Diachronous deposits of Lake Pannon in the Kisalföld Basin reflect basin and mollusc evolution

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Diachrone Ablagerungen des Pannonischen Sees in der Kleinen Ungarischen Tiefebene als Zeugen der Beckenentwicklung und der Mollusken-evolution

Zusammenfassung


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The Neogene Kisalföld Basin is a subunit of the Central European Pannonian Basin. It includes southwestern Slovakia, the easternmost part of Austria, and northwestern Hungary. Littoral sediments of the Late Miocene Lake Pannon outcrop along the western (Burgenland) and eastern (Transdanubian Central Range, TCR) margins of the basin. Seismic reflection profiles across the Kisalföld Basin indicate that the basin was filled with sediments via progradation from the NW to the SE. Consequently, the littoral sediments of Burgenland and the Transdanubian Central Range do not represent opposite shores of the Kisalföld Basin; instead, they were deposited on the same prograding northwestern shoreline of Lake Pannon during two different time intervals. The mollusc fauna of the western outcrops is uniform (referred to here as the Burgenland fauna). Similarly, the eastern outcrops yield a uniform fauna (the TCR fauna). Similarity between the Burgenland and the TCR faunas allows us to establish that they lived in similar environments in the littoral zone of Lake Pannon. There are, however, consistent morphological differences between Burgenland and TCR forms in several bivalve species, which are thus interpreted as evolutionary change. The difference between the Burgenland and TCR faunas is useful for biostratigraphy; it defines the boundary between the *Lymnocardium conjungens* Zone (Burgenland) and *Lymnocardium ponticum* Zone (TCR). Magnetostratigraphic data suggest that the time difference involved is on the order of a half million years.

1. Geological setting

The Kisalföld ("Danube") Basin is a subbasin of the Neogene Pannonian Basin of Central Europe. Its area is shared by Austria, Slovakia, and Hungary (Text-Fig. 1). The geology of the Kisalföld basin has recently been treated by KÖRÖSSY (1987), KEITH et al. (1994), TARI (1994, 1996), HORVATH et al. (1995a), MATTICK et al. (1996), Hrusccky et al. (1996), and KOVAC & BARTH (1996). The Kisalföld Neogene Basin is superimposed on the Alpine thrust-fold belts of the Eastern Alps and Western Carpathians. Following an Early to Middle Miocene, partly terrestrial, partly marine synrift stage, the bulk of the Neogene sedimentary formations were deposited in the Late Miocene brackish Lake Pannon, which flooded the area due to a widespread post-rift (thermal) subsidence. Seismic reflectors show that the Kisalföld Basin was filled with sediments prevalently from the NW, implying that the littoral zone of Lake Pannon shifted from the NW towards the SE (Text-Fig. 2). Seismic profiles also suggest that at this time the Transdanubian Central Range (TCR) was a submerged sill, or a series of islands at best.

Due to Pliocene-Quaternary tectonic inversion, the sedimentary formations of Lake Pannon became exposed and eroded along the western and eastern edges of the basin, while the central part underwent continued subsidence, and was covered by Pliocene and Quaternary terrestrial sediments (HORVATH et al., 1995b). Along the western edge of the basin, the littoral sediments of Lake Pannon outcrop in a number of fossiliferous localities in Burgenland and adjacent areas of Slovakia and Hungary, from Pezinok in the north to Stegersbach in the south. Similar sediments outcrop at the eastern boundary of the basin, along the western foot of the TCR, from Ch'aba in the north to Ukk in the south (Text-Fig. 1).
We observed that the littoral bivalve fauna from the western margin of the basin ("Burgenland fauna") is uniform in the sense that it represents a particular evolutionary stage in each lineage. We found that the same is true for the eastern margin as well: apart from slight facies differences, any member of this "TCR fauna" is represented by the same evolutionary stage in the outcrops throughout the entire length of the TCR. There are striking similarities between these uniform western and eastern faunas, suggesting that their paleoenvironments were very similar. In a number of bivalve species, however, there are relatively slight, but consistent morphological differences between the two faunas, reflecting evolutionary changes through time. These differences in most cases are easily recognizable, and make the two faunas distinguishable.

