

# Infestation of the Torrent Catfish (Siluriformes, Trichomycteridae) by an Exotic Crustacean (Copepoda, Lernaecidae) in Andean Mountains of Argentina

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## ABSTRACT

**Objective:** This study reports the presence of a copepod, affecting adults of the torrent catfish in a tributary of the San Juan River in the southern part of South America.

**Materials and methods:** The fish (48.1-54.1 mm standard length) were collected in Los Bretes, San Juan province, Argentina. They were anesthetized, fixed in formalin, preserved in ethanol and deposited in the Ichthyological Collection of the FACEN.

**Results:** Three torrent catfish (*Trichomycterus corduvensis*) examined were infested with nine copepod parasites (*Lernaea cyprinacea*), which were attached to the gill, urogenital opening, and base pectoral fin.

**Conclusion:** According to our results, this is the first record of parasitism of *Lernaea* on the torrent catfish (*T. corduvensis*) and a new locality from the Andean Mountains of Argentina.

**Keywords:** Anchor worm invasion, *Lernaea cyprinacea*, torrent catfish, *Trichomycterus corduvensis*, andes

## INTRODUCTION

*Lernaea cyprinacea* Linnaeus 1758 or anchor worm is a common parasite and appears almost all over the world in freshwater fish (1). *Lernaea* is an ectoparasitic copepod causing lernaeciosis in several species of fishes. In South America, the reports of lernaeciosis are scarce, and it should be remembered that there are thousands of native freshwater fish on this continent that have never been examined for parasites (2-5). Argentina is one of the most diverse countries in the world and little is known about the diversity of invertebrate species of ichthyoparasites of inland aquatic ecosystems (6). Lernaecids comprise of a family of Copepoda (100+ species) in which the small free-living adult females become parasitic after copulation, metamorphose, and grow to a relatively large size without molting (7). These ectoparasitic copepods are distributed naturally

in Africa, Central Asia, Southern of Siberia, and are reported in Europe, Japan, and Israel (7). In Argentina, the first record of lernaecid parasites infecting freshwater fish is from 1993, parasitizing *Odontesthes bonariensis* in Córdoba (4, 8). The torrent catfish *Trichomycterus corduvensis* is widely distributed in tropical South America and occurring in a remarkable variety of environments such as temporary streams, subterranean drainages in caves, high elevations, fossorial sandy setting, and warm thermal waters (9). *Trichomycterus corduvensis* feed on benthic aquatic macroinvertebrates, such as dipteran larvae, coleopterans, ephemeropterans, trichopterans, plecopterans, and crustaceans and it is distributed in the western part of Argentina, including thermal waters and high elevations (9, 10). Species of Trichomycteridae (Figure 1) have never been reported with infestation by lernaecids, being this study and the first report in San Juan province (Figures 2A-B).



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Figure 1. *Trichomycter corduvensis* widely distributed in Argentina.

**Table 1.** Specimens of *Trichomycter corduvensis* (FACEN 61) infested by *Lernaea cyprinacea*.

n=3 (in mm SL)	Parasites number and area
48.1	3 p (right) (Fig. 3B), 1 p (left), 2 g (right)
54.1	1 u (Fig. 3C)
48.1	2 g (left) (Fig. 3A)

Abbreviations: standard length (SL), gill (g), urogenital opening (u), pectoral-fin base (p).

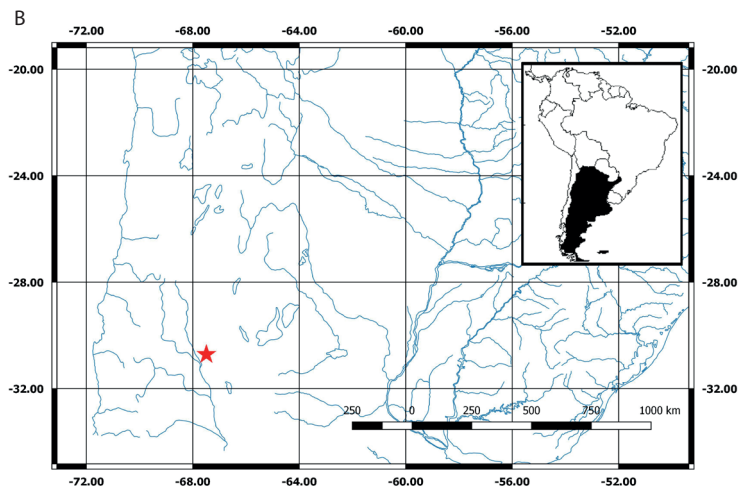


Figure 2. A. Map of *Lernaea cyprinacea* modified from Waicheim et al 2017. B. The new record (red asterisk) is at 1,011 m above sea level in Los Bretes, San Juan.

