Slovak Geol. Mag. 3, 4(1997) 247–261

Mollusc Fauna of loess complex from Mnešice locality, Danube Basin

JANA KERNÁTSOVÁ

Geological Survey of Slovak Republic, Mlynská dolina 1, 817 04 Bratislava

Abstract. A detail lithologic, physical-chemical and biostratigraphic research of the locality Mnešice - near cow-house is described in the work. The main part of the paper consists of systematic overview of the identified mollusc fauna and its ecologic and biostratigraphic evaluation. This renders a good correlation with other localities of Lower Váh river area.

Key words: Quaternary, Pleistocene, loess complex (loess serie), continental gastropoda, stratigraphy, palaeoecology, granulometry

Introduction

The locality Mnešice with the occurrence of Late and Middle Pleistocene loesses separated by several soil complexes and with the occurrence of archeological findings suggesting the existence of Older Palaeolith, belongs to a few important loess profiles in the Lower Váh river area.

The morphological most important phenomenon of the area is a conspicuous pseudoterrace consisting of several loess horizons separated by soil complexes. It overlies the gravel of river Váh Middle terrace. The base of the terrace occurs max. 10 m above the contemporary Váh valley (Vaškovský, 1970). The deposits forming the pseudoterrace fill the valley cut with exposed underlying rocks at the bottom. We meet here dell type of stratigraphy resulting in pinching out of some beds of loess complex.

Overview of existing biostratigraphic researches

Locality	Stratigraphic assignment	References
Mnešice– Búdy	W_3, $W_{2/3}$, W_2, $W_{1/2}$, W_1, R/W, R_2, $R_{1/2}$,?, R_1?	Ložek – Tyráček, 1960
Mnešice - brick kiln	W_3, $W_{2/3}$, W_2, $W_{1/2}$, W_1, R/W, R_2, $R_{1/2}$?, R_1?	Kukla – Ložek – Barta, 1962 Halouzka – Maglay, 1995

Description of loess complex

Mnešice are a part of a Nové Mesto nad Váhom town suburb. Loess outcrop Mnešice - is located to the NE behind the village near the local vaste deposit. It is an artificial outcrop in a slope about 11 m high and 150 m wide (Fig. 1)

Lithofacial analysis distinguished 17 various lithologic beds at the profile. Schematic illustration of the lithologic profile (Fig. 2).

Overview of some physical-chemical properties of the studied sediments

As seen from Tab. 1 and Chart 1 the studied deposits especially fit into two lithotype categories consisting of sandy-clayey silt and clayey silt. Sample No. 14 with sand fraction up to 29 % and sample No. 45 with clay fraction reaching up to 79.5 % do not match these categories.

The amount of silt and clay fractions differs in the samples taken from loess beds and from soils. In loess beds the silt fraction content is above 63 % while in soils the silt fraction varies from 50 to 59 %. An increase of clay fraction and decrease of $CaCO_3$ content is observable in soil layers. These changes of physical-chemical properties of soils reflect a climate warming, increased precipitation and decalcification of soil horizons pointing to their development during some warm interstadial or even interglacial period.

Dionýz Štúr Publishers, Bratislava ISSN 1335-96X

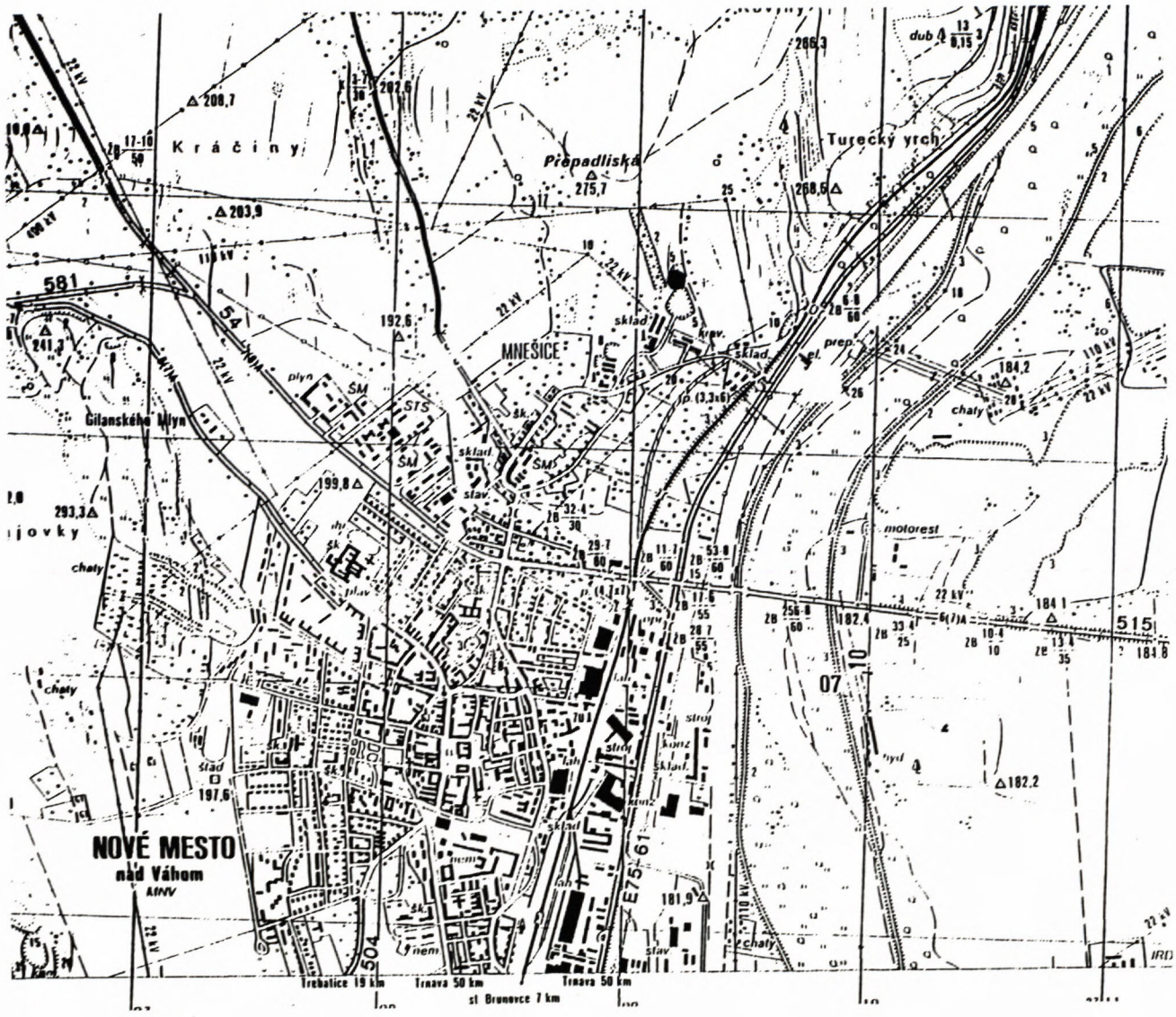


Fig. 1

The $CaCO_3$ content in the loesses of the studied profile also varies. It decreases from youngest superposed beds toward the underlying beds consisting of older loesses (Chart 2).

Systematic overview of the identified mollusc fauna

Class: *GASTROPODA*
Subclass: *PROSOBRANCHIA*
Order: *ARCHAEOGASTROPODA*

Family: *ACICULIDAE*
Genus: *Acicula* Hartmann, 1821 Eocene- Recent

***Acicula* sp.**

Subclass: *EUTHYNEURA*
Order: *BASOMMATOPHORA*

Family: *LYMNAIDAE*
Genus: *Lymnaea* Lamarck, 1799

***Lymnaea truncatula* Muller, 1774**

1952 *Galba truncatula* (Muller) - Žadin: p.175, Fig. 76
1964 *Lymnaea (G.) truncatula* (Müller) - Ložek: p.176, Tab. III/7
1994 *Lymnaea truncatula* (Müller) - Skompski - Makowska: p. 59, Tab. XXXIV/2

Order: *STYLOMMATOPHORA*
Family: *COCHLICOPIDAE*
Genus: *Cochlicopa* Risso, 1826 Paleocene - Recent

***Cochlicopa lubrica* Müller, 1774**

1956 *Columella edentula columella* (Martens) - Ložek: p. 98, Tab. V/2

1964 *Columella columella* (Martens) - Ložek: p. 198, Tab. VI/3
1983 *Columella columella* (Martens) - Kerney - Cameron-Jungbluth: p. 87
1994 *Columella columella* (Martens) - Skompski - Makowska: p. 64, Tab. 39/6

Genus *Vertigo* Müller, 1774 Paleocene - Recent

***Vertigo pygmaea* Draparnaud, 1801**

1956 *Vertigo pygmaea* (Draparnaud) - Ložek: p. 93, Tab. IV/5
1964 *Vertigo (V.) pygmaea* (Draparnaud) - Ložek: p. 203, Tab. VII/3
1983 *Vertigo (V.) pygmaea* (Draparnaud) - Kerney - Cameron - Jungbluth: p. 92
1994 *Vertigo pygmaea* (Draparnaud) - Skompski - Makowska: p. 64, Tab. 39/6

