Description:
Size and shape: Test very small, usually less than 6 mm in length. Outline oval (antero-posteriorly elongated) to egg-shaped (test width ranges from 71.4 to 90.8 % TL, mean: 81.3 %). Maximum width lying slightly posterior of centre. In profile test is low arched with a tumid ambitus (test height usually ranging from 32.4 to 55.9 % TL, mean: 45.7 %). The maximum height coincides with the position of apical disc. The oral surface is flattened, without infundibulum.
Apical disc: The apical disc lies slightly anterior of the centre (~ 47 % of TL from the anterior margin) at the highest point of the test. Four moderately large subcircular genital pores are present. As in the former species gonopore size varies, probably due to sexual dimorphism. The five ocular pores are small and vary in their position regarding the polygon formed by the genital pores. Only a single circular hydropore is present, it lies at the point where the imaginary lines drawn between genital pore 1 and 3, respectively 2 and 4 intersect (Pl. 38, Fig. 1e).

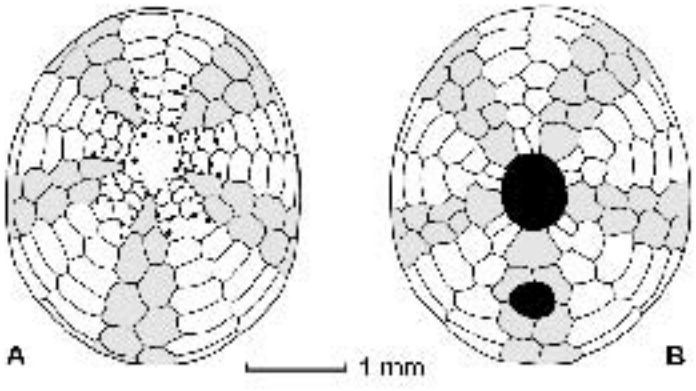

Figure 33: *Echinocyamus pseudopusillus* Cotteau, 1895: aboral (A) and oral (B) plating (Hartl Fm., Eisenstadt, Bgld; NHMW 1859.L.800b).

Ambulacra: Adapically more or less well developed petals are present. They consist of 4 to 7 strongly oblique pore pairs in each column. The petals are straight, open distally, with poriferous zones that converge towards each other at the tip of each petal. The frontal petal is longest, the paired petals are subequal in length, approximately 80 to 85 % of the frontal one. They extend about 50 to 55 % of the corresponding test radius. The interporiferous zones are as wide as or slightly wider than a single poriferous zone (Figs. 33.A). Outside the petals, distinct arcs of accessory pores (micro-unipores) which lie transversely to the axis of the ambulacra are found. The size of these accessory pores varies, but they are always distinctly smaller than the respiratory pores in the petals.
Interambulacra: The interambulacra are not inflated or depressed between the ambulacra. They are covered by small perforate tubercles, between which many miliary tubercles are found.
Peristome: The peristome is subcircular and rather large (~20 % of TL in diameter), lying subcentrally on the oral surface. The posterior margin of the peristome is usually depressed, sometimes forming a shallow groove connecting the peristome to the periproct. In some specimens the oral surface is slightly depressed around the peristome but not so much as to form a true infundibulum.
Periproct: About half the size of the peristome (~10 % of TL wide), of oval size, transversely elongated. It lies halfway between the peristome and the posterior margin or slightly posterior (Fig. 33.B).
Internal support structures: Five pairs of internal radial partitions are present in the ambulacra (see Pl. 38, Fig. 3a), substantiating the attribution to the genus *Echinocyamus*.

Differential diagnosis:
The Aquitanian to Langhian Maltese *Echinocyamus*, which has been referred to *E. stellatus* Capeder, 1906 by various authors (e.g. Challis, 1980) differs from this species by its more rounded outline, usually higher test, fewer respiratory pores (even in large specimens there are usually not more then 5 pore pairs in each ambulacral column), its raised apical disc, and its slightly inflated, cushion-shaped coronal plates (see Figs. 34.6a-c).

Echinocyamus ovatus (Münster in Goldfuss, 1829) from the Late Oligocene of Germany differs by its more rounded outline, rostrate posterior end, much smaller petalodium with fewer respiratory pores and more anteriorly eccentric apical disc (see Figs. 34.4a-c).

The contemporaneous *Echinocyamus calariensis* (Lambert, 1907) differs by its strongly elongated outline, "pointed" anterior margin and more flattened profile.

E. transylvanicus Laube, 1869, a contemporaneous species, differs from this species by its more rounded outline, higher test, fewer respiratory pores and not depressed posterior margin of the peristome (see Figs. 32.A-B, Figs. 34.1a-c).

Echinocyamus sp. B from the Badenian of Poland differs strongly by its submarginal periproct, fewer respiratory pores (in specimens of comparable size) and slightly subpentagonal outline (see Figs. 34.5a-c).

Discussion:
Although common, this species is rarely well preserved in the Badenian sediments of the Central Paratethys. No less than eight different species have been described from this age and region. Most of those are extremely similar to each other and vary only by slight differences in test outline and/or elevation. Szörényi (1950), for example, described four species of *Echinocyamus* (under the genus *Fibularia*) from the Badenian of the Mecsek Mts. (Hungary). Her differential diagnoses, descriptions and illustrations, however, do not allow a confident separation of these forms and seem to fall well within the variation displayed by *E. pseudopusillus*.

Most specimens of *E. pseudopusillus* come from psammitic sediments, often in association with rich bryozoan faunas, whereas the other Badenian species discussed here (*E. transylvanicus*) usually occurs in pelitic sediments. Since the two species differ mainly in shape characters rather than structural differences they could represent end-members of an ecological gradient. Currently, however, not enough data are available to prove or to reject this hypothesis and thus the question is set aside for the time being. Moreover, most of the 11 extant species likewise differ mainly in shape characteristics when only the corona is considered (compare the data presented by Mironov & Sagidachny, 1984). In the Upper Oligocene of Landes (Aquitaine Basin, France; Cahuzac & Roman, 1994) there are also two species [attributed to *E.* cf. *bouillei* (Lambert in Castex & Lambert) and *E. pusillus* (Müller) by the authors] differing mainly in corona outline.

