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Article

The role of photography as a form of visual content in the popularization of the fauna of the Vologda Region

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Abstract. Photography is a form of visual content and acts as a universal cognitive tool. It can play a multifaceted role in popularizing knowledge about living organisms, specifically, the fauna of the Vologda region, helping to identify species. It provides information about the species composition of the flora and fauna, documents physiological processes, and illustrates types of biotic links and relationships and behavioral characteristics of animals. Photography can reflect the dynamics of processes and phenomena, developing imagination, and helping to tackle environmental issues. When photographing wildlife, it is important to maintain a balance between aesthetics and scientific relevance. Photographs expand information on the distribution of species known in the region and provide an additional opportunity for rapid identification of new taxa.

Keywords: animals, protection, biological and ecological education and education.

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Introduction

Visual content provides objects in a visual, convenient form for visual perception: illustrations, graphics, photographs, videos, etc. (Proydakov and Teplitsky, 2004).

The Vologda Region is one of the largest such regions in European Russia, its area is 144500 km^2. Its great size inevitably influences the landscape and biotopic diversity, which is a prerequisite for the species richness of faunas. Representatives of 33 classes of 14 phyla of invertebrates and vertebrates live in the Vologda Oblast, about 6000 species have been recorded, of which 421 are vertebrates (Shabunov..., 2021).

In Russia, the national “Ecology” project has been implemented since 2018, and in 2021–2030 a Federal Scientific and Technical Program in the Field of Environmental Development[1, 2].

The educational institutions of the Vologda Region have accumulated a great deal of experience

[1] Decree of the President of the Russian Federation dated 07.05.2018 No. 204 “On national goals and strategic objectives for the development of the Russian Federation for the period up to 2024”.
[2] Decree of the President of the Russian Federation No. 76 of 08.02.2021 “On measures to implement the state scientific and technical policy in the field of environmental development of the Russian Federation and climate change”.

in biological and environmental education. This is aimed at children and parents, teachers and students involved in biology and ecology lessons, extracurricular activities, as well as environmental protection. Representatives of Vologda State University have always taken an active part in educational and environmental activities of a scientific and educational-methodological nature, carried out biological, ecological, and aesthetic education and upbringing, and increased the ecological culture of people of different ages.

Biologists and ecologists help to identify and explain biological diversity, patterns of development, the importance of living organisms, contributing to the conservation of species and their habitats. It is important to popularize this information, in particular, about the species inhabiting a particular territory, and to make the data available to people. The need for regional faunistic data can be interpreted from the large numbers of visitors to the department of natural history of the Vologda State Museum-Reserve: 70–72 thousand people a year (Stramova, 2017).

The purpose of this study is to show the role of photography as a form of visual content in popularizing knowledge about species and ecological diversity, behavior and protection of animals in the Vologda Region.

Materials and methods

The research was carried out using theoretical and empirical methods: theoretical and methodological analysis, questionnaires and mathematical statistics. A voluntary anonymous survey was conducted at the end of popular science lectures to obtain feedback from the audience; 107 respondents participated. The age group of respondents from 8 to 69 years old was distributed as follows: 8 – 1.8%, 13–14 – 45.6%, 16–17 – 31.6%, 30–40 – 10.5%, 50–59 – 5.3%, 60–69 – 5.3 %. Employment groups of respondents: middle-level pupils 45.6%, students 31.6%, pensioners 10.5%, employees 7%, primary school students – 1.8%, parents with children 1.8% and teachers 1.8%. The processing of the results of the questionnaire was carried out using the MS Excel software. The characteristics of the types of educational activities of the authors are given in Tables 1 and 2.

Results

The importance of photography in popularizing animals

Photography plays a significant role in the popularization of living organisms, in particular animals.

1. It helps to identify animals caught in the camera lens to species from their exterior (morphology), which contributes to the compilation of lists of species of different regions. In this process scientists interact with nature lovers. For example, questions often arise about the identification of snakes. Important characteristics of the common grass snake (*Natrix natrix* (L., 1758)), clearly visible in photographs, are

Table. 1. Authors' photo exhibitions.

