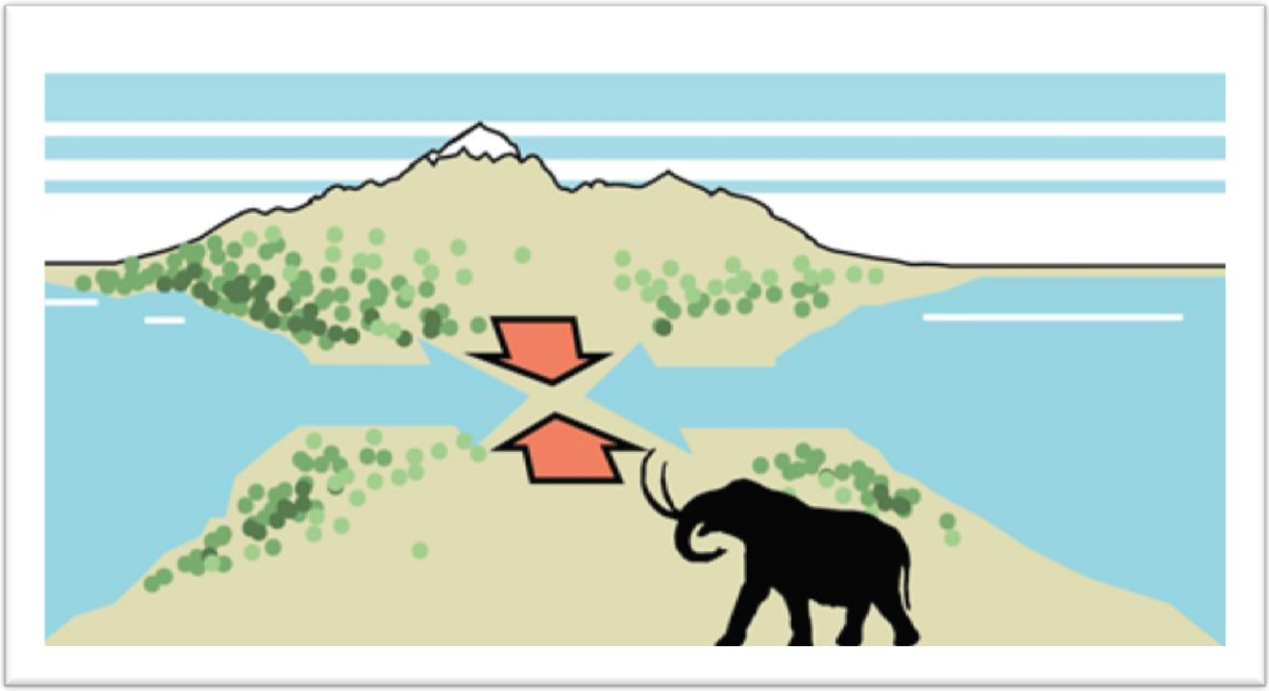
PRIDE-RCMNS conference 2018

Ecosystem isolation and connection: rise and demise of biota in the Pontocaspian-Caucasian region



ABSTRACTS

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Orals: Monday 27 - 09:30-17:15 & Wednesday 29 August - 09:30-16:15

Auditorium and Library Reading Hall

Posters: Monday 27 & Wednesday 29 August - 17:15-19:00

Main Hall

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Palaeonvironment of the Late Miocene Eastern Paratethys Sea, Azerbaijan

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The Paratethys Sea formed after several sea-level drops in Eocene-Oligocene times. It is divided into western, middle and eastern Paratethys. The eastern Paratethys included the Black Sea and Caspian Sea basins. The lake/sea levels in the eastern Paratethys changed several times during the Miocene: Connections between Mediterranean and eastern Paratehys occurred several times. The goal of the research is to investigate palaeoclimatic conditions and water levels of the eastern Paratethys based on mineralogical and geochemical composition of the Lower Miocene sediments from the Islam Dagh section in Azerbaijan.

Major oxide composition suggested that source area of the Lower Miocene in Islam Dagh section was mainly stable condition. Chemical Index alternation showed that the climate was arid in the source area. The clay minerals illite, chlorite and kaolinite, which were found in the Lower Miocene from the Islam Dagh section are detrital. The smectite is authigenic and it derived from volcanic ash. The smectite is rich in Fe, which coincide nontronite. The composition sheds light on the marine environment in the eastern Paratethys during the Early Miocene.

Based on authigenic minerals like pyrite, jarosite, gypsum, Mg-calcite in the Lower Miocene sediments from the Islam Dagh section, we identified four different environmental conditions. The lower part of the section contains abundant pyrite, suggesting reduction process in anoxic environments. Upwards the amount of pyrite decreases indicating dysoxic conditions in the interval. The appear of jarosite suggests that the amount of oxygen increased, which indicate oxic zone. In the upper interval, the appearance of gypsum and increasing Mg calcite are associated with high evaporation in the basin.

Small vertebrates from the late Miocene hominoid-bearing site of Udabno (Georgia)

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The microvertebrate record of Udabno includes fishes (*Scardinius* sp., *Carassius* sp.) anourans (*Pelophylax* sp.), squamates (Lacertidae indet., *Ophidia* indet.), insectivores (*Schizogalerix* sp., cf. *Turiasorex pierremeini*) and rodents (*Byzantinia pikermiensis*, *Hansdebruijnia erksinae*, *Vasseuromys pannonicus*). The rodent association of the cricetid *Byzantinia pikermiensis* and the murid *Hansdebruijnia erksinae* enables for the first time to constrain in a straight way the age of the Udabno fauna. *Byzantinia pikermiensis* was first recognized at the site of Pikermi (Chomateri) by Bruijn (1976) and later recovered in other sites from Turkey, including the hominid-bearing site of Çorakyerler. At Udabno, *Byzantinia pikermiensis* is associated with the murid *Hansdebruijnia erksinae*, again described from Çorakyerler in Turkey. Therefore, the association from Udabno clearly post-dates late Vallesian faunas like Biodrak (Greece) or Bayraktepe II (Turkey), characterized by the association of the more archaic species *Byzantinia nikosi* and *Progonomys cathalai*. In this way, it is coeval of typical Turolian sites from Europe, such as Pikermi, Samos, Çorakyerler or Crevillente 2.

Pontocaspian mollusks in the Pontocaspian Basin: what is already discovered and what left unknown?

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Paleontological record evidences that a prototype of the modern Pontocaspian biota have arisen only in the Late Miocene ca. 7 Ma when the Pontian Basin formed. The triggers of the process are unclear though several brackish-water basins existed before and some species presumably related or convergent similar to modern *Caspiohydrobia/Ecrobia* occurred already in the Sarmatian Basin.

The Pontocaspian complex contains a lot of vertebrates and invertebrates, including more than 100 nominal species of gastropods and bivalve mollusks. Not clear how many biological species belong to the pontocaspians; their number is possibly greatly overestimated.

Similarly, it still enigmatic why the modern taxonomic diversity of the pontocaspian mollusks is restricted to only few families (Neritidae, Hydrobiidae, Dreissenidae, Cardiidae) and whether huge number of viviparid, valvatid, bithyniid, lithoglyphid and melanopsid gastropod species occurred e.g. in Pannonian/Cimmerian basins are reasonably attributing to the pontocaspian fauna.

Among the modern water-bodies containing pontocaspian malacofauna the greatest diversity is in the Caspian Sea: over 70 gastropod and about 20 bivalve species are listed here. Not clear how the pontocaspians shared among the others water-bodies, e.g. the estuaries of the Black Sea and satellite basins. Clear relationship between the taxa inhabiting different parts of the Pontocaspian Basin is unknown.

A presence of lamellar keel in the phenotype of many pontocaspian species is well-known. However, the mechanism of keel 'evolution' in the different taxa is enigmatic in many respects.

Mollusks in the Caspian Sea are clearly stratified in water column – one complex replaces the other in the direction from the coastal waters to the bottom. The relationship of shallow and deep-water species remains questionable: are they of separate species or they just representing ecogical morphs of coastal ones? Bathymetrical distribution of mollusks in the basins-predecessors of the Caspian Sea remains unclear as well.

Strontium Isotopic Ratios in the Caspian Sea: Implications for Caspian - Arctic connection and Caspian Sea level reconstruction during the Early Pleistocene

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Since the fragmentation of the Eastern Paratethys Basin during the latest Miocene, the Black and Caspian seas have been isolated basins with episodes of reconnection to each other and to the open ocean. As a result, these basins have developed a unique biota that has Paratethyan, open marine and freshwater ancestry (e.g., herring, mollusc species). In addition, the Caspian Sea harbours some species (e.g., the Caspian seal and several crustacean genera: *Onisimus*, *Gammaracanthus*, *Mysis*) whose sister taxa occur nowadays in the coastal and estuarine waters of the Arctic Ocean. Genetic studies of these polar elements in the Caspian Sea have suggested a Caspian - Arctic Ocean connection, but the timing is controversial. Palo and Väinölä (2006) have suggested an Early Pleistocene (2 – 3 Ma) connection between the Caspian Sea and the Arctic Ocean, while van Baak et al. (in prep) suggest that this marine connection is the driver of the Akchagylian flooding in the Caspian Sea between 2.7 – 2.4 Ma.

In this study, we use the Sr isotopic ratio (87Sr/86Sr) measured on fossil ostracods collected from a marginal Caspian Sea section, Goychay, as a tracer for input water into the basin between 2.6 and 1.9 Ma. Using these data and salinity estimates deduced from the ostracod assemblages, we model the hydrologic system and explore the viability and timing of the Caspian Sea's connections to the Black Sea and Arctic Ocean. Our results show that the hydrological budget of the Caspian Sea was influenced by the Amu Darya River, which at the time was flowing into the Caspian Sea. The Caspian Sea also had connections with the Black Sea and the Arctic Ocean. The Caspian - Arctic connection in the north was likely via the Aral Sea region and lasted until about 2.1 Ma. By comparing the Goychay 87Sr/86Sr record with coeval 87Sr/86Sr data from an adjacent but deeper water Caspian Sea section (Jeirankechmez section; van Baak et al. in prep) we reconstruct the evolution of the Caspian sea level and show that there were at least four periods when the sea level was lower than the Goychay section between 2.6 and 1.9 Ma.

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Black Sea evolution since the Last Glacial Maximum based on microfaunal and stable oxygen isotope records

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The Black Sea is a semi-enclosed marginal basin, which connects with the Mediterranean Sea through the Bosphorus Strait, Marmara Sea and Dardanelles Strait. Beside the connection with the Mediterranean Sea, in the Late Pliocene-Pleistocene times the Black Sea experienced a period of connection with the Caspian Sea through the Manych Corridor due to the melt waters from the Scandinavian ice sheets.

In the early Holocene, water composition in the Black Sea evolved from brackish to marine; biotic turnover mirrors this change. The transition of the Black Sea from an inland lake to a marine basin during the last glacial/deglacial episode is still generating discussion in the scientific community. In this study, high resolution microfaunal analyses coupled with isotopic and calcium carbonate performed on an AMS 14C dated core, 09 SG 13, revealed changes that occured in the Black Sea from the Last Glacial Maximum through the transition to the present day semi-enclosed marine basin. In the sedimentary record this deglaciation accumulated allochthonous continentally derived red sediments, simultaneous with the global Heinrich Event 1, 18 to 15 kyr BP.

Our study was also focused on shallower sediments recovered with a multicorer from the Romanian Black Sea inner shelf, at the water depth of 78 m. Based on qualitative and quantitative ostracod analysis, their fluctuation pattern is interpreted in terms of environmental changes.

Plant food resources and implications on the diet of *Homo erectus* in the Caucasus

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The earliest hominid expansions from Africa into Eurasia date to about 1.8 Ma based on the Dmanisi record of *Homo erectus* in Georgia. Since then, humans were present in this region and required an energy- and nutrient rich diet.

As plants contribute to the amount and variety of obtainable food resources vegetation and vegetation diversity are important factors for human habitats. By evaluating the plant food potential of different vegetation units in the Southern Caucasus this study aims at exploring the resource space of early humans in the Early Pleistocene. The main research questions here are, which and how many edible plant parts can be found in different vegetation units and how is the availability distributed in the course of the year?.

Vegetation units are chosen according to palaeobotanical reconstructions in the region, based on fossil records from plant macro fauna and pollen data. The units range from steppes to altimontane forests, comprising published taxa lists of dominant and most frequent species. The database PlantBITES hosts the relevant information compiled from the literature.

The results show that forest units provide the most edible plant parts, followed by open woodlands. The fewest ones are found in the steppes. Moreover, open woodlands and forests provided more species with high quality plant parts than the steppes. Especially fruits and nuts provide an energy- and nutrient rich diet. On the other hand, steppes provide a huge amount of grasses, which are considered good forage for grazing animals. Also, the availability of edible plant parts is more stable around the year in steppes compared to a strong seasonality in forests. However, the absolute numbers of edible plant parts are still higher in forests even during winter.

Based on the characteristics of the dentition, the stature and body proportions of *Homo erectus* it is widely assumed that they relied on a mixed diet of meat and plant food. However, it is not yet assessed in detail which plants may have contributed to their diet and to what extend different vegetation types can deliver necessary nutrition. This study is a first attempt to quantify plant food resources and their availability for *H. erectus* showing the importance of access to edible plant parts from forests for a stable supply of an energy- and nutrient rich diet.

Dmanisi 1.8 million years ago – paleoenvironmental aspects disclosed by large mammals

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Dmanisi mammals are remarkably diverse and count 39 species besides *Homo*; good preservation and abundance of fossils are the reasons that allow taxonomic identifications, but still, this large array of species is exceptional among contemporaneous faunas.

Relative abundances of large mammal remains reflect habitat, pray mass preferences and efficiency of different carnivores acting on the site rather than the actual paleoenvironment at the very site. But in general terms, the predominance of woodland to grassland inhabitants among large mammals undeniably demonstrates prevalence of woodlands with open spaces in the vicinity of the Dmanisi site.

At first glance, this picture disagrees with (1, 2) the small mammalian, and herpetofaunal evidence – suggesting predominance of arid environments, (3) and with the pollen and phytolith data from the sediments, indicating open landscape dominated by herb taxa with steppic and xeric elements; but agrees with the pollen data of coprolites, which reveal a rich spectrum of vegetation cover existing in the surroundings of the site. These different results are due to scale differences: pollen and phytolit assemblages from the sediments, as well as small mammals reflect the local environment directly on the site, while pollen spectra from the coprolites and faunal composition of the Dmanisi vertebrates represent conditions in a larger area around the site.

The landscape depicted by large mammals echoes the geologic history of the Dmanisi landscape. The intense volcanism phase (2.8 – 1 Ma) in the area led to the appearance of open landscapes; frequent ash falls as well erosion processes were disturbing the plant growth, resulting into early vegetation successions, open habitats, with loose, weekly developed soils, although forest could continually present on the areas that were relatively unaltered by the volcanism. This is a logical, yet purely hypothetical scenario suggested by the geological history of the area. It assumes that the appearance of open landscapes in Dmanisi is not necessarily linked with arid climatic conditions, but can be due to volcanism, which in its turn might be changing/modifying the former. Reasons of the high diversity of Dmanisi fauna can be found into this scenario as well.

Disentangling Quaternary deposits and faunas in the Marmara Basin (Turkey) shows its key position between Mediterranean and Pontocaspian Basins

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Mollusk faunas of the Marmara Basin show its key position between the Pontocaspian and Mediterranean realm.

The Sofular isotope record suggests 12 overflow phases from the Caspian and 6 marine transgressions from the Marmara Sea into the Black Sea Basin in the past 670 ka. These intervals are partially preserved in the Marmara Basin and surroundings. The various connections did cause rapid and strong changes in salinity and nutrient regimes determining the type of faunas that could establish (marine, Pontocaspian, fresh water) in the Marmara Basin and adjacent Iznik Lake Basin. Sudden fauna turnover events were common.

The earliest fossil mollusk data recorded in Marmara Basin concerns a Pontocaspian assemblage from Chaudian (early middle Pleistocene) intervals from Gelibolu containing e.g. *Didacna* species. New mollusc records confirm the Chaudian age and give insights into the diversity of the fauna. The Gelibolu section possibly contains several Pontocaspian overflow episodes and is subject of further investigation. The gastropod fauna shows already a modern Black Sea Pontocaspian component. Middle Pleistocene (Eoeuxinian = early Khazarian) terrace successions around Lake Iznik document at least one and possibly three further Middle Pleistocene Pontocaspian overflow phases. Late Pleistocene Pontocaspian faunas (Neoeuxinian) have been obtained from bottom cores in the Marmara Sea . Furthermore, Surozian molluscs were also found in cores from Lake Iznik. Our findings show that the Marmara region was at times the southwestern extension of the Pontocaspian system.