Contemporaneous material of *E. stellatus* Capeder, 1906 from the Langhian of Malta (> 1000 specimens from a single horizon/locality), however, shows that intraspecific variation in outline (ranging from nearly circular to oval [most common] to slightly subpentagonal [rare]) and elevation of the test (strong variation, ranging from low arched to highly domed) can be quite severe. To further explore this situation more material, especially of *E. transylvanicus*, is needed.

Up to 5 species co-occur in extant setting of comparable size as the Central Paratethys [e.g. the south-eastern Australian part of the Tasman Sea or the Hawaiian Islands; compare Mironov & Sagidachny (1984)].

E. pseudopusillus is very similar to the Pliocene to extant species *E. pusillus* (Müller) found throughout the Lusitanian bioprovince and the North Sea. Indeed some fossil specimens from the Hungarian and Polish Middle Miocene have been attributed to the extant species (see Vadász, 1915; Mączyńska, 1977). Whether *E. pseudopusillus* is a junior synonym of *E. pusillus* or not cannot be decided here because more material has to be investigated (possible with the aid of morphometric methods). The extant form seems to be differentiated from this species by its non convergent, straight poriferous zones in the petals, a larger number of accessory pores per plate (compare Fig. 31), and a more "pointed" outline at least (see Figs. 34.3a-c).

Occurrence:

Austria: Early to Late Badenian (Langhian-Early Serravallian)
- Vienna Basin: Brunn am Steinfeld, NÖ ([NHMW]); Gainfarn, NÖ (Kroh, 2002b; [NHMW]); Nußdorf, Vienna (Schmid, 1989); Rauchstallbrunngraben (bryozoan marl), near Baden, NÖ [NHMW]; Stotzing (sandpit Mayer), Bgld [NMHW]
- Eisenstadt-Sopron Basin: Eisenstadt (Hartl Fm.), Bgld (Kroh et al., 2003 [NHMW]); old sandpit between Großhöflein and Kleinhöflein, Bgld ([NHMW])

Paratethys (non-Austrian occurrences): ? Karpatian, Early to Late Badenian (Langhian-Early Serravallian)
- Great Hungarian Basin (Pannonian Basin): Acsa, Pest, Hungary (Vadász, 1915); ? borehole Alcsútdoboz, SE Budapest (Kókay, 1988); Garáb, Nógrád, Hungary (Vadász, 1915); Háromház, Baranya, (Vadász, 1915); Magyaregregy, Csigadulö, Mecsek Mts., Hungary (Szörényi, 1950); Magyaregregy, Leányköi árok, Mecsek Mts., Hungary (Szörényi, 1950); Mátraverebély (Meszestetö), Nógrád, Hungary (Vadász, 1915); ? Mogyoród, near Fót, NW Budapest, Hungary (Horusitzky, 1927); Piliny, Nógrád, Hungary (Vadász, 1915); Nógrádszakál (= Szakall), Nógrád, Hungary (Vadász, 1915)
- Fore-Carpathian Basin: Busko, Poland (Mączyńska, 1993); ? Chomentów, Poland (Mączyńska, 1987); ? Huta Różaniecka and Huta Lubycka, Poland (Mączyńska, 1979); ? Karsy, Poland (Mączyńska, 1987); ? marly sands overlying the Korytnica Clays, Poland (pp Mączyńska, 1977); Mykolaiv (= Mikołajów), Ukraine (Szörényi, 1953); ? Niechobrz near Rzeszów, Poland (Mączyńska, 1996); Pińczów, Central Poland (Mączyńska, 1993); Radziechów (= Radziejów), Ukraine (Szörényi, 1953); Rybnice, Poland (Mączyńska, 1988); ? Świniary, Poland (Radwański & Wysocka, 2004); ? Zhukov (= Zukowce), Ukraine (Szörényi, 1953)
- Transylvanian Basin: Buituri (= Bujtur), Romania ([NHMW]);? Coşteiu de Sus (= Kostej), Romania (Vadász, 1915); Gârbova de Sus (= Felsö-Orbó), Romania (Vadász, 1915); ? Lăpugiu des Sus (= Lapugy), Romania (Vadász, 1915); Rugi-Delineşti, Romania (Stancu & Andreescu, 1968)
- Lom Basin: Bivolare, Opanez and Opansko bardo Northern Bulgaria (Kojumdgieva & Strachimirov, 1960)

Echinocyamus sp. A

(Fig. 35.A-C)

Material:

Early Eggenburgian (Early Burdigalian) – Gösing (Fels Fm.), NÖ, Austria
- NHMW: 5 specimens (NHMW 1998z0048/0064, NHMW 2003z0074/0001-2)

Dimensions (in mm)**:**

Inv. No.	TL	TH	TH*
NHMW 1998z0048/0064a	7.8	7.0	> 2.7
NHMW 1998z0048/0064b	7.0	5.9	> 2.4
NHMW 1998z0048/0064c	6.4	5.4	> 1.9
NHMW 2003z0074/0001	6.5	5.3	> 1.8
NHMW 2003z0074/0002	6.0	5.5	> 1.4

* All specimens crushed during diagenesis by sediment compaction.

Description:

Size and shape: Test small, TL ranging from 6 to 7.8 mm in the studied specimens. Outline conspicuously egg-shaped, anteroposteriorly elongated, the posterior end being much wider than anterior one. Maximum width far posterior, about halfway between centre and posterior margin. Profile shape not discernible in the present material, all specimens crushed. The oral surface is flattened, with a wide depression around the peristome.

Apical disc: The apical disc lies anterior of the centre, about one third of TL from the anterior margin. Four moderately large subcircular genital pores are present. Only a single circular hydropore is present, lying slightly anteriorly eccentric. Ocular pores poorly visible due to syntaxial rim cement formation.

Ambulacra: Adapically well developed petals are present. The petals are formed by 7 to 10 strongly oblique partitioned isopores in each column. The petals are straight and open distally. The poriferous zones of the paired petals are straight, that of the frontal petal are diverging distally. The frontal petal is longest, the paired petals are subequal in length. The frontal petal extends about two third of the corresponding test radius, whereas the posterior paired petals extend only half of the corresponding test radius. The anterior paired petals are intermediate. The interporiferous zones are about one to one and a half times as wide as a single poriferous zone. Outside the petals, distinct arcs of accessory pores (micro-unipores) which lie transversely to the axis of the ambulacra are found.