Exhibition / display no.	Data	Exhibition / display title	Place
1.1	October – November, 2011	Nature is a living science	Cherepovets, Cherepovets Museum Association, Museum of Nature
1.2	December, 2011 – February, 2012	Nature is a living science	Cherepovets, Secondary School no. 28
1.3	March, 2012	Not just bugs	Cherepovets, kindergartens
1.4–1.5	April, 2012	Nature is a living science	Vologda, Vologda State University
2	June 1, 2019 – November 17, 2019	Love and protect	Vologda, Vologda State Museum-Reserve, Department of Nature
3	January 28 – March 24, 2020	Be surprised by knowing nature, rejoice developing with it (856 people attended)	Tarnogsky Gorodok, Museum of Traditional Folk Culture

Table 2. Lectures by N.S. Kolesova on the popularization of animals in the Vologda Region in 2019–2021.

Lecture no.	Data	Lecture title	Place	Number of visitors
1	June 1, 2019	These amazing insects (as part of the Day for the protection of animals)	Vologda, Vologda State Museum-Reserve, Department of Nature	50
2	April 23, 2021	Virtual excursion to nature: swamp	Vologda, Vologda Library no. 15	27
3	May 14, 2021	Virtual excursion to nature: swamp (conversation at the swamp diorama)	Vologda, Vologda State Museum-Reserve, Department of Nature	33
4–6	2019–2021	Popular science events for schoolchildren of the region	Vologda, Vologda State University	75

large yellow (sometimes whitish or orange) patches on the sides of the head. The common toad (*Bufo bufo* (L., 1758)) can also be unmistakably identified from photographs (Fig. S1, Appendix). Two Internet projects that implement the idea of identifying species from photographs and georeferencing of their meetings are iNaturalist (www.inaturalist.org) and Plantarium (https://www.plantarium.ru/).

2. It allows recording of physiological processes. Thus, we managed to capture the phenomenon of trophallaxis in red wood ants (*Formica* sp.) (Fig. S2, Appendix), which plays a very important role in communication, since it has not only a trophic, but also an informational component.

3. It makes it possible to illustrate biotic connections and relationships (ecology), in particular, the trophic spectrum of different species. For example, the field scabious (*Knautia arvensis* (L.) J.M. Coult.), is a plant where insects of different species can be found, but each of them has a wide food base. When including a plant species in the trophic spectrum, it is important not only to take into account the presence of the animal on the plant, but also to record the collection of nectar or pollen, as shown in the photograph (Fig. S3, Appendix).

4. It fixes the behavioral characteristics of animals (ethological criterion). Thus, it was possible to capture the feeding activity of a common bumblebee (*Bombus lucorum* (L., 1761)) on yellow rattle (*Rhinanthus minor* L., 1756) (Fig. S4, Appendix). The short proboscis of this species does not allow it to extract nectar in the usual way from plants with a long corolla tube. The bumblebee bites through it, thus gaining access to the nectar.

5. Despite its static nature, photography is capable of reflecting the dynamics of processes and phenomena. It has both artistic values, for example, when photographing a landscape from one point in different seasons of the year, and scientific, allowing stages of development, in particular, phenological cycles, to be shown. One can see a gradual change from one biogeocenosis to another (succession), photographing the same community after a long time. In the first color photographs of the Vologda Oblast, taken by S.M. Prokudin-Gorsky and currently available for comparison, natural communities and architectural structures of the early 20th century (mainly 1909) are captured using a unique author's technique (Po Vologodskoy gubernii.., 2021; Fotografii.., 2021). O.V. Zazhigin and his colleagues in the photo album "Vologda v obiyektive vremeni (Vologda through the Lens of Time)" (2018) had the idea of combining 140 modern and retro photographs in collages.

6. Good photography can develop imagination, carry out aesthetic education (Fig. S5, Appendix). It is very important to maintain a balance between aesthetics and scientific relevance. Each picture has its own story, informative base, and emotional charge. Photography is becoming a universal cognitive tool that is understandable and interesting to everyone.

7. Photographs have an environmental function. They make it possible to depict an animal in a familiar posture and to accurately visualize certain species without it being removed from its natural habitat, which contributes to conservation. On the other hand, many species (in particular, insects) cannot be identified without analyzing microscopic features under a binocular microscope.

