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KABAZI II:
LAST INTERGLACIAL OCCUPATION, ENVIRONMENT & SUBSISTENCE

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НАЦИОНАЛЬНАЯ АКАДЕМИЯ НАУК УКРАИНЫ
ИНСТИТУТ АРХЕОЛОГИИ
КРЫМСКИЙ ФИЛИАЛ

КЁЛЬНСКИЙ УНИВЕРСИТЕТ
ИНСТИТУТ ДО- И ПРОТОИСТОРИИ

Палеолитические стоянки Крыма,
Том 1

КАБАЗИ II: ПРИРОДА И ЧЕЛОВЕК ВРЕМЕНИ ПОСЛЕДНЕГО ИНТЕРГЛЯЦИАЛА

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Chapter 4

Snail Fauna from Kabazi II

Constantine Mikhailesku

During the excavations at Kabazi II between 1986 and 2001, shells from fossilised snails and freshwater molluscs were recovered. The principal task of the palaeontological investigations of the freshwater and snail fauna is to establish a species composition of mollusc assemblages from each cultural level, as well as to reveal changes and to elucidate the characteristics of the palaeoenvironments surrounding the sites as related to climatic fluctuations. The archaeologists responsible for this site, Drs. V. Chabai, A. Yevtushenko, Yu. Demidenko and A. Veselsky, ensured samples of snails for this study, and I would like to extend my sincere thanks to them for the very hard and accurate work in sample collecting.

During excavations, traditional methods of sample selection were applied. The methods of sampling and the principal ecological groups of Western Crimean Snails, as well as the environmental and morphometrical parameters of the identified species, are described in Chapter 5 of "The Middle Palaeolithic of Western Crimea, Vol. 2" (Mikhailesku, 1999). Additionally, for the identification of the fossil snails and mollusc fauna, descriptions from the following guides were used: I. I. Pusanov (1925, 1926, 1927); V. Lozek (1946); I. M. Likharev and E. S. Rammelmeier (1952); L. A. Nevesskaya (1965); N. N. Akramovski (1976); J. J. Puissegur (1976); Ya. I. Starobogatov & L. A. Kutikov (1977); A. A. Shileico (1978); N. A. Golikov and O. G. Kusakin (1978); V. M. Motuz (1982) and A. V. Grossu (1955, 1981, 1983).

Ecology Of Snails And Methodology Of The Palaeoenvironmental Reconstructions

Snails and fresh water molluscs are mainly sedentary and display very large distributions in diverse types of landscapes. As a rule, the shells of fossil snails and fresh water molluscs are well preserved in sediments (especially in dry areas). For this reason, they are a suitable material for stratigraphical correlations and environmental reconstructions. The distribution of snail fauna associations, as well as the specific composition of each faunal assemblage, closely reflect the local climatic and environmental conditions of its life area. Such particularities have led to an appreciation of their significance for palaeoenvironmental reconstructions and the elucidation of major climatic changes during the Quaternary.

The main environmental factors that determine snail fauna distribution are:

1. Weather and climatic conditions, usually reflected by the average values of the main para-meters: air temperature, atmospheric pressure, precipitation, humidity, predominant direction of the wind, and other meteorological factors.
2. Type of vegetation: as the main source of snail food, an indispensable factor of their life area.
3. Type of relief, type of the soil, and the composition (lithology) of the rocks are also important, especially for the distribution of rocky and soil snail assemblages. Very favourable conditions for such assemblages are the calcareous soils which predominate on the Crimean Peninsula. These soils have a porous structure and contain the main useful elements for cockleshell construction and snail nutrition.
4. Presence of a water source: an indispensable condition for the distribution of some groups of snails, especially for the hydrophiles and rocky and soil species.

A more detailed description of the ecology of Crimean snails and their ecological classification is published in Mikhailesku (1999, pp. 99-114). For the palaeoenvironmental reconstructions, I follow the ecological classification made by the French researcher Jean-Jaques Puissegur (1976, p. 16), who classifies the distribution of fresh water molluscs and snail assemblages according to the main types of vegetation and landscapes. According to this classification, the Crimean species may be attributed to the following seven ecological groups.

I. Fresh water fauna: *Valvata piscinalis, Limnaeapygmaea, Pisidium casertanum, Theodoxus fluviatilis, Theodoxus transversalis, Lithoglyphus naticoides.*

