ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Ecological Network of the Kerch Peninsula as the Basis for Preserving Biodiversity of Natural Steppe Biocenoses.

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ABSTRACT

In conditions of chaotic exploitation and development of relatively pristine Kerch Peninsula's landscapes, it is an important issue to protect the areas of unique steppe zone. The article proposes to implement the strategy of ecological networks (econet) – systems of conservation areas and connecting ecological corridors, buffer zones, and other areas with environmentally sound mode of use.

Keywords: ecological network, econet, Crimea, Kerch Peninsula, specially protected nature areas, SPNA.

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ISSN: 0975-8585

INTRODUCTION

The south coast of the Black Sea is the most traditional recreational area of the Crimean Peninsula, but over the last 5-10 years the Azov and Black sea coasts of the Kerch Peninsula also became intensively used. Natural landscapes that form the ecological environment and create favorable conditions for maintaining a high level of landscape and biological diversity are actively exploited for recreational purposes. The coastal territories of the Kazantip bay, Zuk, Takil, and Chauda capes, as well as other unique natural areas are being actively and sporadically built up with boarding houses, recreation centers, and private households (National Energy Security Fund, 2015; Tarasenko, 2014; Boarding houses…, 2016).

At the same time there are vast natural areas of great importance for the conservation of the steppe zone's biodiversity on the Kerch Peninsula. Some areas, like the Opuk cape, were declared conservation areas and are unique for they combine steppe zones, water bodies and mountainous landscapes with numerous bird nesting sites, stone quarry mazes and grottos. Such a combination of steppe zones with intact vegetation and unique environmental corridors (the coastal areas are considered as such) is typical for many areas of the Kerch Peninsula. At the same time, only a small fraction of the Kerch Peninsula's preserved natural complexes have gained the status of protected nature area.

As of March 2016, there are 19 Specially Protected Nature Areas (SPNAs) of federal and regional significance on the territory of the Kerch Peninsula (Table 1, Figure 1).

Table 1. Special Protected Nature Areas of the Kerch Peninsula (SPNAs of the Kerch Peninsula, 2008)

No.	Name	Profile	Area, ha
State Nature Reserve			
1	Kazantip Nature Reserve		450.1
2	Opuksky Nature Reserve		1,592.3
State Nature Sanctuary			
3	Arabatsky	Botanical	600
4	Zelyonoe koltso	Botanical	172
5	Chokrak Lake	Hydrological	1,000
6	Astaninskie Plavni	Ornithological	50
Nature Park			
7	Karalarsky	Landscape	6,806
Natural Monument			
8	Coastal aquatic complex (CAC) by Cape Chauda	Hydrological	90
9	COC by Cape Karangat	Hydrological	150
10	COC by Cape Opuk and Skaly-Korabli island	Hydrological	150
11	COC by Cape Chroni	Hydrological	180
12	COC by Cape Kazantip	Hydrological	240
13	COC by Arabatsky Spit	Hydrological	150
14	Djau-Tepe Mud Volcano	Geological	10
15	Cape Chauda	Geological	5
16	Andrusov Mud Volcano	Geological	1
17	Vernadsky Mud Volcano	Geological	1
18	Obruchev Mud Volcano	Geological	1
Landscape and Recreation Park			
19	Takil Cape	Landscape	850
Total area of SPNAs			**12,498.4**

SPNAs occupy only 3.84% of the total Kerch Peninsula area (3,255 km^2), which is much less than the national average (from 9% of the Russian Federation territory, according to Conservation dashboard for Russian Federation (2016), up to 11.95%, according to Ministry of Natural Resources and Environment (2015)) and far less than the European (21%, according to European Environment Agency (2012)), Southeast Asian (15.7%, according to United Nations Environment Programme ("Asia...", 2014)), and the global averages (15.4%, according to (United Nations Environment Programme ("Protected...", 2014)). A serious problem of Kerch Peninsula's SPNAs is their considerable fragmentation, which turns them into reservations where nature slowly but steadily deteriorates.