Open marine connections between the Mediterranean and Black Sea Basin are shown by the marine faunas in the Marmara Basin as determined in the Yalova and Dardanelles outcrops. Marine connections occured during MIS7, MIS5e possibly MIS5c and some marine species have been reported from the early middle Pleistocene Gelibolu sections. The marine faunas from the Dardanelles are very similar to the contemporaneous Black Sea faunas rather than Mediterranean faunas. It concerns Uzunlarian and Karangatian type of faunas of the Black Sea: these are characterised by the absence of typical stenohaline and tropic/subtropic Thyrennian mollusk species.

Our stratigraphic framework and ongoing research will help to identify the role of climate and sea-level change and tectonic thresholds in the Marmara Basin in shaping the nature and duration of Pontocaspian and Mediterranean connections.

An evolutionary reappraisal of the Ponto-Caspian amphipod radiation: from old Sarmatian origins to recent Pleistocene inter-basin dispersal

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The Ponto-Caspian amphipod radiation (PCAR) is a monophyletic group consisting of more than 70 described taxa, several of which are successful invaders in European and North American freshwaters. The temporal origin of the radiation is debatable due to a lack of sufficient understanding of its phylogenetic position within the Amphipoda, thus precluding the utilization of fossils as molecular clock calibrations. Previous estimates of the PCAR temporal origin lie between 45 and 8 Ma ago, and relied on adopting molecular rates from distant crustacean relatives or using historical geological events as calibrations. The aim of this study was to reevaluate the evolutionary timeline of the PCAR based on a large-scale molecular phylogeny of the Amphipoda which permitted the incorporation of fossil taxa. Specifically, we were interested in narrowing down the timeframe of the PCAR origin as well as reconsidering the timing of more recent dispersal events between the Black Sea (BS) and Caspian Sea (CS) basins. Publicly available data (one mitochondrial and two nuclear markers) from 14 species was used to reconstruct a time-calibrated Bayesian phylogeny. For six species molecular data was available from both basins. Three fossils (9 to 40 Ma) and a recent well-dated gammarid radiation in Lake Ohrid (ca. 2 Ma) were used as calibration priors. The results indicate that the PCAR originated ca. 14 Ma ago (Serravallian, Middle Miocene), a period when the Sarmatian Sea became isolated from the world ocean and developed a strongly endemic brackish fauna. Most of the splits among extant species pairs took place during the late Early to late Pliocene, coinciding with the initial separation of the BS and CS basins. On the intraspecific level, the BS and CS populations of four species diverged 1.2 to 1.5 Ma ago, probably during the Aspheronian transgression, while the populations of the remaining two species diverged 0.28 and 0.4 Ma ago, most likely during the several mid-late Pleistocene Caspian transgressions. These results point out that the PCAR has a lot of potential to illuminate the complex palaeogeographic history of the Ponto-Caspian region and to understand the evolutionary context of highly adaptable species with invasive potential. Further studies including a larger number of species, more markers and eco-morphological data are required.

Sedimentary environments and fauna of the Late Miocene to Early Pleistocene Slănicul de Buzau Section in the Dacian Basin: An example of integrated research by the PRIDE team

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Pleistocene shortening in the Southeast Carpathians has folded and uplifted the more than 6 km thick Late Miocene to Early Pleistocene foreland basin fill. These strata are now excellently exposed along the Slănicul de Buzau River in Romania. The section provides a detailed insight into the co-evolution of the local sedimentary environment and mollusc- and ostracod fauna, against the backdrop of the evolution of the Dacian Basin. Paleo-environments range from distal shelf to terrestrial and include several types of delta and shoreface environments. Changes in the environment of deposition over time exerted a strong control on the local fauna. The section has a complete magnetostratigraphy, which provides excellent time-control. This facilitates correlations with other Paratethys basins and helps to unravel environmental forcing factors: Some of the larger base-level variations are clearly related to Paratethys-wide events, as is also evident from faunal immigrants. A prominent cyclicity observed in Pliocene strata that intuitively might be ascribed to astronomical forcing, was demonstrably caused by autocyclic delta lobe switching. Diminishing sedimentation rates in the Late Pliocene to Pleistocene are likely related to the basins tectonic evolution, while a final switch to fluvial sedimentation might highlight the arrival of a new sediment supply system. Many of the inferences made during the course of this research would not have been possible without the integrated approach applied by the multidisciplinary PRIDE team. It has become evident that the dynamic evolution of the various Paratethys Basins during the Late Miocene and Pliocene essentially set the scene for the rise of the Pontocaspians.

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Ponto-Caspian diversity: origin and recent challenges

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The Black, Caspian and Aral 'seas' are surviving fragments of the Paratethys. The Miocene paratethys, with its fluctuating salinity, is also the cradle of the unique animal assemblage of these three environments. This illustrates the fact that not salinity per se, but its variation from fresh to mesohaline may be at the heart of the evolution of an endemic Ponto-Caspian fauna, partly of marine, but largely of freshwater or uncertain origin.

The Mediterranean broke through the Bosporus around 6000 BP. It transformed the Black Sea, previously similar with the Caspian, into a meromictic hybrid between a lake and sea. allowing marine elements (e.g. Echinoderms, Chaetognaths and others) to immigrate. True ponto-caspian faunal elements were pushed back into coastal lagoons and river estuaries, mainly in the shallow north. The Aral Sea, even more recently, largely dried out. Endemic sturgeon barely survive in the rivers Amu Darja and Syr Darja. The former does no longer reach the Aral to date.

Examples of animals derived from marine ancestors are the sturgeon fish, and crustaceans of the orders Cumacea and Mysidacea. All are endemic, often at the genus and family level, like in Lake Baikal. The pelagic "Cladocera", in contrast, are lacustrine. Taxa may have been described, not taking into account variability. This became clear when recently, the closed Caspian was opened by canal building (converting Europe and West Asia to a network) and damming of all major rivers. The endemic brackish faunas expanded along these river-lakes and reached the Baltic Sea, where some Caspian species became a nuisance. A characteristic of the fauna was thus its incapacity to deal with running water rather than salinity. Its morphological variability became clear in the Baltic, and is currently tackled by DNA taxonomy. For example, in the genus *Cornigerius*, *C. maeoticus* is the main pelagic species; *C. lacustris* was discovered a century ago in Hazar Golu, a lake in East Anatolia. But is this really a good species? If not, passive dispersal form the endorheic Caspian basin was possible before the dam constructions.

Drivers of dominance shifts between invasive Ponto-Caspian dreissenids *Dreissena polymorpha* (Pallas, 1771) and *Dreissena bugensis* (Andrusov, 1897)

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Two of the most invasive freshwater bivalve species in temperate regions worldwide are the Ponto-Caspian dreissenids *Dreissena polymorpha* and *D. bugensis*. Throughout their range, observations have been made of a dominance shift favouring *D. bugensis* where the two species co-occur. Although both dreissenids have been widely studied, the mechanisms driving this dominance shift are not completely understood. Our long-term and short-term field experiments aimed at assessing a selection of species traits related to growth and settlement, which may be linked to a competitive benefit for either of both species. We assessed relative population densities in time and space, mortality and inter- and intraspecific interactions in relation to environmental factors like temperature, salinity, and light intensity, using 14x14 cm PVC settlement plates. Dreissenids were identified, counted and measured over a timeframe of 11 years in the waterbody where *D. bugensis* was first discovered in Western Europe. *Dreissena polymorpha* appeared to have a competitive benefit over *D. bugensis* by being able to settle earlier, i.e. in spring, while other studies indicate the opposite. As salinities in the study region were relatively high in spring, this discrepancy may be explained by a higher salinity tolerance of *D. polymorpha*. In addition, observations were made of the common coot predating on *D. bugensis* clusters. *Dreissena polymorpha* is usually not found in such clusters. Regardless of these competitive benefits for *D. polymorpha, D. bugensis* has become the dominant species in the region. One explanation was that *D. bugensis* was found in similar densities on both light exposed and shaded fouling plates, while *D. polymorpha* was practically absent on light exposed plates after 12 months. Therefore, a wider range of habitats is suitable for the settlement of *D. bugensis*. Another driver can be linked to the faster growth than *D. polymorpha*, especially during spring. More in general, *D. bugensis* occurred in higher population densities on plates with *D. polymorpha* than on plates on which only *D. bugensis* was found, indicating that *D. polymorpha* individuals may induce the settlement of additional individuals of *D. bugensis*. A final reason for the dominance of *D. bugensis* concerns its low winter mortality. While the number of *D. polymorpha* individuals more than halved over the winter of 2016-2017, no significant decrease in numbers of *D. bugensis* was recorded.

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Pontocaspian basin as a source and sink of invasive species: extent and mitigation strategies

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Invasive species are recognized to be a global problem causing huge ecological and economic impacts worldwide. The Pontocaspian basin, which consists of the Caspian Sea, the Black Sea and adjacent rivers and lake systems, is rich with endemic fauna. The existence of this unique fauna is currently threatened by invasive species. The Pontocaspian region is particularly sensitive to the introduction of alien species because of the ongoing human mediated habitat degradation which helps newcoming species to find a niche. At the same time, numerous species originating from the Pontocaspian basin became invasive worldwide, e.g. *Dreissena polymorpha* and *D. bugensis*. For effective management of non-native species and conservation planning it is important to identify and engage various stakeholders in the process. Social network analyses (SNA) can be a useful tool for identifying and studying the networks of organisations involved in conservation planning. Here we introduce examples of the Pontocaspian basin as sink and source of invasive species. Furthermore, we present two case studies from Ukraine and Romania on the stakeholders' SNA involved in Pontocaspian biodiversity management and conservation. Our conclusion is that relevant organisations in Ukraine and Romania are well connected. This can provide a good foundation for effective biodiversity conservation and management of invasive species. Similar studies are needed in other countries around the Black Sea and the Caspian Sea.

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Invasive species and their role in the Caspian ecosystem

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In the 20th century alien species were introduced by man in the stabile Caspian ecosystem. The earliest invasives were introduced through fouling on ships, which became very prominent after the opening the Volga-Don Canal in 1952. Another way was the intentional transplantation (acclimatization) of species in order to increase the Caspian productivity. In last decades the main way of penetration is with ballast water. Today at least 50 alien species occur in the Caspian and a further 20 species did immigrate but failed to survive.

The first acclimatizers were two species of mullet, transplanted in 1934, and these now live mainly off the Iranian coast. The most successful acclimatization was transplantation of two forage species for sturgeon, the polychaete *Nereis* and bivalve mollusk *Abra*. They were acclimatized after careful studies of their ecology and food preferences of sturgeon, and transplanted into the empty ecological niche of deposit feeders living in silty soils. Native species were hardly affected after this event and the food base increased greatly.

Some invading species have great competitive advantage and occupy dominant position in their part of ecosystem, and their introduction caused a restructuring of main energy flows. The most significant changes in ecosystem happened after invasion of three species. In 1918 the mollusk *Mytilaster lineatus* was transported from the Black Sea to Baku bay with ships fouling, began to gradually settle down. Within 15 years the species settled throughout the Caspian, its biomass was about 11% of total. In 1934, with acclimatization of mullet, was transplanted also diatom *Pseudosolenia calcar-avis*. Due to large size and hard shell, there were no phytophages able to eat this diatom in the Caspian, so the species colonized the entire Caspian within a year, reaching 100% of total biomass in the central part of the sea. Because the absence of consumers a great part of the synthesized organic matter wasn't used in pelagic communities, but fell down to the benthos. However, *Mytilaster* was only one consumer, able to use this organic matter. Because of this its biomass in 1934-1938 increased in 5-6 times, to 42% of the total benthos. In 1999 the jellyfish *Mnemiopsis leidyi* entered the Caspian. The species actively consumes zooplankton, so biomass of pelagic phytophages sharply decreased and as a result decreased its grazing pressure. In these conditions *P. calcar-avis* lost its advantage, and in competition for nutrients is inferior to small-celled species, and now its biomass is 6-4% of the total phytoplankton, which decreased by 2-3 times.

The preservation of Sturgeon species in the Danube and Black Sea

Kateryna Kurakina, Natalia Gozak, Inna Hoch & Mila Arseniuk, WWF, Kyiv, Ukraine

Sturgeons are the most endangered fish worldwide, there was a 100 time decline in the populations of these species over the last 25 years. In the EU one of the very few regions still holding viable, naturally-reproducing sturgeon populations is in the Lower Danube and North-Western Black Sea.

The reasons for the decline are complex, but lack of awareness is a root cause of the most important one, overexploitation. Despite strict legal protection, illegal fishing and trade in meat and caviar from wild sturgeons still endanger these species.

Joining the efforts, 7 organisations from 6 countries of the region (Austria, Bulgaria, Germany, Romania, Serbia, Ukraine) initiated a project “Sustainable protection of lower Danube sturgeons by preventing and counteracting poaching and illegal wildlife trade”, aiming to stop the threat to highly endangered sturgeons in the Lower Danube and northwestern Black Sea region. The project will last from October 2016 to December 2020.

The project focuses on the 3 key target groups (results to date for Ukraine):

1. Fishermen and fishing communities depending on natural resources. A socio-economic study was performed, alternative income sources will be investigated and developed to reduce the dependency of the communities on sturgeon fishing. Sturgeon Advocate has made 8 visits to the local communities, raising awareness for the need for sturgeon protection. Sturgeon Watchers mission was conducted in May 2017 and is planned for 2018.

2. Law enforcement agencies will be supported in capacity building, experience exchange and enhancing their fight against poaching and illegal trade. Eight trainings for fish and customs inspectors are made, project team participated in 7 Ichtiological/Fisheries events to raise the topic higher in scientific agenda, two newsletters are distributed, targeted information packages are under preparation. Set of changes to local fish regulations are achieved. A regional workshop with related agencies fosters the crucial cross-border coordination and collaboration. A legal study is done to identify gaps and form a ground to lobby the legal changes to strengthen the entire enforcement chain in order to protect sturgeons.

3. The markets for caviar and sturgeon meat are closely monitored to understand better trends and customer behavior (44 sell points visited and 24 samples collected). The respective retailers will be made aware of legislation that will prevent illegal products from reaching the market.

Seeing the wood for the trees: appraisal of archive integrity and taxonomic & palaeoecological assumptions (using examples from present and ancient pollen, dinoflagellates, molluscs and ostracods)

Thomas M. Hoyle, Utrecht University, Utrecht, The Netherlands; Justine Vandendorpe & Arthur F.Sands, Justus Liebig University Giessen, Giessen, Germany; Alberto Martínez Gándara, Grigore Antipa National Museum of National History, Bucharest, Romania; Manuel Sala-Pérez, University of Bristol, Bristol, UK; Liesbeth Jorissen, Utrecht University; Lea Rausch, University of Bucharest; Sabrina van de Velde & Frank Wesselingh, Naturalis Biodiversity Center, Leiden, The Netherlands

In this contribution we highlight the biases when interpreting the geological record for biodiversity change in the Pontocaspian region. Such biases derive mainly from a) transport, preservation and taphonomy issues, and b) assumptions behind widely used methods, some of which may need re-evaluating in the light of modern methods.

Part 1: appraisal of archive integrity
In the first part of this talk we consider the many processes (fluvial, aeolian, lacustrine etc.) that transport soon-to-be fossils (of any kind) from their life position to their location in the sedimentary archive. We also look at the processes that may affect fossils during burial and diagenesis. We use examples from palynology (pollen and dinoflagellate cysts), ostracod and mollusc studies carried out in relation with PRIDE geology projects. We explore how transport and taphonomic factors may affect the integrity of the fossil archive and how it may, in turn, result in signals that could potentially be misleading in terms of palaeoenvironmental, palaeoclimatic and/or stratigraphic interpretations. We highlight the importance of considering transport and taphonomy during all palaeontology related work.

