The ecological tourism in the islands of Peter the Great Bay (Sea of Japan)

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Abstract. The article considers the objects and main types of ecological tourism on the islands of Peter the Great Bay (Sea of Japan). The accelerated pace of socio-economic development in the Primorsky Krai, its strengthening cooperation with the countries of the Asia-Pacific region (ATR), the annual holding of economic summits in Vladivostok make the tourism industry a promising path of the economic development. The Primorsky Krai is a leader in the development of tourism and recreation in the Far East. Ecological tourism is a journey through nature. The main types of ecological tourism are scientific, educational and recreational ones. A trip to nature should be combined with respect for the latter, the study, protection, and restoration of unique landscapes. Ecological tours are offered to vacationers as an alternative to traditional long-distance travels to foreign countries. The Peter the Great Bay is the largest bay in the Sea of Japan at the coast of Russia. The large and small islands of the bay, the island territories of Vladivostok (Russkiy, Popova and Reineke) and the adjacent waters of the Sea of Japan are natural complexes with a unique nature and favorable climate. Sandy beaches and amazingly beautiful shores, convenient bays and inlets, are good objects for the development of various types of ecological tourism.

Keywords. Ecological tourism, recreation, island ecosystems, biodiversity, rare species, natural monuments.

1. Introduction

Currently, the Primorsky Krai is leading in the efficiency of the tourist and recreational sphere in the Far East [1]. In connection with the active socio-economic development, strengthening of cooperation with the countries of the Asia-Pacific Region (APR) and annual holding of economic summits in Vladivostok, the development of tourism industry in the Krai can become one of the promising paths for the development of the regional economy. Ecological tours are offered to vacationers as an alternative to traditional long-distance travels to foreign countries of Europe and Asia, but an outdated infrastructure of the tourism industry, an insufficient number of tours and excursions, poor knowledge of the unique nature of our region hinders the tourism development in Primorye.

According to B.A. Voronov, the term "ecological tourism" means a journey through nature and reflects the idea of harmony between recreation and ecology. He considers a trip to nature as a...
combination of recreation with a careful attitude to nature, which allows combining acquaintance with flora and fauna with the possibility of their conservation and protection [2]. According to the prevalent purpose of a travel (to rest or acquire a certain knowledge), there are three main types of ecological tourism: scientific, educational, and recreational one. Scientific tourism allows visitors to receive new information about poorly studied areas and phenomena, which is necessary both for science and for effective planning of the development of recreation and ecological tourism. Cognitive tourism examines some of the most interesting biological species and attractions of inanimate nature for tourists. The objects of ecological tourism embrace exotic plant communities, biocenoses, and intact landscapes.

The purpose of our research is to show the uniqueness of the island ecosystems of the Peter the Great Bay and substantiate the importance of the development of ecological tourism for nature conservation in the islands. At the same time, special attention should be paid to the allocation and arrangement of specially protected natural areas, organization of viewing sites, ecological and tourist routes with rationing of an anthropogenic load.

2. Objects and methods of the research
The Peter the Great Bay is the largest bay in the Sea of Japan at the coast of Russia. It is located in the south of the Primorsky Krai, between Cape Povorotny in the east and the mouth of the Tumannaya River in the west. The area of the bay is 55600 km². The length of the coastline, including the islands, is about 1700 km. The large islands including Russky, Popova, Reyneke, Rikorda and Rimsky-Korsakov are the extension of the Muravyov-Amursky Peninsula. Furugelm Island is distinguished in the west of the bay, and the Putyatin and Askold Islands stand out in the east. Several large and small rivers flow into the bay. In the geological past, the river mouths were flooded by the sea and several second-order bays were formed, namely, the Amur, Ussuri, Vostok, America and Possiet (Figure 1).

