The conservation of ecosystem and biological diversity in Alakol Biosphere Reserve (East Kazakhstan)

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Abstract. Alakol Biosphere Reserve includes Alakol-Sasykkol lake system and is situated in Alakol depression. Its total area is 193 089.9 ha including water areas (529 300 ha): the core zone is 19 712.9 ha, buffer zone – 26 667 ha and transition zone – about 511 300 ha. There are 58 ecosystems in the Reserve’s territory, grouped in 3 orders: terrestrial natural (35 types), aquatic (10 types) and terrestrial anthropogenically transformed (13 types) ecosystems. The largest area is occupied by terrestrial natural ecosystems (49.45%), followed by aquatic ecosystems (44.37%) and anthropogenically transformed ecosystems, which are registered for comparatively large area (13.43%). Terrestrial natural ecosystems are merely touched by human activity and occupy large spaces mainly on the territory of the core and buffer zone of Alakol Reserve, as well as Eastern and South-Eastern parts of the transition zone. Biosphere Reserve as a whole is situated in transition zone between Dzhungar and Northern-Turan desert types, and this is the cause of unique vegetation associations with peculiar floristic composition and different geographic orientation. Zonal spectrum of foothill plains is characterized by the change of ephemerooid-Artemisia deserts on sierozem soils, steppified cereal-Artemisia deserts on brown soils and genuine deserts on gray-brown soils. Central lowest part of Alakol depression is occupied by lakes surrounded by hydromorphous vegetation (meadow and marsh vegetation). The territory of biosphere reserve is located on the Central Asian – Indian bird migration route and is a wetland of world significance as waterbirds' habitat and aggregation site. The biosphere reserve reflects regional ecosystem and biological diversity and represents rich composition of flora and fauna.

1. Introduction
Alakol Biosphere Reserve (Alakol BR) was approved by UNESCO MAB in 2013, it is situated in Alakol depression and includes Alakol-Sasykkol lake system, bordered by Tarbagatai ridge in the North, Dzhungar Alatau in the South, Barlyk ridge in the East and South-East [1]. According to the scheme of physical-geographical regioning of Kazakhstan, the its territory is located in Balkhash-Ili-Alakol province of Semirechye desert region, and according to botanic-geographic division it is situated in Sahara-Gobi desert region, Northern-Turan (Eastern Northern-Turan subprovince) and Dzhungar (in its South-Eastern most part) provinces. Biosphere Reserve as a whole is situated in transition area between Dzhungar and Northern-Turan desert types, and this is the cause of unique
vegetation associations with peculiar floristic composition and different geographic orientation (Dzhungar, Dzhungar–Northern Turan and Northern-Turan botanic-geographical types). Zonal spectrum of foothill plains is characterized by the change of ephemeral- _Artemisia_ deserts on sierozem soils, steppified cereal- _Artemisia_ deserts on brown soils and genuine deserts on gray-brown soils (Eastern part of Biosphere Reserve adjacent to Dzhungar gates). Central lowest part of Alakol depression is occupied by lakes surrounded by hydromorphous vegetation (meadow and marsh vegetation). Besides, hydrophilic vegetation types grow in Tentek river valley and delta. There is sparse desert vegetation on Alakol lake islands. Small areas of sor solonchak are characterized by _Salsola_ vegetation. The territory of biosphere reserve is on the Indian bird migration route and has a world significance as waterbirds habitat and aggregation site. This territory, listed in Ramsar Convention's Internationally Important Wetlands List on November 25, 2009, is nesting habitat for 203 bird species out of 342 registered here. In this publication we would like to analyze the conservational role of Alakol BR for regional ecosystem and biological diversity [2].

2. Methods
Generally accepted traditional methods and techniques with some minor modifications were used for the collection of the field zoological and botanical materials as well as for analyze of the ecosystem and biological diversity. Within the ecosystem approach the taxonomic determination of the plants and animals, their distribution, phytocenological composition and role of the studied species were provided by generally accepted classical methods.

3. Results
Total area of Alakol Biosphere Reserve's territory is 193 089.9 ha (with water areas – 529 300 ha). The core zone (which is strict reserve zone of Alakol State Nature Reserve) is 19 712.9 ha, buffer zone – 26 667 ha (2 km stripe along nature reserve's perimeter), transition zone – about 511 300 ha.

The core zone of Biosphere Reserve is strictly protected nature reserve zone of Alakol State Nature Reserve, which represents wetland natural complex of Tentek river delta, also including a part of Sasykkol lake waters and three islands of Alakol lake with their coastal territories, which are very important nesting areas for many rare bird species. It is 19 712.9 ha and compiled of four areas – Tentek river delta, Ulken Araltobe island, Sredniy and Kishkene Araltobe islands.