Interambulacra: The interambulacra are not inflated or depressed between the ambulacra. They are covered by small perforate tubercles, between which many miliary tubercles are found.

Peristome: The peristome is subcircular and rather large (nearly 20 % of TL in diameter). It lies subcentrally on the oral surface in a wide depression.

Periproct: The periproct lies at the margin of the circum-oral depression, slightly closer to the margin than to the peristome. It is irregularly oval and about half the size of the peristome.

Internal support structures: unknown

Discussion:

Although the presence of internal partitions could not be shown in the present material due to the poor preservation, all other features support an attribution to the genus *Echinocyamus*. The specimens are clearly not conspecific with *E. transylvanicus*, *E.* sp. B or *E. pseudopusillus* from the Badenian (Langhian-Early Serravallian). The Eggenburgian species differs from the Badenian one by its larger size, pronounced egg-shaped outline, more respiratory pores in the petals, straight or even diverging poriferous zones. Due to the limited amount of material and the poor state of preservation (all specimens crushed and most overgrown by syntaxial rim cement) the specimens could not be securely referred to any known species and have to be named in open nomenclature.

Occurrence:

Austria: Early Eggenburgian (Early Burdigalian)
- Molasse Zone: Gösing (Fels Fm.), NÖ ([NHMW])

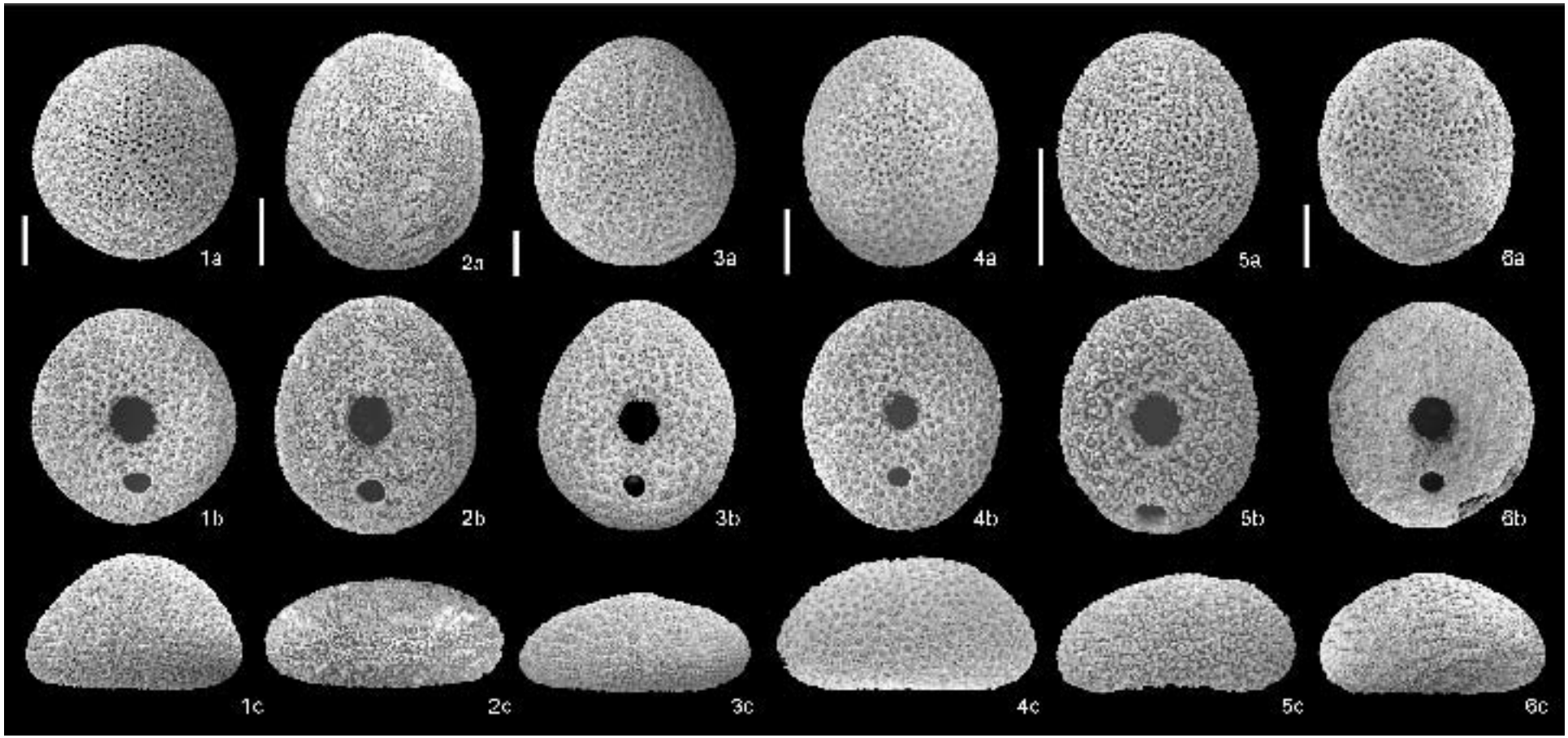

Figure 34: Comparison between selected European species of *Echinocyamus* from the Late Oligocene to Recent.
1: *Echinocyamus transylvanicus* Laube, 1869: Early Badenian (Langhian), Lapugy, Romania (NHMW.1860.XL.529a); note high profile
2: *Echinocyamus pseudopusillus* Cotteau, 1895: Early Badenian (Langhian), basal Hartl Fm., Eisenstadt, Bgld (NHMW 1859.L.800b); note low profile and small petalodium
3: *Echinocyamus pusillus* (Müller, 1776): recent, Mediterranean Sea, coast of Croatia (NHMW coll.); note egg-shaped outline, large petalodium and well developed petals
4: *Echinocyamus ovatus* (Münster in Goldfuss, 1829): Late Oligocene of Astrup, Germany (Univ. Münster coll. AS1-60); note peculiar outline and small petalodium
5: *Echinocyamus* sp. B: Early Badenian (Langhian) of Korytnica, Central Poland (Nebelsick coll., Tübingen); note submarginal position of periproct (same position in large specimens)
6: *Echinocyamus stellatus* Capeder, 1906: Langhian, Xwieni Bay Mb, Upper Globigerina Limestone Fm., Gozo, Malta (NHMW coll.); note large petaloid area

Scale bars equal 1 mm each; a: aboral view, b: oral view, c: right lateral view.

