Educational potential of landscape-recreational resources of shore areas of Lake Baikal

Zh V Atutova¹, D V Kobytkin¹ and M Zhao²

¹ Sochava Institute of Geography SB RAS, Irkutsk, Russia
² Institute of Geographic Sciences and Natural Resources Research CAS, Beijing, China

E-mail: atutova@mail.ru, agrembrandt@inbox.ru, my.z@yeah.net

Abstract. We made a map of the contemporary landscape structure on the site of the Goloustnenskoe coast to analyze the recreational development of the coast of Lake Baikal; based on this map, we identified the main factors of natural attractiveness for the development of the tourism industry. We determined historically formed and preferred types of recreation activities. With a view to reveal environmental problems, we identified the main directions for recreational activities that have the greatest negative impact on the functioning of landscape complexes in the area. It is noted that a low level of ecological culture of vacationers is often the main reason for the activation of adverse events. Having considered the high degree of sensitivity of landscape complexes to anthropogenic impact, we proposed ecotourism-oriented leisure activities that can not only reduce the burden on the part of recreational activities but also increase the level of environmental morality. Besides, we provided examples of recreational facilities, already existing on the Goloustnenskoe coast of Lake Baikal and methods of their management, guaranteeing environmental stability, which is necessary for the implementation of measures aimed at sustainable development of the Baikal territory.

1. Introduction

Recently, conspicuous is the fact that the issue of anthropogenic transformation of the picturesque landscape complexes of the Baikal coast is caused by the growing recreational load. The areas frequently visited by tourists need educational measures that would provide knowledge about the unique natural features of the territory, as well as form the ecological consciousness and environmental responsibility of the recreants. This study is aimed at assessing the educational value of landscapes for solving environmental problems arising from growing tourist activities. The area of our study is the Goloustnenskoe shore of Lake Baikal, where there is no targeted planning of recreational use and the schemes for arranging tourist infrastructure are not informative enough. However, this area is recreationally attractive for the population of the Irkutsk agglomeration. If we do not address the issues of improving the level of ecological culture of recreants, the flow of which has sharply increased in recent decades, there is a high probability of a threat for the original Baikal landscapes, up to the possibility of losing some of them.

2. Models and methods

We analyzed the educational potential of landscapes based on the compiled map of the modern landscape structure of the Goloustnenskoe shore of Lake Baikal (1: 100 000). We used multi-temporal
topographic maps, field study materials, and remote sensing data in creating the map. Aerial photography was taken from a DJI Mavic 2 Pro drone with a Hasselblad L1D-20c camera. The analysis of the images helped to identify foci of unfavorable processes caused by anthropogenic impact and contributed to the calculation of the areas of recreationally transformed complexes.

When classifying geosystems and compiling a legend to the landscape map, a five-stage structure was applied: type of natural environment – class of geoms – geom – class of facies – group of facies. The basis for their identification was the map “Landscapes of the South of Eastern Siberia” [1], according to which planetary and regional complexes are represented by North Asian goletz and taiga, as well as Central Asian steppe geosystems with the distribution of mountain taiga South Siberian and mountainous Western Baikal Daurian classes of geoms. Within their limits four geoms are highlighted – the lowest subdivisions of the regional dimension, combining classes of facies with similar structural and dynamic indicators. In separating classes and groups of facies we took into account the morphological features of the surface, which, in turn, impacted the features of the development of biotic components. Their boundaries coincide with the landscape-morphological boundaries proposed by Abalakov, Kuzmin and Snytko [2]. However, we enriched them by facts obtained in field studies, and distinguished 12 groups of facies, reflecting both natural state of their components and the anthropogenic component of their current functioning.

3. Results and discussion

The considered section of the Baikal shore (the southern part of the lake) includes the lower reaches of the Goloustnaya river, which has a relatively small area but is distinguished by the diversity and contrast of landscape complexes, due to the features of the mountain relief (figure 1a).