The buffer zone of Alakol Biosphere Reserve is a protective zone of nature reserve which embraces two-kilometer stripe along the nature reserve's core zone perimeter according to the legislation of Kazakhstan. On the territory of Biosphere Reserve the lands of the buffer zone are not withdrawn from the main land users, they consist of the lands of agricultural purpose and are administered by agricultural organizations and private owners. Economic activity at some parts of the protective zone (haymaking, cattle pasture) is carried out by agreement with state authorized body and under the control of state nature reserve's administration.

The transition zone of the reserve is located on the territory of two administrative districts of two oblasts: mainly in Alakol (Almaty oblast) and partly in Urzhar district (Eastern-Kazakhstan oblast). Total area of transition zone's terrestrial territory is 146 710 ha (with water areas – 511 300 ha). The territory of transition zone is occupied by pastures, numerous wetlands and villages. It is situated mainly in the regions where people live and use the land for a long time. It is important to organize rehabilitation procedures for natural resources at these territories. First of all, it concerns sustainable fishing and hunting activities.

There are 58 ecosystems in the territory of Biosphere Reserve, grouped in 3 orders: _terrestrial natural_ (35 types), _aquatic_ (10 types) and _terrestrial anthropogenically transformed_ (13 types) ecosystems. The largest area is occupied by terrestrial natural ecosystems (49.45%), followed by aquatic ecosystems (44.37%) and anthropogenically transformed ecosystems, which are registered for comparatively large area (13.43%). _Terrestrial natural ecosystems_ are merely touched by human activity and occupy large spaces mainly on the territory of the core and buffer zone of Alakol Reserve, as well as Eastern and South-Eastern parts of the transition zone [3-6].
There are 3 orders of ecosystems on the territory of Alakol Biosphere Reserve: terrestrial natural, terrestrial anthropogenically transformed and aquatic ecosystems. The most area is occupied by terrestrial natural ecosystems (49.45 %), the percentage of anthropogenically transformed ecosystems is considerable (13.43 %), aquatic ecosystems occupy 37.12% of the area. Terrestrial natural ecosystems are almost not touched by human activity and occupy large spaces. First of all, those are the territory of core and buffer zone, as well as Eastern and Southeastern parts of Biosphere Reserve’s transition zone. They are characterized by the higher level of ecosystem type diversity.

There are 3 most important ecosystems on Alakol biosphere reserve:

3.1 Terrestrial hydromorphous ecosystem of meadow vegetation on meadow soils
Terrestrial hydromorphous ecosystem of meadow vegetation on meadow soils mainly represented by true halophyte meadows in the zone of water outcrops, the vegetation of this group is characterized by both true (reedgrass, Elytrigia and cereal – motley-grass) and halophyte (Achnatherum, Puccinellia, Aeluropus) meadows. The vegetation here is often meadow cereal – rich in herbs (Inula caspica, Leonurus glaucescens, Festuca regeliana, Agrostis gigantea, Puccinellia distans) and reed – reedgrass (Calamagrostis epigeios, Phragmites australis), and vegetation associations usually change in season thanks to the high number of blooming in summer “gigantic” herbs (Inula caspica, Sium sisaroidaum, Althaea officinalis, Angelica decurréns). This group of ecosystems is quite rich in floristic diversity (168 species). The group of fodder plants is very numerous, although with less representativeness of medicinal, melliferous and aromatic species.

Ecosystems’ group of true meadows in river flood-lands is represented in large rivers’ flood-lands (Tentek, Emel, Urzhar), and some small rivers. These ecosystems usually are alternated by the ecosystems of tugay forests. The vegetation is represented by reedgrass (Calamagrostis epigeios, C. macrolepis, C. pseudophragmites), motley-grass – reed – reedgrass (Calamagrostis epigeios, Phragmites australis, Clematis orientalis, Glycyrrhiza uralensis, Lactuca tatarica, Pseudosophora alopecuroides) meadow associations, forming ecologic changes in the associations of flood-lands and flood-land terraces above rivers.