2. Materials and methods

In this study, we included only fossils that we have seen ourselves or that were depicted in publications. We did not use reports or determinations that we have not had the opportunity to check. We utilized the following museum and private collections (the list of fossils that formed the basis for this study is given in the Appendix):

- **BL:** Collection of the Burgenland Museum (Eisenstadt, Austria)
- **DHG:** Collection of Dana H. Geary (Madison, USA) (Stegersbach material is courtesy of Franz Sauerzopf)
- **FS:** Collection of Franz Sauerzopf (Rust, Austria)
- **HPM:** Collection of the Croatian Natural History Museum (Zagreb, Croatia)
- **JPL:** Collection of Josef Paul Luesger (St. Leonhard am Forst, Austria)
- **MÁFI:** Collection of the Hungarian Geological Institute (Budapest, Hungary)
- **MM:** Collection of Pal Müller and Imre Magyar (Budapest, Hungary)
- **NHMW:** Collection of the Vienna Natural History Museum (Vienna, Austria)
- **TTM:** Collection of the Hungarian Natural History Museum (Budapest, Hungary)
- **UV:** Collection of the University of Vienna (Vienna, Austria)

The fossils were collected from littoral sandy or gravely deposits. Even in the case of museum specimens, we were able to identify the original embedding rock because we knew the outcrop from which the specimens came, the description of the outcrop was available, or because sand grains attached to the shells indicated the sandy environment. These sand layers are either amalgamated, forming thick sandy sequences, or they are thin intercalations in sublittoral silt sequences.

In Burgenland as well as adjacent areas of Slovakia and Hungary, the littoral deposits of Lake Pannon are of various ages. In this study we included the youngest and most widespread littoral deposits only, omitting older formations (Congeria ornithopsis and Congeria hoernesi Zones, or B and C Zones of Papp, 1951) which outcrop in more restricted areas (e.g. in several localities around Sopron [Papp, 1951; Vitáli, 1951], and in the Styrian Basin [Eisner & Sächsenhofer, 1995]). These older formations are missing at the eastern margin of the basin.

Our objective here is not to compile a comprehensive list of bivalve species for each locality; instead, we want to com-
plete earlier published information with unpublished data coming from different collections, in order to demonstrate similarities and differences among bivalve faunas. We omitted some relatively rare, or less studied dreissenid and cardiid species, and the sporadically appearing *Pisidium*. On the other hand, we included species that rarely occur in the given fauna if they are common on the opposite side of the basin (e. g. *Congeria ungulacaprae* is common in the TCR fauna, so we included its occurrences in Sopron and Pezinok; or *Dreissena* deserta is very common in the Burgenland fauna, so we included its single known occurrence in the TCR area).

3. Comparison of the Burgenland and TCR faunas

3.1 Similarities

Many identical or very closely related species occur in the Burgenland and TCR faunas. Some of these common species are rare in other parts of the Pannonian basin, thus enhancing the impression that the Burgenland and TCR faunas are closely related. Some of our new findings confirm a close relationship between the two faunas: we found *Euxinicardium schreteri*, a species that had been known from the TCR only, in Burgenland. We also found two "typical" Burgenland species, *Lymnocardium tucanii* and "*Monodacna* viennensis" in the TCR.

Species that occur in both faunas include: *Congeria ungulacaprae*, *Dreissena bipartita*, *Lymnocardium hanckeni*, *Congeria tucanii*, *Caladacna steindachneri*, *Euxinicardium schreteri*, *"Monodacna" viennensis", *"Didacna" deserta*, and *Parvidacna sp.* Ancestor – descendant pairs in the two faunas are (with the older, Burgenland form first): *Unio atavus-U. mihanovicii*, *Congeria gitnerii-Dreissena auricularis*, *Lymnocardium schedelianum-L. variocostatum*, *L. conjungens-L. pensili*, and *L. edlaueri-L. ponticum*.

3.2. Differences

Some of the differences between the Burgenland fauna and the TCR fauna are conspicuous. The TCR fauna lacks shou­dered *Melanopsis* (M. vindobonensis, M. fossilis), certain large *Congeria* species (C. pancici, C. spathulata), and some cardid species (L. brunnense, L. danicici, L. carnuntinum, L. stoosi), whereas the Burgenland fauna lacks *Dreissenomya unioideis*, *"Lymnocardium" priscae*, and *L. apertum*. Significant differences in the frequency of certain species exist as well. *"Didacna" deserta* is very common in Burgenland, but we know only a single intact specimen from the TCR. *Congeria ungulacaprae*, on the other hand, is one of the most common species in the TCR, but it is much less common in Burgenland.

