could represent a deeper water species, as do its extant congeners, which could also explain its rarity.

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Plate 1

- Fig. 1: *Lepidopleurus cajetanus* (POLI, 1791); Grund, NÖ; head valve (NHMW 1859.XXXVIII.Anfang)
- Fig. 2: *Chiton corallinus* (RISSE, 1826); Grund, NÖ; intermediate valve (IPUW 3124)
- Fig. 3: *Chiton corallinus* (RISSE, 1826); Grund, NÖ; intermediate valve (IPUW 3125)
- Fig. 4: *Chiton* sp.; Nodendorf, NÖ; tail valve (IPUW 3122)
- Fig. 5: *Ischnochiton rissoi* (PAYRADEAU, 1826); Grund, NÖ; tail valve (NHMW 1868.I.281)
- Fig. 6-7: *Acanthochitona faluniensis* (ROCHEBRUNE, 1883); Niederleis, NÖ; intermediate and tail valves (NHMW 1863.XV.862)
- Fig. 8-10: *Cryptoplax weinlandi* ŠULC, 1934; Nodendorf, NÖ; intermediate valves (IPUW 3116-3118)
- Fig. 11-12: *Cryptoplax weinlandi* ŠULC, 1934; Nodendorf, NÖ; tail valves (IPUW 3119-3120)

all figures are SEM photographs and are given in the same magnification, scale bar equals 1 mm

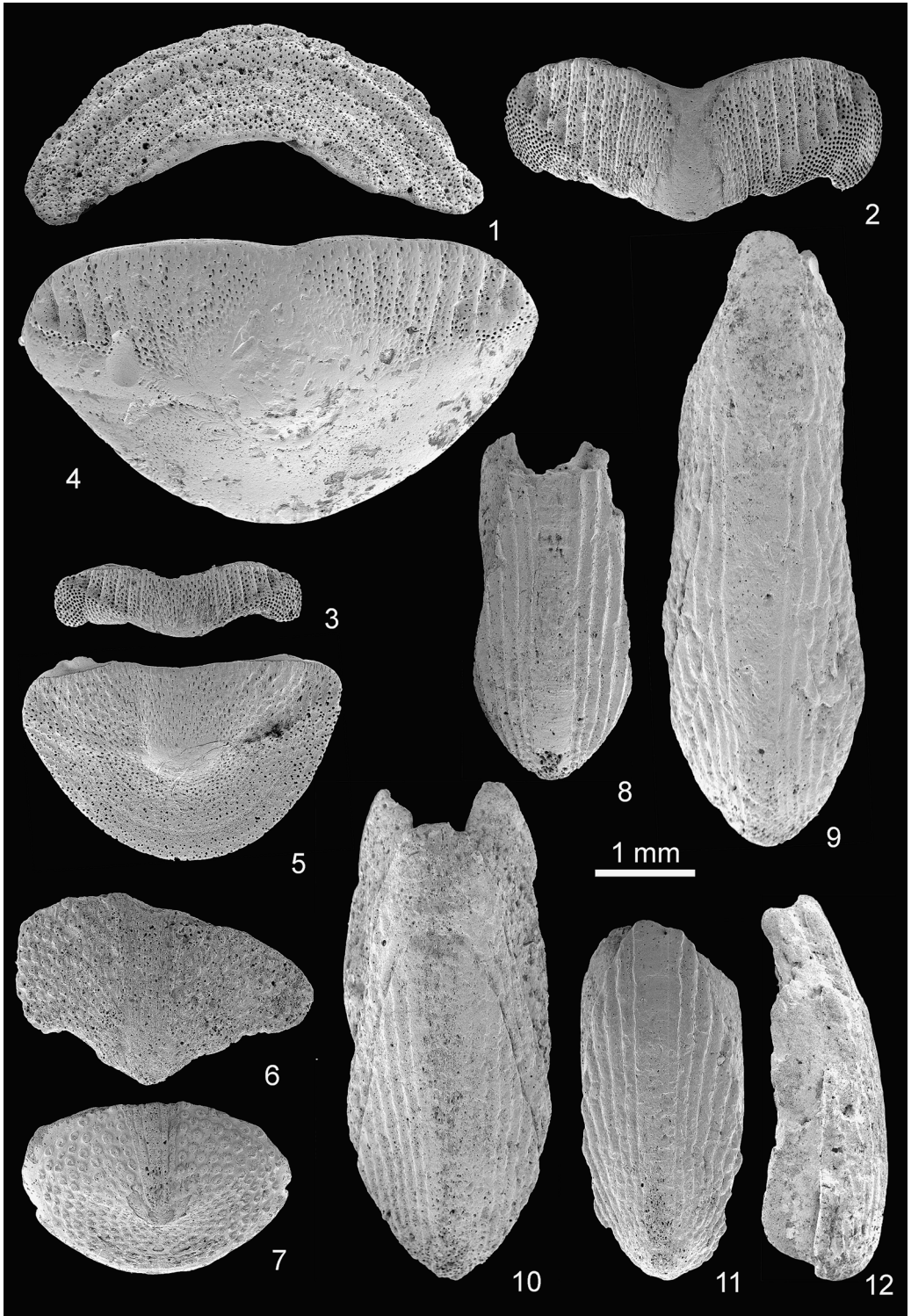


Plate 2

- Fig. 1: *Lepidopleurus subcajetanus* (SACCO, 1897); Niederleis, NÖ; tail valve (IPUW 3123)
- Fig. 2: *Lepidopleurus cajetanus* (POLI, 1791); Niederleis, NÖ; tail valve (NHMW 1863.XV.860/A)
- Fig. 3: *Lepidopleurus cajetanus* (POLI, 1791); Niederleis, NÖ; tail valve (NHMW 1863.XV.860/B)
- Fig. 4: *Notoplax schafferi* (ŠULC, 1934); Niederleis, NÖ; tail valve (Holotype; NHMW 1863.XV.861)

all figures except fig. 4 are SEM photographs and are given in the same magnification, scale bar equals 1 mm

