Freshwater Fauna of Invertebrates of the Northern Slopes of the Central Caucasus

S. K. Cherchesova[1,*], *M. I.* Shapovalov[2], *V. I.* Mamaev[1], *I. E.* Dzhioeva[1], and *A. V.* Yakimov[3]

[1]North-Ossetian State University named after K.L. Khetagurov, Vatutina str., 44-46, 362025, Vladikavkaz, Russia
[2]Adyghe State University, Pervomayskaya str., 208, 385000, Maykop, Russia
[3]Kabardino-Balkarian State University named after Kh.M. Berbekov, Chernyshevsky str., 173, 360004, Nalchik, Russia

Abstract. Data on the degree of knowledge on different groups of aquatic invertebrates on northern slopes of the Central Caucasus are given. It is shown that the best known groups are mayflies, stoneflies, odonates and caddisflies. Other groups have been studied to a much smaller degree. The estimated number of species in the study area is several hundreds. Secondary aquatic insect groups, such as those of the order Diptera, are the most speciose. Data on the degree of study of various groups of aquatic invertebrates on the northern slopes of the Central Caucasus are presented. It is shown that the most studied groups are mayflies, stoneflies, dragonflies and caddisflies. Other groups have been studied to a much lesser extent. The estimated number of species in the study area is several hundred. Minor groups of aquatic insects, such as the order Diptera, are more diverse.

1 Introduction

The Caucasus region is of special interest for the study of rheophilous hydrobiont communities. Studies performed in the Terek River basin (Central Caucasus), originally of applied nature, assessing the natural food supply of fishes in small agricultural waterbodies (Selegenenko, 1976), are now oriented also towards studying and conserving the biodiversity of aquatic ecosystems of the region. Several groups of hydrobionts have been revised to date, in particular the orders Trichoptera, Ephemeroptera, Plecoptera, Odonata, Heteroptera, Coleoptera and others [1 -4]

Four species of sponges and bryozoans, mostly confined to spring-fed brooks or oxbows, have been recorded in the region: Hyalinella minuta Toriumi, Spongia lacustris (L.), Eunapis flagilis (Leidy) (syn. Spongia flagilis Leidy) and Plumatella repens (L.).

Cnidarians are represented in the Caucasus by a small number of species [3]. The presence of only two cnidarian species in the region is reliably known: Hydra vulgaris Pall. and the freshwater jellyfish Craspedacusta sowerbii Lankester. The hydra is sometimes recorded in hydrobiological samples taken from macrophytes in lakes and ponds of the

*Corresponding author: cherchesova@yandex.ru

flatland part of the republic (Prokhladnensky and Maysky districts). We believe that it is common in standing waterbodies of the flatland part. The freshwater jellyfish was twice recorded in Mayskiye quarry lakes of Kabardino-Balkaria [4].

Only one turbellarian species has been found so far in waterbodies of the region: Dugesia gonocephala (Duges). In some places (near sources of brooks) their abundance is considerable, up to 1500 ind./m2.

The horsehair worm Gordius aquaticus Duj., a parasite of amphibiont insect larvae, is known to live in natural waterbodies of the region. It is rather often recorded in aquatic communities of rivers and brooks of the foothill zone (for instance, in Kabardino-Balkaria, environs of the Belaya Rechka and Germenchik villages). The latest records of these worms are from the Urvan River (2002), system of spring-fed brooks in foothills (2000–2005), Nalchik River (2006) and Kauridon River (Gornaya Saniba village, 2012). The main hosts of this parasite are the larvae of Tipulidae, Limoniidae, and other large dipterans. The horsehair worm has also been found in caddisfly larvae of the genus Hydropsyche.

2 Research Methodology

This study is based on materials of various hydrobiont groups collected in the Central Caucasus from the 1970s–1980s to the present time. The material was collected and processed according to standard hydrobiological methods (Rukovodstvo…, 1992). Quantitative samples of benthos were collected with a Sadovsky benthometre (Sadovsky, 1948) with a bottom coverage area of 0.05 m². This benthometre is convenient for using in shallow rapid watercourses [12].