Part 2: assessment of taxonomic and palaeoenvironmental assumptions
In part two we will use examples from ongoing PRIDE biology projects to critically assess some of the assumptions implicit in the interpretation of geological archives. We first assess discrepancies between dates provided by the fossil record vs. the molecular clock, using the examples of mud snails (*Ecrobia* = *Ventrosia* = *Caspiohydrobia*) from the Caspian Sea. Secondly, we examine the nature of inter- vs. intraspecific variation on morphology in key mollusc groups and, in particular, assess the validity of shell patterning in *Theodoxus* as an indicator of species. Thirdly, we use two modern case studies; one from dinoflagellates and the other of Pontocaspian cockles (Lymnocardiinae) to re-assess the validity of their use as indicators of past salinity.

We conclude that consideration of taphonomy and transport should be a staple part of any modern palaeontological or biogeochemical study of the past. We highlight that, wherever possible, species should be defined using a combination of morphological and genetic characteristics, although we acknowledge that this is not always possible, due to the general lack of genetic material in geological samples. Finally, as a direct result of PRIDE biology projects, we propose that the autecological tolerances of certain taxa must be re-evaluated and re-considered in the context of Pontocaspian geological archives.

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Oral – Monday 27 August – Auditorium

Reconstructing Pontocaspian Interbasinal Connections

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The Plio-Pleistocene dynamic of the Pontocaspian basins (the Black, Caspian and Marmara Seas) was strongly depended on climatic oscillations and ongoing tectonic activity of the Caucasian orogeny. Controlling the amount of precipitation and evaporation, together with changes in eustatic sea level and runoff, these factors regularly caused fluctuations of the basin levels. It resulted in numerous interbasinal (re)connection events that preconditioned the distribution of the Pontocaspian Biota throughout the entire region. However, there are many uncertainties regarding the number, nature and duration of these connectivity- and isolation events, mostly due to poor age constrains and diverse techniques used in identifying these events. As a result, there is a considerable gap in our understanding of the drivers of these events and their consequences.

Here, we review the existing data from around the Black-and Caspian Sea region and combine them with our integrated magnetostratigraphic, micropaleontological and strontium isotopic ratio (87Sr/86Sr) data from the regional key sections. We specifically aim to reconstruct the connectivity history of the Pontocaspian region from the Late Pliocene to the Middle Pleistocene.

Improved stratigraphic coverage enables us to establish and date the momentum of interbasinal connectivity, while combined micropaleontological and 87Sr/86Sr data allow us to elucidate the paleoenvironmental changes and processes shaping the Pontocaspian basins. Thus, our multiproxy approach is contributing towards a better understanding of the timing, nature of the connections and their impact on the evolution of the Pontocaspian Biota.

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MIS5 in the Marmara Sea: palynological reconstructions of climate and water parameters in the Pontocaspian stages

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The Marmara Sea is the ultimate western connection of the Pontocaspian to the Mediterranean Sea. It has had a complex history of connections both with the latter and with the Black Sea. During periods of isolation, it was fully Pontocaspian with a brackish environment. Palynology has been studied in two sedimentary sequences with a special focus on the sapropel periods of MIS5, when the Marmara Sea was isolated. The MIS 5 interval is indirectly dated by the presence above the sapropels of a couple of well-known volcanic ashes.

The dinocyst assemblages in the sapropels are dominated by *Pyxidinopsis psilata* and *Spiniferites cruciformis* and clearly differentiate the sapropels from the underlying and overlying marine phases. The terrestrial pollen shows a clear alternation of steppic landscape (*Artemisia*) and oak forests, corresponding to the substages of MIS5. This confirms the proposed age-depth model.

Rise and fall of the Pontocaspians

Alberto Martínez Gándara, Grigore Antipa National Museum of National History, Bucharest, Romania; Lea Rausch, University of Bucharest, Bucharest, Romania; Arthur F. Sands, Justus Liebig University Giessen, Giessen, Germany; Sabrina van de Velde, Naturalis Biodiversity Center, Leiden, The Netherlands; Justine Vandendorpe, Justus Liebig University Giessen

The current Pontocaspian biodiversity crisis is a textbook example of an emerging biodiversity change. To better understand these changes and to plan conservation efforts, it is essential to understand the long-term biotic responses to (a)biotic perturbations. By combining sedimentology, paleogeography, paleontology and phylogenetics we can elucidate biogeographic patterns and processes shaping the Pontocaspian ostracod and mollusk fauna.

The highly endemic Pontocaspian fauna originated in the Paratethys, which after frequent changes in paleoenvironmental conditions turned into several low salinity basins. Ostracod and mollusk assemblages from the Neogene provide an excellent opportunity to study long-term paleoecological changes and help to reconstruct intrabasinal connectivity. Our results from satellite basins in Anatolia suggest that the influence of the Paratethys reached further south than previously believed.

Phylogenetic studies show that the origin of the Pontocaspian fauna might be far more complex than previously assumed. For instance, Caspian Hydrobiinae exhibit a similar distribution pattern as the Caspian seal, i.e. they have a close history with the Arctic Ocean. Furthermore, Caspian *Theodoxus* seems to have dispersed over the Alborz mountains into Central and Southern Iran.

While the full extent of the Pontocaspian downfall is not yet understood, we can see that many endemic and indigenous species are in severe decline, especially coastal and benthic mollusks. However, estimating the extent of biodiversity changes of endangered endemic species is a complex issue. Molecular studies now suggest a lower species diversity of Lymnocardiinae and a variety of gastropods (Hydrobiinae) than previously assumed, bringing challenges regarding species concepts and taxonomy.

Our multiproxy approach shows that the geographical distribution, evolution and responses to perturbations of Pontocaspian species are complex and lead to a highly endemic and diverse fauna. Current indications for a species diversity loss show that both patterns, processes and taxonomic data need to be reviewed if we are to properly plan for the conservation of species.

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Climate forcing of Pontocaspian sea-level changes

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The link between lake level variations and environmental evolution in the Pontocaspian region is still not fully understood. Good model systems exist for the Late Pleistocene and Holocene Caspian region, yet are limited for other paleo time scales and regions. Our study examines the climatic conditions and processes driving Caspian Sea level (CSL) variations during the Pleistocene. We assess the impacts of various forcings by combining hydroclimate modelling (using the climate model CESM in combination with the hydrological model HYDRA) with the geological sedimentary succession recorded along the Hajigabul section in Azerbaijan. The study focuses on the Pleistocene basin evolution under the influence of Milankovitch cycles, which strongly control climatic patterns. We simulate four climatic phases with maximum/minimum obliquity and precession. For each phase, we identify the vital characteristics of the water budgets (precipitation minus evaporation), temperature evolution, and catchment dynamics. Dynamic changes under these conditions have implications for changes in the CSL, recorded within the sedimentary infill of the Caspian basin. Here, we outline information required to further improve our understanding on lake level changes through time. The modelled results for these four climatic phases may help interpret reconstructions of past CSL high- and low-stands. This study may also help to constrain key factors in future CSL variation under anthropogenic climate change, and is therefore of high importance for future coastal management within the Pontocaspian region.

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Drivers of species diversification vary with temporal scale in continental aquatic gastropods

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Understanding processes and settings controlling species diversity and diversification is an ongoing subject of intense research. Especially in the light of the current biodiversity crisis worldwide and in the Pontocaspian region in particular, a more profound knowledge of the parameters that influence speciation and extinction is crucial. Which are the most relevant drivers and on what spatial and temporal scales do they act? Studies investigating these questions have yielded quite diverging answers. A main limitation to inferring drivers of diversification has been the fixed temporal scope applied so far. Assuming that the same processes operate uniformly across different time scales might severely hamper our ability to understand the factors controlling diversification. Also, it is of paramount importance to address the impact and interplay of multiple (biotic and abiotic) factors sustaining biodiversity and driving turnover.

The present contribution addresses these issues using an extensive fossil record of European continental aquatic gastropods over the last 100 myr (late Cretaceous to present) and a diverse set of abiotic (temperature, precipitation, altitude and continental land mass area) and biotic (competition) factors. To estimate the impact of climate change, we included both global and regional parameters. A novel approach is presented assessing covariation between diversification rates and potential drivers across variable time frames.

Preliminary analyses indicate that drivers of diversification vary considerably with temporal scale. Global temperature is shown as a main driver over the entire period of 100 myr. For shorter time frames of variable duration (20 and 40 myr), however, the main drivers are variably competition, altitude, global temperature and area. These preliminary results have major implications for the study of diversification dynamics, stressing the importance of the temporal scale at which correlations are observed. Moreover, by unravelling background rates of speciation and extinction, as well as the abiotic and biotic parameters that drive diversification over geological time, this study may help to disentangle natural processes from anthropogenic impact.

The Neogene and Quaternary successions from Transcaucasian basins: advances from Georgia

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Magnetostratigraphic and geological studies in Georgian sites in the Black Sea and Caspian basins contribute to understand how climate and tectonics ruled paleoenvironmental change in this part of the Pontocaspian Region. The Neogene and Quaternary record from the Transcaucasian Basins (extending between the Greater and Lesser Caucasus) is variable through time and space. Understanding the time correlation of local stratigraphic units is a first step to integrate abundant paleobiological data.

The most prominent outcrops are in the Kura foreland basin (extension of the South Caspian Basin), where several sequences of tectonic origin are bounded by angular unconformities and its lateral paraconformable evolution. Stratigraphic thickness and completeness is variable as a result of growth strata. This structural control is coeval with external controlling factors inducing transgressions and regression. The paleontological succession of 'marine' mollusc fauna with vertebrate and floral sites, provide potential paleoenvironmental reconstruction for the Caucasus and its climate from Late Miocene to Early Pleistocene. Combined magnetostratigraphic, geologic and paleontological studies permit tentative regional and global correlations. Three main Miocene sections along the Kura river valley have been studied. First one is located in David Gareja (Udabno area), containing a succession of the Eldari and the Shiraki fluvial units. Magnetobiostratigraphic data from this first section, has enabled the time correlation of a faunal list including *Dryopithecus garedziensis*. The second section is located in the foothills of the Pirukugma Mount, where the Shiraki group mudstones host the Dzedstakhevi site. The third section is found in Chachuna and spans an interval dominated by marine strata of the Middle and Late Sarmatian sl. The Miocene succession is truncated by the pre-Akchagylian unconformity. The Akchagylian succession and mammals site of Kvabebi is found in combination with mollusc fauna and is the continuation of the older Pirukugma succession. The Akchagylian succession is also very thick and well exposed in the Kotsakhuri area, where the younger Apsheronian stage is also represented. Ongoing geological and magnetostratigraphic works in these sections will provide an integrated and well dated succession of palaenvironmental change.

The Quaternary succession has been also investigated in the Guria area (western Transcaucasia), where limited outcrops (up to 170 m thick) provide a rich paleobiological proxy (pollen and molluscs) of the Quaternary infill of the Rioni bay (inland extension of the Black Sea basin). Magnetostratigraphies at the sections of Khbarbeti, Tsiagubani and Tsikhisperdi, permitted the strict correlation of the local Gurian local unit with the Calabrian stage.

From the Great Drying of Eurasia to Messinian mega-rivers flooding the Mediterranean

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Central Eurasia underwent significant paleoclimatic and paleogeographic transformations during the middle to late Miocene. The open marine ecosystems of the Langhian and Serravallian seas progressively collapsed and were replaced in the Tortonian by large endorheic lakes. These lakes experienced major fluctuations in water level, directly reflecting the paleoclimatic conditions of the region. Under a negative water budget, the region experienced extreme lowstands during the regional Khersonian stage, revealing a period of intensely dry conditions in Central Eurasia causing a fragmentation of the Paratethys region. This period of "Great Drying" ended by a climate change towards more humid conditions at the base of the Maeotian stage, resulting in a large transgressive event that reconnected most of the Paratethyan basins. During the early Maeotian, under a positive hydrological budget, the water level of this lake could have risen significantly above global sea level.

Here we present a new chronostratigraphic framework for the Khersonian and Maeotian deposits of the Dacian Basin of Romania, based on integrated magneto-biostratigraphic studies on long and continuous sedimentary successions. We show the dry climate conditions of the late Khersonian started around 8.6-8.4 Ma. The Khersonian/Maeotian transition is dated at 7.6 – 7.5 Ma, several million years younger than previous estimates. The Maeotian transgression occured later (7.5 – 7.4 Ma) in more marginal and shallower basins, in agreement with the time transgressive character of the flooding. In addition, we date a sudden water level drop of the Eastern Paratethys lake, the Intra Maeotian Event (IME), at 6.9 Ma, that would correspond to a reconnection phase with the Aegean basin of the Mediterranean. We postulate that outflow water from Paratethys has triggered at least two mega-floods into the Mediterranean during Messinian times.

Hydroclimatic variability in the Caspian catchment area and its impact on past and future lake-level changes

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The Caspian Sea level has undergone dramatic variations of more than 3 m during the past century with important implications for the life of coastal people, economy and the ecosystem. The origin of these variations as well as future changes in the Caspian water budget are still a matter of debate. Here, we review modes of climate variability and atmospheric teleconnections that have potential effects on the hydroclimate of the Caspian catchment area. Based on the output of the state-of-the-art climate model CESM1.2 (Community Earth System Model version 1.2) we analyze and discuss future changes in atmospheric teleconnections and their impact on the Caspian region. Climate projections of the 21st century under the Representative Concentration Pathways RCP8.5 suggest not only an increase in the North Atlantic Oscillation (NAO) index but also an increasing influence of the NAO on winter climate variability in the Caspian catchment region. However, the influence of the NAO on the Caspian Sea level will remain small due to a north-south dipole pattern in NAO-driven P-E (precipitation minus evaporation) anomalies over the catchment area canceling out an effect on the total Caspian water budget. Nevertheless, due to enhanced evaporation over the Caspian Sea in the warming climate, CESM1.2 predicts a Caspian Sea level decrease of about 3 m by the end of the 21st century, which is less than previous projections.

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Spatial and temporal variations of sedimentation processes in the Razim-Sinoie Lagoon Complex (Romania)

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The Razim-Sinoie Lagoon Complex is a lacustrine area that evolved as a result of the evolution of coastal barriers that closed a marine bay located south of the Danube Delta. The complex consists of four main lakes - Razim, Goloviţa, Zmeica and Sinoie and a series of smaller marginal lakes and limans. The lakes system is supplied with water and sediments from the Danube (Sf. Gheorghe Branch), mainly through the Dunavăţ and Dranov channels. The bottom sediments of the lakes are represented at the upper part, through a layer of blackish mud, which always shows a yellowish oxidation film on the top. This level may include shells and live specimens of mollusks, especially *Anodonta*, more rarely *Unio*, *Dreissena*, *Viviparus*, *Corbicula* and, accidentally, Limnocardiidae. In the Sinoie Lake, where the salinity is higher, *Lentidium mediterraneum* and *Mya arenaria* are present. Below the upper layer, a 2-7 cm level very rich in Cardiidae shells, with subordinate or sporadic appearance of *Dreissena*, *Abra*, gastropods etc. is present. The constitution of the sediment ranges from a shelly mud with a blackish muddy matrix to a coquina, sometimes almost without matrix. Usually, the black shelly mud level passes to the lower part, gradually, to a light gray, very cohesive mud, in which the Cardiidae shells appear. More sandy sediments are frequent in the fan areas of the main intake channels - Dunavăţ and Dranov, and along the eastern bank of the lake. In the Goloviţa Lake, organic-mineral muds predominate in most part of the lake, with the exception of the eastern area, adjacent to the sandy littoral ridges. The three distinct levels of sediments described above are partly identified in southern lakes, Zmeica and Sinoie, but here, the sedimentation is dominated by coarser fractions due to the sandy substrate of the adjacent and underlying paleobeach ridges. Within the lake complex there is a general water flow from North (L. Razim) to South (lakes Goloviţa, Zmeica and Sinoie), which controls the transport and the areal distribution pattern of the sediments supplied by the Danube River. The discharge of water to the Black Sea runs through the Periboina and Edighiol outlets of Lake Sinoie. The vertical variation of sediments has been controlled by temporal variation in Danubian supply and by the connectivity of the lagoon system with the Black Sea, leading to a high variability in salinity regimes.