The study area is located within the boundaries of the Pribaikalskii National Park, established in 1986. Its functional zoning, carried out with the aim of rational nature management, assigned the key site to the zone of recreation and educational tourism. The unique mountain taiga dark coniferous and light coniferous, subtaiga light coniferous and piedmont steppe landscape complexes adjacent to the water area of Lake Baikal have been attractive vacation spots for many decades. Back in the days of lack of organized tourism here, the shore territories were a place of self-organized leisure activities, which was favored by the relative proximity of the regional center - the city of Irkutsk, connected with the village of Bolshoe Goloustnoe with the motorway of about 120 km long. On weekends about 150 units of vehicles were found near the campsites [3].

Currently, there are about 27 tourist and recreation hostels as well as three children's medical and sports facilities in the study area. In 2007 the settlement was considered as a center for the development of a special economic zone of tourist and recreational type "Gate of Baikal" with the establishment of a world-class resort. However, the project was not implemented for a number of reasons.

Of the greatest interest for recreationists are the active types of recreation with a preference for visiting the natural attractions of the area. The main places of "pilgrimage" are Lake Sukhoe in the upper reaches of the Semyonikha river, the viewing peak Mailgar on a lateral spur of the watershed of the left bank of the lower reaches of the Goloustnaya river (figure 1b), as well as a poplar grove in the river delta (figure 1c). Walking and car excursion routes often pass outside the paved paths and roads, which leads to a decrease in natural species biodiversity, suppression of forest stand, and disturbance of ground cover; littering and trampling of the territory, together with the lack of an adequate level of ecological self-awareness and education of vacationers. Without any control over the number and behavior of tourists, there is a gradual loss of natural aesthetic value of objects due to the manifestation of a chaotic multi-path network on treeless slopes (figure 1d), appearance of "memorable" inscriptions on steppe slopes and rocky outcrops (figure 1e); consequences of the pyrogenic factor are also observed.
Figure 1. The landscape and ecological situation of the Goloustnoe shore of Lake Baikal: a – a landscape map (see table 1); b – view of the panoramic peak Mailgar; c – a fragment of the orthoimage of the Goloustnaya delta with the area of poplar distribution, d – chaotic road and path network on treeless recreationally developed slopes; e – "memorable" inscriptions on steppe slopes and rocky outcrops; f – campfire site on the alluvial cone of the Semenikha river; g – slopes of the Primorskiy range, subject to fires; h – a fragment of the orthoimage of the Goloustnaya valley with marked territory of the landfill; i – landfill.
| Topographic feature (class of facies) | Group of facies | Number on the map |
|--------------------------------------|----------------|------------------|
| Geosystems of north asian golets and taiga | Geomes of mountain-taiga dark coniferous |  |
| Class of facies of gentle and flat summit plumes of the Primorskii Range with structural ridges and steps of Siberian stone pine and mixed bergenia, with green-moss on brown forest and podzolic soils | Watershed surfaces of pine-larch-Siberian stone pine cowberry-green-moss, with bergenia on podburl and podzolic soils | 1 |
| Class of facies of Inclined and dissected slopes of the Primorskii Range, larch-pine with Siberian stone pine grass-green moss, with cowberry on sod and sod-carbonate soils | Steep near watershed slopes of larch-Siberian stone pine-pine, with birch shrub-grass on sod forest soils | 2 |
| Geomes of mountain taiga pine | Steep slopes of larch-pine with Siberian stone pine, with rare birch, rhododendron cowberry-herbaceous on sod forest forests | 3 |
| Class of facies of steep southeastern slopes of the Primorskii Range pine rhododendron with steppes on chernozems and chernozem-like soils | Steep slopes, pine, with larch and birch, rhododendron, often steppe on thin chernozems | 4 |
| Geomes of piedmont subtaiga pine | Lower parts of the steep slopes, pine, open woodlands, with larch, forbs, steppe on chernozem-like soils | 5 |
| Class of facies of piedmont sloping plains of the Primorskii Range steppe, mainly on sod forest soils | Inclined plumes meadow steppes with rare pine on soddy forest soils used for grazing | 6 |
| | Floodplain pine-larch-birch with willow coarse grass on alluvial and meadow soils | 7 |
| | Floodplain and above floodplain terraces meadow forbs on meadow, alluvial and sod forest soils, used for haying | 8 |
| | Deeply incised valleys of larch-pine-birch forbs on alluvial soils | 9 |
| Geosystems of central asian steppe | Class of mountain western baikalskii daurian type geomes |  |
| Geomes of piedmont steppe | Class of facies of Alluvial cones of piedmont plains of Primorskii Range, steppe on chestnut and meadow soils |  |
| | Alluvial cones meadow forb steppe on chestnut soils | 10 |
| | Delta plains steppe forb-gramineous on meadow soils, subject to grazing | 11 |
| | Delta plain meadow-bog grass-sedge on meadow soils | 12 |
| Current natural and economic situation | |  |
| Areas affected by forest fires in May 2019 | 13 |
| Border of the Pribaikalskii National Park | 14 |
| Settlements | 15 |
| Road | 16 |
| Landfill | 17 |
| Tourist hostels | 18 |
The risk of fires is often promoted by the uncontrolled arrangement of bonfires when organizing picnic leisure. For example, in the mouth of the Semyonikha river, the campfire sites are randomized and excessively concentrated – 52 sites on an area of 2 hectares (figure 1f). Accumulation of trunks damaged by fire and blown down by wind or with the exogenous processes contributes to the loss of landscape value and recreational attractiveness of taiga landscape complexes (figure 1g).