The invertebrates were identified using appropriate reference books (Jacobson, 1927; Martynov, 1934; Zaitzev, 1953; Lepneva, 1964, 1966; Lukin, 1976; Kutikova, Starobogatov, 1977 and others), some of them modern [7-10] Aquatic animals and details of their morphology were drawn under an MBS-1 or Mikromed-1 dissecting microscope and Biolam microscope.

3 Results and Discussions

Several parasitic nematodes (including representatives of the genus Mermis) have been recorded as living in nonbiting midge larvae of the genera Chironomus (Terek River) and Orthocladius (upper reaches of glacier rivers) and in mayflies of the genus Baetis (Urvan River).

Parasites of fishes are the best studied roundworms in the region. Cystidicola farionis (Fischer) from the swimbladder of the trouts Salmo trutta fario and Salmo gairdneri, which live in foothill spring-fed brooks of Kabardino-Balkaria, and Raphidascaris acus (Bloch), collected in October 2003 in the body cavity and intestine of the Prussian carp from Lake Shakhdurey, are rather common or abundant among parasitic roundworms. Five species of acanthocephalans have also been found in fishes.

A total of 24 rotifer species have been recorded in waterbodies [5-8]. We have also recorded 12 other species of these free-living worms [8-12]: Filinia longiseta (Her.), Habrotrocha angusticollis Mur., Dissotrocha macrostyla Ehr., Platyias quadricornis (Ehr.), Keratella cochlearis Gosse, Keratella quadrata Muller, Brachionus plicatilis Mull., Brachionus quadridentatus Hermann, Brachionus angularis Plate, Brachionus diversicornis Daday, Brachionus calyciflorus amphiceros Ehrb., Polyarthra euryptera Wierzejski, Colurella gastracantha Hauer., Colurella obtusa (Gosse), Colurella uncinata (Mull.) (in lakes in the upper reaches of the Cherek Balkarsky River described as Colurella uncinata f. bicuspidata (Ehr.) (Tarnogradsky, 1923-1925), Lepadella patella (Mull.), Lepadella triptera

Ehr., Lepadella acuminata (Ehr.), Lecane luna (Mull.), Lecane stichaea Harr., Lecane ungulata (Gosse), Lecana nana (Murray), Lecana agilis (Bryce), Lecana quadridentata (Ehr.), Kabardino-Balkaria: Lecana pyriformis (Daday), Lecana hamata (Stokes), Lecana closterocerka (Shmarda), Lecana bulla (Gosse), Lecana subulata (Harr.), Lecana lunaris (Ehr.), Lecana hastata Mur. Trichocerca longiseta (Schrank), Trichocerca lata Jennings, Trichocerca weberi (Jennings), Testudinella patina (Hermann) and Asplanchna priodonta Gosse.

The fauna of aquatic oligochaetes was almost never studied until the 1990s. Kasymov (1972) in his monograph The Freshwater Fauna of the Caucasus recorded only one species, Nais communis Piquet., while the same author recorded 53 oligochaete species in the whole Caucasus Region (mostly the Transcaucasia).

Taxonomic analysis of the hydrobiological material from different waterbodies of the Central Caucasus has revealed the presence of 12 oligochaete species: Aelosoma hemprichi Ehr., Nais communis (Piguet.), Chaetgaster diaphanus (Gruith.) (predaceous oligochaete: fragments of the rotifer Brachionus sp. have been recorded in the intestine), Limnodrilus udekemianus Claparede, L. profundicola (Verril) (syn. L. helveticus), Tubifex tubifex (Muller), T. ignotus (Stolc.), Lumbicillus sp., Spirosperma velutinus (Grube) (syn. Peloscolex velutinus), Lumbriculus variegatus (Muller), Eiseniella tetraerda (Savigny) and Branchiobdella pentodonta Whitmann.