8. Photographs expand data on the distribution of species known in the area and provide an additional opportunity to identify new ones. Expeditionary trips

can subsequently be carried out to the indicated locations. For example, in 2021, on the territory of the Vologda region, at several points at once, a new species for the region, the praying mantis (*Mantis religiosa* (L., 1758)) was reliably photographed and identified. The rapid dissemination of this information was possible because of the Internet.

Currently, due to the development and widespread availability of photography and video equipment and Internet resources for posting photographs and videos, it has become possible to obtain additional information about living organisms. Such data are probably mosaic and cover only prominent systematic groups, but, nevertheless, they complement the results of monitoring studies. When photographing and saving photographs, so that they act as documentary evidence of the habitation of a species in a given geographic point, it is necessary to take into account aspects (a minimum set of attributive data) that were discussed previously (Kolesova, 2019). One of the main aspects is the mandatory indication of the precise geographical location. Only in this case will it have not only aesthetic value, but also a scientific role. It is also very important to record the habitat (biotope).

Educational activities using photography

The authors carry out the following types of educational activities to popularize knowledge on the animal life of the Vologda Oblast using photographs:

1. Organization of photography exhibitions, the first of which was preceded by the All-Russian non-commercial project “The Art of Science – 2010” (Moscow, Ministry of Education and Science of Russia, Lomonosov Moscow State University), where the authors presented photographs with descriptions and won the science prize in the nominated categories “for commitment to their work” and “for imaginative thinking”. The information on the authors’ photography exhibitions are presented in Table 1.

All photographs at the first exhibition contained informative captions, which were gradually expanded with the implementation of subsequent photography exhibitions. Feedback from visitors confirmed the importance of the information accompanying photographs, increasing their cognitive function. This information acts as a guide, providing a deeper view into the photograph, allowing a wider outlook and helping to learn. Photograph descriptions help to see the features of living objects behind a beautiful image, a bright color spot, that help animals to adapt to the environments.

For all exhibitions, visitors left positive reviews in the guest books. In addition to personal photography exhibitions, images by the authors with descriptions have participated in many collective photography exhibitions and photography contests.

2. Conducting popular science lectures – conversations ending with games (Table 2).

According to the results of the survey, it was revealed that at such events (such as biological and ecological excursions), all respondents enjoyed both the photographs and their descriptions. All the visitors wanted to visit the next excursion and get to know the authors’ portfolios, which are to be published. Most attendees (95%) liked to take pictures in nature themselves, and of these 46% do so frequently.

Among the suggested habitats that they would like to visit for an excursion, all respondents (100%) chose forests, many (52.6%) rivers, 40.4% lakes, 36.8% villages (Fig. 1).

For the most popular aspects of the activities, the audience noted clarity, colorfulness of the photographs (78.9%) and the biological characteristics of organisms (75.4%) (Fig. 2).

To the question of the questionnaire “Please describe your impressions”, a lot of emotionally coloured responses were received: “I liked it very much; interesting; informative; a lot of different information; I learned a lot; discovered new things; a lot of new things; thank you; thank you very much; good quality photos; interesting presentation of the material; excellent; very good; I give my heart to the guide; my respect for the guide; would like more details about the caterpillars; when is the next excursion; perfect; very cool; exciting; got a great interest in the nature of the Vologda Region; a pleasant voice; learned many species from the Red Book; a clear story; everything was wonderful; had a pleasant experience; an excellent presentation; beautiful photos; accessible; I invite you to visit us in Opoki; how to get to these places; the best impressions; well done; I love nature”.

3. Participation in scientific and practical conferences. Personal photographs are regularly used to illustrate faunal reports. Over the past four years, the authors have delivered two reports on the educational role of photography at all-Russian scientific conferences (Kolesova, 2020; Kolesova and Balukova, 2018).

