

DETECTION OF THE PARASITIC COPEPODS *LAMPROGLENA PULCHELLA* NORDMANN,
(1932) AND *LARNAEA CYPRINACEA* LINNAEUS, 1758 ON THE GILLS OF FISH FROM
YUGOSLAV WATERS

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*During studies on the parasitofauna of fish in Serbia (Yugoslavia) in the waters of the Sjenica-Pešter plateau (the region of Raška), i. e. in the Uvac river basin, a parasitic copepod *Lamproglena pulchella* has been identified on the gills of the fish species *Leuciscus cephalus*. This is the first finding of this copepod in the ichthyoparasitofauna of Yugoslavia (Čakić, 1992). In addition, *Larnaea cyprinacea* was also identified and the finding was compared with the data of other authors.*

*Key words: Freshwater fish, New parasitic species, Copepods, *Lamproglena pulchella*, *Larnaea cyprinacea**

INTRODUCTION

The studies on the ichthyoparasitofauna in the Uvac river basin situated at the Pešter-Sjenica plateau performed during the time period 1986-1989 included all fish species caught in these waters. A copepod *Lamproglena pulchella* was identified on the gills of *Leuciscus cephalus*. Later on (the time period 1992-1993), the studies were extended far north from the Sjenica-Pešter plateau to the plain waters of South Banat especially to the river Ponjavica transformed by damming to a channel. In this habitat, another parasitic copepod species, *Larnaea cyprinacea* has been identified on the gills of *Carassius auratus gibelio*. These findings prompted us to examine more closely the arthropods from the class of Crustacea and with this aim, morphometric characteristics and some biological properties of collected and preserved specimens were studied in detail. Based on the morphometric parameters of the copepods and employing the classification of Bihovska-Pavlovska et al. (1962) it was concluded that the copepods represent the species *Lamproglena pulchella* (family Dichelestidae) and *Larnaea cyprinacea* (copepod stage V, a female during metamorphosis) from the Larnaeidae family.

MATERIAL AND METHODS

During the time period October 1986 - May 1989, material for parasitological examinations of fish was collected from the Uvac river basin situated on the

Sjenica-Pešter plateau. For parasitological investigations 3.373 fish specimens (18 different species from 4 orders, 3 suborders, 5 families and 14 genera) were analyzed. Along the line of these studies, fish parasites in the river Ponjavica (South Banat) were also examined. Material was caught using a Honda electrofishing apparatus (220 V, 12 A). A part of the specimens caught was observed in the field. Another part was fixed in 4% formaldehyde solution and some specimens were transferred into aquaria maintained at 7°C. The fishes were thoroughly observed and during these examinations the copepods were found (adult *Lamproglena pulchella* females and a *Larnaea cyprinacea* female during the stage of metamorphosis). The parasites were stained using alanyl red and atebrine and the preparations were cleared using lactophenol. Stained and cleared copepods served to prepare semi-permanent microscopic preparations which were observed on an Olympus CO-1-CH microscope and classified using the keys of Bihovska-Pavlovska et al. (1962) and Bauer (1987). Drawings were done using an AB-apparatus.

RESULTS

The structure of the parasitic copepods described in the present paper is shown in detail in Figures 1-11.

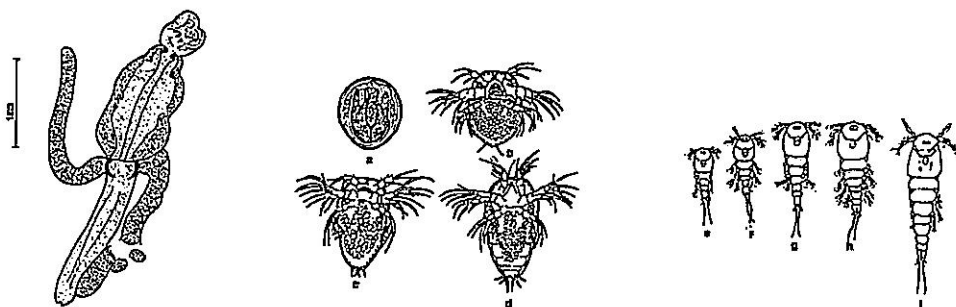


Figure 1. Individual of the parasitic copepod *Lamproglena pulchella*.

Figure 2. Development of naupliar and copepod stages of *Larnaea cyprinacea*. a. egg; b nauplius I; c. nauplius II; d. nauplius III; e. copepod I; f. copepod II; g. copepod III; h. copepod IV and i. copepod V (according to Grabda, 1963).