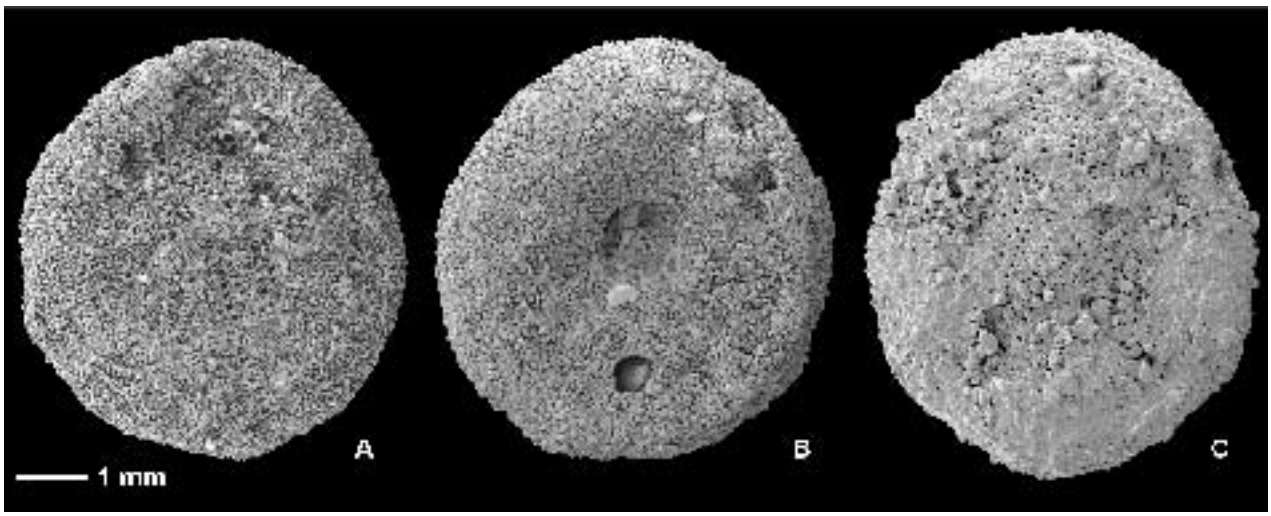

Figure 35. *Echinocyamus* sp. A: aboral (A, C) and oral view (B) (Eggenburgian of Gösing, NÖ; A-B: NHMW 2003z0074/0001, C: NHMW 1998z0048/0064c)

Other *Echinocyamus* species reported from the Central Paratethys:

Apart from the species discussed above (and records of species placed into their synonymy) three other species of *Echinocyamus* have been reported from the Central Paratethys. Two of these (*E. calariensis* and *E.* sp. B) are sufficiently well known and are considered to be distinct from those discussed above. A third (*E. sandalinus*) is based on a single specimen, which has not been re-examined, its status is unclear.

***Echinocyamus calariensis* (Lambert, 1907)**

v 1915 *Fibularia calariensis* Lamb. – Vadász: 114; pl. 8 (2), figs. 22
1977 *Echinocyamus pseudopusillus* Cotteau, 1895 – Mączyńska: 196; pl. 6, figs. 1-3
1987 *Echinocyamus pseudopusillus* Cotteau, 1895 – Mączyńska: 148

Reported occurrence: Badenian (Langhian-Early Serravallian) of Hungary (locality Acsa, Pest, Vadász, 1915), Romania [locality Rachiş (= Oláh-Rákos), Vadász, 1915], and Early Badenian (Langhian) of Poland (marly sands overlying the Korytnica Clays; under the name *E. pseudopusillus*, Mączyńska, 1977).

Remarks: This species is characterised by its very elongated outline, pointed anterior margin and low, flattened profile. It was reported under the name *Fibularia calariensis* Lambert by Vadász (1915: 114; pl. 2, fig. 22) and as *Echinocyamus pseudopusillus* Cotteau by Mączyńska (1977: 196; pl. 6, figs. 1-3 and 1987: 148, not 1988: 61; pl. 4, fig. 3). This form does not fall within the morphological range of the species discussed above. After examining the material of Vadász housed at the Hungarian Geological Survey (MAFI Ech 248, 303) I would indeed regard these specimens as specifically different from the other species discussed here (at least MAFI Ech 248; the three specimens of Ech 303 could also be deformed *E. pseudopusillus*). This form was not found in Austrian localities until now, only a single, poorly preserved specimen (NHMW 2004z0076/0047) from the Early Badenian of Gainfarn might be tentatively assigned to this species (Pl. 38, Figs. 2a-c).

***Echinocyamus* sp. B**

non 1906 *Echinocyamus linearis* n. f. – Capeder: 517; figs. 12a-c
1977 *Echinocyamus linearis* Capeder, 1906 – Mączyńska: 197; pl. 7, figs. 1-6
1987 *Echinocyamus linearis* Capeder, 1906 – Mączyńska: 148
1993 *Echinocyamus linearis* Capeder, 1906 – Mączyńska: 111; pl. 3, fig. 8; pl. 6, fig. 1g
2003 *Echinocyamus linearis* Capeder, 1906 – Ceranka & Złotnik: 491ff.; figs. 1A-E

Reported occurrence: Early Badenian of Poland [marly sands overlying the Korytnica Clays (Mączyńska, 1977, 1987; Ceranka & Złotnik, 2003) and the localities Pińczów and Skowronno in Central Poland (Mączyńska, 1993)].