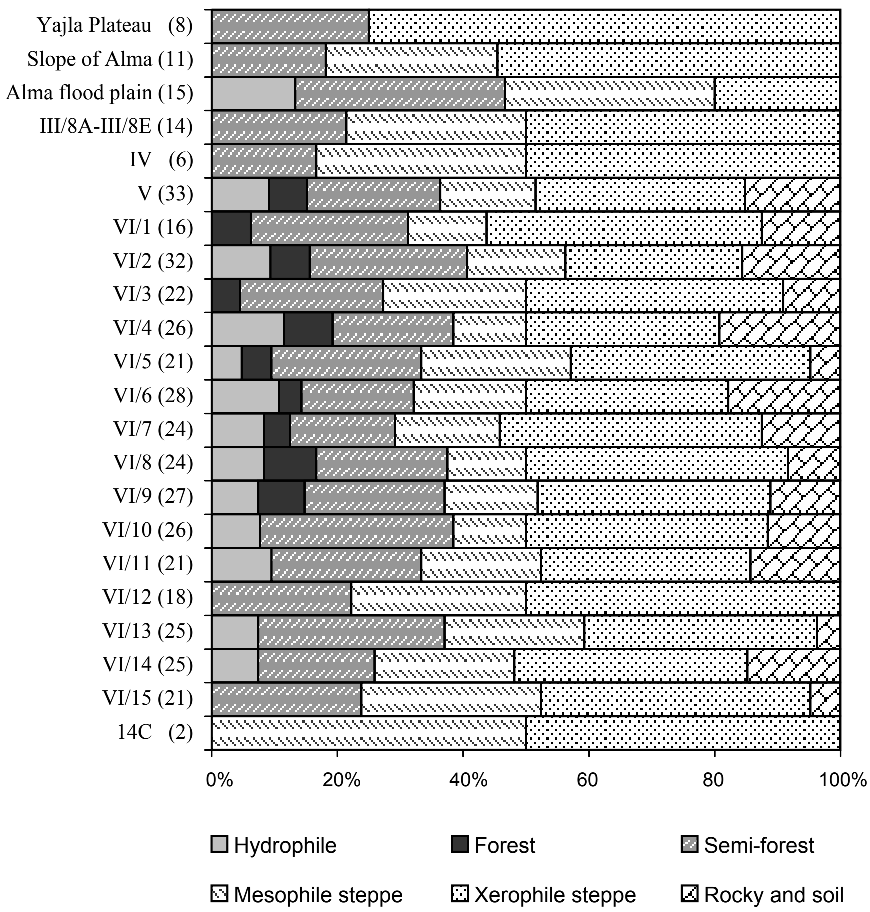

Fig. 4-1 Kabazi II, level III/8, Units IV, V, VI, Strata 14C, modern Alma flood plaine, slope of Kabazi cuesta and Yajla plateau: cumulative percentages of shells of modern and fossil snails.

II. Hydrophile fauna: *Vallonia pulchella, Vallonia costata, Columella edentula, Cochilicopa lubrica, Succinea elegans, Carichium minimum*
III. Fauna of humid forest areas: *Acantinula aculeate, Vitrea diaphana, Vitrea iphigeniae, Eucomulus fulvus, Punctum pygmaeum, Columella columella, Retinella radiatula.*
IV. Fauna of semi-forest areas: *Clausilia gracilicosta, Clausilia canalifera, Clausilia laminata, Oxychillus deilus, Oxchyllus diaphanelus, Vitrea pygmaea, Vitrea subeffusa.*
V. Fauna of mesophitic (meadow) steppes with small trees, bushes & shrubs: *Helix lucorum taurica, Helix vulgaris, Theba carthusiana, Zebrina cylindricus, Chondrula tridens, Chondrula tetrodon.*
VI. Fauna of xerophitic steppes (xerotermic): *Helicella dejecta, Helicella striata, Helicella gireiorum, Helicella Retowski, Helicella filimargo, Helicella Krinickii, Zebrina subulata, Chondrus bidens, Truncatellina cylindrical, Truncatellina costulata.*
VII. Rocky and soil fauna: *Caecilioides acicula, Caecilioides raddei, Pyramidula rupestris, Pupilla muscorum, Pupila gallae.*

The ecological distribution presented above was used in turn to compose diagrams showing the ecological niches of snails in modern samples and in the archaeological levels at Kabazi II (Fig. 4-1 and 4-2). Using these diagrams, I have attempted to show the main changes in the ecological composition of the investigated samples on both an individual- and specimen-level. This allows the reconstruction of the main environmental fluctuations caused mainly by climatic changes. Some snails are ecologically specialised and occur only in certain habitats. This group includes most hydrophilic species and some rocky and soils species, which are dependent mostly on the presence of a water source and have an intrazonal distribution.