Lamproglena pulchella Nordmann, 1832. - Body length of the adult females ranges from 4-5 mm with a maximum body width of about 0.8 mm (Figure 1). The limits of body segments are clearly expressed. Body shape is cyclopoid or similar. During postlarval development metamorphosis does not occur. The head-pectoral part, clearly separated by a short neck, is larger than the following segments, but it usually does not exceed the width of 2-3 pectoral segments. The neck is formed of the pectoral segment of the first pair of legs and sometimes includes the second segment, as well. The pectoral part is tube-shaped and clearly divided into short and longer segments. Pectoral and ventral parts are also divided into

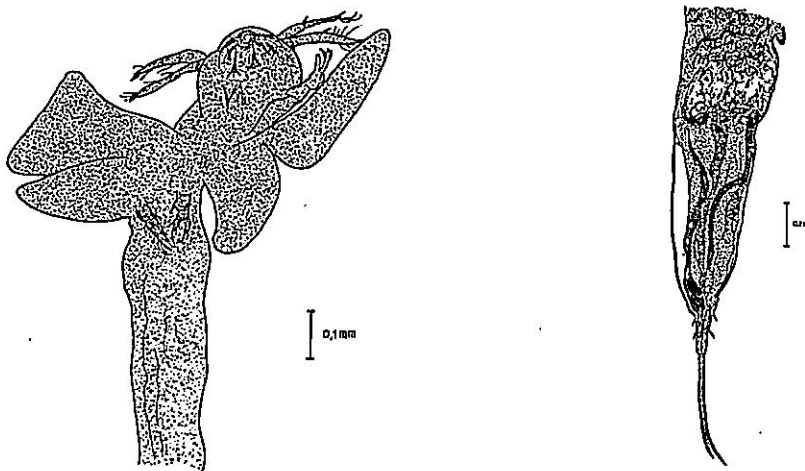


Figure 3. Frontal part of *L. pulchella* female during metamorphosis.

Figure 4. Rear part of *L. pulchella* female during metamorphosis.

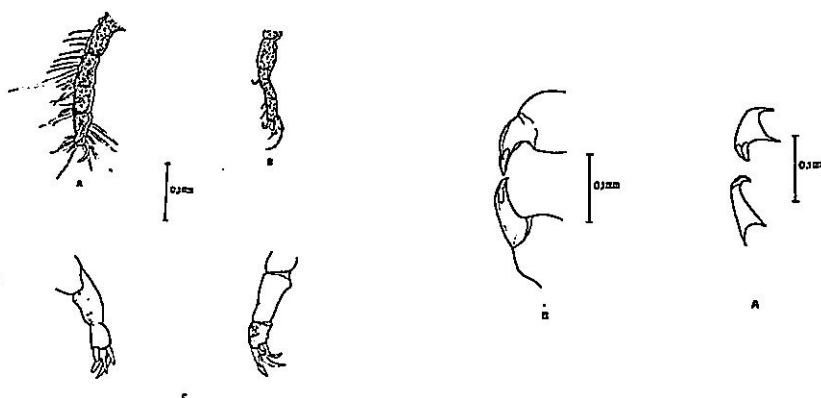
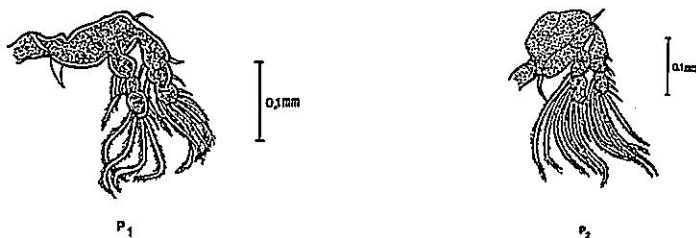
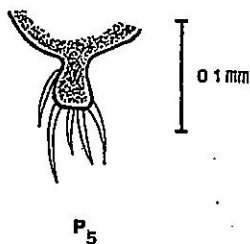


Figure 5. *L. pulchella* - A - antenna I, B - antenna II and C - mandible.

Figure 6. *L. pulchella* - A - maxillipeds I, B - maxillipeds II.

