



# The first data on the freshwater microcrustaceans of Shokalsky Island (Russian Arctic)

Anna Novichkova ‡, §

‡ Lomonosov Moscow State University, Moscow, Russia

§ A.N. Severtsov Institute of Ecology and Evolution, Moscow, Russia

Corresponding author: Anna Novichkova ([anna.hydro@gmail.com](mailto:anna.hydro@gmail.com))

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## Abstract

## Background

Information on freshwater invertebrates of the Russian Arctic is very scarce, especially concerning insular biota. The species composition of microcrustaceans (Cladocera, Copepoda) of many arctic islands is still unknown and have never been explored. Here we report the results of the first investigation of the zooplankton of the Shokalsky Island (YamaloNenets Autonomous Okrug, Russia).

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## New information

The new records reported here are novel for the region and significantly expand the knowledge of the high-latitude aquatic biota. We studied the species composition of

Cladocera and Copepoda of 21 freshwater habitats located on the southwestern part of Shokalsky Island. We found 15 species of microcrustaceans in total and all of them are reported for the first time here. Also, the obtained data expand the existing ranges of distribution of some species and report several new taxa for the whole YamaloNenets region of Russia.

## Keywords

Cladocera, Copepoda, microcrustaceans, freshwater, Russian Arctic, Shokalsky Island

## Introduction

Shokalsky Island is a small island in the Kara Sea located in the YamaloNenets Autonomous Okrug of Russia (Fig. 1). It is separated from the mainland by a narrow strait, which is only 59 metres in width. The island is a flat plain covered by tundra with a great number of rivers, small lakes and ponds (Il'yna et al. 1985). It belongs to the Gydan Nature Reserve, which includes a diverse terrain of northern Gydan Peninsula, preserving waterfowl nesting areas, polar bear, and walrus and is known as the northernmost nature reserve in Western Siberia (Nikiforov 1997). Due to its remoteness and very limited access to some territories, the level of scientific researches here is rather low and some of the aspects are under studied. Despite the long period of freshwater observations in the region, invertebrate fauna of all the peninsulas lying in the YamaloNenets Autonomous Okrug is known only fragmentarily (Sharapova and Abdullina 2004). According to the latest data, information on the zooplankton of the northern Yamal is very scarce, while the species inhabiting water bodies of Tazovsky and Gydan Peninsulas are known only from rare publications focused on large lakes and rivers (Popov 2012). The species composition of the microcrustaceans (Cladocera, Copepoda) of Shokalsky island has never been explored.

## Materials and methods

The samples were collected during a hydrobiological survey of the complex expedition of KUBZ (Moscow Zoo young biologist's coterie) in August, 2014. Microcrustaceans were collected from 21 freshwater habitats from southwestern part of Shokalsky Island, most of them were small thermokarst ponds with the depth of 0.5 - 1.5 m (Fig. 2). Environmental variables such as bottom sediment type (clay, silt, sand, detritus or thick mosses, measured in accordance with Wentworth Grade Scale (Ongley 1996)), average depth (mean value for the whole sampled area) and size (average length of diameters) of the water body were noted for each site (Table 1). The sampling was performed from the shore using a qualitative plankton net (type "Apstein", mesh size 50  $\mu\text{m}$ ). Upon collection, all samples were preserved in ethanol (96%). Species identification and enumeration was carried out primarily in Bogorov counting chambers; the total numbers of Cladocera and

Copepoda were recorded. Description of the distributional ranges of the species is also provided in the checklist: AT - Afrotropical, AU - Australasian, ANT - Antarctic, NA - Nearctic, NT - Neotropical, OL - Oriental, PA - Palaeartic, PAC - Pacific oceanic islands.



Figure 1.

Location of the Shokalsky Island on the map. Original map from: commons.wikimedia.org.

Table 1.

Locations and dates of sampling with notes on the water body type and substratum (bottom sediment).

Site No.	Date	Coordinates	Altitude	Water body type	Bottom Sediment	Average Size	Average Depth
1	03.08.2014	72.91667°N, 74.33418°E	7m	bayou pond	silt, mosses	5m x 13m	0.5m
2	03.08.2014	72.91928°N, 74.33338°E	2m	bayou pond	silt	5m x 10m	0.5m
3	03.08.2014	72.92120°N, 74.33328°E	-6m	bayou pond	silt	8m x 20m	0.3m
4	04.08.2014	72.91103°N, 74.39402°E	-1m	thermokarst pond	silt, detritus	6m x 10m	0.5m
5	04.08.2014	72.91523°N, 74.40652°E	7m	thermokarst pond	clay, sand	15m x 30m	1.5m