***Vertigo parcedentata* Braun, 1847**

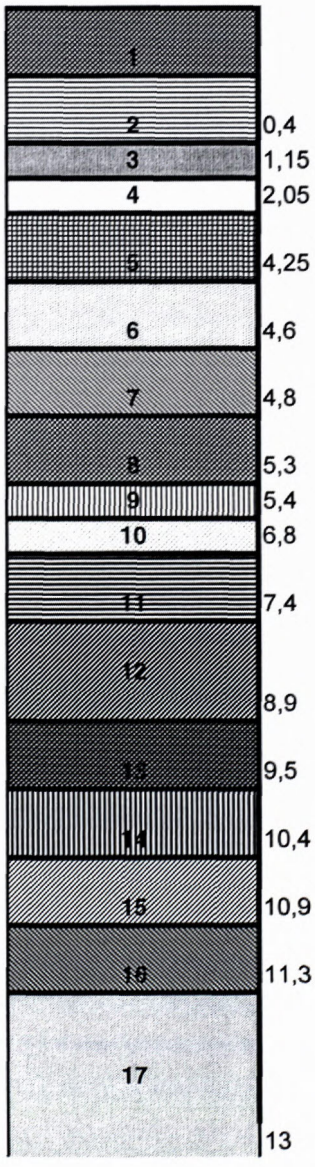
1964 *Vertigo parcedentata* (Braun) - Ložek: p.206, Tab. VII/8
1994 *Vertigo parcedentata* (Braun) - Skompski - Makowska: p. 66, Tab. 40/2

***Vertigo* sp.**

Family: *ORCULIDAE*
Genus *Orcula* Held, 1837 Paleocene - Recent

***Orcula dolium* Draparnaud, 1801**

1956 *Orcula dolium* (Draparnaud) - Ložek: p. 103, Tab. VII/2
1964 *Orcula dolium* (Draparnaud) - Ložek: p. 208, Tab. VIII/6
1983 *Orcula dolium* (Draparnaud) - Kerney - Cameron-Jungbluth: p. 99



1 - Oak soil with many roolets, and fine cloddy structure

2 - Brown soil with calcium precipitates, on one´s back cloddy structure

3 - Oak loess with solitary clay dols of calcium, firm
4 - Progressive crossing to brown soil, firmly fluffy
5 - Light firmly calcified loess with large calcium clay dols on contact with soil. Loess is firm and compact.
6 - Brown soil with tone to red. Firmly about pass between loess and soil
7 - Oak soil, firm, thick mo, with solitary calcium aggromerate, on fissures are magnesium oxids precipitates, calcareous
8 - Dark brown soil with tone to red firm, on overhead part are solitary magnesium oxids precipitates, calcareous
9 - Oak soil, firmly fluffty
10 - Oak loess with calcium clay dols
11 - Yellow brown loess, firmly clayer with solitary magnesium oxides precipitates and clay dols
12 - Dark brown firm gumbo, magnesium oxides, infrequent clay dols with more clay parting till clear clay 8,3 - 8,9 darkly brown gumbo with clay dols and noduls of Mn and Fe
13 - Light brown clay primary loess with magnesium oxides, solitary calcium noduls.
14 - Dark brown clay loess with magnesium oxides, for dept calcium noduls are decrease
15 - Oak with fine tone to red, slightly clay loess (immature soil), magnesium oxides
16 - Oak slightly clay loess with clay dols many meroleim

17- Brown, firmly clay loess (clay loam) on fissures are calcium clay dols and for dept meroleim are increase, solitary grey and terracotta spottiness (veined). From 12,7 m dept parts of clay are decrease

Fig. 2 Litologic profile on the outcop Mnešice

Tab 1 Granulotype and physicochemical properties of sediments

Layer No.	Sample No.	Sampling depth (m)	Granulotype	Granulotype	pH	Humus v (%)	Content of calcium
			Classification of sedimentology	Pedological scale			
2	1	0.15 - 0.30	clayey mo	loam			13.21
	2	0.40 - 0.60	sandy clayey mo	loam			22.36
3	3	0.60 - 0.80	sandy clayey mo	loam			17.3
	4	0.80 - 1.00	sandy clayey mo	loam			25.83
	5	1.00 - 1.15	sandy clayey mo	loam			11.14
4	6	1.15 - 1.35	sandy clayey mo	loam	7.25	0.42	6.8
	7	1.35 - 1.60	sandy clayey mo	clay loam	7.16	0.4	3.34
	8	1.60 - 1.80	clayey mo	clay loam	7.2	0.37	2.12
	9	1.80 - 2.05	clayey mo	loam	7.2	0.2	2.4
5	10	2.05 - 2.30	clayey sandy mo	loam			24.27
	11	2.30 - 2.60	clayey sandy mo	loam			23.55
	12	2.60 - 2.90	clayey sandy mo	loam			17.87
	13	2.90 - 3.20	sandy clayey mo	loam			15.77
	14	3.20 - 3.50	clayey sandy mo	loam			15.07
	15	3.50 - 3.80	sandy clayey mo	loam			17.1
	16	3.80 - 4.10	sandy clayey mo	loam			17.23
	17	4.10 - 4.25	sandy clayey mo	loam	7.5	0.2	11.37
6	18	4.25 - 4.45	sandy clayey mo	loam			10.23
	19	4.45 - 4.60	clayey mo	loam			7.33
7	20	4.60 - 4.80	clayey mo	clay loam	7.3	0.46	1.91
8	21	4.80 - 5.00	clayey mo	clay loam	7.2	0.41	0.58
	22	5.00 - 5.30	clayey mo	clay loam	7.1	0.44	0.49
9	23	5.30 - 5.40	clayey mo	loam			0.28
10	24	5.40 - 5.70	sandy clayey mo	loam			11.65
	25	5.70 - 6.00	sandy clayey mo	loam			11.25
	26	6.00 - 6.30	sandy clayey mo	loam			8.78
	27	6.30 - 6.60	sandy clayey mo	sandy mo load			8.38
	28	6.60 - 6.80	sandy clayey mo	sandy mo load			9.08
11	29	6.80 - 7.10	sandy clayey mo	loam	7.4	0.16	5.29
	30	7.10 - 7.40	clayey mo	loam			4.87
12	31	7.40 - 7.70	clayey mo	loam			4.95
	32	7.70 - 8.00	sandy clayey mo	loam			1.04
	33	8.00 - 8.30	clayey mo	loam	7.35	0.3	1.26
	34	8.30 - 8.60	clayey mo	loam	7.35	0.38	0.99
	35	8.60 - 8.90	clayey mo	loam			1.28
13	36	8.90 - 9.20	clayey mo	loam			0.65
	37	9.20 - 9.50	clayey mo	loam			0.73
14	38	9.50 - 9.80	sandy clayey mo	loam			1.05
	39	9.80 - 10.10	sandy clayey mo	loam			0.65
	40	10.10 - 10.40	sandy clayey mo	loam			0.23
15	41	10.40 - 10.70	clayey sandy mo	loam	7.1	0.26	0.36
	42	10.70 - 10.90	clayey sandy mo	loam	6.9	0.4	0.45
16	43	10.90 - 11.10	clayey mo	loam			0.38
	44	11.10 - 11.30	clayey mo	clay loam	6.8	0.51	0.3
17	45	11.30 - 11.50	sandy mo	clay	6.6	0.45	0.15
	46	11.50 - 11.80	sandy clayey mo	loam			0.21
	47	11.80 - 12.10	sandy clayey mo	loam			0.32
	48	12.10 - 12.40	clayey mo	loam			0.23
	49	12.40 - 12.70	sandy clayey mo	loam			0.3
	50	12.70 - 13.00	sandy clayey mo	loam			0.27

Family: *PUPILLIDAE*
Genus: *Pupilla* Fleming, 1828 Oligocene- Recent

***Pupilla triplicata* Studer, 1820**

1956 *Pupilla triplicata* (Studer) -Ložek: p.102
1964 *Pupilla triplicata* (Studer) - Ložek: p. 244, Tab. IX/5,6
1983 *Pupilla (Pupilla) triplicata* (Studer) - Kerney - Cameron - Jungbluth: p.119

***Pupilla muscorum* Linne, 1758**

1956 *Pupilla muscorum* (Linne) - Ložek: p. 99, Tab. VI/1
1964 *Pupilla muscorum* (Linne) - Ložek: p. 215, Tab. IX/1,7
1983 *Pupilla (Pupilla)muscorum* (Linne) - Kerney - Cameron - Jungbluth: p. 118
1994 *Pupilla muscorum* (Linne) - Skompski - Makowska: p. 66, Tab. 40/2

***Pupilla sterri* Voith,1838**

1956 *Pupilla sterri* (Voith) - Ložek: p. 101, Tab. VI/3
1964 *Pupilla sterri* (Vopith) - Ložek: p. 216, Tab. IX/2
1983 *Pupilla (Pupilla) sterri* (Voith) - Kerney - Cameron- Jungbluth: p.120

***Pupilla loessica* Ložek, 1954**

1964 *Pupilla loessica* (Ložek) - Ložek: p.277, Tab.IX/3
1994 *Pupilla loessica* (Ložek) - Skompski - Makowska: p. 67, Tab. 40/5

***Pupilla muscorum densegyrata* Ložek, 1954**

1955 *Pupilla muscorum densegyrata* (Ložek) - Ložek: p. 401, Tab. II/1,2
1964 *Pupilla muscorum densegyrata* (Ložek) - Ložek: p. 216, Tab. IX/4

***Pupilla* sp.**

Family: *VALLONIIDAE*
Genus: *Vallonia* Risso,1826 Paleocene - Recent

***Vallonia costata* Müller, 1774**

1955 *Vallonia costata* (Müller) - Ložek: p.107, Tab.VIII/1
1964 *Vallonia costata* (Müller) - Ložek: p. 219, Tab. X/3a,b,c
1983 *Vallonia costata* (Müller) - Kerney - Cameron- Jungbluth: p.125
1994 *Vallonia costata* (Müller) - Skompski - Makowska: p. 67, Tab. 41/1

***Vallonia pulchella* Müller, 1774**

1955 *Vallonia pulchella* (Müller) - Ložek: p. 108, Tab. 8/3
1964 *Vallonia pulchella* (Müller) - Ložek: p. 221, Tab. X/5a, b, c
1983 *Vallonia pulchella* (Müller) - Kerney - Cameron- Jungbluth: p.127
1994 *Vallonia pulchella* (Müller) - Skompski - Makowaska: p. 67, Tab. 41