Figure 7. *L. pulchella* - P₁ - pectoral leg of the pair I of a female individual in the copepod stage.Figure 8. *L. pulchella* - P₁ - pectoral leg of the pair II of a female individual in the copepod stage.Figure 9. *L. pulchella* - P₁ - pectoral leg of the pair III of a female individual in the copepod stage.Figure 10. *L. pulchella* - P₁ - pectoral leg of the pair IV of a female individual in the copepod stage.Figure 11. *L. pulchella* - P₁ - pectoral leg of the pair V of a female individual in the copepod stage.

segments. The fourth segment is some 1.7 times wider than the ventral one. The 5th segment is usually shorter and narrower, sometimes joined together with the previous or sex segment. The sex segment, approximately as wide as the remaining ones, sometimes bears rudiments of the 6th pair of legs. The abdomen, usually consisting of 3-4 segments, is long, almost flat and its length corresponds to the length of the other parts of the body. Antennae I. usually longer than antennae II are not clearly segmented. Both the 1st and 2nd mandible and maxilla consisting of 2 segments have 1-5 small appendages at the end. Maxillipeds consist of 2 segments bearing 1-5 appendages at the end. The first 4 pairs of swimming legs are bifid, each consisting of two segments with bristles at the end. The fifth pair of legs is present either in the form of small outgrowths with bristles, or absent. In the males and females during the larval stage, rudiments of the 6th pair of legs are situated on the sex segment. The ovula in the follicles of the females are arranged in a row. The males which are free-living, resemble females in structure and dimensions but they perish after fertilization of the females during the late copepod stage.

The presence of *L. pulchella* can damage the gill apparatus of fish by injuring the gill interbranchial septa and feeding on blood cells. This copepod frequently moves from one to another gill septum leaving behind thickenings that prevent the circulation and blood supply, thus decreasing gill capacity, i. e. the exchange of oxygen with the surrounding. This leads to reduced viability of the fish organism. The injuries of the gill septa present suitable sports for secondary bacterial and viral, as well as fungal infestations. *L. pulchella* was found on the gills of *L. cephalus* and *Barbus meridionalis petenyi* during May and October, but the intensity of the infestation was always rather low. Out of 979 individuals of *L. cephalus*, 28 specimens, i. e. 2.9% were infested with this parasite. Among 538 *Barbus meridionalis petenyi* individuals examined throughout the present study, this parasitic copepod was found only on the gills of one specimen (0.002%) caught in October and at the moment we are considering it as a sporadic finding.

Larnea cyprinacea Linnaeus, 1758 (syn. *L. carassii* Tidd, 1933) represents an organism which has been largely transformed during evolution. Adult females occur as parasites on the skin and fins of fish. Findings and description of the females have been reported by numerous authors (Dogelj and Bihovski, 1939; Bauer, 1959, 1981, 1987; Šerbina, 1960; Bihovski-Pavlovski et. al., 1962; Osetrova, 1978). The complex development from the egg to sexual maturity of this parasite includes eight stages (Fig. 2) During the copepod stage V, sexual differentiation and copulation occur and after that, the males perish and the females undergo metamorphosis. The fifth stage of the females during metamorphosis, when they occur as parasites on fish gills was described so far only by Gradba (1963). This stage of the parasite *L. cyprinacea* was recorded on the gills of *C. auratus gibelio* in the present study (Figs 3-11). Due to the specificity of the finding, these results are only graphically presented. The first copepod stage is free-swimming, but there is the possibility for its attachment to a host, while this organism in copepod stages II-V represents a fish parasite. This copepod can undergo its complete life cycle on one host, but there are examples where it

changes its host which is possible only till the end of metamorphosis. In addition, all copepod stages are freeswimming. Young, adult females after molting in the copepod stage V can swim as shown in Figs. 7-11, before the metamorphosis stage, when they attach to a host and remain there till the end of their life cycle. This parasite is very sensitive to changes in water salinity and develops only in fresh waters.

DISCUSSION

According to the data of Bihovska-Pavlovska et al. (1962) and Bauer (1987), the copepod *Lamproglena pulchella* represents a fish parasite occurring on the gills of many cyprinid fish species, e. g. *Leuciscus idus*, *Rutilus rutilus*, *Scardinius erythrophthalmus*, *Aspius aspius*, *Alburnus alburnus*, *Chondrostoma nasus*, *Abramis brama*, *Cyprinus carpio*, *Alburnus alburnella* and *Leuciscus agassizi*, then in the fish of the genus *Barbus*, as well as of *Esox lucius* in the basins of the rivers joining the Black Sea, the Caspian Sea and the Aral Sea. The same authors reported that this parasite is widely distributed in some regions of western Europe. Kulakovska and Koval (1973) have found it in the river basin of the Danube on the gills of *Rutilus rutilus*, *Leuciscus cephalus*, *Barbus barbus*, *Chondrostoma nasus*, *Alburnus alburnus*, *Rhodeus sericeus amarus*, *Tinca tinca*, *Phoxinus phoxinus*, *Blicca bjoerkna* and *Aspius aspius*. Our finding of this parasite on the gills of *Leuciscus cephalus* and *Barbus meridionalis petenyi* from the Uvac on the Sjenica-Pešter plateau, represents the first finding of *Lamproglena pulchella* not only in Yugoslavia, but also in south-eastern Europe.

