

# AN UPPER PANNONIAN (PONTIAN, NEOGENE) MOLLUSC FAUNA FROM THE WESTERN MECSEK HILLS, HUNGARY

by

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## Abstract

A new Upper Pannonian (Pontian, Neogene) locality was found in the western part of Mecsek Hills. A 4 m thick fine sand to silt sequence contains two limonite-cemented fossil-rich beds with casts and moulds of the bivalves *Lymnocardium cristagalli*, *L. majeri*, *L. pelzelni*, *L. schmidti*, *L. szaboi*, *Prosodacna vutskitsi*, *Congeria croatica*, *C. triangularis*, *Dreissenomya schröckingeri*, and a gastropod *Viviparus sadleri*. The beds were deposited in a nearshore, less agitated, well oxygenated environment below wave base. Palaeobiogeographical relations exist mostly with regions south of Mecsek.

Recognition of the locality increases the known extension of the Upper Pannonian nearshore sediments.

## Introduction

A new fossiliferous locality of Upper Pannonian age (Pontian, Neogene) was found during a summer field work by students L. BUJTOR, T. FEHÉR and A. MOLNÁR. The small exposure lies in the western Mecsek Hills, 2,5 km northeast of the village Nyugotszenterzsébet (Fig. 1). It is located 700 m north of the well in Fekete-erdő-dűlő, 20 W of the field road. The outcrop is 12 m long, 4 m high, produced by slumping.

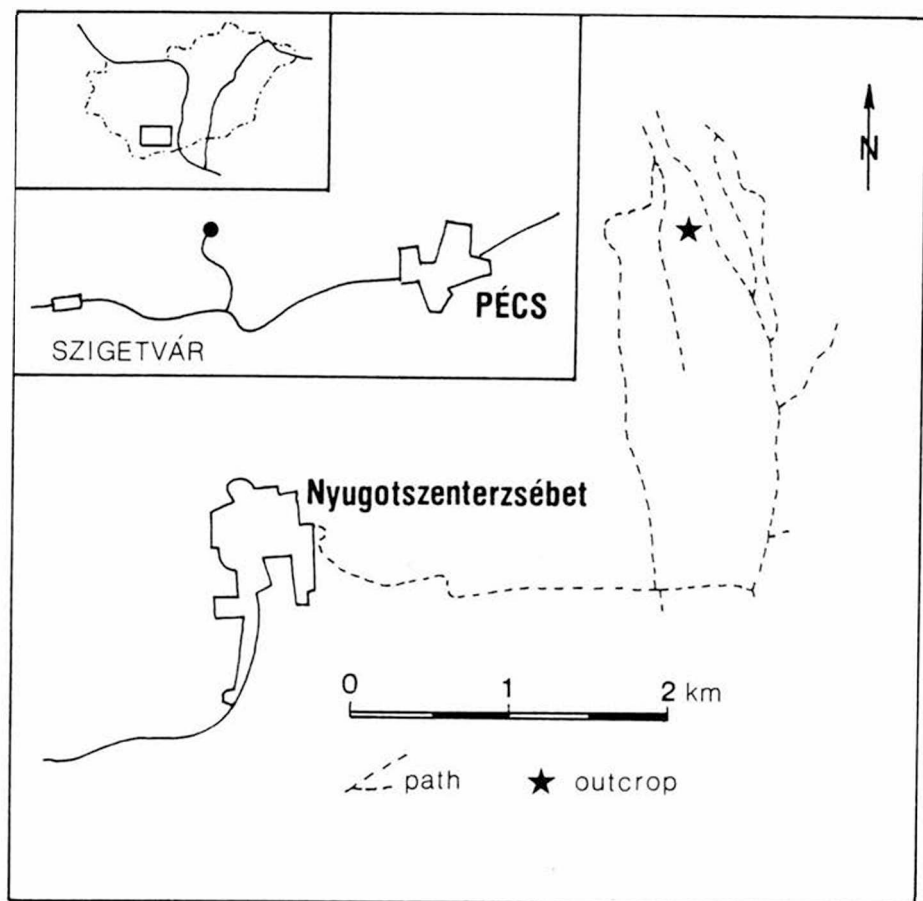


Fig. 1. Location of the Pannonian outcrop in Mecsek Hills

The sequence is the following:

Bed 1 : 1,3 m fine-grained, micaceous sand. Rare, unrecognizable mollusc moulds.

Bed 2: fine sand, less mica. Granite pebbles and detrital feldspar.

Bed 3: mica-less grey fine sand. Much detrital feldspar. Rare unrecognizable gastropod steinkerns.

Bed 4: reddish brown, strongly oxidized, limonitic, fine sand-silt. Rich in fossils.

Bed 5: yellow, fine sand, with rare mica flakes. The upper 5 cm is rich in fossils. Same lithology as of Bed 4, but more fossils.

Bed 6: argillaceous sand.

Beds 7, 8: greenish grey argillaceous marl, changing into cryoturbated slope debris, covered by soil (Fig. 2).

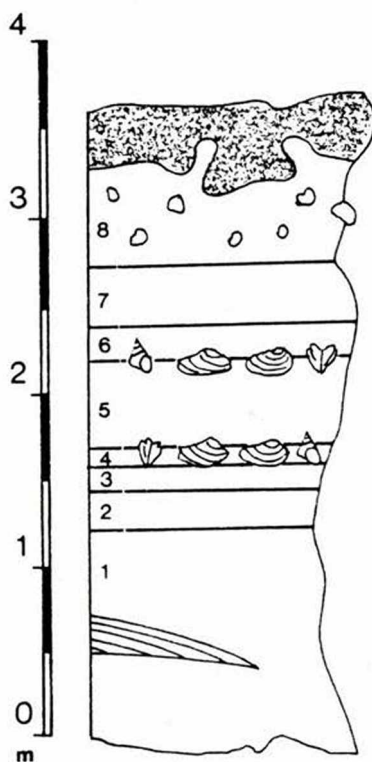


Fig.2. Sequence of the Pannonian outcrop:

1. fine-grained, yellow-grey micaceous sand, cross-bedded, 2. yellow-brown sand, 3. grey, micaceous, fine sand, 4. limonite-cemented fine sand-silt, fossil-rich, 5. yellow, fine sand-silt; upper 5 cm fossil-rich, 6. argillaceous silt, 7. green-grey argillaceous marl, 8. slope debris, cryoturbated, with calcareous concretions; soil

The fossil-rich beds are cemented by limonite; this feature is characteristic for the Mecsek Pannonian (BÖCKH, 1876). The fine limonite film helped to preserve even the minute details of the fossils. Although the molluscs have been dissolved, no subsequent compression occurred, and the moulds and casts can be recognized easily.

Ten species of five genera (including 9 bivalves and a gastropod) were determined.

### Systematic palaeontology

BIVALVIA LINNÉ 1758 class

HETERODONTA NEUMAYR, 1884 subclass

VENEROIDA ADAMS et ADAMS, 1856 order

CARDIACEA LAMARCK, 1809 superfamily

LYMNOCARDIIDAE STOLICZKA, 1870 family

LYMNOCARDIINAE STOLICZKA, 1870 subfamily

LYMNOCARDIUM STOLICZKA, 1870 genus

*Lymnocardium cristagalli* (ROTH, 1878)

Pl. 1. Fig. 1, 2.

