FOREWORD

Vojen Ložek , a prominent Czech naturalist, malacologist and a leading personality of the European Quaternary research throughout the second half of the 20th Century celebrates his 80 birthdays at late July 2005.

Since time of his first steps in science (his first publication appeared in 1939) amount of knowledge and diversity of topics in natural sciences increased quite a much. The major source of the current boom is a transdisciplinarity – smoothing the boundaries between various distant branches with interconnections between their conceptual and methodological specificities. Nevertheless, until quite a nearest past, such approach has neither been applied nor especially appreciated - simply because it appeared rather impossible that anyone could succeed to performe it without falling in a trap of „jack of all trades but master of none". In any case, Vojen´s pathaway in science has since its beginning been marked just with such a risky approach. Against expectancy, Vojen demonstrated that it is possible to be a respected master not only in taxonomy of mollusc or in biodiversity and ecology of that group, but at the same time also in phytogeography and geobotanics, in regional geography, sedimentary geology, pedology, archeology or history of science. At the same time, he show how imporant is to integrate all such approaches continuously into vivid programmes of Nature Conservancy, both on local and interregional scales, and in various education projects without any damage to his remarkable international scientific reputation. Already in sixties Ložek grew in a top European expert in the Quaternary research. His achievements in study of faciality of lithogenetic processes and faunal development, and, in particuar, in study of the Holocene environmental dynamics markedly predated the current status of the Quaternary science as an essentially integrative discipline. A spectrum of branches which Ložek mastered and amount of knowlege he accummulated and distributed throughout the community of his friends and colleagues can hardly be repeated by anybody else, of course. Nevertheless, everyone of many students who met Vojen clearly comprehended how productive and fascinating insights into various aspects of natural history can transdisciplinarity provide. In that respect, Vojen did a true pioneering work for many branches.

Ložek contributed many topics in essential way and influenced many students of both Life and Earth sciences throughout Europe. His capability to integrate fine specificities of neontologic malacology with multi-sided approach in study of the Quaternary past and with a deep insight into dynamics of environmental processes resulted in numerous original discoveries and extensive syntheses over broad spectrum of conceptual and geographical scales. Ložek authored more that 1300 publications (including voluminous monographs like 1964 *Quartärmollusken der Tschechoslowakei*, 1973 *Nature in the Quaternary period* a.o.). His achievements were awarded e.g. by the honorary membership in Philosophical Society of Cambridge, with Albrecht Penck Award, etc. Of course, it would be largerly useless to introduce Vojen - most of the students of the respective branches know Vojen personally from his conference and university lectures, field excursions or joint research projects, and could personally enjoy his extraordinary insight into many topics of natural history and his friendly attitude towards his colleagues and students.

We hope that the present meeting became not only an opportunity to ackowledge Vojen´s scientific contribution but, at the same time, a platform to discuss the current progress and further development in the branches staying in focus of Vojen´s interest: *Quaternary paleoecology, paleobiogeography and stratigraphy, environmental dynamics and* – last but not least*: Molluscs*.

Ivan Horáček – Lucie Juřičková – Václav Cílek

Molluscs, Quaternary, faunal changes and environmental dynamics

A symposium on occasion of 80th birthdays of Vojen Ložek

Prague, 25-28 July 2005

Department of Zoology, Charles University - Geological Institute AS CR – National museum Prague

Monday, 25 July 2005

National Museum
Wenceslas square (Václavské náměstí)
Auditorium

15.00 - 20.00	Registration
17.30	Opening of the Symposium
	80th birthdays of **Vojen Ložek:** *Malacology and Quaternary research along the millenial transition*
	Social gathering, snacks

Programme

Tuesday, 26 July 2005

Zoological Institute, Faculty of Science, Charles University
Viničná 7, Praha 2

9.30 - 12.15	*Morning session*	**Molluscs and Quaternary stratigraphy**
	Chair persons:	C-D.Jäger, A.A.Svitoch
09.30	Tom MEIJER: A review of Quaternary molluscan stratigraphy of the Netherlands	
09.55	Nicole LIMONDIN-LOZOUET: Pleistocene Interglacial malacofaunas: new results from Northern France	
10.20	Richard C. PREECE: The Hoxonian (Holsteinian) interglacial and palaeolithic site at West Stow, Suffolk, UK.	
10.45-11.00	Coffee break	
11.00	Marcin SZYMANEK: Variability of snails *Viviparus diluvianus* from eastern Poland versus climatic changes in the Holsteinian (Mazovian) Interglacial	
11.25	Márton VENCZEL: An outline of Pliocene - Pleistocene herpetofaunal changes from the Carpathian Basin	
11.50	David BRIDGLAND: River terraces sequences - frameworks for correlation and dating using biostratigraphy and other means	
12.15-14.00	Lunch	
14.00-16.00	*Afternoon session*	**Distribution, palaeogeography, refugia**
	Chair persons:	R.Preece & A.Markova
14.00	Jürgen GEIST: Molecular Genetic Approaches in Mollusc Conservation: The example of European Freshwater Pearl Mussels (*Margaritifera margaritifera* L.)	
14.25	Jozef ŠTEFFEK & Jozef GREGO : Preliminary research report on the genus cf. *Hauffenia* (Mollusca: Gastropoda: Hydrobiidae): distribution in Slovakia	
14.50	A.A. SVITOCH : The importance of molluscs of the genus *Didacna* Eichwald for the Caspian Sea paleogeography	
15.15	Thijs van KOLFSCHOTEN: The Pleistocene – Holocene transition and the role of refugia	
15.40	Ivan HORÁČEK: Glacial refugia in Carpathians: a direct fossil record	
16.00	*Poster session*	
17.00	**Open meeting of EQMal** (European Quaternary Malacologists) convened by Tom MEIJER	

POSTER SESSION

1 Libor DVOŘÁK, Alois HONĚK & Zdeňka MARTÍNKOVÁ: The spreading of *Cepaea nemoralis* populations in the Czech Republic

2 D.A. GARBAR & O.V. GARBAR: Structure of the genus *Planorbarius* in the Ukrainian fauna

3 Lucie JUŘIČKOVÁ & Tomáš KUČERA: The interplay of environmental pattern of mollucs communities along highways

4 Olga KLISHKO: The pearl mussels (Bivalvia, Margaritiferidae) from water reservoirs of the Upper Amur basin

5 Tereza KOŘÍNKOVÁ: Microscopic anatomy and histology of the genus *Sphaerium* s.l. (Mollusca: Bivalvia:Sphaeriidae)

6 Mikuláš J. LISICKÝ: Slovak molluscs now and then

7 Ruslana MELNYCHENKO, Olesya PAVLYCHENKO, Agnes STADNYCHENKO: The distribution, morphology and peculiarities of ecology of new in the fauna of Ukraine species *Sinanodonta woodiana* (Mollusca, Bivalvia, Unionidae)

8 Olesya PAVLYUCHENKO: *Aspidogaster conchicola* Baer – the parasite of Unionidae in Ukraine

9 Julien ROSSIGNOL: A new method to increase snail counting speed

10 Aleksander SANKO: Malacofauna of Eemian Interglacial in Belarus: stratigraphical aspect.

11 E. A. SNEGIN: The relics molluscs of Central Russian Upland

12 M.O. SON: Molluscs of genus *Theodoxus* Montfort, 1810 (Gastropoda, Neritidae) of Ukrainian Black Sea Coast and hypothesis of its descent in Black Sea bays

13 Agnes P. STADNYCHENKO: The molluscs of the family Lymnaeidae of Ukraine

14 Olena UVAYEVA: The fauna, ecology and zoogeographical analysis of Planorbinae (Mollusca: Gastropoda: Pulmonata) in Shatsky national park (Ukraine)

15 Svetlana A. VAL´KOVA & Irina V. ZENKOVA: Characteristic of molluscs community in native and polluted podzol soils of the Kola Peninsula

16 Heike WUNDERLICH: The use of mollusc shells for DNA based molecular analyses

17 Tamara YANINA: The Quaternary stratigraphy and correlation of the Pont-Caspian Region (on the basis of molluscs of the genus *Didacna*)

18 Larysa YANOVYCH: The influence of phenol on inorganic phosphorus content in tissues of freshwater bivalve mollusc *Unio tumidus* (Mollusca, Bivalvia, Unionidae)

Programme

Wednesday, 27 July 2005

Zoological Institute, Faculty of Science, Charles University
Viničná 7

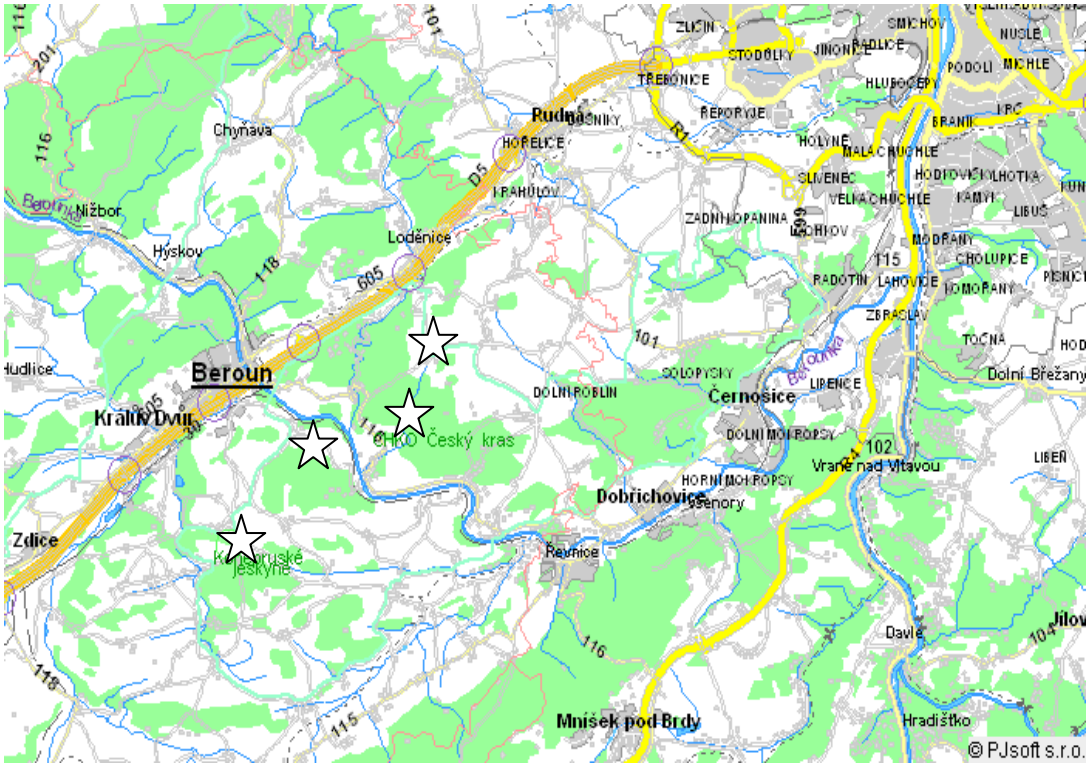
9.30 - 12.15	*Morning session*	**Pleistocene-Holocene transition and Land-sea correlation**
	Chair persons:	N.Limondin-Louzet & T. van Kolfschoten
09.30	TALDENKOVA E., BAUCH H.A., STEPANOVA A. & SIMSTICH J.: Postglacial to Recent molluscs of the Laptev and Kara seas	
09.55	Jarmila KRZYMIŃSKA: Late Glacial and Holocene assemblages of molluscs in the bottom sediments of the Southern Baltic	
10.20	Olivier MOINE: Last glacial palaeoenvironmental changes in western Europe recorded by the malacofauna of Nussloch loess (Germany) and perspectives in quantitative palaeoclimatic reconstructions	
10.45-11.00	Coffee break	
11.00	Anastasia K. MARKOVA & Constantine D. MIKHAILESCU : Continental-marine correlations based on Pleistocene small mammal and the brackish-water mollusc data of southwestern Eastern Europe.	
11.25	Aleksandra SIMAKOVA: Late Pleistocene and Holocene vegetation by the materials of the Southern Russian Plain	
11.50	Nadezhda ALEXEEVA: Late Pleistocene biota and environment of the West Transbaikalia in context of global and regional climatic changes:specific features and comparison with adjacent regions	
12.15-14.00	Lunch	
14.00-16.00	*Afternoon*	**Pleistocene-Holocene transition and environmental changes**
	Chair persons:	T.Meier & J.Steffek
14.00	Klaus-Dieter JÄGER : Subboreal and Epiatlanticum	
14.25	Tivadar GAUDÉNYI, Slobodan B. MARKOVIĆ, Mladjen JOVANOVIĆ and Stevan SAVIĆ: The Late Pleistocene palaeoenvironment of Susek exposure based on molluscan assemblages (Vojvodina, Serbia)	
14.50	Martina ÁBELOVÁ: Late Weichselian environment in the Moravian archaeozoological record	
15.15	Jana KERNATSOVA: Upper Pleistocene of Slovakia and molluscs assemblages	
15.40	Christa FRANK: Quaternary malacology in Austria. A general review.	
16.10	*Plenary discussion and closing the meeting*	

Programme

Thursday, 28 July 2005

Excursion by bus in the Bohemian karst (Sv.Jan, Srbsko, Koněprusy)

Departure: Kajetánka (hostel) at 9.00
Lunch in Srbsko
Expected arrival to Kajetánka at 18.00



The Bohemian karst build by limestones of the Silurian and Devonian age is since time of Joachim Barrande a world-wide known classical area of the Lower Palaeozoic (with current stratotypes of the Silurian-Devonian boundary and several subseries of that period situated just there). At the same time, it is a region quite rich in sites important for study of Quaternary period and Quaternary paleontology. Several of them will be visited at the excursion: 16 m deep section in the Holocene travertine in Sv.Jan p.Skalou, a series of fossil karst fillings in Chlum near Srbsko, including a series demonstrating a boundary of the Early and Middle Pleistocene (Chlum 4), a complicated multifacial Holocene series near Tetín and paleokarst and its fossiliferous deposits in Koněpruské caves.

Late Weichselian environment in the Moravian archaeozoological record

Martina ÁBELOVÁ

Institute of Geological Sciences, Faculty of Science, Masaryk University, Kotlářská 2, 611 37 Brno, Czech Republic; abelova.m@mail.muni.cz

The period of Late Weichselian is characterized by dramatic climatic oscillations and environmental rearrangements. Nevertheless, a detailed information on nature of these processes in a local continental scales is still largerly missing. The extensive excavations in classical paleolithic sites in Moravia (aurignacien, gravettian, epigravettian, magdalenian) provided a large amount of direct and indirect evidence available for that purpose (Valoch, 1989, Svoboda et al. 2002). The present contribution summarizes these results and supplements them with new data on a fine micromorphological dental analyses undertaken with several taxa of large mammals obtained from these sites and on the paleobiological meaning of these data.

Dental cementum analysis: There are number of fossil findings of fossil bears at many localities, mainly in cave sediments, in the course of whole Pleistocene. Among these belongs the skeleton and teeth of individuals of various ontogenetic stages. It is very important to know the individual age of studied findings for the structure of given community. But after worn away of tooth crown it is impossible to determine the individual age of given individual. The analysis of teeth wear allow as to assess only the relative age categories (see Kurtén 1958; Stiner 1998). Crucial way to reliable establish of individual age is using the microstructure analysis of dental cementum on the bases of counting cement increments. On the base of this method is possible to determine also the season in which animal died.

Thickness of the cementum increases with age. Dental cementum is composed of “winter” and “summer” layers. Bright (“summer”) and dark (“winter”) increments together create one year. “Summer” and “winter” increments differ in colour and different structure. This structure is obvious thanks to distinct organisation of collagen fibres and cell content, which is influenced by relatively percentage of mineral and organic fraction (Carlson 1991; Hillson 1986).

For microstructure study was used and compared the methods of thin sections study in polarize microscope; combination of etching and colouring and cathodoluminiscence. Each of these methods has both advantages and disadvantages. Cathodoluminiscence was used for study of dental microstuctures for the first time.

Microstructures of Proboscidean tusks: In the analysis of fossil proboscidean tusks we focused on the suite of features of the Schreger pattern. This consists of the Schreger angle, the wavelength of the corrugated sets of dentinal tubules and the qualitative pattern category, which is used in classification of the Schreger pattern. We studied both thin sections and polished samples, which were etched with 10-20% orthophosphoric acid (H_3PO_4) and coloured with gentian violet.

A possibility to identify tusks and their fragments as well as the microscopic analysis of tusks of different proboscidean taxa can be very useful from various viewpoints. It may become a useful indicator of probable climatic changes. Thicknesses of the incremental layers can be used to study the periodicity and
variations in tusk growth rate during lifetime, as suggested by the investigations of Fox, (2000).