***Vallonia tenuilabris* Braun, 1843**

1955 *Vallonia tenuilabris* (Braun) - Ložek: p.106
1964 *Vallonia tenuilabris* (Braun) - Ložek: p. 223, Tab. X/1a,bc
1994 *Vallonia tenuilabris* (Braun) - Skompski - Makowska: p. 68, Tab. 42/2

Family: *ENIDAE*
Genus: *Chondrula* Beck, 1837 Pliocene - Recent

***Chondrula tridens* Muller, 1774**

1955 *Chondrula tridens* (Muller) - Ložek: p.114, Fig. 29, Tab.10/3
1964 *Chondrula tridens* (Muller)- Ložek: p.2, i. 41
1983 *Chondrula (Chondrula) tridens* (Muller) - Kerney - Cameron- Jungbluth: p.133
1994 *Chondrula tridens* (Muller) - Skompski - Makowska: p. 68, Tab. 40/3

Family: *SUCCINEIDAE*
Genus: *Succinea* Draparnaud, 1801 Paleocene - Recent

***Succinea oblonga* Draparnaud, 1801**

1955 *Succinea (Succinella) oblonga* (Draparnaud) - Ložek: p. 83, Tab. II/2
1964 *Succinea (Succinella) oblonga* (Draparnaud) - Ložek: p. 230, Tab.12/7, 8, 9
1983 *Succinea (Succinella) oblonga* (Draparnaud) - Kerney - Cameron- Jungbluth: p. 79, 2/2
1994 *Succinea oblonga* (Draparnaud) - Skompski - Makowska: p. 69, Tab. 40/8

Genus: *Catinella* Pease, 1870 Pleistocene - Recent

***Catinella arenaria* Bouchard-Chantereaux, 1837**

1964 *Catinella (Quickella) arenaria* (Bouchard-Chantereaux) - Ložek: p. 232, Tab. 12/5,6
1983 *Catinella (Quickella) arenaria* (Bouchard-Chantereaux) - Kerney - Cameron- Jungbluth: p.78, Tab. 2/3

Family: *ENDODOTIDAE*
Punctum Morse, 1864 Upper Oligocene - Recent

***Punctum pygmaeum* Draparnaud, 1801**

1955 *Punctum pygmaeum* (Draparnaud) - Ložek: p.146, Tab.18/1
1964 *Punctum pygmaeum* (Draparnaud) - Ložek: p. 233, Tab.13/2 a,b,c
1983 *Punctum (Puncum) pygmaeum* (Draparnaud) - Kerney - Cameron - Jungbluth: p.135
1994 *Punctum pygmaeum* (Draparnaud) - Skompski - Makowska: p. 70, Tab. 47/2

Family: *VITRINIDAE*
Genus: *Semilimax* Agassiz, 1845 end of Pliocene - Recent

Tab. 2 The frequency of individual Taxons and their ecological characteristics on the outcrop Mnešice

Main ecological groups	Ecological characteristics	Biostratigraphic date	Sampling depth (m)	0,15 - 0,30	0,40 -0,60	0,60 -0,80	0,80 - 1,0	1,0 - 1,15	1,15 - 1,35	1,35 - 1,60	1,8 - 2,05	2,05 - 2,30	2,30 - 2,60	2,60 - 2,90	2,90 - 3,20	3,20 - 3,50	3,50 - 3,80	3,80 - 4,10	4,10 - 4,25
	L/V/	/ + /	*1 Vitrea crystallina*																
	L		*2 Semilimax semilimax*																
A	L/V		*3 Clausilia pumila*																
	L/V/		*4 ?Perforatella rubiginosa*			U								1					
	L/V	/ + /	*5 Perforatella bidentata*																
	L/M/	/ + /	*6 Arianta arbustorum*	U					U			U		U					U
	O	+ +	*7 Columella columella*																
	O	/ G /	*8 Vertigo pygmaea*																
	O	+	*9 Vertigo parcedentata*						1										
	S	+	*10 Pupilla triplicata*										63	46	65	17	1		4
	O	+	*11 Pupilla muscorum*										33	4	37				
	S	+	*12 Pupilla sterri*									1	22	6	5	1		4	
B	O	+ +	*13 Pupilla loessica*	1										2		5			1
	O	+ +	*14 Pupilla musc. densegyrata*											2		1		2	
	O	/ + /	*15 Vallonia costata*			2			1				2				3	3	
	O	G	*16 Vallonia pulchella*		1							1				1			
	O	+ +	*17 Vallonia tenuilabris*	1									106	106	97	8			
	S	/ + /	*18 Chondrula tridens*		1			1	2	2		1			2		1		
	O	/ + /	*19 Catinella arenaria*									1	17	3	17	3	2		
	S	+	*20 Helicopsis striata*		1	1	2	2	2				4	U	7	5	2	U	1
	M	/ + /	*21 Cochlicopa lubrica*					1				1							
	RL	/ + /	*22 Orcula dolium*	1	1				1										
	VS	+	*23 Succinea oblonga*		1														
C	M	/ + /	*24 Punctum pygmaeum*																
	M	/ + /	*25 Nesovitrea hammonis*				1			1				1					
	M	/ + /	*26 Limacidae/Agriolimacidae*				1	1	3						1				
	RL	/ + /	*27 Clausilia dubia*			1	5	1											
	M	+	*28 Trichia hispida*	1											1				
D	H	/ + /	*29 Lymnaea truncatula*																
			30 ? Acicula sp.							U									
			31 Vertigo sp.																
			32 Pupilla sp.														U		
			33 Clausilidae	U	U				U	U			U	U	U			U	
			34 Helicidae																
			35 Rodentia																
			Sum	4 + U	5 + U	4 + U	5	6	10 + U	3 + U	U	5+U	247+U	171+U	232+U	41	9+U	9+U	6+U

Main ecologic group:
A - forest (in general)
B - tree-less landscape
C - forest and tree-less landscape
D - water, bogs

Ecologic characteristics (Biotop)
L - forest
L(V) - forest, locally moderately humid tree-less locality
L/V - humid forest
O - open landscape
S - steppes, xerotherm rocks
M - moderately or variosly humid locality
RL - moderately humid rocks, tree logs in forest
VS - more humid forest and tree-less localities
H - water environment

Tab. 2 The frequency of individual Taxons and their ecological characteristics on the outcrop Mnešice

4,25 - 4,45	4,45 - 4,60	4,60 - 4,80	5,0 - 5,30	5,30 - 5,40	5,40 - 5,70	5,70 - 6,0	6,0 - 6,30	6,30 - 6,60	6,60 - 6,80	6,80 - 7,10	7,10 - 7,40	7,40 - 7,70	7,70 - 8,0	8,30 - 8,60	8,60 - 8,90	8,90 - 9,20	9,20 - 9,50	9,50 - 9,80	9,80 - 10,10	10,10 - 10,40	10,70 - 10,90	10,90 - 11,10	11,30 - 11,50	11,50 - 11,80	11,80 - 12,10	12,10 - 12,40	12,40 - 12,70	Sum
							1	11	25	5	2																	44
					1		1		1																			3
							1	1	1	2	1	U																6+U
																												1+U
									1		1	2																4
	U	U				U	U	U	U	U	U	U	U															U
					1	6	5	20	30																			62+U
									2																			2
									1			1																3
	1					1		5	8																			211
						4	3	8	13	12	7	4																125
3					3	2		9	9																			65
							2	4	6																			21
					2			5	6	5	3																	26
					1			1	2																			15
		1									1																	5
					1			2	12																			333
							1																					11
																												43
	1				1																							29+U
								2	4	5	4	1																18
					1			15	15	3	12																	49
					3	17	25	30	50	32	38	17																213
													1															1
																												3
							2	U	2		2	1																13+U
						1		2	1		1																	8
						U		2	1	U	U																	5+U
									2																			2
								U																				U
	U											U																U
		U											U											U				U
													U			U												U
																	U											U
3+U	2+U	1+U	U	0	14+U	31+U	41	117+U	192	64+U	72+U	26+U	1+U	0	0	U	U	0	0	0	0	U	0	U	U	0	0	1321

Biostratigraphic data:

\+ - loess species
++ - index loess species
(+) - local or occasional loess species
g - species surviving glacial outside the loess zone
(G) - species surviving glacial outside the loess zone as a relic

U - fragments

W3 - the third Würm stadial
W2/3 - the second Würm interstadial
W2 - the second Würm stadial
W1/2 - the first Würm interstadial
W1 - the first Würm stadial
R/W - interglacial Riss - Würm
R2 - the second Riss glacial
R1/2 - Riss interglacial
R1 - the first Riss glacial

***Semilimax semilimax* Ferussac, 1802**

1964 *Semilimax semilimax* (Ferussac) - Ložek: p. 240, Tab. XIV/3a, b
1983 *Semilimax (Semilimax) semilimax* (Ferussac) - Kerney - Cameron - Jungbluth: p.152

Family: *ZONITIDAE*

***Nesovitrea hammonis* Ström,1765**

1955 *Perpolita radiatula* (Alder) - Ložek: p.151,Tab.1 19/1
1964 *Perpolita radiatula* (Alder) - Ložek: p. 243, Tab. 19/3a,b,c
1983 *Nesovitrea hammonis* (Ström) - Kerney - Cameron - Jungbluth: p.168
1994 *Nesovitrea hammonis* (Ström) - Skompski - Makowska: p. 70, Tab. 43/1

Genus: *Vitrea* Fitzinger, 1833 Neogene - Recent

***Vitrea crystallina* Müller, 1774**

1955 *Vitrea crystallina* (Müller) - Ložek: p.164, Tab.22/2
1964 *Vitrea crystallina* (Müller) - Ložek: p. 256, Tab. XVII/1a,b,c
1983 *Vitrea (Crystallus) crystallina* (Müller) - Kerney - Cameron - Jungbluth: p.162