- 1878 *Cardium cristagalli* ROTH - TELEGDI-ROTH Pl. 4. Fig. 1, 2.  
 1890 *Adacna cristagalli* ROTH - LÖRENTHEY Pl. 1. Fig. 1.  
 1893 *Lymnocardium cristagalli* ROTH - LÖRENTHEY Pl. 5. Fig. 4.  
 1943 *Budmania cristagalli* ROTH - GILLET Pl. 6. Fig. 9.  
 1964 *Budmania cristagalli* ROTH - ANDRUSOV Tab. 7. Fig. 11, 12.

*Material:* Of 43 available external and internal moulds, one bivalved, 22 intact and 9 broken single valves and 8 fragments. Of 35 single valves 15 are right and 20 are left one.

*Measurements:*

	R	R	R	L	R	L	L	L	L	L	L	
Length:	49	53	37	48	49	53	48	47	44	44	37	31
Height:	51	55	40	46	42	50	42	48	46	43	38	33
Width:	21	24	18	19	19	17	15	18	16	20	11	13

(R = right valve; L = left valve; values in mm)

*Description:* Oval, tapering slightly anteriorly. Umbo slightly twisted in anterior direction. Posterior margin vertically truncated. Most of the internal moulds bear 6 ribs, but some giant specimens a seventh one can be observed. The total number of ribs are not preserved on the external moulds, as none of them are intact.

## Plate 1

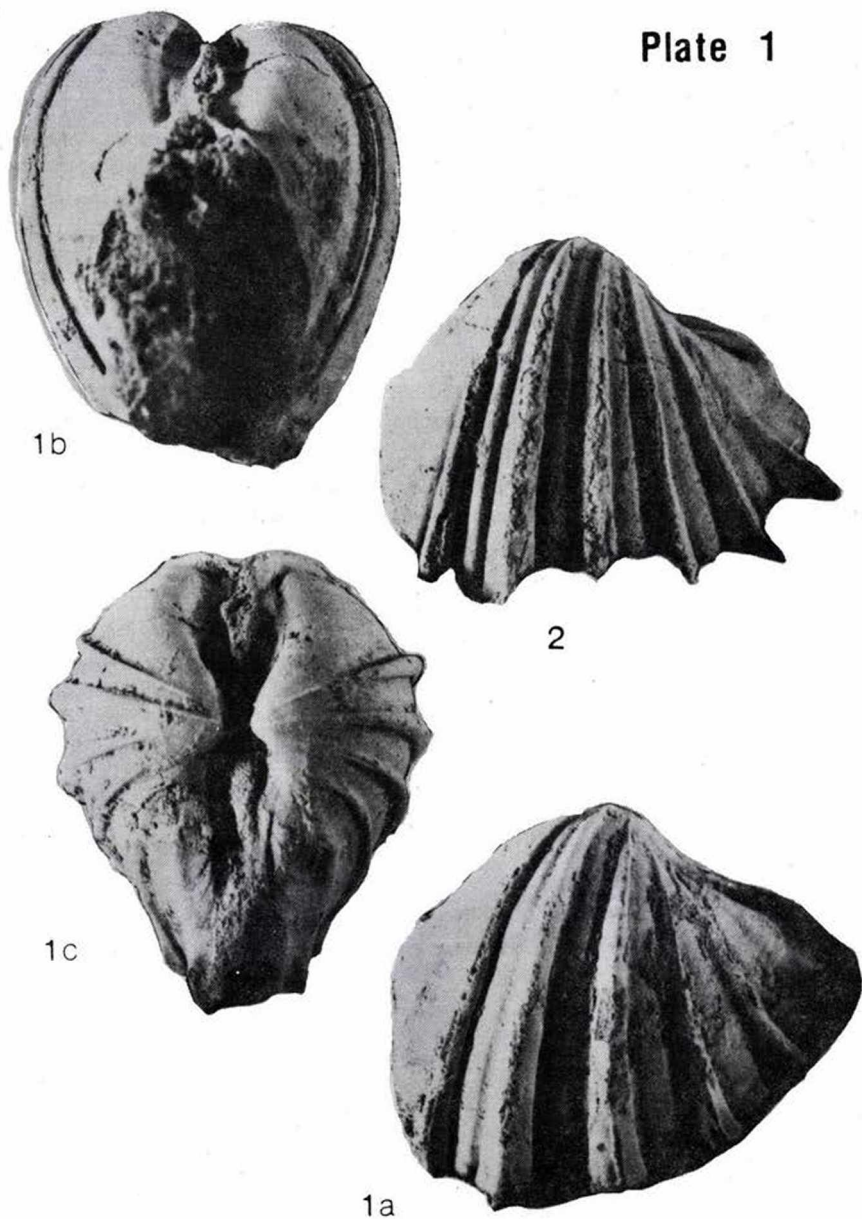


Plate 1. (All figures are in natural size)

Fig. 1. *Lymnocardium cristagalli* (ROTH, 1878) Fig. 2. *Lymnocardium cristagalli* (ROTH, 1878) external mould

Rarely two more ribs can be seen, like on the type (6-8 ribs). Width and height of ribs increase posteriorly. The sixth rib is poorly developed, and is followed by the widely gaping posterior margin. Ribs on internal moulds are broader than intervals. Thickness of ribs gradually increases towards the margin and before it they slightly broaden out. Ribs are of wavy surface, continuing into thin keels. Keels are very thin considering the size of valves, but high. Their measurable height (6-9 mm) differs from the type on which keels are 20 mm high. Width of intervals on external moulds are approx. half of those of ribs. This feature is characteristic for the type also.

*Remarks:* The types are preserved with complete shell and are, probably due to their shell, somewhat larger (6-7 cm long) than the specimens described here.

On external moulds of adult specimens commarginal rugae, as records of interruptions in secretion of the shell or of changes in the rate of secretion, are recognizable. Except imprints of 2-2 strong lateral teeth, hinge is not observable. Pallial line and muscle scars are not visible. Reconstruction of cross-section of the shell is shown in (Fig. 3).

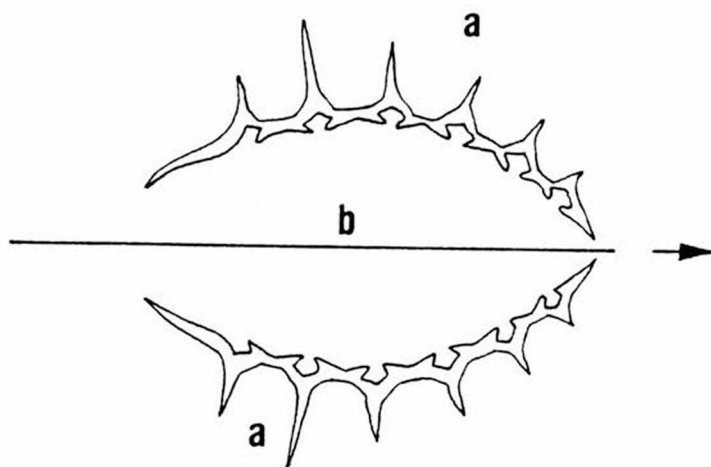


Fig. 3. Cross-section of the shell of *Lymnocardium cristagalli* based on the steinkern and the mould (natural size; c = plane of symmetry)

*Occurrence:* *L. cristagalli* (s. str.) is known only from the Mecsek Mts. and its surroundings. Forms related to *L. cristagalli* (*L. hungaricum*, *L. histiophora*, *L. semseyi*) occur in a wider area: in the Mecsek Mts. and south of it.