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Late Pleistocene biota and environment of the West Transbaikalia in context of global and regional climatic changes: specific features and comparison with adjacent regions

Nadezhda ALEXEEVA

Geological Institute, Siberian Branch, Russian Academy of Sciences, Ulan-Ude, 670047, Russia
ochotona@online.ru

During the Late Pleistocene the territory of Western Transbaikalia was occupied by the vast "periglacial zone" which ranged from the south of Arctic Ocean to the desert Gobi (Ravsky, 1972). In the region the fossil-bearing Upper Pleistocene sediments represented by sands of Krivoyarskaya Suite, by sandy-loam and loess-like loam, as well as alluvial sand-gravels were widely distributed (Ravsky et al., 1964). Long-term field investigations have revealed more than sixty localities with mammal fossils and pollen. Moreover some of them are archaeological sites (Tseitlin, 1979).
Obtained data on biota, geology and geoarchaeology based on the multidisciplinary investigations produce important evidences on the past climatic development in the region influenced by global change.
At the Late Pleistocene with further progressive cooling in Northern Hemisphere, the climate in the Transbaikal area continued to be cold and became more arid. It might be supposed that the onset the climate aridisation in this region occurred because of uplift of surrounding the Lake Baikal mountains, which isolated the Transbaikalia from the influence of West humid Atlantic cyclone.
The alternation successive small mammal faunas and data on plant communities characterize the paleoenvironment of the region.
At the beginning of the Late Pleistocene, during Kazantsevo interglacial time, the climate of the Transbaikal area, according to the plant community was rather warm and temperate humid. Common pine-birch forests with alder and spruce were distributed along river valleys and expanded the mountain slope. Scarce fossil small mammals are characteristic to that time.
The following intensive cooling of the climate led to the further reorganisation of the mammal community and vegetation. Small mammal faunas of Zyryan time and next Sartan time included *Ochotona daurica, Lepus tolai, Spermophilus undulatus, Marmota sibirica, Lasiopodomys brandti, Meriones unguiculatus, Allactaga sibirica, Lagurus lagurus, Ellobius tancrei, Microtus (Stenocranius) gregalis, M. fortis, M. mongolicus,* a.o. (Alexeeva, 2003). Next interglacial Karginian time was more arid than the previous Kazantsevo one. The faunas included the same species, except *Meriones unguiculatus* and *Lepus tolai* was replaced by *Lepus timidus.* However, faunas of cold and interglacial periods differ mainly by the quantity ratio of taxa in the fauna. This phenomenon is the main peculiar of arid Transbaikalian region. The dominant forms were marmots, pikas, steppe lemming, Brandt vole, jerboa which were distributed over a greater area than at present. By contrast the adjacent contemporaneous Prebaikalian region included taxa of non-analogue faunas such as *Dicrostonyx*, *Lemmus* , which are never found in the Transbaikal area.

River terraces sequences - frameworks for correlation and dating using biostratigraphy and other means

David BRIDGLAND

Department of Geography, University of Durham, South Road, Durham DH1 3LE, UK
d.r.bridgland@dur.ac.uk

River terrace sequences have long been recognized as important archives of Quaternary climatic and environmental change, especially in areas where calcareous groundwater aids the preservation of numerous vertebrate and/or molluscan fossils. In Europe, many such sequences are repositories for stone age artefacts, recording the presence of early humans. Now that many terrace sequences can be reliably dated and correlated with the oceanic record, potentially useful patterns can be recognized in the distribution of artefacts, recording changes in lithic industries. A key means of dating remains biostratigraphy, especially using the same fossil groups mentioned above: vertebrates and molluscs. Amino acid geochronology (again using molluscs) and various absolute dating methods have also been employed.

IGCP Project No. 449 (Global Correlation of Late Cenozoic fluvial deposits) has instigated the compilation of fluvial records from all over the World. Matching of climatically-forced river terrace generation to Quaternary Milankovitch cycles, using independent lines of evidence, allows the fluvial archive of climatic fluctuation, landscape change and human occupation to be well constrained temporally.

The spreading of *Cepaea nemoralis* populations in the Czech Republic

Libor DVOŘÁK[1], Alois HONĚK[2], Zdeňka MARTÍNKOVÁ[2]

[1]*Šumava National Park Administration, Sušická 399, CZ-34192 Kašperské Hory, Czech Republic, e-mail: libor.dvorak@npsumava.cz*
[2]*Research Institute of Crop Production, Ruzyně 507, CZ-16106 Praha 6, Czech Republic, e-mail: honek@vurv.cz*

Cepaea nemoralis (Linnaeus, 1758) is a helicine species with Atlantic and Central European distribution. In western Europe many populations live at grassy or forest habitats while in the East the species is nearly exclusively restricted to urbane areas. Populations at the territory of the Czech Republic are probably of recent origin. The species was not mentioned in the first review of Czech molluscs (Slavík 1868), and its occurrence was reported by Uličný (1892–95). Several authors since then published records of *C. nemoralis*. We summarize the published data and several new records of *C. nemoralis* distribution in the Czech Republic. The data were retrieved from published sources, the review compiled by Flasar (1989) and Honěk (1995a, b). Further included are unpublished findings made by several authors. The systematic survey was limited predominantly to western part of the Czech Republic (Bohemia) and it consisted in visiting urban sites convenient for *C. nemoralis* life (cemeteries, surroundings of railway stations, old gardens, ruins). The geographic distribution of localities was plotted onto a standard reference grid of the Czech Republic. In order to investigate geographic increases in the distribution (=spreading) of *C. nemoralis*, the territory of the Czech Republic was divided into northern (>50° N), central (49–50° N) and southern (<49° N) zones. Each zone was divided into 1° N ×1° E rectangles, then grid quadrants were laid onto these rectangles. Number of quadrants at least partly situated within the Czech territory was counted for each rectangle. The number of quadrants containing at least one locality of *C. nemoralis* was determined for three periods, before 1950, between 1950–1989, and 1989–2003. The probability of finding *C. nemoralis* was

calculated for each rectangle as (number of quadrats with *C. nemoralis*)/(total number of quadrants in the rectangle). The average probability for each zone was derived from the arithmetic mean of the probabilities of rectangles belonging to this zone. The differences between zones were tested, separately for each time period, by one-way analysis of variance (ANOVA) with probability of finding *C. nemoralis* in particular rectangles as replicates and zones as factors. The species distribution over the Czech territory is uneven. The area of "continuous" distribution extends in the north-west of the country.The species distribution is patchy because most *C. nemoralis* populations live close to the anthropogenous biotopes. Only rarely they occupy sites away from interior of human settlements, particularly railroads, roadsides, isolated cemeteries or banks of ponds. On the territory of the Czech Republic, *C. nemoralis* lives at low altitudes, mostly below 500 m a.s.l. The highest locality was Pavlův Studenec, at 730 m a.s.l. The area where species was found increased since its first report by Uličný (1892–95). Until 1950 the species was known from several quadrants. Between 1950 and 1989, several new localities were added. Since before 1950, the species remained most abundant in the northern part of Bohemia (zone >50° N). The probability of finding *C. nemoralis* in the central and southern zones of the country also increases, although in 2003 it remained 4–5 times smaller than in the north. The increase was greatest in central zone where the probability of finding *C. nemoralis* had increased 14. By contrast, in the southern zone the probability increased only 2 times. This is an indirect indication of the gradual spread of *C.nemoralis* distribution from north to south, first to the central then to the southern parts of the country.

Quaternary malacology in Austria. A general review.

Christa FRANK

Biozentrum der Universität Wien, Althanstrasse 14, A 1090 W i e n, Austria

In Austria, Quaternary malacology is a rather young science. In the late fifties, A. PAPP, and twenty years later, H. BINDER started with descriptions of different Pleistocene localities in Lower Austria.
In the middle 1990-ies, the scientific project Nr. 9320 (Pliocene and Pleistocene faunas of Austria), supported by the FWF, Vienna, and carried out in the Palaeontological Institute of Vienna, started. Aim of this project was the description of the most important Oleistocene localities in Austria (about 150), covering the time span between 1.77 mill. to 10.000 a BP. Only a few localities date back to the middle Pliocene (Csarnotium).
The greatest part of the palaeontological material originates from former excavations. Our most important intention was the cooperation between palaeozoology (Vertebrata, Mollusca), palaeobotany, archeology and geology. Most interesting were the localities with both vertebrata and molluscan remains. The relative chronology based on the evolutionary level of certain mammals (Ursus; Micromammalia) could be completed by radiometric data.
I always tried to compare the thanatocoenoses with the recent malacofaunas of the surroundings in order to understand changes in the structure of assemblages and in the enviromental history.
The investigated localities are in the following geological regions:
In the crystalline area of the Bohemian massive and in the "Wachau" are some famous loess profiles like Willendorf, Schwallenbach and Krems-Schießstätte, and loess stations (Aigen, Furth, Aggsbach), as well as some caves; all of them of young pleistocene age.
In the molasse zone and in the Vienna Basin; f.i.: The type locality of Stillfried an der March (late wurmian, with the "Stillfried B" –layer); Stranzendorf (middle and late pliocene; l.t. of *Clausilia stranzendorfensis*; stratigraphically important Arvicolidae), Neudegg (middle pliocene), Radlbrunn (earliest pleistocene, l.t. of *Clausilia rugosa antiquitatis*); some localities in former brickworks like Laaerberg (earlier part of middle pleistocene; with *Ursus thibetanus* and *Trogontherium schmerlingi*).
In the Northern Alps: Some caves with cave bear, f.i.: Gamssulzenhöhle, Nixloch (both of them are of late glacial age) and Ramesch (R–W-interglacial period).

In the Central zone are the most fossiliferous caves of Austria: In the surroundings of Graz: Große Badlhöhle (late glacial, l.t. of *Congeria steiningeri*; only one other cave-inhabiting *Congeria* species is known: the recent *C. kusceri* from Zira-cave, Popovo polje, Hercegovina); Lurgrotte, a.o.; in the Hainburg mountains: the Deutsch Altenburg cave system, f.i.: locality 4B (l.t. of *Archaegopis*? *acutus, "Klikia" altenburgensis, Oxychilus*? *steiningeri*; early pleistocene); localities 2, 3, 10 (earliest pleistocene, with the "*Mimomys-Microtus*-transition zone"); Hundsheim: earliest part of the middle pleistocene (l.t. of *Aegopis*? *klemmi*, *Neostyriaca corynodes schlickumi*; with biostratigraphically important micromammalia).
In the Southern Alps: The Durezza – Schachthöhle with holocene Gastropoda; Gracarca (9 th century up to late Latène period); and not in Austria: the famous Conturines cave (Southern Tyrolia, Italy), in about 2800m altitude, with a lot of cave bear bones (middle Wurmian), and middle holocene Gastropoda and Arthropoda from a considerable guano layer in the entrance hall, demostrating all the habitats from the cave downhill to the lowlands.
The "Bundesdenkmalamt" of Vienna and of Graz, the "Institut für Ur- und Frühgeschichte" of the University of Vienna, the "Karst- und Höhlenkundliche Abteilung of the "Natural Hist. Mus. Vienna" and the Austrian Academy of Science provided me with mollusca from different prehistoric settlements from Neolithic and Bronze age up to the Medieval period. Especially interesting was the material from the mid-neolithic circular ditches (Kamegg, Gauderndorf, Glaubendorf I, II, Hornsburg III, Karnabrunn, Mühlbach a. M., Rosenburg, Schletz, Straß i. Straßertale, Strögen), which made it possible to reconstruct the faunal development in cultivated areas in relation to the archeological and sedimentological results. A lot of data could be gathered from the Roman period (Carnuntum: city and auxiliary castle; Favianis: auxiliary castle, southern and eastern vicus), the older Hallstatt- and younger Latène period (Braunsberg), the Slavian period (Gars-Thunau), from medieval castles (Lanzenkirchen, Ternitz), a.o.
So, the past 30 years were filled up with a plenty of Quaternary molluscs, and I want to thank all my colleagues who were helpful for my work.

Structure of the genus *Planorbarius* in the Ukrainian fauna

D.A. GARBAR & O.V. GARBAR

Zhitomir University, street. B. Berdichivska 40, Zhitomir , 10008, Ukraine,
E-mail: garbar@zu.edu.ua

Freshwater pulmonate snails of the family Bulinidae are represented in Ukraine by the genus Planorbarius. However the question about the structure of this genus is disputable. The part of the researchers (Stadnichenko, 1990 and others) considers, that the genus is represented by 5 species: *Planorbarius corneus* (Linnaeus, 1758), *P.banaticus* (Lang, 1856), *P.purpura* (Müller, 1774), *P.grandis* (Dunker, 1856), *P.stenostoma* (Bourguignat, 1881). But there is also an opinion, what the genus Planorbarius consists of one polymorphic species P.corneus (Glöer, 2002 and others). For the decision of this taxonomical problem this research was carried out.

The collections from 3 remote populations have been used as material for the research: Zhitomir (r. Teteriv), Sumy (Durov's lake), Vilkove (r. Danube). In the collection all listed forms were represented, the exception is P.stenostoma which was not found by us on the territory of Ukraine. Morfometrical analysis of conchological parameters was carried out. Besides electrophoretic research of snail's tissue was carried out in 7.5 % polyakrylamid gel (ferments and proteins of muscles, hepatopancreas and hemolimf were investigated).

Discriminant analysis has found out weak differentiation of the researched forms on morphology of the shell. Much greater there was the differentiation by the geographical indications. The presence of essential geographical differences was confirmed also by the method of principal components.
For the benefit of opinion about presence of the only polymorphic species *P.corneus* testifies also electrophoretic research. The received results give us the bases to consider,

that the investigated general sample is not the group of 4 species, for which the genetic intermittence is characteristic, but represents set specimens of one species very changeable externally.

Besides it was found out that the snails from Sumy have some genetic differences from other investigated samples, that proves the possibilities of allospecies structure of *P.corneus*. However this question requires the further researches.

The Late Pleistocene palaeoenvironment of Susek exposure based on molluscan assemblages (Vojvodina, Serbia)

Tivadar GAUDÉNYI, Slobodan B. MARKOVIĆ, Mladjen JOVANOVIĆ and Stevan SAVIĆ

Quaternary Research Centre, Dept. of Geography, University of Novi Sad, Trg Dositeja Obradovića 1., 21000 Novi Sad, Serbia and Montenegro
e-mail: tiv@neobee.net

The Susek loess exposure (45^{o} 05' N, 19^{o} 35' E) is situated in the central part of the north slope of Fruška Gora (Vojvodina, Serbia). Initial investigations focus on the two loess layers and two paleosols preserved in the 7.5 m thick exposure. The recent soil S0 is 0.5 m thick was not suitable for malacological analysis. The last glacial cycle L1 loess unit is 4.25 m thick and includes two loess subunits L1L1 and L1L2 intercalated with paloeosol L1 S1. Basal interglacial-early glacial paleosol S1 is 2.5 m thick.
Snail assemblage of 40 analyzed samples contains13.444 individuals of 31 species. Upper part of paleosol L1S1 and loess horizon L1L1 provide a rich molluscan fauna which represents woodland-steppe like environment. The coldest phase in the whole profile is examined in loess layer L1L1 at 0.85-1.15 m, represented with cryophilous species *Columella columella* and *Vallonia tenuilabris*. Malacofuna of the lower part of paleosol L1S1 and the uppermost part of loess layer L1L2 shows different environmental conditions represented by very poor snail fauna. Other parts of loess sub unit L1L2 is unexpected sterile molluscan layer, as well as, strong developed paleosol S1.
The investigation of the Susek site proves that the northern slopes of Fruška Gora was a *Paleopreillyrian refugium* for the shade demanding, closed-forest habitat preferring elements (e.g. *Aegopinella ressmanni, Discus ruderatus, Ena Montana, Cochlodina laminata*).

Molecular Genetic Approaches in Mollusc Conservation: The example of European Freshwater Pearl Mussels (*Margaritifera margaritifera* L.)