A total of 12 leech species have been recorded in natural and artificial waterbodies of the republic; 11 of them are new to Kabardino-Balkaria and one new to the Caucasus: Protoclepsis tessulata (Muller), Hemiclepsis marginata (Muller), Haementeria costata (Muller), Batracobdella paludosa (Carena), Boreobdella verrucata (Muller), Helobdella stagnalis (L.), Glossiphonia complantata (L.), Piscicola sp., Hirudo medicinalis L., Haemopis sanguisuga (L.), Herpobdella octoculata (L.), H. nigricollis (Brandes).

A total of 22 species of aquatic mollusks have been recorded as a result of processing our own material and summarizing published data; they represent six families: Lymnaeidae (1 genus, 5 species), Planorbidae (3 genera, 5 species), Fhysidae (2 genera, 3 species), Ancylidae (2 genera, 2 species), Valvatidae (1 genus, 1 species), Unionidae (2 genera, 2 species) and Pisidiidae (3 genera, 4 species). Ten species are known in republics of the Central Caucasus [15-16]. Lymnaea stagnalis L., Fhysa fontinalis (L.), Aplexa hypnorum (L.), Planorbis planorbis (L.), Anisus albus Mull, Anisus laevis Alder, Segmentina nitida Müller, Ancylus fluviatilis Müller, Acroloxus lacustris Muller and Pisidium casertanum Poli are known in Central Caucasus republics. (We have also revealed 12 more species of aquatic mollusks new to Kabardino-Balkaria.)

Lower crustaceans of the waterbodies of the Central Caucasus are extremely poorly known: of the 300 species and subspecies known in the Caucasus only 20 have been recorded. Most of them are recorded as new to Kabardino-Balkaria.

Brine shrimp (Artemia salina L.) is a hyperhaline species, recorded in salt waters of Lake Tambukan, Zolsky District, Republic of Kabardino-Balkaria [10-11]. It has not been recorded among our materials collected in this waterbody. In the recent years, it has become probably extinct as the lake has probably become fresher.

Tadpole shrimps (Apus cancriformis Schaff.) are represented by one female stored in the collection fund of the Museum of Living Nature, Kabardino-Balkar State University. This female was collected in a long standing pool within the town limits of Prokhladny. Judging by the available information, the appearance of the tadpole shrimp in this waterbody is a result of artificial release.

Taxonomic analysis of our own collections and processing of published data within the republic have revealed a total of 13 species of 9 genera, 7 families and two suborders of copepods Calanoida, Cyclopoida, Harpacticoida, Poecilostomatoida: Diaptomidae, Cyclopidae, Ergasilidae, Lernaeidae, Canthocamptidae, Cletodidae and Argulidae. The

checklist includes the following species: Diaptomus castor (Jurine), Arctodiaptomus (Rn.) salinus (Daday), Cyclops strennus (s. lat) (L.), Ergasilus sieboldi Nordmann, Sinergasilus major Mark., S. licne Gin., Lernaea elegans morpha ctenopharyngodontis Yin Wenyirg, L. cyprinacea L., L. quadrinucifera Yin Wenyirg, Maraenobiotus brucei (Richard), Cletocamptus retrogressus (Schman.), Argulus foliaceus (Linnaeus) and A. japonicus Thiele.

Of the 13 copepod species recorded, eight are parasites of fish and some other aquatic animals: amphibians (frogs and news) and reptiles (turtles).

All crawfish that live in Kabardino-Balkaria belong to the same species, Caspiastacus pachypus (Rathke). This species lives in estuaries of rivers that flow into the Black and Azov seas and the Caspian (Tsalolikhin, 1995) [20-21]. Our records are mainly confined to oxbows and ponds of the flatland part of Kabardino-Balkaria.

Taxonomic analysis of collections and processing of published data have revealed the presence of at least six species of six genera and two suborders: Arthropleona and Symphypleona. Only Podura aquatic (L.) has been recorded earlier in the Central Caucasus; Isotoma viridis Bourlet., Isotomurus palustris (Müller), and Deuterosminthurus novemlineatus (Tullberg) were recorded as possible in the North Caucasus. Proisotoma ripicola (Linnaniemi) and Sminthurides aquaticus (Bourlet) were altogether absent from the checklist of the Collembola of the North Caucasus [15-16].