Figure 1. A sketch map of the Peter the Great Bay

The large and small islands of the bay and the island territories of the city of Vladivostok (Russky, Popova and Reyneke islands), and the adjacent waters of the Sea of Japan form a peculiar system of natural complexes with a unique beauty of nature and a favorable climate. Sandy beaches and green capes, an amazingly beautiful coastline, convenient bays and inlets make a good addition to the natural and climatic features of the islands [3]. For the development of recreation near the city of Vladivostok, the authors examined the ecosystems of the islands of the Peter the Great Bay, namely, Russky, Putyatin and Reyneke, and the possibilities for developing ecological tourism in this area. Comparative geographical and landscape methods were used in the work. The approved and subject to approval specially protected natural areas (SPNA), biodiversity of vegetation cover, objects of inanimate nature,
zoning of the territory [4], as well as literature data and field geobotanical descriptions of vegetation were studied.

3. Research results and their discussion

Russky Island (the area is 14 thousand hectares, the height of its mountains is about 300 m above sea level) belongs to the Vladivostok urban district. The combination of flat and mountainous terrains allows for the preservation of wildlife in close vicinity of the city. The abundance of sun and warmth, the emerald sea, vast beaches create favorable conditions for the construction of innovative and entertainment centers, tourist bases and mass recreation not only for local residents, but also for numerous tourists from other regions of Russia and the APR countries.

The contemporary level of knowledge of the landscapes, flora and fauna of Russky Island is rather high. Its flora includes 859 species of 123 families. Over 30 species of vascular plants were included in the Red Book of Russia [5].

At present, the forest vegetation in Russky Island and adjacent small islands mainly consists of oak vegetation with dimorphant (Kalopanax septemlobus), Amur, Manchurian, and Mongolian lindens (Tilia amurensis, T. mandshurica, T. mongolica), Manchurian ash (Fraxinus mandshurica) and mountain ash (Fraxinus rhynchophylla), Manchurian walnut (Juglans mandshurica), lianas and an abundance of heart-leaved hornbeam (Carpinus cordata). Oak and linden forests, mixed forests of Manchurian ash (Fraxinus mandshurica), Amur velvet (Phellodendron amurense) and heart-leaved hornbeam (Carpinus cordata) are widely represented [6].

Historical tourism is the other important aspect of the development of ecological tourism in Russky Island. At the beginning of the 20th century, the Vladivostok fortress, which patterns are also located in the island, included 3 forts, 9 field fortifications, 20 land and 23 coastal batteries. Currently, these historical sites are very popular with tourists, especially schoolchildren.

The Department of Natural Resources and Environmental Protection of the Primorsky Krai Government approved only three natural monuments of regional importance such as the geological sections in the area of 4.65 hectares in Russky Island. The exposures of the largest “Tobizinsky Geological Section” show imprints of ancient ammonite shells and bivalve mollusks. Mining, vegetation burns, pollution and littering of the territory are prohibited there [7].

Until now, the state authorities have not approved the botanical natural monuments in the island proposed by V.P. Seledets, the outstanding botanist-ecologist [8]. They are “Desmodium”, oak groves near the Ekipazhny settlement, where Desmodium Oldhami grows, a rare and endangered species listed in the Red Book; “Rynda”, coastal and marine communities, flooded during high tides and storms, edges of the oak forests with (Rosa rugoza), groves Ainus japonica with stinking symlocarpus (Symlocarpus foetidus); “Helena” or “Land of Signalmen”, ash-linden-pear forest (the northern slope of Helena Island). Sheep fescue (Festuca ovina), drooping lily (Lilium cernuum), Schmidt birch (Betula schmidtii) and other rare species grow there.

Helena Island is the only territory of Russky Island where the Vladivostok administration allocated a small area for parks, gardens and arboreta. Quite a long time has passed, but the development of this territory has not yet begun, although travel agencies are already successfully conducting one-day ecological excursions to the island of Helena [3].

Russky Island belongs to a nature protection zone with a moderate severity of problems of flora and fauna protection. Therefore, the creation and approval of "specially protected natural areas" (SPNA) in this territory, namely, natural monuments, are of particular importance for recreation. Natural monuments are not alienated from the use of natural resources and are intended not only for the conservation of biodiversity, but also for educational purposes, ecological excursions and ecological tourism as well.