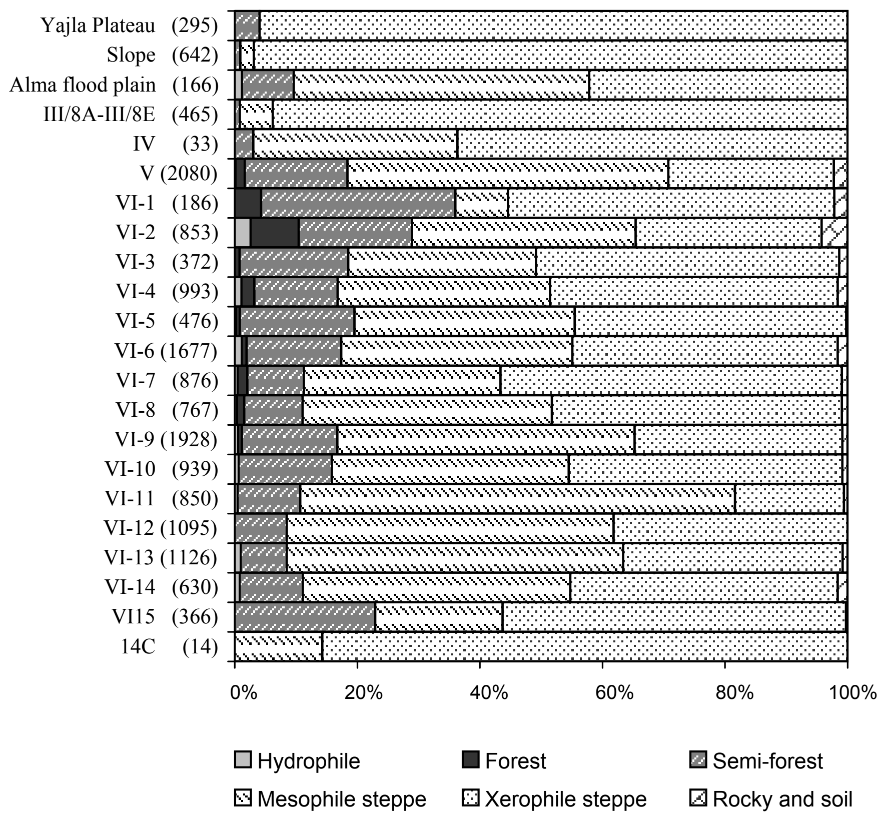

Fig. 4-2 Kabazi II, level III/8, Units IV, V, VI, Strata 14C, modern Alma flood plaine, slope of Kabazi cuesta and Yajla plateau: cumulative percentages of specimens of modern and fossil snails.

Kabazi II Snail Assemblages

The fossil snail fauna from the lower part of the Kabazi II section is both diverse and numerous. The samples collected during the excavations in 2000/2001 alone, comprise 16,814 shells, appertaining to 35 species belonging to seven ecological groups (Table 4-1, Fig. 4-1 and 4-2).

Strata 11 (lower part), 13, 14A, 14B and 14C contain 19 comparable complexes of snail fauna which correspond to the main archaeological units and levels. Thus, these snail assemblages represent all investigated cultural bearing deposits of the lower part of the Kabazi II sediments. In an earlier publication, 21 samples from the sondage, and 3 samples of the modern fauna collected from different landscapes around the site were also described (Mikhailesku 1999).

The following analysis begins with the oldest assemblage, which corresponds to Stratum 14C. The description of archaeological units at Kabazi II and their subdivision into levels can be found in Chapter 1 of this volume.

At the time of sedimentation of the upper part of Stratum 14C, only a steppe snail fauna was present at the site. *Helix (Helicogena) lucorum taurica* (2) and *Chondrus bidens* (12) serve as good indicators of relatively humid and warm climatic conditions, characteristic of meadow and xerophytes steppes. The sample is very poor and homogenous; involving only 14 shells of the two species mentioned. Therefore, it is not definite whether this small

Species/Units	Ecological groups	III/8	IV	V	VI/1	VI/2	VI/3	VI/4	VI/5	VI/6	VI/7	VI/8	VI/9
Vallonia pulchella (Mull.)	Hydrophile	–	–	1	–	5	–	2	1	4	2	–	6
Vallonia costata (Mull.)	Hydrophile	–	–	1	–	8	–	3	–	8	2	1	5
Columella edentula (Drap.)	Hydrophile	–	–	1	–	9	–	6	–	7	–	2	–
Euconulus fulvus Mull.	Forest areas	–	–	1	–	3	–	2	–	–	–	2	–
Punctum pygmaeum (Drap.)	Forest areas	–	–	30	8	64	3	19	3	14	14	7	12
Theba fruticola (Kryn.)	Semiforest areas	–	–	–	–	1	–	–	–	–	–	–	2
Oxychillus (Schistophalus) deilus (B.)	Semiforest areas	–	–	3	–	1	–	–	–	–	–	–	–
O. (Oxichillus) diaphanellus (Kryn.)	Semiforest areas	–	–	14	–	1	–	–	–	–	–	–	–
Vitrea pygmaea Bttg.	Semiforest areas	–	–	10	2	17	4	28	5	16	5	7	10
Vitrea subeffusa Bttg.	Semiforest areas	–	–	5	–	6	1	7	3	6	–	1	2
Clausilia (Mentissa) gracilicosta Rssm.	Semiforest areas	1	–	47	3	14	3	7	4	7	10	1	34
Cl. (M.) canalifera Rssm.	Semiforest areas	2	1	240	42	107	42	85	59	180	60	54	237
Clausilia (Mentissa) sp.	Semiforest areas	1	–	30	12	11	16	8	18	50	6	10	15
Chondrula tridens Mull.	Mesophile steppe	1	–	2	–	6	5	3	1	1	1	–	1
Ch. tetrodon (Mort.)	Mesophile steppe	11	–	3	5	–	3	–	1	1	–	–	–
Helix (Helicogena) lucorum taurica (Kryn.)	Mesophile steppe	7	9	954	11	275	95	335	148	592	258	296	892
H. (H.) vulgaris Rssm.	Mesophile steppe	6	2	126	–	24	5	6	19	36	17	15	37
Theba carthusiana Mull	Mesophile steppe	–	–	–	–	2	–	–	–	2	–	1	5
Zebrina (Buliminus) cylindrica Menke.	Mesophile steppe	–	–	4	–	4	6	–	2	–	5	–	–
Zebrina (Buliminus) subulata (Rssm.)	Xerophile steppe	–	–	1	–	–	–	–	–	–	–	–	–
Helicella (Helicopsis) dejecta Cr. et J.	Xerophile steppe	78	–	74	18	27	28	35	36	69	43	33	50
H. (H.) striata (Mull.)	Xerophile steppe	158	3	48	9	31	21	26	23	18	47	24	19
H. (H.) gireorum Lindh.	Xerophile steppe	2	–	2	–	–	1	–	–	–	2	1	1
H. (H.) retowski Clessin.	Xerophile steppe	8	–	5	–	1	2	–	–	1	4	4	4
H. (Xeropicta) krynickii (Kryn.)	Xerophile steppe	166	9	82	26	28	39	12	21	42	48	46	40
Truncatellina cylindrica costigrella Lindh.	Xerophile steppe	–	–	112	18	114	2	43	7	42	14	33	33
T. costulata (Nilss.)	Xerophile steppe	–	–	16	–	22		14	2	9	2	12	8
Chondrus (Buliminus) bidens (Kryn.)	Xerophile steppe	17	9	185	2	30	53	74	84	257	224	96	280
Ch. (B.) bidens natio pygmaea (Kryn.)	Xerophile steppe	7	–	18	16	4	32	193	31	138	77	51	116
Ch. (B.) bidens attenuatus Kryn.	Xerophile steppe	–	–	18	10	2	6	69	7	150	27	63	103
Pyramidula rupestris (Drap.)	Rocky and soil	–	–	9	–	25	2	7	–	10	3	5	5
Caecilioides acicula nodosaria Bttg.	Rocky and soil	–	–	11	1	3	–	1	–	2	4	–	–
C. raddei (Bttg.)	Rocky and soil	–	–	12	–	4	–	3	–	2	–	–	–
Pupilla gallae Tzv.	Rocky and soil	–	–	12	–	2	–	2	–	4	–	–	2
P. muscorum L.	Rocky and soil	–	–	3	3	2	3	3	1	9	1	2	9
Total number of shells:		**465**	**33**	**2080**	**186**	**853**	**372**	**993**	**476**	**1677**	**876**	**767**	**1928**