Family: *LIMACIDAE / AGRIOLIMACIDAE*
Family: *CLAUSILIIDAE*
Genus: *Clausilia* Draparnaud, 1805 Pliocene - Recent

***Clausilia dubia* Draparnaud, 1805**

1955 *Clausilia dubia* (Draparnaud) - Ložek: p.127, Tab.12/3
1964 *Clausilia dubia* (Draparnaud) - Ložek: p. 269, Tab. 20/10,11
1983 *Clausilia (Clausilia) dubia* (Draparnaud) - Ložek: p. 228

***Clausilia pumila* Pfeiffer, 1828**

1955 *Clausilia pumila* (Pfeiffer) - Ložek: p. 128, Tab. 12/4
1964 *Clausilia pumila* (Pfeiffer) - Ložek p. 270, Tab. 20/10, 11
1983 *Clausilia Clausilia) pumila* (Pfeiffer) - Kerney - Cameron - Jungbluth: p. 230

Family: *HELICIDAE*
Genus: *Helicopsis* Fitzinger, 1833

***Helicopsis striata* Müller, 1774**

1955 *Helicella (Helicopsis) striata* (Müller) - Ložek: p. 195, Tab. 30/1
1964 *Helicopsis striata* (Müller) - Ložek: p. 289, Tab. 22/2a, b, c
1983 *Helicella (Helicopsis) striata* (Müller) - Kerney - Cameron - Jungbluth: p. 251

Genus: *Perforatella* Schluter, 1838 Pleistocene - Recent

***Perforatella rubiginosa* Schmidt,1853**

1955 *Monachoides rubiginosa* (Schmidt) - Ložek: p.209, Tab. 34/1,2
1964 *Monachoides rubiginosa* (Schmidt) - Ložek: p. 289, Tab. 22/2a, b, c
1983 *Perforatella (Pseudotrichia) rubiginosa* (Schmidt) - Kerney - Cameron - Jungbluth: p. 259
1994 *Perforatella rubiginosa* (Schmidt) - Skompski - Makowska: p. 73, Tab. 45/1

***Perforatella bidentata* Gmelin, 1788**

1955 *Perforatella bidens* (Chemnitz) - Ložek: p. 213, Tab. 35/1
1964 *Perforatella bidentata* (Gmelin) - Ložek: p. 294, Tab. 23/2a,b,c
1983 *Perforatella (Perforatella) bidentata* (Gmelin) - Kerney - Camaron - Jungbluth: p. 254
1994 *Perforatella bidentata* (Gmelin) - Skompski - Makowska: p. 74, Tab. 45/2

Genus: *Trichia* Hartmann, 1840 Paleogene - Recent

***Trichia hispida* Linne, 1758**

1955 *Trichia hispida* (Linne) - Ložek: p. 208, Tab. 32/3
1964 *Trichia (Trichia) hispida* (Linne) Ložek: p. 300, Tab. 25/1a, b, c
1983 *Trichia (Trichia) hispida* (Linne) - Kerney - Cameron-Jungbluth: p.261
1994 *Trichia hispida* (Linne) - Skompski - Makowska: p. 74, Tab. 44/3

Genus: *Arianta* Turton, 1831 - Recent

***Arianta arbustorum* Linne, 1758**

1955 *Arianta arbustorum* (Linne) - Ložek: p. 221, Tab. 37/2
1964 *Arianta arbustorum* (Linne) - Ložek: p. 309, Tab. 30/5
1983 *Arianta arbustorum* (Linne) - Kerney - Cameron-Jungbluth: p. 272

Quantitative - qualitative analysis of the studied fauna

From the loess profile Mneaice - near cow-house 44 samples were analyzed in order to identify fauna, ten samples of them were negative. From this amount of samples 1231 pieces of fossil molluscs, which belongs to 15 families and 32 species were obtained (Tab. 2). The occurrence of individual taxons in the whole profile and the occurrence of taxons in the individual samples of the profile in percentage are depicted on charts from 3 to 10.