## MATERIAL AND METHODS

The fish were collected in San Juan province, Argentina (67°29'35"W, 30°42'54"S, at 1,011 m elevations) in December 2005 (Figure 2B). Specimens were kept alive and later anesthetized and killed with ice *in situ*. They were fixed in 10% formalin, preserved in 70% ethanol and deposited in the Ichthyological Collection of the Facultad Ciencias Exactas y Naturales, Universidad Nacional de Catamarca, Argentina (FACEN): FACEN 61, 3 specimens, 48.1-54.1 mm Standard Length (SL), Los Bretes, Departamento Valle Fértil, Provincia San Juan, Argenti-

na. The taxonomic identification was based on Gervasonii et al. (8), Moreno et al. (11), and Fuentes Parra (12).

## RESULTS AND DISCUSSION

Three torrent catfish showed severe physical damage by the adult parasites of *Lernaea cyprinacea*. They were found macroscopically on various parts of the host's body of *Trichomycterus corduvensis* (Figures 3A-C, Table 1). Nine parasites were attached in: the gill (4 parasites), urogenital aberture (1 parasite), and the base of the pectoral fin (4 parasites). Although *Lernaea cyprinacea* seem to

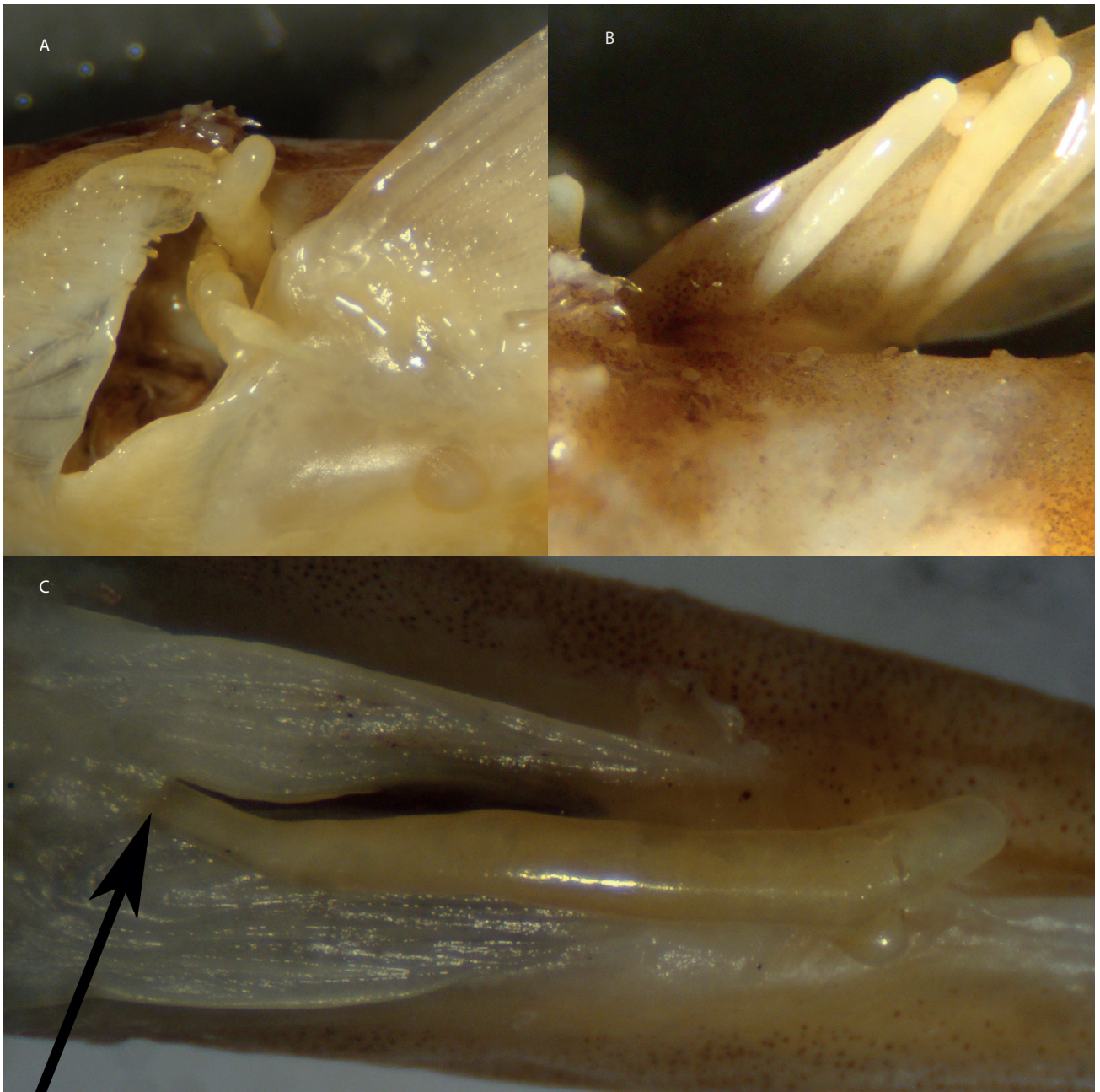


Figure 3. *Trichomycterus corduvensis* infected with *Lernaea cyprinacea*. FACEN 61: Argentina, Provincia de San Juan, Departamento Valle Fértil, Los Bretes, 48.1 mm SL: A. gill (2) and B. pectoral fin base (3); 54.1 mm SL: C. urogenital opening (1).

attach themselves to random parts of the host's body, Bulow et al. (13) and Stavrescu-Bedivan et al. (14) found that *L. cyprinacea* preferred sheltered areas on the fins and skin for attachment. One of the hypotheses proposed to explain this copepod attachment preference is that fins offer greater protection against currents and tissues at the base of the fins may be more easily penetrated (14-16). We agree with that (4 specimens) and we add the gill (4 specimens) and urogenital opening (Table 1 and Figures 3A-C) as sites of preference.

Paul et al. (5) and Gervasoni et al. (8) summarized in Tables 1 and 2 the localities of *L. cyprinacea* in Argentina (Buenos Aires, Corrientes, Córdoba, Mendoza, Río Negro, San Luis, La Rioja, and Santa Fé) and mentioned as hosts of fish species: Siluriformes: *Corydoras paleatus*, *Hypostomus* sp., *Rhamdia sapo*; Characiformes: *Astyanax bimaculatus*, *A. eigenmanniorum*, *A. hermosus*, *Astyanax* sp., *Bryconamericus iheringii*, *Cheirodon interruptus*, *Oligosarcus jenynsii*, *Prochilodus lineatus*, *Cyphocharax voga*; Cypriniformes: *Carassius auratus*, *Cyprinus carpio*, *Botia macracantha*; Atheriniformes: *Odontesthes bonariensis*; Cyprinodontiformes: *Jenynsia* sp., *Poecilia* sp., *Xiphophorus helleri*; Salmoniformes: *Oncorhynchus mykiss*; Perciformes: *Percichthys trucha*.