Table 4-1 Kabazi II, level III/8, Units IV, V, VI, Stratum 14C fossil snails and modern snails from the Yajla Plateau, the Kabazi questa slope and Alma flood plaine.

sample accurately represents the prevailing climatical conditions specific to Strata 14C.

Stratum 14B contains archaeological Unit VI. In comparison to the fauna from Stratum 14C, and to that observed in the vicinity of the site today, the snail fauna from this Unit is much more diverse and abundant. It involves 13,134 shells, representing 35 species from 6 ecological groups (Table 4-1). Unit VI is subdivided into 15 levels, each of which is represented by a separate sample. As the fauna from each level is very reach and diverse, each sample will be described separately.

The snail fauna from Level VI/15 comprises 366 shells, representing 25 species. Of these, 5 species are characteristic of semi-forest areas, 6 of mesophytic steppe, and 9 of xerophytic steppe. One further

VI/10	VI/11	VI/12	VI/13	VI/14	VI/15	14C	Yajla plato	Kabazi slope	Alma flood plaine
4	3	–	3	2	–	–	–	–	1
2	1	–	8	3	–	–	–	–	1
–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–
1	–	1	1	1	3	–	11	2	6
1	–	–	2	–	–	–	–	4	1
1	–	–	7	–	–	–	1	–	3
2	5	–	23	6	2	–	–	–	2
3	4	–	7	–	–	–	–	–	–
25	28	9	5	20	3	–	–	–	–
87	46	65	36	36	68	–	–	–	2
23	4	18	4	2	8	–	–	–	–
–	–	5	5	6	2	–	–	1	–
–	–	6	2	1	2	–	–	1	3
345	579	534	552	229	48	2	–	–	21
16	19	21	36	24	9	–	–	–	12
2	2	–	4	6	12	–	–	–	18
–	3	18	19	9	3	–	–	12	26
–	–	3	13	–	–	–	–	–	–
72	4	54	44	28	18	–	6	223	–
27	–	23	27	16	17	–	–	–	–
2	–	1	–	2	–	–	–	5	22
4	–	5	4	5	4	–	24	16	32
94	6	65	32	32	24	–	2	102	–
7	16	–	112	53	7	–	–	–	–
32	8	–	16	24	2	–	–	–	–
128	83	133	67	58	92	12	243	272	16
32	5	92	18	23	37	–	6	4	–
21	29	42	70	34	4	–	2	–	–
1	3	–	–	5	1	–	–	–	–
–	–	–	–	–	–	–	–	–	–
–	–	–	–	1	–	–	–	–	–
2	1	–	–	1	–	–	–	–	–
5	1	–	9	3	–	–	–	–	–
939	**850**	**1095**	**1126**	**630**	**366**	**14**	**295**	**642**	**166**

Table 4-1 continued

species is typical of faunas found in rocky and soily conditions. As may be observed in the diagrams, on an individual level, the snails belonging to the xerophytes steppe fauna dominate. These constitute about 60% of the total number of shells. The remaining 40% comprises roughly equal numbers of snails belonging to semi-forest and mesophytic steppe faunas. The rocky and soil inhabitants are represented by only one cockleshell from *Pyramidula rupestris*. The absence of hydrophytes and forest species is a clear indication that warm and dry conditions were prevalent, a fact which is also confirmed by the abundance and large diversity of xerophile forms.