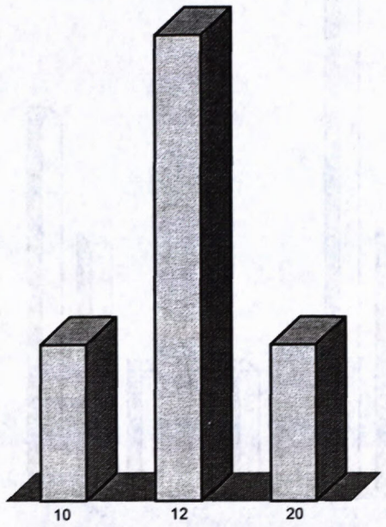


Chart 7 The frequency of Taxons in Bed No. 6

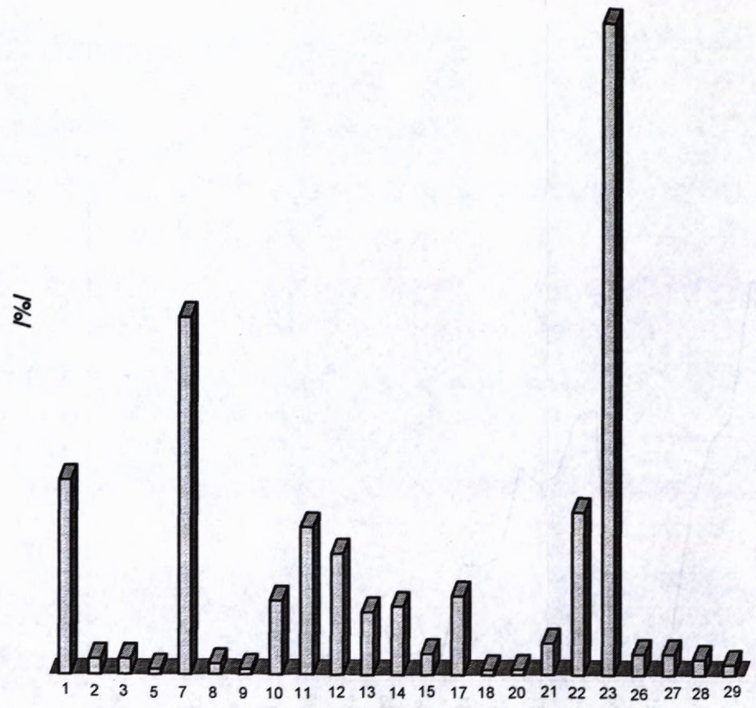


Chart 8 The frequency of Taxons in Bed No. 10

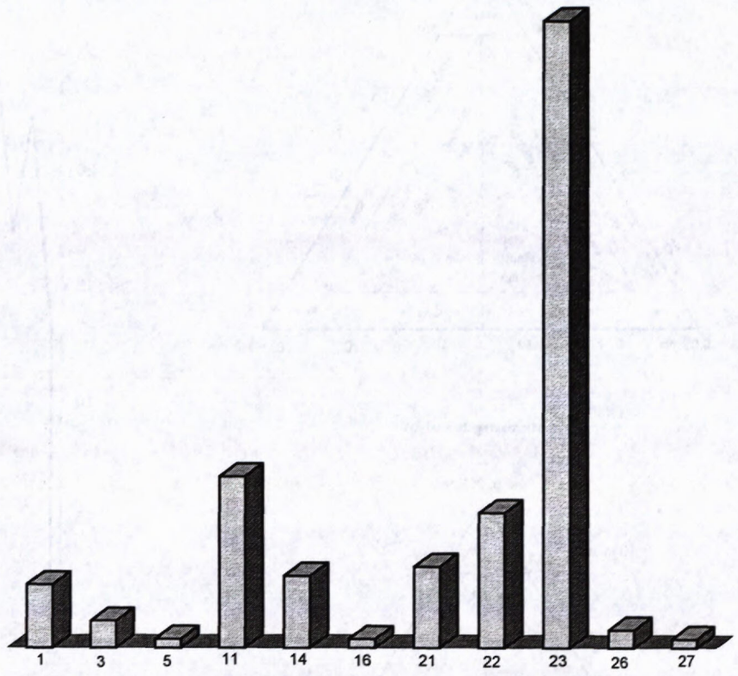


Chart 9 The frequency of Taxons in Bed no. 11

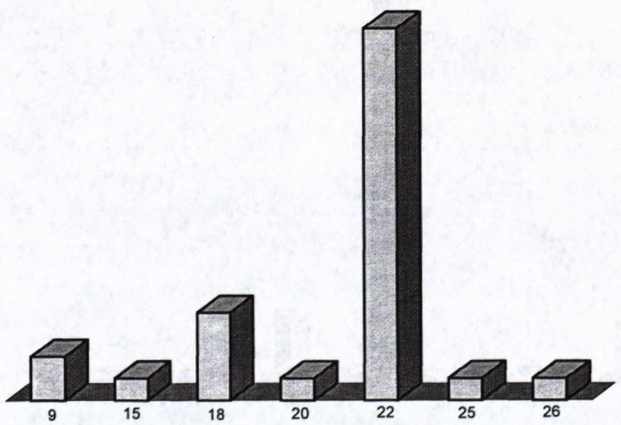


Chart 10 The frequency of Taxons in Bed No. 12

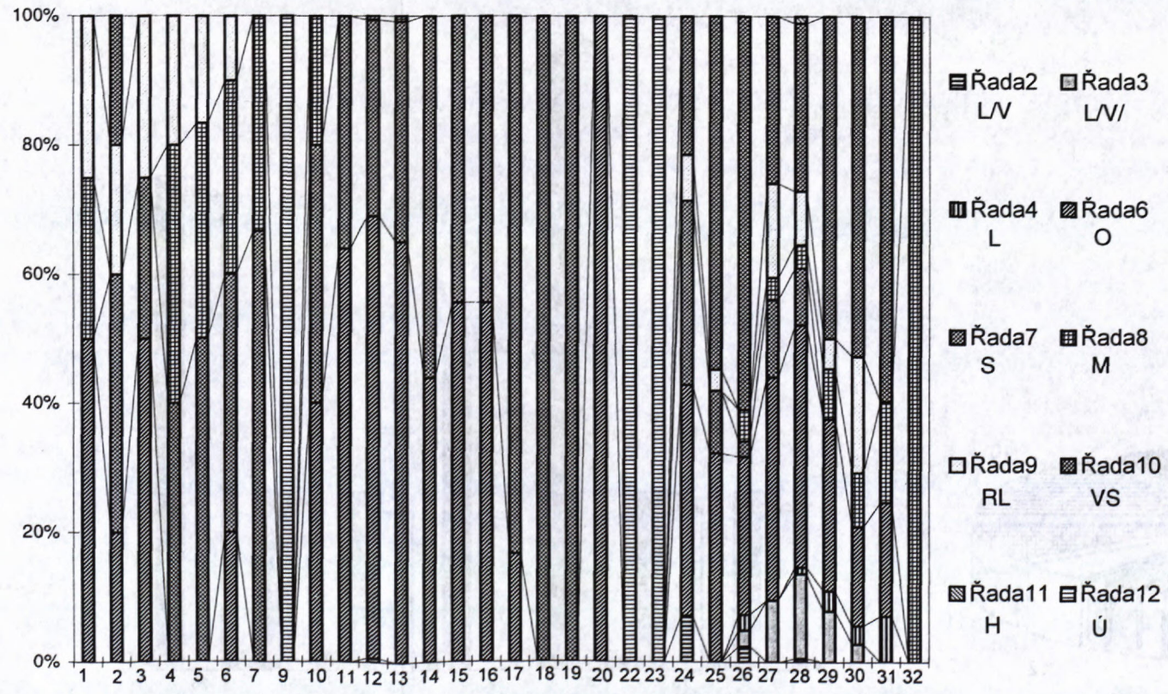
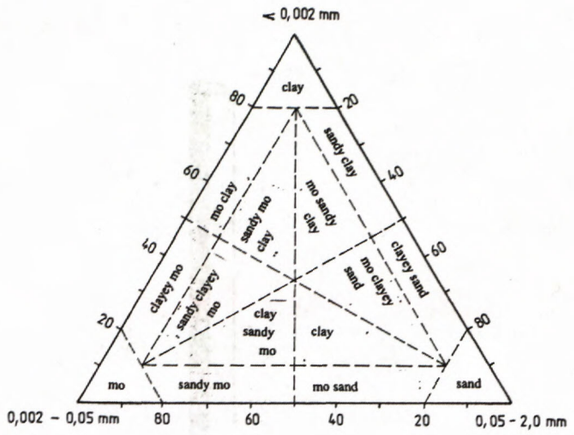


Chart 11 The frequency of Biotops in individual Samples on the outcrop Mnešice



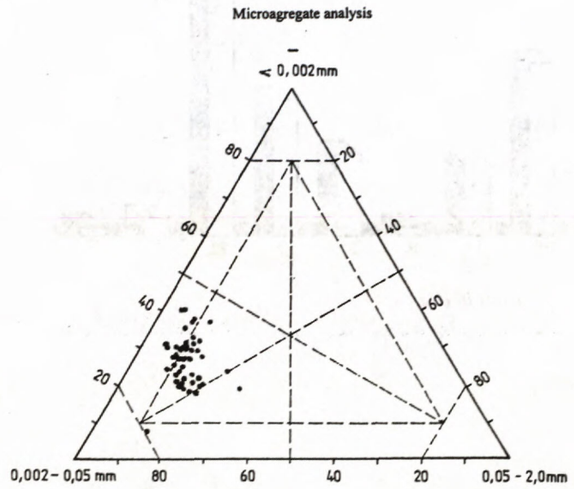


Chart 1 Grafics of classification from J. Konta (1972)