Putyatin Island is located in the Strellok Bay and is separated from the mainland by a small strait (1.5 km). The area of the island is about 30 km². Most of the territory is covered with dense forest, mainly of Mongolian oak (Quercus mongolica). There are also Amur linden (Tilia amurensis), green maple (Acer tegmentosum), Manchurian ash (Fraxinus mandshurica) and mountain ash (Fraxinus
rhynchophylla), and Manchurian walnut (Juglans mandshurica). Among its underwater rocks are ruffs, mussels, scallops, stingrays and octopuses.

In summer, the island attracts tourists with its extraordinary landscapes, clean and warm sea, peculiar landscapes, an abundance of mushrooms and medicinal plants. There is a famous Lake Gusinoye near the village of Putyatin in the island, where the Komarov lotus (Nelumbo nucifera), listed in the Red Book of Russia, grows. Twenty years ago, the entire shallow water of the lake was covered with a dense carpet of lotus, and now, due to the negative human impact, the area where the lotus grows has significantly decreased. Blooming lotus can be observed in late July–August (Figure 2).

![Figure 2. Komarov’s Lotus (Nelumbo nucifera) in Lake Gusinoye](image)

There are seven natural monuments in the island: 1) Lake Gusinoye, which is a natural monument of regional importance, where Komarov’s lotus (Nelumbo nucifera) grows; 2) Five Fingers Kekurs, their contours resemble five fingers of one hand; 3) Unkovsky Rocks, which were chosen by seals; 4) Iretsky Rock; 5) Underwater grotto near Shulepnikov Cape; 6) Rock Rooster; 7) Rock Elephant.

Recreation and ecological tourism on Putyatin Island is interesting for lovers of hiking, mountain climbing, which even beginner climbers can do. Climbing Startseva Mount in the north of the island, inspecting the Five Fingers Kekurs, Rooster and Elephant rocks are popular among fans.

There are no tourist bases on Putyatin Island, but the organizers of the tent camp, set up near the village, always offer catering services and excursions to Lake Gusinoye, climbing Startseva Mount, and boat trips around the adjacent water area. For a secluded recreation, you can choose any of the 13 bays of the island (e.g. Elephant, Rooster, Tortoise and Marble bays), which are very beautiful and suitable for camping. Experienced tourists always note the beauty of the Marble Bay, which shore is strewn with multi-colored stones. Putyatin Island is popular with tourists who, at the first opportunity, try to visit this beautiful corner of Primorye. The population of the Putyatin settlement is about 700 people and is constantly decreasing. The island has a store and a school with a museum. There is a regular ferry service between Putyatin Island and the Dunai settlement, which is located on the mainland.

**Reyneke Island** (the area is 4.6 km², the highest mountain height is about 149 m) is located 25 km south of the city of Vladivostok and belongs to the Vladivostok urban district (Figure 3).

The first examination and description of Reynke was carried out by the hydrographic expeditions of V.M. Babkina and A.A. Maltsev in 1861–1888. Until the 1970s, up to 2 thousand people lived in the settlement of Reineke. A local fish factory kept a sheepfold, and there were more than 100 heads of cattle in the private sector. A significant part of the island meadows was hay-mowed and grazed, and forests were cut down. Despite the cessation of all economic activities, except for recreational ones, the landscapes of the island have been significantly transformed by humans, and the restoration of indigenous vegetation is slow.
There are currently 13 permanent residents in the island. The settlement has two stores and a small tourist center. In the summertime, a large catamaran ship “Moskva” goes to the island every day, with a call to Popova Island.

The children’s sports club "Hyperborea" has been organizing tent camps in the island for several years in a row. Here children rest, go in for sports, do ecological tourism. In good weather, they visit neighboring islands on equipped catamarans and study their nature.