Jürgen GEIST

Wildlife Biology and Wildlife Management Unit, Technische Universität München – Weihenstephan, Am Hochanger 13 , D-85354 Freising, Germany
email: geist@wzw.tum.de

The global decline of freshwater molluscs is raising increasing concern. The development of sound conservation and management programmes for endangered molluscs can greatly benefit from an interdisciplinary approach, integrating genetic studies in order to maintain a maximum of within-species genetic diversity and to retain the evolutionary potential. In this case study on endangered freshwater pearl mussels (*Margaritifera margaritifera* L.), 14

polymorphic microsatellite markers were developed, representing the first published microsatellite markers for an European freshwater bivalve mollusc (order Unionoida). The markers revealed wide ranges of allelic richness and heterozygosity levels and proved to be suitable for monitoring of neutral genetic divergence and diversity in order to describe the current genetic structure of pearl mussel populations. The methodology of non-destructive sampling with no impact on living populations was established for pearl mussel DNA-analyses (dead individuals and haemolymph sampling). In addition, the successful use of shell-DNA was demonstrated. The potential of using mollusc shells for DNA-based analyses and the required precautions and limitations to avoid erroneous results were discussed. The genetic diversity and differentiation of the last and most important central European pearl mussel populations from the drainages of Elbe, Danube, Rhine, Maas and Weser were assessed in order to determine conservation units (CUs), to select priority populations for conservation, and to deduce conservation strategies on a genetic basis for free-living populations and for supportive breeding measures. A high degree of fragmented population structure and different levels of genetic diversity within populations were detected. This observation can most likely be explained by historic, demographic and anthropogenic effects.

Glacial refugia in Carpathians: a direct fossil record

Ivan HORÁČEK

Department of Zoology, Charles University, Viničná 7, CZ 128 44 Praha, Czech Rep.
horacek@natur.cuni.cz

The traditional model of European historical biogeography predicted that the interglacial elements survived glacial stages in the Mediterranean refugia from where they expanded to their mid-European ranges after onset of Holocene. During the last decade, a repeated indirect evidence (mostly from molecular phylogeography) suggested that the refugial populations which actually acted as source of the postglacial recolonization were distributed rather in some regions of the Central Europe than in the Mediterranean, first of all in the Carpathians. In spite of that, until recently, a direct evidence for that prediction was largerly missing. Here I report three sites, all continuous sedimentary series, that essentially support that view:
Dzerava skala cave (Male Karpaty Mts., SW Slovakia) provided particularly rich sequence of small mammal assemblages (MNI = 2013, 52 spp.) which exhibited a repeated fluctuation in percentage of core glacial elements and species diversity corresponding to the climatic development from early middle Weichselian to the beginning of Holocene (MIS 4 to MIS 1).
Besides of predominant glacial elements also a contribution of the recedent and subrecedent elements is here continuously remarkably high. This is pertinent not only of the obligatory recedent elements of the glacial assemblages such as *Microtus nivalis, Ochotona pusilla* or *Phodopus* sp., but also of the elements indicating woodland habitats and/or riparian vegetation, supposedly in the narrow bottom of the neighbouring valley: first of all, *Clethrionomys* cf. *glareolus* and *Sorex* cf. *araneus.* As concerns these two species, their continuous record throughout all layers of the section Dzeravá represents perhaps the strongest support obtained until now for their refugial survival throughout the Weichselian glacial period in Central Europe.
The other two series (Muran and Novy caves in High Tatras Mts., N Slovakia) show a similar pattern even with some other intrerglacial elements (e.g. *Microtus subterraneus / tatricus).* Both the records are particularly worth of mentioning because of their altitudinal position. They were situated above the surface of the mountain glacier what suggests that just such locations may played a considerable role in the respective connections.

Subboreal and Epiatlanticum

Klaus-Dieter JÄGER

Institut für Prähistorische Archeologie, Martin-Luther-Universität, Halle/Salle, Brandbergweg 230, D 06099 Halle/S.

On occasion of VII INQUA Congress (Denver, Colorado, USA) the present author has presented a recommendation related to proposal modifications of the chronostratigraphic subdivision of the Holocene. Object of this proposal was so-called Subboreal according to the traditional Holocene classification of A.Blytt (1876) and R.Sernander (1894). The term Subboreal suggests a period of mainly continental climatic conditions with low average precipitation values. However, the time range of the traditional Subboreal fits merely in part to these climatic preconditions. Therefore, according to previous considerations of the Polish archaeologist T.Sulimirski (1961) it seems to be senseful to restrict the application of the term Subboreal to the realy continental and dry part of the traditional range. Such a situation could be evidenced by geostratigraphical and archaeological investigations in Central Europe with ragard to the period between the 13th and the 8th centuries B.C. For instance, during this hal-millenium at many sites fresh-water lime deposition has been replaced by intensive rendzina formation and in several regions fresh-water sulphate layers are intercalated in Holocene sequences.

The preceeding part of the Holocene, according to traditional use covering thefinal part of the Atlantic and the early Subboreal is characterized by alternationg subaquatic sedimentary layers and buried humous horizons in many fres-water lime sequences. They reflect climatic oscillations of a transitional period from the preceeding Atlantic to Subboreal units in the restricted sense. This transitional unit may be named Epiatlantic. Geostratigraphical and archeaological records in different regions support the supraregional validity of such concept of Holocene subdivision in Central Europe.

Therefore, these recommendations have been published and introduced into Czech literature by V.Ložek since 1968 as well as applied and precised from viewpoint of palaeomalacology. These Czech experiences support the proposal of international discussion and acceptance.

The interplay of environmental pattern of mollusc communities along highways

Lucie JUŘIČKOVÁ & Tomáš KUČERA

Department of Zoology, Charles University, Viničná 7, CZ 128 44 Praha, Czech Rep.
Lucie.jurickova@seznam.cz

Highways are one of the most increasing and frequently discussing landscape feature, especially in Middle Europe. We established three transects along the three main highways in east, southwest and north directions from Prague (D1, D5, R10). These transects cover main environmental gradients of geographical position, altitude, succession and vegetation cover. Altogether 44 mollusc species (more then 18% of the Czech Republic mollusc fauna) were found in 45 localities along 225 km of highway verges. Surprisingly 21% of species are in Red List of the Czech Republic molluscs, including very abundant population of endangered species *Daudebardia brevipes*. We expected the importance of highways as manmade linear structure for spreading of invasive species, but only single one has been found - *Monacha cartusiana* inhabiting the localities of initial stages of succession. Hypothesis about monotonous communities of invasive or synantropic species was not verified. The most important factors are: various geographical positions, altitude, vegetation cover (especially shrubs) and succession stage explained by the age of highway construction. We distinguish three main groups of molluscs: open stands species, natural

woodland species, and seminatural woodland species. Open country species and widespread species participate in molluscan communities of highway verges more frequently than in the fauna of the Czech Republic as a whole. The number of natural habitat sensitive species increases in highway verges regrown by vegetation in opposition to plantations.

Upper Pleistocene of Slovakia and molluscs assemblages

Jana KERNATSOVA

Štátny geologický ústav Dionýza Štúra, Mlynská dolina 1, 817 04 Bratislava, kernat@gssr.sk

The mollusc assemblages of the Weichselian Pleniglacial in lowland regions of Slovakia were investigated. Loess's from Upper Pleistocene are very massive and least attack of post sedimentation processes in Podunajská nížina Lowland (SW Slovakia). Therefore our interpretation of results is concern circa 437 samples from eolian and eolian - deluvial sediments largely in Podunajská nížina Lowland The aim of our research is evaluation from fossil malacofauna and reconstruction of all fossil ecosystems**.**

At the study of zoo and phyto assemblages we use three basic accesses:

- Fauna and flora analyses
- Information from abiotic component
- Analogy from recent ecosystems, principal of actualism

In term of quantitative and qualitative analyses, biotopic and zoogeographic structures of phyto and zoo assemblages as well as by biometric and isotopic measurements on shells of quaternary gastropods and with statistics and malacothermometry (Szõõr et al., 1991) we have been monitored significant climatic changes from Upper Pleistocene. Some of those are stratigraficaly classify by AMS and ^{14}C methods.

We have documented existence of the ten climatic warm periods with various intensity (interglacial, interstadials, subinterstadials) by malacofauna from Upper Pleistocene.

Last interglacial we accept in conception sensu lato. For Upper part of Eem we use name Prewürm phase. There are two stadials and interstadials (tabl.1).

First and second Würm stadial are divided on older and younger phase (tab.1).

Last Würm stadial is by first subinterstadial also divide on older and younger phase (tab.1). In younger phase of stadial we retain another „subinterstadial" (more warm and mainly humid oscillation), this above mentioned phase divided on younger and older sub phase (tab.1) In the Late Glacial we have two warm periods: bölling and alleröd.

From the view the climatic changes and molluscs assemblages is the most interesting the last stadial of Würm. In its older phase (24 – 21 000 BP) we meet with so – called disharmonic assemblages, which were formed with psychrophilous elements of pupila-columela fauna together with elements of warmer tridens-striata fauna. In assemblages of *Succinella* we located ecological bred *Succinella oblonga elongata* (Braun). The species *Pupilla cf. bigranata* (Ross.) which has great affinity to meridional element *Pupilla bigranata* (Ross.) is important component of disharmonic assemblages. We consider about ability, that it can be as in case of Succinella also ecological bred of *Pupilla muscorum* (L.).

In younger sub phase of younger phase on the last stadial (16 – 15 000BP) absent findings of extinct taxon *Vertigo parcedenta* (Braun) and xerothermic element *Helicopsis striata* (Müll.), dominated to *Succinella oblonga* (Drap) species.

According to biometric measurements in Succinella assemblages has been showed forms of transient morphotypes between *Succinella oblonga* (Drap) and *Succinella oblonga elongata* (Braun). From this period we knows many foundings of calcified eggs of fossil gastropods. After Scan monitoring of diagonal structure of eggs we could identify their gastropods genus .

Isotopic analyses of oxygen from shells of freshwater snails suggest on higher part of light oxygen isotope in cold phases of Glacial. Isotopic analyses of carbon and oxygen

from shells of terestric gastropod suggest on lower ration of light isotopes oxygen and carbon in periods with humid climate.

The pearl mussels (Bivalvia, Margaritiferidae) from water reservoirs of the Upper Amur basin

KLISHKO Olga

Institute of Natural Resuurces, Ecology and Criology, Siberian Branch of Russian Academy of Sciences, 26, Butina Str., Chita 672090, Russia. E-mail: root@cinr.chita.su

For the present only one species of pearl mussels – *Dahurinaia dahurica* Middendorff, 1850 in water reservoips of Upper Amur basin was known. Inspection of materials and detailed statistical analysis of pearl mussels parameters morphometric and contours of frontal sections of valves was allow to distinguish five species of genus *Dahurinaia* and interspecific polymorphic form. Moreover, pearl mussels were recorded in lakes without drainage. This lakes are considering as a body refugium with the concerved relict Quaternary fauna. The most early record of pearl mussels in Transbaikalye concern to Upper Jurassic.

The Pleistocene – Holocene transition and the role of refugia

Thijs van KOLFSCHOTEN

Faculty of Archaeology, Leiden University, P.O. Box 9515, 2300 RA Leiden, The Netherlands (e-mail: T.van.Kolfschoten@arch.leidenuniv.nl)

“The evolution of the fauna and flora during the period 25 – 8 Ka ago covering the Pleistocene-Holocene transition” was the theme of a project (2001-2004) that resulted in an extensive database with e.g. botanical, and zoological data from Europe, north of the Alps and the Pyrenees. The database was used to compile maps with the distribution of species, or groups of species during the defined time slices. The project revealed an enormous amount of ecological data on changing ecosystems and also showed e.g. the occurrence of a number of glacial refugia for warm-adapted species.

A new project is formulated; a project in which (palaeo)botanists, (palaeo)zoologists, modern ecologists, mathematicians, isotope physicists and population geneticists will cooperate, focuses on the dynamic changes in the ecosystems. Changes that are a crucial part of understanding human evolution at the late Pleistocene-Holocene transition. The objective of this project is: how to explain the late Pleistocene/early Holocene bio-geographical patterns of flora and fauna (including humans)?

The bio-geographical patterns of flora and fauna show, during the glacial maximum, the occurrence of several relatively small areas with a high biodiversity; i.e. glacial refugia for warm-adapted species. The importance of each of these refugia in the dispersal of the warm-adapted species and the post-glacial establishment of the present-day ecosystems is unknown so far. To understand the bio-geographical changes we will investigate the refugial origin of a number of species (flora and fauna), the taxonomic relation between (relict) species as well as the way in which particular mammalian species adapted to the changes of the environment. Morphological studies of the dentition and the skeleton remains, (ancient) DNA studies and stable isotope studies of the fossil record as well as the modern relatives of a number of key species (larger as well as smaller mammals) will be applied to investigate these adaptations.

The results will be interpreted in terms of climate changes. In order to obtain independent proxies from the investigated material, the content of the stable isotope ^{18}O in bone phosphate and carbonate deposits will be measured. In addition, climate change, ^{14}C and migration are linked, as is hypothesized for south-central Siberia.

An outline of the project will be presented during the conference. The idea behind is that we would like to discuss our approach and would like to invite colleagues to contribute to the project.

Microscopic anatomy and histology of the genus *Sphaerium* s.l. (Mollusca: Bivalvia:Sphaeriidae)

Tereza KOŘÍNKOVÁ

Department of Zoology, Charles University, Viničná 7 128 44 Praha 2, korinko1@natur.cuni.cz

In the last years, anatomy and morphology of viviparous freshwater bivalves of the family *Sphaeriidae* is subject of intensive research.
In the present study, three species of the genus *Sphaerium s. l.* (including *Sphaerium* s. str. and *Musculium*) were investigated – *Musculium lacustre* and sibling taxa *Sphaerium corneum* and *S. nucleus*. For the majority of investigations, paraffin serial sections (staining with Masson´s triple stain) were used.
Many details of the internal anatomy (namely of the alimentary tract, urogenital system and gills) were observed, as well as gametogenesis, formation of brood pouches and development of larval stages in the inner demibranches of adults. The main characters proved to be the same in all three species. Thus, the results obtained could serve as important arguments when discussing the generic respectively subgeneric level of the taxa *Sphaerium* s. str. and *Musculium*.

Late Glacial and Holocene assemblages of molluscs in the bottom sediments of the Southern Baltic

Jarmila KRZYMIŃSKA

Polish Geological Institute, Branch of Marine Geology, Kościerska5 St. 80-328 Gdańsk, Poland
jarmila.krzyminska@pgi.gov.pl

Molluscs have been used since a long time as index fossils defining patricular phases of the geological history of the Baltic Sea. The fauna indicates changes of palaeogeographical conditions controlling both the evolution of lakes, mires and fluviatile system in the coastal zone and evolution of the Baltic Sea since the termination of the late glaciation. Freshwater molluscs occur in lacustrine sediments of the Late Glacial end Early Holocene in seaward and along zones of the coast while marine molluscs are found in sediments accumulated since the climatic optimum in the shore zone and within the sea.

The mollusc analysis was carried out on the basis of the samples taken from 146 cores of the bottom sediments. The obtained results show the changes of the palaeoclimate as reflected by the composition of the mollusc communities in the Late Glacial and Holocene bottom sediments.

The results of the other previous lithological, seismoacoustical, petrographical researches and radiocarbon dating suggested, that the age of the sediments originated from western part (Odra Bank and Pomeranian Bay), the Middle part (Slupsk Bank and Southern Middle Bank) and the eastern part (Gulf of Gdansk and Puck Bay) areas had been Late

Glacial and Holocene ones (Uścinowicz 1999, Kramarska 1998, Krzymińska 2001, Krzymińska, Przezdziecki 2001, Krzymińska et al. 2003, Krzymińska et al. in press, Przezdziecki 2004).

In the shallow area of the Southern Baltic Sea also along the Polish coast, which was under deglaciation in the Late Glacial period, malacofauna development was in close relation to environment conditions. The first stage of the water basins presence is reflected by lacustrine fauna occurring in the sediments, which is characteristic for the cold climate. It is related to Late Glacial Period. The sediments (sandy mud, mud, and locally clay and peat) consisted of the following species: *Armiger crista f. cristatus* Draparnaud, *Gyraulus laevis* (Alder), *Lymnaea peregra* (Müller), *Pisidium casertanum* (Poli), *Pisidium casertanum* f. *ponderosa* Stelfox, *Pisidium conventus* Clessin, *Pisidium milium* Held, *Pisidium nitidum* Jenyns. The presence of these species points out lacustrine sedimentation, which occurred in cold climatic conditions favourable for them.

In Preboreal Period besides cold- and freshwater species as: *Valvata cistata* Müller, *Pisidium casertanum* f. *ponderosa* Stelfox, *Pisidium conventus* (Clessin), *Pisidium milium* Held, *Pisidium nitidum* Jenyns, also freshwater mollusc, needed higher temperature occurred: *Bithynia tentaculata* (Linnaeus), *Physa fontinalis* (Linnaeus), *Pisidium amnicum* (Müller), *Pisidium moitessierianum* (Paladilhe). It points out the warming of the climate.