3.2 Aquatic ecosystem of saline lakes
Aquatic ecosystems of saline lakes are characterized by their unique vegetation and biodiversity, they belong to reed island – lithoral order of water and near-water associations which form primary coenoses of hydromorphous overgrowing ecological series in the systems lake → land, river → land. Instability of structure and species composition of the vegetation is typical here, especially in case of swimming “islands” of reed (Phragmites australis), fat duckweed (Lemna gibba), common duckweed (Spirodela polyrhiza), etc. Reed usually survives well on this “islands”, creates anchor root system and serves as an excellent medium-former for the biotic organisms. Islands are common refuges for the nesting. This type of ecosystem is observed at Alakol, Zhalanashkol, Urmanovskiye lakes, lakes of Tokty spills, Beskol lake system at the irrigation channels. Ecosystems of shallow coastal line of Alakol lake is characterized mostly by reed (Phragmites australis), reed – cattail (P. australis, Typha angustifolia, T. latifolia, T. laxmannii) overgrowth in North and North-West. Floristic diversity (32 species) of this group is not rich. There are no Red Data Book, endemic or key species. There are relatively big number of resource species (about 75%). There are 317 bird species, 162 of them are nesting. Dominating species are Common coot and Common tern, numerous - Great cormorant. The category of common species lists Herring gull, Red-crested pochard, Great black-headed gull, Mallard, Great crested grebe, etc. Absolute dominant of Alakol islands in the summertime is Common tern, common species include Great cormorant, Gull-billed tern, Herring gull and Great black-headed gull. In late August dominating species include Common tern (24.3%), Common coot (21.3%), Sand martin (10.6%), Great cormorant (10.5%), Red-crested pochard (9.2%) and Herring Gull (4.8%). One of the mammal species inhabiting mouths of the rivers flowing into Western and Northern coast of Alakol and Zhalanashkol lakes is characteristic species – muskrat (Ondatra zibethicus), which inhabits shallow waters overgrown by reeds and cattails. In zooplankton of mineralized Alakol lake dominating...
faunistic complex is *Arctodiaptomus salinus* - *A. brighthwelli* - *Hexarthra fennica*, and at Zhalanashkol Lake it was the complex *A. salinus* - *Ceriodaphnia reticulate* - *Bosmina longirostris*.

3.3 Terrestrial automorphous cereal-Artemisia deserts
The terrestrial automorphic cereal-*Artemisia* deserts are distributed on the outcrop surfaces of Southern coast of Sasykkol lake, foothill plains of Dzhungar Alatau, Barlyk ridge, as well as in foothill plains of Tarbagatay ridge, adjoined with lake-alluvial plains of Alakol and Sasykkel lakes in the North. They occupy 4.57% of the territory and are formed on brown desert soils.

The vegetation of Alakol Biosphere Reserve is rather rich and consists of 5 types of vegetation on the territory of Biosphere Reserve: desert, meadow, marsh, tugai, aquatic and fragmentally 2 more types: shrub and broad-leaved – forest: 1. Desert vegetation type with domination of *Artemisia*, cereals, annual and perennial (dwarf semi-shrubs, semi-shrubs) includes 5 subtypes: *Artemisia*; perennial *Salsola*, ephedra, saxaul, *Nitraria*, psammophyte shrubs and *Salsola*. 2. Meadow vegetation type consists of 3 subtypes: marshy meadows, genuine meadows, halophyte meadows. 3. Marshy vegetation type – grass marshes are formed on the soils of marshy type (silt-marshy) with domination of large hydrophyte and hygrophyte rhizomatus cereals; 4. Tugai vegetation type includes flood-land forests, tree-shrub and shrub thickets; besides typical species (willows, oleaster) this unique tugai tree-shrub associations of foothill river valleys include such species as hawthorn, rose hip, various grassy and tree-like liana; 5. Submerged-water vegetation of the water reservoirs is the main component of lithoral complexes of Alakol intermountain depression, it is widely represented at shallow waters of the lakes and in delta streams of Tenteke river. 6. Shrub vegetation type is observed in fragments and includes the areas of *Atraphaxis* (*Atraphaxis repicata*, *A. frutescens*, *A. compacta*) groups. 7. Broad-leaved forests with unique apple (*Malus sieversii*) forests is also recorded in fragments. Besides, there is a special vegetation type – vegetation of fallow lands and anthropogenically disturbed areas, where weeds prevail in fallow lands in place of arable and rainfed croplands; according to vegetation associations’ dominant composition they may be in three stages: wild weeds, gradually rehabilitating and rehabilitated zonal quasi-native [7-10].