A burning environmental problem is the lack of measures for the management of solid household waste (MSW); in the village of Bolshoe Goloustnoe there are no schemes for cleaning the territory, no containers for the collection and temporary storage of garbage, which creates causes littering forest areas along the road, as well as on the territories of households. Most of the garbage accumulates in an unauthorized dump at the site of an old quarry 11 km from the village of Bolshoe Goloustnoe. A garbage dump directly at the entrance to the quarry contributes to littering an area of 2.86 hectares (figure 1h and 1i).

Taking into account the current landscape and ecological situation of the Goloustnoe shore, one of the directions in the implementation of the principles of sustainable development is the orientation of the recreational industry to the development of ecotourism with an aim to protect natural resources by creating “Great Baikal Trail”, which creates causes littering forest areas along the road, as well as on the territories of households. Most of the garbage accumulates in an unauthorized dump at the site of an old quarry 11 km from the village of Bolshoe Goloustnoe. A garbage dump directly at the entrance to the quarry contributes to littering an area of 2.86 hectares (figure 1h and 1i).

As part of the volunteer project "Great Baikal Trail", implemented with the aim of developing hiking ecotourism around Lake Baikal, within the territory of the project there is a path to the view point Mailgar 3 km long; and a section of the route Bolshe Kuty – Bolshoe Goloustnoe [4] runs along the lake shore. All objects equipped with campsites, information boards and markings are a kind of tool for optimal management of the tourist flow, allowing to transfer the anthropogenic load to a certain route, restricting access to another territory, thereby contributing to the preservation of unique landscape objects and preventing their transformation.

In solving the issues of biodiversity conservation and environmental protection of unique objects, it is advisable to use the cognitive (educational) potential of landscapes in order to increase knowledge about the specifics of natural conditions, as well as to develop environmental awareness, environmental responsibility and culture of recreants. The science-driven educational resource of the landscape complexes of the Pribaikalskii National Park is currently used in the ecological work of such tourist organizations located on the Goloustnoe shore, as the base of educational field practices of the Pedagogical Institute of Irkutsk State University, the ecological international camp for schoolchildren, the campsite of the Irkutsk regional public organization for children and youth "Baikal scout". In 2018, in the village of Bolshoe Goloustnoe one of the most ambitious all-Russian volunteer projects was carried out - the Ecodemia educational camp, which brought together 450 participants from various regions of the country. The main goal of the event in the process of knowledge of the Baikal Natural Territory was to obtain the necessary environmental skills as a part of eco-education.