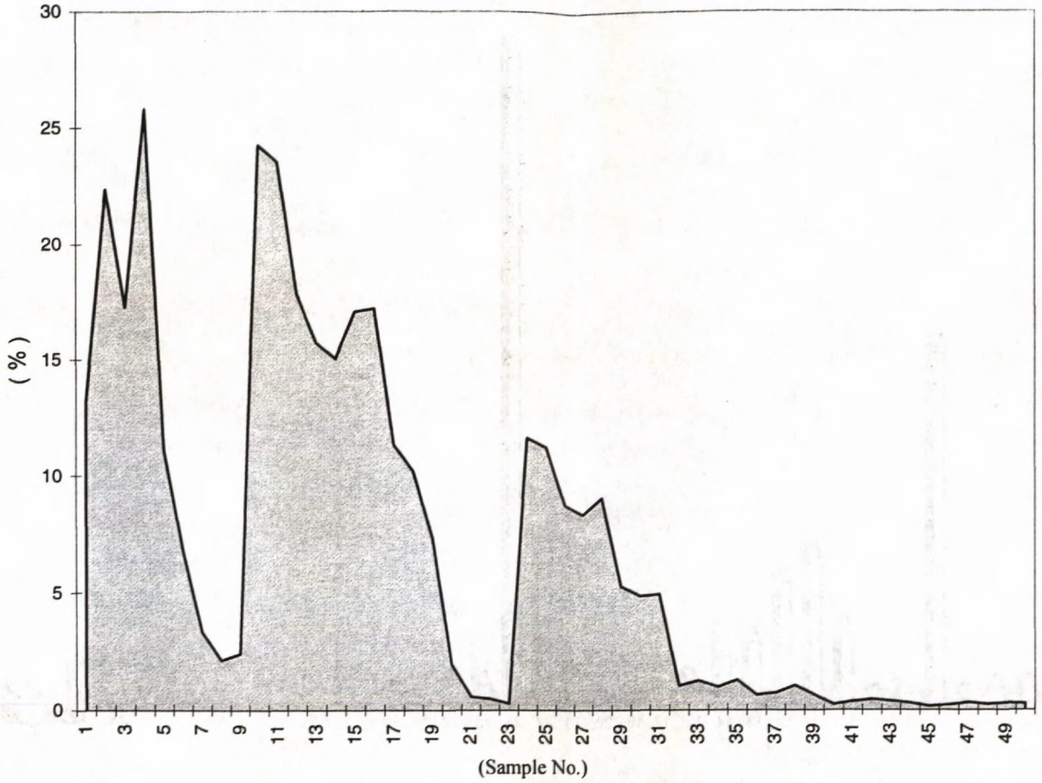


Chart 2 The Content of Calcium bicarbonate in samples on the outcrop Mnešice

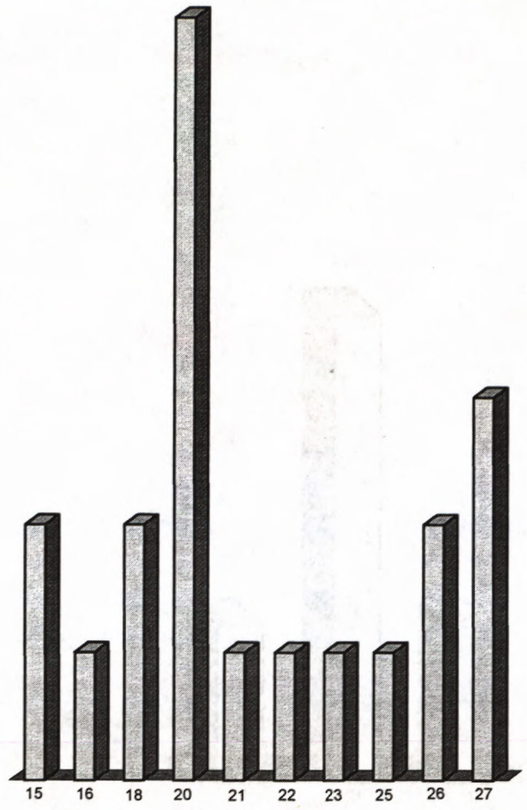


Chart 4 The frequency of Taxons in Bed No. 3

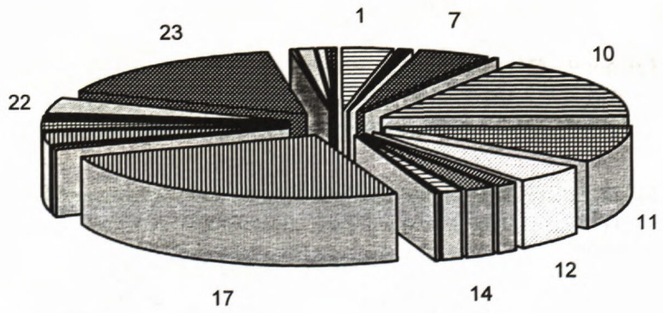


Chart 3 The frequency of assessment Taxons on the outcrop Mnešice

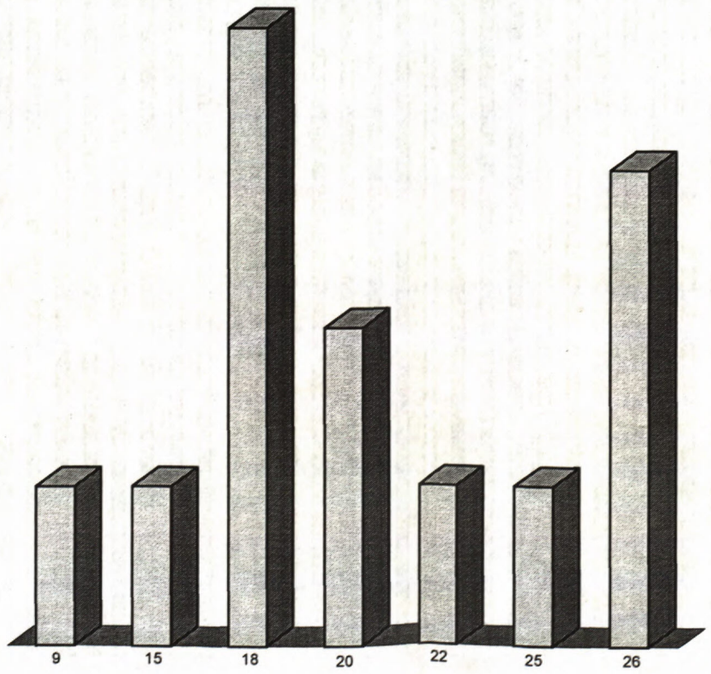


Chart 5 The frequency of Taxons in Bed No. 4

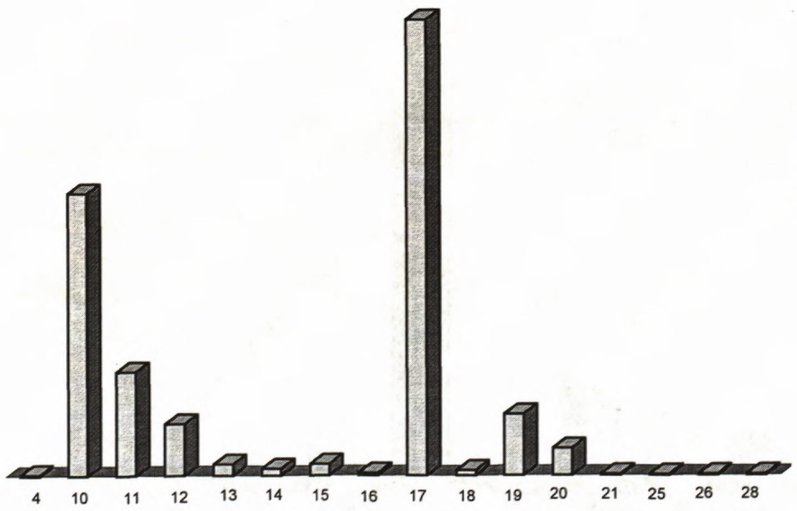


Chart 6 The frequency of Taxons in Bed No. 5

Tab. 3 The frequency of Biotops on the outcrop Mnešice

Sample No.	Sampling depth (m)	L	L / V /	L / V	L / M /	O	S	M	RL	VS	H
1	0.15 - 0.30	-	-	-	-	50.00	-	25.00	25.00	-	-
2	0.40 - 0.60	-	-	-	-	20.00	40.00	-	20.00	20.00	
3	0.60 - 0.80	-	-	-	-	50.00	25.00	-	25.00	-	-
4	0.80 - 1.00	-	-	-	-	-	40.00	40.00	20.00	-	-
5	1.00 - 1.15	-	-	-	-	-	50.00	33.30	16.60	-	-
6	1.15 - 1.35	-	-	-	-	20.00	40.00	30.00	10.00	-	
7	1.35 - 1.60	-	-	-	-	-	66.60	33.30	-	-	-
9	1.80 -2.05	fragments of fauna									
10	2.05 - 2.30	-	-	-	-	40.00	40.00	20.00	-	-	-
11	2.30 - 2.60	-	-	-	-	63.96	36.03	-	-	-	-
12	2.60 - 2.90	-	0.58	-	-	68.42	30.40	0.58	-	-	-
13	2.90 - 3.20	-	-	-	-	65.08	34.05	0.86	-	-	-
14	3.20 -3.50	-	-	-	-	43.90	56.09	-	-	-	-
15	3.50 - 3.80	-	-	-	-	55.55	44.44	-	-	-	-
16	3.80 - 4.10	-	-	-	-	55.55	44.44	-	-	-	-
17	4.10 -4.25	-	-	-	-	16.66	83.33	-	-	-	-
18	4.25 -4.45	-	-	-	-	-	100.00	-	-	-	-
19	4.45 - 4.60	-	-	-	-	-	100.00	-	-	-	-
20	4.60 - 4.80	-	-	-	-	100.00	-	-	-	-	-
22	5.00 - 5.30	fragments of fauna									
23	5.30 - 5.40	negative sample									
24	5.40 - 5.70	7.10	-	-	-	35.71	28.57	-	7.10	21.42	-
25	5.70 - 6.00	-	-	-	-	32.25	9.67	-	3.22	54.83	-
26	6.00 - 6.30	2.43	2.43	2.43	-	24.39	2.43	4.87	-	60.97	-
27	6.30 - 6.60	-	9.40	0.85	-	34.18	11.96	3.41	14.52	25.64	-
28	6.60 - 6.80	0.52	13.02	1.04	-	37.50	8.85	3.64	8.33	26.04	1.04
29	6.80 - 7.10	-	7.81	3.12	-	26.56	-	7.81	4.68	50.00	-
30	7.10 - 7.40	-	2.77	2.77	-	15.27	-	8.33	18.05	52.77	-
31	7.40 - 7.70	-	-	7.69	-	19.23	-	17.09	-	65.38	-
32	7.70 -8.00	-	-	-	-	-	-	100.00	-	-	-
34	8.30 - 8.60	negative sample									
35	8.60 - 8.90	negative sample									
36	8.90 - 9.20	fragments of fauna									
37	9.20 - 9.50	fragments of fauna									
38	9.50 -9.80	negative sample									
39	9.80 - 10.10	negative sample									
40	10.10 - 10.40	negative sample									
42	10.70 - 10.90	negative sample									
43	10.90 - 11.10	negative sample									
45	11.30 - 11.50	negative sample									
46	11.50 - 11.80	negative sample									
47	11.80 - 12.10	negative sample									
48	12.10 - 12.40	negative sample									
49	12.40 - 12.70	negative sample									

Ecologic characteristics

According to ecology the identified fauna represents forest-free, forest and even water biotops. A detail analysis of the occurrence of biotops typical for every identified species in the individual samples is shown in Tab. 3 and schematicaly on the chart 11.

On the basis of biotop analysis of the identified fauna species we can divide the profile into three major units from the viewpoint of ecology. In the superposed beds 2, 3 and partly also 4 (samples 1 - 9) we observe open landscape and steppes biotops prevailing biotops with higher requirements for humidity. An entire substitution of humid biotops with biotops of open landscape and steppes is observable in the central part of the profile corresponding to the beds number 5, 6 and 7 (samples 10 - 20). On the contrary in the beds 10, 11 and partly also in the bed 12 (samples 24 - 35) we observe a progressive substitution of biotops of open landscape and steppes with biotops with smaller requirements for humidity. We meet here even forest and water biotops.

The changes of relative occurrence of biotops in the individual parts of the profile reflect climatic changes which were taking place during formation of the studied deposits. Together with the analysis of taphocenosis of identified species in individual profile beds they suggest the stratigraphy of loess profile.

Biostratigraphic conclusions

Bed No. 2 (sample 1: 0.15 - 0.40 m)

Loess species of cold glacial climate as North-Asian species Vallonia tenuilabis and European? species *Pupilla loessica* occur in bed No. 2. Together with them species occasionally occurring in loesses are present in the sample e.g. European species *Trichia hispida*, Meridial species Orcula dolium and Central- and North-European species *Arianta arbustorum*. These species occur in moderately humid and humid biotops. They represent pupilla and columella fauna of cold periods. The species Arianta arbustorum indicates forest environment. It especially occurs in the late cold or early warm period. On the basis of biotops and species composition we can characterize the landscape during the deposition of the bed as a steppes with islands of park taiga. The climate is cold with conspicuous warmer and more humid fluctuations (-1(C +3(C). Stratigraphicaly we assign this bed to the latest Würm glacial, at the beginning of the late glacial.

Bed No. 3 (samples 2 - 5: 0.40 - 1.15 m):

Loess species and the species occasionally present in loess occur in the bed No. 3. They represent both the unpretentious fauna of steppes containing the main species as the Central- European species Helicopsis striata, Pontomeridial species *Chondrula tridens* nd also more humid fauna containing species as Euro-Sibirian species Perforatella rubiginosa, holoarctic species *Vallonia costata* and *Nesovitrea hammonis* and Central-European species *Clausilia dubia*. According to the occurrence of species *Vallonia costata* suggesting a mild climate as well as other indications we assign the bed No. 3 to the final phases of the Latest Würm (W3) main glacial . The sedimentary environment is thought to be steppes with park taiga islands.

Bed No. 4 (samples 6 - 9: 1.15 - 2.05 m):

The fauna of loess species and species occassionally occurring in loess is described in the bed No. 4. The warm or cold character of the fauna is ambiguous. It does not contain representants of the Pupilla fauna. We characterize it as a mixtured fauna. It contains Central-North European species *Arianta arbustorum*, Boreoalpine extinct species *Vertigo parcedentata*, holoarctic species *Vallonia costata*, Central-European species *Helicopsis striata*, Pontomeridial species *Chondrula tridens* and *Orcula dolium* and others. The increased number of mollusc test fragments, especially in depth 1.8 - 2.05 m may suggest deposition by rainwash. On the basis of grain-size analysis, environmental fauna composition as well as general characteristics of the identified fauna we assign the origin of the bed to a warmer phase of a glacial, most likely to the last Würm interstadial W2/3. It may be an uncompletely developed soil complex PK-1 corresponding to the Stillfried B soil complex.

The depositional environment is interpreted as a park taiga with average temperature about 0 °C. The climate is little warmer but not too humid according to the occurrence of xerophilous species *Helicopsis striata.*

Bed No. 5 (samples 10 - 17: 2.05 - 4.25 m):

In the bed No. 5 there are again present loess species and species sporadically occurring in loesses. They indicate dry and cool climate of a glacial, especially the Central-European species *Helicopsis striata* as an indicator of a dry climate and species of a cool Boreoalpine assemblage as North-Asian species *Vallonia teniulabris*, *Pupilla loessica* and *Pupilla muscorum densegyrata*. Interesting is a complete absence of the Euro-Sibirian species Succinia oblonga and its substitution by the Atlantic species *Catinella arenaria*, which is by Kovanda (1991) considered as a representant of the Early Pleistocene. However, the occurrence of this species in Slovakia is proved in younger deposits of the Middle Würm (e.g. in Trnava brick kiln). On the basis of the environmental as well as species composition of the fauna we interpret the depositional environment as a cold steppes of the main Würm glacial - stadial W2.