ISSN: 0975-8585

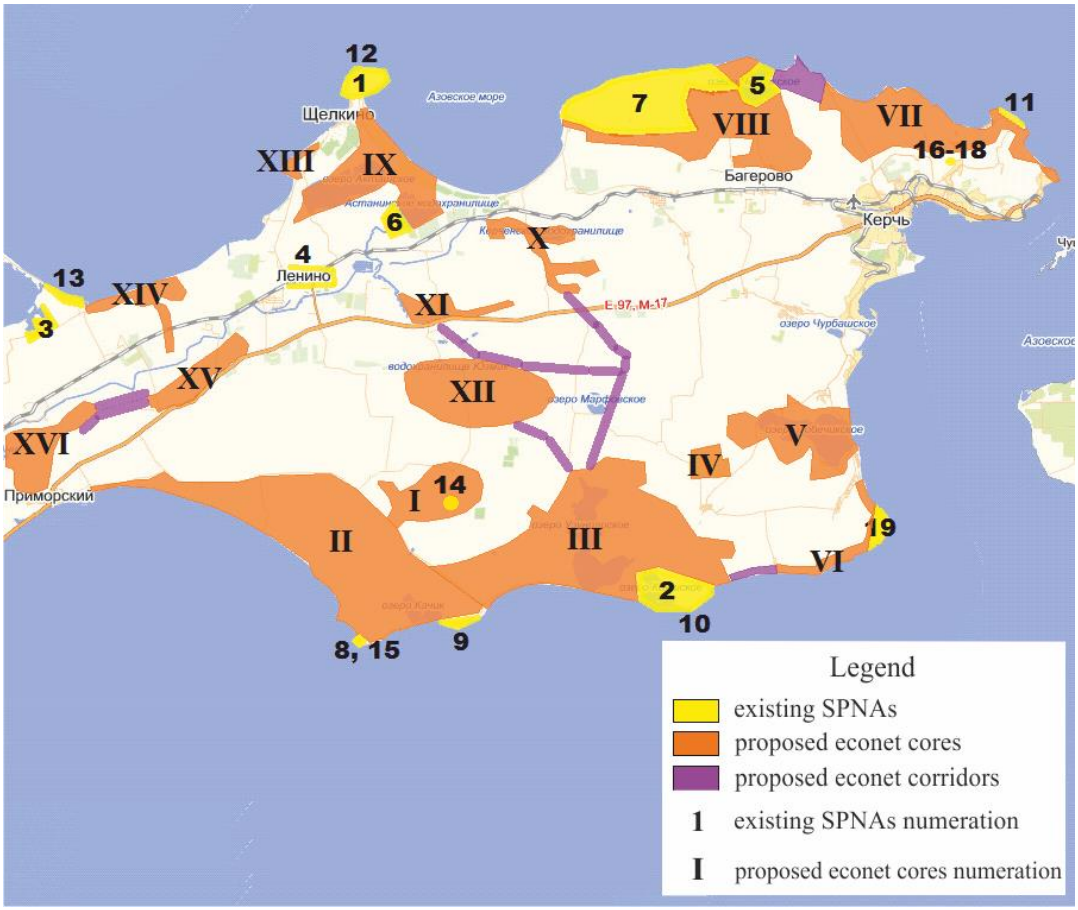

Figure 1. Kerch Peninsula's SPNAs (numeration of the existing SPNAs corresponds to the Table 1) (Parnikoza, 2011; Ivanov, 2013)

METHOD

To improve this situation, the authors propose a strategy of ecological networks (econets) – systems of protected areas and linking ecological corridors, buffer zones, and other territories with an environmentally sound mode of use. The econets provide an ecological cohesion of habitats and at the same time do not harm the social-economic development of recreational and residential territories. Protected areas are regarded as node elements in the econets, allowing conservation of the most valuable and vulnerable habitats. On the basis of migratory routes of birds and mammals, the ecological corridors are established (Figure 2) and anthropogenic activities (deforestation, plowing, laying of line structures, etc.) are restrained.