Homo erectus paleoenvironments in the early Pleistocene Denizli Basin: an integrated paleontological, sedimentological and geochemical approach

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The early Pleistocene travertines from the Denizli Basin (Turkey) that host the only one known *Homo erectus* from Anatolia (Kocabaş) are laterally interfingering with a succession of shallow, alkaline lake deposits. We studied the sedimentary succession, micro- and macropaleontology of the deposits and stable isotope compositions (δ18O and δ13C) of the mollusc shells in order to reconstruct paleoenvironments for these early hominins and explore the opportunities and limiting landscapes providing their life. Three units are defined in the upper part of the Quaternary succession which consists of a partially coeval succession of shallow lake carbonates, bedded fine-grained carbonates and travertines. The age of the studied fossiliferous travertine units is constrained by a variety of approaches between 1.2 and 1.6 Ma. The vertebrate fossils (*Archidiskodon meridionalis, Palaeotragus, Metacervoceros, Cervalces, Stephanorhinus* and two species of *Equus*) including *Homo erectus* derive from the uppermost travertines that formed at the shore of a shallow alkaline lake. The ostracods derived from the underlying lake deposits are abundant and well preserved. The assemblage consists of a mixture of brackish or strongly alkaline taxa (e.g. *Cyprideis, Tyrrhenocythere, Loxoconcha* and *Amnicythere*) together with fresh water species (e.g. *Candona, Pseudocandona, Eucypris, Lineocypris*). The molluscs from the shore zone deposits experienced very unusual diagenetic alterations, probably caused by the travertine forming process, resulting in an unique recrystallization. Both ostracod and mollusc associations suggest the presence of an anomalohaline (or strongly alkaline) lake setting, constraining the habitat of the *Homo erectus*. The presence of travertine terraces next to the alkaline lake may have posed challenges on hominin occurrences, their habitat and landscape adaption.

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After the (Akchagylian) flood: what happened in the early to middle Pleistocene (Apsheronian-Bakunian) of the Caspian Sea?

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The flooding of the Caspian Sea at the end of the Pliocene and beginning of the Pleistocene (Akchagylian) was not a normal marine transgression. It began as a freshwater event within the Caspian itself and was briefly augmented by marine waters, most probably from the Arctic Ocean. Predominantly brackish waters then persisted during the remainder of the early Pleistocene and part of the middle Pleistocene during the Apsheronian and Bakunian regional stages. Ostracod and palynological assemblages have been investigated at several outcrop localities in Azerbaijan. Results show that brackish conditions during the Apsheronian had, in most instances, salinities that were higher (~mesohaline) than those of the present-day Caspian Sea. Similarities exist, particularly in the palynofloras, between the Apsheronian deposits and those of the Black Sea, Dacian and Pannonian basins of Eastern Europe. At least periodic connections between the Black Sea region and the Caspian Sea are likely to have occurred during the Apsheronian, and these would have maintained mesohaline conditions. Bakunian sediments yield quite different ostracod faunas and palynofloras that point to very low salinity, brackish (~mesohaline to oligohaline) to freshwater conditions. This is the first indication of water conditions during the Pleistocene in the Caspian Sea that were similar to those of the present day. In the more offshore regions this change is marked by a major expansion and diversification of the dinoflagellate cyst *Spiniferites cruciformis*. The results show that Bakunian sediments in the Caspian Sea were deposited away from any direct marine influence. The Caspian Sea would have been largely isolated at this time, with overflow to the Black Sea occurring during the maximum highstands. The early to middle Pleistocene Bakunian palynological assemblage closely matches that seen in the late Pleistocene to early Holocene (Neoeuxinian) of the Black Sea, prior to water inflow from the Mediterranean at ca. 7500 BP. In general, there is a close relationship between ostracod faunas and palynofloras in the Caspian Sea throughout the Pleistocene and Holocene which accurately reflects degrees of marine, brackish and freshwater influence.

The Sarmatian-Maeotian transition in Eastern Paratethys

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In Eastern Paratethys, the Sarmatian stage is divided as follows: early Sarmatian (Volhynian), middle Sarmatian (Bessarabian) and late Sarmatian (Khersonian). The age of the Khersonian-Meotian transition is controversial. According to some authors the age of the Khersonian–Meotian transition arrives at 8.6 or 8.2 Ma. In the opinion of other researchers the lower boundary of the Meotian has an age of ~7.3–7.6 Ma. However, it is generally agreed that the age of the top of the Sarmatian is not less than 8.0–8.2 Ma. Furthermore, there might be a significant hiatus with a duration of ~0.6–0.7 Myr at the Khersonian/Meotian transition. In Taman sections of Zheleznyi Rog and Popov Kamen (Russia), a volcanoclastic ash layer at the upper part of the Khersonian is radio-isotopically dated at 8.69±0.18 Ma and 8.5±0.7 Ma.

The Zelensky-Panagia section is located on the Black Sea coast of Taman Peninsula (Eastern Paratethys) and comprises well-exposed upper Chokrakian-Meotian sediments. The Khersonian and Meotian sediments are mainly clays. The total thickness of studied sediments is approximately 45 m. In this study the Khersonian-Meotian sediments were investigated by cyclostratigraphic methods using the magnetic-susceptibility rocks and statistical techniques. The magnetic susceptibility record fluctuates with values ranging from 0.06 to 0.24 × 10-3 SI units. In the studied interval, spectral analysis revealed statistically significant signals related to eccentricity cycles. This astronomical tuning of the Khersonian-Meotian part of the Zelensky-Panagia section delivered an average sedimentation rate estimate of about 16 cm/kyr for the clays. This is consistent with our earlier data on the sedimentation rate during Early Meotian, i.e. 11–12 cm/kyr. Data of the orbitally calibrated Khersonian-Maeotian record can be used for additional dating of the top of the Eastern Paratethys Sarmatian and will help to correlate biotic events.

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The paleobiological characteristics of Meotian deposits of Abkhazia (pollen and foraminifera)

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The boundary between Middle and Upper Sarmatian was the turning point in the geological history of the Caucasus. As a consequence of crustal movements, the Transcaucasian intermountain depression transformed into dry land, split into two parts by the Dzirula Massif. Eastward the Kura Bay was formed. In the West the Rioni Bay was linked to the Black Sea and surrounded by high mountains. Due to its isolation from the rest of the Southern Caucasus, a warm and humid climate prevailed here, helping to preserve rich forest vegetation. Thus, from the end of the Middle Sarmatian, the Colchis Refuge took shape with many Tertiary species surviving until present. Neogene marine deposits from Transcaucasia younger than Sarmatian are known mainly from Western Georgia, where they are represented by the Meotian stage. In Guria as well as in Abkhazia Meotian deposits are widely distributed and represented by two substages: Bagerovian and Akmanaian.

Here, Lower and Upper Meotian deposits of Abkhazia were studied, with samples taken from the sections Gudou, Galidzga, Gedjiri and Otaphi, dated by mollusks and foraminifera. Plant macrofossils and pollen comprise nearly 190 elements, belonging to 82 families and 124 genera. The majority of the flora is composed by subtropical and warm-temperate plants. Their distribution was connected with a vertical zonation of the relief, which was already well developed in the Meotian.

On coastal plains swamp forest was distributed. On higher levels evergreen laurel communities occurred, which were distributed up to the foothills. In the lower and middle belts subtropical mountain forests, with broadleaved trees and conifers, was growing. Compared to the Sarmatian, temperate conifers increased in abundances and occupied the upper mountain zone.

During Meotian the climate of Abkhazia was subtropical on coastal plains and in the lower mountain belt. By uplift of the relief it changed to warm-temperate and temperate conditions.

Judging by the taxonomical composition of ferns and their contents of spores in pollen assemblages, it is possible to suppose that the humidity of climate was less high compared to more southern regions of Western Georgia (Guria). Probably, in spite of the existence of the Colchis refuge, the process of xerophytisation, which embraced the whole southern territory of the Russian plain during the Upper Miocene, influenced the territory of the Abkhazia already in Meotian.

Oral – Wednesday 29 August – Auditorium

Pliocene-Pleistocene ostracods from Caspian Basin

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The high morphological diversity of the ostracods fragile shell that has evolved over time, mirrors the paleoecological differences of each Ponto-Caspian basin throughout the Pliocene and post-Pliocene period.

The predominant facies association during the deposition of the Productive Series (PS) was fluvial-lacustrine. Respectively the ostracod fauna consists mainly of freshwater genera (*Cyclocypris, Ilyocypris, Zonocypris, Cypris, Eucypris, Darwinula, Cyprinotus, Cypridopsis, Limnocythere, Pseudocandona*).

The onset of the Akchagylian is marked by an important transgressive momentum, suggesting a marine connection at the PS – Akchagylian boundary, reflected by the influx of planktonic foraminifera. The prevailing freshwater assemblage was rapidly replaced by a brackish water association that is poorly preserved as the result of alternating dysoxic-and oxyc conditions. The environment Marius Stoica stabilized towards the top of the Akchagylian and a more diverse and strongly calcified ostracod fauna re-established. The assemblage is dominated by *Eucythere naphtatscholana* and candonids like *Candona abichi, C. candida, C. combibo, C. convexa, C. angulata, Camptocypria acronasuta, Typhlocypris gracilis* and *Eucypris* sp. Several occurring limnocytherids, loxoconchids and leptocytheridae species include *Limnocythere alveolata, L. luculenta, L. tschaplyinae, Loxoconcha eichwaldi, L. petasa, L. babazananica* and *Leptocythere gubkini, Amnicythere nata, A. bona* and *A. cymbula*. In the late Akchagylian sequence, *Amnicythere andrussovi* and possibly related morphotypes of the species (*A. saljanica, A. palimpsesta, A. olivina* and *A. picturata*) became more prominent.

At the base of the Apsheronian another appearance of euryhaline foramnifera is suggesting the occurrence of a minor flooding event. Brackish conditions re-establish shortly after the transgression and a great diversification in the ostracod assemblage occurred. Most species from the previous Akchagylian continued to flourish next to newly occurring species like *Tyrrhenocythere azerbaidjanica, T. papillosa, T. bailovi, Cyprideis torosa, Cytherissa bogatschovi, Camptocypria acronasuta* and *Candona candida*, suggesting a proximal – distal environment. The uppermost part of the Apsheronian (equivalent to the Tyurkanian stage) contains fluvial –lacustrine freshwater ostracods.

The Bakunian ostracod fauna consists of brackish water species, resembling the assemblage present in the Apsheronian. Morphological transformations of some of the carapace features are occurring. Some of these early stage morphotypes finally evolved into new species that are characterizing the modern day Caspian Sea ostracod fauna.

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Dynamic changes of depositional systems: a key to perpetual changes of the biota (an example from Lake Pannon, Central Paratethys)

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In the upper Miocene to Quaternary of the Pontocaspian region, chronostratigraphic boundaries were defined where significant changes in the biota and lithology were observed, supposing that these mark basin-wide synchronous events. These were then used to reconstruct the environmental history. Little effort has been made to understand the dynamics of related sedimentary systems, which crucial role is shown by examples from Late Miocene-Pliocene brackish-water Pannonian basin. Here we demonstrate how and where various shallow and deep water depositional systems, each with its characteristic endemic biota, developed and existed synchronously in Lake Pannon, confusing litho- and chronostratigraphic interpretations for many decades.

At 11.6 Ma ago a lacustrine archipelago formed within the Carpathian arc. During the following 4 myrs islands gradually got flooded. The mollusc fauna of the littoral zone was followed by sublittoral faunas living in 80-100 m deep waters. At the same time in the several-hundred-meter-deep lake interiors clay accumulated. Laminated shales with burrows and fully bioturbated beds indicate that some animals adapted to these harsh conditions; shells of cardiids and pulmonate gastropods occur. This habitat did not change for millions of years.

The northern shoreline changed dramatically 10 Ma ago: large rivers began to dump their sandy-silty sediments. A wide morphological shelf formed and prograded gradually to the south. Deltas and shelf-slope were the main conduit for large volumes of sand; turbidity currents swept the bottom and large mass wasting of slope material occurred frequently. The area of deep-water dwellers gradually shrank, and they found refuge in the quiet southern part of the lake. In the shallow environments, however, several new habitats developed: few tens of meters deep shelf, prodelta, delta-front, delta-plain with embayments, channels and swamps, some with strongly agitated sandy, others with silty-clayey substratum. Nutrient-rich waters both on the shelf and near the deltas led to an increase of diversity. Due to river floods, frequent avulsion of channels, compaction-induced floodings and climatically-driven few tens of meter large lake-level fluctuations the loci of these depositional conditions rapidly altered. The short-term, dynamic environmental fluctuations triggered an increasing tempo of adaptation and evolution, and maintained an increased diversity of the biota.

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Hidden refugia of western Caucasus - how genetics changes the perspective

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The Western Caucasus, the historical Colchis is hypothesized as a Tertiary refugium since a long time. With the course of time, this hypothesis was developed into a pattern with some details, specifically about the particular role of the south-eastern Black Sea area in maintaining forest landscape and a high diversity of the organisms. However, molecular genetic data produced in the past twenty years this pattern was modified and currently there are two “mainland” and few “island” or “minor” refugia identified in close proximity to the Black and Caspian seas. The forest landscapes and the associated biodiversity has a non-interrupted geological past in the south-eastern Black Sea and south-western Caspian area. During the periods of unfavorable climate, such as the Messinian Crisis and glacial maxima, they host multiple lineages of living organisms that went extinct elsewhere, such as rhododendrons, wingnuts, salamanders, or even brown trout. The isolates of close relatives separated between these two refugial areas, have the longest independent evolution histories. However, there are also at least two additional minor semi-hidden refugia in the western Caucasus, one around the Likhi Range in Central Georgia and another at the Western Greater Caucasus. Modeling shows there were open forests during glacial maxima, with a denser forest vegetation along the major river courses. Presence of three isolated refugia in the West Caucasus is first shown by genetic studies of salamanders, lizards, and large-bodied snails and were later confirmed by few additional studies. In the talk, more details about the geological past of the Caucaus refugia will be discussed.

Marine influx hits Caspian Sea at the Pleistocene transition

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Landlocked basins like the Caspian Sea are highly sensitive to changes in their hydrological budget, especially at times of disconnection from the global oceans. Modifications to the balance of river runoff, evaporation and precipitation are hence transferred quickly to changes in water lever while subsequent reconnection to open marine conditions may result in complete environmental turnover. Here we reconstruct hydrological and environmental changes in the Caspian Sea basin, using compound-specific hydrogen isotope (δD) data on excellently preserved long chain n-alkanes and alkenones. These biomarkers were extracted from Pliocene to Pleistocene successions, including the Productive Series, Akchagylian and Apsheronian (as in the regional Caspian Basin nomenclature). Terrestrial plant wax long chain n-alkanes δD values reflect continental hydrological changes in the region surrounding the Caspian Sea. δD values of long chain alkenones, in contrast, are derived from haptophyte algae within the basinal water column and typically reflect changes in δD of Caspian Sea water. The δD values of the terrestrial long chain n-alkanes show a variation of 55‰ from as high as -120 ‰ at the base of the sampled section (at ~ 3.55 Ma) to as low as -175 ‰, in the youngest part (at ~ 2.2 Ma). The change towards constant δDn-alkane values around -175 ‰ appears to be correlated with the occurrence of alkenones in the sampled section suggesting a newly installed connection of the Caspian Sea with a marine basin at that time. This observation is supported by δDalkenone values of around -190 ‰ being similar to age-equivalent δDalkenone values recorded in the marine realm. Based on the appearance of alkenones in the Caspian Basin sections and on their δD values we conclude that during Akchagylian, at ~2.5 Ma, the Caspian Sea became connected to the open ocean, permitting the influx of marine biota into the basin.