According to the latest forest inventory (1996), the forest cover of the island is about 11.4 %. In 2016, K.S. Ganzei et al. pointed out 457 species of vascular plants here [9]. In the island, the forest vegetation is represented by the oak-broadleaf forest. Mongolian oak (Quercus mongolica) dominates here, there are Amur linden (Tilia amurensis), Manchurian birches (Betula manshurica) and Daurian birches (B. dahurica), Manchurian ash trees (Fraxinus mandshurica), and nasoliferous ash (Fraxinus rhynchophyla), and Manchurian walnut (Juglans mandshurica) as well. Rare species, heart-leaved hornbeam (Carpinus cordata), dimorphant (Kalopanax septemlobus), small-leaved alder (Micromeles alnifolia), are less common, but quite abundant on shaded slopes and in the bottoms of drainage funnels. Communities of halophyte plants are being formed on the seaside sandy and pebble beaches. These are sand-loving sedge (Carex arenicola), soft spikelet (Leymus mollis), Asian mertensia (Mertensia asiatica), Komarov’s hodgepodge (Salsola komarovii), Japanese toadflax (Linaria japonica), creeping lettuce (Chorisí repens), and other.

There are no approved natural monuments in Reyneke Island. But, such unique ecosystems as thicket of rudbeckia (Rudbéckia hírta), introduced with the grain imports from North America (Figure 4); a grove of hornbeam (Carpénícia hírta) with Okhotsk onion (Allium ochotense), abrasive kekurs in the picturesque bay “Krasnye Skaly” on the southeastern tip of Reyneke Island (Figure 5), require further studies and approvals in the status of “natural monuments”.

![Figure 3. The Reyneke Settlement, the Primorsky Krai, 2020](image)

![Figure 4. Thickets of rudbeckia (Rudbéckia hírta) on a flat watershed](image)
Figure 5. Abrasive kekurs in the picturesque bay “Krasnye Skaly”

There are no artificial plantings of coniferous trees near residential buildings in the island. To increase the aesthetics and attractiveness of landscapes, the setting up of small parks and alleys is necessary here. In the bays closed from the southwestern winds and along the streets of the settlement, groves of whole-leaved fir (*Abies holophylla*), Korean pine (*Pinus koraiensis*), pointed yew (*Taxus cuspidata*) and other trees and shrubbery growing in the island will take root well.

4. Conclusions

1. Ecological tourism is a growing trend in the tourism industry. Its task is to organize an economically profitable active form of recreation with minimal changes in the environment. In recent years, all types of ecological tourism have been widely used in the cultural, educational and environmental work of reserves and national parks in the Primorsky Krai, promoted and developed by the scientists from the Far Eastern Branch of the Russian Academy of Sciences, Far Eastern Federal University (FEFU) and other universities in Vladivostok. Organization of ecological and educational excursions for schoolchildren, as future environmentally educated consumers of tourist services, is an important issue in the development of ecological and historical tourism in the coastal-sea zone.

2. With the development of mariculture in the bays and in the islands near the city of Vladivostok, culinary and gastronomic tourism should become widespread with establishing of cafes and restaurants of marine delicacies, offsite gastronomic tours and festivals.

3. The effective use of the recreational resources of the islands of the Peter the Great Bay is possible only after a comprehensive study of the recreational potential of the territory and the development of a scheme for the development and placement of the tourism and recreation facilities, taking into account the social, natural, ecological and economic aspects. The identification of protected zones and the proposed botanical natural monuments in the islands of the Peter the Great Bay, the laying of ecological trails and tourist routes should be carried out immediately. Recreation and ecological tourism are not only a full-fledged rest, but also cultural and environmental education of tourists, as well as the financial support for protection and conservation of unique landscapes.

4. An analysis of local ecological tours shows that about 2/3 of all tourist flows in the Primorsky Krai, in summer, are carried out on the coast and islands of the Sea of Japan. In recent years, the anthropogenic and recreational load on the ecosystems of the islands of the Peter the Great Bay has increased dramatically. In this regard, the preservation of the recreational potential of the territories and biodiversity of vegetation and fauna is an urgent issue that should be dealt with not only by ecologists, scientists, but also by government authorities.
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