Aside from these conspicuous taxonomic differences, slight but consistent morphological differences characterize the ancestor (Burgenland) – descendant (TCR) species pairs in some bivalves. Traditionally, the ancestral and the derived forms were described as different species, although the morphological difference between them is sometimes very slight, and can be appreciated only when larger samples are compared.

In Burgenland specimens of *Unio atavus*, the position of the beak in relation to the anterior margin is variable, but typically quite distant. In its descendant, *U. mihanovicii*, however, it is invariably terminal, very close to the anterior margin. In addition, the beak is always above the dorsal margin in *U. atavus*, whereas it is in much lower position in *U. mihanovicii* (MÜLLER, 1990, Plate 1, Fig. A, A').

According to PAFF (1950), the Vienna Basin and Burgenland fossil record shows that *Congeria* lost its apophyse (a tiny plate where the adductor muscle attached) in at least two independent lineages. *Congeria* has a well-developed apophyse, whereas the lack of it is a diagnostic feature of *Dreissenia*, where both the anterior adductor and retractor attach to the same septum. One of these morphological changes is reflected in the Burgenland/TCR material. *Congeria gitneri* (= "D. minima" in LUEGER, 1980) in Stegersbach and Großholfein (Burgenland) has a rudimentary apophyse (Plate 1, Fig. B, C, D). *In Dreissenia auricularis* (TCR), however, there is no trace of the apophyse left (Plate 1, Figs. B', C', D'). (We know a sample from Pezinok [MÄFI Pl. 6091] where there is no apophyse, although this locality yielded Burgenland fauna.)

The Burgenland *Lymnocardium schedelianum* is a large cockle with relatively wide and rounded ribs, which are always separated by intercostal space (Plate 1, Fig. E). The only difference between this form and its descendant from the TCR, *L. variocostatum*, is that the ribs of the latter are completely flat and tightly spaced; intercostal space is present only on the very anterior slope of the shell (Plate 1, Fig. E'). *Lynnocardium conjungens* (Burgenland; Plate 1, Fig. F, G) is similar to the early form of *L. pensili* (TCR). The latter is generally larger, and with different proportions in being higher, and having a wider posterior gape (Plate 1, Fig. F', G). The umbo above the hinge is also higher. LUEGER (1980) reported the common occurrence of *L. conjungens* and *L. pensili* from Großholfein, Burgenland. Indeed, his *L. pensili* specimens are unusually large for *L. conjungens*, but they

Plate 1

Ancestor – descendant pairs in bivalves from the western (Burgenland) and eastern (TCR) margins of the Kisalföld Basin.

Fig.-A: *Unio atavus* Horváth, Großholfein.
Fig.-A': *Unio mihanovicii* BRUSINA, Dáka;
Fig.-B, C, D: *Congeria gitnerii* BRUSINA, B, C; Stegersbach, D; Großholfein.
Fig.-B', C', D': *Dreissena auricularis* (FUCHS), B': Lázi, C': Szák, D': Neszmély.
Fig.-E: *Lymnocardium schedelianum* (PARTSCH) (authorship and taxonomic status needs revision), Oggau.
Fig.-E': *Lymnocardium variocostatum* VITALIS, Dáka.
Fig.-F, G: *Lymnocardium conjungens* (HÖRNES), Stegersbach.
Fig.-F', G': *Lymnocardium pensili* (FUCHS), F': Ukk, G': Tüskevár.
Fig.-H, I, J: *Lymnocardium edlaueri* PAFF, H; Pezinok, I, J; Stegersbach.
Fig.-H', I', J': *Lymnocardium ponticum* HALAVÄTS, H; Rápa, I', Nyárad, J; Dáka.