Onset of continentalisation in the circum-Black Sea region during the latest Miocene: a multiproxy approach

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The present day Black Sea represents the sink for some of the largest European rivers. The Black Sea basin acted as water and sediment sink since Cenozoic times, when it was a part of the Eastern Paratethys, an epicontinental sea covering substantial regions on the Eurasian interior. Previous investigations revealed several phases of strongly enhanced evaporitic and dry conditions in the late Miocene. Here we present the first time record of continental temperature and soil type changes, and biomass burned in the circum-Black Sea region during the late Miocene to the transition into Pliocene (from ~10.0 to 5.0 Ma). To this extent we use branched glycerol dialkyl glycerol tetraether (brGDGT) for the reconstruction of the mean annual air temperature (MAAT) and soil pH of the land mass and charcoal morphologies to determine interactions between climate and biomass burned. Based on our MAAT record, a generally decreasing temperature trend was recorded between ~10 and 7.5 Ma. Our record of soil types indicate acidic soils, which is in line with vegetation dominated by mega- and mesothermic trees in the Black Sea region. The Pontian flooding at 6.12 Ma brought a large quantity of organic debris and charcoal fragments indicating that it concerned a forceful event. A sharp cooling record at 840 mbsf the DSDP42 B 380 site coincided with the TG 20 and TG 22 glacial peaks at 5.8 Ma. The negative water budget affecting the Mediterranean Basin has influenced the vapor (i.e. precipitation) availability in the entire circum-Mediterranean. For the interval between 5.8 and 5.0 Ma the source for the brGDGTs is dominantly from north of the Black Sea basin, likely from a cold steppe environment. Enhanced fire activity at time of cooler temperature but higher proportion of grasslands, give support for increased continentally between 5.8 and 5.0 Ma. Our data pin down the large environmental changes affecting the continental realm around the Black Sea during the latest Miocene and the transition into Pliocene when alterations in connectivity to the ocean led to quasi-isolation and shrinkage of the Paratethys Sea of Eurasia.

New data on the upper Miocene continental record of Armenia

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The late Miocene represents an important time period which characterises the rise of modern ecosystems. The upper Miocene continental record in Southern Caucasus is extremely poor. Here we present the first late Miocene age locality from Armenia which reflects dynamic environmental changes in the section, from aquatic (freshwater lake) to terrestrial environment. The studied section Jradzor is located in Central Armenia on the Eranos Mountainous Chain (1940 m a.s.l.), southwest from the Gegham mountains of volcanic origin. The base of the section is represented by volcanic breccia, which is overlain by a seven to eight meter thick diatomite package showing fine lamination. The diatomite contains abundant fossil fauna of fishes, amphibian and small mammal. Upwards in the section, the package provides sedimentological and palaeontological evidences of intensification of the terrestrial input into the lake and its gradual shallowing. This diatomite package is covered by a lens of lithified volcanic ash of high-K calc alkaline series. The lacustrine environment re-establishes and represents the second package (3 m) of the diatomite, overlying the first diatomite package. The top of the second diatomite package is overlain with erosional contact by 40 cm thick volcanic breccia, indicating full regression of the lake. The section follows by an about six meter thick series of terrigenous sediments (sandstones, clay-loess) intercalated by volcanic ash of high-K calc alkaline series. At the base of this package as well as below the (second) volcanic ash a rich fauna of amphibian, reptiles and small and large mammals has been recorded. The small mammal fauna can be correlated with the MN13 mammal zone, suggesting a late Miocene age of the sediments. The section continues with the second 7 m thick continental loess (mixtures of loess, sand and cobble) dominated package. In its base the package contains at least two fossiliferous horizons with vertebrates (small mammals (MN13 zone) and reptiles). The last 2-2,5 m of the section are represented by a horizon of palaeosol containing evidence of bioturbation. A lens of scoria (of 20-80 m) in this layer is the last evidence of volcanic activity in the area. For comprehensive understanding of the environment, faunal, and vegetation evolution of the late Miocene of the area, further analyses (e.g. stable and radiogenic isotopes, phytolith, and pollen) on the Jradzor section will be provided.

The genus *Radix* in the Ponto-Caspian region and beyond: A new taxonomic structure for a classical lymnaeid genus

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The radicine pond snails represent a species-rich group widely distributed in the Old World, many species of which are key vectors of human and animal trematodes. It is a good model for biogeographic and evolutionary studies. Since Hubendick (1951), most authors accepted this group as comprising a few (4-5) valid species worldwide (but see Kruglov & Starobogatov, 1993a, b). Here we clarify the taxonomy, distribution and evolutionary biogeography of the radicine lymnaeids in the Old World, with an emphasis on the Ponto-Caspian malacofauna, based on the most comprehensive multi-locus molecular dataset sampled to date. We show that the subfamily Amphipepleinae is monophyletic and contains ten genus-level clades: *Radix* Montfort, 1810 s.str., *Ampullaceana* Servain, 1881, *Peregriana* Servain, 1881, *Tibetoradix* Bolotov, Vinarski & Aksenova gen. nov., *Kamtschaticana* Kruglov & Starobogatov, 1984, *Orientogalba* Kruglov & Starobogatov, 1985, *Cerasina* Kobelt, 1881, and *Myxas* G. B. Sowerby I, 1822 from the Old World, as well as *Austropeplea* Cotton, 1942 and *Bullastra* Bergh, 1901 endemic to Australasia. In other words, the taxonomic structure of the classical lymnaeid genus *Radix* s. lato. has been totally revised, and now it is split into as many as 6 separate genera. The generic name *Radix* should be retained for a relatively compact group of species closely allied to *R. auricularia*. With respect to our species-delimitation model and morphological data, the Old World fauna includes at least 34 biological species of radicines. Our phylogenetic modelling suggests that the MRCA of the radicine clade could have originated near the Cretaceous – Paleocene boundary. The Tibetan Plateau and Eastern Europe harbor the richest faunas, while East Asia and Africa appear to be the most species-poor areas. The Ponto-Caspian region maintains a relatively rich fauna of radicines, with not less than 8 valid species. The origin of the Ponto-Caspian fauna of the radicines as well as some problems related to their nomenclature, taxonomy, and identification are discussed. A species *Radix euphratica* (Mousson, 1873) has been identified as one of the most common radicine species for the Ponto-Caspian area. Its range covers a vast area, including Middle East (Iraq), Central Asia (Uzbekistan and Tajikistan), Transcaucasia (Georgia), and Eastern Europe (lower courses of the Don River). We propose a novel climate-dependent biogeographic model explaining the radicine radiations that predicts broad-scale dispersal events during the warm and humid episodes followed by the range fragmentation during the cold and dry periods.

The Northern Caspian Sea: Environmental consequences of climate change during the Holocene

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A succession and architecture of Holocene deposits in the Northern Caspian Sea reflects past sea-level fluctuations of different scale. Analyses of high and low frequency seismic-acoustic profiles, as well as multidicplinary investigations of cores reveal palaeogeographic events of different scale recorded in the sequence. The large-scale Mangyshlak regression left lowstand signals at about -90 m bsl. The event is dated between~11 600–8000 yr BP, that is, in the Boreal period of the early Holocene. During the Boreal climate conditions were warm arid. A short-term sharp cooling known as the "8200 event" that coincided with an increase in aridity resulted in a maximum drop of the level at the final stage of the regression. The Novocaspian transgression had three transgressive stages separated by short regressions. The first stage (8200-5600 yr BP) developed under conditions of a warm and wet climate of the Holocene optimum. The second stage (3600-3400 yr BP) could be a response to the Subboreal cooling and increase in moisture supply on the East European Plain. The third transgressive stage occurred after 2300 yr BP. The transgressive stages are characterized by different mollusk assemblages. Brackish-water species of *Monodacna*, *Adacna*, and *Hypanis* were dominant in the early Novocaspian basin and *Didacna* species were rare. The marine *Cerastoderma glaucum* was absent. The middle transgressive stage is characterised by a more diversified malacofauna, with common *Didacna* species and the first occurrence of *Cerastoderma glaucum*. As to the late transgressive stage, its species composition is similar to the present-day one. At the latest stages of the sea basin evolution there appeared some of the Black Sea species – *Mytilaster lineatus* and *Abra segmentum*. Two regressive phases occurred 5600-3700 and 3080-2300 yr BP, the sea level being lowered by 5–14 m. The first phase corresponds to the Subboreal thermal maximum of the Holocene which is characterised by a low moisture supply over the European part of Russia. The second phase is considered to be the Caspian response to the warming and rainfall decrease in the Volga drainage basin. In the Holocene sequence the regressive phases are manifested as depressions filled with freshwater (and occasionally slightly brackish-water) deposits (similar to the ilmens in the modern Volga delta).

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Poster – Wednesday 29 August – Main Hall

Ichnofacies distribution in offshore sediments of the Langarud-Rudsar region of Iran, southern Caspian Sea

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The South Caspian Sea Basin is situated to the south of the Apsheron Sill and has undergone significant subsidence during the Neogene. It has a maximum water depth at present of ca. 1025 m. In this research we present the results of a lithofacies and biofacies study of two short cores. These were collected from the southern Caspian Sea offshore from the Langarud-Rudsar region of Iran, to the east of the Sefidrud Delta and provide a sedimentary record for the last 200+ years.

A non-marine *Mermia* ichnofacies type is reported for the first time in the Caspian Sea based on burrowing patterns revealed by the CAT-scan method. Horizontal burrows formed by *Treptichnus* and *Cochlichnus* (both part of the *Mermia* ichnofacies) occurred in the periods ~1821 to 1838 CE and ~1948 CE, at times when the Caspian Sea level was rising and falling respectively. *Treptichnus* is probably indicative of relatively low energy deposition within poorly oxygenated waters. Vertical burrows occurred in the periods ~1906 to 1932 CE, ~1940 to 1958 CE and 1973 CE, which coincide with fairly stable but variable Caspian Sea levels (-27 to -29 m) and maybe linked to more oxygenated waters. Ichnofacies show a probable link with Caspian Sea level fluctuations within the past 200 years and should be investigated further.

Poster – Monday 27 August – Main Hall

Changes of the biodiversity in the lagoons in the background of the Caspian Sea level oscillations

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The reaction of the coastal zone to the rise of the sea level is considered. Around the Caspian Sea lowlands are widespread, and during the sea-level oscillations these lowlands were flooded at sea level rise or drained at regression. Detailed studies on the coast of Dagestan in the late twentieth century, when the level of the Caspian Sea rose by more than 2 m, showed that the development of the coastal zone during transgression depended on the combinations of slopes of the coastal plain and underwater coastal slope. On the coastal plain, where the primary slopes of the land, on which the sea transgresses, less than the slopes of the nearshore, lagoons form behind the bars as the result of flooding by ground and sea waters. In these lagoon-barrier systems malacofauna were different from the open Caspian Sea, so in palaeo reconstructions it is important to allocate the locations, depths of the lagoons and their character of isolation from the sea. The nature of the malacofauna in them is different in the initial stages of transgression, its maximum and subsequent regression stage. At the same time, in the open sea, faunal communities persist unchanged.

In the outcrops and boreholes there is a simultaneous formation of two lithological different types of the deposits – lagoon and coast deposits. During paleogeographic reconstructions it is necessary to take into account paragenesis of such deposits, since the sharp occurrence of lagoon sediments on the alluvial or marine sand, as a rule, is interpreted as the erosion and changes in the depth of the sea. After the sea level fall extensive lagoons were drained and it gives reason to allocate a special type of terrace - lagoon-transgressive - on many low-lying shores not only in the Caspian Sea, but on the Word Ocean shores.

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Correlation of the paleogeographic events in the Caspian Sea and on the East European plain during the last glacial epoch (from boreholes)

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The problem of correlation between transgressive-regressive oscillations in the Caspian and glacial events on the East European Plain is of great importance in Pleistocene paleogeography. There is no unequivocal opinion on the correlation scheme. The authors have carried out complex paleogeographic analyses of the cores from the Northern Caspian Sea. Paleogeographic evidence on events on the Plain is based on published data. Events during the last glacial epoch (MIS 2) left their distinguishable imprint on the Caspian Sea environmental evolution. Based on the analysis of seismic-acoustic profiles and drilling data, the stages of glacial epoch development are well distinguishable in the sedimentary sequence. Before the LGM the development of the interstadial warming led to increase in surface runoff from the catchment of the Caspian and resulted in the rising of the lake level (Atelian) and the onset of the first stage of the Khvalynian transgression. The level rising was interrupted during maximum cooling and aridization at MIS 2 (Late Valdai) and resumed when the ice sheet was decaying. The events known as warm phases of Bølling and Allerød promoted the ice sheet melting along with thawing of permafrost, the latter having been widespread in the Volga drainage basin. All the above contributed to the Khvalynian transgression. The 'chocolate' clays were accumulated in the Volga estuary and in depressions in the Pre-Khvalynian relief. Phases of a cooling known as the Oldest, Older and Younger Dryas were marked by a decrease runoff volume from the Caspian drainage basin are correlatable with regressive stages in the Khvalynian basin history. The most pronounced regression corresponds to the Younger Dryas. The Khvalynian came to its end at the first sharp warming that resulted in the rise of the Caspian level and is generally taken as marking the Pleistocene/Holocene boundary. The Mangyshlakian regression is dated to the Holocene and was essentially a response to the increase in the climate continentality.

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Neogene-Quaternary vertebrate faunas from the Middle Kura Basin

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The middle part of the Kura Basin, the territory in the Southern Caucasus between the Mtkvari (Kura) and Alazani Rivers, including the vicinities of the Mingachevir Reservoir (Eastern Georgia and Western Azerbaijan), is remarkable because of its lengthy stratigraphic sequences preserving an outstandingly rich terrestrial fossil record.

Excluding the sites with a single taxon (four sites), fourteen terrestrial vertebrate sites are found in the Kura Foreland. Terrestrial mammalian sites found here cover a time span from the Late Miocene through the Quaternary.

The general biostratigraphic framework suggests two major intervals of the terrestrial fossil record in the area, spanning ca. 10-7 Ma and ca. 3-1 Ma and points to an important hiatus between the Late Miocene and late Pliocene.

The greatest value of this fossil record is the potential to understand a detailed history of terrestrial life during demise of Late Miocene Hominoidea in Eurasia and early *Homo* dispersal out of Africa. The Late Miocene record of the Middle Kura Basin captures the very last moment of the Eastern Paratethys regression, and among other fossils counts the latest and the easternmost dryopithecine - *Udabnopithecus garedziensis*; while the almost uninterrupted fossil record of the late Pliocene - Early Pleistocene precedes, is contemporaneous with, and postdates early human occupation of the Caucasus and Eurasia.

The fossil record in general speaks about the enormous paleontological potential of this area, which in fact is very poorly explored, and rather poorly studied. The impressive successions of alternating marine/lacustrine and continental deposits with intercalations of volcanic ash can potentially provide a direct correlation of terrestrial and marine records through absolute dating, making the region promising for complex, interdisciplinary research on the evolutionary history of life.

Research of the New Late Miocene fossil vertebrate site Chachuna

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Chachuna (Gare Kakheti, Georgia) is a new fossil vertebrate site in the Middle Kura Basin of the Eastern Paratethys. It is one of the sites from the Late Miocene (Khersonian) deposits along the Iori river. This terrestrial fossil record (Udabno, Chachuna, Eldari sites) captures the very last moment of the long-term regression of the Eastern Paratethys and counts among other fossils the latest and easternmost driopithecine –*Udabnopithecus garedziensis*.

The Chachuna site occupies a large area with an extent of 16 km in EW direction on the Aktakhta-tapa anticline. Remarkable concentrations of terrestrial vertebrate remains were encountered in three stratigraphic successive localities: Chachuna 1, 2 and 3. Most of the research so far was done for the Chachuna-2 section.

Two lithofacial units, shallow marine and continental, were established in the Upper Sarmatian interval of the Chachuna-2 section, which grades into the Meotian-Pontian Shiraki Formation above. Total thickness of the measured section is 880 m. The section reveals cyclic changes of the basin depth, which can be due to climatic fluctuations or localized tectonics.

The first testing of the sediments on pollen content of the Chachuna-2 section (the Upper Sarmatian s.l./Khersonian deposits) showed that mainly subtropical and warm-temperate plants (trees and ferns) were found in the samples from the lower, shallow marine part. Impoverishment of the subtropical hygrophilous plants, decrease of forest elements, and the expansion of herbaceous associations were observed in the upper, continental deposits of the Eldari Formation.

Joint evidence of the biostratigraphic distribution of the land mammalian taxa of the Chachuna 2, malacofauna, litho- and magnetostratigraphy supports its inclusion in the Early Turolian (MN11).

Palynological and macrobotanical comparative investigation of Gurian (Late Early Pleistocene) marine sediments in Western Georgia

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Outcrops of Gurian strata are known only from the region of the same name in SW Georgia. The Gurian regional stage covers the time from 1770 to 750 ka and correlates to the Apsheronian and the Calabrian. The beginning of this period is marked by the oldest fossil finds of *Homo erectus* outside Africa, in Dmanisi, Southern Georgia. Thus, it is crucial to know which processes formed the paleolandscapes across the Southern Caucasus and contributed to the formation of a corridor for early human migration. The Gurian deposits have been partially analyzed by palynology, but macroscopic remains of plants have not been investigated yet at all. The current study of palynolgical and macrobotanical material from the long section Khvarbeti-1, which comprises the whole Gurian stage, aims to reconstruct regional late Early Pleistocene vegetation and climate dynamics and its correlation with sea level oscillations of the Black See.