4. Preparation of photo-albums – popular science monographs. The authors have been working on photo-albums since 2011. Personal photographs and descriptions of them in popular science form, as well as poems of poets from Vologda and beyond, are combined in a single format. The ecosystem principle was used to structure the material. The photo-albums present the views of photography biologists on the beauty, diversity, complexity, and expediency of organizing the communities of the Vologda Oblast, as well as the species of plants, animals and fungi that inhabit them. By now, the author’s version of the manuscript of the photo-albums dedicated to the forests of the Vologda Region (spruce, pine and deciduous forests) is ready, a publication is being prepared on wetlands (swamps, lakes, rivers) and

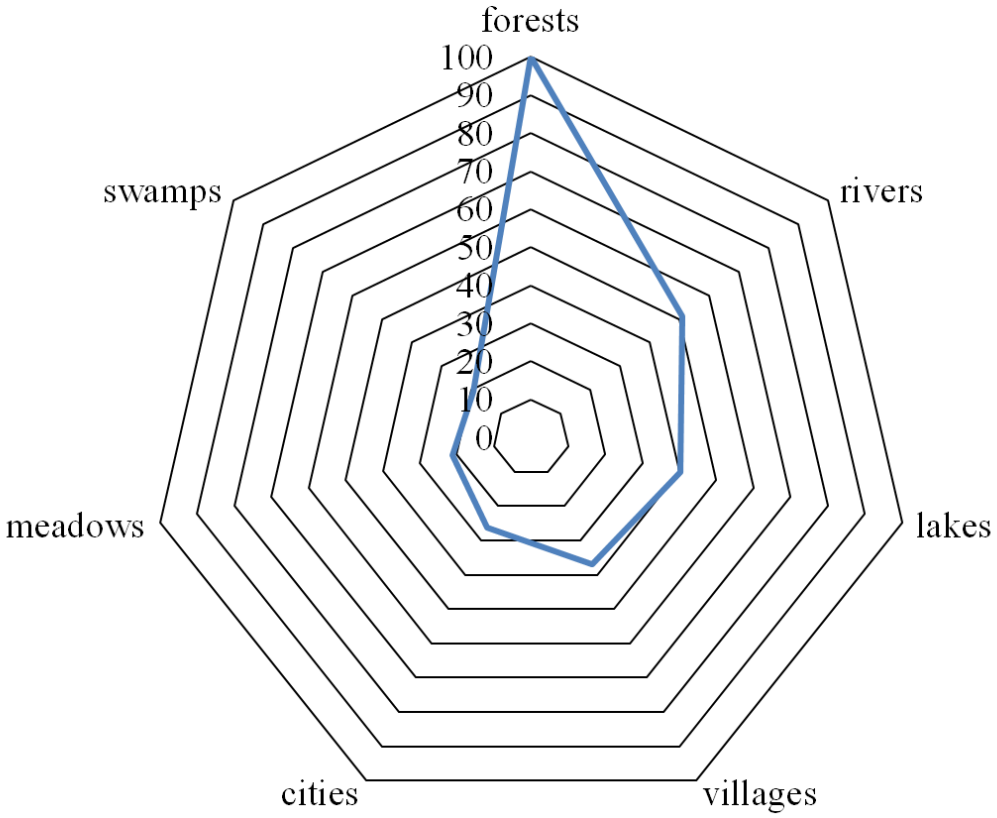

Fig. 1. Analysis of respondents' answers to the question "Where would you like to take a virtual excursion around the Vologda Region?"

human-modified territories (meadows, villages and cities). The text under each photograph is divided into several parts:

– names: artistic and biological, in Russian and Latin;

– location of subject, with reference to districts and settlements of the region;

– personal attitude to events, emotions when meeting with living subjects, the history of the creation of the picture;

– biological characteristics of organisms, life processes;

– ecological component: forms of the relationship of living organisms with each other and with the environment, adaptations to environmental factors, significance in the community and for humans;

– the relationship between man and nature, the need for rational use of natural resources, reduction of anthropogenic pressure.

The photo-albums in fact contain interactive biological and ecological excursions intended for a wide audience of readers who want to get acquainted with the diversity and beauty of nature in the Vologda Region.

Conclusions

For a long time (more than 10 years), the authors have been systematically involved in biological and environmental education and enlightenment of the population, using new forms of popularization of knowledge about living organisms. Thanks to photographs, the presentation of the material becomes more visual, imaginative, informative, capacious and emotionally colored. Photography is a cognitive tool, it helps to adapt material for people of different ages. As a type of visual content, it plays an important role in environmental education and popularization of the fauna of the Vologda Region. The work on popularizing information about living organisms, and monitoring feedback from the audience is of an ongoing nature and will be continued.

