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PROGRAMME AND ABSTRACTS

The IOS were dominated by benthopelagic and benthic ones, presenting more redundancy (EMI= 0.03), with oval, oblong, flattened and deep-laterally compressed bodies. The MSS showed similar species with IOS (EMI= 0.05), however was important to represent the rocky shore species, with fusiform bodies. Regarding to functional diversity results, Feve evidenced broad occupation of the functional space by biological entities in IOS (0.61), indicating the well use of the resources. By contrast, the MSS functional space was underused suggesting low competition (Fdiv = 0.92) among the biological entities. The RaoQ designated the IH as the habitat with more distinct species abundance (RaoQ = 0.68) while MSS showed similar abundances but were distant inside the functional space (Fdis= 2.14, RaoQ= 4.75). According to the functional redundancy, among the three habitats, IOS (FR= 1.60) was more stable and resilient in case of a loss of the ecosystem functioning. The conclusion is that the three habitats deserve the species with functionally distinct manner, as nursery, food supply or protection. The proximity of IH to a remaining mangrove vegetation, the presence of two islets, its low hydrodynamics, and the constant change in its granulometry support a higher number of functional groups with little functional redundancy. Since functional redundancy acts as biological insurance against diversity loss, we can suppose that IH is most vulnerable to disturbances, even so with high-species diversity. The similarity between IH and IOS related to some functional groups and species composition, reinforce the idea of ecological connection between them. Considering IH habitat is essential in the tidal flat as an important feeding source for all fish assemblages, in case of it damage, the whole ecosystem functioning would be very affected.

The effects of water and bottom sediments from Lake Balkash (Central Asia) on early development of fish and amphibians (EcoP8)

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In recent years, one of the major reservoirs of the Republic of Kazakhstan - Lake Balkash is experiencing dramatic environmental problems: shallowing and high pollution by contaminants of various origin. Lake Balkash, having spawning grounds and large areas for mass fish feeding, is one of the reservoirs that form the basis of the fisheries industry in the republic. In addition, at the expense of the lake's resources, drinking, domestic and industrial water supply is provided, which makes it necessary to control the ecological status of the reservoir. The main source of hydro resources (up to 80%) of Lake Balkash is the transboundary river Ile, 70% of

which flows through the People's Republic of China. Environmental problems have arisen as a result of the intensification of agriculture and industry in both the PRC and Kazakhstan. Uncontrolled water intakes and wastewater discharges into the river from industrial enterprises and agricultural production transforms the conditions of reproduction and development of commercial fish living in the lake and background species of amphibians, which affects their ontogenesis, abundance, and life expectancy. Fish and amphibians are extremely sensitive to pollution of water and bottom sediments, since toxicants enter their bodies with water and swallowed food. In addition, the most important and vulnerable stage of their life cycle - embryogenesis - takes place in the water. Violations of embryogenesis lead to the appearance of defects and malformations that reduce the viability and survival of the species, because of which entire populations are depleted and die. Thus, the state of biodiversity of fish and amphibians reflects the ecological state of Lake Balkash. Therefore, the aim of the research was to study cyto- and embryotoxic effects of water and bottom sediments of Lake Balkash on commercial fish and amphibians, as a possible cause of a decrease in biological diversity. The objects of the research were embryos and larvae and juveniles of commercial species of fish (asp *Aspius aspius*, roach *Rutilus rutilus*, rosy bitterling *Rhodeus ocellatus*) and background species of amphibians (marsh frog *Rana ridibunda* and green toad *Bufo viridis*). Biotesting of water and sediments of Lake Balkash according to guidelines for standard assays Zebrafish Embryo Toxicity Test (ZFET) and Frog Embryo Teratogenesis Assay-Xenopus (FETAX) modified for studied species was performed. Water and sediments for biotesting were collected from five sites in the southwestern part of Lake Balkash: Kunayev Bridge, Karaoi, Bakanas, Topar, and Kuigan. In addition, content of malon dialdehyde (MDA) and activity of superoxide dismutase (SOD) and catalase (CAT) of juvenile fish and amphibians caught in these sites were studied, too.

Laboratory experiments revealed adverse effects of water and sediments from Lake Balkash on early development of fish and amphibians, which was manifested by increased mortality and malformations occurrence. Biotesting of water on fish demonstrated the highest survival rate (83%) of embryos incubated in water from the site near Kunayev Bridge. Survival rate was lower by 1.4-fold, 1.9-fold, 2.2-fold and 1.1-fold in groups of embryos incubated in water from Bakanas, Topar, Kuigan, and Karaoi, respectively. Similar results were obtained when tested water from the sites on amphibians embryos. The highest survival rate was in the group incubated in water from the site near Kunayev Bridge (80%), and difference between the groups was analogous to that from biotesting experiments on fish. Survival rates in groups of fish incubated with bottom sediments added into water were alike in groups Kunayev Bridge, Topar, and Karaoi (77, 72 and 73%, respectively) and higher than in groups Bakanas and Kuigan (64 and 59%, respectively). Similar trend was observed in biotesting experiments on amphibians. In all biotesting studies there were different numbers of malformations, and most common included pericardial

edema, abnormal development of the yolk body, curvature of the spine and the tip of the tail, embryo coagulation both before and after hatching from the chorion in fish and abdominal edema, gut uncoiling, axial curvature, malformations of eyes and mouth in amphibians. The biochemical study revealed increased content of MDA in liver of juvenile fish and amphibians collected in the sites. At the same time, activity of the antioxidant enzymes SOD and CAT was depressed. These results show high oxidative stress in the liver of fish and amphibians, which can be an indicator of unfavorable conditions for development of water animals. Thus, the results of the research demonstrated that water and bottom sediments of the Lake Balkash cause mortality and developmental disorders in fish and amphibians, which indicates adverse effects of pollution of the lake by anthropogenic activity and the need for measures to restore and preserve the lake's ecosystem.

Multiple sex chromosome system X1X2Y in African killifish genera *Nothobranchius* and *Fundulosoma* (Cyprinodontiformes) (GenP3)

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In contrast to amniotes, heteromorphic sex chromosomes in fishes have been found in about only 10% of species investigated. Many independent groups of fishes show evidence for sex chromosome turnover and formation of multiple sex chromosome systems. African annual killifish genus *Nothobranchius* is a convenient model for sex chromosome evolution and turnover studies. This genus includes 76 valid species and has one of the most variable diploid number of chromosomes among all other genera of vertebrates. It ranges from 2n = 16 (NF = 30) in *N. rachovii* to 2n = 50/49 (female/male; NF = 50) in N. brieni. This dramatic variation of karyotypes in *Nothobranchius* species may be related to extreme conditions in their natural habitat, ephemeral pools in East Africa. In the majority of species from this genus, heteromorphic sex chromosomes were not detected with the conventional methods of cytogenetics. However, a multiple sex chromosome system X1X1X2X2/X1X2Y was found in the following 5 species, in which males have one chromosome less than females: *N. lourensi* (2n=28/27), *N. guentheri* (2n=36/35), *N. janpapi* (2n=38/37), *N. ditte* (2n=40/39) and *N. brieni* (2n=50/49). Genus *Fundulosoma* is closely related to genus Nothobranchius and represented by one species – *F. thierry* with 2n = 44/43 (also X1X2Y sex chromosome system).