*Lymnocardium* sp. aff. *majeri* (HÖRNES, 1856)

Pl. 2. Fig. 1.

- 1856 *Cardium Majeri* HÖRNES – HÖRNES Taf. 28. Fig. 5.  
 1886 *Cardium (Adacna) Majeri* HÖRNES – HÖRNES – HALAVÁTS Pl. 25. Fig. 7.  
 1890 *Adacna Majeri* HÖRNES – LÖRENTHEY p. 43.  
 1893 *Cardium (Adacna) Majeri* HÖRNES – HALAVÁTS p. 29.  
 1942a *Limnocardium majeri* HÖRNES – STRAUZ Tab. 1. Fig. 7, 12, 15.  
 1943 *Limnocardium mayeri* HÖRNES – GILLET Pl. 4. Fig. 6.  
 1951 *Limnocardium (Arpadicardium) mayeri* HÖRNES – STEVANOVIC Taf. 6. Abb. 10, 11.  
 1956 *Limnocardium (Arpadicardium) mayeri* HÖRNES – STEVANOVIC Taf. 1. Fig. 6.  
 1961 *Limnocardium majeri* HÖRNES – STEVANOVIC Taf. 5. Abb. 15, 18.  
 1971 *Limnocardium mayeri* HÖRNES – BARTHA Pl. 30. Fig. 6.  
 1971 *Limnocardium majeri* HÖRNES – SZÉLES Pl. 1. Fig. 7.

*Material:* 1 bivalved specimen and 5 small internal moulds. Double valves are slightly moved on one another.

*Measurements:*

	L	R	R	L
Length:	19	19	16	20
Height:	11	11	12	17
Width:	16	16	5	5

*Description:* Nearly equilateral and equivalve but variable in outline: elongated elliptic or oval. Valves with narrow posterior gape. Number of ribs (13-19) differs from the type which shows 12-13 ribs. Ribs are narrow, unevenly spaced and well observable as far as the beak where they are represented by thin treads. The type of *L. majeri* is less inflated and gaping than specimens found recently.

*Remarks:* Umbo is small, hinge, muscle scars and pallial line are not visible. It is worthy to note that this form is relatively small.

*Occurrence:* A widespread species in the Pannonian basin.

## Plate 2

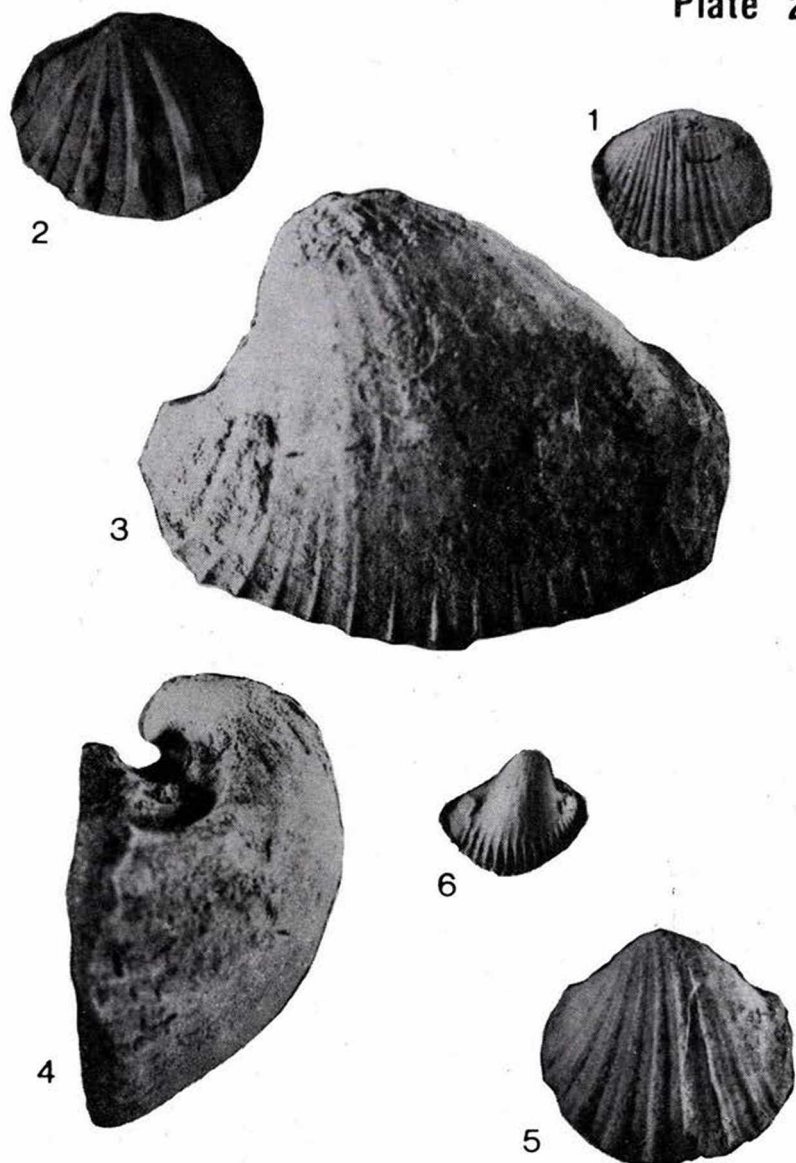


Plate 2. (All figures are in natural size)

Fig. 1. *Lymnocardium* sp. aff. *majeri* (HÖRNES, 1856) internal mould, Fig. 2. *Lymnocardium pelzelni* (BRUSINA, 1884) internal mould, Fig. 3. *Lymnocardium schmidtii* (HÖRNES, 1856), internal mould Fig. 4. *Lymnocardium schmidtii* (HÖRNES, 1856), internal mould Fig. 5. *Lymnocardium* cf. *szaboi* LÖRENTHEY 1893 internal mould of a bivalved specimen, Fig. 6.

*Prosodacna vutskitsi* (BRUSINA, 1902) internal mould



*Lymnocardium pelzelni* (BRUSINA, 1884)

Pl. 2. Fig. 2.

- 1884 *Adacna Pelzelni* BRUSINA - BRUSINA Taf. 28. Fig. 37.  
 1893 *Cardium (Adacna) Pelzelni* BRUSINA - HALAVÁTS p. 29.  
 1893 *Limnocardium Pelzelni* BRUSINA - LÖRENTHEY Pl. 4. Fig. 1, 2.  
 1943 *Limnocardium pelzelni* BRUSINA - GILLET p. 53.  
 1973 *Limnocardium Pelzelni* BRUSINA - MARINESCU Pl. 3. Fig. 4.

