Short communication

ISSN 2658-3518
LIMNOLOGY FRESHWATER BIOLOGY
www.limnolfwbiol.com

Diatoms of the Aleutian Islands (Alaska, USA) in the Holocene

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ABSTRACT. Here presented a short overview of paleoreconstruction works started since 2018 for the Aleutian Islands region. Material is from four Aleutian Islands that represented by peat deposits and modern waterbodies samples are studied. Modern and fossil diatom communities of these islands are described, diatom analyses and paleoreconstructions are performed.

Keywords: the Aleutian Islands, Alaska, the Holocene, diatoms, paleoreconstruction, peat sediments

1. Introduction

Diatoms are well known to be a good and sensitive bioindicators. The valves of diatoms are well preserved in the bottom sediments of marine and continental waterbodies. These features of diatoms allow to apply the data on the species composition of bottom or peat sediments to reconstruction of the environmental conditions at certain points in time in the past and to reconstruct the changes in the intervals between them (Battarbee, 1984; Reid et al., 1995).

The region of Aleutian Ridge is a region with complex geological and climatic history and is of interest for different paleoreconstructions. Diatom flora of the Aleutian Islands, both modern and fossil, represented by fragmentary data for some waterbodies on particular islands. Despite the fact that the study of diatoms in mainland Alaska and some islands of the Aleutian Ridge dates back more than 100 years, in general, this group of algae is insufficiently studied in this region (Saunders, 1901; Patric and Freese, 1960; Foged, 1981; Hein, 1990; Bahls and Luna, 2018). A comprehensive study describing the species diversity of both the diatoms of modern waterbodies and the Holocene ones has not been conducted. This work, beginning since 2018 as a PhD thesis, is aimed to trace the dynamics of the diatom communities on the Aleutian Islands during the Holocene and to identify its relationship with local and global environmental changes in the region. The main objectives of this work are: to study the taxonomic composition of diatoms of modern waterbodies and Holocene peat deposits on several islands; to reconstruct developmental stages of five waterbodies on four islands in the Holocene using diatom analysis; to check the correlation in time of such changes and identify their relationship with local changes in paleoenvironments and global climatic changes in the region.

2. Material and methods

The Aleutian Islands (USA) are the archipelago in the North Pacific Ocean of volcanic origin, divided into 6 large groups of islands, which extend in an arc from the coast of the Alaska Peninsula (USA) to the base of the Kamchatka Peninsula (Russia) (Fig.).

Material from four different Aleutian Islands (Table) was used in this study. The material was collected by A.B. Savinetsky and his colleagues (A.N. Severtsov Institute of Ecology and Evolution RAS) in 1997-2018 on Adak, Carlisle, Shemya and Unalaska Island. For all peat sediments radiocarbon data has been obtained. Samples are prepared according to standard methods and studied by light and studied using light and scanning electron microscopic methods. Diatom analysis is performed for Shemya Island and Carlisle Island peat sediments.

3. Results and discussion

Total 253 samples from four different islands are analyzed (Table). Sixty four diatom taxa were identified from peat deposit McDonald point of Shamya Island. Results of this paleoreconstruction have been published by Neplyukhina et al. (2018a; 2021). In addition, a new diatom - *Pinnularia arkadii* was described from this peat deposit (Neplyukhina et al., 2018b).

Ninety diatom taxa were identified from peat deposit CR-03 of Carlisle Island, the paleoreconstruction

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Received: June 01, 2022; ***Accepted:*** August 01, 2022;
Available online: September 02, 2022

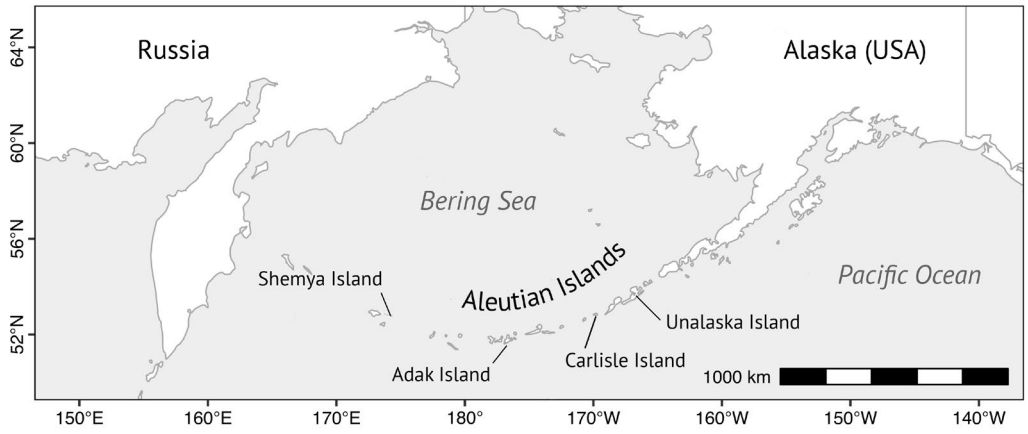

Fig. The map of Aleutian Islands and position of islands, where samples were collected.