The species biodiversity of Alakol Biosphere Reserve is rather rich. The list of vascular plants consists of 678 species, which belong to 293 genera and 85 families (see Table 1). The leading role in flora composition is played by the representatives of the following families is presented on Table 2. Thus, 10 first families contain the main part (65%) of species diversity and 74% of genera diversity of the flora. The other 76 families contain only 256 species and 76 genera. Big amount of species in Asteraceae (101 species), Poaceae (65), Fabaceae (50), Brassicaceae (43), Lamiaceae (23), Borraginaceae (20), Polygonaceae (19) families characterize Biosphere Reserve’s flora as arid flora of Ancient Mediterranean, and species abundance of Chenopodiaceae (62) family indicate the desert character of the territory. The largest genera include only about 20% of the flora, and 11 genera have only 5 species each. Those are mostly representatives of mesophyte, hydrophilic flora (*Medicago, Vicia, Juncus, Plantago, Calamagrostis, Rumex, Potamogeton, Potentilla, Galium, Salix and Tamarix*). The abundance of *Artemisia* in flora composition, including semi-dwarf-shrub species, as well as representatives of *Ferula, Salsola, Suaeda* genera indicates the presence of considerable desert coenoflora core. The majority of the species of *Allium, Atraphaxis, Astragalus* genera are also desert species. Even among mostly steppe species of *Stipa* there is one representative of Gobi desert coenoflora.

Aquatic flora is represented by 25 plant species. Pondweed is one of the most numerous genera is species composition; it contains 5 species with two species – *Potamogeton natans* and *P. perfoliatus* – being the most often recorded. All water flora species are submerged in water macrophytes distributed in the waters of lakes, rivers and channels among reed swimming islands. Another typical water plants are *Nymphaea candida* and *Nuphar luteum*, and other water macrophytes include *Myriophyllum spicatum* and *M. verticillatum*, *Hydrocharis* sp., *Najas* sp., *Ceratophyllum demersum*, *Spirodela polyrhiza* and other species.
The list of endemic species of Kazakhstan also includes *Tragopogon scoparius, Artemisia scopiformis* и *Microcephala sublogosa*, subendemic species - *Scutellaria albertii, Artemisia saissanica, Turaniphytum eranthemum, Zygophyllum semenovii, Z. macropterum, Paraeremostachys dchungarica, Scutellaria albertii, Astragalus brachypus, A. cognatus* and *A. karakugensis*. Besides, there are several very rare species in the flora of Biosphere Reserve: *Ferula teterrima* (Eastern Kazakhstan – Dzungarian species with irradiations to the mountains of Eastern Pamir and Central Tien Shan), *Arthrophytum balchaschense* (South-Kazakhstan – North-Kashgar species), *Artemisia kashgarica* (Dzhungarian – Kashgar species), *Lagochillus diacanthophyllus* (Eastern-Kazakhstan – Dzhungarian species) and *Stipa glareosa* (Dzhungarian – Gobi species). The portion of resource-important species is not less than 40% of all floristic diversity. The majority of higher plants possess valuable traits, many of them have great economic importance.

| Taxonomic units | Terrestrial higher plants | Aquatic higher plants |
|----------------|---------------------------|----------------------|
| Families       | 85                        | 14                   |
| Genera         | 293                       | 16                   |
| Species        | 653                       | 25                   |

**Table 1. Relation of systematic groups of different rank in the flora**

**Table 2. Representativeness of the leading families in the flora of Alakol region**

| #  | Family       | Number of species absolute | Number of genera absolute | |
|----|--------------|----------------------------|---------------------------|
| 1  | Asteraceae   | 101                        | 41                        |
| 2  | Poaceae      | 65                         | 33                        |
| 3  | Chenopodiaceae | 62                    | 29                        |
| 4  | Fabaceae     | 50                         | 19                        |
| 5  | Brassicaceae | 43                         | 30                        |
| 6  | Apiaceae     | 23                         | 13                        |
| 7  | Lamiaceae    | 23                         | 17                        |
| 8  | Cyperaceae   | 21                         | 6                         |
| 9  | Borraginaceae | 20                    | 15                        |
| 10 | Polygonaceae | 19                         | 7                         |
| 11 | Scrophulariaceae | 19                   | 7                         |
|    | Total        | 446                        | 217                       | 74,1%      |