Evidently more humid conditions were prevailing during the sedimentation of level VI/14. At this time, the fauna became more diverse and numerous (630 shells). Two species of hydrophytes (*Vallonia pulchella and Vallonia costata*) appear, and there is a significant increase in the diversity of rocky and soil inhabitants (4 species). An increased humidity is also suggested by the predominance of mesophytic *Helix lucorum taurica* (229 shells), and by the general decrease in the number of xerophytes, which now only constitute about 30% of the total number of species. These changes indicate that the climate had become more humid, and that trees and bushes had appeared near the site. An increased diversity of rocky and soil inhabitants may indicate that the ground-water level had at this time risen very close to the surface. There was probably a temporal spring in the vicinity, because such species as *Caecilioides raddei* prefer the calcareous humid soils found near fresh water sources.

The sample from Level VI/13 is extremely large, containing 1126 snail shells from 25 species and 5 ecological groups. As in the previous sample, the mesophytic *Helix lucorum taurica* predominate, representing about 45% (522) of the total number of shells. Despite the fact that this sample contained fewer shells belonging to semi-forest inhabitants, the diversity of this type of fauna clearly increases. On the specimen level they represent about 30% of the total number of species. Both these facts serve as reliable indicators that meadow steppes and semi-forest areas predominated during the sedimentation of this level. An increasing number of hydrophytes, semi-forest-, and mesophytic forms probably means that climatic conditions were much more favourable than in the previous horizon.

The sample taken from Level VI/12 shows an increasing number of steppe xerophyte forms, e.g., *Helicella dejecta, H. striata, H. retowski, H. krynicki* and *Chondrus bidens*. As may be observed from the diagrams (see Fig .1-2), the xerophytes now constitute roughly 50% of the total number of species, and about 40% of the total number of shells. The hydrophytes disappear, and the diversity of semi-forest forms decreases significantly. Such a composition indicates that - at the time of sedimentation - steppe landscapes and dry climatic conditions predominated. Both the smaller dimensions of *Helicella*, and the dominance of small and very thin *Chondrus* (*Buliminus*) *bidens natio atteenuatus*, show that the climate was drier and colder than at present. Furthermore, both rocky and soil fauna disappear completely, a sure sign that the ground-water level had dropped.

The sample from Level VI/11 involves 850 shells, assigned to 21 species from 5 ecological groups. This sample is much more diverse than the previous one, and contains two species of hydrophytes and 3 species of rocky and soil fauna. The number of Xerophytic forms decreases, which implies that there was an increase in semi-forest type areas. On the individual level, the inhabitants of meadow steppes predominate: *Helix lucorum taurica* (579 shells). The general composition of fauna indicates that the climatic conditions had now become much more humid and favoured a meadow steppe with bushes and small trees. The presence of both hydrophytes and of a rocky and soil fauna indicate that either a water source or humid conditions were to be found close to the site.

The same kind of fauna was still predominant during the sedimentation of Level VI/10. This sample comprises 939 shells from 26 species, representing 5 ecological groups of snails. Semi-forest and xerophyte steppe assemblages are very diverse on the specimen level, more so than in the previous sample. The same type of meadow and xerophyte steppes with small areas of bushes and small trees probably predominated. In fact, the climatic conditions may have been a little more favourable than during the deposition of the previous level. This may be indicated by a slightly increased number of hydrophytes, semi-forest and rocky and soil forms. The large diversity of *Clausiliidae* and *Vitrinidae* serve as good indicators of shrubs and bushes in the adjacent areas. This is confirmed by a few shells of *Oxichillus deillus*, *Oxichillus diaphanellus* and *Theba fruticola*.

Similar, relatively humid and warm conditions persisted during Level VI/9. This sample is, however, much larger, and consists of 1928 shells comprising 27 specimens from the same 6 ecological groups. New to this sample is the forest inhabitant -*Punctum pygmaeum* (12 shells) , and – in comparison to the previous level - there is a slight increase (from 40% to 47%) in the ratio of meadow steppe inhabitants. The number of steppic xerophyte and semi-forest inhabitants remains more or less constant, and constitutes 35% and 15% of the assemblage respectively (Fig. 4-1 and 4-2).

The sample from Level VI/8 is evidently smaller and more homogenous. It encompasses 767 shells from 24 specimens belonging to 6 ecological groups. The number and ratio of snails from this level differs only slightly from the previous sample. The inhabitants of open, steppe landscapes still predominate, and constitute about 90% of the total number of shells. The climate had become slightly colder as only a few shells of *Columella edentula, Euconulus fulvus* and *Vallonia costata* were found in this horizon. These forms prefer relatively humid conditions found in forest and semi-forest landscapes.

