

NEWS

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

SERIES OF BIOLOGICAL AND MEDICAL

ISSN 2224-5308

Volume 5, Number 311 (2015), 21 – 26

UDC 591.524.11

**DIAPTOMUS (CHAETODIAPTOMUS) MIRUS LILLJEBORG
IN GUERNE ET RICHARD, 1889 –
NEW SPECIES OF CALANOIDA (CRUSTACEA: COPEPODA)
IN FAUNA OF KAZAKHSTAN**

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Keywords: Copepoda, Calanoida, Chaetodiaptomus, Kazakhstan.

Abstract. Only one species of *Diaptomus* was previously known in Kazakhstan up until recently – *Diaptomus (Diaptomus) castor* (Jurine, 1820). A description of *Diaptomus (Chaetodiaptomus) mirus* Lilljeborg in Guerne et Richard, 1889, female and male, new species of Calanoida within the fauna of Kazakhstan, is outlined below. The new species inhabit low mineralized low-to-middle organically polluted waters, Class of Water Quality II-IV.

Introduction. *Diaptomus* originally comprised around 200 species of the order Calanoida. During the continued revisions, different genera of *Diaptomus* were singled out, such as *Eudiaptomus*, *Neurodiaptomus*, *Arctodiaptomus*, *Mixodiaptomus*, *Eodiaptomus*, and others. According to various sources, the world's fauna includes from 12 [1] to 60 species [2] of *Diaptomus*. All of them inhabit the Palearctic. The geographic range of the species extends from the tundra to the steppes and deserts. They mainly inhabit temporary water bodies and are much less common in the littoral areas of lakes. *D. glacialis* Lilljeborg, 1889 was found in large tundra lakes [3], *D. cyaneus* Gurney, 1909 – in mountain lakes of Africa [4].

Genus is divided into two subgenus – *Diaptomus* Westwood, 1836 and *Chaetodiaptomus* Stepanova, 1991. Males of *Diaptomus* subgenus have short internal setae and short distal process on the 2nd segment of exopodite on the left leg of 5th pair, unlike the males of *Chaetodiaptomus*, which have shorter setae and longer process.

Only one species of *Diaptomus* has been previously registered in Kazakhstan and neighboring countries – *D. (Diaptomus) castor* (Jurine) [1; 5-7]. The description of *Diaptomus (Chaetodiaptomus) mirus* Lilljeborg in Guerne et Richard expands our understanding of the diversity of fauna of Calanoida in Kazakhstan and Central Asia.

Materials and methods

Zooplankton samples were taken in the period from 30 May to 3 June 2010 in a small steppe water body called Aidarly, located 400 km to the west from Uralsk city, Western Kazakhstan (coordinates N 50°07'02.0 E 047°32'05.2). Samples were collected using Juday net with 12 cm diameter of the upper ring. The samples were fixed with 4% formalin. The samples were processed with standard methods [8].

For descriptions and photographs of the male and female species, Cannon 1000D camera and microscope Axiolab.A1 were used. When photographing at high magnification, the object was located in different planes, so it was impossible to achieve the same image clarity for all the details. Therefore, series of pictures were made with alternate focusing on individual components (spines, setae, rami, segment as a whole, etc.). Image processing (cleaning background, juxtaposition) was performed using the program Adobe Photoshop and Corel Draw.

We involved bio-indication results of accompanying zooplankton species in the pool community for ecological characteristics of new species habitat. Species-specific indices come from recent references [9-12]. Water chemistry was classified from ecological point of view according to Barinova et al [13].

Results

Description of the water body. Aidarly is an artificial body of water, formed by the clay dam with three sides that catch melt-water. It is rectangular in shape. The lake is 130 m in length, 60 m in width, 2.0-2.5 m in depth. The transparency of the water does not exceed 0.2 m. The soil is gray mud, clay. The banks are clay. Weediness of the surface of water is not more than 5-7%. The water body is used as a watering place for domestic animals. Mineralization of water during the study period was 0.25 g/dm³. High concentration of copper was found in the water – on average, 0.028 mg /dm³.