In the transition zone of Biosphere Reserve there are artificial plantations of Siberian Elm (*Ulmus pumila*) in the area of forest associations of Tentek river flood-land and Poplar (*Populus nigra*) on the cordones and some farms, as well as forest recultivated stripes along the roads. In the past forest farms used to organize plan plantation of Siberian Elm (*Ulmus pumila*) and Maple (*Acer negundo*) on modern territory of Biosphere Reserve. Anthropogenic plantations of Siberian Elm (*Ulmus pumila*), carried out in 1960-70s, are especially noteworthy. Their growth happened according to tugay type, and stable reproduction of the trees and shrubs indicate the stability of the forest in local ecological conditions.
Entomofauna is yet insufficiently studied, at the present time insects, registered for the Biosphere Reserve’s territory, belong to 88 families of 13 orders: Odonata, Mantoptera, Phasmoptera, Orthoptera, Dermaptera, Plecoptera, Homoptera, Hemiptera, Coleoptera, Hymenoptera, Lepidoptera, Diptera, Neuroptera [11]. Fourteen insect species are included in the Res Data Book of Kazakhstan, one of them – Bolivaria brachyptera – is also listed in IUCN Redlist. Endemic species of insects in Biosphere Reserve include representatives of Coleoptera: Callistenes karelini, Cicindela lacteola brodskii, Dorcadion cephalotes, D. alakolense, Xylotrechus arnoldi, Stenocorus minutus, as well as Orthoptera: Tropidopola turanica iliensis, Sphingonotus eurasius kazakus, Mesasippus kozhevnikovi robustus, Eremippus pusillus, Damalacantha vacca.

The composition of zooplankton in Biosphere Reserve's lakes consists of 140 taxa, including widely distributed in all lakes rotifer Keratella quadrata quadrata and crustaceans Diaphanosoma lacustris and Arctodiaptomus salinus. The category of key species includes 12 zooplankton taxons: Arctodiaptomus salinus, Diaphanosoma lacustris, Thermocyclops crassus, Mesocyclops leuckarti, Ceriodaphnia reticulate, Megacyclops viridis, Bosmina longirostris, виды рода Brachionus, Hexarthra fennica, Keratella quadrata, Asplanchna brightwelli, Filinia longiseta. Taxonomic composition of macro-zooplankton species of Alakol-Sasykkel lake system water reservoirs is represented by 82 species and forms of four groups, including insects – 60 species, mollusces – 12 species, worms – 9 species and crustaceans – 1 species. Alakol lake is the richest in species and forms of benthofauna – 43 taxons. Recorded benthos organisms are widely distributed in water reservoirs of Palaeartic, excluding endemic mollusk species Bithynia caerulans, which at the present time inhabits Balkhash lake and lakes of Alakol Biosphere Reserve (Koshkarkol, Sasykkel and Alakol lakes).

There are 22 fish species of 6 families on the territory of Alakol Biosphere Reserve. Before acclimatizational works local native ichthyofauna was represented by following species: Common Minnow, Balkhash Marinka, Gymnoptychus dybowskii, Tibet Stone Loach, Nemachilus dorzalis, Noemacheilus labiatus, N. sewerzowi and Balkhash Perch. As the result of acclimatizational measures fish species composition of Alakol lakes and inflowing rivers was enriched more than in half and many of acclimatized species are now background and most numerous. Some introduced species, such as Grass Carp, Silver Carp couldn't make self-reproducing population. Native species inhabit mainly river part of the basin and deep waters of Alakol lake [12-14]. The 3 most valuable native fish species are:

Perca schrenki, listed in the Red Data Book of IUCN. It is endemic species previously widely distributed in water reservoirs of Balkhash-Alakol basin. In the present time there is only one fishing population of this species in Alakol lakes.

Schizothorax argentatus, reproduces in spring, with one-time spawning on the rocky grown. Maturity is reached in 3-5 years. Dominating foods are plants and benthos. Initially is inhabited all Biosphere Reserve's water reservoirs, with two forms: lake and river. After carp's acclimatization the number of this species started declining. In late 1930s – early 1940s Marinka lost its fishing importance in Sasykkel and Koshkarkol, but was still conserved in Alakol. Then it completely disappeared from fishing in 1968 at Koshkarkol lake, and in 1969 – at Alakol lake and in 1977 – at Sasykkel lake. On the territory of Biosphere Reserve in the present time only separate specimens may be caught in Sasykkel lake. It is more often recorded in lakes flowing into Alakol and Sasykkel, where there are isolated self-reproducing populations.

Noemacheilus stoliczkai; N. doraslis. Spawns in April-June. Maturity is reached in 2 years. Food includes mostly benthos and plankton. Due to this genus weak systematics’ development the data on the biology and population structure dynamics in Alakol basin are often controversial. In the present time Noemacheilus are dominant species in river part of Alakol system and are partly conserved at the saline part of Alakol lake waters.

Reptiles and amphibians are rather numerous. Amphibians are represented by 2 species – Green Toad Bufo viridis and Marsh Frog Rana ridibunda, and reptiles – by 24 species (full species list is given in the website www.kazmab.az). The list of reptiles of Biosphere Reserve’s territory includes: turtles – 1 species, geckoes – 3 species, agamas – 5 species, lizards – 6 species, boas – 1 species, grass
snakes – 5 species, ribbon snakes – 1 species, vipers – 1 species and pit vipers – 1 species. Among the named species the most interesting species is Variegated Toadhead Agama *Phrynocephalus versicolor*, listed in the Red Data Book of Kazakhstan. In Alakol depression this species inhabits Northeastern coast of Alakol Lake.