Scale bars indicate 1 cm, except Fig.-B, C, B', D', where it is 1 mm, and Fig.-D and C', where it is 100 μm.
Text-Fig. 3.
Generalized cartoon representing the paleogeographic evolution of the Kisalföld Basin between the time of the "Burgenland fauna" (*Lymnocardium conjungens* Biochron; Fig. A) and the time of the "TCR fauna" (*Lymnocardium ponticum* Biochron; Fig. B).

Text-Fig. 4.
Assessment of the age of the Burgenland and TCR faunas by means of magnetostratigraphy. Along the western margin of the Kisalföld Basin, the boundary between fine-grained, sublittoral slope deposits and delta front sands were correlated to the top of C5n (Nagylozs-1, Zsira-1) and to the base of C4Ar2r (Szombathely-II). These correspond to ca. 9.7 and 9.5 Ma, respectively, according to Berggren et al. (1995). The littoral lacustrine fauna appears both in the Nagylozs-1 and Szombathely-II boreholes in C4Ar2r. At the eastern margin of the basin, in the Duka-II borehole, the base of the delta front deposits correlates to C4Ar1n (ca. 9.3 Ma), and the littoral fauna occurs from C4Ar1n to C4n. (Correlation of the actual polarity record of each borehole to the standard scale was carried out by Lantos, using the long normal C5n as tie-point in the western boreholes, and utilizing seismic profiles to connect the Duka section with Szombathely; see also Magyar et al., 1999.)
are injured and fragmentary thus cannot be subject to morphometric analysis.

Lymnocardium edlaurei is a common, but small bivalve in Burgenland (Plate 1, Fig. H, I, J) that is very similar to L. ponticum (TCR; Plate 1, Fig. H', I'), L. edlaurei tends to be more elongate antero-posteriorly; L. ponticum usually grows bigger, and in larger specimens the umbo is high above the hinge.

In two additional cases, the significance of the morphological differences between the Burgenland and the TCR specimens is unclear because we have so few specimens from the TCR. Lymnocardium tucani from Burgenland usually has more than 30 ribs. The TCR specimens, however, have only 23 to 26. Apart from this difference, the shells from the two regions look very much alike. The only known full TCR specimen of "Didacna" deserta significantly differs from the Burgenland specimens in having a longer posterior margin, and consequently, a smaller angle between the posterior and posterodorsal margins. The ventralmost point of the valve is in the posterior part, instead of being in central position (see Mílan et al., 1974).

4. Discussion

The only alternative to an evolutionary explanation for the morphological differences observed between Burgenland and TCR bivalves is that these differences reflect geographical variation. This hypothesis would require the presence of a paleogeographic barrier between the western and eastern margins of the Kisalföld Basin, such as, for instance, a profound lacustrine zone in the axis of the basin. Seismic evidence, however, indicates that although the Burgenland outcrops and the TCR outcrops are presently situated on the opposite margins of the Kisalföld Basin, historically they represent the same (NW) shoreline of Lake Pannon at two different times in the evolution of the lake (Text-Fig. 3).

The morphological and temporal differences between the Burgenland fauna and the TCR fauna provide the basis for the distinction of the Lymnocardium conjungens Zone (Burgenland) and L. ponticum Zone (TCR). Our paleogeographic model implies that between the Burgenland and TCR faunas there must be a continuous littoral fossil record buried beneath Pliocene and Quaternary sediments in the central part of the Kisalföld Basin.

Our progradational model has further predictions/consequences. It implies that 1) the youngest lacustrine fauna in the Vienna Basin is older than the Burgenland fauna; and 2) the littoral fauna southeast of the TCR is younger than the TCR fauna. The second prediction is met by the presence of the Lymnocardium decorum Zone (with Tihany- and Rádmánești-type faunas; see MÜLLER, 1980 and MARINESCU, 1980) south and east of the TCR. Data relevant to the first prediction are more ambiguous. Austrian, Czech, and Slovak stratigraphers traditionally assign the uppermost lacustrine fauna of the Vienna Basin as well as that of Burgenland to Zones D and E of PAPP (1951), and do not recognize an age difference between the faunas of the Vienna Basin and Burgenland (see, for instance, PAPP, 1951; Sauerzopf, 1952; Lueger, 1980; Jiriček, 1985; Fornalík, 1997). At this time, we cannot provide convincing paleontological evidence that the Vienna Basin littoral faunas are older than those from Burgenland, however we know of no evidence that argues against this interpretation.