The sample from Level VI/7 involves 876 shells, representing 24 specimens and 6 ecological groups. Although the same kind of open landscapes characteristic of the previous layer still predominated, the climate had probably turned slightly drier. Only one of the forest species identified in the previous layer is still present in this sample. Furthermore, there was a continual increase in the ratio of xerophytes (55%).

The sample from Level VI/6 is both very large and representative. It involves 1677 shells and 28 specimens. Although the number of xerophyte specimens remains high (30%), there is an evident increase in the number of hydrophytes (10%), semi-forest (20%), mesophyte (20%) and rocky and soil species (18%). Characteristic for this sample are the extended number of hydrophytes and rocky and soil assemblages. The composition of this assemblage is indicative of warmer and more humid conditions than those presently prevailing.

The fauna from Level VI/5 is less diverse (21 species) and less numerous (476 shells), though the same ecological groups of snails still predominate. In comparison to the previous sample there is, however, an increase in the total amount of steppe forms, and a slight decrease in the number of rocky and soil, hydrophile and forest inhabitants. These changes in the snail fauna composition suggest a slight aridisation and degradation of the climatic conditions.

The sample VI/4 is much more diverse (26) and numerous (993). At the specimens level there occurs an evident increase in the diversity of hydrophile, forest, and rocky / soil forms. Although the steppe inhabitants still predominate on the individual level, the climatic conditions of this level would appear to be more humid in comparison to those previous.

A renewed deterioration of climatic conditions, accompanied with the extension of steppe forms can be observed in the sample from Level VI/3. At this time, the number of hydrophiles, forest and rocky / soil inhabitants drops. The situation described above is also confirmed by the increased homogeneity of the snail assemblage and the decrease in the total number of shells in the sample (372).

Very favourable climatic conditions persisted during the deposition of Level VI/2. This is reflected in the greater diversity (32 specimens) and abundance (853 shells) of the fauna from this sample. The amount of xerophytes evidently diminishes, and there is an increase in the number of hydrophiles, forest, semi-forest and rocky / soil types. This snail complex would appear to be of an interglacial type, and is indicative of climatic conditions which are more humid and warmer than those currently prevailing.

Relatively dry and slightly worsening climatic conditions were prevailing during the sedimentation of Level VI/1. This is indicated by an increase in the number of xerophytes, which now constitute about 45% of the assemblage. Nevertheless, there are still high ratios of semi-forest and forest forms. For this reason, I consider that the fauna from this level does not differ very much from that of the previous sample. As such, it may correspond to the end of the very same warm phase encountered in Level VI/2.

The biggest (2080 shells) and most diverse (33 specimens) sample was collected from Unit V, Levels V/3, V/4, V/5 and V/6. There is again a decrease in the number of xerophytes, and an increase in hydrophiles, mesophiles, forest, semi-forest and rocky / soil inhabitants. This sample would appear to be a typical interglacial type assemblage, characterised by humid and very warm climatic conditions. Judging from its composition and morphometrical parameters, this fauna is evidently warmer and older than the fauna from Level 4 at Starosele. Therefore, it may correlate with the very end of the Last Interglacial. A huge number (954) of *Helix lucorum taurica*, which display large morphometrical parameters, would appear to confirm such a conclusion. The large number of *Caecilioides acicula nodosaria, C. raddei, Punctum pygmaeum, Pyramidula rupestris, Pupilla galae* and *P. muscorum* indicate that semi-forest and forest areas were located near the site, and that the ground-water level had risen very close to the surface. As was probably the case during the sedimentation of Level VI/2, these conditions, which were characterised by more humid conditions than at present, led to the reactivation of the spring.

A very small and homogenous sample was collected from Unit IV. It comprises 33 shells belonging to 6 specimens and 3 ecological groups. A total of 97% of shells appertain to mesophile (11) and xerophile (21) steppe-types. Only one shell of a semi-forest inhabitant *Clausilia* was identified. If this sample is complete it gives the impression of a glacial type assemblage, which would denote much drier and colder climatic conditions than at present. Thus, this fauna may correlate to the first cooling phase of the Early Glaciation.

A very similar, relatively dry and moderate fauna was also collected from the lower part of Unit III, Levels III/8A to III/8E. This sample comprises 465 shells, representing 11 steppe and 2 semi-forest types. According to previous collections taken between 1995 and 1997, a similar steppe fauna is still predominant in the upper part of Unit III (samples a, b, c, d and e). However, the increasing number of mesophiles *Helix lucorum taurica* and *H. vulgaris* serve as a reliable indicator that – in comparison to the previous sample - more favourable climatic conditions prevailed. This relatively more humid and warm climate is characterised by the appearance of *Vitrea subeffusa* in the upper part of this Unit, this snail being typical for humid locations in forests with a nearby water course. The fauna from Unit III may be attributed to an interstadial type, and probably corresponds to one of the interstadials of the Early Glaciation: Amersfoort-Brörup or Odderade.

Specific to the snail fauna from Unit II is that steppe xerophytes forms, such as: *Helicella dejecta, H. retowski, H. krynicki* and *Chondrus bidens* are predominant. Such a composition denotes that the steppe landscapes were very arid at the time this second cultural unit was formed. The very small dimensions of *Helicella*, and the very fragile shells of *Chondrus bidens* natio attenuatus are typical for a much drier and colder climate than that presently prevailing. The presence of semi-forest and mesophile forms, such as *Vitrea pygmaea, Chondrula tridens* and *Helix vulgaris*, shows that small areas of bushes and small trees were located around the site.