Birds consists of 342 species, 203 of them nest there. In core zone 267 species are recorded and 125 species are nesting, the most noticeable are European pelican and Dalmatian pelican, Great Crested Grebe, Ferruginous Duck, etc. In the first half of October there are migration aggregations of Mute Swan and Whooper Swan (up to 300 specimens). In Biosphere Reserve’s buffer zone 226 species are registered and 80 species are nesting [15, 16, 17, 18, 19, 20, 21, 22]. Among those Sand Martin, Rufous-crested duck, Herring Gulls, Common Terns, Gadwall, Bearded tit and Common Black-headed Gulls are most often recorded at shallow waters along the edges of reed thickets. The main bird fauna of buffer zone is represented by gulls, terns and cormorants, flying there to feed. In the buffer zone around Alakol islands 12 species are observed in July, and 15 species – in late August. The main background was formed of feeding Great cormorant, Herring Gull, as well as grebes and Roody Shelducks, which came here for molt. Another 317 species (162 of which are nesting) are recorded in the transition zone, which includes Alakol, Sasykkol, Koshkarkol, Korzhinkol, Beskaska, Uyaly, Zhalanashkol lakes, Yertuyskaya lake system and their coasts and where active economic activity takes place. Dominating species: Coot and Common Tern. The category of common bird species includes Herring Gull, Rufous-crested duck, Great Black-headed Gull, Mallard, Great crested grebe, etc. The most typical species of Alakol Biosphere Reserve are:

Great Crested Grebe *Podiceps cristatus*. Common nesting species, inhabits most lakes of Tentek and Urzhar deltas. In Alakol it nests in the bays along Northern and Western coasts, and also in lagoon lakes of Ulken Araltobe island. In summer time small groups of molting birds are recorded in the bays and near the islands.

European Pelican *Pelecanus onocrotalus*, the main colony was located in Tysyachnye lakes in the Eastern part of Sasykkol lakes. Usually not less than 500 pairs of these Pelicans nest in this colony. In summer time up to 100 feeding specimens were observed in Tentek delta lakes.

Great Cormorant *Phalacrocorax carbo*. Numerous nesting species. The main nests are concentrated in Tentek river delta at Baklanya and Pelikanya Kurya lakes (about 1,000 pairs), and in the feeding period they are observed almost on every delta water reservoir.

Great White Heron *Egretta alba*. Common nesting species of Tentek delta, where its population number in the recent years does not exceed 30 pairs. In small amounts it nests also at Western, Northern and Eastern coasts of Alakol Lake, as well as at Koshkarkol and Uyaly lakes, and in inner water reservoirs of Urzhar delta.

Eurasian Spoonbill *Platalea leucorodia*. Rare nesting species of Tentek delta. In the only colony at Pelikanya Kurya in 1998 there were 12 known nests, in 1999 – 11 nests, but in the following years the number of nesting pairs decreased because of frequent visits of fishermen. In 2002 Eurasian Spoonbill moved to the neighboring Baklanya Kurya.

Graylag Goose *Anser anser*. The main nests are concentrated at Baklanya Kurya. Insignificant concentrations of migrating and molting geese (not more than 500) are observed in the Western part of Alakol lake in the bays between Chubar-Tyubek and Chornyia foreland, and along the Southern lake coast at Onagash peninsula and in Kishi Alakol bay. Up to 1,000 Graylag Geese inhabit Alakol in August-September. Small flocks were recorded on wheat fields at the foothills of Barlyk mountains, 20-25 km Eastern from Kabanbay village.

Mute Swan *Cygnus olor*. Common nesting species in Tentek delta lakes (10-15 pairs) and in the bays along Northern and Western coasts of Alakol Lake. There were known summer molt aggregations, but in the recent years they moved to Tentek delta water reservoirs. In the period of spring and summum migrations up to 350-400 swans concentrate at delta lakes.

Whooper Swan *Cygnus cygnus*. The main nests are conserved in Tentek delta, where usually up to 5 pairs are nesting, and one more pair usually nests in the Eastern part of Zhalanashkol lake. Whooper
Swan does not nest at Alakol lake, but is regularly registered during migrations, and in warm winters it stays on the Southern lake parts which doesn’t freeze.

