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Preliminary investigation on Cladocera and Copepoda in summer and autumn in Baiyangdian Lake, China

Tiefeng Cui¹, Zizhu Li¹, Chenyan Liao¹, Zhihan Cao^{1, 2}, Xiaoqiong Sun¹, Tongtong Cui¹, Hongchang Li¹, Haichao Li¹, Hongwei Wang^{1,3,*}

¹College of Life Sciences, Hebei University, Baoding, China

²College of ocean, Shandong University (Weihai Campus), Weihai, China

³ Department of Zoology, University of Otago, PO Box 56, Dunedin, New Zealand

*Corresponding author E-mail: whw66@hbu.edu.cn

Abstract. In July and October of 2018, a survey of plankton resources was conducted in Baiyangdian Lake. There were 8 species of cladocerans and 5 species of copepods were identified. The water quality and aquatic resources of Baiyangdian Lake were preliminarily grasped, and some advice was given on how to protect aquatic living resources and water ecological environment in Baiyangdian Lake.

Keywords: Baiyangdian Lake, Cockroach, Copepods, Investigation

1. I ntroduction

With the increacing interest in studing Cladocera and Copepoda in Chinese freshwaters, there is a needed to update our knowledge on its taxonomy and distribution in some important areas, such as Baiyangdian Lake. Because of the continued deterioration of water quality and increase urbanization in many areas of Philippine, Dela Paz's research gives an updated list of freshwater microcrustaceans and their distribution in Metropolitan Manila. In their studies, 3 cyclopoid copepods are new records for Metropolitan Manila [1]. Garibian made inventory of the Cladocera and Copepoda fauna of the Lake Bolon basin, the southern portion of Russian Far East, and evaluated the biogeographic status of microcrustaceans found there [2]. Sousa invastigated cladocerans collected in six water bodies from the Upper Xingu River Basin, Central Brazil, and describe a new and highly specialized genus of Chydoridae [3]. Dimante-Deimantovica's study presents data on presently existing and fecently arriving frsh and brackish water microcrustacean species including Cladocera and Copepoda in Norwegian High Archtic-Svalbard archipelago. And their study increased the number of species by more than 20% there, and some of new species have never been found that far north [4]. Some of Cladocera and Copepoda may serve as indicators for the changes of nutrient levels. It is important to monitor freshwater biodiversity for their potential in determining aquitic ecosystem health and maintaining aquitic sanctuaries which serve as habitat for flora and fauna in rapid development of urban centers. Baiyangdian Lake is the largest lake in Hebei Province, China. The main body is located in the Xiong'an NewArea. It is themost typical shallow grassland lake and has a total watershed area of 366 square kilometers and a total drainage area of 31,199 square kilometers. In this study, the species of Cladocera

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and Copepoda in Baiyangdian Lake have been identified and water quality and aquatic resources of Baiyangdian Lake have been estimated.

2. Materials and Methods

2.1. Investigation time and scope

Water quality and zooplankton investigations were conducted in Baiyangdian Lake in July and October 2018. According to the layout of the national controlling sites of the environmental department, combined with the current status of Baiyangdian water environment, taking into account the water inlet, outlet (upstream and downstream), the layout of the village and industry (tourism, farming), the focus is on the investigation of the areas more than 100mu. There are a total of 26 Sites, as follows: Pingyangdian, Panyudian, Julongdian, Shihoudian, Qiantang, Houtang, Lianhuadian, Guangdian Zhangzhuang, Longwangdian, Laowangdian, Damaidian, Xiaomaidian, Chiyudian, Wanloudian, Badadian, Maidian, Shaochedian (2 points), Dayajuan, Yangjiaodian, Yudingdian, Wanggangdian, Dayangdian (Nan Liuzhuang), Dabaiyangdian (2), Julongdian (Caiputai), Jinlongdian, Wangjiazhai, Mapengdian. As shown in Figure 1 below.



Figure 1. The sample sites in Baiyangdian Lake

2.2. Investigation Methods

2.2.1. Phytoplankton quantitative sample collection. Use a 5 liter plexiglass water collector to collect 10 liters of water sample at a distance of 50 cm from the surface water sample and 50 cm from the bottom water sample. After filtering with a No. 13 plankton net, the water samples was collected into the numbered sample bottles and 75% ethanol was used to seal and store [1].