Description of *Diaptomus (Chaetodiaptomus) mirus* Lilljeborg in Guerne et Richard, 1889.

Female (Figure 1). Rostrum is small. Pediger 4 is with hair-like setae on its dorsal side, on the hunch-like distal part; pediger 5 is with small blades having two spines on each. Genital segment is rounded, with small hyaline spines; anal segment is elongated. Caudal rami on the back, inner and outer sides are thickly covered with hair-like setae. Antennules reach the end of cephalothorax; 10th segment of antennule is with 2 setae, which is uncharacteristic of other types of diaptomids except for *Diaptomus falsomirus*. Coxa of the fifth pair of legs is with a large spine on the outer distal corner. Basis is with small setae on its outer side. The 1st exopodite-segment in its lower third part has the spine sitting on the elevation. Endopodite is with two long setae, extended beyond the distal edge of the 1st segment.

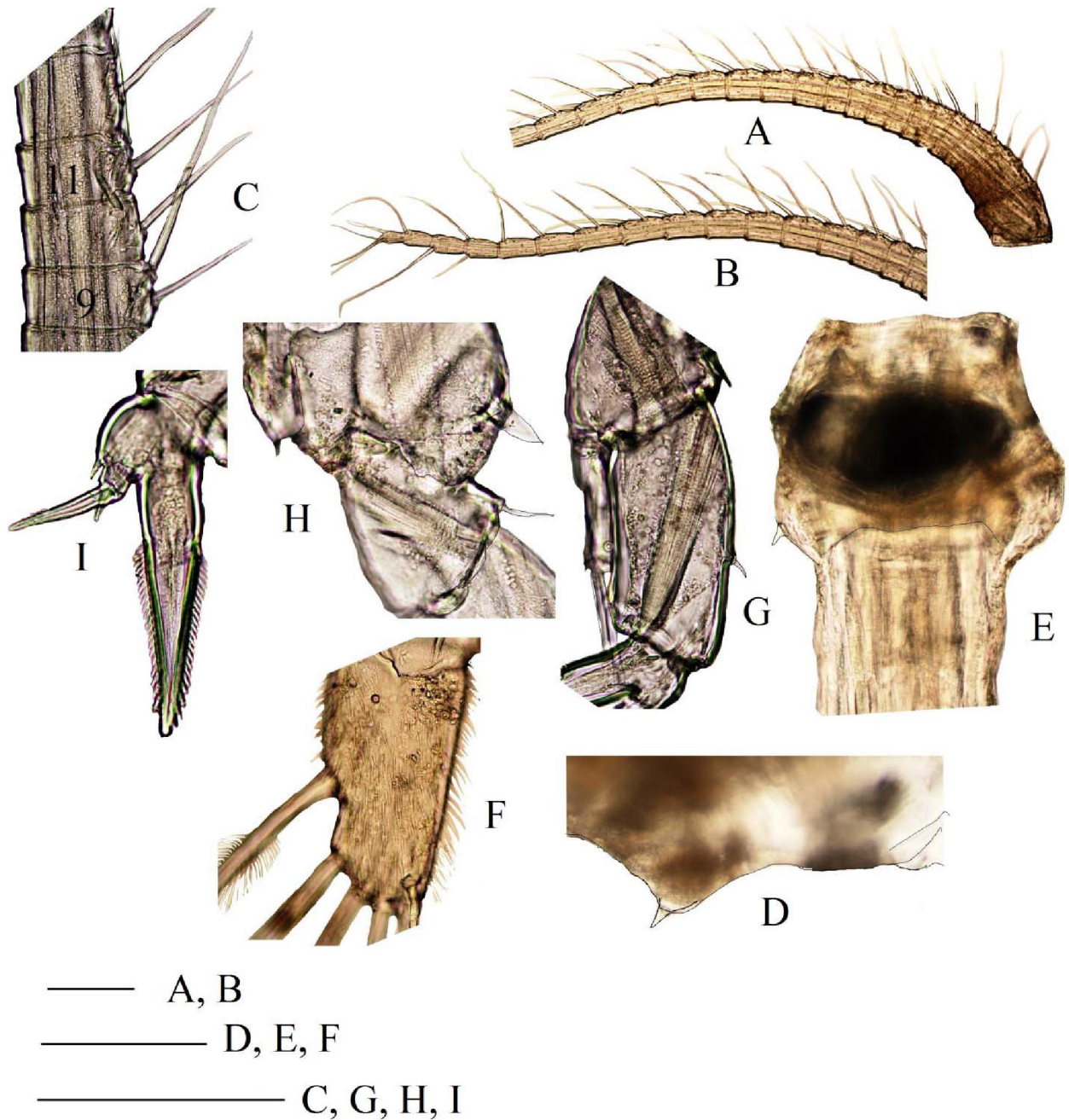
Male (Figure 2). Rostrum with processes, wide at the base. Pediger 5 with small sensory spines. Genital segment is moderately expanded. Caudal rami are like those of females, but without hair-like setae. Right antennule with spines on the 10th, 11th and 13th segments; processes of the 10th and 11th segments are long; processes of the 15th and 16th segments are reduced [14]; the third segment from the end has thin a hyaline membrane. 11th segment of the left antennule with 2 setae. The right leg of the fifth pair. The distal part of coxa with large process and hyaline spine; basis's length is about 1.5 times longer than the width; middle of the inner edge has an elongated, slightly rounded hyaline plate; near the inner distal angle is chitinous process. The outer distal corner of the 1st exopodite-segment is small; relatively short lateral spine of the 2nd segment is located distally from the middle of the outer edge. Endopodite is relatively short, slightly longer than the 1st exopodite-segment. The left leg of the fifth pair. Hyaline spine of coxa is small.