In a marine sand during of the Atlantic Period, the area was influenced by Litorinian Sea, when hyaline species appeared: *Cerastoderma* glaucum (Poiret), *Macoma balthica* (Linnaeus), *Mytilus edulis* Linnaeus, existing together with freshwater species: *Bithynia tentaculata* (Linnaeus), *Theodoxus fluviatilis* (Linnaeus) and *Pisidium amnicum* (Müller). The sediments consist association of marine molluscs only: *Hydrobia ulvae* (Pennant), *Hydrobia ventrosa* (Montagu), *Rissoa membranacea* (Adams), *Cerastoderma* glaucum (Poiret), *Macoma balthica* (Linnaeus), *Mytilus edulis* Linnaeus *Retusa truncatula* (Bruguière), *Retusa obtusa* (Montagu), *Scrobicularia plana* (Da Costa), *Cerastoderma edule* Linnaeus, *Mya truncata* Linnaeus, *Mysella bidentata* (Montagu), *Thracia papyracea* (Poli) It has been probably fully developed Litorinian Sea phase.

Fauna of Postlitorinian Sea was represented by: *Hydrobia ulvae* (Pennant), *Hydrobia ventrosa* (Montagu), *Cerastoderma glaucum* (Poiret), *Mytilus edulis* Linnaeus, *Macoma balthica* (Linnaeus). In the sandy sediments of Subboreal and Subatlantic Periods the domination of marine fauna is observed.

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Pleistocene Interglacial malacofaunas : new results from Northern France

Nicole LIMONDIN-LOZOUET

UMR CNRS 8591-Laboratoire de Géographie Physique, 1 Pl. A. Briand, F-92195 Meudon cedex - limondin@cnrs-bellevue.fr

Quaternary deposits in Northern France are mainly represented by slope and fluvial deposits. In this geomorphological context Interglacials periods are marked by palaesol sequences and calcareous tufas. The latter can reach several meters in thickness and contain diverse biological remains providing good opportunities for reconstructing and comparing past Interglacials. Moreover, among fossil communities, molluscs appear as a crucial proxy because shells are generally abundant and very well preserved, allowing detailed environmental reconstructions. The aim of malacological studies is to assess regionally typical references for each Interglacial.

Recent research focusing on Pleistocene malacofaunas has allowed to recover long successions from two sites (Caours and La Celle), respectively allocated to MIS 5 and MIS 11. Both successions provide records long enough to show transition from open landscape towards forest development, corresponding to periods of climatic optimum, finally evolving to less shaded conditions. The site of Caours delivers the very first data in the region concerning the MIS 5 Interglacial while La Celle site, allocated to MIS 11, can be compared to several other malacological sequences analysed in tufa deposits from Northern France and South-West Great Britain. Specific assemblages, including species out of their modern range, can be defined for each of these Interglacials.

Both Pleistocene records are also compared to neighboring Holocene molluscan successions. The evolution of malacological populations structure exhibits similarities between Pleistocene Interglacials and the Postglacial period. Development and order of occurrence of pioneer species in response to improvement of climatic conditions are comparable. However the composition of forest land snails communities during climatic optima differs markedly. Pleistocene faunas includes Central European immigrants that lack completely in Holocene successions. Besides, postglacial faunas comprise a few Western European species that do not occur within any previous Pleistocene sequence.

Continental-marine correlations based on Pleistocene small mammal and the brackish-water mollusc data of southwestern Eastern Europe.

Anastasia K. MARKOVA (1) & - Constantine D. MIKHAILESCU (2)

*(1) Institute of Geography, Russian Academy of Sciences, Moscow, 119017, Russia, e-mail: **nature@online.ru**;*
(2) Scientific Association INQUA-Moldova, Chisinau, Moldova

Several dozens of localities with the remains of Pleistocene small mammals and brackish-water molluscs were found together in the marine-liman and fluvial-deltaic deposits of S-W of the Russian Plain. The localities of molluscs and small mammals are related to the series of the transgression phases of the Black Sea and characterized the interglacial stages of the Pleistocene and cover more than 1,5 MA. More than 40 outcrops of marine, marine-liman, alluvial and subaeral deposits were investigated on the Northwestern Coast of the Black Sea as well as in the Crimea and Taman Peninsula so on the Caucasus. Most of these sections are in the lower drainage basins of large river' valleys, such as the Danube (Etulia, Nagornoe, Plavni, Novonekrasovka, Vladiceny, Ozernoe, Suvorovo, Novoseliskoe, Limanskoe), the Pruth (Valeni, Cahul, Slobodzya Mare, Djurdjuleshty, Kyshlitsa-Prut, Reni), the Dniester (Tiraspol, Khadzhimus, Roksolany), were the Black Sea transgressions penetrated repeatedly.

The investigated Pleistocene horizons of loess-fossil soils, alluvial and marine-liman sediments gave a lot of diverse paleogeographic information and are a very good base for the correlation of principal events on the land and on the sea. These materials permitted to reveal the peculiarities of the species composition and evolutional stages of small mammals and brackish-water molluscs, correlated with the different transgression stages of the Black Sea. Paleontological data could be the basis for marine – continental correlations and could help to carry out the comparison between the natural events on the Russian Plain and in the Black Sea basin during the Pleistocene. They also allow reconstructing the main paleoclimatic changes and the oscillations of the level and salinity of the Black Sea.

A review of Quaternary molluscan stratigraphy of the Netherlands

Tom MEIJER

Cainozoic Mollusca - Naturalis/ National Museum of Natural History
P.O. Box 9517, 2300 RA Leiden, The Netherlands
meijert@naturalis.nl & t.meijer@inter.nl.net

The Dutch Quaternary subdivision starts with the Praetiglian (at c. 2.55 Ma; early Gelasian) being the first stage in which arctic biota enter shallow marine water in the North Sea Basin. Among the taxa are a few Pacific immigrants (*Yoldia oblongoides, Y. lanceolata, Serripes groenlandicus, Clinocardium ciliatum,* etc.). Simultaneously about 75% of the non-marine taxa is replaced, representing the largest faunal turnover of the last few millions of years. In borehole Noordwijk marine molluscan assemblages show alternating temperate and arctic phases during the Praetiglian. With a multi-disciplinary investigation these phases could be correlated with MIS 96-99.
The succeeding Tiglian (late Gelasian) is a complex of cool and temperate phases as well and lasts for c. 0.8 Ma. The most significant non-marine taxon is the extinct fluvial gastropod *Viviparus glacialis.* Other taxa are: *Theodoxus danubialis, Valvata goldfussiana, V. salebrosa, Lithoglyphus jahni, Tournouerina belnensis, Parafossarulus priscillae, Corbicula fluminalis, Pisidium clessini, Sphaerium subtile,* and *S. rosmalense*. Several extinct land snail taxa (*Cochlostoma, Soosia, Helicigona, Monachoides, Aegopinella, Lyrodiscus*, etc.) may prove to be usefull for correlation with more continental European sites. During the Late Tiglian the first occurrence of the marine Pacific immigrant *Macoma balthica* is noted. A concurrent range zone of this bivalve with *Viviparus glacialis* has regional significance. A second, but smaller faunal turnover event is at the end of the Tiglian.

The first stage after the Tiglian with a clear non-marine molluscan signal is the Bavelian, especially the Bavel Interglacial itself that is considered to overlap with the positive Jaramillo magnetozone at about 1 Ma. This means that from c. 1.6 to c. 1 Ma no substantial well dated molluscan data are available. The fluvial assemblages of Bavel yield *Viviparus viviparus, Valvata goldfussiana, V. salebrosa, Tanousia runtoniana, Lithoglyphus jahni, Fagotia wuesti, Parafossarulus crassitesta, Neumayria bavelensis, Pisidum clessini, Corbicula fluminalis,* etc.
The next stage from which molluscs are known is the Middle Pleistocene Noordbergum Interglacial. The period between the Bavelian and this stage only shows scattered molluscan evidence, but several taxa suffer extinction (e.g. *Valvata goldfussiana, Fagotia wuesti, Tanousia runtoniana, Lithoglyphus jahni, Neumayria bavelensis).* Most probably the Noordbergum Interglacial can be correlated with MIS 11. The deposits at the stratotype are of an estuarine facies, representing the first more or less well dated marine phase after the Late Tiglian, and yield *Littorina littorea*, *Macoma balthica, Cerastoderma edule, Viviparus diluvianus, Valvata naticina, Parafossarulus crassitesta, Pisidium clessini.* The significant non-marine taxa are similarly known from the classical fluvial site of Neede. Several of these taxa are extinct after this stage (*Viviparus diluvianus, Parafossarulus crassitesta*).

During the remaining Middle Pleistocene, two temperate stages (Belvédère and Oostermeer Interglacials) are observed. Both share the occurrence of *Corbicula fluminalis*. *Theodoxus danubialis, Valvata naticina*, and *Pisidium clessini* are observed only during the second stage. The latter of these species is extinct after this stage, whereas both other are

locally extinct. Marine beds are only known from the Oostermeer Interglacial containing temperate marine assemblages with a few lusitanian elements. Amino acid analysis in molluscs of these interglacials point to ages of MIS 9 and 7 respectively.

Especially the Eemian and to a minor extend the Holocene are characterised by high numbers of warm temperate marine taxa. During the Eemian, however, this may not only be the result of higher water temperatures but also of an exceptionally high diverse substratum and topography caused by the immediate preceeding retreat of the late Saalian ice advance. The Eemian is characterised by the unique occurrence of marine taxa such as *Gibbula magus, Turboella radiata, Ocenebra erinacea, Haedropleura septangularis, Chlamys flexuosa, Crassadoma distorta, Lucinella divaricata, Hemilepton nitida, Acanthocardia tuberculata, A. paucicostata, Tellina distorta, Gastrana fragilis, Gastrochaena dubia*, etc. Characteristic non-marine taxa are *Orcula dolium, Perforatella bidentata* (small form). *Theodoxus fluviatilis* has a first Quaternary appearance during an early phase of the Eemian and characterises Eemian and Holocene fluvial assemblages.

Cold Quaternary marine assemblages only yield significant stratigraphical species during the Early Pleistocene (see above). Similar assemblages of Middle to Late Pleistocene age are only scattered preserved in the record and yield age indifferent impoverished assemblages with e.g. *Portlandia arctica*, several *Yoldiella* taxa, *Altenaeum dawsoni*, etc. Non-marine cold assemblages are already present during the Tiglian and the Bavelian (*Vallonia tenuilabris, Columella columella*) but are more frequently found in Late Middle and Late Pleistocene deposits. Critical taxa are: *Columella columella, Vertigo genesii, Vertigo parcedentata, Pupilla loessica, Vallonia tenuilabris, Gyraulus acronicus, G. rossmaessleri, Pisidium stewarti, P. obtusale lapponicum, P. lilljeborgi*, etc.

Although the Netherlands are situated in a rather continuously subsiding part of the North Sea Basin, molluscan biostratigraphy only covers part of the Quaternary stratigraphical column. However, the geographical position of the area may provide important clues for correlating continental European stratigraphy with the marine oceanic (isotope) record.

The most important molluscan Quaternary biostratigraphical phenomena are:

- Immigration of marine Pacific immigrants into the North Sea Basin, starting already in the Pliocene and ending in the Late Tiglian,
- Immigration of high boreal and arctic marine taxa into shallow marine water of the North Sea Basin at the start of the Praetiglian, c. 2.55 Ma,
- Extreme faunal turnover in non-marine taxa at the Plio-Pleistocene boundary (Reuverian/Praetiglian transition),
- A second, but much less severe faunal turnover event at the end of the Late Tiglian, especially in the marine and land assemblages,
- A gradual extinction of fluvial, especially prosobranch taxa. The main observed steps are at the end of each of the following stages: Tiglian, Bavelian, Noordbergum/Neede Interglacial (~MIS 11), and Oostermeer Interglacial (~MIS 7),
- The occurrence of high amounts of warm-temperate marine taxa during the Oostermeer to Holocene interglacials, with a culmination in the Eemian.

The distribution, morphology and peculiarities of ecology of new in the fauna of Ukraine species *Sinanodonta woodiana* (Mollusca, Bivalvia, Unionidae)

Ruslana MELNYCHENKO, Olesya PAVLYCHENKO,
Agnes STADNYCHENKO

Zhytomyr State University, B. Berdichevskaya Str. 40, 10008, Zhytomyr, Ukraine,
E-mail: melnicenko@orta.zt.ua

One of the main trends in modern zoology is the study of implant species. Thus, in the middle of the last century, the far - eastern *Sinanodonta (=Anodonta) woodiana* Lea, 1834, which is natural in China, Korean peninsula, the South of Primorsky Territory in Russia, was

implanted in the freshwater ecosystems of Europe. According to literature data, the *Sinanodonta (=Anodonta) woodiana* populations are registered in France, Germany, Austria, Romania, Serbia, Hungary, Poland, Czech Republic. On the territory of Ukraine this species was first registered in the August of 1999 in the Danube-Sasyk canal near the village Primorskoe in Odessa region by the scientist from the Hydrobiology Institute, National Academy of Sciences of Ukraine (Yurishinets, Kornyushin, 2000). In the summer of 2003 the stable populations of *S. woodiana* were registered in the many branches, Bazarchuk back-water and in the shallow waters of the Danube delta (Sinictsyna et al., 2004).

In the July of 2004 we registered *S. woodiana* in other 3 places of Odessa region: in the ditch in 1 km from the Kugurluy Lake near the village N. Nekrasovka; the Repida river near the village Matroska; the canal in 2-3 km from Reny settlement.

The Ukrainian *Synanodonta* populations are characterized with high level of shell morphological variability which testifies to the high ecological plasticity of this unionids species. The shell is large, of elliptical, irregular rhombic shape; the width and the height of the shell and the wing differ greatly. The coloring of periostracum varies from very bright green-pink or green-yellow to dark olive-brown with small pink patches in the upper part of the shell. The shell morphometric characteristics of the researched populations are: the length 46,6-179,4, the width 17,5-111,0, the crown height 27,2-111,85, the wing height 36,5-115,7 mm, the apex-lentgh ratio 0,24-0,54. The W/H index is most variable. In the waters with low stream veliocity (canals, lakes) wide molluscs with low wing prevail (W/H index 0,62±0,05) and *Sinanodonta* in the Repida river have narrow and high shells (W/H index 0,33±0,06).

In the researched *S. woodiana* populations 3-6 year-old molluscs prevail (62,5-81,8 %), the youngest are 2 years old and the oldest ones are 10 years old. The population density and the biomass are small, 0,5-5 specimens / m^2 and 61-910 gr / m^2 respectively, the highest indices are in mollusc populations of the Danube-Sasyk canal near village Primorskoye. *S. woodiana* is met with aboriginal representatives of European Unionidae fauna: *Unio tumidus* (Philipsson, 1788), *U.pictorum* (Linnaeus, 1758) and *Anodonta piscinalis* Nilsson, 1822. The population density varies from 1 (the Danube-Sasyk canal) to 9-13 specimens / m^2 (the Repida river), the size and the weight are much lower than those of *S. woodiana.*

The researched molluscs live mostly in canals, rivers with low stream velocity and also in rushy lakes. In the researched reservoirs *S. woodiana* live at the depth of 0,4-1 m and only in the Repida river at the depth of 2-2,5 m. The ground deposits are mostly silt, sometimes sand, the water hardness is moderate 2,9-3,8 mmol/l, the oxygen level – 75-95 %, acidity within the mesotype (pH 7,6-8,4).

Last glacial palaeoenvironmental changes in western Europe recorded by the malacofauna of Nussloch loess (Germany) and perspectives in quantitative palaeoclimatic reconstructions

Olivier MOINE

Department of Geosciences, University of Massachusetts
611 North Pleasant Street, Amherst, MA 01003 USA
omoine@geo.umass.edu

The climate of the last glacial period is characterised by numerous millennial-timescale warm and cold oscillations, the so-called Dansgaard-Oeschger cycles and Heinrich events, put in evidence by ice-core and marine records in the North Atlantic area. Up to now, their impact on European terrestrial environments was mainly studied through several pollen records and a few speleothems. However, most of the complete records of the last climatic cycle are located in southern Europe and often present a low resolution for the glacial times. The high resolution study of two loess sequences from Nussloch (Germany) allowed the construction of a synthetic record encompassing the last glaciation between -70000 and -20000 years that complements geographically and temporally those previously presented.