*Material*: Internal moulds of an intact right valve and of two fragments.

*Measurements*:

R  
 Length: 29  
 Height: 25  
 Width: 7

*Description*: Oval, nearly equivalve shell with median, slightly prosogirous beak. The unbroken internal mould is ornamented with 6 ribs. Intervals are slightly than ribs except at margin where ribs widen out. Well developed protrusions corresponding to spines of the shell, are visible on third, fourth and fifth ribs. Ribs are curved, increasing in width gradually from beak, but always narrower than intervals.

*Remarks*: Muscle scars are not visible. Growth lines and imprints of two elongated lateral teeth are recognizable.

*Occurrence*: This relatively rare species is known from the Mecsek Mts. and south of it. There are only a few indications to its occurrence north of the Mecsek.

*Lymnocardium schmidti* (HÖRNES, 1856)

Pl. 2. Fig. 3, 4.

- 1856 *Cardium Schmidti* HÖRNES - HÖRNES Taf. 28. Fig. 1.  
 1884 *Adacna Schmidti* HÖRNES - BRUSINA p. 144.  
 1890 *Adacna Schmidti* HÖRNES - LÖRENTHEY p. 44.  
 1893 *Cardium (Adacna) Schmidti* HÖRNES - HALAVÁTS p. 27.  
 1893 *Limnocardium Schmidti* HÖRNES - LÖRENTHEY Pl. 3.  
 1943 *Limnocardium schmidti* HÖRNES - GILLET p. 65.  
 1964 *Limnocardium schmidti* HÖRNES - ANDRUSOV Tab. 4. Fig. 6, 7.

- 1971 *Limnocardium schmidti* HÖRNES – BARTHA Pl. 30. Fig. 1, 3.  
 1971 *Limnocardium schmidti* HÖRNES – SZÉLES Pl. 1. Fig. 5, 6.  
 1973 *Limnocardium schmidti* HÖRNES – KLEB Fig. 29/2.  
 1973 *Limnocardium (Pannonicardium) schmidti* HÖRNES – MARINESCU  
 Pl. 4. Fig. 1, 3.

*Material:* 5 internal and 1 external moulds. A fragmentary internal mould and an external mould belong together. Of 3 intact internal moulds 2 are adult specimens and 1 juvenile exemplar. Three right valves and 2 left ones have been collected. No bivalved specimen has been found.

*Measurements:*

	R	L
Length:	41	27
Height:	36	24
Width:	16	11

*Description:* Inequilateral shell with large, slightly anteriorly placed, protruding umbo and with 16-18 ribs. Ribs on internal moulds are thin, well visible from beak to margin where they are broadening out. On the external mould are broad and obtuse, crossed by fine growth lines. Intervals are narrow and not observable on internal moulds.

*Remarks:* Ribbed part of the shell is bordered posteriorly by a protruding keel. The gaping posterior margin is covered by growth rugae. Hinge is not observed.

*Occurrence:* A widespread species in the Pannonian basin.

*Limnocardium cf. szaboi* LŐRENTHEY, 1893  
 Pl. 2. Fig. 5.

- 1893 *Limnocardium Szabói* LŐRENTHEY – LŐRENTHEY Pl. 3. Fig. 2, 3, 8. Pl. 4. Fig. 4.  
 1911 *Limnocardium Szabói* LŐRENTHEY – LŐRENTHEY p. 79.  
 1964 *Limnocardium szaboi* LŐRENTHEY – ANDRUSOV p. 489, Text-fig. 5.

*Material:* 35 more or less unbroken internal moulds have been collected. Except one bivalved specimen, all are single valves. Of 35 valves 17 are left valves and 18 are right ones.

*Measurements:*

	L	L	R	L	L	L	L	R	R	L	L	R	R	L
Length:	27	28	32	30	28	31	26	27	25	31	33	33	29	27
Height:	24	25	29	29	26	28	26	23	23	29	30	30	25	26
Width:	10	8	10	11	10	10	9	8	9	11	11	11	10	9

Distribution of length values is plotted in *Fig. 4*.

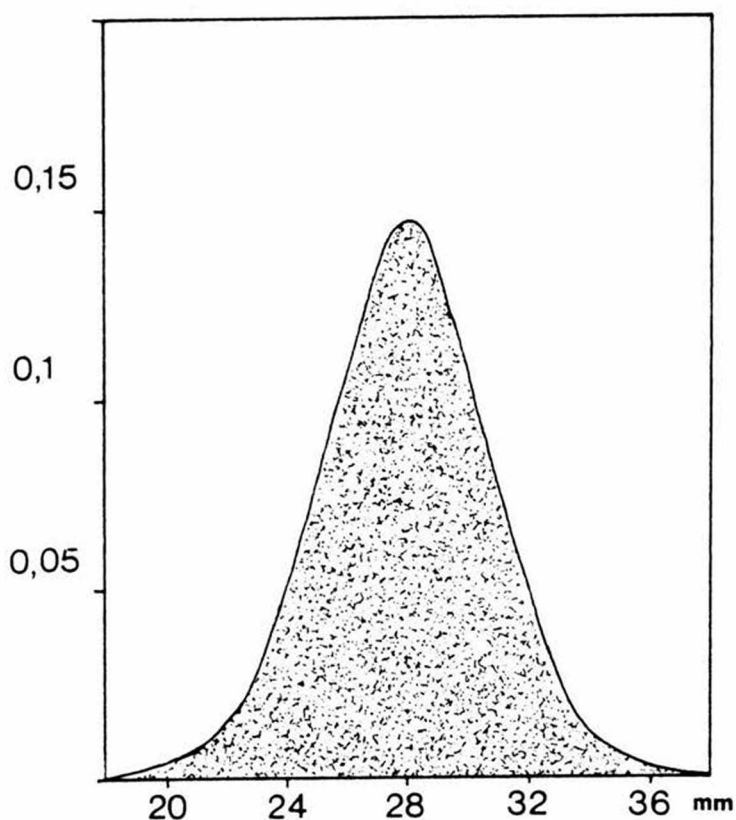


Fig. 4. Length distribution of *Lymnocardium szaboi*. (Approximated by a density function of standard normal distribution,  $m = 28$  mm expected value and  $\sigma = 2,7$  mm standard deviation)

*Description:* Strongly inequilateral somewhat inflated shell with slightly prosogirous beak. Anterior margin rounded, posterior one straight. The difference between numbers of ribs observed on the type (10-12) and the recently collected specimens (9-10) is probably attributable to the lack of imprints of first, weak ribs on internal moulds. Ribs are narrower than intervals and gradually increasing in width from beak towards margin where they broaden out.

*Remarks:* Growth lines are not observable on the internal moulds, posterior margin is smooth. The trapezoidal shape and the broadly rounded anterior margin, described by LÖRENTHEY (1893), can be probably due to the nature of preservation, not recognizable. Although ribs do not show uniform inclination towards beak, the closest agreement is shown with *L. szaboi*.

*Occurrence:* Until now the species is known only from the Mecsek Mts. and sporadically from the environs of the Balaton.