Basis with inner process. The 1st exopodite-segment on the inner edge has a roller of hair-like setae and a spine on the outer edge; inner seta of the 2nd segment is large, slightly arched, with armour on the inside, slightly longer than the fingerlike process. Endopodite is relatively long, vaguely two-segmented. The length of the females from Aidarly water body is 3.1-3.2 mm, for males it is 2.4-2.6 mm. According to the literature [1], body size of *Diaptomus (Chaetodiaptomus) mirus* is in the same range: 3.10-3.25 mm for females, and 2.75-2.85 mm for males.

Discussion. Individuals of *Diaptomus (Chaetodiaptomus) mirus* from Aidarly water body are no different from existing morphological descriptions of this species [1; 3; 15-18]. In comparison with species from other habitats, males from Aidarly water body have the lateral spine on the 2nd segment of the 5th pair of legs located less distally.

D.(Ch.) mirus is distributed in the vicinity of Ufa, Chelyabinsk region, Western and Eastern Siberia [1]. O.V. Dobrokhotova [19] mentioned the possibility of finding the species in the waters of Kazakhstan. Currently *Diaptomus (Chaetodiaptomus) mirus* has been found only in the above-mentioned steppe reservoir, located near the border between Kazakhstan and Russia.

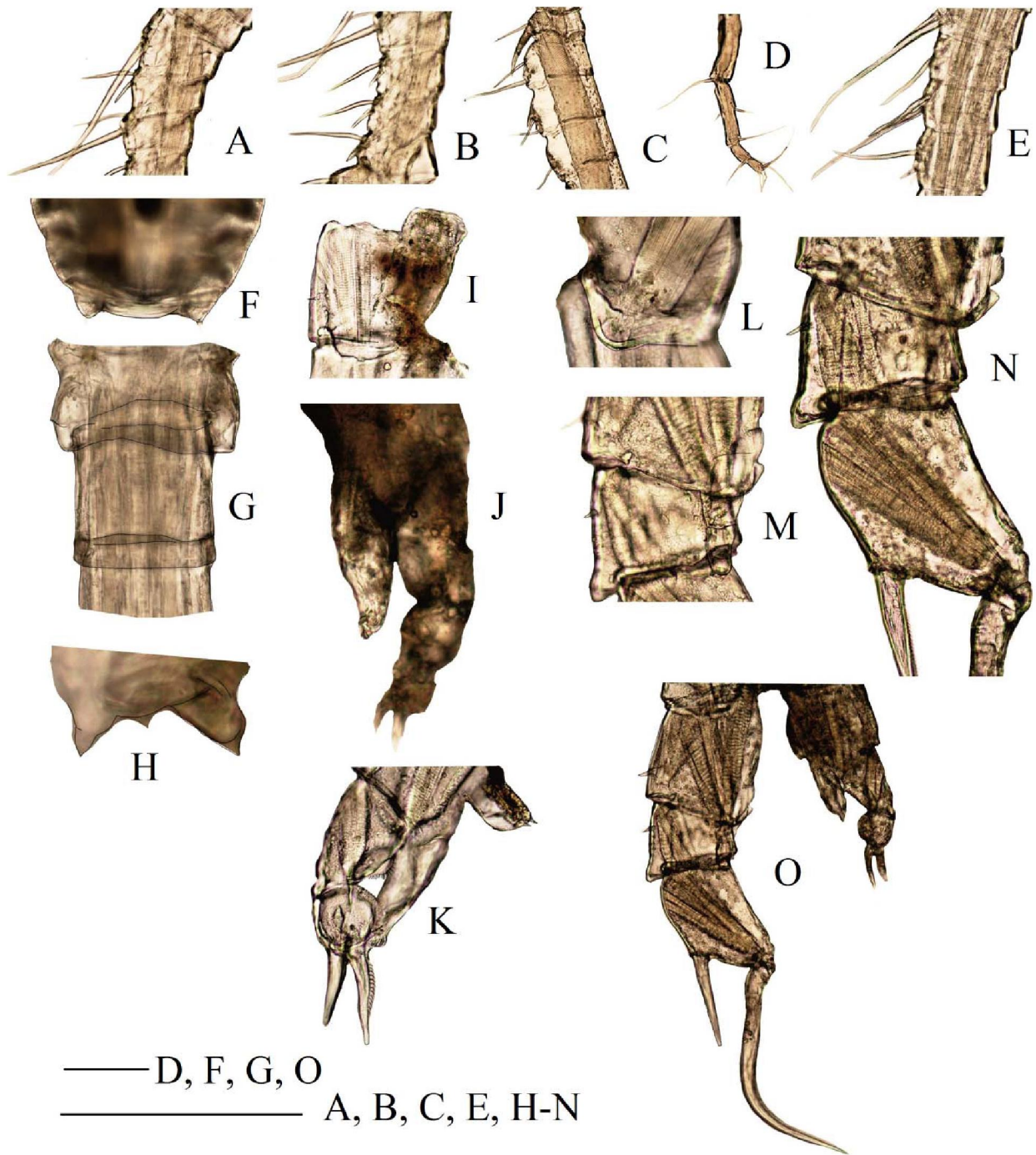
D.(Ch.) mirus is typical for small steppe water bodies, including temporary. In the estuaries of the Saratov region, it occurs together with bare Branchiopoda *Pristicephalus josephinae* Grube, 1853, *Chirocephalus horribilis* S. Smirnov, 1948, *Branchinecta orientalis* G.O. Sars, *Branchipus schaefferi* Fischer, 1834, and exists as spring monocyclic form [20-21]. In the context of increased lifespan of water body, the proportion of its male population drops from 86 to 65%. According to morphological and functional features of mouth parts that were studied by the above-mentioned author, *Diaptomus (Chaetodiaptomus) mirus* relates to the filterers-grabbers. Their main food is phytoplankton and zooplankton.



A. Spines of the pediger 4; B. 1-19th segments of the antennule; C. Distal end of the antennule; D. 8-12th segments of the antennule; E. Genital segment; F. Caudal rami; G. Coxa and basis of the 5th pair of legs; H. The 1st segment of the 5th pair of legs; I. Distal segment of the 5th pair of legs.

Scale bars: 100 μ m.