Remarks: This species is characterised by its submarginal position of its periproct, its elongated outline, subpentagonal shape and low number of pore pairs in the petals. It is clearly different from the type material of *E. linearis* figured by Capeder (1906: 517, figs. 12a-c), which has a periproct lying halfway between peristome and posterior margin. Among the numerous nominal species of the genus *Echinocyamus* there are few with a similar posterior position of the periproct. Among the extant species this is only the Australian endemic *Echinocyamus platytatus* Clark, 1914, which occurs in fine sands between 9 to 365 m all along the southern coast of Australia from Port Stephens (New South Wales) to Point d'Entrecasteaux (Western Australia) (Miskelly, 2002). Additionally three fossil species have a similar periproct position: *E. lecointreae* (Lambert, 1907a) from the "Helvetian" of the "Faluns Touraine" of Western France (Indre & Loire), *E. studeri* (Sismonda, 1841) from the Miocene of the "Colli Torinesi" and Monte Gargano (d'Alessandro et al., 1979) in Italy, and *E. lebesconti* Bazin, 1884 from the Middle Miocene of the Bretagne (Western France). Unfortunately, the available descriptions are insufficient to decide whether the Polish material is conspecific with any of them or not.

***Echinocyamus* ? *sandalinus* (Szörényi, 1953)**

1953 *Fibularia sandalina* n.sp. – Szörényi: 60-61; pl. 5, figs. 6, 6a

Reported occurrence: Early Badenian (Langhian) of Zhukov (= Zukowce), Ukraine Szörényi, 1953).

Remarks: Only the short description and poor illustrations of Szörényi (1953) are available of this species. The single described and figured specimen is slightly elongated antero-pos-

teriorly, has a pointed anterior and a transversely truncated posterior margin, a low, wedge-shaped profile (thicker anteriorly) and its periproct lies roughly halfway between the peristome and the posterior margin. The development of the petaloid area and other details are unknown. Based on the available information alone it is impossible to confidently relate this species to any other. A re-examination of the type-material is necessary.

Szörényi (1953) followed Lambert's (1891) use of the names *Fibularia* and *Echinocyamus*. According to the current usage (Mortensen, 1948b; Durham, 1966) this species has to be transferred to *Echinocyamus*, although the presence of internal partitions remains to be shown.

***Echinocyamus* ? sp.**

	1893	*Echinocyamus* sp. – Toula: 288
	1927	*Fibularia* sp. – Horusitzky: 27, 167
	1894	*Echinocyamus ovatus*. Ag. – Lörenthey: 59
	1981	*Echinocyamus studeri* Sism. – Halmai: 106
pp	2003b	*Echinocyamus* sp. – Kroh: 249

Reported occurrence: Karpatian (Late Burdigalian) of Kisalag (Halmai, 1981) and Mogyoród, NW Budapest, Hungary (Horusitzky, 1927; pp Kroh, 2003b); Badenian (Langhian-Early Serravallian) of Kralice nad Oslavou (= Kralitz), Moravia, Czech Republic (Toula, 1893), and Rachiş (= Oláh-Rákos), Alba, Romania (Lörenthey, 1894)

Remarks: The present records lack sufficient information for revision and the reference material could not be traced. It is likely that they refer to any of the species described above. The record of *Fibularia* sp. by (Horusitzky, 1927) most probably also refers to an *Echinocyamus*, as convincing records of *Fibularia* from the Miocene of the Central Paratethys are missing. The species *Echinocyamus ovatus* Agassiz recorded by (Lörenthey, 1894) is unknown to the present author. It is possible that Lörenthey meant *E. ovatus* (Münster in Goldfuss, 1829), a species from the Late Oligocene of Germany. Halmai's (1981) record lacks any decription or illustration and is based on an unpublished Ph.D. thesis. It remains to be shown if either species occurs in the Miocene of the Central Paratethys.

Suborder Scutellina Haeckel, 1896
Family Scutellidae Gray, 1825
Genus *Parascutella* Durham, 1953

Type-species: *Scutella leognanensis* Lambert, 1903; by original designation (Durham, 1953: 173)
Diagnosis: Test large and thin; petals extending about 65-70 % of the corresponding test radius. Anterior petals shorter than posterior ones. Five to six ambulacral and four to five interambulacral coronal plates on oral surface. Interambulacra about as wide as ambulacra at the ambitus. Periproct submarginal, between the 3rd pair of postbasicoronal plates (modified from Durham, 1953, 1955, 1966).
Distribution: Miocene – Europe (Durham, 1966)
Remarks: When revising the Clypeasteroida Durham (1953, 1955) found that two very different groups were attributed to the genus *Scutella*, partly explaining the confusion in the literature. Based on a re-examination of the type-species Durham provided an emended diagnosis for the genus *Scutella* and established a new genus, *Parascutella*, for a group of species erroneously attributed to the former. The two genera differ strongly in the position of their periproct in relation to the coronal plates. In *Scutella* the periproct lies between the 1st pair of postbasicoronal plates, about halfway between the peristome and the posterior margin. In *Parascutella* it lies submarginally, between the 3rd pair of postbasicoronal plates. Additionally the two genera differ by the length and structure of the petals. In the former the petals are usually half as long as the corresponding test radius and closed, while in the latter they are two third as long and distally open. The frontal petal is the longest of the petals in *Scutella* and the shortest in *Parascutella*.

Although this separation was very clearly documented and published three times (Durham, 1953, 1955, 1966) it was largely ignored by the palaeontologists working in the Paratethys region (e.g. Schaffer, Mihály, Mączyńska). All Paratethyan specimens attributed to the genus *Scutella* previously have to be transferred to the genus *Parascutella*. Until now no "true" *Scutella* species have been found in the Neogene of the Paratethys (see Ali, 1998 and Kroh, 2002a).

Parascutella gibbercula (de Serres, 1829)

(Fig. 36, 37; Pl. 39, Figs.1a-b; Pl. 40, Figs. 1-2; Pl. 41, Figs. 1-3; Pl. 42, Figs. 1a-c)