PROSODACNINAE ANDRESCU, 1974 subfamily  
*PROSODACNA* TOURNOUER, 1882 genus

*Prosodacna vutskitsi* (BRUSINA, 1902)  
 Pl. 2. Fig. 6.

- 1856 *Cardium semisulcatum* HÖRNES (non ROUSSEAU) – HÖRNES Taf. 28. Fig. 7.  
 1874 *Cardium semisulcatum* ROUSSEAU – HÖRNES p. 48.  
 1888 *Cardium semisulcatum* ROUSSEAU – HALAVÁTS p. 170.  
 1893 *Limnocardium semisulcatum* HÖRNES (non ROUSSEAU) – LÖRENTHEY p. 2. Fig. 11.  
 1902 *Limnocardium Vutskitsi* BRUSINA – BRUSINA Pl. 30. Fig. 36-38.  
 1911 *Prosodacna Vutskitsi* BRUSINA – LÖRENTHEY p. 66.  
 1951 *Prosodacna vutskitsi* BRUSINA – STEVANOVIC Pl. 8. Fig. 11, 12.  
 1971 *Prosodacna vutskitsi* BRUSINA – BARTHA Pl. 30. Fig. 6.

*Material:* Two small, well preserved internal moulds of left valves, coated and cemented by limonite.

*Measurements:*

	L	L
Length:	18	17
Height:	16	16
Width:	6	11

*Description:* Elongated elliptical, very inflated shell with anteriorly placed, relatively large umbo. Internal moulds are ornamented by 21-22 very thin ribs, which are sharply protruding between margin and pallial line and thin gradually towards beak.

*Remarks:* Hinge is hardly observable except a strong large anterior lateral tooth. The two muscle scars are very large, elliptical, and well developed. Pallial line is integripalliate. Distance between pallial line and margin is approx. 3 mm.

It seems to be probable, however, that specimens figured by ROUSSEAU (1842) and HÖRNES (1856) do not belong to the same species.

*Occurrence:* A widespread species in the Pannonian basin.

*DREISSENACEA* GRAY in TURTON, 1840 superfamily  
*DREISSENIDAE* GRAY in TURTON, 1840 family  
*CONGERIA* PARTSCH, 1835 genus

*Congeria croatica* (BRUSINA, 1884)  
 Pl. 3. Fig. 1.

- 1884 *Dreissena croatica* BRUSINA - BRUSINA Taf. 27. Fig. 53, 54.  
 1893 *Congeria croatica* BRUSINA - LÖRENTHEY Pl. 1. Fig. 2, 3.  
 1897 *Congeria croatica* BRUSINA - BRUSINA Tab. 16. Fig. 2.  
 1944 *Congeria croatica* BRUSINA - JEKELIUS Taf. 60. Fig. 3.  
 1951 *Congeria croatica* BRUSINA - STEVANOVIĆ Taf. 3. Abb. 2, 3, 4.  
 pars 1964 *Congeria croatica* BRUSINA - ANDRUSOV Tab. 6. Fig. 4, 5.  
 (non 8, 9, 10)

*Material:* An internal mould of a large right valve.

*Measurements:*

R  
 Length: 49  
 Height: 45  
 Width: 17

*Description:* Almost regularly triangular from with large wing.

*Remarks:* The specimen agrees with the type in showing very strong sinuous growth rugae. A well developed keel is visible running from beak to ventral margin.

## Plate 3

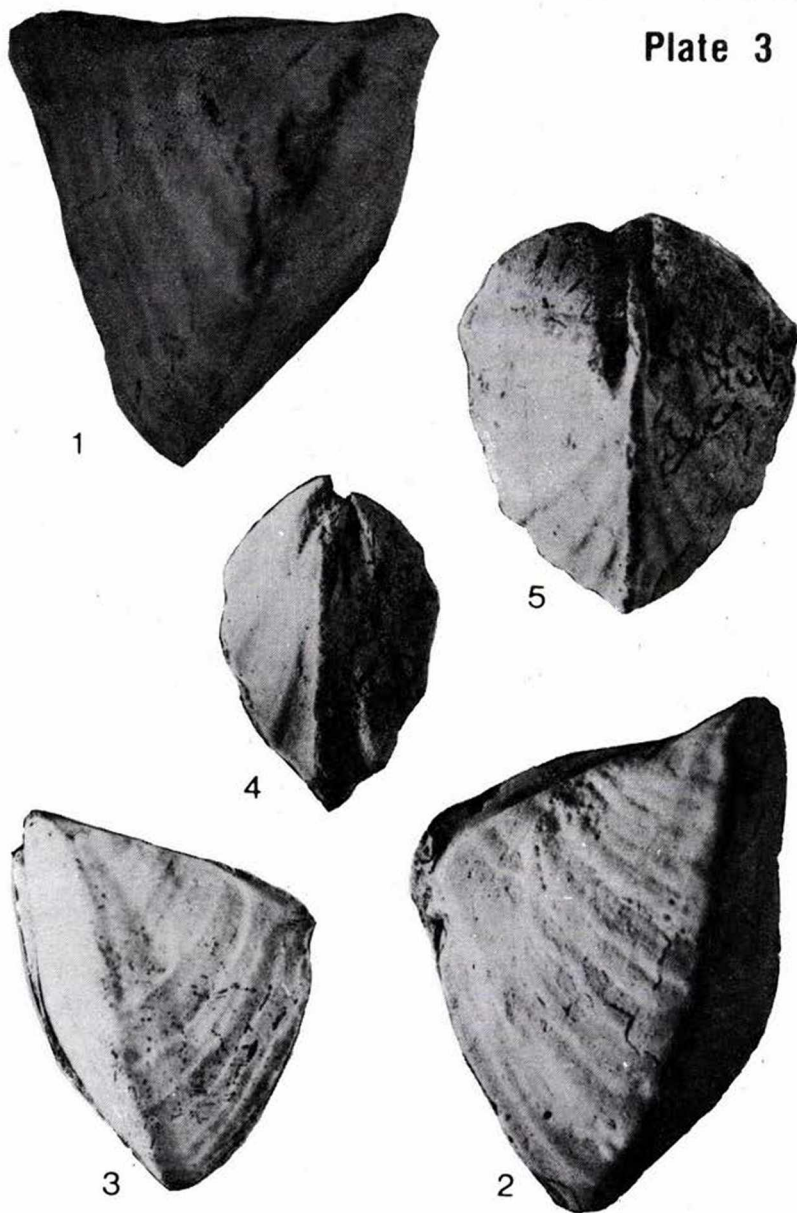


Plate 3. (All figures are in natural size)

Fig. 1. *Congeria croatica* (BRUSINA, 1884) internal mould, Fig. 2. *Congeria triangularis* PARTSCH, 1835 internal mould, Fig. 3. *Congeria triangularis* PARTSCH, 1835 internal mould of a bivalved specimen, Fig. 4. *Congeria trinagularis* PARTSCH, 1835 internal mould, Fig. 5. *Congeria trinagularis* PARTSCH, 1835 internal mould of a bivalved specimen

*Occurrence:* A very frequent species south of the Mecsek Mts., mainly in Slavonia, Croatia and Serbia. While *C. croatica* is rather common in the Mecsek, north of the mountains only rare occurrences are known.