The species list of adult odonates of the North Caucasus, including Kabardino-Balkaria and Stavropol krai, comprises 51 species [17-18]. The larval stages are known in Kabardino-Balkaria only in 12 such species [10].

The stoneflies and mayflies of the Northern slopes of the Central Caucasus have been well studied; the number of species reaches 48 [14].

The order Megaloptera is probably represented by several species. However, only Sialis lutaria L. is known with certainty. It has been found in quarry lakes of the Kabardino-Balkaria flatland (environs of Maysky city and Priblizhnyaya village). It is a common species. Adults fly from late May to June.

Analysis of materials on aquatic heteropterans from waterbodies of Kabardino-Balkaria and North Ossetia have revealed the presence of 32 species; one of them, Anisops sardeus sardeus Herrich-Schaeffer, is recorded for the first time in Russia. However, this group remains insufficiently studied [15-16].

A total of 126 species of water beetles have been recorded as a result of the studies performed in the Central Caucasus; they represent ten families: Dytiscidae – 51 species, Hydrophilidae – 26, Haliplidae – 8, Gyrinidae – 4, Noteridae – 2, Spercheidae – 1, Helophoridae – 8, Heteroceridae – 3, Elmidae – 3, Hydraenidae – 6 (Khatukhov et al., 2005; Shapovalov et al., 2012; Kornoukhova, Lvov, 2013 and others) [18-19].

A total of over 250 species of Diptera have been recorded in the hydrofauna: Tipula obscuriventris Strobl, T. lateralis Meigen, T. caesia Schummel, T. pierrei Tonnoir, T. montium Egger, Tipula sp., Hexatoma bicolor (Meigen), Hexatoma fuscipennis (Curtis), Dicranota bimaculata (Schummel), Dicranota sp., Elliptera sp., Orimarga sp., Dicranomia sp., Eloeophila sp., Scleroprocta sp., Molophilus sp., Erioptera sp., Blepharicera fasciata (Westwood), Liponeura decipiens Bezzii, Liponeura cinerascens Loew, Aspistomyia elegans Bigot, Tinearia sp., Psychoda sp., Berdeniella sp., Dixa frizzii (Contini), Dixa submaculata Edwards, Prosimulium pronevitshae Rubzov, Metacnephia nigra Macquart, Schoenbaueria subpussila (Rubzov), Montisimulium montium (Rubzov), Simulium variegatum Mg., S. monticola Friederichs, S. ornatum Rubzov, S. caucasicum Rubzov, Wilchelmia pseudequina Mg., Wilhelmia lineata Meigen, W. veltistshevi Rubzov, W. paraequina Puri, W. mediterranea Puri, W. equina L., Boreoheptagyia legeri (Goetghebuer), Diamesa insignipes Kieffer, Pagastia sp., Pseudodiamesa gr. branickii, Prodiamesa olivacea (Meigen), Hydrobaenis pilipes (Malloch), Eukiefferiella sp. 1. (mountain species),

Eukiefferiella sp. 2. (flatland species), Orthocladius rivicola Kieffer, O. rivulorum Kieffer, Crycotopus sp., Brilla flavifrons Johannsen, Brilla modesta Meigen, Tanytarsus sp., Micropsectra recurvata Goetghebuer, Cryptochironomus sp., Chironomus sp. (Ch. riparius), Endochironomus stackelbergi Goetghebuer, Polypedilum sp., Oxycera pardalina Meigen, Chrysopilus sp., Tabanus unifasciatus Loew, Tabanus cordiger Meigen, Tabanus autumnalis L., Tabanus sp., Atherix ibis (F.), Ibisia marginata F., Hemerodromia sp., Wiedemannia lamellata (Loew), Pteromicra sp., Hydromyia sp., Limnophora sp., Lispe sp., Spilogona sp.

4 Conclusions

Over 500 aquatic invertebrate species have been recorded to date in small rivers and spring-fed brooks. A substantial proportion of these species is represented by subadults or adults of secondarily aquatic insects: stoneflies, odonates, mayflies, aquatic true bugs, water beetles and dipterans. Over 50% of all species diversity belongs to the order Diptera.

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