Conclusion

The results of investigations of Quaternary snails and freshwater fauna from Eastern- (Russia, Ukraine, Moldavia, Romania), Central- (Poland, Germany, Chech Republic, Slovakia) and Western Europe (France) have demonstrated that during the last million years the evolution of snails and freshwater molluscs has taken place predominantly on the morpho-, natio- and subspecies levels. The analyses of the systematic composition of the Crimean assemblages of fossil snails, as well as their comparison with the composition of modern fauna, serve to confirm this conclusion. The main changes in the Crimean snail assemblages during the Upper Pleistocene mainly reflect changes to the palaeoenvironment (firstly the changes of climatically conditions) and less the evolutional transformation of fossil species.

During the Würmian, in southeastern Europe and the northwestern coast of the Black Sea, a number of interstadials or short phases of warming may be distinguished, e.g., Krutitsa/Amersfoort-Brörup, Odderade, Moershoofd, Bryansk/ Hengelo, Arcy/ Denecamp, Tursac, Laugerie/ Lascaux, Bolling and Alleröd. Their number and names, as well as their geochronological terms differ very much from region to region. For this reason, it is very difficult to make a reliable regional or interregional correlation using only malacofaunal data. Due to the fact that during the Late Pleistocene the mollusc assemblages tend to reflect mostly environmental changes and less evolutionary ones, all the investigated assemblages may be subdivided into three categories: glacial, interstadial and interglacial. Furthermore, any correlation must be undertaken properly, and should be founded on an adequately large and representative sample. Despite the fact that the Crimean snail assemblages comprise an extremely large number of fossil cockleshells (more than 20,000), many samples are very homogenous and not sufficiently representative.

Peculiar to the composition of Crimean snail and fresh water fauna is that during the warm (interglacial and interstadial) phases the number of cryophilic species evidently decreases, and there is a significant increase in warm elements. In addition to the freshwater assemblages, which react only to changes in temperature, the Crimean snail fauna is also very sensitive to changes in humidity. Consequently, in order to distinguish correctly the type of snail assemblage (glacial, interstadial or interglacial), the number of hydrophiles and the deferring ratios of the main ecological groups should be considered. For example, for interglacial and interstadial snail assemblages, not only is a larger ratio of termophiles characteristic, but an increase in the number of hydrophiles and a reduced ratio of xerophiles is also typical. The fact that this method enables us to determine and evaluate changes in humidity is extremely important for the palaeoenvironmental reconstruction of the Crimean, particularly as during the last glaciations, this region - due to its geographical location - experienced temperature variations which were not as significant as those in periglacial areas.

Most of the snail assemblages identified in Layers from Unit VI at Kabazi II can be attributed to interglacial types of faunas. The general compilation of these faunas gives reason for us to assume sufficiently warm and mainly dry climatic conditions, which may correspond to the last interglacial of the Late Pleistocene. The fauna from this Unit comprises 15 assemblages, one from each level. Considering the frequent changes in the composition of specimens and in the environmental groups of snails from one sub-horizon to another (Fig. 4-1 and 4-2), one may propose that there was a certain degree of climatic fluctuation during the last Interglacial. On the basis of these 15 assemblages, the following stages of snail fauna evolution can be distinguished for this period:

a) Assemblages VI/15, VI/14 and VI/13: In comparison to the older and very dry assemblage observed in Stratum 14C, this sample witnesses the appearance of some hydrophiles, semi-forest and rocky / soil elements. Such a composition is indicative of the establishment of more favourable, warmer, however not necessarily drier conditions. These assemblages may correspond to the beginning of the last interglacial.
b) Assemblages VI/12, VI/11 and VI/10: In these layers there is a continual increase in the ratio of mesophile and xerophile steppe types. This is characteristic of a period in which a temporary aridisation, and a general degradation of climatic conditions occurs.
c) Assemblages VI/9, VI/6, VI/4, and VI/2: In these levels a number of forest specimens appear, e.g., *Euconulus fulvus* and *Punctum pigmaeum*. Furthermore, there is an increased ratio and diversity of hydrophiles, forest, semi-forest and rocky / soil elements. Such a composition with a high diversity of fauna attests to short phases with more favourable climatic conditions. The dimensions of many shells in these samples are also indicative of optimal climatic conditions during this stage.
d) Assemblages VI/8, VI/7, VI/5, VI/3 and VI/1: These samples, which display more homogenous xerophytic faunas, are characteristic of phases which experienced temporary climatic deterioration. Despite a reduction in the diversity of specimens, these assemblages are still more diverse than the homogenous fauna observed in samples from cooler interstadial phases.