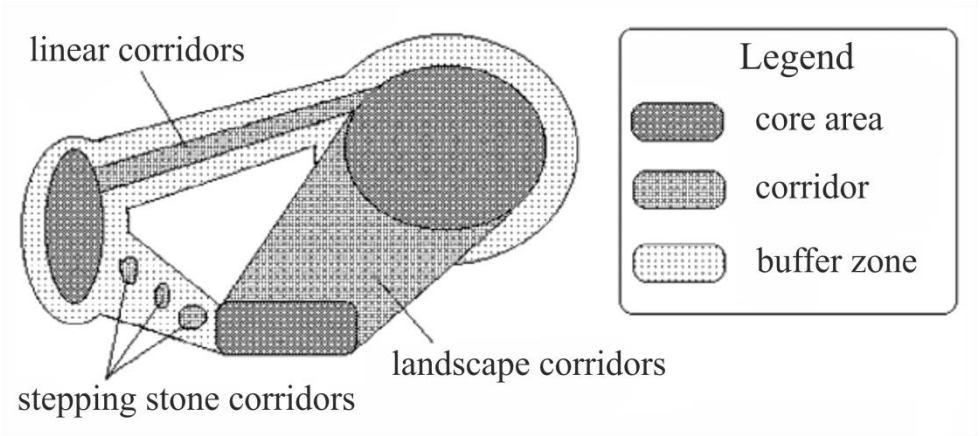

Figure 2. Elements of the ecological network (Elements of the ecological network, 2016)

Within an econet, existing SPNAs and territories that are to become the cores of the econet must ensure the preservation of objects of high conservation value, such as natural habitats, vast natural areas, and populations of endemic, rare and threatened species.

One of the main reasons for the biodiversity decline is fragmentation and isolation of population habitats, mainly due to anthropogenic activities. This leads to a disruption of gene exchange between populations and seasonal migration routes and to the inability of migration in case of accidental or large changes in environmental conditions.

The transit territories (corridors) in econets allow solving the aforementioned problems. In the steppe zone conditions, most transit territories adhere to rivers and other watercourses. These are floodplains and terraced meadows, forests, as well as steppe regions along the continental slopes of rivers and ridge-and-ravine network.

If necessary and where possible, econet cores and corridors are further protected from external influence and anthropogenic activity by buffer zones. Their necessity and configuration directly depend on requirements for species protection, external influence specifics and landscape properties.

It should be noted that the realization of the econet concept does not have to be at odds with satisfaction of human economic needs. Econet, by maintaining ecological balance, will indirectly contribute to the increase in production. Contradictions between objectives of natural environment conservation and of economic development are less serious than they appear (Vells, 1995). It is possible to reduce the area of agricultural land that is not cultivated or not needed to farms due to low fertility and convert it into steppe pastures. On the one hand, there would begin eventual resurgence of steppe ecosystems being close to the natural state and having a high degree of diversity, including plants that are valuable as fodder, while on the other hand, those lands will provide livestock with pastures. This would allow not only including those territories into the econet, but also their active use (Elizarov, 1998).

Econet can be tightly linked with agricultural lands through the use of strip cropping (Kolobovsky, 2008; The European Union's Tacis Regional programme, 2014). On the one hand, such an approach allows improving the microclimate of cultivated territories, minimizing erosion processes and normalizing the water balance. On the other hand, integrated forest and steppe strips serve as protection and feeding remises for wild animals which feed on agricultural lands. It is noted that in places with frequent alternation of different habitat types, the populations of wild animals reach the greatest numbers (Kolobovsky, 2008). Thus, strip cropping provides a shelter and a nesting ground for animals.

RESULTS

Despite a large area of land being occupied by farmland, currently there are large steppe zones in a relatively intact state which need protection and which have to be included into the Kerch Peninsula econet. The Kerch Peninsula econet should include the following elements (Parnikoza, 2011; Ivanov, 2013):

- Steppe segments in the Parpachsky ridge region (approx. 7,000 ha). It is the habitation of at least 185 different species, mostly of steppe and hydrophilic ornithocomplexes, 18 of which are listed in the Red Book of the Republic of Crimea (RBRC).
- Chaudinsky steppe region (approx. 17,000 ha). It is a well-preserved steppe community inhabited by 3 species of reptiles and 12 species of ornithofauna included in the RBRC.
- Opuksko-Uzunlarsky steppe region (approx. 13,000 ha). Vegetation is represented by steppe and halophytic (on the banks of water bodies) communities. 113 species of lichens, 50 species of moss, 456 species of Embryophytes, out of which 40 have a conservation status, grow there. 18 species of mollusks, approx. 6,000 species of insects (41 of which are in RBRC), 3 species of amphibians and 9 species of reptiles (4 of which are in RBRC) have been listed. 195 species of birds (37 of which are in RBRC) and 28 species of mammals (12 of which are in RBRC) are found there.
- Marievsky forest (approx. 1,000 ha). The territory is known for artificially planted oaks and ashes, under the canopy of which communities of forest herbs have developed.