Roody Shelduck Tadorna ferruginea. Nesting species, small in numbers. Every year several pairs nest at Ulken Araltobe and Srednyi islands of Alakol Lake; also 100-300 birds molt there. It is more often observed along the Western coast of the lake. Large feeding aggregations (200-300 specimens) are observed in Tenteke delta in September and October.

Mallard – Anas platyrhynchos. Common nesting species of Alakol and Sasykkol lakes and other water reservoirs. During molt and migration forms large aggregations on delta water reservoirs, in Alakol and Sasykkol bays. In autumn of 2005 about 2,000-3,000 Mallards stayed in Alakol-Sasykkol lake system.

Gadwall– Anas strepera. Common nesting species of Tenteke and Urzhar deltas. At Alakol lake the nesting is reported from the bays along the coast, and at Ulken Araltobe and Srednyi islands. Large aggregations of molting Gadwalls are observed in summer along Northern and Western coasts, and at shallow lakes of Ulken Araltobe, Piski and Kondaral (Chubar-Tyube) islands. In autumn of 2005 Alakol-Sasykkol lake system was inhabited by 5,000-7,000 Gadwalls.

Rufous-crested duck Netta rufina. Numerous nesting species of Tenteke and Urzhar lake deltas, Northern and Western coasts of Alakol lake; occupies dominating position among diving ducks. In autumn of 2005 about 10,000 ducks stayed in Alakol – Sasykkol lake system.

There are 38 bird species listed in the Red Data Book of Kazakhstan. Among those 22 species are proven to nest at this territory: Dalmatian Pelican – Pelecanus crispus; European Pelican – Pelicanus onocrotalus; Eurasian Spoonbill – Platalea leucorodia, Black Stork – Ciconia nigra; Whooper Swan – Cygnus cygnus; Ferruginous Duck – Aythya nyroca, White-headed Duck – Oxyura leucocephala; White-tailed Eagle – Haliaeetus albicilla, Short-toes Eagle- Circetus gallicus; Imperial Eagle – Aquila heliaca, Steppe Eagle – Aquila nipalensis, Common Crane – Grus grus, Demoiselle Crane – Anthropoides virgo, Great Bustard – Otis tarda, Houbara Bustard – Chlamidopterus undulata, Little Bustard – Otis tetrax, Great Black-headed Gull – Larus ichthyæetus, Relict Gull – Larus relictus; Eastern Stock Dove – Columba eversmannii, Black-bellied Sandgrouse – Pterocles orientalis, Pallas’s Sandgrouse – Syræhaptes paradoxus and Eagle Owl – Bubo bubo.

Mammals consists of 44 species, which is 80% of the total number of representatives of this class, inhabiting Alakol depression (55 species). They include representatives of insectivores – 4 species, cheiropterans – 3, predators – 10, ungulates – 3, rodents – 23 and lagomorphs – 1 species [23-25].

All mammals are subdivided in 2 groups: residents – 21 species and migrating (or locally migrating) – 23 species. Resident mammals include, first of all, rodents and insectivores, and representatives of cheiropterans, lagomorphs, predators and ungulates carry out seasonal migrations of different distance. Dominating species (by registered specimens number) are Muskrat, Red-cheeked Ground Squirrel, Small five-toed Jerboa, Tamarisk Jird, and hunting species – fox and stoat. According to habitat type the mammals inhabiting this territory are divided into 2 groups: semi-aquatic and terrestrial. The first group includes only Muskrat, the second – all other mammals. Within the mammals of biosphere reserve one species (Zhitkov’s Jerboa Pygerethmus zhitkovi) is an endemic of Kazakhstan, and 15 species are resource species, including 10 important hunting species (wolf, fox, badger, wild boar, muskrat, stoat, steppe polecat, African wildcat, Siberian roe deer, Tolai hare).

4. Discussion
The territory of Alakol Biosphere Reserve plays an important role in conservation of regional ecosystems and genetic biodiversity. Many valuable species are under strict protection in the Reserve's core zone, and in the transition zone commercial species are under the control of nature protection inspectors. Among animals many species are economically valuable and important for genetic biodiversity conservation.