According to this progradational model, the TCR lacustrine fauna cannot occur in Burgenland, because the latter area was transformed into alluvial plains by the time the TCR fauna evolved. The Burgenland fauna, however, could have lived in the TCR region, in littoral zones around islands. Indeed, we know one such occurrence from the southernmost part of the TCR. The Kálla Gravel and Sand Formation (Jambor, 1980) contains typical "Burgenland" molluscs: Unio atavus, Congeria sp. ex group C. subglobosa-pancici, Lymnocardium cf. soproniense (or schedelianum?), and Melanopsis fossilis (see Magyar, 1988).

There are no radiocarbon ages from the Kisalföld Basin to determine the age of the respective faunas. We must rely on magnetostratigraphic analyses from the Nagyőlőzs-1, Zsira-1, Szombathely-II, and Duka-II boreholes. Interpretation of these polarity profiles by Lantos (in LANTOS & Elston, 1995 and pers. comm.) is anchored to the long-lasting Chron 5 normal. In the Nagyőlőzs and Szombathely boreholes, which lie close to the western margin of the Kisalföld Basin, the interval with the littoral lacustrine fauna was correlated to C4Ar2r (Magyar et al., 1999; cf. Korpás-Hödi, 1992 and Lantos & Elston, 1995). On the opposite (eastern) side of the basin, in the Duka-II borehole, however, the littoral fauna correlates to C4Ar1r (Magyar et al., 1999; identification of molluscs in all three boreholes was carried out by Korpás-Hödi; Text-Fig. 4). If we accept this correlation, then the age of the Burgenland fauna is somewhat older than 9.5 m.y. (because the Burgenland outcrops lie westward from these boreholes), whereas the age of the TCR fauna is slightly younger than 9.3 m.y. The age difference between the eastern and western littoral faunas of the Kisalföld Basin is thus on the order of 0.5 million years.

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APPENDIX

In the Appendix we give known occurrences of characteristic bi-valves of sandy, littoral deposits of Lake Pannon from Burgenland and the Transdanubian Central Range, respectively. Species names given by the collector or author of paper are given in brackets where they do not correspond to our identification. Key to the collections is given in the Materials and methods section. Materials from outcrops in the vicinity of Müllendorf and Großhöflein (Föllig or Föllik) are united under the name "Großhöflein".
Litzelsdorf: FS [Psilunto litzelsdorfensis]
Oberdorf: SAUERZOPF, 1952 [Psilunto stegersbachensis]; FS; MÄFI
Pezinok: MÄFI

**Congeria spathulata**
Großhöflein: LUEGER, 1980; JPL; FS
Stegersbach: DHG; FS
Oberdorf: FS

**Congeria ungulacaprae**
Pezinok: FORDINÄL, 1997; MM
Sopran: ANDRUSOV, 1897 [Congeria hoemesi]; PAPP, 1953, 1985 [Congeria hoemesi]; MÄFI

**Congeria pancici**
Großhöflein: LUEGER, 1980; JPL; FS
Stegersbach: SAUERZOPF, 1952 [Congeria pancici longiconcha]; PAPP, 1953, 1985; FS; DHG; MÄFI; BL

**Congeria praebalatonica**
Großhöflein: LUEGER, 1980 [Congeria balatonica]; JPL; FS
Stegersbach: SAUERZOPF, 1952 [Congeria spathulata praebalatonica]; PAPP, 1953; Congeria spathulata praebalatonica

**Congeria doderleini**
Stegersbach: PAPP, 1953, 1985; DHG

**Congeria praebalatori**
Stegersbach: DHG

**Lymnocardium schedelianum**
Großhöflein: LUEGER, 1980; JPL; FS
Stegersbach: SAUERZOPF, 1952; PAPP, 1953, 1985; FS; DHG; MÄFI; BL

**Lymnocardium brunense**
Großhöflein: JPL
Sopron: TTM
St. Margarethen im Burgenland: MÄFI; FS
Bratislava: FORDINÄL, 1993

**Lymnocardium conjuungen**
Großhöflein: LUEGER, 1980; JPL; MÄFI
Stegersbach: FS; DHG; MÄFI; TTM
Steinbach: MÄFI
Sopron: TTM
Gols: JPL
St. Margarethen im Burgenland: MÄFI; FS
Purbach am Neusiedlersee: FS
Oggau: FS