Bed No. 6 (samples 18 - 19: 4.25 - 4.60 m), No. 7 (sample 20: 4.60 - 4.80), No. 8 (sample 21 - 22: 4.80 - 5.30 m), No. 9 (sample 23: 5.30 - 5.40):

The above mentioned beds belong to the lithofacially described soils. Only sporadically occurring fauna determines only approximate environmental and biostratigraphic interpretation of the beds. Considering all up to now available facts, not only fauna study but also physical-chemical properties of the sediments, we can assume their origin during warmer and more humid climate. It would be consistent with the uncomplete development of the soil complex PK II of the interstadial W1/2.

Bed No. 10 (samples 24 - 28: 5.4 - 6.8 m):

The identified fauna in the loess bed No. 10 has a varied species and environmental composition. The loess species, varying from index species to the species occasionally occurring in loesses, are represented here. The fauna has a mixtured character. On one side there are species of a cool loess deposition as European species *Vitrea crystallina,* Boreoalpine species *Columella columella*, the representants of Pupilla fauna. On the other side there are species of warmer, arianta fauna containing the Central-North European species *Clausilia pumila,* Alpine-Central European species *Semilimax semilimax* and East-European species *Perforatella bidentata.* The last one is typical for a marginal phase of glacials and indicates a close neighbouring of interglacial horizons or their hiatuses. Comparing to the former beds, the forest environment is more conspicuous in the bed. The absence of the species Helicopsis striata and frequent occurrence of Euro-Sibirian species *Succinea oblonga* indicates increased humidity of climate. This interpretation is strengthen by the presence of the holoarctic species *Lymnaea trunculata*, even though only one individual, which shows the increased humidity and watering of the depositional environment. The fauna, similarly to the fauna of bed No. 11, can be assigned as a marginal fauna of Würm glacial (we are speaking about early development of the stadial W1).

Bed No. 12 (samples 31 - 35: 7.4 - 8.9 m):

The more humid ariant fauna occurs only in the upper part of the bed. The fauna is represented by species as Arianta arbustorum, East-European species *Perforatella bidentata*, East-Central European species *Clausilia pumila*, palaeoarctic species *Punctum pygmaeum* and others. They indicate humid and warmer climate. The part of the soil sediment in the depth 8.3 - 8.9 m could be an analogue of the described motley soil found in the Mnešice brick kiln (Ložek and Tyráček 1960). It comprises the most important horizon of soil complex PK III. Considering all available information we can assume that at least a part of this sediment originated during the last R/W interglacial and it is a part of the Stillfried complex A.

The underlying loess beds without fauna content and only occasional fragments is difficult to interpret stratigraphicaly. The entire underlying complex is strongly decalcified and it has an acid soil reaction. The increased amount of clay fraction as well as presence of Mn oxides shows possible redeposition of the sediments. They can be rests of the loess deposits from the Riss glacial. The beds No. 14 and 15 with indications of initial soil could suggest warmer fluctuation of R1/2 Treene interglacial. This would be consistent with soil horizon PK-IV.

Conclusion

On the basis of the obtained data it is possible to state that the studied outcrop confirmed a complexity of the Dolnø Váh valley development during the Middle and Late Pleistocene. The complexity reflects the erosive and depositional activity of water and wind. The fauna development points to climatic changes as well as to finer climatic oscillation during the time of the origin of the studied deposits. It enables to recognize two major types of fauna: cold fauna of stadials (glacials) with prevailing species of pupilla and columella fauna and mixtured faun of interstadials (interglacials) and transitional periods with prevailing species of tridens and ariant fauna. This renders a stratigraphic correlation with another loess profiles of Dolný Váh river area.

References

Halouzka, R. - Maglay, J. 1995: Stop 44, Nové Mesto nad Váhom - Mnešice. - In : 5, Czech-Slovakian Traverse, K.- D. Jager (ed.); In : W. Schirmer (ed.) " Quaternary field trips in Central Europe "(INQUA, XIV International Congress, Berlin 1995), vol. 1.- Verlag Dr. Fr. Pfeil, Munchen, s. 287 - 289.

Kerney, M. P. - Cameron, R. A. D. - Jungbluth, J. H., 1983: Bie Landschnecken Nord-und Mitteleuropas, Vyd. Verlag Paul Parey, Hamburg - Berlín, 384 s.

Kovanda, J.,1991: Výskum významních pleistocenních lokalit Brno-Stránska skala, Sedlec a Hôtka - Sv. Ondrej. Zprávy o geologických výzkumech v roce 1991,84 - 87.

Kukla, J. - Ložek, V. - Bárta, J., 1962: Das Lossprofit von Nové Mesto im Waagtal. Eisetzeitalter und Gegenwart, 12, 73 - 91.

Ložek, V., 1955: Měkkýši československého kvarteru. Rozpravy Ústředního ústavu geologického (Praha), 17, 3, 510 s.

Ložek, V., 1956: Klíč československých měkkýšu. Bratislava, Vyd. SAV, 7-487.

Ložek,V.- Tyráček, J., 1960: Příspěvek k poznání vývoje údolí Váhu mezi Trenčínem a Piešťany. Sborník československé společnosti zeměpisné (Praha), 65, 1, 6-14.

Ložek,V.,1964: Quartermollusken der Tschechoslowakei. Rozpravy Ústředního ústavu geologického (Praha), 31, 7-374.

Skompski,S. - Makowska A., 1994: Molusca. Geology of Polard III. Atlas of Guick and Characteristic fossils, Carnozoic, Quarternary, Vyd. PIG, Warsawa, 36-75.

Vaškovský,I.,1970: Geological profile of the Quarternary near Nové Mesto nad Váhom (Mnešice). Věstník Ústředního ústavu geologického (Praha), 45, 41-44.

Žadin,V. I., 1952: Molljuski presnych i solonovanych vod, Vyd. Akademia Nauk SSSR, Moskva, Leningrad, 374 s.

Tab. I

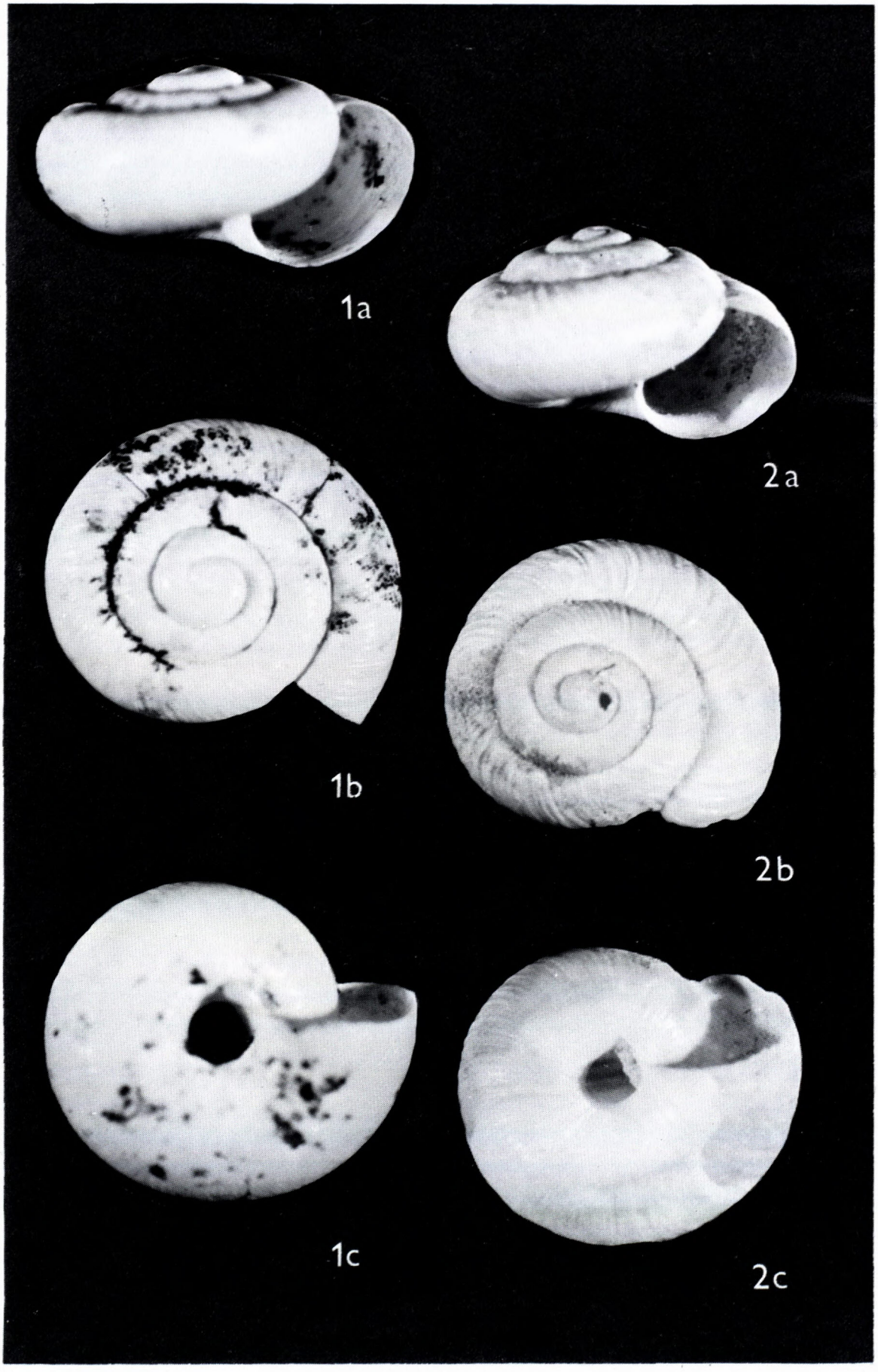
Fig. 1a, b, c *Trichia hispida* — width: 3.9 mm
Mnešice, sample No. 28: 6.6–6,8 m — hight: 2.1 mm
Fig. 2a, b, c *Helicopsis striata* — width: 4.0 mm
Mnešice, sample No. 14: 3.2–3.5 m — hight: 5.7 mm