2.2.2. Qualitative sample collection of zooplankton. The zooplankton net (No. 13) is tied with a rope on the bamboo pole, and the steel head opening is closed. The zooplankton net is dragged by 20-50 cm under the water surface, and the net is slowly lifted after 3-5 minutes. The water samples are placed in a sampling bottle and sealed with 3%-4% formaldehyde [5].

3. Result

3.1. Quantitative analysis of zooplankton.

In July and October of 2018, the number of cladocerans in 26 samples of Baiyangdian Lake was sampled and investigated. As shown in Figure 2 below:



Figure 2. Quantitative analysis of the cockroach in July and October of Baiyangdian Lake.

In July and October of 2018, the number of copepods in 26 samples of Baiyangdian Lake was sampled and investigated. The result is shown in Figure 3.



Figure 3. Quantitative analysis of copepods in Baiyangdian in July and October

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3.2. Qualitative analysis of zooplankton

There were 8 species of Cladocera and 5 species of copepods in Baiyangdian Lake in July 2018.

3.2.1. A total of 1 orders, 3 families, 7 genera, 8 species of Cladocera. As shown in Table 1 below.

Table 1. Qualitative Analysis of the cockroach of Baiyangdian Lake in July

Latin name	Taxonomic status
Bosmina coregoni	Cladocera, Bosminidae, Bosmina
Alona rectanggula	Cladocera, Chydoridae, Aloninae, Alona
Chydorus ovalis	Cladocera, Chydoridae, Chydorinae, Chydorus
C. sphaericus	Cladocera, Chydoridae, Chydorinae, Chydorus
Pleuroxus aduncus	Cladocera, Chydoridae, Chydorinae, Pleuroxus
Daphnia pulex	Cladocera, Daphniidae, Daphnia
Simocephalusvetuloides sars	Cladocera, Daphniidae, Simocephalus
Moina micrura Kuurz	Cladocera, Daphniidae, Moina

3.2.2. A total of 2 orders, 2 families, 4 genera, 5 species in Copepod. As shown in Table 2 below.

Table 2. Qualitative A	Analysis of the c	opepods of Baiya	ngdian Lake i	n July, 2018
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Latin name	Taxonomic status
Cyclops vicinus	Copepoda, Cyclopoida, Cyclopidae, Cyclopinae, Cyclops
Mesocyclops leukarti	Copepoda, Cyclopoida, Cyclopidae, Cyclopinae, Mesocyclops
Microcyclops longiramus	Copepoda, Cyclopoida, Cyclopidae, Cyclopinae, Microcyclops
Eucyclops macruroides denticulatus	Copepoda, Cyclopoida, Cyclopidae, Eucyclopinae, Eucyclops
Mongolodiaptomus birulai	Copepoda, Calanoida Sars, Diaptomidae Sars, Mongolodiaptomus Kiefer

4. Discussion

There were 8 species of cladocerans and 5 species copepods investigated in Baiyangdian Lake in July 2018. The species are less but the number is large. Baiyangdian Lake is the only natural freshwater lake in North China, and is known as the "Pearl of North China". The Baiyangdian District is rich in resources, the place where people often say "days to fight gold", and it also has certain functions of preventing floods and stagnation and regulating microclimate. However, since the 1970s, the urban industry in the upper reaches of Baiyangdian Lake has developed rapidly. A large amount of industrial sewage has been discharged into Baiyangdian Lake, and the amount of water entering the river has decreased sharply with the change of climate, which has caused Baiyangdian Lake to be seriously polluted [6]. Coupled with the invasion of alien species and the eutrophication of water bodies, the ecological environment in the area is seriously damaged and the biological richness is drastically reduced. Moreover, excessive application of pesticides, chemical fertilizers and agricultural film of agricultural production in Baiyangdian District has increased the yield of crops to a certain extent, but directly led to the decline of soil fertility, and the water quality has been polluted to a certain extent [7].

The governance can refer to the following methods: First, strict control of upstream pollution emissions. Eliminate backward production capacity, ban the closure of heavy polluting enterprises such as the industry of paper making, printing and dyeing; build sewage treatment plants to strictly control sewage discharge. Second, vigorously rectify the illegal projects in the Dian District, speed up the implementation of sewage waste treatment projects, and collect and treat domestic sewage [8]. Third, reduce the density of farming and prevent eutrophication of water bodies. Fourth, create ecological demonstration towns, and create a conservation-oriented society [9].

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