**Lymnocardium hantkeni**
Stegersbach: NHMW; FS [Lymnocardium stegersbachensis n. sp.]
Bratislava: FORDINÄL, 1993

**Lymnocardium edlaueri**
Großhöflein: JPL
Stegersbach: FS; DHG
Pezinok: MÄFI [Lymnocardium vicinum]; MM
St. Margarethen im Burgenland: FS
Gols: JPL

**Lymnocardium lucani**
Großhöflein: LUEGER, 1980; JPL; DHG; MÄFI; FS
Stegersbach: FS; DHG; MÄFI
(? Sopron: TTM

**Lymnocardium subdiprosopum**
Großhöflein: LUEGER, 1980 [L. diprosopum]; JPL; FS

*Lymnocardium* carnutinum
Großhöflein: DHG
Steinbrunn: MÄFI [Lymnocardium pseudosuessi]
Zillingtal: MÄFI

*Lymnocardium* danici
Großhöflein: LUEGER, 1980; JPL; MÄFI; DHG; FS
Sopron: TTM [Lymnocardium galeatum]

*Lymnocardium* stojadinovici
Unterschützen: MÄFI
Stegersbach: MÄFI

**Euxinocardium schreiteri**
Stegersbach: FS; DHG; MÄFI

"Didacna" desert
Stegersbach: MÄFI
Großhöflein: LUEGER, 1980; JPL
Stegersbach: STOLICKA, 1962 [Cardium desertum]; PAPP, 1953, 1985; FS; DHG; MÄFI
Steinbach: MÄFI
Sopron: TTM
Siegendorf: JPL
Bruck an der Leitha: MÄFI
Bratislava: FORDINÄL, 1995
St. Margarethen im Burgenland: FS

*Monodacna* viennensis
Großhöflein: JPL

Parvidacna petkovici
Stegersbach: FS [Parvidacna loerentheyi]; PAPP, 1953, 1985; NHMW
Bratislava: FORDINÄL, 1993
Großhöflein: LUEGER, 1980

The TCR fauna

Unio mihanovici
Däka: TTM SZILAJ et al., 1999; MM
Päpa: MÄFI
Kocs: MÄFI
Román: UV
Ukk: MÄFI
Veszprémgalsa: MÄFI
Kerékelek: MÄFI

**Congeria aff. simulans turgida**
Neszmbly: ANDRUSOV, 1897 [Congeria turgida]
Däka: SZILAJ et al., 1999; MM; MÄFI
Päpa: MÄFI
Kocs: MÄFI

**Congeria ungulacaprae**
Kup: FUCHS, 1870 [Congeria balatonica var. crassitestä]; MÄFI
Mocs: KORPÄS-HÖDI, 1983
Tata: KORPÄS-HÖDI, 1983
Ch'taba: MÄFI
Somlovásáthely: ANDRUSOV, 1897; MÄFI
Doba: MÄFI
Gic: MÄFI
Kapocs: MÄFI
Neszmbly: MÄFI
Kocs: MÄFI
Dreissenomya uniooides
Lázi: BARTHA, 1963; MÁFI
Dáká: Szilaj et al., 1999; MM; MÁFI
Szák: MM

Dreissena auricularis
Kup: FUCHS, 1870; MÁFI
Dáká: Szilaj et al., 1999; MM; MÁFI
Lázi: BARTHA, 1963; MÁFI
Naszály: KÖRPÁS-HÖDI, 1983
Dunaszentmiklós: KÖRPÁS-HÖDI, 1983
Szák: MM

Dreissena bipartita
Kup: ANDRUSOV, 1897; BRUSINA, 1902; MÁFI
Dáká: SZILAJ et al., 1999; MM; MÁFI; TTM
Lázi: MÁFI
Dunaalmás: KÖRPÁS-HÖDI, 1983
Papá: MÁFI

Lymnocardium variocostatum
Dáká: Szilaj et al., 1999; MM, MÁFI, TTM;
Kocs: VITALIS, 1994; MÁFI
Kup: MÁFI
Papá: MÁFI; UV
Tárkány: MÁFI
Somlőjenő: UV; MÁFI
Románd: UV
Tüskevár: TTM
Gic: MÁFI
Külsővat: MÁFI
Veszprémlánska: MÁFI