Ecosystems of meadows on meadow soils are widely distributed on the territory of Biosphere Reserve and are recorded in marshy level in foothill plains, low river terraces above flood-lands, lake terraces, as well as in depressions between ridgy-hilly sands. In spite of the extreme diversity of
geomorphological conditions of meadow soils establishment, the main factor defining the direction of soil-forming process is ground water. The periodic natural processes include 1) spring floods on the rivers, especially on Tentek, leading to flooding of the lake sides and animal habitats, 2) hard snowy winters, periodically leading to death of important hunting-game animal species (wild boar, pheasant, roe deer, partridge) and 3) flooding or drying of coastal territories as the result of cyclical increase and decrease of water level. The most significant human impact factors consist of 1) unsustainable use of biologic resources, 2) considerable water withdrawal in Tentek, Zhamanty, Karakol, Yeginsu rivers for arable fields, leading to destabilizing influence on hydroecosystems and animal world, especially in delta water reservoirs of Tentek, and 3) cattle pasture in flood-land and lake ecosystems, leading to degradation of soil-vegetation cover.

For the aquatic ecosystem of saline lakes the most important natural processes are 1.) flooding or drying of coastal territories as the result of cyclical decrease or increase of the water level at the lakes, leading to long-term change in the spawning sites location, habitats of wild boar, muskrat, waterbirds, 2) storms at Alakol lake, resulting in flooding and washing out of low islands and death of birds’ colonial settlements, and 3) reeds are burnt from the storms, this is especially dangerous in spring, because wild animals are harmed. The main human impact factors are 1) unsustainable use of biological resources, mostly excessive poorly controlled fishing, especially at Sasykkol and Koshkarkol lakes; considerable death of waterbirds in the nets, reaching 150-200 thousand birds every year, 2) increasing recreational press on the lake coast due to development of beach tourism, especially in the area of Kabanbay, Koktuma, Akshi, Alakol and Rybachye villages, and 3) periodically steppe fires on the territory of transition and buffer zone of Biosphere Reserve caused by hunters and fishermen, as well as after burning of old grass by local people.

As for ecosystem of terrestrial automorphous cereal- Artemisia deserts, the main periodical natural processes are hard snowy winters leading to periodical death of important hunting-game animals as well as periodical spring floods on the rivers, especially Tentek, causing floods. The important factors of human impact consist of unsustainable use of biological resources, over pasture and haymaking and fires.

Very high level of floristic diversity of the territory is explained by the following reasons: the position of the territory at the merge point of North-Turan and Dzhungar deserts, diversity of plant habitats (clay, rubbly, rocky desert plains, sandy massifs, lake and river coasts, water reservoirs, solonchaks), proximity of mountain ridges causing mountain species inversion into river and river-bed low part, intensive anthropogenic activity which leads to the increase of adventive and ruderal species. The large portion of species from Cyperaceae (21), Polygonaceae (19), Rosaceae (18) families in Biosphere Reserve’s flora is caused by its enrichment by mountain elements (mainly Dzungarian) and presence of moist habitats (wetlands). Arid elements sum up to 55% of the whole flora of Biosphere Reserve, and humid – 45%. Abundance of humid flora indicates the high diversity level of moist habitat (lake and river coasts, marshy areas, water reservoirs) species.

The territory of modern Alakol State Nature Reserve is regularly monitored for water reservoirs' dynamics (from 1930s), vegetation productivity and condition at the monitoring sites, population condition of rare and model species of birds and mammals (from mid-1970s). Since 1990s anthropogenic influence is researched, including fires, different violations of nature reserve's regime, etc., as well and observations of objects' condition conducted throughout the whole year by the staff of scientific department and security service of nature reserve. Scientific research organizations of corresponding research field help in research conduction, sometimes with participation of foreign specialists. Since 1999 monitoring and observations are carried out in the limits of annual «Nature Chronicles» according to standart unified program. Key indices for evaluation of natural objects conservation condition include: 1) Waterbird fauna condition, 2) Population number of background and rare protected animal species (mammals, birds, fishes), 3) Population condition of the main fish species, 4) Hydrocoenoses condition of protected lakes, 5) Phenologic dates of seasonal events in animal and plant life, 6) Species composition and vegetation associations' structure.
5. Conclusion
Alakol Biosphere Reserve is an extremely important natural complex of Alakol-Sasykkol lake system in the transition zone between Dzhungar and North-Turan desert types and is one of the key bird migration sites of global significance is Eurasia. The territory of biosphere reserve is located on the Central Asian – Indian bird migration route and is a wetland of world significance as waterbirds' habitat and aggregation site. Tentek river delta and lakes of Alakol depression are internationally important sites and are nominated for the water reservoirs' list of Ramsar Convention for criteria Ia, Ib. These spacious water reservoirs attract huge amounts of waterbirds. The regional diversity of ecosystems is well presented in Alakol Biosphere Reserves and according to the Kazakhstan national legislation is under the strict conservation regime in core and buffer zone as well as it is protected in transition zone of biosphere reserve. The biosphere reserve is characterized by rich composition of flora and fauna.

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