*	1829	*Scutella gibercula*. Nobis. – de Serres: 156
?	1830	*Scutella subrotunda*, Lam. – Eichwald: 195-196
	1835	*Sc.*[*utella*] *gibberula* M. de S. – Agassiz: 188
	1837	*S.*[*cutella*] *gibercula*. M. de Serres – des Moulins: 80
?	1837	*Scutella subrotunda* Lam. – Pusch: 181, tab.
	1841a	*Scutella gibbercula* de Marcel de Serres – Agassiz: 86
pp	1847a	*Scutella subrotunda* Lamk. – Agassiz & Desor: 134
?	1852	*Scutella subrotunda* Leske. – Eichwald: pl. 3, figs. 1a-c
?	1853	*Scutella subrotunda* Leske. – Eichwald: 47
pp	1858	[*Scutella*] *Faujasii* Defr. – Desor: 233
?	1860	*Scutella Faujasii* – Foetterle: 76
	1869	*Scutella Faujasii* – Fuchs: 194
	1869	*Scutella Vindobonensis* Laube sp. ined. – Fuchs: 194
v. #	1869a	*Scutella vindobonensis* Laube. – Laube: 183
	1870	*Scutella Faujasii* Defr. – Wolf: 38
v.	1870	*Scutella Vindobonensis* Lbe. – Laube: 314
v.	1871	*Scutella Vindobonensis* Laube. – Laube: 62; pl. 17, fig. 1
	1873	*Scutella vindobonensis* Laube. – Stur: 91
#	1874	*Scutella kalksburgensis* – Wiesbaur: 164-165.
	1874	*Scutella Vindobonensis* – Quenstedt: pl. 82, figs. 19-21; pl. 83, fig. 1
	1875	*Scutella Vindobonensis* – Quenstedt: 542-544
v.	1877	*Scutella vindobonensis* Laube. – Karrer: 78, 303, 312
	1877	*Scutella vindobonensis* Laube. – Lóczy: 63
	1881	*Scutella Vindobonensis* Laube. – Franzenau: 33, 86
	1887b	*Scutella Vindobonensis*, Laube. – Koch: 261-262
? #	1887b	*Scutella pygmea*, nov. sp. – Koch: 262-263; pl. 5, figs. 1a-c
	1888b	*Scutella Vindobonensis*, Laube – Nemes: 22, 32
?	1888b	*Scutella pygmaea*, Koch, nov. sp. – Nemes: 22, 32
	1894	*Scutella vindobonensis*. – Lörenthey: 67
	1894	*Scutella vindobonensis*, Laube. – Mártonfi: 153
	1905	*Scutella vindobonensis*, Lbe. – Gaál: 344, 362
	1906	*Scutella Vindobonensis* Lbe. – Schaffer: 69
	1906	*Scutella vindobonensis* Lbe. – Vadász: 329
	1907	*Scutella Vindobonensis* Laube – Schaffer: 35
.	1912	*Scutella Gibbercula* M. de Serres, 1829. – Lambert: 73-74; pl. 5, figs. 1-2
	1913a	*S.*[*cutella*] *gibbercula* M. de Serres. – Cottreau: 53
v ? #	1915	*Scutellina hungarica* nov. sp. – Vadász: 112-113; pl. 10 (4), figs. 2-3
	1915	*Scutella vindobonensis* Lbe. – Májer: 35, 88
v.	1915	*Scutella vindobonensis* Lbe. – Vadász: 115-117; figs. 12-13