*Congeria triangularis* PARTSCH, 1835  
Pl. 3. Fig. 2 - 5.

- 1856 *Congeria triangularis* PARTSCH - HÖRNES Taf. 48. Fig. 1, 2, 3.  
1870b *Congeria triangularis* PARTSCH - FUCHS Taf. 16. Fig. 1, 2, 3.  
1893 *Congeria triangularis* PARTSCH - HALAVÁTS p. 30.  
1902 *Congeria triangularis* PARTSCH - BRUSINA Tab. 18. Fig. 16, 17, 20, 22, 24.  
1951 *Congeria triangularis* PARTSCH - STEVANOVIC Taf. 2. Abb. 3.  
1964 *Congeria triangularis* PARTSCH - ANDRUSOV Tab. 5. Fig. 15, 16, 17.  
1971 *Congeria triangularis* PARTSCH - BARTHA Pl. 26. Fig. 2, 3, 6. Pl. 27. Fig. 3, 4.

*Material:* 20 double-valved specimens and 26 single valves of which 13 are right and 13 are left valves. Average size of the recently collected specimens (4,1 cm) is characteristically larger than that of the type (*Fig. 5*). Available data are not sufficient to explain this feature.

*Measurements:*

	L	R	L	R	R	R	L	L	L	R	R	R	L	L
Length:	37	35	40	44	41	41	50	44	27	29	50	41	36	57
Height:	29	29	31	31	32	34	33	32	20	19	40	31	21	41
Width:	12	13	16	17	19	19	18	17	10	12	22	19	14	19

*Description:* Triangular form, agreeing with the type. Outline of double valves from anterior view is variable from elliptical to circular.

*Remarks:* While the keel on internal moulds is well developed, imprint of first rib is not always visible. Thickness of the shell does not reach 1 mm even on the largest specimens. On internal moulds growth lines are represented by coarse rugae.

The specific determination is based only on observations carried out on internal moulds. Valves of some bivalved specimens are removed on one another. *C. triangularis* is the single recently found species whose specimens are dominantly bivalved.

*Occurrence:* A widespread, very frequent species in the Pannonian basin.

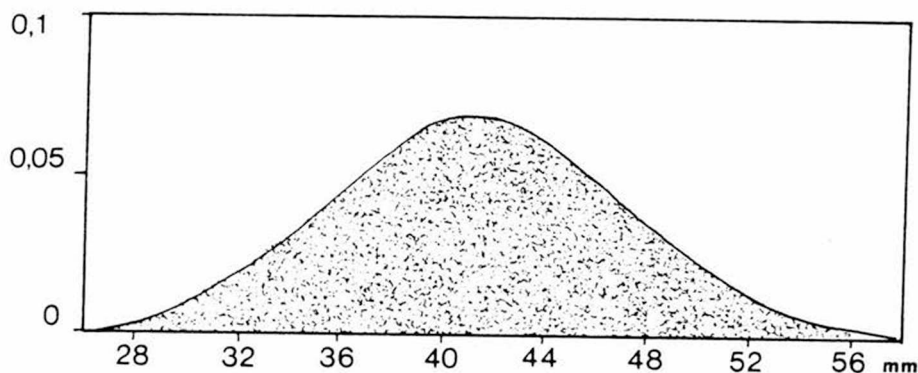


Fig. 5. Height distribution of *Congeria trinagularis* approximated by a density function of standard normal distribution,  $m = 41$  mm expected value and  $s = 5,7$  mm standard deviation.

*DREISSENA* BENEDEN, 1835 genus

*DREISSENOMYA* FUCHS, 1870 subgenus

*Dreissenomya schröckingeri* (FUCHS, 1870)

Fig. 4. Fig. 1 - 5.

- 1870a *Congeria Schröckingeri* FUCHS - FUCHS Taf. 16. Fig. 10, 11.  
 1893 *Dreissenomya Schröckingeri* FUCHS - LÖRENTHEY p. 78.  
 1960 *Dreissenomya schröckingeri* FUCHS - BARTHA Pl. 2. Fig. 2.  
 1964 *Dreissenomya schröckingeri* FUCHS - ANDRUSOV Tab. 19. Fig. 9 - 11.  
 1971 *Dreissenomya schröckingeri* FUCHS - BARTHA Pl. 23. Fig. 6, 7.  
 1977 *Dreissenomya schröckingeri* FUCHS - MARINESCU Pl. 4. Fig. 8, 9.

*Material*: 20 available bivalved internal moulds, many are fragmentary, and some of them slightly removed on one another. 10 external moulds of single valves are also available.

*Measurements*:

Length: 74 43 51 43 52 48 38 79 65 43 83 80 45  
 Height: 28 24 24 22 27 23 21 33 28 20 40 35 23  
 Width: 16 12 16 12 16 12 14 19 10 - - - -

H/W ratios against length values are plotted in Fig. 6.



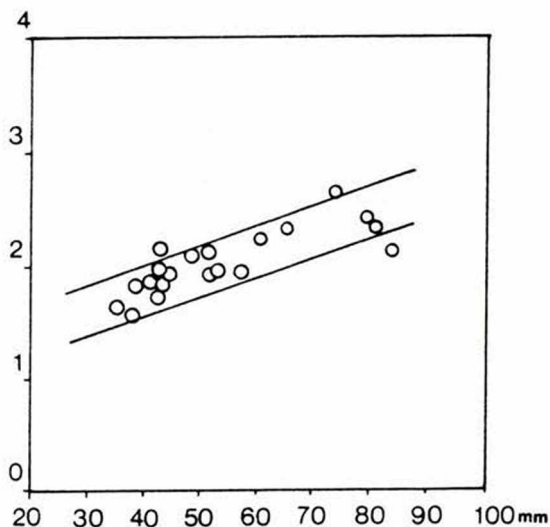


Fig. 6. Growth of *Dreissenomya schroëckingeri* during ontogeny. (Length compared to length/width ratio)

*Description:* Slightly oblong-shaped elliptical shells. The terminal beak is small. Shell is flattened with umbo below beak. Valves are strongly gaping anteriorly, becoming closed below beak and again gaping from the strong inflexion of the posterior margin. The two radial ribs ending back of the beak are well visible on the external mould.

*Remarks:* Shell is ornamented by dense, usually thin, somewhere stronger growth lines. Thickness of shell approx. 0,5 mm. Pallial line sinupalliate with well observable very deep sinus occupying approx. 1/3 of the internal valve surface. The elliptical muscle scars are well visible.

On a left valve internal mould a damage is observable (Pl. 4. Fig. 5). The animal survived the probably mechanical effect and grew a "half pearl" (for a similar case, see BACHMAYER - BINDER 1967).

*Occurrence:* A widespread species in the Pannonian basin.