Tab. II

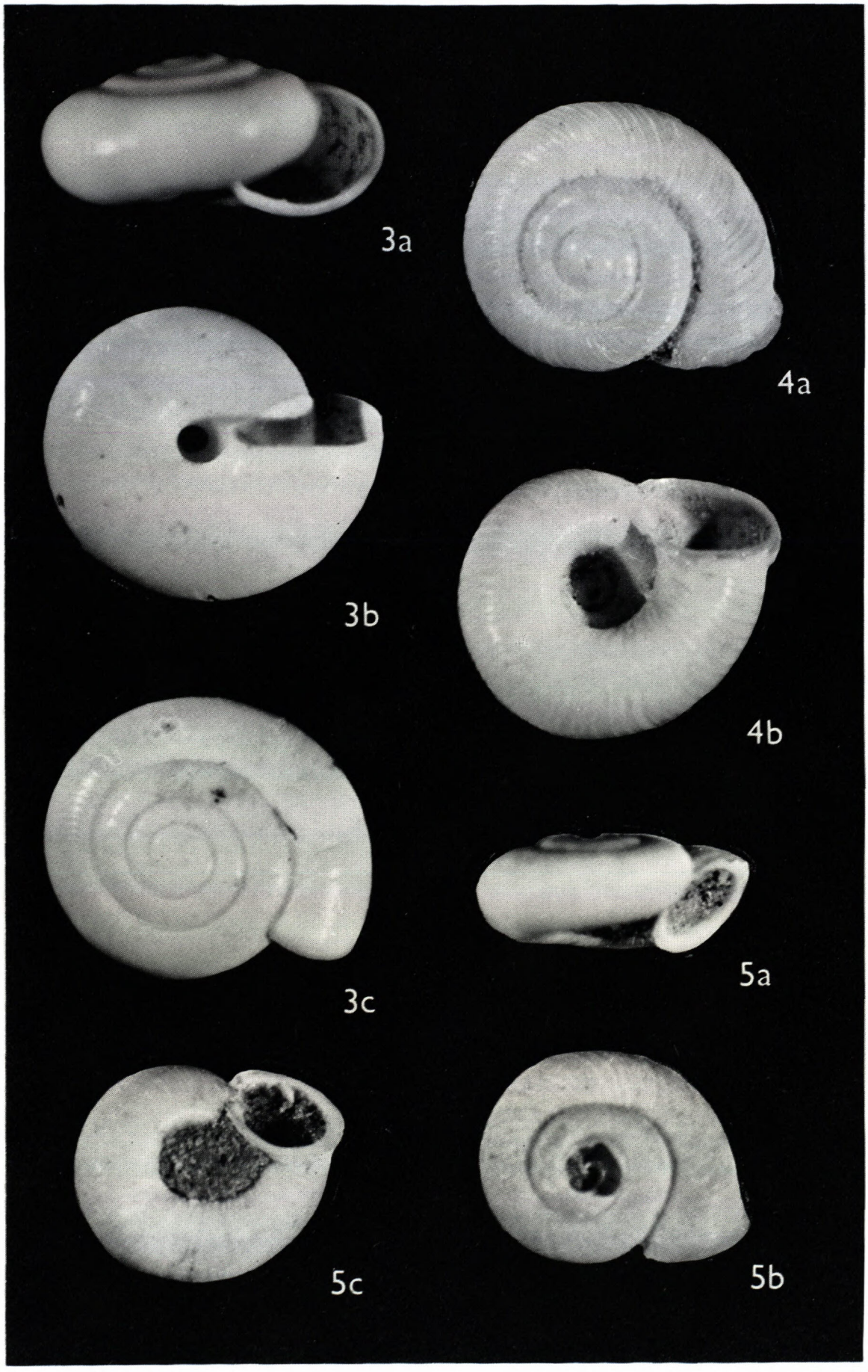
Fig. 3a, b, c *Vitra crystallina* — width: 1.5 mm
Mnešice, sample No. 28: 6.6–6,8 m — hight: 3.0 mm
Fig. 4a, b *Vallonia tenuilabris* — width: 1.4 mm
Mnešice, sample No. 11: 2.3–2.6 m — hight: 3.0 mm
Fig. 5a, b, b *Vallonia pulchella* — width: 1.1 mm
Mnešice, sample No. 20: 4.6–4.8 m — hight: 2.1 mm

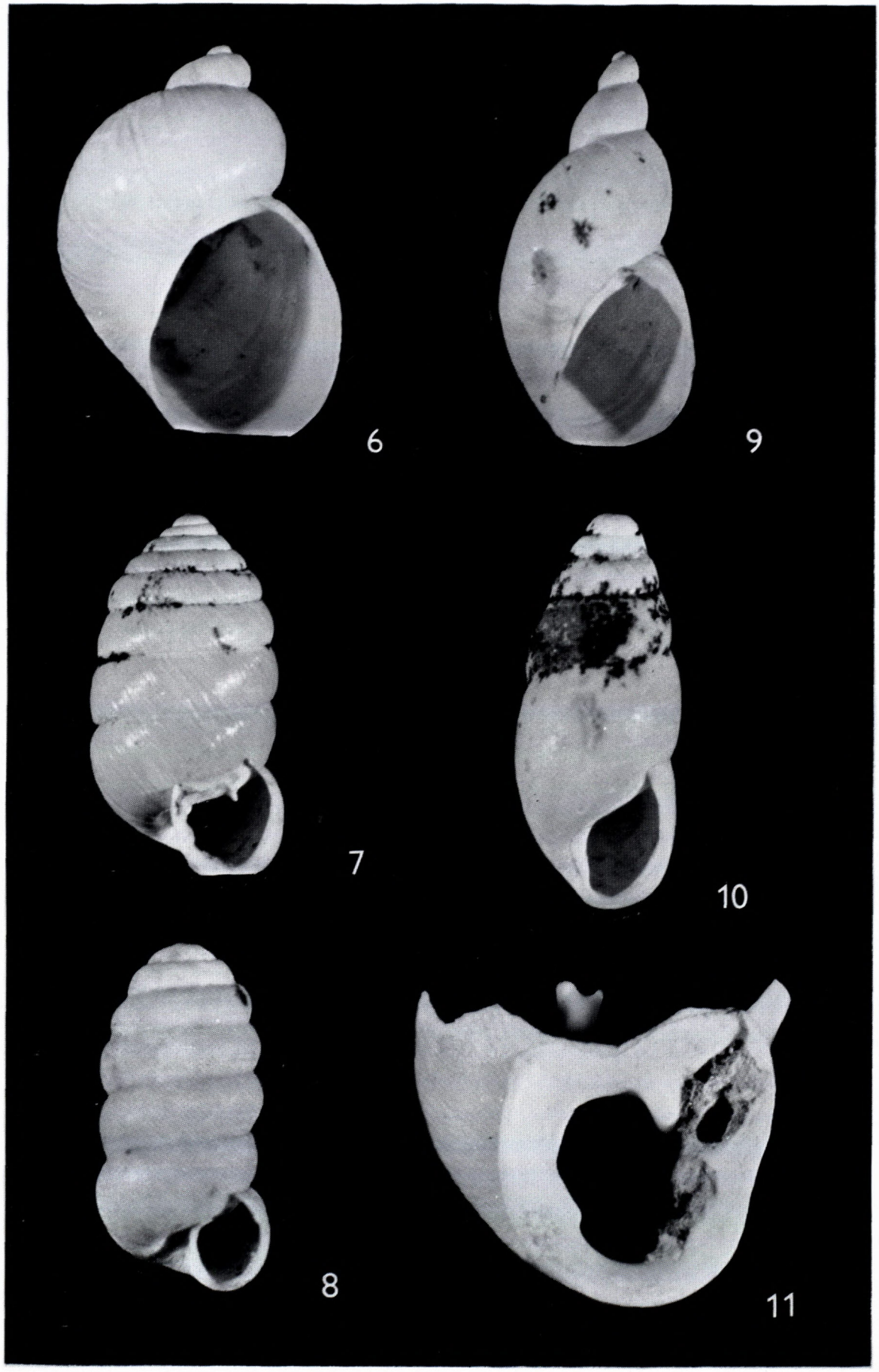
Tab. III

Fig. 6 *Catinella arenaria* — width: 7.0 mm
Mnešice, sample No. 13: 2.9–3.2 m — hight: 4.3 mm
Fig. 7 *Orcula dolium* — width: 6.8 mm
Mnešice, sample No. 29: 6.8–7.1 m — hight: 3.1 mm
Fig. 8 *Columella columella* — width: 3.0 mm
Mnešice, sample No. 28: 6.6–6.8 m — hight: 1.2 mm
Fig. 9 *Succinea oblonga* — width: 9.0 mm
Mnešice, sample No. 28: 6.6–6.8 m — hight: 4.0 mm
Fig. 10 *Cochlicopa lubrica* — width: 6.0 mm
Mnešice, sample No. 29: 6.8–7.1 m — hight: 2.1 mm
Fig. 11 *Chondrula tridens*
Mnešice, sample No. 15: 3.5–3.8 m


1a
2a
1b
2b
1c
2c

Tab. II




6
9
7
10
8
11