v. 1915 *Scutella gibbercula* M. de Serr. – Vadász: 117-118, fig. 14
v ? 1915 *Scutella leognanensis* Lambert. – Vadász: 119-120; figs. 15-16
v. 1915 *Scutella paulensis* Ag. – Vadász: 121, fig. 17
? 1915 *Scutella pygmea* Koch. – Vadász: 122; pl. 9 (3), figs. 10-11
v. 1922 *Scutella vindobonensis*, Laube – Abel: 243, fig. 202
1928 *Scutella gibbercula* […] M. de Serres – Lambert & Jeannet: 206, no. V.56
1930 *Scutella vindobonensis* Laube. – Vendl: 76
1930 *Scutella leognanensis* Lamb. – Vendl: 77
1931 *Scutella vindobonensis* Laube – Janoschek: 68, 78, 79, 81, 83, 84, 85, 86, 87 (fide Schaffer, 1962)
1936 *Scutella vindobonensis* Laube. – Paucă: 143
1939 *Scutella vindobonensis* Lbe. – Kapounek: 72
1942 *Scutella Vindobonensis* Laube –Schaffer: 94
1953b *Scutella vindobonensis* Laube – Sieber: 194
. 1953 *Scutella vindobonensis* Laube, 1871. – Szörényi: 62-64; pl. 1, figs. 4, 4a-b
? 1953 *Scutella cf. leoganensis* Lambert, 1903. – Szörényi: 64-65; pl. 1, fig. 7
? 1953 *Scutella paulensis* Agassiz, 1841. – Szörényi: 65-66; pl. 1, figs. 1-3, 3a-b; pl. 2, fig. 2
? # 1953 *Scutella almerai parva* n. ssp. – Szörényi: 67; pl. 1, figs. 6, 6a-b
? # 1953 *Scutella eichwaldi* n. sp. – Szörényi: 67-68; pl. 1, figs. 5, 5b
1958a *Scutella* aff. *vindobonensis* Laube – Sieber: 152
v. 1959 *Scutella* C. – Schaffer: 255
v. 1959 *Scutella* D. – Schaffer: 255
v. 1959 *Scutella* E. – Schaffer: 255
1959 *Scutella* F. – Schaffer: 255
1959 *Scutella* G. – Schaffer: 255
1960 *Scutella* aff. *gibbercula* M. de Serres – Roman: 89-90; pl. 8, fig. 3
#. 1960 *Scutella vindobonensis planata* Kókay nov. ssp. – Somos & Kókay: 341-342, 346; 3 figs.; pl. 16, figs. 1-2; pl. 17, fig. 1.
? 1960 *Scutella* sp. – Somos & Kókay: 342
1962 *Scutella styriaca* n. sp. – Schaffer: 153-154; fig. 9; pl. 19, fig. 1
v. # 1962 *Scutella multiconcava* n. sp. – Schaffer: 154-156; fig. 10; pl. 17, figs. 4-5; pl. 18, figs. 1-5
v. 1962 *Scutella vindobonensis vindobonensis* Lbe. – Schaffer: 156-157; fig. 1; pl. 16, figs. 1, 6; pl. 19, fig. 3
v. # 1962 *Scutella vindobonensis secunda* n. ssp. – Schaffer: 157-159; fig. 11; pl. 19, figs. 2, 4
1962a *Scutella vindobonensis* – Thenius: 27
v. 1963 *Scutella vindobonensis* Laube – Müller, 521; figs. 683B a-c
1965 *Scutella styriaca* Schaffer – Kollmann: 541
1969 *Scutella vindobonensis* Laube – Mihály: 254-255
#. 1969 *Scutella szoerenyiae* nov. sp. – Mihály: 255; pl. 1, figs. 1-2; pl. 2, fig. 1
. 1969 *Scutellina hungarica* Vadász – Mihály: 255; pl. 2, figs. 2-3
1969 *Scutella gibbercula* Serr. – Mitrović-Petrović: 137-138; pl. 27, figs. 1, 1a
1969 *Scutella vindobonensis* Lbe. – Mitrović-Petrović: 138; pl. 27, fig. 2; pl. 28, figs. 1, 1a
1969 *Scutella multiconcava* Serr. – Mitrović-Petrović: 138-139; pl. 29, fig. 1; pl. 30, fig. 1
1969 *Scutella styrica* Schaf. – Mitrović-Petrović: 139; pl. 29, figs. 2; pl. 30, fig. 2
1970 *Scutella vindobonensis* – Thenius: p. 216
1974 *Scutella gibbercula* Ag. – Roman: 334-338
1974 *Scutella vindobonensis* – Thenius: 27
1975 *Scutella vindobonensis* Laube, 1871 – Kalabis: 176
1978 *S.*[*cutella*] *szoerenyiae* Sándor, 1969 – Kier & Lawson: 67 [correct author is Mihály, Sándor is his first name]
v. 1978 *S.*[*cutella*] *multiconcava* Schaffer, 1962 – Kier & Lawson: 67
. 1978 *S.*[*cutella*] *styriaca* Schaffer, 1962 – Kier & Lawson: 67
. 1978 *S.*[*cutella*] *vindobonenis* Laube *planata* Kókay in Somos and Kókay, 1960 – Kier & Lawson: 67
v. 1978 *S.*[*cutella*] *vindobonenis* Laube *secunda* Schaffer, 1962 – Kier & Lawson: 67
1978 *Scutella styriaca* Schaffer – Kollmann & Rögl: 165
v. 1978 *Scutella vindobonensis* Laube – Müller, 566; figs. 695B a-c
. 1981 *Scutella multiconcava* Schaffer, 1962. – Codrea: 141-145; figs. 3-5
. 1984 *Scutella vindobonensis* Laube – Kókay et al.: 288, 290
. 1984 *Scutella* (*"Scutellina"*) *hungarica* (Vadász) – Kókay et al.: 288
. 1984 *Scutella szoerenyiae* Mihály – Kókay et al.: 288
. 1984 *Scutella* n. sp. 1– Kókay et al.: 288
. 1984 *Scutella* n. sp. 2 – Kókay et al.: 288
. 1985 *Scutella szoerenyiae* Mihály, 1969 – Mihály: 238-239, 258-259; pl. 2, figs.1-3
. 1985 *Scutella hungarica* (Vadász, 1914) nov. comb. – Mihály: 239-240, 259-260; pl. 1, figs.6-10
. 1985 *Scutella pygmea* Koch, 1887 – Mihály: 240; pl. 3, figs.1-4
#. 1985 *Scutella romani* n. sp. – Mihály: 240-241, 260; pl. 2, figs.4-6
#. 1985 *Scutella muelleri* n. sp. – Mihály: 241, 260-261; pl. 3, figs.5-6; pl. 4, fig. 1
. 1985 *Scutella vindobonensis* Laube, 1871 – Mihály: 241-242
1988 *Scutella gibbercula* N. de Serres, 1829 – Saraiman: 37, pl. 1, figs. 1-2
1988 *Scutella vindobonensis* Laube, 1871 – Saraiman: 37, pl. 1, figs. 3-4
#. 1990 *Scutella vindobonensis altus* n. ssp. – Mihály: 237-238, 240; pl. 1, figs.1-2; pl. 2, fig. 1
1996 *Scutella subtrigona* Laube – Ghiurca: 189, unnumbered fig. [misidentification]
. 1998 *Parascutella gibbercula* (de Serres, 1829) – Philippe: 150-151; pl. 15, figs. 7 a-d
non 1998 *Parascutella striatula* (de Serres, 1829) – Philippe: 143-145; pl. 15, figs. 1-3
v. 2002 *Parascutella vindobonensis* – Plöchinger & Karanitsch: 161, fig. 336

Type-material:
Scutella gibbercula de Serres, 1829:
Holotype: according to Philippe (1998: 150, 315) the specimen figured by Lambert (1912: 73-74) could probably be the holotype of de Serres' species [see also comment of Cottreau (1913b) and reply of Lambert (1913b)]; a cast of that specimen is housed in the collection Lambert at the Muséum national Paris under the number L 18 399
Locus typicus: Cadenet, Vaucluse, France
Age: Tortonian (according to Philippe, 1998: 150)

Scutella vindobonensis Laube, 1869:
Lectotype (Pl. 39, Figs. 1a-b; Pl. 40, Fig. 2): NHMW 1904.VIII.59, figured by Laube (1871: 62; pl. 17, fig. 1), designated by Schaffer (1962: 156); originally in the collection of Karrer, since 1903 at the Naturhistorisches Museum Wien, Geologische Abteilung
Paralectotypes: most of the *Ps. gibbercula* specimens from the

NHMW collection registered before 1869 have to be considered paralectotypes (see below under "Material").
Locus typicus: Kalksburg near Vienna, Austria
Age: Badenian (Langhian-Early Serravallian), Middle Miocene

Scutella kalksburgensis Wiesbaur, 1874:
Holotype: Naturhistorisches Museum Wien, Geologische Abteilung (no located)
Locus typicus: Kalksburg near Vienna, Austria
Age: Badenian (Langhian-Early Serravallian), Middle Miocene
Remarks: None of the *Ps. gibbercula* species from Kalksburg in the collection of the Naturhistorisches Museum Wien is accompanied by a label or any other indication that it might represent the type material of this species. Unfortunately, the type material was never figured, so there is no possibility to identify the type material of this species. However, since all the scutellids from the locality Kalksburg examined during the present study are *Ps. gibbercula*, it is only valid to assume that *S. kalksburgensis* is a junior synonym of that species. Moreover, the description and diagnostic features given by Wiesbaur (1874) fall well within the variation of *Ps. gibbercula*.