## Plate 4

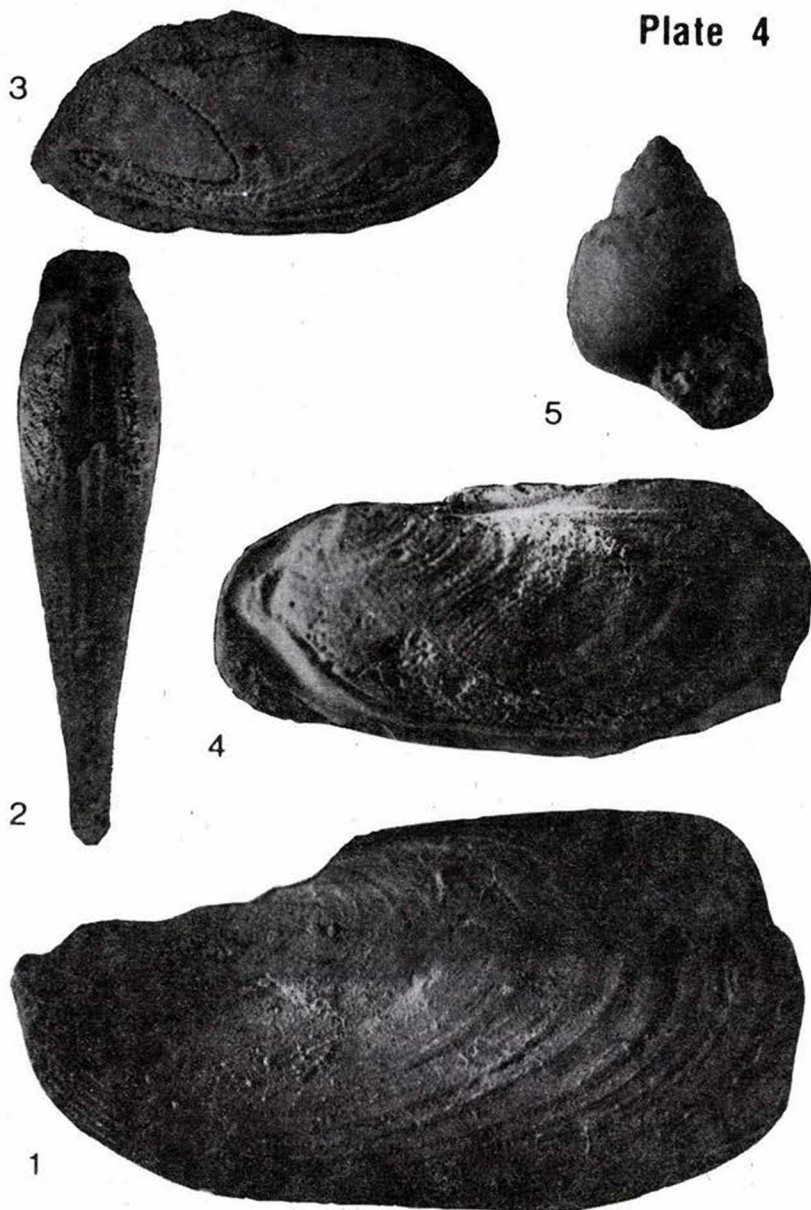


Plate 4. (All figures are in natural size)

Fig. 1. *Dreissenomya schröckingeri* (FUCHS, 1870) external mould, Fig. 2. *Dreissenomya schröckingeri* (FUCHS, 1870) internal mould of a bivalved specimen, Fig. 3. *Dreissenomya schröckingeri* (FUCHS, 1870) internal mould of a bivalved specimen, Fig. 4. *Dreissenomya schröckingeri* (FUCHS, 1870) mould of a "semi-pearl" in internal mould, Fig. 5. *Viviparus sadleri* (PARTSCH, 1835) rubber cast

GASTROPODA GUYIER, 1798 class  
 PROSOBRANCHIA MILNE - EDWARDS, 1848 order  
 MESOGASTROPODA WENZ, 1938 suborder  
 VIVIPARIDAE family  
 VIVIPARUS MONTFORT, 1810 genus

*Viviparus sadleri* (PARTSCH, 1835)  
 Pl. 4. Fig. 6.

- 1869 *Vivipara Sadleri* PARTSCH - NEUMAYR Taf. 13. Fig. 17. Taf. 14.  
 Fig. 2, 3.  
 1870a *Vivipara Sadleri* PARTSCH - FUCHS p. 348.  
 1870b *Vivipara Sadleri* PARTSCH - FUCHS p. 534.  
 1875 *Vivipara Sadleri* PARTSCH - HERBICH - NEUMAYR Taf. 16. Fig.  
 1, 4.  
 1884 *Vivipara Sadleri* PARTSCH - BRUSINA Taf. 30. Fig. 12.  
 1897 *Vivipara Sadleri* PARTSCH - BRUSINA Taf. 12. Fig. 31, 33.  
 1942b *Viviparus Sadleri* PARTSCH - STRAUZ Taf. 1. Fig. 8, 24.  
 1971 *Viviparus sadleri* PARTSCH - BARTHA Pl. 7. Fig. 1, 6.

*Material:* 11 internal moulds and 6 imprints. Imprints were determined by means of rubber casts. Internal moulds probably also belong to this species.

*Measurements:*

Height: 25 23 29  
 Width: 17 17 20

*Description:* Variable form with thin shell. First three whorls are convex, involute, then whorls become higher. Last whorl flat or slightly concave. Penultimate whorl of larger specimens can be also flat. Aperture elliptical, without shell thickening. Orthocline growth lines are the only sculpture.

*Remarks:* Because shell is rather thin (less than 1 mm) internal moulds well reflect the external morphology.

*Occurrence:* A widespread species in the Pannonian basin.

### Environmental interpretations

Analysing relations between litho- and biofacies it must be taken into consideration that recently collected species were previously recorded from different rock types in the environs of the Mecsek Mts. (TELEGDI-ROTH 1878,

LÖRENTHEY 1894a, BÖCKH 1876) so the biofacies probably is not closely related to the lithofacies.

*Biofacies:* High amount of fragmentary specimens, especially characteristic to the thin-shelled, large *Dreissenomya* indicates an environment of agitated water. The presence of large *Dreissenomya* unbroken and *L. cristagalli* specimens with intact thin keels, however, points that water energy could be moderate.

The investigated fauna could occupy a nearshore shallow-water environment. Based on data obtained on recent Dreissenidae, water depth did not exceed some 10 metres (DAVITASVILI 1966). The bottom could be characterized by moderate water energy below wave base (KORPÁS-HÓDI 1983) and good aeration.

The total lack of remains of juvenile specimens is a striking feature of the fauna. Their shell thickness (less than 0,5 mm) probably could be comparable with the grain size of the host rock and the dissolution of shells during diagenesis could eliminate juveniles.

208 adult specimens representing a thanatocoenose have been collected. Generic composition of the fauna is shown in *Fig. 7a*. Distribution of Lymnocardiid species is shown in *Fig. 7b*. Specimens of *Dreissenomya* of them fragmented are usually embedded with commissure plain parallel with the bedding. All other faunal elements are randomly oriented. The dominance of single valves, the frequent fragmentary preservation and the random orientation may indicate some reworking, but no direction of transport has been recognized.

The investigated molluscs belong to groups of different life habits:

*Lymnocardium* species were shallow burrowers. *Dreissenomya* the most successful deeper burrower (GRAY 1988) represents a deeper inbenthonic life habit. Species of *Congeria* are sessile epibenthonic forms.