The malacological analysis reveals that terrestrial land snail populations reacted to these millennial-timescale climate changes and are thus a good mean to depict associated environmental changes. Thanks to the correlation established with the GRIP ice-core (Greenland), we show that increases in mollusc abundance and juvenile proportions are linked with warmer phases, i.e. interstadials. In the same way, cyclic modifications of the local steppe-tundra environment characterise the impact of Dansgaard-Oeschger cycles, like repeated increases in local humidity alternating with phases of vegetation development. The se pattern is more clearly detectable throughout the expanded Upper Pleniglacial deposits, between around -35000 and 20000 years, than in the other parts of the sequence which are either characterised by a lower sedimentation rate like the Lower Pleniglacial, or reflecting different environmental conditions like during the Middle Pleniglacial.

However, in this study as in many others, the palaeoenvironmental interpretations of malacofauna variations are restricted to qualitative inferences due to a crucial lack of quantitative reconstruction methods adapted to this proxy. Consequently, the development of quantitative transfer functions appears to be an essential step for terrestrial mollusc fauna to be acknowledged as a valuable and inescapable proxy for palaeoenvironmental and paleoclimatic reconstructions by the paleoclimatologist community. In this direction, both a basic adaptation and application of the Mutual Climatic Range method to modern and fossil malacofauna was attempted a few years ago. Its applications allowed the characterisation of both modern latitudinal thermal gradient in Europe and main temperature fluctuations during the last climatic cycle at Achenheim (France). However, this preliminary study put in evidence several limitations and bias inherent to the format and extension of species geographical distributions, the calculation of environmental parameter estimations, the lack of knowledge on which parameters (or combinations of parameters) really constrain species geographical distributions. All these points require to be solved before any further applications, but are far to be insuperable. We are still confident that it can be done, but some of them will require a joint effort of the malacologist community. Indeed, the only tool that could now helps in making striking progresses in this direction would be the creation of a European database of modern terrestrial mollusc assemblages, as others were already set up for pollen in Europe and Africa, leading to the development of the BIOME models and numerous pollen-based transfer functions whose the usefulness is nowadays fully acknowledged by the paleoclimatologist community. Inspired from the biome reconstruction principle, e.g. determination of a vegetation biome based on present taxa in a pollen assemblage, we also plan to develop a similar method to reconstruct the vegetation type from mollusc assemblages, as terrestrial mollusc species show physiological adaptations to their environment similar to plant taxa ones, making the Mutual Climatic Range method less accurate in the case of the vegetation.

Consequently, this would allow us to realise a significant progress in the quantitative knowledge of the ecological tolerance thresholds of terrestrial mollusc species, and to establish a more precise link between species and environmental parameters that will facilitate qualitative interpretations. This would also give us the opportunity of taking into account much more parameters in quantified environmental reconstructions and choosing the most appropriate ones depending on the present species and both studied area and time period.

Aspidogaster conchicola Baer – the parasite of Unionidae in Ukraine

Olesya PAVLYUCHENKO

Zhytomyr State University
V. Berdychivska Str., 40, Zhytomyr, Ukraine, 10008.
E-mail: pavljuchenko@mail.ru

One of the most distributed parasites of *Unionidae (Mollusca, Bivalvia*) in Ukraine is the *Aspidogaster conshicola* Baer, 1827 (*Plathelminthes, Aspidogastrea)* in molluscs this helminth is located mainly in pericardium and seldom in kidneys. In Ukraine it is registered in 18 species *Unionidae*: *Batavusiana nana carnea* (Küster, 1878), *B. fuscula fuscula*

(Rossmaessler, 1836), *B. musiva gontieri* Bourguignat, 1881, *B. irenjensis* (Kobelt, 1912), *Unio pictorum ponderosus* Spitzi & Rossmaessler, 1844, *U. rostratus rostratus* (Lamarck, 1819), *U. tumidus falcatulus* Drouët, 1881*, U. conus borysthenicus* Kobelt, 1879, *U. limosus graniger* Ziegler, 1847, *C. ponderosum rumanicum* Bourguignat, 1880, *C. piscinale falcatum* (Drouët, 1881), *Anodonta cygnea* (Linné, 1758), *A. zellensis micheli* Modell, 1945, *A. stagnalis* (Gmelin & Linné, 1791), *Pseudanodonta complanata complanata* (Ziegler & Rossmaessler, 1835), *P. kletti* (Rossmaessler, 1835), *P. elongata tanousi* Bourguignat, 1880, *Sinanodonta woodiana* Lea, 1834. The helminth is found in basins of all the main rivers of Ukraine. More often it is met with in basins of the Siversky Donets (the occurrence 97%), the Western Bug (93.3%), the Dnieper (91.9%). The lowest occurrence is registered in the Danube – 68.9%.

It is established that *Unionidae* are characterized with different levels of invasion with this helminth. The highest levels of invasion extensivity are registered in *U. limosus* and *B. irenjensis* (72.7 and 62.5% respectively) Other representatives of *Batavusiana* genus are characterized with low level of invasion – 12.5–20.3%, invasion intensivity – 1.6–4.1 specimen/individual. The *A. conchicola* helminth is more often found in these molluscs in the basin of the Western Bug; it is found only in 5.1–12.9% of examined molluscs in other regions of Ukraine. The invasion extensivity in *Pseudanodonta* species is moderate (28.7–46%), but they have the highest intensivity levels of invasion with aspidogasters (3.7-6.1 sp/ind.) As species of this genus are found very seldom, the occurrence of *A. conchicda* in woodland, steppe, forest-steppe regions is only within 3–8,8%. The invasion extensity in genus *Anodonta* molluscs – 21.6–34.5%, the intensivity 2.3–3.0 sp/ind. The helminth occuttence in these animals is 15.6–29%. In the basis of the Danube the extensivity of invasion with *S. woodiana* aspidogasters is 25.5–28.6%, the intensivity – 1.5–2 sp/ind. In most river basins of Ukraine (except the Western Bug) the highest levels of helminth occurrence are registered in *Unio* and *Colletopterum* (24.1 – 100%). The representatives of these two genera are most distributed among *Unionidae*. And they (*U. conus, U. tumidus, C. Ponderosum,* C piscinale) are characterized with high levels of invasion extensivity (up to 62.1%). Thus,exactly these species of *Unionidae* play the main role in keeping up the aspidogaster population. But low levels of invasion extensivity and intensivity (19.3% and 1.2 sp/ind respectively) are registered in *U. pictorum,* one of the most distributed species of *Unionidae* in Ukraine, and thus testify to the selectivity of mollusc invasion with *A. conchicola* helminth.

The Hoxonian (Holsteinian) interglacial and palaeolithic site at West Stow, Suffolk, UK

Richard C. PREECE

Department of Zoology, University of Cambridge, Downing Street, Cambridge CB2 3EJ UK
rcp1001@cam.ac.uk

Results will be presented of multidisciplinary investigations undertaken on a Middle Pleistocene sequence at Beeches Pit, West Stow, Suffolk, UK. Here, glacial deposits (till and outwash gravels) referable to the Anglian (Elsterian) Lowestoft Formation fill a subglacial channel cut in Middle Chalk. Above these glacial deposits, a series of interglacial sediments occurs, consisting of limnic, tufaceous and colluvial silts, lacking pollen but rich in shells, ostracods and vertebrates. Lower Palaeolithic flint artefacts of Acheulian character, including refitting examples, have also been recovered. Charcoal is abundant at certain horizons and many of the bones have been burned, as well as discrete areas of sediment, which are interpreted as hearths. The molluscan fauna comprises some 78 taxa and includes species of considerable zoogeographical and biostratigraphical importance. The land snail assemblage from the tufa consists of woodland taxa with no modern analogue, including species that are either extinct (e.g. *Zonitoides sepultus*) or which no longer live in Britain (e.g. *Platyla polita, P. similis, Neniatlanta pauli*). This is also the type locality of *Retinella (Lyrodiscus) skertchlyi*, which belongs to a subgenus of zonitid land snail now living only on the Canary Islands. There are indications from this fauna that the climate was

wetter and perhaps warmer than the present day. The vertebrate fauna is also noteworthy and includes *Arvicola terrestris cantiana, Microtus (Terricola) subterraneus, Talpa minor, Trogontherium cuvieri, Oryctolagus* cf*. cuniculus, Apodemus maastrichtiensis, Eliomys quercinus* and *Zamenis longissimus*. Both the molluscan and vertebrate faunas suggest correlation with the Hoxnian (= MIS 11). Uranium series dates from the tufa (>400 ka BP), TL dates from burnt flints (414 ± 30 ka BP) and a range of amino acid racemization data are broadly consistent with this correlation. The upper levels include much material reworked from the interglacial sediments but there is clear faunal evidence for climatic deterioration. Archaeologically the site is unusual in showing the presence of Acheulian activity within closed deciduous forest. Biostratigraphical correlations with other Lower Palaeolithic sites lends support to the suggestion that Acheulian and Clactonian industries occurred in southern Britain during the same substage of the Hoxnian, although not necessarily at precisely the same time.

A new method to increase snail counting speed

Julien ROSSIGNOL

Institut des Sciences de l'Evolution de Montpellier, (UMR CNRS-UM2 5554)
Equipe Paléoenvironnement, Bât.22 CC061
Place Eugène Bataillon, 34095 Montpellier France
rossigno@isem.univ-montp2.fr

Malacological analyses require much patience. Indeed, counting snails parts (apex, entire individuals, and apertures), is very long and fastidious. One part of this work is to separate the snail shells from their sediment. In loess studies, most of the sediment is first sieved and dried on the field, then sieved another time in the laboratory in sieving rooms to eliminate as much sediment as possible. However, many loess granules are not eliminated, and in addition loess obstructs many apertures. Apertures are often keys to determinate species appartenance (denticles, lips...), and washing them one by one takes time.
Many methods have been tried to separate better snails from their sediment: density liquors, chemical treatments (H_2O_2), but they cost money and require security.

To clean obstructed apertures, we used to put them in an ultrasound bath. We knew that some apertures were broken by doing so, but not how many. We propose a new method to increase counting speed based on ultrasound bath, but on a loess sample. This study presents preliminary results using this method. It seems to present advantages:

1) Ultrasound-bath have the property of defloculating loess granules so that they are eliminated through sieving. Only the snail shells are left, saving a lot of time.
2) You can use this method with a relatively cheap ultrasound machine. Once bought, you can use it on all samples.
3) Ultrasounds involve no chemical alterations on snail shells, so they can be used for further analysis such as geochemical or racemization analyses.
4) This method allows to clean snails massively, helping greatly the identification of snail shells having diagnosis aperture characteristics.

For this study we experimented ultrasounds effect on snail shells to determinate if the destruction of snail shells was important or not. We used different times of exposition to see which brings the lowest destruction with the best sediment reduction. We exposed different species to evaluate a potentially differential destruction, as well as different parts of the shells to evaluate which are the most likely destroyed. We evaluated as well the sediment reduction, and also the time gained in counting after using such a method (to see if this method is worth it or not).

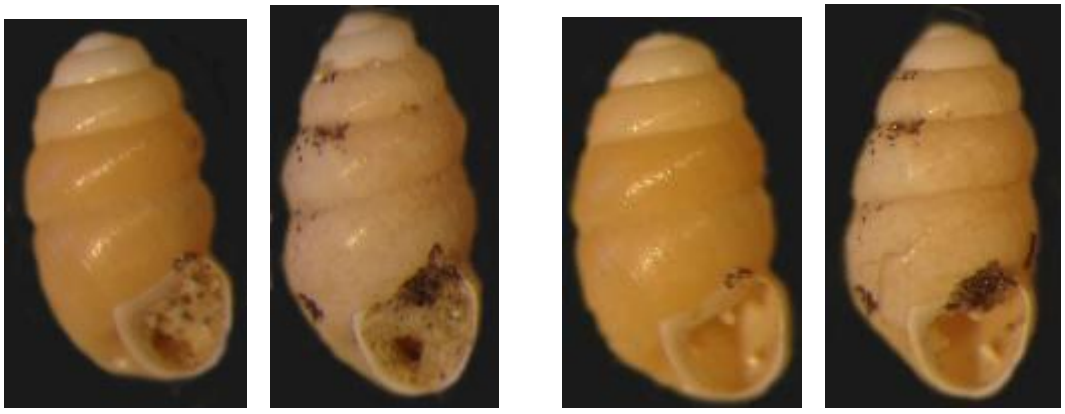
It appeared that this method works! Less of 10% of snail shells are destroyed by the process when a short time exposition is applied, with great sediment reduction, so you save a lot of time. However, it has its limits, as not all kind of samples can be used. With samples containing hard granules as calcareaous or MgO grains the shells are more likely crushed

and the sediment reduction is not worth it, whereas samples containing only loess granules are surprinsingly well reduced without affecting the shells (as shown below).

Photos of a sample (Eustis loess sample 16,4-16,5) before and after ultrasound bath:

Before After

Here is a photo of a shell before and after ultrasound bath.



Before After

Malacofauna of Eemian Interglacial in Belarus: stratigraphical aspect

Aleksander SANKO

Institute of Geochemistry and Geophisics, NAS of Belarus, Kuprevich str. 7, 220141 Minsk, Belarus, *sanko@ns.igs.ac.by*

The list of the Eemian (Muravian) Interglacial malacofauna of Belarus includes 95 (43 land and 52 freshwater) taxa. The land fauna has consist of forest species (41.9 %), mesophiles (30.2), gidrophiles (18.6) and species of open environments (9,3 %). Comparison of amount of taxa of forest molluscs to species of open spaces (factor of forestiation) shows, that the territory of the country has been covered with forests on 81.8 % in Eemian Interglacial.

The ratio of lake and marsh to river taxa in Eemian Interglacial was 40:12 (77:23 %). It means that the territory of Belarus was mainly lake plain on which there was an accumulation of lake sediments in quiet sedimentological conditions. The basis of erosion

on the rivers changed in small limits that caused rather weak movement of river waters embodied in the reophile fauna.

The land Eemian malacofauna contains 34.9 % of the species typical for warm epoch of Pleistocene. The quantity of peryglacial species in Early and Late Eemian fauna makes 9.3 %. Other species are indifferent.

Eemian molluscs as a whole and its separate representatives are used for diagnostics of age of Eemian sediments. Freshwater mollusc *Pisidium sulcatum (=P. astartoides)* belongs to fossil species of Eemian Interglacial. Exotic species *Fagotia acicularis, F. esperi, Dreissena polymorpha, Belgrandia marginata* and some other have stratigraphic value and allow to diagnose age of fauna and sediments.

Ponto-Caspian species *Dreissena polymorpha* has penetrated on territory in Quaternary twice: during the historical epoch conterminous on time with distribution of navigation on the rivers, and in Eemian Interglacial. The species was one of the most widespread freshwater molluscs in an optimum of Eemian Interglacial. The quantity of its shells in the common structure of fauna achieved up to 91.5 %. *D. polymorpha* shells are not found out in more ancient interglacial sediments. Northern area of *D. polymorpha* marked a line of a watershed between Black and Baltic seas water-pools.

Two mollusc from the Black sea shore (*Fagotia acicularis* and *F. esperi)* were distributed to territory of Belarus from the south. Northern border of their area was moved to the north on 5-10° latitude in Eemian optimum in comparison with a modern area.

Atlantic mollusc *Belgrandia marginata* has penetrated on territory from the west only into time of Eemian Interglacial. Shells of *B. marginata* are found out by present time in two sites: outcrop Zhukevichi in the Grodno area and borehole TL-48 (Belynichi) in the Mogilev area. Freshwater mollusc *B. marginata* lives in the rivers of France and Spain. The species expanded an area to the Middle Europe during the Pleistocene Interglacials. If interpolate climatic conditions of northern France where the species lives, for Middle Belarus, we can assume the average temperatures of January in limits 1-5°C and average temperatures of July 17-22°C.

Hence, the freshwater fauna of molluscs has penetrated into dranage-basin of the Upper Dneper in an optimum of the Last Interglacial from the south and from the west. Such phenomenon specifies warmer and damp climatic conditions of the Eemian (Muravian) Interglacial of Belarus in comparison with modern climate and even one of optimum in Holocene.

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Late Pleistocene and Holocene vegetation by the materials of the Southern Russian Plain

Aleksandra SIMAKOVA

Geological institute of RAS, Pyzhevsky 7, Moscow, Russia;
e-mail simakova@ginras.ru

The new pollen data received from the three loess-soil sections, located on the Northern Azov Sea coast areas have allowed carrying out a more realistic reconstruction of the paleovegetation history of the southern Russian Plain during the Late Pleistocene – Holocene. The analysis of collected palynological materials made it possible to study temporal dynamics of distribution of indicator plant species and vegetation paleophytocoenoses during the second part of the Late Pleistocene and Holocene.