- Steppes around the Tobechik Lake (approx. 1,500 ha). A conserved segment of steppe vegetation. 3 species of amphibians and 9 species of reptiles (4 of which are in RBRC) have been observed.
- Takil Cape (approx. 700 ha). Vegetation is represented by steppe, littoral halophytic complex and occasionally by semisavannas. Approx. 130 species of plants (17 of which are in RBRC) have been observed. At least 2 species of amphibians and 6 species of reptiles (3 of which are in RBRC) are found there.
- Osovinsky steppe region (approx. 5,000 ha). Vegetation is represented by various types of steppes. 350 species of Embryophytes (22 of which are in RBRC), 3 species of amphibians and 7 species of reptiles (3 of which are in RBRC), and approx. 100 species of ornithofauna (7 of which are in RBRC) have been observed.
- Kalarasky steppe region (approx. 13,000 ha). Vegetation is represented by true, meadow, psammophyte and petrophyte steppes. Approx. 400 species of Embryophytes (20 of which are in RBRC), 3 species of amphibians and 7 species of reptiles (3 of which are in RBRC) and no less than 200 species of ornithofauna (18 of which are in RBRC) have been observed.
- Aktash Lake (approx. 6,000 ha). The wetlands in the area of Aktash Lake should be included into the Astaninskie Plavni state nature reserve of ornithological profile. No less than 150 species of ornithofauna (15 of which are in RBRC), 2 species of amphibians, and 2 species of reptiles (2 of which are in RBRC) are found there.
- Adjielsky steppe region (approx. 1,500 ha). Steppe close to a natural state has been preserved there. No less than 3 species of amphibians and 6 species of reptiles (2 of which are in RBRC) have been observed.
- Parpachsky steppe region (approx. 1,500 ha). Segments of true and petrophyte steppes have been preserved there. Approx. 190 species of Embryophytes (10 of which are in RBRC) have been observed.
- Marfovsky steppe region (approx. 7,000 ha). No less than 185 species of steppe and hydrophilic ornithocomplex (18 of which are in RBRC) have been observed.
- Schiolkinsky steppe region (approx. 400 ha). Steppe and psammophyte vegetation complexes preserved in a state close to natural have been listed. No less than 1 species of amphibians and 5 species of reptiles (2 of which are in RBRC) are found there.
- Ali-Baisky complex (approx. 1,500 ha). Disturbed steppe, petrophyte and hygrophilous communities have been noted. No less than 2 species of amphibians and 5 species of reptiles (2 of which are in RBRC) are found there.
- Meadows by the Batalnoe and Lugovoe villages (approx. 800 ha). A preserved halophytic meadow has been noted.
- Akmonaisky steppe region (approx. 3,000 ha). No less than 180 species of steppe and hydrophilic ornithocomplex (30 of which are in RBRC) and no less than 6 species of Chiroptera (all of which are in RBRC) have been found.

These territories represent relatively intact segments of biocenoses. Their important feature is the presence of a large number of terio-, ornitho- and herpetofauna species requiring special attention and biodiversity protection.

CONCLUSIONS

The analysis of modern ecological situation, biodiversity of Kerch Peninsula, and main threats to its conservation shows an urgent need for speedy creation of a local econet as the only alternative to degradation and loss of unique natural complexes of this territory. The current system of nature conservation areas cannot provide a proper level of biodiversity protection of the region.

The conservation of Kerch Peninsula's nature is a complex and multidisciplinary task. Its solution must be started with developing a concept of econet of the region and ended with developing an action plan for its implementation. At the same time, the principle of maximum possible preservation of even the smallest section of native nature of the region should be fundamental.

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