was completed. The results of paleoreconstructions for Shemya and Carlisle Islands reveal the same patterns in history of two Holocene waterbodies. Three hundred nine diatom taxa were identified from modern waterbodies of Unalaska Island (Neplyukhina and Gololobova, 2021). Diatoms of two peat deposits of Unalaska Island and peat deposit of Adak Island are in the process of identification for diatom analysis and further paleoreconstructions.

4. Conclusion

The diatom communities of two Holocene waterbodies are described, their historical change is studied. Modern diatom flora of Unalaska Island is also described. Diatoms communities of three peat deposits are in the process of describing. Two of the five paleoreconstructions have been performed, the performance of the remaining ones will make it possible to build a comprehensive picture of the Holocene climate for this region.

Acknowledgements

The study is supported by RFBR grant № 20-34-90011.

Conflict of interest

The authors declare no conflict of interest.

References

Bahls L., Luna T. 2018. Diatoms from Wrangell-St. Elias National Park, Alaska, USA. PhytoKeys 113: 33-57. DOI: 10.3897/phytokeys.113.29456

Battarbee R.W. 1984. Diatom analysis and the acidification of lakes. Philosophical Transactions of the Royal Society of London. B, Biological Sciences 305(1124): 451-477.

Foged N. 1981. Diatoms in Alaska. Bibliotheca Phycologica 53.

Hein M.K. 1990. Flora of Adak Island, Alaska: Bacillariophyceae (Diatoms). Bibliotheca Diatomologica 21.

Neplyukhina A.A., Chudaev D.A., Krylovich O.A. et al. 2018a. Diatoms of the Peatbog ыediments from Shemya Island (Aleutian Islands, United States). Moscow University Biological Sciences Bulletin 73(2): 76-81. DOI: 10.3103/S0096392518020074

Neplyukhina A.A., Chudaev D.A., Gololobova M.A. 2018b. *Pinnularia arkadii* sp. nov., a new diatom (Naviculales, Bacillariophyceae) from Shemya Island, Alaska, USA. Novosti Sistematiki Nizshikh Rastenii [News of Systematics of Lower Plants] 52(1). DOI: 10.31111/nsnr/2018.52.1.83

Neplyukhina A.A., Tchabovsky A.V., Gololobova M.A. et al. 2021. The Holocene history of the diatom community in a small water body on Shemya Island (Aleutian Arc, USA): the influence of global and local environmental changes. Water 13(21): 3134. DOI: 10.3390/w13213134

Neplyukhina A., Gololobova M. 2021. Diatomovie vodorosli ostrova Unalashka (Aleutskie ostrova) [Diatoms of Unalaska Island (Alaska, USA)]. In: Materialy XVII mezhdunarodnoj nauchnoj konferencii "Diatomovie Vodorosli", pp. 262. (in Russian)

Patrick R., Freese L.R. 1960. Diatoms (Bacillariophyceae) from Northern Alaska. Proceedings of the Academy of Natural Sciences of Philadelphia 112: 129-293. DOI: 10.2307/4064585

Table. Information about samples and taxa number from different Aleutian Islands.

Island name	Samples localities	Number of samples	Taxa number	Commentary
Shemya Island	McDonald Point peat deposit	76	64	*Pinnularia arkadii* described
Carlisle Island	CR-03 peat deposit	70	90	
Adak Island	Adak'97 peat deposit	20	>89	
Unalaska Island	Modern waterbodies	12	309	
	Icy Creek peat deposit	21	>200	In the process of identification
	Iliuliuk peat deposit	54	>190	In the process of identification

Reid M.A., Tibby J.C., Penny D. et al. 1995. The use of diatoms to assess past and present water quality. Australian Journal of Ecology 20(1): 57-64. DOI: 10.1111/j.1442-9993.1995.tb00522.x

Saunders D.A. 1901. Papers from the Harriman Alaska expedition. XXV. The algae. In: Proceedings of the Washington Academy of Sciences, Vol. 3. Washington: Washington Academy of Sciences, pp. 391-486.