During the last interglacial warming (Mikulino) forest-steppe landscapes dominated on the territory of the Sea of Azov coast. Broadleaf forest occurred in river valleys, and patches of pine forests were associated with the uplands and terraces. The meadow-steppe vegetative communities occupied the open territories.

During the Briansk Interstade (33000-24000 yr. B.P.) periglacial grass steppe and Chenopodiaceae- grass communities prevailed on the southern Russian Plain to the south of 49° -50° N.

The last glaciation (24000-12400 yr. B.P.) *Artemisia*-Chenopodiaceae steppes have been widely developed with participation of tundra species and semidesertic elements, rare with *Pinus, Betula, Quercus,* and *Ulmus* on the seaside territories of the Russian Plain.
During the Bølling–Allerød Interstadial complex warming (12400-10900 yr B.P.) *Artemisia*-Chenopodiaceae steppes of the glaciation time were replaced by herb-grass steppes. In river valleys the forests from a willow, birches, pines, alder, and sallow-thorn occurred.
During the Younger Dryas Stadial cooling (10900-10200 yr. B.P.) paleophytocoenoses of meadow, grass-herb, and Artemisia-Chenopodiaceae steppes with patches of mixed forest occurred here.
Within the limits of the steppe zone forest-steppe landscapes were located in the Donetsk highlands and in the Don River valley (Grichuk, 1982).
During the Early Holocene (10200-8000 yr. B.P), the northern boundary of a steppe zone coincided with the northern boundary of modern grass-herb steppe. During the Atlantic optimum (6000-4800 yr. B.P.) xerophytic forest-steppe communities were widespread on the Northern Azov Sea coast areas.
The paleovegetation reconstructions demonstrate the relative stability of paleovegetation zones in the southern Russian Plain and a significant transformation of coenoses structure connected to ranges dynamics of separate plant representatives.
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The relics molluscs of Central Russian Upland

Eduard A. SNEGIN

Belgorod state university, Russia, ***snegin@bsu.edu.ru***

The relict fauna of terrestrial molluscs of Central Russian Upland is presented by several xerophilous species. These species are united into three relict groups. The first, the so called Mediterranean group, includes *Helicopsis striata* Mull., *Pupilla triplicata* Stud., *Pupilla sterri* Voith., the second – East- Mediterranean group - *Chondrula tridens* Mull., the third – Middle-European group - *Truncatellina cylindrica* Fer.

The basic area of these species is the mountaineus regions of Europe and Asia. These molluscs penetrated on the Central Russian Upland in the maximum glaciation epoch (quartenary period). At that time the Central Russian Upland was not covered by the glacier and was an island in the middle of the “glacial sea”. Therefore these species have survived in this area. Later on, in the post-glacial period, they spread over the adjacent territories.

The habitat of the above mentioned molluscs is a relict phytocoenosis now, which is known as “lowered alpine plants”. They were developed on chalky slopes. These associations include some plants of the glacial period: *Hyssopus officinalis* L., *Genista tanaitica* P. Smirn., *Selene cretacea* Fisch., *Artemisia hololeuca* Bess., *Scrophularia alata* Gilib., *Androsace koso-poljanskii* Ovcz., *Schivereckia podolica* Andrz., *Bupleurum falcatum* L. and others. All these plants are represented in alpine and mountain type groups.

One more the Pleistocene relict is mollusc Cepaea vidobonensis Fer. Nowadays at the territory of Central Russian Upland this species dwells in glacial and pre-glacial community, such as cretaceous pine and mountain oak forests. Same relicts of the tertiary period - *Pinus silvestris* L. var. *cretacea* Kom. and *Daphne sophiae* Kalen can also be found in these plant associations.

All of the above mentioned species of molluscs have been entered into the regional Red Book.

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Molluscs of genus *Theodoxus* Montfort, 1810 (Gastropoda, Neritidae) of Ukrainian Black Sea Coast and hypothesis of its descent in Black Sea bays

Mikhail O. SON.

Odessa Branch of the A. O. Kowalewsky Institute of Biology of Southern Seas, NASU, Pushkinskaya str. 35, Odessa, 65000 Ukraine, malacolog@ukr.net

There are 6 species pointed in freshwater and brackishwater continental waterbodies of: *Theodoxus astrachanicus* Starobogatov in Starobogatov, Filchakov, Antonova et Pirogov, 1994 (Dnister Delta); *Th. donasteri* (Lindholm, 1908*)* (bottom of rivers: Danube, Dniester, Dnieper, South Bug; Kuchurgan and Dniester limans, Lake Yalpuh, Lake Sasyk); *Th. euxinus* (Clessin, 1885) (Dniester Delta, Berezan, Sosyk and Dnieper-Bug limans, Lake Yalpug); *Th. fluviatilis* (Linnaeus, 1758) (rivers: Danube, Dnieper, Dniester, South Bug, Dnieper-Bug Liman, Kuchurgan Liman, Liman Zbur'evskij, Lake Yalpuh, Lake Kagul, in XX centuries expansion in Crimea); *Th. sarmaticus* (Lindholm, 1901) (South Bug, Dnieper-Bug Liman, Liman Zbur'evskij); *Th. velox* V. Anistratenko in O. Anistratenko, Starobogatov et V. Anistratenko, 1999 (Danube Delta (det. V. V. Anistratenko), Liman Zbur'evskij).

Findings of *Th. euxinus* and *Th. fluviatilis* in desalinated bays of Black Sea (Odessa, Yagorlitsky and Tendrovsky bay) (Anistratenko, 1996; Butenko, 2001), don't connected with recent estuary systems, are the very interesting facts. We propose hypothesis of their descent, connected with changes of direction of Dnieper's channel.

Initially the Dnieper flows into the Karzhinsky bay and formed seashore in the Karkinitsky bay (Mindel Epoch of Quaternary Period). Afterward mouth of Dnieper moved to the west, to the depth of Tendrovsky bay (Riss Epoch of Quaternary Period). Afterward the Dnieper in series moved its mouth to the middle of Tenderovsky bays and to the Yagorlitsky bays (Velikochat'ko, 1938). Forming of Kinburnskaya Kosa Peninsula sharply turned direction of stretch to the west, captured South Bug estuary system, (Mordukhaj-Boltowskoj, 1960) and formed seashore rested to Odessa Bay. In XX century took place regulation of Dnieper's run-off and desalination of Black Sea by Dnieper outside the province of Dnieper-Bug Liman comparative declined.

So, in Black Sea located 3 zones of quaternary seashores of Dnieper: Karkinitsky Bay; Yagorlitsky and Tendrovsky Bays; zone from mouth of Dnieper-Bug Liman to Odessa Bay.

It is appropriate propose here that, what habitation *Th. euxinus и Th. fluviatilis* in Yagorlitsky, Tendrovsky abd Odessa Bays have relic character and above-mentioned molluscs treated as separate zoogeographical group of Black Sea fauna, what we called: «relicts of quarternary mouth areas of Dnieper».

The molluscs of the family Lymnaeidae of Ukraine

Agnes P. STADNYCHENKO

Bolshaya Berdichevskaya str., 40, 10001 Zhytomir, 10008 Ukraine
Kyrychuk@zu.edu.ua

The fauna of the family Lymnaeidae of Ukraine was the object of investigation by zoologist fairly (Eichwald, 1830; Knynicky, 1837; Siemaschko, 1849; Jachno, 1870 a, b, Kotula, 1882, 1884; Bąkowski, 1892). Heterogenety of the zoogeographical composition of the Lymnaeidae fauna of this region, it qualitative variability and quantative development is associated with a complex structure of relief, climatic differences between natural zones of the district, peculiarities of water regime and with increasing economic activities of man.

Author's collections and the funds of number zoological museums (Moscow, St.-Petersburg, Kiev, Lvov) served as a basis for the work presented below. During period 1964 – 2005, over 2000 samples were investigated in the different waterbodies of Ukraine. More then 9 thousands specimens were used.

According to a recent taxonomy of European/Asian Lymnaeidae fauna of Ukraine it is represented by 41 species and subspecies, belonging to one genera – Lymnaea, to 8 subgenera – *Lymnaea* s. str., *Corvusiana, Stagnicola* s. str., *Ompiscola, Galba, Peregriana, Myxas, Radix* and to 12 sections (Starobagatov, 1977; Stadnychenko, 2004). It is the list of this species: *L. stagnalis* (L., 1758), *L. fragilis* (L., 1758*), L. doriana* Bgt., 1862, *L. corvus* Gmel., 1791*, L. gueretiniana* Serv., 1881*, L. palustris palustris* (O.F. Müll., 1774), *L. atra atra* (Schr., 1803), *L. callomphala* Serv., 1881, *L. turricula* Held, 1836, *L. pachyta* Wstl., 1885, *L. vulnerata* Küst., 1867, *L. danubialis* (Schr., 1803), *L. badia* Küst., 1867, *L. berlani* Bgt., 1870, *L. clavata* Wstl., 1885*, L. glabra* (O.F. Müll., 1774), *L. gingivata* Goup., 1835*, L. truncatula* (O.F. Müll., 1774*), L. thiessae* Cles., 1879, *L. subangulata* Rof., 1868*, L. goupili* Moq.-Tand., 1855, *L. oblonga* Put., 1847*, L. peregra* (O.F. Müll., 1774*), L. bącowskiana* Cles., 1879*, L. gibilmannica* (Da Costa, 1839*), L. mucronata* Held, 1836*, L. fulva* (F. Schmidt, 1847), *L. monnardi* (Hart., 1844*), L. intermedia* (Lam., 1822), *L. ovata* (Drap., 1805), *L. ampullacea* Rossm., 1835*, L. balthica* (L., 1758), *L. lagotis* (Schr., 1803), *L. fontinalis* (Stud., 1820), *L. tumida* Held, 1836, *L. patula* (Da Costa, 1778), *L. hartmanni* (Stud., 1820), *L. mabillei* Loc., 1893, *L. glutinosa* (O.F. Müll., 1774), *L. dupuyi* Loc., 1893, *L. auricularia* (L., 1758), *L. psilia psilia* Bgt., 1862.

Usually Lymnaeidae lives in the great and small rivers and in different type of the other waterbodies, namely: streems, springs, crecks, natural and artificial lakes, ponds, marshes, pools, canvases, etc. Often Lymnaeidae molluscs produce numerous populations. The density of these animals is rich 17 – 261 specimens/m^2. As a rule, in the big and small rivers inhabit *Lymnaea* s. str. and *Radix* species. In the small temporary waterbodies meet *Galba* species. *Corvusiana, Stagnicola, Omphiscola, Peregriana, Myxas, Radix* live in the various waterbodies – big and small, with the stream and without it, near the shores and on the depth (to 1.5 – 2 m).

The majority of Lymnaeidae act as intermediate hosts for larval stages (sporocyst, redia, cercaria) of Trematoda. The adult stages of these worms parasite in various species of freshwater fishes, amphibians, birds and mammals.

Preliminary research report on the genus cf. *Hauffenia* (Mollusca: Gastropoda: Hydrobiidae:) distribution in Slovakia.

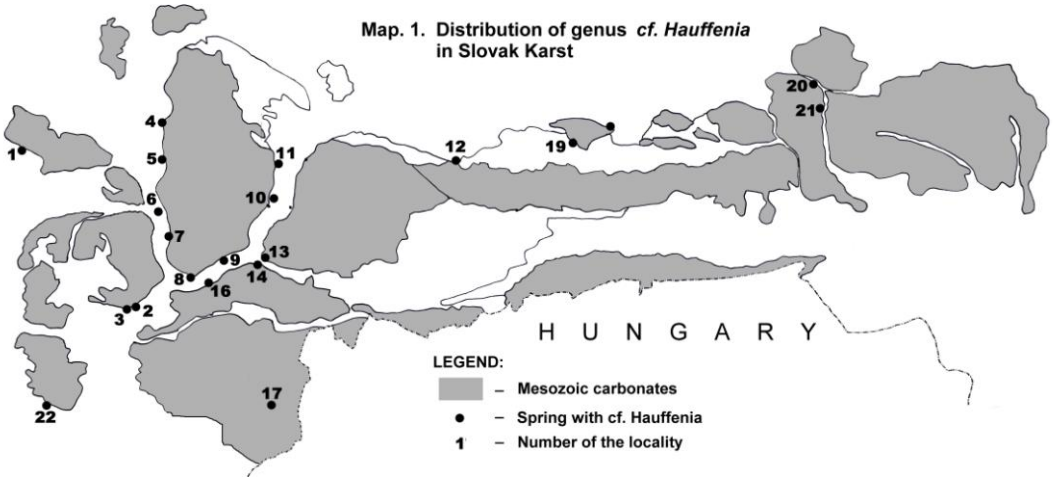
*Jozef ŠTEFFEK,**Jozef GREGO **

**Technical University Zvolen, Faculty of Ecology and Environmental Sciences, Department of Applied Ecology, SK-969 01 Banská Štiavnica, Kolpašská 9/B, steffekjozef@yahoo.com*
*** SK-97409 Banská Bystrica, Limbová 23, jozef.grego@degussa.com*

The valvatiform Hydrobiidae species detected in karstic springs of Slovakia are probably closest related to East-Alpine genus *Hauffenia*, but due to vast geographical and hydrological separation and lack of anatomical data the justification of the use of the genus name cf. *Hauffenia* for those populations is still not confirmed. The field research of all springs and caves in the area is in progress with the purpose to monitor their distribution range, as well as anatomical and molecular-biological studies to find their position within the Hydrobiidae. 39 springs out of the 110 possible localities have been sampled so far and the genus cf. *Hauffenia* has been detected in 25 Slovakian localities, belonging to 10 hydrologicaly isolated groundwater systems. However, the potential of the area is much bigger, and at the end of our research we would like to bring a comprehensive overview about their taxonomy and distribution.

The 10 known *Hauffenia* species are only known from Southeast and Northeast Alpine springs and have been revised in detail by Bodon, Manganelli & Giusti (2001). Surprising finds of similar species in Slovakia are very remote from all other known localities. So far

shells of the genus cf. *Hauffenia* were detected in 25 Slovakian localities (21 in the Slovak Karst, two in Zvolenská kotlina Basin and one in Horehronské podolie Hills) belonging to 10 hydrologically isolated systems. Live captured animals from seven springs were obtained.



The main distribution range of cf. *Hauffenia* in Slovakia is the area of Slovak Karst and adjacent parts of Rimavská kotlina Basin. Singular finds in Driekyňa Valley, Mičiná travertine suggest its distribution also in Ponický kras Karst and the find in Maríková suggests the potential of Horehronské podolie Hills. Samples taken from the spring on the southern slopes of Muráňska planina Plateau, Slovenský raj and Tisovecký kras Karst were negative so far.

The importance of molluscs of the genus *Didacna* Eichwald for the Caspian Sea paleogeography

SVITOCH A.A.

Geographical Faculty, Moscow State University, Moscow, 119899, Russia
palaeo@geogr.msu.ru

Molluscs of *Didacna* Eichwald genus are known since the end of the early Pleistocene. They migrated to the Ponto-Caspian area from the adjacent brackishwater basin located close to the Aegian Sea. Abundant *Didacna* occurred in the Ponto-Caspian area during the late Pontian and Kimmerian epochs. In the Pleistocene epoch, active formation of the modern-like *Didacna* took place in the brackishwater Euxinian and, especially, Caspian basins. Later these species inhabited all shallow-water regions of these seas. Fossil *Didacna* shells are common component of the ancient Caspian Sea beds where they form, in combination with other species, several tanatocoenoses. Among other endemic ancient Caspian molluscs, *Didacna* were the most ecologically plastic species used as the index group for paleogeographical reconstructions.

In the Caspian Sea Pleistocene *Didacna* groups form a sequence of four faunas: Bakunian-Urundzhikian, Khazarian, Khvalinian and Late Khvalinian ones used as the basis for subdivision of transgressive-regressive epochs, establishing the epochs of connection between the Caspian and Black seas and evolution of their salinity regimes.Three groups of *Didacna* molluscs are distinguished in relation to salinity: *trigonoides, crassa* and *catillus*. The relative abundances of these groups in sediments of various age show that during the Pleistocene the Caspian Sea represented a brackishwater basin which experienced small salinity and temperature variations. Its molluscan fauna consisted of the Caspian *Didacna* species with admixture of the species originating from the Sea of Azov and freshwater species.