The Gurian section Khvarbeti-1 is 166 m thick and is build up mainly of marls in the lower part of the section and calcarenitic sandstones in the upper part. Sampling comprises 93 samples for palynological investigation and 265 samples for macrobotanical study, with imprints of leaves and fruits. Preliminary results are based on material from the middle and upper part of the profile Khvarbeti-1 and broadly point to three palynological zones (PZ-1 to PZ-3).

Based on pollen and NPP analyses and with the correlation of palynological and macrobotanical data, the preliminary data show that environmental and climatic changes are reflected in the composition of the assemblages. The abundance of *Tsuga* pollen seems to be a good indicator of temperature changes, which caused significant shifts of the vegetation belts.

Evidence of Paleoecological changes and its connection with Human resettlement in Javakheti Highland (Central South Caucasus) based on recent Palynological data of sediment core samples and previous studies

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Our research presents palynological records from a 2 m sediment core from the Paravani lake shore (Georgia). The core contains a record of paleoecological changes in the central South Caucasus driven by climate and/or human impact. We present preliminary results, based on first year of summer field-work on Paravani Lake, funded by ISTC project G2153 “High mountain large lakes as a key components of local environment, study of natural and man-made impacts”. The lake is located in the South Caucasus on the Javakheti Volcanic Plateau between Abul-Samsari and Javakheti Ranges, and lies 2100 m above sea level. Nowadays the sparesely populated Paravani plateau is mostly grass-dominated. Several studies suggest that the plateau was forested and densely inhabited during the bronze age. Geomorphological characters/features of Lake Paravani basin provide evidence of drastic changes in the local environment during the Holocene period, which is supported by archaeological data as well as by studies of previous authors (Messager et al., 2003).

The new sediment core was derived using Percussion Drilling on the Paravani lake shore. After preliminary analysis and description of main sediment layers, in total 12 samples, 5- cm length each were taken for palynological analyses. The samples cover an interval between 25 and 177 cm depth. The high mineral content in the samples required special chemical treatments for pollen analyses in order to get clear and high-quality material for further investigation.

Based on pollen types and their concentration, several palaeoecologically distinguished phases can be identified. Comparative analysis of obtained results, with the archaeological data shows the favorable environmental conditions for human settlement at these high altitudes. The late forestation at circa 8000 years BP has also been found in the Paravani Lake Valley. We expect that Bronze age anthropogenic activity, expressed in sparsely studied megalithic culture of Javakheti Highland, to be connected with the phase of a climatic maximum and should correspond to best environmental condition from human perspective. The third phase shows the decline of forests and expansion of herbaceous formations, leading to the present-day steppic environment. Our preliminary results well correlate with existing studies mentioned above.

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Using social network analysis to streamline marine biodiversity conservation in Ukraine

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Social networks as sets of relationships between stakeholder institutions involved in environmental management and conservation are very important in determining the positive outcomes for Biodiversity. Effective management and conservation of biodiversity is best achieved through collaboration (information exchange, coordination of action) of various stakeholders. However, few studies have applied social network analyses for understanding the patterns of relationships between the organisations involved in biodiversity conservation, planning and management. Here we present an example of a social network that is involved in conservation of so-called Pontocaspian biota in the coastal zones of Ukraine. We investigate if the existing stakeholder framework permits an effective conservation of Pontocaspian biota in Ukraine. We show that relevant stakeholders are in general well connected. The network is decentralized. Although the Ministry of Ecology of Ukraine has the most central position, there are several other institutions with high centrality scores. The frequency of interaction is diverse and accounts for strong, hence regular, half of the times of all the recorded relationships and weak, hence 'opportunistic', the other half of the cases. We conclude that the stakeholders' network in Ukraine is well suited to deal with effective biodiversity conservation. Improvements can be made on better coordination of action among the stakeholder institutions and increased focus on the Pontocaspian species. This is an exploratory study that will set a baseline for further studies in the region examining stakeholder networks in biodiversity conservation.

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Significance of calcareous nannofossils as indicator of connection of the Pontocaspian with the adjacent marine basins

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The present study is based for our dataset the study of calcareous nannoplankton from the sections of Turkmenistan, Georgia, Azerbaijan, Russia, Ukraine and Moldova during the Miocene-Pliocene . The presence of calcareous nannofossil assemblages in the Miocene-Pliocene sediments is used as indicator of connection with the adjacent marine basins. An analysis of the quantitative and qualitative characteristics of nannofossil assemblages can be the key to the reconstruction of the hydrological regime of the basin since the calcareous nannoplankton is very sensitive to salinity fluctuations. Some of oceanic species tolerate narrow fluctuations of salinity while cosmopolitan species and long-lived tolerate wider salinity changes. We use the calcareous nannoplankton an important tool both for biostratigraphic studies and for paleoecological and paleogeographic reconstructions from Tarkhanian to Akchagylian. Special attention was focused on the study monospecific nannofloras assemblages because the nannofloras blooms represents good proxy to characterize the specific environmental conditions.

The research complies with the state theme AAAA-A17-117030610119-6 of the Geological Institute RAS. The field expedition was supported by the Russian Foundation for Basic Research № 16-05-01032.

Late Holocene environmental changes in the Lake Sevan basin– implications from palynological and carpological analyses of peatbog sediments from Tsovinar-1, Armenia

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Lake Sevan is the biggest lake in Armenia and the Caucasus region, and one of the largest highmountain freshwater lakes in Eurasia. The lake is situated at an altitude of 1,900 m above sea level. Late Holocene peat bogs are widespread at the southern shore of the lake. This work presents the first results of a high resolution paleobotanical investigation of these peat bog sediments from the section Tsovinar-1 with the aim to reconstruct and correlate climate changes and the dynamics of lake level fluctuations in Lake Sevan. Furthermore, we assess the role of anthropogenic factors on the ecosystems in the Sevan basin and possible interdependencies between human economic activities and climate change.

The three meter section of Tsovinar-1 shows lithological changes from light, clayish lake sediments to partly laminated brown to black peats followed again by grey clays and I covered by modern soil. The peat and lake sediments were sampled continuously and studied with palynological and palaeocarpological methods.

The radiocarbon dating reveals a late Holocene age with a hiatus between the lower lake sediments (ca 5-6000 BC) and the upper parts of the section (ca. 2000 BC – 1000 AD). The preliminary results from four radiometrically dated levels of the younger part of the section show repeated changes of the environment of Lake Sevan basin. The warmest and humid climatic conditions are seen in the 7th century BC. Broad-leaved forests were widespread at this time. The water level in Lake Sevan was high. In the 4th century BC climatic conditions deteriorated. Cooler and dryer conditions correspond to a recution in forests, and the water level of Lake Sevan dropped. In the 3rd century AD, open landscapes prevailed in the vicinity of Tsovinar-1 and the lake level remained low. Later, in the 9th century forests with thermophilous taxa expanded and the water level of Lake Sevan rised again.

Generally, these preliminary data seem to indicate a parallel development of climate and lake level with low stands during cooler and drier phases and high stands during warmer and more humid phases.

400,000 years of climate-driven connectivity changes in the Late Quaternary of the Black Sea

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The Quaternary witnessed multiple periods of connection and disconnection between the Black Sea and adjacent water bodies (Mediterranean Sea and Caspian Sea), and these events drove changes in aquatic environments that are recorded in each basin's sedimentary archive.

We present a record from 430,000 to 50,000 years ago (Marine Isotopes Stages, MIS 11 to 3) from Deep Sea Drilling Programme (DSDP) Site 379, in the central part of the Black Sea. By analysing dinoflagellate cyst (dinocyst) assemblages and 87Sr/86Sr ratios on ostracods, we reconstruct the properties of past surface waters (dinocysts) and the 87Sr/86Sr composition of the entire water column. Episodes where marked changes occurred in the percentage of key dinocyst species appear to correlate with super-interglacial episodes (MIS 11, 9, 7 and 5). Contemporaneous deviations in ostracod 87Sr/86Sr towards the values of the global ocean also occurred during MIS 5 and 9. These signals could correspond to high global sea levels, prompting connection between the Black Sea and the Mediterranean. However, different interglacials show different signatures.

Changes in dinocyst assemblages and 87Sr/86Sr suggest that marine water flowed into the Black Sea during MIS 5 and 9 influencing the entire water column. Against a background dominance of *Pyxidinosis psilata*, MIS 5 and 9 contain influxes of dinoflagellates tolerant to fully marine conditions (high proportions of *Lingulodinium machaerophorum* along with *Spiniferites* spp., *Operculodinium centrocarpum* and *Tectatodinium pellitum*). The increase in *L. machaerophorum* (MIS 5 and 9) may also indicate seasonal water column stratification due to saline waters forming a dense basal layer in the Black Sea water column. Strontium isotope ratios show a shift towards oceanic values during MIS 5 and 9, supporting connection with the Mediterranean during these periods.

Dinocyst assemblages show deviations from background assemblages in all four interglacials studied. However, the signal is not equal during all interglacials. Dinocyst signals during MIS 7 and 11 show increased *Spiniferites cruciformis* and *Spiniferites* spp., and (during MIS 7) *Impagidinium inaequalis*, *I. spongianum* and cf. *Leptodinium*. Strontium isotope ratios do not deviate towards oceanic values during MIS 7, and no ostracods were retrieved from MIS 11. Dinocyst assemblages of MIS 7 and 11 (and strontium isotope ratios in MIS 7) may therefore be a result of increased river input, or overflow from the Caspian Sea. Although the causes of changes in dinocyst assemblages in MIS 7 and 11 are not yet clear, low 87Sr/86Sr ratios suggest that Mediterranean inflow was weak (or absent) during MIS 7.

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Caspian sea-level changes during the Pleistocene: onshore sedimentary reconstruction in the Kura Basin, Azerbaijan

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The Caspian Sea represents the largest endorheic basin in the world. Due to restricted connection with the marine realm, the Caspian Basin is very sensitive to sea-level changes. Since the Pleistocene, the basin recorded drastic sea-level variations, which severely affected the environmental evolution, in association with fauna evolution and human migration. The amplitude, frequency and drivers of these sea-level variations remain nevertheless poorly understood.

By studying an onshore sedimentary record in the Azerbaijani Kura Basin, we aim to reconstruct a sea-level curve for the Pleistocene Caspian Sea. The well-exposed Hajigabul section (also known as the 'Dream section') documents a 2500 meter continuous stratigraphical succession, previously dated between 2.6 Ma and 0.6 Ma (Akchagylian, Apsheronian, Bakunian regional stages). We here only focus on the Apsheronian which records a 1200 meter sedimentary succession. If the Akchagylian and Bakunian are marked by major long term transgressive events, the Apsheronian stage displays a repeated alternation between offshore, shore and onshore deposits. On the base of detailed sedimentological and paleontological observations, we estimate water-depth for each depositional environment and reconstruct a sea-level curve of the Pleistocene Caspian Sea.

We identify 3 major stratigraphical sequences of 400 meter thick, marked by a regression from offshore up to onshore sediments. Thanks to the robust time frame available for this section, we estimate these major regressive events to occur every 400 kyr and may correlate to eccentricity minimums. This study allows therefore apprehending the amplitude and timing of large-scale sea-level changes in the Caspian Sea during the Pleistocene.

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Poster – Monday 27 August – Main Hall

Drivers of Caspian and Black Sea level change during the Quaternary period

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The Black Sea and Caspian Sea experienced water level changes on various time-scales during the Quaternary period. The Caspian Sea in particular has undergone extreme water level changes ranging from tens to hundreds meters. Numerous studies have suggested that, the water level variations of this region have depended on both geophysical processes, affecting the opening and closing gateways with the marine realm, and hydro-climatological processes, resulting in water balance changes. However, there are conflicting ideas concerning the relative importance of different potential drivers of past sea level variability as well as the mechanisms/routes by which they impacted basin connectivity and sea level variation. In this study, firstly we focus on reviewing the potential drivers of sea level change and secondly we study the impacts of hydro-climatological processes and catchment dynamics on water level. Climate model simulations from a global coupled ocean-atmosphere-vegetation climate model, HadCM3, are used to drive the THMB (formerly known as HYDRA) hydrological model to examine lake level change. We explore catchment water balance (runoff from catchment – evaporation over the sea) variability as well as changes in catchment size over the last 122 thousand years. Hypothetical scenarios of runoff source area are investigated to understand the impact of extinct river systems and pro-glacial melt water pulses on lake levels and connectivity. By this method we plan to explore and constrain the drivers and sources of runoff that control the sea level variations in the Pontocaspian region.

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Geomorphological evolution of the Iranian coast of the Caspian sea during the last 15 ka (Golestan province)

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The Iranian Caspian coastal region is unique in our understanding of the history of the Caspian Sea in the Pleistocene and its correlation with the global and regional climate changes. The reason is representativeness of Quaternary sections, presence of both marine and subaerial sediments, paleontological richness of the materials that are available for study.

At present, large-scale studies of the subaerial deposits of the region - first of all - the so-called Iranian loess plateau are being carried out. Works on the paleoclimatic reconstructions of the region in Holocene were performed by Leroy (2016). However, the Iranian coast remains one of the few sections of the Caspian where sea level reconstructions based on geomorphological evidence have not been performed. In our work, we tried to reconstruct the history of the development of the last and largest transgression of the Caspian Sea – Early Khvalynian, and to reveal the stages of its development in the territory of Northeast Iran. The object of research was the valley of the Gorgan River, in the sides of which a series of sections with marine, alluvial and aeolian deposits are preserved. We have described more than 30 sections throughout the valley, within the bounds of the possible influence of the Khvalynian transgression (up to a height of +70 m abs). For the first time, deposits of mixed alluvial-marine genesis, reflecting the early Khvalynian transgression of the Caspian Sea, were found in the sections. Completed OSL-dating of sediments allowed to reconstruct the stages of development of the natural environment of the region after the LGM. Thus, 14-15 thousand years ago the middle part of the valley of the Gorgan River was covered by the waters of the Caspian Sea. In sections of the middle part of the Valley (altitude of +30 m), this stage is represented by rhythmic clays and loams of mixed marine and alluvial genesis. The transition to purely alluvial floodplain deposits. The upper part of the section is represented by subaerial loess deposits, with thickness of 7-8 m. The subaerial phase of sedimentation began about 11 thousand years ago with a high rate of formation of loesslike deposits. Obtained new data allow us to reconstruct the history of the development of the region's geomorphology in the final stages of the Early Khvalynian transgression of the Caspian Sea (14-12 thousand years ago) and the subsequent continental stage, during which a deep cutting of the Gorgan River channel is noted with a synchronous accumulation of a thick layer of loess.

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Poster – Monday 27 August – Main Hall

Differential impact of anthropogenic pressures on he Caspian Sea may affect endemic species distribution

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In the Caspian Sea, a basin rich in endemic species, taxonomic diversification is influenced by variation in selective environmental parameters such as temperature, salinity and water depth. These environmental parameters were used previously to delimitate three sub-basins: i) North Caspian, ii) Middle Caspian, and iii) South Caspian. In the past decades, a biodiversity decline probably caused by a combination of natural and anthropogenic pressures, was reported from all three sub-basins. In this study, we analyzed the anthropogenic impact of 9 human-derived pressures in the three sub-basins by the use of Cumulative Effect Assessment (CEA) methods. Furthermore, we investigated changes in selected endemic species distribution in the Middle and South Caspian before and after the rise of anthropogenic activities, comparing data from two biodiversity expeditions: the first from 1876 and the second from 1986. We found that the North Caspian showed higher average CEA scores compared to the Middle Caspian and the South Caspian. Moreover, we detected differences in the anthropogenic pressure contribution to the CEA score among the sub-basins: the North Caspian was mostly affected by poaching (46% of the CEA score), whereas the Middle and South Caspian by pollution (45% and 51%). In the two southern sub-basins, our results suggested that in areas with highest anthropogenic impact, habitat suitability for some endemic species decreased. We also found that spatial patterns of the CEA scores were mostly explained by inherent limnological characteristics of the water basin and by the distance from sources of anthropogenic pressures. For biodiversity conservation purposes, it is important to identify the Caspian Sea areas prone to an accumulation of anthropogenic pressures and to assess if they overlap with suitable habitats for endemic species. Finally, our study may serve as baseline for future spatially explicit monitoring of environmental conditions and to implement water basin management plans focusing on the conservation of the unique Caspian Sea faunas.