The copepod *Larnaea cyprinacea* inhabits the entire Holarctic and as a parasite it has been found on the skin of cyprinid fish. It is widely distributed on fish from the waters of England (Fryer, 1982). According to the data of Kulakovska (1972) this parasite was identified on the gills of *Carassius carassius* (in the Thais by the town of Segedin) and of *Esox lucius*, *Rutilus rutilus*, *Tinca tinca*, *Chondrostoma nasus*, *Gobio gobio*, *Rhodeus sericeus amarus*, *Cobitis taenia* and *Acerina cernua* (in the river basin of the Danube). Mann (1961) reported that this parasite which has been known for a long period of time, uses the following fish species as host: *Cyprinus carpio*, *Carassius carassius*, *Carassius auratus gibelio*, *Tinca tinca*, *Abramis brama*, *Rutilus rutilus*, *Phoxinus phoxinus* and other white fish species. The same author (Mann, 1961) observed a severe infestation of *Leuciscus idus* and *Abramis brama* with *L. cyprinacea*, while a relatively moderate infestation was recorded in *Rutilus rutilus*, *Blicca bjoerkna* and *Scardinius erythrophthalmus*. According to Bauer (1981) one-year-old individuals of *Carassius auratus gibelio*, *Cyprinus carpio*, *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix* and *Aristichthys nobilis* are much more susceptible to the infestation with *L. cyprinacea* than two-year-old fish. *L. cyprinacea* is widely distributed in Yugoslavia, especially in fish-ponds where it can cause great damage. Tomašec (1953) reported the presence of this parasite on the skin of cyprinid fish and *Anguilla anguilla*. Fijan (1982) found that this copepod attacks *Cyprinus carpio*, *Ctenopharyngodon idella* and other herbivorous fish species,

as well as *Carassius carassius*, *Tinca tinca* and *Esox lucius*. During our previous studies on the ichthyoparasitofauna in open waters, this parasitic copepod was identified on *Lepomis gibosus* (Cakić, 1986) and *Leuciscus cephalus* and *Phoxinus phoxinus* (Cakić, 1992). Based on our own results and the data from the available literature, the parasitic copepod *Lamproglana pulchella* usually occurs on fish inhabiting relatively cold, highland waters, while *Larnaea cyprinaea* undergoes its life cycle successfully in warmer, lowland waters. The finding of adult *L. pulchella* females, as well as of the females of *L. cyprinaea* during developmental stages which differ greatly from adult individuals, represents a contribution to knowledge about the ichthyoparasitofauna of Yugoslavia.

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NALAZI PARAZITSKIH KOPEPODA LAMPROGLEN A PULCHELLA (HORDMANN, 1832) AND LARNAEA CYPRINACEA (LINNAEUS, 1758) NA ŠKRGAMA RIBA U VODAMA JUGOSLAVIJE

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SADRŽAJ

U okviru istraživanja faune parazita riba Srbije i Jugoslavije u slivu reke Uvac na Sjeničko-peštorskoj visoravni (Raška oblast) na škrigama *Leuciscus cephalus* nalazili smo parazitske račiće koji pripadaju vrsti *Lamproglena pulchella*. Istu vrstu račića, pronašli smo i na škrigama, ali samo kod jednog primerka *Barbus meridionalis petenyi*. Ovi nalazi su prvi o prisutnosti ove parazitske kopepode na škrigama riba u vodama kako bivše tako i sadašnje Jugoslavije. Pored pomenutih visinskih voda proučavali smo i nizijske vode južnog Banata. Pregledom ribljeg materijala iz rečice Ponjovice, koja je zasipanjem pretvorena u kanal, na škrigama riblje vrste. *Carassius auratus gibelio* uočili smo prisutnost parazitskog V kopepoidnog stadijuma (ženka u fazi preobražaja) vrste *Larnaea cyprinaesa*. Ženke u fazi preobražaja do sada nisu nalažene u vodama Jugoslavije, a od adultnih ženki, koje parazitiraju na koži i perajima riba, u mnogome se razlikuju, što je ilustrovano slikama od 3 do 11.