Figure 1 – *Diaptomus (Chaetodiaptomus) mirus* Lilljeborg in Guerne et Richard, 1889, female



A. 7-9th segments of right antennule; B. 9-12th segments of right antennule; C. 13-16th segments of right antennule; D. Distal end of right antennule; E. 9-12th segments of left antennule; F. Pediger 5 with wings; G. Genital segment; H. Rostrum; I. Coxa of the left leg of 5th pair; J. Left leg of the 5th pair; K. Distal part of the left leg of the 5th pair; L. Coxa of the right leg of the 5th pair; M. Coxa with endopodite and the 1st segment of the right leg of the 5th pair; N. Right leg of the 5th pair; O. 5th pair of legs.

Scale bars: 100 μ m.

Figure 2 – *Diaptomus (Chaetodiaptomus) mirus* Lilljeborg in Guerne et Richard, 1889, male

Ecological data for new species are minimal that because we try to characterize their environment by bio-indication methods which give an integral characteristic of habitat. Known data about water chemistry of the Aidarly pool [22] can be characterize the new species as surviving in low mineralized but with high TSS water, hydrocarbonate-calcium, with low salinity and low nutrients concentration, Class of Water quality I-II. In the pool was not recognized any pesticides. Heavy metals also stay in lower concentration except zinc (Class of Water Quality IV). Pool water was enriched also by ammonia (up to Class IV) as a result of grazing.

We used zooplankton community as indicators of the Aidarly pool environment. Invertebrate community is not so rich in species number and presented by 13 species, five from them are indicators of organic pollution. Species-specific Index of saprobity of the pool invertebrates' community [9-12] varied between 1.14 and 2.28 in the range of beta-alpha-mesosaprobic group. It characterizes the pool environment as moderate organically polluted, Class of Water Quality III-IV.

Conclusion. Including *Diaptomus (Chaetodiaptomus) mirus*, Kazakhstan's Calanoida comprises 37 species from 18 genera and 5 families. Kazakhstan's male *D. (Ch.) mirus* are characterized by less distal location of the lateral spine on the 2nd segment of the 5th pair of legs, compared to individuals from other habitats. The new species inhabit low mineralized low-to-middle organically polluted waters, Class of Water Quality II-IV.

Acknowledgements. The author expresses her gratitude to the head of the Laboratory of Hydrobiology of Kazakhstan, Agency of Applied Ecology (Almaty, Kazakhstan), D.A. Smirnova for the opportunity to photograph.

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**DIAPTOMUS (CHAETODIAPTOMUS) MIRUS LILLJEBORG IN GUERNE ET RICHARD, 1889 –
CALANOIDA (CRUSTACEA: COPEPODA) ҚАЗАҚСТАН ФАУНАСЫНДАҒЫ ЖАҢА ТҮР**

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Тірек сөздер: Copepoda, Calanoida, *Chaetodiaptomus*, Қазақстан.

Аннотация. Қазақстанда бұрын *Diaptomus* туысының жалғыз ғана түрі – *D.(Diaptomus) castor* (Jurine) белгілі болған. Қазақстан фаунасындағы Calanoida – жаңа түрі *Diaptomus (Chaetodiaptomus) mirus*-н, аталығы мен аналығына сипаттама берілген. Сипатталып отырған түр әлсіз минералданған, орташа және төмен деңгейдегі органикалық ластанған су сапасы II-IV кластағы суқоймаларда мекендейді.

**DIAPTOMUS (CHAETODIAPTOMUS) MIRUS LILLJEBORG IN GUERNE ET RICHARD, 1889 –
НОВЫЙ ВИД CALANOIDA (CRUSTACEA: COPEPODA) В ФАУНЕ КАЗАХСТАНА**

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Ключевые слова: Copepoda, Calanoida, *Chaetodiaptomus*, Казахстан.

Аннотация. В Казахстане ранее был известен единственный вид рода *Diaptomus* – *D.(Diaptomus) castor* (Jurine). Приводятся описание самок и самцов *Diaptomus (Chaetodiaptomus) mirus*, нового вида Calanoida для фауны Казахстана. Описываемый вид населяет мелкие слабо минерализованные водоемы с низким и умеренным уровнем органического загрязнения, класс качества вод II-IV.

Поступила 31.07.2015 г.