6	05.08.2014	72.94028°N, 74.33675°E	3m	thermocarst pond	mosses	1.5m x 15m	1.5m
7	05.08.2014	72.94101°N, 74.33377°E		boggy stream	mosses	1m x 1.5m	1.5m
8	06.08.2014	72.96975°N, 74.33328°E	-1m	thermocarst pond	clay, silt	5m x 10m	0.5m
9	07.08.2014	72.93123°N, 74.29818°E	3m	bayou pond	sand, mosses	3m x 5m	0.5m
10	07.08.2014	72.93850°N, 74.30105°E	0m	thermocarst pond	sand, mosses	2m x 5m	1.5m
11	10.08.2014	72.93318°N, 74.40840°E	-1m	thermocarst pond	silt, mosses	5m x 10m	1m
12	10.08.2014	72.93198°N, 74.29845°E	8m	thermocarst pond	sand, mosses	1.5m x 6m	0.5m
13	11.08.2014	72.93358°N, 74.29932°E	3m	thermocarst pond	mosses	2m x 2.5m	1m
14	12.08.2014	72.95233°N, 74.34007°E	3m	thermocarst pond	sand, mosses	2m x 10m	0.5m
15	12.08.2014	72.94750°N, 74.33728°E	9m	thermocarst pond	silt, mosses	1.5m x 2m	1.5m
16	13.08.2014	72.93787°N, 74.39213°E	1m	thermocarst pond	silt, mosses	5m x 20m	2m
17	13.08.2014	72.95078°N, 74.38572°E	0m	thermocarst pond	sand, silt	10m x 30m	2m
18	14.08.2014	72.93840°N, 74.42920°E		thermocarst pond	silt, mosses	5m x 20m	1m
19	15.08.2014	72.93803°N, 74.34598°E	-9m	thermocarst pond	silty sand, mosses	20m x 40m	1m
20	15.08.2014	72.94862°N, 74.46823°E	0m	thermocarst pond	clay	20m x 45m	1.5m
21	15.08.2014	72.98183°N, 74.51590°E	7m	lake	sand	450m x 550m	1.5m



Figure 2.

Location of the sampled stations in inner water bodies on the map of Shokalsky Island (Google Maps).

## List of species Cladocera and Copepoda recorded on Shokalsky Island

### Infraorder Cladocera Latreille, 1829

#### Family Chydoridae Dybowski et Grochowski, 1894

##### *Acroperus harpae* (Baird, 1834)

Notes: localities no. 1, 7. **Distribution:** AT, AU, NA, NT, OL, PA.

##### *Alona affinis* (O.F. Müller, 1776)

Notes: localities no. 1, 3, 5, 6, 7, 16, 21. **Distribution:** AT, AU, NA, NT, OL, PA.

##### *Alona quadrangularis* (Leydig, 1860)

Notes: locality no. 9. **Distribution:** AT, AU, NA, OL, PA.

##### *Chydorus sphaericus* (O.F. Müller, 1776)

Notes: localities no. 1-9, 11, 13, 16, 19, 20, 21. **Distribution:** AT, AU, NA, NT, OL, PAC, PA.

***Graptoleberis testudinaria* (Fischer, 1848)**

Notes: locality no. 17. **Distribution** (subsp. *testudinaria*): AT, AU, NA, NT, OL, PA.

**Family Euryceridae Kurz, 1875 sensu Dumont et Silva-Briano, 1998*****Eurycerus (Teretifrons) glacialis* Lilljeborg 1887**

Notes: localities no. 1, 21. **Distribution**: NA, PA.

**Family Daphniidae Straus, 1820*****Daphnia cf. pulex* Leydig, 1860**

Notes: localities no. 3, 5, 6, 7, 13, 19. **Distribution**: AT, NA, NT, PA.

***Scapholeberis mucronata* (O.F. Müller, 1776)**

Notes: localities no. 1, 6, 7. **Distribution**: NA, NT, PA.

***Simocephalus vetulus* (O.F. Müller, 1776)**

Notes: locality no. 1. **Distribution**: PA.

**Family Bosminidae Baird 1845 sensu Sars 1865*****Bosmina (Bosmina) longirostris* (O. F. Müller, 1785)**

Notes: localities no. 17, 18. **Distribution**: : AT, ANT, AU, NA, NT, OL, PAC, PA.

**Family Sididae Baird, 1850*****Latona setifera* (O.F. Müller, 1776)**

Notes: localities no. 21. **Distribution**: NA, PA.