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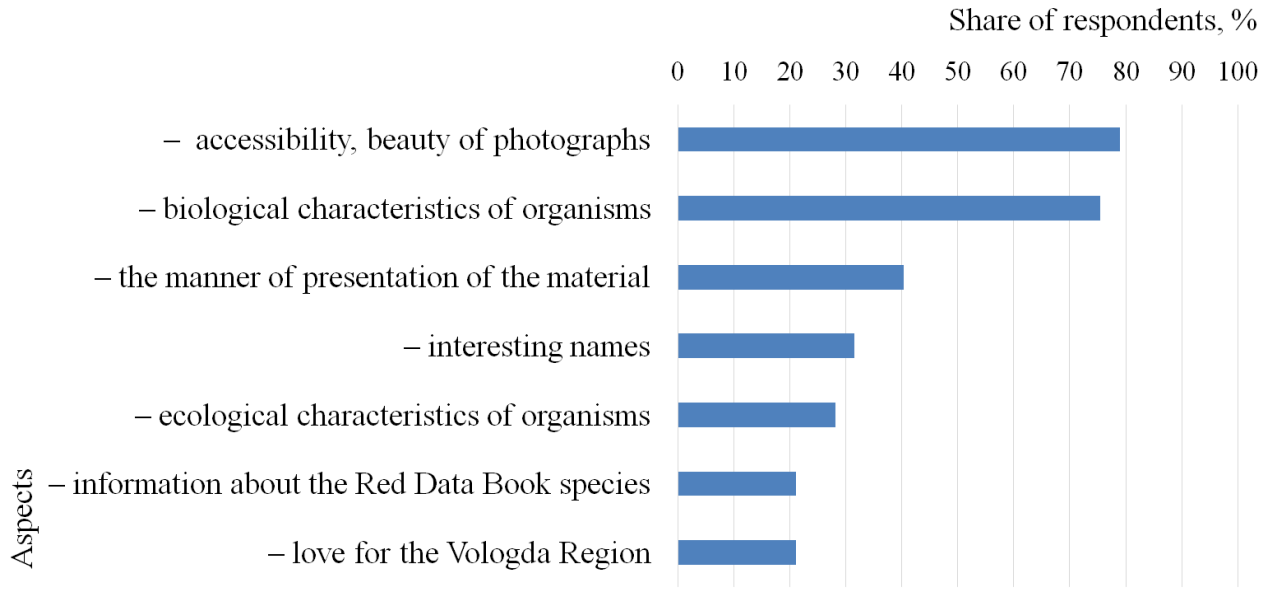

Fig. 2. Analysis of respondents' answers to the question "What did you enjoy of the lectures?"

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APPENDIX

Fig. S1. Common toad (*Bufo bufo* (L., 1758)). Vologda Region, Vozhegodsky District, 4 km NW of village of Nikitinskaya, green moss spruce forest. Photograph by N.S. Kolesova.

Fig. S2. Red wood ant (*Formica* sp.). Vologda Region, Vozhegodsky District, 5 km southeast of the village of Nikitinskaya, large-herb spruce forest. Photograph by O.M. Balukova.

Fig. S3. Common bumblebee (*Bombus lucorum* (L., 1761)), field scabious (*Knautia arvensis* (L.) J.M. Coult.). Vologda Region, Kadui District, 1 km S of the village of Zaozerye, continental meadow. Photograph by O.M. Balukova.

Fig. S4. Common bumblebee (*Bombus lucorum* (L., 1761)), yellow rattle (Rhinanthus minor L.). Vologda Region, Vozhegodsky District, 3 km SE of the village of Nikitinskaya, continental meadow. Photograph by N.S. Kolesova.

Fig. S5. Cep mushroom (*Boletus edulis* Bull., 1782). Vologda Region, Vozhegodsky District, 5 km SE of the village of Nikitinskaya, large-herb spruce forest. Photograph by N.S. Kolesova.