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Variability of snails *Viviparus diluvianus* from eastern Poland versus climatic changes in the Holsteinian (Mazovian) Interglacial

Marcin SZYMANEK

Faculty of Geology, University of Warsaw, Al. Żwirki i Wigury 93, 02-089 Warsaw, Poland. E-mail: m.szymanek@uw.edu.pl

The Holsteinian lake deposits from Ortel Królewski in eastern Poland are characterised by a rich occurrence of malacofauna. Among mollusc shells the snail *Viviparus diluvianus* (Kunth) is very common and well preserved. Biometric analysis of five samples collected from deposits at Ortel Królewski shows variability within the population of *V. diluvianus*. Towards the top of the succession the mean slimness of the shell increases, the height of the last whorl and the height of the aperture become smaller in relation to shell height. These changes in shell morphology correlate with climatic conditions existing during the pre-optimum part of the Holsteinian Interglacial. Shells of the snail *V. diluvianus* from a rather cool *Picea-Alnus* pollen zone are smaller and much less slim than in population from the *Taxus* Zone registering the influence of oceanic climate. Higher temperatures and humidity favour growth of the *V. diluvianus*. In better climatic conditions population is more abundant and snails reach larger dimensions than in the *Picea-Alnus* Zone. Larger individuals are slimmer than the small ones, their last whorl and the aperture are smaller in relation to shell height. Thus in population from the *Taxus* Zone the mean slimness of the shell increases, the mean relative height of the last whorl and the aperture decrease. Variability in the snail *V. diluvianus* population results from changes of the distribution of shell size in particular samples, which is connected with climatic changes.

Postglacial to Recent molluscs of the Laptev and Kara seas

TALDENKOVA E.[1], BAUCH H.A.[2], STEPANOVA A.[3], SIMSTICH J.[4]

1 – Geographical Faculty, Moscow State University, Moscow, Russia (etaldenkova@mail.ru)
2 – Mainz Academy of Sciences, Humanities and Literature, c/o IFM-GEOMAR, Kiel, Germany (hbauch@ifm-geomar.de)
3 – Paleontological Institute RAS, Moscow, Russia (austepan@yandex.ru)
4 – Department of Earth Sciences, Cambridge University, Cambridge, UK (jsim03@esc.cam.ac.uk)

During the last ten years in the frame of the joint Russian-German „Laptev Sea System“ and SIRRO („Siberian River Runoff“) projects, several expeditions were organized to the Laptev and Kara seas, which enabled obtaining abundant new data on the present and past environments of these severe arctic regions. Here we present the results of our investigations of recent and fossil molluscs as an important component of benthic assemblages and an indicator of paleoenvironments.

The distribution of recent molluscs in coretop samples is analyzed in relation to environmental parameters. In the river-affected inner-shelf regions of the eastern Laptev and Kara seas *Portlandia arctica* is the dominant species. These areas are characterized by strong seasonal variations in salinity (bottom water salinity averaging 15-25), sediment and nutrient input, and existence of a fast ice cover during 8-9 months. Close to the river mouths, where bottom water salinity is around 10, *P. arctica* is accompanied by a brackishwater species *Portlandia aestuariorum*. In the middle-shelf regions with bottom water salinity around 30-32, the largely monospecific *P. arctica* assemblage is replaced by a more taxonomically diverse molluscan assemblage dominated by *Leionucula bellotii*, also including *Macoma calcarea, M. moesta, Astarte montagui, A. borealis*, and some other

species. The outer shelf and upper continental slope regions, where water depths exceed 60-70 m and bottom water salinity is 33-34 and more, molluscan assemblage is mainly represented by relatively deep-living species of *Yoldiella* genus, *Dacrydium vitreum, Arctinula groenlandica*.

Temporal changes in fossil molluscan assemblages are studied in six AMS^{14}C-dated cores, five from various parts of the Laptev Sea and one from the Kara Sea. Depending upon core site locations and ages, they display different patterns of paleoenvironmental changes in the course of postglacial transgression resulting from a combination of the rates of sea-level rise and coastal retreat, sedimentation rates, variations in freshwater discharge.

The oldest molluscan assemblage which dates back to 15.8 cal.ka has been recorded in core PS51-154 from the western Laptev Sea continental margin (water depth 270 m). The impoverished assemblage represented by only 2 species, *P. arctica* and *Thyasira gouldi*, occurred between 15.8 and 14.0 cal.ka, when, according to the other sedimentological and microfossil (ostracods and foraminifers) evidence, the core site was located close to the paleocoast and was subject to active downslope sediment movements. Absence of brackish shelf water masses and steep slope morphology favoured seasonally open-water nearshore conditions as indicated by the maximum percentage of planktic foraminifers. A constant inflow of Atlantic water to the site since 15.8 cal.ka till present is evidenced by the continuous occurrence of an indicator benthic foraminiferal species *Cassidulina teretis*. Between c.14.0 and 11.1 cal.ka, *P. arctica* dominated among molluscs. This time interval was characterized by seasonally changeable freshwater-affected environment, maximum freshwater outflow (especially around 13 cal.ka), highest supply of nutrients and freshwater organic matter, highest total abundances of microfossils, highest percentage of river-proximal species of foraminifers and euryhaline and brackishwater ostracods. The onset of the outer shelf flooding at 12.7 cal.ka (basal dating from core PS51-159, water depth 62 m) resulted in a drastic decrease in sedimentation rates at the continental margin. During the subsequent period, a transition occurred from *P. arctica* dominated assemblage to the modern-like deep-water one, which marked an establishment of full-marine conditions. *P. arctica* completely disappears from the core site area since c. 2 cal.ka. This period is characterized by increasing climatic cooling and humidification, growth of the Severnaya Zemlya ice cap as marked by the first IRD in the core sequence. Active ice-rafting of river-proximal microfossils to the continental slope might be caused by an increase in river discharge and sea-ice cover extent.

The cores obtained from paleoriver valleys of the outer-middle shelf in the western (PS51-159, Khatanga paleovalley, water depth 62 m) and eastern (PS51-135, Yana paleovalley, water depth 51 m, and PS51-138, Lena paleovalley, water depth 45 m) Laptev Sea date back to c. 12.7, 11.3, and 11.2 cal.ka, respectively. Fossil assemblages of these cores exhibit a similar downcore pattern documenting a gradual transformation of the Laptev Sea shelf environment due to the southward transgressing sea. However, the timing of the transitions between assemblages is different depending on the specific water depth of each core site. Three major phases have been recognized. These reflect: (1) a nearshore brackishwater environment of the initial stage of inundation with *P. aestuariorum* and *Cyrtodaria kurriana* assemblage, which existed for a very short time interval of 2-4 hundred years; (2) a shallow inner-shelf, fluvially-affected environment with *P. arctica* assemblage, which occurred during not more than 2 thousand years; (3) a modern-like marine environment with *L. bellotii* assemblage which eventually became established in the cores since c. 11.1, 10.8 and 8.2 cal. ka, respectively.

The cores from the inner-middle shelf of the Laptev (PS51-80, water depth 21 m) and Kara (BP00-07, water depth 43 m) seas date back to c. 6.4 and 8.1 cal.ka, respectively, and thus document the middle to late Holocene period of gradual sea-level stabilization and highstand. Therefore, changes in the species composition of fossil assemblages reflect not only the southward migration of shoreline but largely the variations in the amount and/or direction of river runoff. Although taxonomic diversity increases upcore, *P. arctica* predominates through both core sections, which is reasonable given the fact that the sites were continuously located within the inner shelf zone freshened by river discharge. In the core from the Laptev Sea, an increase in freshwater influence upon the site primarily evidenced by the appearance of brackishwater and euryhaline ostracod species corresponds to c. 2.7 cal.ka. In the core from the Kara Sea, similar increase occurred since c. 3.5 cal.ka.

The fauna, ecology and zoogeographical analysis of Planorbinae (Mollusca: Gastropoda: Pulmonata) in Shatsky national park (Ukraine)

Olena UVAYEVA

Zhytomyr State University, B. Berdichevskaya Str. 40, 10008, Zhytomyr, Ukraine,
E-mail: Uvaeva1980@mail.ru

There are more than 200 lakes on the territory of Shatsky national park. These lakes are located in the north-western part of Volyn region of Ukraine. The largest of them are Svityaz, Pulmo, Pisochne, Lyutsymyr. The littoral zone of lakes is shallow. The water clarity is rather high – 2-5 m, the water pH level varies from 7,6 to 8,8, the water mineralization is not high – 118-306 mg/l. The Svityaz and Pisochne lakes are α-oligosaprobic, the Lyutsymyr and Chorne lakes are β´´- mesosaprobic.

The Planorbinae subfamily of molluscs fauna in reservoirs of Shatsky lakes numbers 14 species (see the table). We discovered *A. perezi* here for the 1-st time.

It is worth noting, the Planorbinae are almost absent in the lakes themselves. Only single individuals of *P. planorbis* occur. For the water temperature in lakes is low, the water vegetation is poor, the bottom sediments are sand, the intensive water movement is registered in the littoral zone. Such conditions are very unfavourable for Planorbinae. But Planorbinae have very favourable conditions for their development on the lakeside (temporary ponds, pools, canals) and the high density of mollusc population is the proof of it (see the table). In semidry biotops of Svityaz lake the highest density of *P. planorbis* population in Ukraine (28000 specimens/m^2) is registered. For the stream is absent, the water vegetation is rich, the bottom sediments are silt, the water is well warmed. These conditions are very favourable for mollusc population, its growth in quantity and quality. The most distributed species in Shatsky lakes are *P. planorbis* (the occurrence – 70%), *A. leucostoma* (35%), *S. nitida* (30%). As for the zoogeography, the malacofauna of Shatsky lakes belongs to the Baltic province of the North-European superprovince. The highest diversity in species is typical for Holarctic and Palaeoarctic mollusc groups (see the table).

The structure of species, zoogeographical analysis and Planorbinae population density (N, spesimen/m^2) and biomass (B, g/ m^2) indices in Shatsky lakes

Molluscs species	Zoogeographical group	N / B
Planorbis planorbis (Linné, 1758)	Holarctic	631/42,1
Anisus albus (O. F. Müller, 1774)		7/0,065
A. acronicus (Férussac, 1807)		4/0,064
Armiger crista (Linné, 1758)		12/0,004
A. contortus (Linné, 1758)	Palaeoarctic	78/0,62
A. spirorbis (Linné, 1758)		13/0,15
A. leucostoma (Millet, 1813)		32/0,61
Segmentina nitida (O. F. Müller, 1774)		542/6,9
A. vortex (Linné, 1758)	Europe-Siberian	26/0,73
A. vorticulus (Troschel, 1834)		321/0,33
Hippeutis fontana (Lightfoot, 1786)		9/0,009
S. distinguenda (Gredler, 1859)	Europe-westsiberian	10/0,015
A. perezi (Graells in Dupuy, 1854)	European	12/0,04
A. septemgyratus (Rossmaessler, 1835)		15/0,27

Characteristic of molluscs community in native and polluted podzol soils of the Kola Peninsula

Svetlana A. VAL´KOVA & Irina V. ZENKOVA[2]

[1] *Kola Branch of Petrozavodsk State University, Apatity town 184209, Russia*
E-mail: Valkova@bel.arcticsu.ru
[2] *Institute of the North Industrial Ecological Problems, Kola Science Center, Russian Academy of Sciences, Apatity town 184209, Russia*
E-mail : Zenkova@inep.ksc.ru

According to the literature data, fauna of soil-dwelling molluscs (*Gastropoda*) at southern part of the Kola Peninsula consist of 13 species in total (Byzova at all, 1986). We have investigated the structure and dynamics of molluscs community at the territory of the central part of the region (67°34′N, 33°17′W) in the native northern-taiga podzol soils under the pine forests and in soils industrial polluted by the Kandalaksha aluminium factory (67°20′N, 33°20′W).

Such structural parameters of the community as species diversity, number, a biomass, domination and spatial distribution were investigated. Variation of these parameters in many-years and seasonal dynamics and their dependence from soil factors (temperature, humidity, acidity, depth and level of industrial pollution) were analased.

Under the northern-taiga pine forests at the research territory soil belongs to the Al-Fe-humus podzol type. Depth of organogenic horizon varies from 2,0 up to 9,5 cm. The value of pH_{H2O} makes 5,11-6,41. Variation of soil humidity in different months of a vegetative season consists 90-230%.

Community of soil-dwelling molluscs in pine forest consist of 8-9 species such us *Cohlicopa lubrica* Muller, 1774, *C. nitens* Gallenstein, 1852, *Discus ruderatus* Studer, 1820, *Euconulus fulvus* Muller, 1774, *Nesovitrea petronella* L.Pfeiffer, 1853, *Zoogenetes harpa* Say, 1824, *Vitrina pellucida* Muller, 1774, *Arion sp, Deroceras sp.* The share of *D. ruderatus* and *N. petronella* makes 49 and 31% of total quantity of molluscs correspondently.

Occurrence of molluscs in soil samples has made 40%. Mean number of molluscs for the 1996-2004 years has made 9,0±1,5 ind./m^2 and a biomass - 141,2±49,4 mg/m^2. Variation of these parameters in long-term dynamics has not exceeded 100%: CV_N = 47,3±11,8% and CV_B = 78,2±24,7%. In seasonal dynamic the greatest values of number and a biomass about 20 ind./m^2 and 150-200 mg/m^2 were marked in May-June. In the end of a vegetative season (August-October) these parameters decreased to 5 ind./m^2 and 30 mg/m^2.

The share of molluscs has achieved only 5-6% of the total number and a biomass of mesofauna. At the same time**,** share of molluscs biomass was reach up to 33% without taking into account the alive mass of earthworms. So, molluscs are one of dominant group of mesofauna and comparable with such polyspecies and numerous groups of soil invertebrates of the Kola region as flyers (*Diptera*), spiders (*Aranea*) and beetles (*Coleoptera*).

The main changes of structure of molluscs community in the soils polluted by emissions of an aluminium factory are reduction of number and a biomass and transformation the polyspecies structure of the community on monospecies one submitted by such eurytopy and polyphages species as *D. ruderatus.*

An outline of Pliocene - Pleistocene herpetofaunal changes from the Carpathian Basin

Márton VENCZEL

Tarii Crisurilor Museum, RO-410464 Oradea, B-dul Dacia 1-3, Romania, E-mail: mvenczel@rdslink.ro

The fossil record of amphibians and reptiles indicates that during Ruscinian - Villanyian times (MN 14 - MN 17) the territory of the Carpathian Basin was inhabited by representatives of at least 16 different families (Cryptobranchidae, Hynobiidae, Salamandridae, Albanerpetontidae, Discoglossidae, Palaeobatrachidae, Pelobatidae, Bufonidae, Hylidae, Ranidae, Geckonidae, Lacertidae, Anguidae, Boidae, Colubridae, and Viperidae).

The Biharian times are marked by lack of Cryptobranchidae, Albanerpetontidae, Geckonidae, and Erycinae Boidae. However, in some localities from the *Mimomys pusillus+savini* rodent zone, a number of thermophilous forms including the extinct *Pliobatrachus langhae, Pseudopus pannonicus, Zamenis paralongissimus*, were still present in the fauna. Similarly a relatively high number of extant taxa, many of them inhabiting presently south- or south-eastern territories of Europe, (e.g. *Scolecophidia indet., Elaphe quatuorlineata, Hierophis viridiflavus, H. gemonensis, Telescopus fallax, Vipera ammodytes*) were distributed in the Carpathian Basin also. The Last Occurrence Date (LOD) of the only European hynobiid genus *(Parahynobius)* is known from this interval too (Betfia 9/C, Romania). The end of *Mimomys savini* rodent zone is marked by the disappearance of most thermophilous taxa including *Pliobatrachus langhae, H. viridiflavus* and *V. ammodytes*.

In many instances the composition of Toringian herpetofaunas resembled that of our days. All known taxa from the families Salamandridae, Discoglossidae, Pelobatidae, Bufonidae, Hylidae, Ranidae, Lacertidae, Anguidae, Colubridae, and Viperidae belonged to extant genera and species only. In this respect the presence of an indeterminate agamid lizard (Agamidae) from the Late Pleistocene Tokod locality, Hungary may be considered an exception.

The Quaternary stratigraphy and correlation of the Pont-Caspian Region (on the basis of molluscs of the genus *Didacna*)

Tamara YANINA

Dept. of Geography, Moscow State University, Moscow, 119992, Russia, E-mail: didacna@mail.ru

Based on systematization and critical analysis of all known fossil records of a molluscan genus *Didacna* Eichwald from the Caspian and Black sea regions, as well as from the Manych depression, detailed schemes of the stratigraphy and paleogeographical evolution of these areas were established. Correlation of the established paleoevents revealed the major paleogeographical changes to be generally synchronous.

Didacna - molluscs of this genus inhabited the Pleistocene Ponto-Caspian basin, while their modern representatives occur only in the Caspian Sea. These latter represent the Cardiidae group characterized by rapid evolution within species and subspecies. This fact designated the importance of didacnas for stratigraphical differentiation, correlation and paleoenvironmental reconstructions of palaeobasins.