Lymnocardium apertum
Lázi: MÁFI
Dáká: Szilaj et al., 1999; MM; MÁFI, TTM
Szák: MM
Dunaalmás: KÖRPÁS-HÖDI, 1983
Papá: MÁFI
Veszprémlánska: MÁFI

Lymnocardium pensilii
Lázi: BARTHA, 1963; MÁFI
Dáká: Szilaj et al., 1999; MM; MÁFI, TTM;
Kocs: KÖRPÁS-HÖDI, 1983; MÁFI
Szák: MM
Papá: MÁFI
Veszprémlánska: MÁFI
Ulk: MÁFI
Somlőjenő: MÁFI; UV
Kup: NHMW, MÁFI
Románd: UV
Tüskevár: TTM, MÁFI [Lymnocardium banaticum]
Neszmély: TTM, MÁFI
Dunaalmás: TTM
Bársonyos: MÁFI
Tárkány: MÁFI
Gic: MÁFI
Kapolics: MÁFI
Keréktelek: MÁFI
Papákovács: MÁFI

Lymnocardium hantkeni
Kup: FUCHS, 1870; MÁFI
Szák: MM; MÁFI
Dáká: Szilaj et al., 1999; MM

Lymnocardium ponticum
Dáká: Szilaj et al., 1999; MM
Nyárád: MM
Naszály: KÖRPÁS-HÖDI, 1983 [Lymnocardium trifloroides, L. decorum]
Kocs: KÖRPÁS-HÖDI, 1983
Papá: MÁFI
Kup: NHMW, [Cardium decorum]; BRUSINA, 1902 [Lymnocardium trifloroides]; HPM

Lymnocardium tucani
Papá: STRAUSZ, 1942; MÁFI
Lázi: MÁFI [Lymnocardium sp.]
Tüskevár: MÁFI

“Lymnocardium” priscæ
Papá: STRAUSZ, 1942; MÁFI
Lázi: MÁFI
Tüskevár: STRAUSZ, 1942
(?) Kocs: KÖRPÁS-HÖDI, 1983
Kup: HPM

“Lymnocardium” cf. wurmbi
Dáká: Szilaj et al., 1999; MM; MÁFI
Papá: TTM

Caladacna steindachneri
Dáká: Szilaj et al., 1999; MM; TTM
Szák: MM
Papá: STRAUSZ, 1942; MÁFI
Dunaalmás: KÖRPÁS-HÖDI, 1983
Tüskevár: MÁFI

Euxinicardium schreteri
Dáká: Szilaj et al., 1999; MM; MÁFI
Lázi: MÁFI
Szák: MM
Papá: MÁFI
Somlőjenő: STRAUSZ, 1942
Tüskevár: MÁFI

“Didacna” deserta
Kup: MILAN et al., 1974 [Didacna chyzeri]; HPM
(?) Neszmély: MÁFI

“Monodacna” viennensis
Dáká: MM
Lázi: MÁFI

Parvidacna sp.
Lázi: BARTHA, 1963; MÁFI
Neszmély: KÖRPÁS-HÖDI, 1983 [Parvidacna planicostatä]
Kocs: KÖRPÁS-HÖDI, 1983 [Parvidacna planicostatä]
Dunaalmás: KÖRPÁS-HÖDI, 1983 [Parvidacna planicostatä]
Papá: MÁFI
Dáká: MM
Kup: HPM

Hungarian settlement names from Austria and Slovakia in the MÁFI collection (in parenthesis)
Brück an der Leitha (Bruk)
Chl’aba (Helemba)
Gols (Gälos)
Großhöflein (Nagyhöfläny)
Litzelsdorf (Lödös)
Oberdorf (Örälläs)
Olbendorf (Ober)
Pezinok (Bazin)
St. Margarethen im Burgenland (Szentmargitbanya)
Siegendorf (Cinfalva)
Stegersbach (Szentelek)
Steinbach (Köpatak)
Steinbrunn (Büdösküt)
Unterschützen (Alsölövö)
Zillingtal (Völgyfalu)

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