Fauna from Unit V indicates a return to more favourable climatic conditions. Once again, there is a marked decrease in the number of xerophytes, and an increase in hydrophiles, mesophiles, forest, semi-forest and rocky / soil inhabitants. This assemblage may be attributed to interglacial faunas indigenous to relatively humid and very warm climatic conditions. Judging from its composition and morphometrical parameters, this fauna is evidently warmer and older than the fauna from level 4 at Starosele. Consequently, it may be analogous to the end of the last interglacial. An extremely high number of *Helix lucorum taurica* and *Clausilia canalifera*, both displaying large morphometrical parameters, also serves to confirm such a conclusion. It is supported also by a big diversity of forest, semi-forest and rocky and soil specimens.

A glacial fauna may be observed in the very homogenous assemblage from Unit IV. Here, there is a clear increase in the ratio of xerophytic steppes and a drop in the ratio of all other components. Such faunas are indicative of a dryer and colder climate than that presently prevailing. This assemblage may be correlated with one of the cooling phases of the early glacial period.

The fauna from the lower part of Unit III is a typical interstadial type assemblage, in which a larger number of semi-forest and mesophile species are present. Previous collections made between 1995 and 1997 have shown that a similar steppe fauna also predominates in the upper part of Unit III (samples a, b, c, d and e). However, an increase in the number of mesophiles *Helix lucorum taurica* and *H. vulgaris* probably signifies slightly improved climatic conditions. This is also indicated by the appearance - in the higher part of this horizon - of *Vitrea subeffusa*, which pertains to humid conditions in forests and in bushed areas in the proximity to water. The fauna from Unit III may be correlated with one of the interstadials of the Early Glacial.

Characteristic of the snail fauna from Unit II is the predominance of steppe xerophyte forms. These are indicators of steppe landscapes and arid climatic conditions. The extremely small dimensions of *Helicella*, and the very fragile shells of *Chondrus bidens natio attenuatus* denote an evidently drier and colder climate than at present. For this reason, this unit may correspond to one of the cooling phases associated with the last glacial period.

Abstract

ФАУНА МОЛЛЮСКОВ ПАЛЕОЛИТИЧЕСКОЙ СТОЯНКИ КАБАЗИ II

К. МИХАЙЛЕСКУ

Раскопки Кабази II проводились в 1986-2001 годы и включали сбор раковин пресноводных и наземных моллюсков. Основные задачи палеонтологических исследований состояли в выявлении видового состава ассоциаций моллюсков каждого культурного уровня и в реконструкции основных климатических колебаний и палеогеографических условий обитания древнего человека. Фоссильная фауна наземных моллюсков палеолитической стоянки Кабази II очень богата и разнообразна. Только во время раскопок полевых сезонов 2000-2001 было собрано 16814 раковин, принадлежащих 35 разновидностям и 7 экологическим группам. Результаты исследований четвертичных наземных и пресноводных моллюсков Восточной, Центральной, и Западной Европы показали, что изменения фауны происходили, в основном, на уровне видов, подвидов и региональных

морф. Главные изменения в составе изученных крымских фаун наземных моллюсков отражают, прежде всего, изменения состояния среды обитания – изменения климатически условий в доисторические времена и в меньшей степени эволюционные преобразование новых видов и разновидностей моллюсков.

В экологическом аспекте, среди изученных фаун можно выделить три основные типы моллюсковых ассоциаций:

а) межледниковый – очень теплый и относительно влажный;

б) интерстадиальный – менее теплый и относительно сухой;

в) ксерофильный или перигляциальный – умеренно холодный и очень сухой.

К межледниковому типу фауны может быть отнесена большая часть образцов из культурно-хронологических слоев VI и V стоянки Кабази II. Общий фон этой фауны, позволяет реконструировать достаточно теплые, но не очень влажные климатические условия, которые могут соответствовать последнему межледниковому периоду.

К ксерофильному типу фауны может быть отнесена очень однородная фауна культурнохронологического слоя IV, где очевидно увеличивается доля ксерофитных степных форм и уменьшается доля всех других компонентов. Такой состав фауны указывает на более сухой и более холодный климат, чем настоящий. Эта фауна может соответствовать одной из ранних фаз похолоданий последнего оледенения.

К интерстадиальным фаунам может быть отнесена фауна нижней части культурнохронологического слоя III, где возрастает число видов предпочитающих мезофитные степи и лесостепные ландшафты. Подобная фауна разнотравных степей и кустарников преобладает и в верхней части культурно-хронологического слоя III (образцы a, b, c, d, e 1993-97 гг.). Возросшее число *Helix lucorum taurica* и *H. vulgaris* является надежным индикатором более благоприятных условий климата сравнительно со временем образования культурно-хронологических слоев II и IV. На относительно более влажный и теплый климат указывает также появление в верхней части III культурно-хронологического слоя *Vitrea subeffusa*, которые предпочитают леса и кустарники влажной зоны или фации вблизи водных бассейнов. Данная фауна может соответствовать одному из интерстадиалов последнего оледенения Русской Равнины.

В составе фауны II культурно-хронологического слоя явно доминируют ксерофитные формы, которые указывают на преобладание ландшафтов сухих степей и аридные условия климата. Маленькие размеры *Helicella* и очень хрупкие раковины *Chondrus bidens natio attenuatus* свидетельствуют о более сухом и холодном климате по сравнению с настоящим. Вероятно, данная фауна может соответствовать одной из холодных фаз последнего ледникового периода.