The life cycle of this parasite does not include an intermediate host and it has nine stages in its life cycle, including three free-living naupliar stages, five copepodites stages and one adult stage (12, 17, 18). After male and female adults mate on the fish host (23-24 °C temperature) after which males die (24 hs after), females metamorphose, insert their cephalic region with 4 lateral processes into the host tissue and then produce two conspicuous egg sacs (18-20). In the Los Brete de San Juan, *Cyprinus carpio* is absent and thus other fish species are spreading this copepod upstream.

According to Paul et al. (5), Piasecki et al. (21), the existence of the parasite and its pathogenic activity in very austral locality demonstrates an increase in temperature generated by contamination. Paul et al. (5) mentioned that the extreme conditions facilitate the proliferation of the parasites, such as concentration of salts by natural eutrophication or irrigation agriculture. Climatic changes could also increase significantly the geographical dissemination of *L. cyprinacea* in high altitude. *L. cyprinacea* has spread to different parts of the Argentina via movement of aquaculture, such as *Odontesthes bonariensis*. For example Soares et al. (18), Mancini et al. (22), and Bethular et al. (23) mentioned that the silverside (*O. bonariensis*) has been introduced into numerous freshwater environments in Argentina such as other countries (e.g. Japan, Italia, Perú, Bolivia, Uruguay and Chile). Whether accidental or deliberate, the introduction of exotic species is one of the major reasons for the loss of biological diversity, habitat alteration, and overexploitation of natural resources (8, 24-26). This opportunistic ectoparasite is extremely harmful and can be transmitted by water source causing infestation in the Andean basin where others endemic catfishes live (27-29). Parasitological studies are needed to determine the current status of *L. cyprinacea*, especially in the northwestern of Argentina. This new report demonstrates the absence of host specificity and the high adaptability to numerous

habitats of freshwater, including polluted streams or endorheic systems in high elevation. For this reason, the provincial and municipal commissions on the environment must promote strong policies directed to prevention of disease in protected areas and the conservation of Andean catfish endangered by exotic fish and its parasitic infestations.

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**Conflict of Interest:** The author has no conflict of interest to declare.

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