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Poster – Monday 27 August – Main Hall

Major sea level variations of the South Caspian Basin in the Early Pleistocene: magnetostratigraphy, paleoenvironments, fauna

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The evolution of the Caspian Basin in the Early Pleistocene strongly depends on intensification of Quaternary climatic oscillations. Being one of the main drivers of paleoenvironmental evolution, these oscillations strongly controlled the water budget. The Caspian Sea Basin is a semi-isolated basin and even minor shifts in precipitation and evaporation led to strong water level changes. Such shifts determined highstands/lowstands and connection/disconnection between the Caspian and Black Sea basins.

At the same time, strong tectonic activity along the Caucasian orogeny system caused regional landscape restructuring and acted as another active control on depositional environments. Unevenness of tectonic activity in different parts of the Caspian Basin might have caused diachroneity of regional transgression/regression events. This in turn may be a reason of some of the disagreements in the regional time scale. Identification of synchronous/diachronic events in the regional sections should be helpful in differentiation of local tectonically driven base level changes from regional (global) fluctuations caused by climate.

An impressive geological record is preserved in the margins of the Kura Basin in Azerbaijan that is part of the South Caspian Basin. To identify synchronous base level changes in the South Caspian Basin, we conducted paleomagnetic studies on two continuous sections – Hajigabul and Goychay. The sections cover time intervals between 2.7-0.5 Ma and 2.5-1.2 Ma respectively (and include Akchagylian, Apsheronian,Bakunian and Khazarian regional stages).

Our primary magnetostratigraphic results, supported by analyses of sedimentary facies, ostracod and mollusc fauna assemblages, gives an age estimate for the onset of the Akchagylian transgression at 2.7-2.6 Ma. Between 2.2-2.1 Ma in both sections we registered an increase of sand dominated facies. Since this time, the Hajiqabul section shows an alternation between offshore, shore and onshore depositional environments, while the Goychay section displays a gradual transition from offshore to terrestrial environments. This environmental change is accompanied by the first occurrence of Pontocaspian taxa, typical for Apsheronian stage, like *Monodacna* and *Apsheronia* genera. These observations reveal a major basin level drop .

Multidiscliplinary approach of our study helps to evaluate the role of climate and tectonic in evolution of the Caspian Sea and emergence of the Pontocaspian ecosystems.

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Poster – Monday 27 August – Main Hall

The inner structure of Baer's knolls as an indicator of the palaeoecological situation in the lower Volga region

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There are still discussions about genesis, distribution, morphology and inner structure of Baer's knolls (BK). So during our investigations we documented and reviewed the inner architecture. Most often BK have the following structure: the marine Lower Khvalynian deposits lie at the basement, overlain by two main (the Lower and the Upper layer), and Holocene sediments of various origin on top. The units are often separated by angular unconformities and represent a multistage formation during the Late Pleistocene and Early Holocene, after the Early Khvalynian transgression. We carried out a granulometric analysis of samples taken from the Upper and Lower layers. Ca content was measured by using a calcimeter in the laboratory of Resent sediments and Pleistocene Paleogeography. XRF (mineralogical) analysis for several samples were carried out in the laboratory of the Department of Lithology and Marine Geology of MSU. The sediments forming BK have a variable mineralogical composition. This fact indicates either different types of the incoming materials, or a periodic change in the hydrodynamics of the basin. Analyzing the content of Ca, a regularity was revealed: the amount of calcium decreases in Baeri Knolls from the delta plain upstream along the Volga. High Ca contents of the sediments may be attributed either to the abundance of organogenic material in the form of detritus, debris and whole shells of marine and freshwater mollusks, or from eroded limestone from the Volga Uplands. Layers are rich in organogenic material: detritus, debris and whole valves of marine and freshwater redeposited shells *Didacna catillus*, *D. praetrigonoides*, *Dreissena rostriformis*, *Hypanis plicatus* etc. Ostracods also were found in a number of samples. The character of stratification and granulometry indicates that, likely, BK were formed in subaquatic conditions, where a weak current occurred. Simultaneously with the accumulation of sandy material and interlayers of redeposited shells, there was a background deposition of clay particles. It should be noted that the questions of genesis, time of origin and distribution of Baer's knolls are still open. Further detailed studies will help to solve this problem in a complex.

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Geochemical characterization of Khvalynian chocolate clays

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Chocolate clays (CC) are one of the most common facies of the Khvalynian deposits in the Middle and Lower Volga River valley. They also occur in Lower Ural River Valley and ancient depressions within salt dome tectonics (e.g. lakes Baskunchak, Elton, Botkul, Inder etc.). CC were deposited during the Early Khvalynian stage of the Caspian Sea between 17-13.5 ka. This period was characterized by Caspian Sea level oscillations.

During the transgressive stage, Early Khvalynian waters flooded the northern Caspian plains and formed huge estuaries. One of the largest was Volga estuary, which reached 53°N. In this research we analyzed a geochemical composition of CC, which were collected from two sections (Saburovka, Svetly Yar) in the Middle and Lower Volga River valley. These sections are characterized by massive thicknesses of CC and geological completeness without noticeable traces of erosion. Hence, clays in these sections have one of the best high-resolution record for reconstruction of local paleoenvironmental changes.

XRF analysis was performed on 41 samples to identify major and trace elements of CC. Geochemical characterization of CC can potentially provide us information about source, provenance and hydrological cycle during their deposition. To identify the mechanisms of material supply we used elemental rations K/Al, Mg/Al (fluvial supply), Si/Al, Ti/Al (aeolian supply). Redox conditions were analyzed using ratios of V/Al, Mn/Al, V/Cr, Ni/Co.

In Saburovka section CC elements Al2O3 and Fe2O3 are predominant (average 22.6% and 9.2 respectively). K/Al, Mg/Al ratios show gradual reduction of fluvial input with a minimum in the upper part of the section. Si/Al, Ti/Al ratios demonstrate a minimum aeolian supply and increase only in the upper part. Redox ratios indicate oxic conditions during deposition of CC with a maximum in the lower and upper part.

Geochemical composition of CC from Svetly Yar section demonstrates the predominance of Al2O3 and Fe2O3 (average 19.3% and 7.9% respectively). Profiles of K/Al, Mg/Al ratios indicate the reduction of fluvial input from the lower part and increase only in the small interval in the upper part. Aeolian supply prevails at the contact of Atelian and Holocene deposits. Redox ratios show oxic condition.

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Poster – Monday 27 August – Main Hall

Plio-Pleistocene palaeoenvironmental reconstruction, western South Caspian Basin

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The Plio-Pleistocene transition (2.4-3.6 Ma) marks the onset of the North Hemisphere Glaciation. The event influenced climates of Asia and drove reconnection of the Caspian Basin with Black Sea. The first largest transgression happened at Late Pliocene time which is called Akchagyl transgression and second transgression happened at Early Pleistocene time which is called Absheron transgression.

The goal of our research is to identify transgressions and regressions during Akchagyl and Absheron time and reconstruct paleoenvironmental conditions. Our study area is Lokbatan section in Azerbaijan, western South Caspian Basin. 92 samples were taken in startigraphic order for the investigation. We identified number of foraminifer species including *Cibicides* sp., *Cibicides lobatulus, Bolivina* sp., *Gümbelina* sp., *Globigerina bulloides, Globigerinella voluta, Globorotalia* sp., *Nonion* sp., *Globigerina triloculinoides, Globigerina pseudobulloides, Eponides* sp., *Textularia* sp., *Nonion soldanii*, *Guroidina* sp. . Furthermore we identified remains of radiolarians and spiculae. They mainly derived from adjacent land. In addition we found ostracods in Akchagyl intervals: *Candona candida, C. abichi, C. convexa, C. pseudocandida, C. combiba, C. neglecta* . Two species of *Amnicythere* (*A. andrussovi* and *A. saljanica*) which occurred in the Akchagyl are more abundant in the Absheron Stage. However four species of Amnicythere, *A. litica, A. ofortha, A. verricosa, A. sellula* var. *remissa* rarely occurred in some of the intervals. Seventeen species of *Amnicythere – A. olivina, A. saluta, A. palimpsesta, A.bosquety, A. martha, A. propinqua, A. striatocostata, A. sellula, A. sellula* var. *remissa*, *A. sellula* var. typica, *A. sellulla* var. *operosa*, *A. probosquety, A. multituberculata, A. quinquetuberculata, A. pirsagatica, A. bendovanica* are typical species for the Absheron Stage.

The ostracod assemblages showed that the largest transgression took place in the Caspian basin at the initial Early Akchagyl, the onset of the Middle Akchagyl and at the Late Akchagyl time. The Early Absheron is characterised by low water levels in the Caspian basin.

The biodiversity and phylogeny of the endemic Lymnocardiinae in the Ponto-Caspian basin

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The Pontocaspian region covers the Caspian Sea, Sea of Azov, Black Sea and associated lagoons. It is characterized by the presence of endemic species called “Pontocaspians” restricted to low salinity areas and are widely abundant in the fossil record. Lymnocardiinae bivalves, which play an important role in the food web, are species associated with brackish and fresh waters that feed on organic material present in the water column. In concordance with the rest of the Pontocaspian groups, nowadays only a few restricted genera remain. *Monodacna* and *Didacna* are relatively common Lymnocardiinae genera: while the first one is present in the whole region, *Didacna* only occurs in the Caspian Sea. Because of its simplicity, traditional and morphometric techniques have been long used for the taxonomical classification of bivalves. As Lymnocardiinae species have a high shape variability, weighting differently the array of morphological characters has led to controversial classifications. One way to resolve this is the use of DNA. We use the mitochondrial gene sequences for cytochrome oxidase subunit I (COI) and the rRNA 16S (16S). Analysing their genetic diversity can help resolve taxonomic classifications and develop conservation strategies for these molluscs. Specimens of *Monodacna cf. colorata* were collected in the Razim-Sinoe lagoon (RO), Yalpuh lake, Odessa lake, Sasyk lagoon, Dniester estuary and Bug-Dnieper estuary (UA),Taganrog Bay and the Volga River (RU), between 2015 and 2017. DNA was extracted and the target genes were PCR amplified using specific primers and afterwards sequenced. The DNA sequences were aligned and edited with Codon Code Aligner. While based of morphological traits, several morphotypes were identified, our molecular data suggest the presence of only one taxon, which was identified as *Monodacna colorata*, in the Black Sea basin and in the Volga river. The results contrast with previous studies in which different authors claimed the presence of several morphological species.

The molecular data obtained in this study shows a lower species diversity than previously assumed, bringing interesting challenges regarding to the species concept (morphological vs. molecular) and the taxonomical approach of the biodiversity.

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Poster – Wednesday 29 August – Main Hall

Late Pleistocene to Future Hydroclimate Variations in the Caspian Sea Catchment: A Climate Modeling Study

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Throughout the late Pleistocene to present, the Caspian Sea Level (CSL) has varied by ~150 m, with significant recent impacts on the coastal communities, economy and the regional ecosystem. The origin of the key drivers (hydro-climatic processes) and future CSL changes remain uncertain. Here, we examine and discuss the impacts from simulated past, present and future climate states on the hydroclimate (precipitation minus evaporation; P-E) of the CS basin. Simulations are performed with the state-of-the-art coupled Community Earth System Model (CESM1.2.2) for the Last Interglacial (127 ka before present), Marine Isotope Stage 3 (35 ka) (stadial and interstadial states), the Last Glacial Maximum (21 ka), Heinrich Event 1 (15.2 ka), the early Holocene (9 ka), the pre-industrial (1850), the historical period (1850-2005) and the future (2005-2100) (Representative Concentration Pathways RCP4.5 and RCP8.5) at different model versions and atmospheric grid resolutions (1° and 2°). We identify the 35 ka and LGM climate states to be colder and drier compared to present-day with lower precipitation (~1 mm/day) over the CS basin. The Heinrich Event 1 (colder and drier than the above) P-E (~1.5 mm/day) shows even lower precipitation over the CS. However, small P-E anomalies occur for the warmer and wetter climate states of the Last Interglacial and the early Holocene (~0.5 mm/day) with slightly more precipitation over the CS basin. Lastly, the RCP8.5 suggests P-E decrease compared to present (~0.1 mm/day) linked to enhanced evaporation over the CS. The above time slices correspond to geologic timespans of paleo-lake level reconstructions which hypothesize that fluctuations in ancient CSL high and low stands were driven by changes in P-E. Hence, our modelled results may help interpret these reconstructions with respect to the role of changes in P-E.

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Magnetostratigraphic studies of Lower Maeotian-Upper Sarmatian deposits of Panagia section (Taman peninsula, Russia)

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New magnetostratigraphic data on the Sarmatian-Maeotian transition are used for dating the biotic event related to the marine transgression at the beginning of the early Maeotian. Twenty-one samples of Panagia section (Taman Peninsula, Russia) covering the Upper Sarmatian – Lower Maeotian were collected for paleomagnetic analyses. The section is composed mainly of clays and has a total thickness of ~ 30 m. The composition of the ferromagnetic fraction was examined using dependences of magnetic susceptibility on temperature. This thermomagnetic analysis showed that iron sulfides, for example, pyrrhotite or greigite, are the main carriers of the natural remanent magnetization NRM. Coercivity of remanence Bcr values, determined from backfield demagnetization measurements, range between ~20 and 63 mT. In order to determine true NRM directions, we studied the anisotropy of magnetic susceptibility. The rock samples possess planar anisotropy, which is characteristic of normal sedimentary rocks. Alternating field AF-demagnetization of the samples (three duplicates from each level) were used for obtaining NRM vector angle elements. Demagnetization results were analyzed using orthogonal plots and stereographic projections. Polarity components were isolated in most samples between 15-25 mT. The values of the declination D and inclination I of the NRM satisfactory agree for all three duplicates from each level. This allows to average angle elements and construct curves of I and D variations over the thickness of the section. Samples from the Popov Kamen section (Taman peninsula, Russia), which also contains the Upper Sarmatian - Lower Maeotion interval were studied by rock magnetic and paleomagnetic methods in our previous works [Pilipenko and Trubikhin, 2011; Trubikhin and Pilipenko, 2014]. As a result of previous research the studied interval of Upper Sarmatian deposits can be interpreted as Chron C5n, and the interval of Lower Maeotian deposits correspond to the C3Br, C3Bn, C3Ar Chrons. This work was supported by RFBR, project № 17-05-01085.

Conditions and time of deposition of the Black Sea lake strata in the sediments of the borehole 380A DSDP leg 42A

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Miocene-Quaternary deposits are penetrated by DSDP boreholes 380 and 381 on the Bosphorus slope of the Black Sea basin. They mostly contain brackish and fresh water microfossils, which makes biostratigraphic dating of these sediments a difficult task.

The lower part of borehole 380A was divided into six lithological units; Unit IVa (sideritic and diatomaceous sediments 644.6-718 mbsf), Unit IVb (laminated lacustrine chalk (Seekreide), diatomaceous marls 718-816 mbsf); Unit IVc (laminated diatomite, laminated aragonite, diatomaceous shale 820-864.5 mbsf); Unit IVd (coarse clastic, stromatolitic dolomite: the so-called "Pebbly Breccia", 864.5-883.5 mbsf) and Unit IVe (marls and dolomite- 883.5-969.0 mbsf). Below this, Unit V comprises Black shale, with dolomite laminations (969-1073.5 mbsf). Unit IVe and IVd are considered as Tortonian and Messinian deposits. Unit IVc, IVb, IVa were correlated with Zanclean.

In the past years the results of deep-sea drilling in the Black Sea received a new interpretation. The deposits of boreholes 380 and 381 were correlated with the Upper Miocene and Pliocene deposits of the Taman parastratotype Zhelezny Rog based on diatom, nannoplankton, dinocysts flora and paleomagnetic data. The deposits of Unit IVe, IVd, IVc were correlated with Maeotian and Lower Pontian of Eastern Paratethys. The deposits of Unit IVb were correlated to the Upper Pontian. Unit IVa was not considered. Unit IVb and Unit IVa (617-831mbsf) are predominantly lacustrine chalk (Seekreide) and contain endemic association of diatoms. Species of the brackish-freshwater genera *Stephanodiscus*, *Cyclostephanos*, and *Cyclotella* are dominant. Most of these species were first described from these deposits and have a limited age range. Phylogenetic series of species that appeared in Unit IVb and disappeared in Unit IVa were found: *Stephanodiscus proprius-Cyclosephanos ponticus*; *S. multifarus-S. ordinatus*; *C. pantocseki-Cyclotella servant-vildary*. They indicate the continuity of sedimentation and the gradual desalination of the basin.