Among these bivalves the vagile epibenthonic *Viviparus* is unexpected. According to KORPÁS-HÓDI (1983) *Viviparus* indicates an environment different of those presumed for the bivalves. These gastropods and the *Prosodacna* specimens were transported by currents from shallower water facies into the deeper water thanatocoenose. The lack of fossils preserved in life position still among the deeper burrower *Dreissenomya* also points to currents influencing the thanatocoenose. The absence of abraded shells, however, indicates a short distance transport and rapid burial.

Considering extremely large size of the investigated molluscs in comparison with other brackish-water forms, they could live in very favourable conditions.

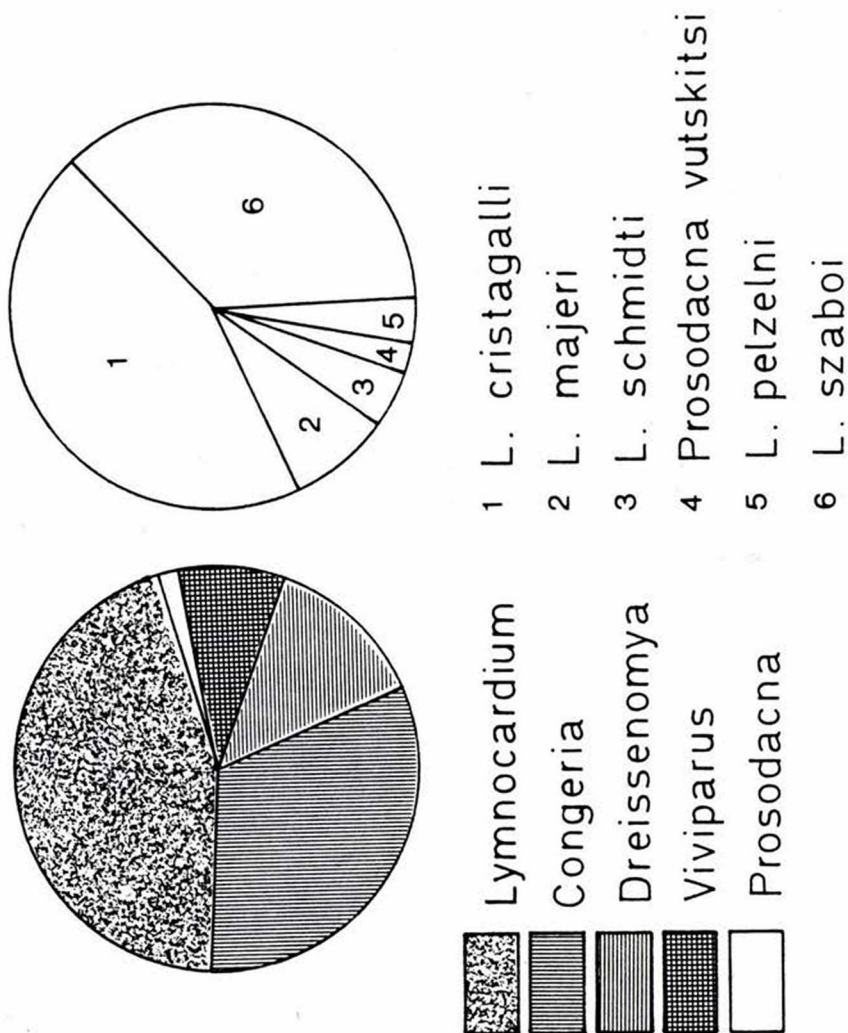


Fig. 7. Composition of the mollusc fauna and the species distribution of the genus *Lymnocardium*

### Conclusions

Following the discovery of Upper Pannonian rocks and fauna at Nyugotszenterzsébet the palaeogeographical map published by BARTHA (1971) must be modified.

Litho- and biofacies of the recently discovered Upper Pannonian section can be fitted into the palaeogeographical map of SZATMÁRI (in: KLEB 1973) some alterations must be also made over it.

Sedimentological and faunal data do not suggest the presence of extended land areas in the environs of Nyugotszenterzsébet during the Upper Pannonian.

Table 1. lists the mollusc species found at Nyugotszenterzsébet and indicates occurrences in other Upper Pannonian faunas of the Pannonian basin.

Fauna and lithology of the recently discovered outcrop fit well into the Upper Pannonian of the Mecsek Mts.

Only a few species found at Nyugotszenterzsébet have been recorded north of the Mecsek Mts. and especially few north of the Balaton.

The Nyugotszenterzsébet fauna shows strong affinities to Upper Pannonian faunas of areas south of the Mecsek.

It is noteworthy that until now the Mecsek Mts. is the northern margin of the distribution of some taxa (*L. cristagalli*, *L. hungaricum*, *L. histiophora*).

Distribution a few species (*L. cristagalli*, *L. szaboi*) have a strong affinity to the outcrops of the Mecsek Mts.

		LYMNOCARDIUM CRISTAGALLI (ROTH, 1878)	LYMNOCARDIUM MAJERI (HÖRNES, 1856)	LYMNOCARDIUM PELZELNI (BRUSINA, 1884)	LYMNOCARDIUM SCHMIDTI (HÖRNES, 1856)	LYMNOCARDIUM SZABOI LÖRENTHEY, 1893	PROSODACNA VUTSKITSI (BRUSINA, 1902)	LONGERIA CROATICA (BRUSINA, 1884)	LONGERIA TRIANGULARIS PARTSCH, 1835	DREISSENOMYA SCHROCKINGERI (FUCHS, 1870)	VIVIPARUS SADLERI (PARTSCH, 1835)
BALATON	Fonyód				•			•	•	•	•
	Balatonaracs								•	•	•
	Tihany					•				•	•
	Tab									•	
	Kúp									•	
MECSÉK	Kurd	•		•	•	•	•		•	•	
	Nagymányok	•	•	•	•	•	•	•			
	Hidas	•	•	•	•	•	•	•	•	•	•
	Szekszárd		•	•	•	•	•	•	•	•	•
	Sormás	•	•		•			•	•	•	
	Bükkösd	•			•			•	•	•	
	Magyar-Soros	•			•						
	Liptód		•	•	•						
	Bakócsa	•	•		•						
	Árpád		•		•	•				•	
	Ibafa	○	•		•			•		•	
Némelürög	•			•							
BANAT, SERBIA SLAVONIA	Királykegye		•	•	•				•	•	
	Radmanest		•	•	•				•	•	•
	Okrugljak	○	•	•	•			•			•
	Černomerec		•					•			
	Remete				•			•			
	Mislodjin		•		•			•	•		
	Brestovik	○	•		•			•	•	•	
	Zagreb	○	•	•	•			•			•

Table 1. Distribution of the investigated species in some selected localities. The comparison based on the following data: Brusina 1884, Fuchs 1870a, Halaváts 1893, Hörnes 1856, Lörenthey 1893, 1894a, 1894b, 1911, Stevanovic 1951, Sümeghy 1939, Telegdi-Roth 1878.

○ morphotypes of *L. cristagalli*

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