In the Caspian Sea region, succession of didacnas in the sediment sequence forms the following faunas: Bakunian, Urundzhikian, Early Khazarian, Late Khazarian, Khvalynian and New Caspian. Faunas were distinguished by the following criteria: taxonomic composition of each faunal group, predominance of a certain Didacna group, index-species, and occurrence in a certain sediment layer separated from neighboring beds by the tracers of disconformities. Each fauna consists of faunal assemblages with characteristic species

composition, strongly interrelated with each other. They correspond to sediment members within a formation containing a fauna. Most faunal assemblages are subdivided into subassemblages.

The established faunal groupings were the base for biostratigraphical subdivision of the Caspian Pleistocene, which is represented by the biozone *Didacna* Eichwald. This biozone is subdivided into subzones according to temporal distribution of fossils. In turn, subzones are the basis for establishing the following horizons: Bakunian, Urundzhikian, Lower Khazarian, Upper Khazarian, Khvalynian and After Khvalynian. Further subdivision of paleo-Caspian deposits into subhorizons is made in accordance with the faunal assemblages. Subdivision of sediments into beds is based on determination of subassemblages.

Pleistocene and Holocene deposits of the Black Sea region are characterized by a succession of different molluscan faunas: Chaudian, Ancient Euksinian-Uzunlarian, Karangatian, New Euksinian and Chernomorian. Unlike the Caspian Pleistocene, where faunas are established according to the distribution of species belonging to one genus, in the Black Sea Pleistocene, faunas are distinguished by the relative abundance of various ecological groups of species, namely the fresh-water, slightly brackish-water, true brackish-water and marine. Didacnas are the main component of brackish-water Chaudian and Ancient Euksinian-Uzunlarian faunas. They include species originating from the Black and Caspian seas. The Uzunlarian assemblage includes didacnas together with marine euryhaline species. The latter gradually become more abundant up the sediment sequence.

The Black Sea, as well as the Caspian Sea Pleistocene represents a biozone (genozone), i.e. deposits accumulated during the time range of Didacna existence interrupted by intrusions of Mediterranean fauna. This biozone is subdivided into five subzones, which are, in turn, the base for establishment of horizons: Chaudian, Ancient Euksinian-Uzunlarian, Karangatian, New Euksinian and Chernomorian. Faunal assemblages comprising a fauna are the base for establishment of subhorizons. Based on assemblage studies of didacnas from brackish-water faunas the following subhorizons were established: Lower Chaudian, Upper Chaudian, Ancient Euksinian, and Uzunlarian. Subassemblages comprising each particular assemblage, in their turn, were used for establishment of the beds.

In the Manych valley didacnas were found throughout all the deposits except for the Holocene. Species of the Caspian origin predominate including the index-species. The Black Sea endemics are represented by single Chaudian didacnas and relatively abundant Ancient Euksinian didacnas.

Malacofaunal analysis reveals the role the Manych strait played in the water exchange between the Pontian and Caspian basins. In the second half of the Early Pleistocene the Caspian waters of the Bakunian transgression inflowed into the Azov bay of the late Chaudian basin of the Pontian. The Caspian Bakunian molluscs settled widely in the Taman'-Kerch' region and penetrated quite far along its Caucasian coast. The presence of molluscs only of the Caspian origin in the Manych region reflects one-direction migration of the Caspian fauna.

In the Middle Pleistocene of the Caspian Sea, a large-scale early Khazarian transgression developed, while in the Black Sea depression the Ancient Euksinian brackish-water basin existed. Faunal exchange through the Manych Strait was intermutual, and direction of dominant migration was towards Pont, which has already been inhabited by numerous Caspian molluscs occurring in the nearshore areas of the Caucasian coast, Taman' and the Crimea. In the Northern Caspian Sea, index-species of the Ancient Euksinian deposits occurred.

At the beginning of the Late Pleistocene the largest Pleistocene Karangatian transgression took place in the Pontian region. It was caused by the intrusion of highly-saline warm Mediterranean waters. In the Manych lowland a deep estuary was formed which served as a pathway for further eastward penetration of transgressing waters as evidenced by numerous findings of shells of Mediterranean molluscs in deposits of this age. During that time the Late Khazarian transgression developed in the Caspian Sea, during the latest stage of which (Girkanian) a deep bay was formed. Its marginal zone reached the estuary of the Karangatian basin. When the regression of the Karangatian basin started the waters of the bay inflowed into the Black Sea depression as indicated by the presence of rare Girkanian didacnas in the Karangatian deposits. At the very end of the Late Pleistocene during the maximum of Khvalinian transgression the Caspian waters flowed through the Manych strait and emptied into the regressive New Euksinian basin. Taxonomic composition of the fauna points to one-direction migration of molluscs from the Caspian Sea into the

Black Sea. And only species able to tolerate strong freshening could reach it. It was the last, proved with palaeontological material, epoch of the existence of the strait.
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The influence of phenol on inorganic phosphorus content in tissues of freshwater bivalve mollusc *Unio tumidus* (Mollusca, Bivalvia, Unionidae)

Larysa YANOVYCH

Zhytomyr State University, B. Berdichevskaya Str. 40, 10008, Zhytomyr, Ukraine

The economic complex of Ukraine has been developing for many decades without regard for ecological after-effects. It resulted in ecological disaster, especially of water systems. The most wide-spread water pollutant is phenol. Phenol both of autochtonic and allochtonic origin is registered in water basins of different types, especially in summer. It forced the process of biological monitoring using model species. The use of molluscs for biological tests is expedient for their pollutants sensitivity is much lower and the endurance is much higher than those of other water inhabitants. Lately, biochemical methods are used for solving many ecological problems. They help to discover organism indicative states in different living conditions. The research of phenol influence on inorganic phosphorus content in mollusc tissues is important as phosphorus is one of the main organogenic elements.

In toxicological experiments about 100 specimens of *Unio tumidus* (Philipsson, 1788) in sprawning period collected in the river Teteriv in June-July of 2001 were used. In the laboratory the animals were poisoned with phenol in concentration corresponding to LC_{25} and LC_{50} (indices established in orienting experiment after U.A. Alekseyev). The exposition time – 2 days, the toxic environment was changed every day.

In females the inorganic phosphorus content is highest in gonads (0,0095±0,0007), then mantle (0,0073±0,0008), gills (0,0068±0,0008), hepatopancreas (0,0065±0,0003 mmol /g). In males the highest content of inorganic phosphorus is also in gonads (0,0082±0,0001), then gills (0,0071±0,0012), mantle (0,0064±0,0007), and the lowest is in hepatopancreas (0,0058±0,0008 mmol / g). In toxicant LC_{25} a sharp decrease of the index (from 70,59 to 91,38 %) is registered. In phenol LC_{50} a less sharp decrease (from 25 to 72,63 %) of phosphorus content in tissues is registered.

In our opinion these changes may be explained by the non-specific protective adaptability to stress factor based on the increase of metabolism. The organism needs more energy that forces the energetic substratum (glucose) fission with the formacion of ATA out ADA and phosphates. The character of changes in organism under increase of toxicant concentration prooves the depressive phase of poisoning pathological process develops rapidly ending in the exhaustion and death of animals.

List of Participants

Abelová Martina
Department of Geology and Paleontology, Masaryk University, Kotlářská 5, Brno
abelova.m@sci.muni.cz

Alexeeva Nadezhda
Geological Institute, Siberian Branch, Russian Academy of Sciences, Ulan-Ude, 670047, Russia
ochotona@online.ru

Bosák Pavel
Geological Institute, Czech Academy of Science, Rozvojová 135, CZ 160 00 Praha 6
bosak@gli.cas.cz

Bridgland David
Department of Geography, University of Durham, South Road, Durham DH1 3LE, UK
d.r.bridgland@dur.ac.uk

Čermák Stanislav
Institute of Geology and Paleontology, Charles University, Albertov 6, CZ 128 43 Praha
stanislav.cermak@seznam.cz

Cílek Václav
Geological Institute, Czech Academy of Science, Rozvojová 135, CZ 160 00 Praha 6
cilek@gli.cas.cz

Dvořák Libor
Šumava National Park Administration, Sušická 399, CZ-34192 Kašperské Hory, Czech Republic,
libor.dvorak@npsumava.cz

Fejfar Oldřich
Institute of Geology and Paleontology, Charles University, Alberov 6, CZ 128 43 Praha
fejfar@natur.cuni.cz

Frank Christa
Biozentrum der Universität Wien, Althanstrasse 14, A 1090 W i e n

Garbar G.A
Zhitomir University, street. B. Berdichivska 40, Zhitomir , 10008, Ukraine,
garbar@zu.edu.ua

Gaudenyi Tivadar
Quaternary Research Centre, Dept. of Geography, University of Novi Sad, Trg Dositeja Obradovića 1., 21000 Novi Sad, Serbia and Montenegro
e-mail: tiv@neobee.net

Geist Jürgen
Wild life Biology and Wildlife Management Unit, Technische Universität München – Weihenstephan, Am Hochanger 13, D-85354 Freising, Germany
geist@wzw.tum.de

Hlaváč Jaroslav
Geological Institute, Czech Academy of Science, Rozvojová 135, CZ 160 00 Praha 6
hlavac@gli.cas.cz

Honěk Alois
Research Institute of Crop Production, Ruzyně 507, CZ-16106 Praha 6, Czech Republic
honek@vurv.cz

Horáček Ivan
Department of Zoology, Charles University, Viničná 7, CZ 128 44 Praha, Czech Republic
horacek@natur.cuni.cz

Jäger Klaus-Dieter
Institut für Prähistorische Archeologie, Martin-Luther-Universität, Halle/Salle, Brandbergweg 230, D 06099 Halle/S.

Jankovská Vlasta
Botanical Institute AS CR Brno
jankovska@brno.cas.cz

Juřičková Lucie
Department of Zoology, Charles University, Viničná 7, CZ 128 44 Praha, Czech Republic
jurickova@natur.cuni.cz

Limondin-Lozouet Nicole
Laboratoire de Géographie Physique 1, Place A. Briand - 92195 Meudon cedex FRANCE
limondin@cnrs-bellevue.fr

Kernátsová Jana
Dionyz Stur Geological Institute, Mlynská dolina 1, 817 04 Bratislava, SK
kernat@gssr.sk

Klishko Olga
Institute of Natural Resuurces, Ecology and Criology, Siberian Branch of Russian Academy of Sciences, 26, Butina Str., Chita 672090, Russia. E-mail: root@cinr.chita.su

Kolfschoten van, Thijs
Department of Archaeology, Leiden University, P.O.Box 9515, 2300 RA Leiden, The Netherlands
t.van.kolfschoten@arch.leidenuniv.nl

Kořínková Tereza
Department of Zoology, Charles University, Viničná 7 128 44 Praha 2, korinko1@natur.cuni.cz

Kovanda Jiří
Institute of Geology and Paleontology, Charles University, Alberov 6, CZ 128 43 Praha

Krzyminska Jarmila
Polish Geological Institute, Branch of Marine Geology
80-328 Gdańsk, Kościerska 5
jarmila.krzyminska@pgi.gov.pl

Lisický Mikuláš
Slovak Academy of Sciences, Institute of Zoology, Dúbravská cesta 9, SK-84205 Bratislava, Slovak Republic
Lisicky@savba.sk

Ložek Vojen
Geological Institute, Czech Acedemy of Science, Rozvojová 135, CZ 160 00 Praha 6

Markova Anastasia
Institute of Geography RAS, Staromonetny 29, Moscow 119017, Russia
nature@online.ru

Martínková Zdenka
Research Institute of Crop Production, Ruzyně 507, CZ-16106 Praha 6, Czech Republic
honek@vurv.cz

Meijer Tom
Rammekens 36, 1823 HH Alkmaar, The Netherlands
t.meijer@inter.nl.net;
meijert@naturalis.nl

Melnychenko Ruslana
Narodychskaya, str. 21, apt. 116, Zhytomir, 10031 Ukraine
melnicenko@orta.zt.ua

Moine Olivier
Department of Geosciences, University of Massachusetts
611 North Pleasant Street, Amherst, MA 01003 USA
omoine@geo.umass.edu

Musil Rudolf
Department of Geology and Paleontology, Masaryk University, Kotlářská 5, Brno,
rudolf@sci.muni.cz

Nadachowski Adam
Institute of Systematic and Experimental Zoology PAS, Slawkowska 17, Krakow, Poland
nadachowski@isez.pan.krakow.pl

Pavlyuchenko Olesya
Sverdlov Str. 61, apt. 12, Berdychiv, Zhytomir Region, Ukraine
pavljuchenko@mail.ru

Preece Richard
Museum of Zoology, University of Cambridge, Downing Street, Cambridge, CB2 3EJ
rcp1001@cam.ac.uk

Rossignol Julien
ISEM (UMR CNRS-UM2 554) Equipe Paléoenvironnements
Bât. 22 CC 061, Place Eugène Bataillon, 34095 Montpellier, France
rossigno@isem.univ-montp2.fr

Sanko Aleksander
Institute of Geochemistry and Geophysics, NAS of Belarus
Kuprevich str. 7, 220141 Minsk, Belarus
sanko@ns.igs.ac.by

Simakova Aleksandra
Geological institute of RAS, Pyzhevsky 7, Moscow, Russia;
simakova@ginras.ru

Smrž Jaroslav
Department of Zoology, Charles University, Viničná 7, CZ 128 44 Praha, Czech Republic
smrz@natur.cuni.cz

Snegin Eduard
308015 Russia, Belgorod, Belgorod state university, Pobeda street 85
snegin@bsu.edu.ru

Son Mikhail O.
Odessa Branch of the A. O. Kowalewsky Institute of Biology of Southern Seas, N ASU, Pushkinskaya str. 35, Odessa, 65000 Ukraine,
malacolog@ukr.net

Speller George
Museum of Zoology, University of Cambridge, Downing Street, Cambridge, CB2 3EJ
grs25@cam.ac.uk

Stadnychenko Agnes
Bolshaya Berdichevskaya, str. 41, apt. 101, Zhytomir, 10008 Ukraine
Kyrychuk@zu.edu.ua

Šteffek Jozef
Fándlyho 1, SK-969 01 Banská Štiavnica
steffekjozef@yahoo.com,
steffek@fee.tuzvo.sk

Sternecker Katharina
Wild life Biology and Wildlife Management Unit, Technische Universität München – Weihenstephan, Am Hochanger 13, D-85354 Freising, Germany

Stworzewicz Ewa
Institute of Systematic and Experimental Zoology PAS, Slawkowska 17, Krakow, Poland
STWORZEWICZ@isez.pan.krakow.pl

Svitoch Aleksander
Geographical Faculty, Moscow State University, Moscow, 119899 Russia
palaeo@geogr.msu.ru

Szymanek Marcin
Faculty of Geology, University of Warsaw, Al. Żwirki i Wigury 93, 02-089 Warsaw, Poland
m.szymanek@uw.edu.pl

Taldenkova Ekaterina
Geographical Faculty, Moscow State University, Moscow 119899 Russia
etaldenkova@mail.ru

Tomek Teresa
Institute of Systematic and Experimental Zoology PAS, Slawkowska 17, Krakow, Poland

Tyráček Jaroslav
Czech Geological Survey Praha
tyracek@cgu.cz

Uvayeva Olena
Marshall Rybalko, str. 43, Zhytomir, 10020 Ukraine
Uvaeva1980@mail.ru

Val´kova Svetlana A.
Kola Branch of Petrozavodsk State University, Apatity town 184209, Russia
Valkova@bel.arcticsu.ru

Vavrová Lubomíra
Štátna ochrana prírody SR – Centrum ochrany prírody a krajiny, Lazovná 10, 974 01 Banská Bystrica, Slovensko
vavrova@sopsr.sk

Wagner Jan
Department of Philosphy, Charles University, Vinicna 7, CZ 128 44 Praha
orksos@seznam.cz

Wunderlich Heike
Wild life Biology and Wildlife Management Unit, Technische Universität München – Weihenstephan, Am Hochanger 13, D-85354 Freising, Germany
Wunderlich-Kormos@t-online.de

Venczel Márton
Tarii Crisurilor Museum, RO-410464 Oradea, B-dul Dacia 1-3, Romania,
mvenczel@rdslink.ro

Yanina Tamara
Dept. of Geography, Moscow State University, Moscow, 119992, Russia
didacna@mail.ru

Zelkova Irina V.
Institute of the North Industrial Ecological Problems, Kola Science Center, Russian Academy of Sciences, Apatity town 184209, Russia
Zenkova@inep.ksc.ru