**Family Polyphemidae Baird, 1845*****Polyphemus pediculus* (Linnaeus, 1761)**

Notes: localities no. 1-9, 13, 14, 20, 21. **Distribution**: NA, PA

## Subclass Copepoda Milne Edwards, 1840

### Order Cyclopoida Burmeister, 1834

#### Family Cyclopidae Rafinesque, 1815

##### *Cyclops vicinus* Uljanin, 1875

**Notes:** localities no. 1, 4, 18, 19.

### Order Calanoida Sars G.O., 1903

#### Family Diaptomidae Baird, 1850

##### *Diaptomus cf. castor* (Jurine, 1820)

**Notes:** locality no. 1. **Distribution:** PA (Europe (Austria, France...), Greenland, Northern Alaska (Colville River)).

##### *Leptodiaptomus angustilobius* (Sars G.O., 1898)

**Notes:** localities no. 1-9, 12, 13, 14, 18, 20, 21. **Distribution:** NA (Arctic and Subarctic Canada, to the Kuril Islands).

## Discussion

In total 15 species of microcrustaceans were identified, comprising 12 species in 12 genera of Cladocera, and three species in three genera of Copepoda. All of the taxa have not been previously documented on the island. Microcrustaceans were found in 90% of the studied sites. The number of species encountered in each water body varied from one to ten (Table 2). The most common species in the studied sites were *Leptodiaptomus angustilobius* (Sars, 1898), *Polyphemus pediculus* (Linnaeus, 1761) and *Chydorus cf. sphaericus* (Muller, 1776), they usually dominate in the communities and occurred in most of the investigated water bodies.

The distributional ranges of all the species are rather wide, none of them are restricted to the arctic area or more limited region. The areas of the species are noted in the Checklist according to the FADA Databases of Cladocera (Kotov et al. 2013) and Copepoda (Boxshall and Defaye 2009). The most important findings are *Latona setifera* (Muller, 1776), *Diaptomus cf. castor* (Jurine, 1820) and *Graptoleberis testudinaria* (Fischer, 1848). The first two species have never been found on the territory of Yamalo-Nenets Autonomous Okrug, and the third one was only known from waters of lower Ob' River (Semyonova et al.

2000). All of them occurred rarely in separate water bodies. For the species *L. setifera* this record is the northernmost finding ever (Korovchinsky 2004).

Table 2.

Main characteristics of microcrustacean communities in the observed water bodies.

Site No.	Dominant species (% of total abundance)	Subdominants (% of total abundance)	Total number of species
1	<i>Scapholeberis mucronata</i> (20%) + <i>Chydorus sphaericus</i> (19,2%)	<i>Simocephalus vetulus</i> (15,8%)	10
2	<i>Leptodiptomus angustilobius</i> (83,3%)	<i>Polyphemus pediculus</i> (12,5%)	3
3	<i>Polyphemus pediculus</i> (90,8%)	<i>Chydorus sphaericus</i> (6,5%)	5
4	<i>Leptodiptomus angustilobius</i> (99,7%)	-	4
5	<i>Leptodiptomus angustilobius</i> (97,9%)	-	5
6	<i>Leptodiptomus angustilobius</i> (70,4%)	<i>Chydorus sphaericus</i> (23,5%)	6
7	<i>Polyphemus pediculus</i> (62,1%)	<i>Chydorus sphaericus</i> (15,3%)	7
8	<i>Polyphemus pediculus</i> (57,1%)	<i>Chydorus sphaericus</i> (28,6%) + <i>Leptodiptomus angustilobius</i> (14,3%)	3
9	<i>Chydorus sphaericus</i> (51%)	<i>Polyphemus pediculus</i> (36%)	4
10	-	-	0
11	<i>Chydorus sphaericus</i> (100%)	-	1
12	<i>Leptodiptomus angustilobius</i> (100%)	-	1
13	<i>Leptodiptomus angustilobius</i> (86,2%)		4
14	<i>Polyphemus pediculus</i> (72,2%)		2
15	-	-	0
16	<i>Chydorus sphaericus</i> (95,7%)	<i>Alona affinis</i> (4,3%)	2
17	<i>Bosmina longirostris</i> (80%)	<i>Graptoleberis testudinaria</i> (20%)	2
18	<i>Leptodiptomus angustilobius</i> (66,7%)	<i>Cyclops vicinus</i> (25%)	4
19	<i>Chydorus sphaericus</i> (93,8%)	-	4
20	<i>Leptodiptomus angustilobius</i> (88,5%)	<i>Chydorus sphaericus</i> (8,8%)	3
21	<i>Polyphemus pediculus</i> (61,2%)	<i>Leptodiptomus angustilobius</i> (24,3%)	6



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