The prospects of involving the educational (cognitive) potential in the process of environmental management become obvious for many SPNAs [5-7]. The aggravated problems of environmental risks from the increased flow of recreants with a high level of consumption and significant volumes of waste are relevant today for China. The similarity of environmental problems within the recreationally developed territories of the two countries contributed to the implementation of a joint study "Nature Education Function Optimization Mechanism and Environment Management Modes for National Parks", carried out by researchers of the V.B. Sochava Institute of Geography, SB RAS (Irkutsk) and the Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences (Beijing). One of the aims is to develop models for improving the ecological culture of recreants using the cognitive (educational) functions of the natural complexes of the Pribaikalskii National Park and the Pudatsuo National Park to optimize nature conservation and sustainable development in accordance with the peculiarities of nature management [8, 9]. The most promising for the Goloustnoe shore of Lake Baikal is the development of ecotourism as the most ecologically safe type of recreational nature management, considered within the framework of this project. Currently, the share of ecotourism in the overall structure of the Russian tourist market is about 1%, but environmental
measures, including taking into account the educational (cognitive) potential, are able to provide an additional flow of tourists of over 0.3 million people [10], guaranteeing both nature conservation and socio-economic benefits.

4. Conclusion

The unorganized and uncontrolled flow of recreants, whose activity contributes to the emergence of environmental problems, causes the danger of losing the tourist attractiveness of the Goloustnoe shore due to the progressive transformation of unique, aesthetically attractive landscape complexes which are weekly resistant to anthropogenic loads.

Taking into account the recreational potential of landscapes adjacent to the water area of Lake Baikal – a UNESCO World Natural Heritage Site, the orientation of nature management towards the development of ecotourism in order to minimize negative consequences on the natural environment is relevant. As part of the sustainable development of the Goloustnoe shore the exploitation of the cognitive (educational) resource of the natural environment is promising in order to increase knowledge about the specifics of natural conditions, as well as for the formation of environmental awareness and environmental responsibility. The organization of hiking trails along well-equipped ecological trails, considered as one of the main directions of ecotourism, contributes to the acquisition of knowledge of nature and ecology.

Acknowledgements

The reported study was funded by RFBR and NSFC according to the research project No. 20-55-53030 NSFC_a.

References

[1] Mikheev V S and Ryashin V A 1977 Landscapes of the South of Eastern Siberia. Map 1: 1500000 (Moscow: Gugk) p 4
[2] Abalakov A D, Kuzmin V A and Snytko V A 1990 Natural specifics of the Goloustnoe coast of Lake Baikal Geography and Natural Resources 4 51-61
[3] Environmentally Oriented Land Use Planning in the Baikal Region. Goloustnaya River Basin. Russian-German Cooperation Project 1997 ed A Antipov and A Hoppenstedt (Irkutsk and Hannover: IG SB RAS) p 234
[4] Luzhkova N M 2011 Classification of hiking trails in the Central ecological zone of the Baikal natural territory Geography and Natural Resources 3 64-72
[5] Chizhova V P and Shlyakova E S 2017 Recreational potential of the landscapes of the Altachey reserve Bulletin of the Moscow University. Series 5. Geography 5 90-8
[6] Gudym A Yu 2012 Ecological tourism in the national park and its educational potential Secondary Vocational Education 8 10-3
[7] Mekh N V 2010 The use of the educational potential of specially protected natural areas in the formation of the ecological culture of schoolchildren Man and Education 3(24) 56-60
[8] Zhao M Y, Dong S C, Wu H C, Li Y, Su T W, Xia B, Zheng J and Guo X 2018 Key impact factors of visitors’ environmentally responsible behaviour: personality traits or interpretive services? A case study of Beijing’s Yuyuantan Urban Park, China Asia Pacific Journal of Tourism Research 23(8) 792-805
[9] Zhao M Y, Dong S C, Guo H J, Gao N and Li Y 2019 Influence of environmental interpretation service in national parks on guiding public behavior Resources and Environment in Arid Areas 9 95-100
[10] Udalykh S K and Zhilenko V Yu 2016 Problems and prospects for the development of ecological tourism in the Baikal region Network Journal Scientific Result. Series Business and Service Technologies 2(2) 15-21