There are only indirect data on the age of the lacustrine unit. Unit IVb lies on Unit IVc, which has an age of Lower Pontian (6.1-5.9 Ma). Unit IVb corresponds to Upper Pontian, the time of maximum isolation in the Euxinian basin. Unit IVa (644-712 mstb sideritic mud) is lithologically correlated with the Kimmerian. Near the base of Unit IVa, some marine diatoms were found – *Coscinodiscus radiates* and marker-species *Thalassiosira oestrupii* (first appearance of 5.5 Ma). Here, the nannoplankton association *Braarudosphaera bigelovii* appears. The appearance of marine microplankton is corresponding to the moment of short-term Euxinian and Mediterranean connection at the time of the Kimmerian onset.

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Effect of temperature and salinity on the growth and morphology of the first isolated strain of *Akashiwo sanguinea* from the Black Sea

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Harmful algal blooms (HAB) are natural phenomena causing millions in losses and ecological disasters worldwide. Algal blooms are driven by environmental physicochemical conditions such as light, temperature, salinity as well as stratification and nutrients availability, besides inter-specific interactions such as competition and grazing. Therefore, it seems of key importance to understand how the main environmental parameters affect the ecophysiology of harmful species. The dinoflagellate *Akashiwo sanguinea* is a harmful but not toxic species known for producing large blooms. These blooms have been reported as the cause of massive mortality events in birds and fish larvae because they result in the formation of surfactant foams leading to severe stranding. *Akashiwo sanguinea* has been reported in the Black Sea with abundances above 8% of the total phytoplankton biomass. In addition, physiological experiments on *A. sanguinea* isolated from natural populations have shown an optimum growth performance at low salinities and in temperate waters, which are the natural conditions present nowadays in the Black Sea. Consequently, a better understanding of the potential of the Black Sea *A. sanguinea* populations to perform blooms is of great interest. This study presents the first morphological and phylogenetic analysis of *A. sanguinea* strain isolated from the Black Sea. In addition, we present growth rate and cell density data collected in a wide range of salinities and temperatures to show the ability of *A. sanguinea* to form a bloom under Black Sea environmental conditions.

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Pontocaspian biogeographic outlooks based on the phylogeography of a gastropod species complex (Neritidae: *Theodoxus*)

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The eastern Pontocaspian region is made up of a number of ancient lakes, long-lived drainage basins and long-lasting springs. The biogeography of aquatic biodiversity that inhabit these systems remains poorly understood. The phylogeography of closely related taxa is particularly useful in illuminating the broad scale biogeographic patterns of a region. One model taxon that is widespread in the eastern Pontocaspian, and may be useful to this cause, is the nerite snail genus *Theodoxus*. Within the genus, a species group of relatively closely related populations extend from the Azov Sea, through the Caspian Sea to isolated fresh and brackish water systems as far as the Persian Gulf. The phylogeographic signatures of this group can help us to determine the connection history between water bodies in the region as well as expand knowledge on the modes of dispersal that aquatic species may have undertaken in expanding their ranges. To determine this through both a spatial and temporal perspective we constructed dated phylogenies and haplotype networks based on mtDNA and nDNA data, supported by measurements of isolation by distance (IBD) and analyses of molecular variance (AMOVA). Our preliminary results show closely related Caspian-Azov populations, which are distinct from populations occurring in isolated, inland drainages (particularly in Armenia and Iran). These results thus suggest a relatively recent dispersal of *Theodoxus* between the Caspian and Azov seas. Given an older split between sea and inland populations from one another, this dispersal may have post-dated a major bottlenecking event (potentially as the result of salinity or lake level fluctuations in the Caspian Sea during the late Quaternary). Finally, our results allowed us to review dispersal hypotheses in accounting for the diversity between isolated inland drainages. Here we believe two modes of dispersal may best account for the current range of the group in the eastern Pontocaspian; namely avian mediated dispersal and Pleistocene climatically driven flooding.

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Poster – Monday 27 August – Main Hall

MIS-5 transgression of the Black Sea (new OSL-dating results)

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The paleogeography of the Azov-Black Sea region has attracted researchers for a long time. A major subject has been the fluctuation history of Late Pleistocene basin sea level. Today there is no consensus on the number of transgressions and regressions, their duration and highstand levels. A major the problem is the lack of an absolute chronology of sea level changes. For example, there is still a discussion about the development time of the largest Karangat (MIS 5, Late Pleistocene) transgression of the Azov-Black Sea region. An attempt to solve this problem was the implementation of OSL-dating of marine sediments from the Eltigen section - containing the most complete series of marine sediments of the Karangat transgression. In the second half of the last century was made an attempt to obtain a series of 230Th/234U dates, which showed that the age of the deposits of the Eltigen section range between 70 and 140 ka, with the maximum Karangat transgression between 119-124 ka.The Eltigen section is located in Crimea, in the coastal cliffs between the Cape Karangat and the Uzunlar Lake on the western coast of the Kerch Strait. Eltigen is a stratotype of the Karangat strata deposits that correspond to the developmentof the Karangan transgression of the Azov-Black Sea basin during the last interglacial (MIS 5e). During the summer of 2017, we studied the Eltigen section and sampled sediment OSL-dating and paleontological research.

The obtained OSL chronology confirms the time of the formation of beach sediments containing numerous Karangat MIS-5 mollusk species. At the same time, the data obtained by us indicate that the sea level highstands persisted for longer then previously reported.. Thus, the Karangat interval in the Eltigen section represents over 50 thousand years. As a result of a decrease in sea level and the beginning of the subaerial stage of sedimentation, a layer of loesslike loam accumulated, the age of which is estimated at 50 to 10 thousand years.

The work was carried out within the framework of the RFBR project No. 18-05-00296.

Paleogeography of the Northeast pre-Azovian area during MIS 7

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MIS 7 is an extremely important period of development in the north-east pre-Azovian area. During that time depositional regimes were partly subaquous and partially subaerial. The main objects of the study were Beglitsa (Beglitsa step) and Nikolskaya (Platov step) localities.The lower layer in Beglitsa corresponds to the sub-aquatic period for the development of this territory. The presence of the fauna of the Khazar complex makes it possible to attribute this unit to the Neopleistocene. OSL dating (Beg 36 227 ± 20.8 ka) (Sychev et al., 2017) and Bg 10 (203.8 ± 18.0 ka) (Chen et al., 2017) clarifies the timeframe for this stage before MIS 7. At this time, the transgressive Uzunlar stage occured in the Black Sea (Yanina, 2012). At the base of the Beglitsa section, the sediments of the estuary of this transgression are present. The liman was freshened, so it contains a mixture of mollusc species of different ecological affinities. T.A. Yanina among the shells of mollusks identified representatives of the genus *Didacna*: *Didacna pallasi* and *D. borisphenica*. The first species is characteristic of the Early Khazar transgression of the Caspian and reached the ancient Euxinian lake in the Black Sea Basinthrough the Manych. The second species was established Neveskaya (1963), as characteristic of the ancient Euxinian basin. With the onset of the interglacial marine Uzunlar transgression, these brackish-water species were forced into the desalinated coastal/estuarinezones. The oppressed form of shells of mollusks testifies to unfavorable habitat conditions, in this case lowered salinities. The overlying units reflect subaerial Depositional conditions as shown by pedological and spore-pollen analyses. Steppe landscapes similar to the landscapes in the lower reaches of the Danube basin), as well as more humid landscapes then today developed.

Biodiversity of the lower Kura river

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The hydrofauna of the Lower Kura River was studied in 2014-2016. Research was carried out according to generally accepted methodology in hydrobiology.

From the collected materials in the Salyan-Neftchala section of the river, 59 species of free-living ciliates were noted. The basis of biodiversity consists of an order Hypotrichida (14 species), as well as orders Hymenostomatida (9 species) and Prostomatida (7 species). Only 16 species (*Coleps tesselatus, Dileptus anser, Litonotus lamella, Nassula ornata, Paramecium caudatum, Pleuronema coronatum, Spirostomum teres, Metopus contortus, Halteria grandinella, Uroleptus piscis, Stylonychia mytilus, Euplotes patella, E.eurystomus, E.harpa, Diophrys scutum, D.appendiculata, Aspidisca costata*) from this site also are known from the Caspian Sea.

Polyhymenophora dominated on density (1.6 million ind. per m3), which were followed by Kinetofragminophora (1.2 million ind.), Oligohymenophora (465 thousand ind.) and Colpodea (110 thousand ind.).

Only 13 species of zooplankton were recorded in Salyan-Neftchala area. Common for both sites were species *Synchaeta pectinata* and *Brachimus bennini*. Only three of these species were found in the Caspian Sea (*Synchaeta pectinata, Daphnia longispina, Rhynchotalona rostata*).

On the Salyan section of the river, average annual indicator for the number was 1821 ind./m3 and for biomass was 0.10 g/m3.

Seventy species of benthic organisms from 18 systematic groups were recorded in the river. The maximum development of species was observed in the spring and summer.

Of the species registered in the Lower Kura River, only 6 (Nematoda sp., *Stylaria lacustris*, *Nais communis, N. simplex, Dikerogammarus haemobaphes, Pontastacus leptodactylus*) also occur in the Caspian Sea.

In formation of biological productivity 16 groups participated. Their biomass was 0.02-0.14 g/m2 (8-70 ind./m2) in autumn, 1.69 g/m2 (562 ind./m2) in spring and 2.13 g/m2, (692 ind./m2) in summer.

This is the first inventory of the Kura basin since almost half a century.

Paleogeographic stages and chronology of Khvalynian transgression of Caspian Sea in the Lower Volga region

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Five transgression phases are identified in the Khvalynian of Caspian Sea, based on the complex paleogeographic analyses 14C and OSL dates:

Alluvial sedimentation, corresponding to the onset of downcutting of the the Volga forms the base of the succession. Three horizons of poorly developed soil formation in the middle part of the Srednaya Akhtuba section corresponds to the moderately warm conditions of the MIS 3 epoch.

Development of early Khvalynian transgression of the Caspian Sea. Its initial phase is characterized by erosion of the underlying sediments and the accumulation of a bundle of sandy sediments, often lying at the base of the Khvalynian strata.

Formation of the chocolate clays, that often overlap the sand deposits. The facies of chocolate clays, according to the author, reflect their accumulation in lagoon conditions as the sea level rose and permeated into the Volga valley. The interlayers of silt and sand within the chocolate clays reflect the unstable position of the sea level and the change in the intensity of runoff to the lagoons from the surrounding area. The different structure of the thickness of the chocolate clays (mainly their massiveness at the base of the bed) can be caused by two factors: (a) a high degree of turbidity as a result of abundant drainage of the material and a lack of seasonal changes in the nature of sediment accumulation; (b) post-sedimentation conditions (for example, the degree of processing of the thickness by permafrost processes). The difference in the accumulation of chocolate clays is confirmed by their position at different altitudes (from -11 to +17 m). The early Khvalynian transgression developed in cold climatic conditions.

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The problem of the boundary of the lower and middle Miocene by the example of sections of the Eastern Paratethys

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Since the time of N.I. Andrusov (1961), the lower boundary of the Upper Miocene was traditionally placed at the base of the lower Sarmatian. Towards the end of the last century the situation changed, and this border (admittedly conditionally) shifted approximately to the boundary between Lower and Middle Sarmatian (Neogene System, 1986). Thus, the upper part of the Middle Miocene began to include the Karagan-Kong sediments and the Volhynian substage (the lower Sarmatian). The Karagan-Kong interval includes from bottom to top the Arkhashen, Varna, Kartvel, Sartagan and Veselyanka layers. In the most sections of the Eastern Paratethys the Karagan horizon transgressively overlaps the underlying sediments of different ages, and all of the above layers, including the lower Sarmatian, are conformable. Thus, we have a single sedimentary cycle from the base of the Karagan to the top of the Lower Sarmatian. At the peak of this transgressive cycle, a good connection with the Mediterranean was established (the Sartaganian strata). Thereafter the connection became restricted and severed during deposition of the lower Sarmatian.

A number of sections of this interval from the Kopet-Dag to Kartli depression were studied. The Paleomagnetic studies of this interval show that it covers the zones (from bottom to top) of C5Ar, C5An and C5r. The paleomagnetic properties of this interval turned out to be extremely homogeneous from Turkmenistan to Central Georgia. The paleontological boundaries, established by the molluscan fauna, turned out to be diachronous. This is quite natural, because the fauna is quite closely related to the facies. One can only say that the Arhashen and Varna layers of the Karagan tend towards the C5Ar zone, the lower Sarmatian occupies the lower part of the C5r zone and the upper layers of the C5An zone, while the Kong, assuming that it includes the Kartvelian layers, occupies an intermediate position. The Sartaganian and Veselyanka layers, if we meet their analogs in the sections, occupy an extremely narrow interval, tending towards the horizon of the reverse polarity in the C5An zone.

In light of all of the above, it is more logical to draw a border between the Middle and Upper Miocene along the base of the Karagan horizon.

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Poster – Monday 27 August – Main Hall

Transpolar interchange, Early Pleistocene faunal connections between the Pontocaspian basin and North America

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Ecrobia is a mud snail genus of small brackish-water species that is widely distributed in the Palearctic and Arctic realms. It has an amphi-Atlantic distribution, i.e. its species occurs on both eastern and western coastlines of the Atlantic. Interestingly, the Northwest Atlantic species, *Ecrobia truncata*, is phylogenetically more closely related to the Pontocaspian taxa, *E. grimmi* and *E. maritima*, than to the Northeast Atlantic and Mediterranean species, *E. ventrosa*. At least three dispersal scenarios may account for this peculiar sister-species relationship: (1) human-mediated dispersal, (2) transatlantic interchange, and (3) transpolar interchange. To test these three scenarios, we used a multi-locus genetic dataset together with fossil and paleogeographic data. Specifically, we (i) inferred the phylogenetic relationships among *Ecrobia* spp., (ii) estimated their divergence times based on both a geological event and a gene-specific substitution rate, and (iii) composed a geological reconstruction of the Arctic during the Late Pliocene/Early Pleistocene. Our results showed that the Northwest Atlantic *E. truncata* diverged from the Pontocaspian taxa at around 1.87 (1.01, 2.69) Ma. Around this time, the geological record of the Caspian Sea suggests a possible short-lived marine connection to the Arctic. These events suggest a transpolar interchange of ancestral individuals of *Ecrobia* between North America and the Pontocaspian basin. Along with the Caspian Seal and some crustacean genera (e.g., *Onisimus*, *Gammaracanthus*, *Mysis*), *E. grimmi* thus constitutes another example of indigenous Caspian taxa that are closely related to congeners from the Arctic.

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Poster – Wednesday 29 August – Main Hall

A natural baseline study of an endemic long-lived lake fauna from the Late Pleistocene Caspian Sea (Selitrennoye, Russia)

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Since the 20th century the Caspian fauna is suffering dramatic change as a result of human-induced immigrant species. There is no natural baseline to compare the current faunas with and therefore no measure of the gravity of the current biodiversity crisis exists. A detailed analysis of Caspian Sea faunas that lived before the biodiversity crisis is necessary to comprehend the magnitude of the recent species collapse. An in situ mollusc fauna at Selitrennoye (Asthrakhan province, Russia) from Late Khazarian deposits (Late Pleistocene, MIS5) provides a snapshot of a natural Caspian assemblage, living under similar circumstances as the current interglacial interval. The fauna is almost entirely composed of endemic species. In total 24 gastropod and 17 bivalve species were found. The fauna represents an anomalohaline lake community that lives on a sandy lake floor in salinities around 8-12 psu. The richness of the fauna is in great contrast with the current Caspian fauna which is dominated by two 20th century invasive species: *Mytilaster minimus* and *Abra segmentum*. The baseine provided y the Selitrennoye fauna underlines the huge magnitude of the current anthropogenic-driven biodiversity crisis.

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