? *Scutella pygmea* Koch, 1887b:
Holotype: the specimen figured by Koch (1887b: pl. 5, figs. 1a-c) and Vadász [1915: pl. 9 (3), figs. 10-11 (seems more accurate and fits better with the descriptions than Koch's figures]; current whereabouts unknown
Locus typicus: Buituri (= Bujtur), 20 km S of Deva, Hunedoara, Romania
Age: Late Badenian (Early Serravallian)
Remarks: The holotype is a poorly preserved juvenile scutellid. Vadász (1915:122) argued that the slightly thickened, rounded margin indicates that the specimen is no juvenile, which according to his opinion should have a thin, sharp margin. In *Ps. gibbercula*, however, a moderately thick, rounded margin is developed throughout the ontogeny and can already be observed in specimens between 15 and 45 mm TL, which still lack gonopores. *S. pygmea* is here tentatively placed into the synonymy of the co-occurring *Ps. gibbercula* on base of the high similarity to juveniles of that species.

? *Scutellina hungarica* Vadász, 1915:
Holotype: MAFI Ech 228, figured by Vadász (1915: pl. 10 (4), figs. 2-3); Geological Survey of Hungary, Budapest
Locus typicus: Biatorbágy (= Bia), Hungary
Age: Late Badenian (Early Serravallian), Middle Miocene
Remarks: The holotype of this species is a poorly preserved juvenile scutellid. It is very similar to juveniles of *Ps. gibbercula*, the only other scutellid present in the Late Badenian of the Central Paratethys and is tentatively placed into the synonymy of the latter. Material attributed to *S. hungarica* by Mihály (1969 and 1985) is clearly conspecific with *Ps. gibbercula*.

? *Scutella almerai parva* Szörényi, 1953:
Holotype: specimen no. 29 figured by Szörényi (1953: pl. 1, figs. 6, 6a-b); University of Lwów, Ukraine
Locus typicus: Velyki Birky (= Borki-Wielkie), near Tarnopol, Ukraine
Age: Badenian (Langhian-Early Serravallian), Middle Miocene

? *Scutella eichwaldi* Szörényi, 1953:
Holotype: specimen no. 15 figured by Szörényi (1953: pl. 1, figs. 5, 5b); University of Lwów, Ukraine
Locus typicus: Zalesce (= Zalezce), Ukraine
Age: Badenian (Langhian-Early Serravallian), Middle Miocene

Scutella vindobonensis planata Kókay, 1960 *in* Somos & Kókay, 1960:
Holotype: MAFI Ech 638, figured by Somos & Kókay (1960: 341-342, 346; 1 fig.; pl. 16, fig.2); Geological Survey of Hungary, Budapest
Locus typicus: Railroad cut near Hird, Hungary
Age: Badenian (Langhian-Early Serravallian), Middle Miocene

Scutella multiconcava Schaffer, 1962:
Holotype: NHMW 390/1961 figured by Schaffer (1962: pl. 18, figs. 1-3); Naturhistorisches Museum Wien, Geologische Abteilung
Figured specimen: NHMW 1964/590 figured by Schaffer (1962: pl. 17, figs. 4) and NMW 391/1961 figured by Schaffer (1962: pl. 15, figs. 3); Naturhistorisches Museum Wien, Geologische Abteilung
Locus typicus: Neckenmarkt, Bgld, Austria
Age: Badenian (Langhian-Early Serravallian), Middle Miocene
Remarks: The holotype (see Pl. 41, Fig. 1a-c) is a pathological specimen. Sometime during its ontogeny the specimen seems to have been injured at the apical disc. This resulted in a posterior and left lateral displacement of the ocular plates, which do not border the madreporite. As a whole this also accounts for the smaller TL/TW ratio than in other specimens from the type locality.

Scutella styriaca Schaffer, 1962:
Holotype: IPUW 1559 figured by Schaffer (1962: pl. 19, fig. 1); Institute of Palaeontology, University of Vienna (not located)
Locus typicus: quarry near "Tittenberg" (probably identically with Seggauberg), south-west Leibnitz, Styria, Austria
Age: Badenian (Langhian-Early Serravallian), Middle Miocene
Remarks: Although this species is registered in the inventory of the Institute of Palaeontology at the University of Vienna it could not be located in the collections.

Scutella vindobonensis secunda Schaffer, 1962:
Holotype (Fig. 36.B, Pl. 40, Figs. 1a-c): NHMW 1964/589, figured by Schaffer (1962: pl. 19, fig. 4); Naturhistorisches Museum Wien, Geologische Abteilung
Locus typicus: Sandberg, near Devínska Nová Ves (= Neudorf an der March), Slovak Republic
Age: Badenian (Langhian-Early Serravallian), Middle Miocene
Remarks: The holotype of this species has been registered at two institutions the Naturhistorisches Museum Wien (as NHMW 1964/589), where it is still located and erroneously at the Institute of Palaeontology, University of Vienna (as IPUW 1560).

Scutella szoerenyiae Mihály, 1969:
Holotype: MAFI Ech 3, figured by Mihály (1969: pl. 1, figs.1-2; pl. 2, fig. 1); Geological Survey of Hungary, Budapest
Locus typicus: Budapest-Rákos, Hungary
Age: Late Badenian (Early Serravallian), Middle Miocene

Scutella romani Mihály, 1985:
Holotype: MAFI Ech 1, figured by Mihály (1985: pl. 2, fig. 4); Geological Survey of Hungary, Budapest
Paratype: MAFI Ech 2, figured by Mihály (1985: pl. 2, fig. 5); Geological Survey of Hungary, Budapest
Locus typicus: Gyakorló út (street), Budapest, Xth district, Hungary
Age: Late Badenian (Early Serravallian), Middle Miocene

Scutella muelleri Mihály, 1985:
Holotype: MAFI Ech 358, figured by Mihály (1985: pl. 3, figs. 5-6, pl. 4, fig. 1); Geological Survey of Hungary, Budapest
Locus typicus: Gyakorló út (street), Budapest, Xth district, Hungary
Age: Late Badenian (Early Serravallian), Middle Miocene

Scutella vindobonensis altus Mihály, 1990:
Holotype: MAFI Ech 400, figured by Mihály (1990: pl. 1,