



Lernaea Cyprinacea Linnaeus, 1758 (Cyclopoida: Lernaeidae) in Grass Carp (*Ctenopharyngodon idella*) from a Commercial Fish Farm in the Rearing Ponds of Shushtar, Khuzestan Province

Alireza Golchin Manshadi^{1*}, Seyed Mohammad Reza Beladi², Mohammad Tarahomi¹

¹Department of Aquatic Animal Health, Faculty of Veterinary Medicine, Kazerun Branch, Islamic Azad University, Kazerun, Iran

²Graduated of Faculty of Veterinary Medicine, Kazerun Branch, Islamic Azad University, Kazerun, Iran

Received: 04/Jul/2023

Revised: 23/Aug/2023

Accepted: 15/Sep/2023

Abstract

Background and aim: *Lernaea cyprinacea* is an important ectoparasitic copepod, commonly known as an Anchor-worm. It is most likely native to Asia, including Iran, but has a wide global distribution including Europe, Africa, Australia, North and South America. It can infects more than 100 species of teleost fish and amphibians. This study was performed in order to survey on the incidence of *Lernaea cyprinacea* on the grass carp (*Ctenopharyngodon idella*), in the rearing ponds of Shushtar, in Khuzestan province.

Materials and Methods: Two hundred seventy five fish were captured from four ponds by fishing net and transferred to laboratory of veterinary medicine, Kazerun Branch of Islamic Azad University by containers of formaldehyde 10%. After identifying the *Lernaea cyprinacea* by key identification, biometric operations were performed on fishes.

Results: The results showed that from 275 fish, 63 fish were infected to *Lernaea cyprinacea* which formed 23 % of the captured fish. The statistical results base on Pearson correlation showed that there was no significant relationship between total length or weight and number of lesions on the body ($p>0.05$).

Conclusion: *Lernaea cyprinacea* infected the population of grass carp in Shushtar region of Khuzestan province. Due to the biological and economic damages, it is necessary to take appropriate actions to eradicate the parasite.

Keywords: *Lernaea cyprinacea*, Grass carp, Shushtar, Iran

Cite this article as: Alireza Golchin Manshadi, Mohammad Reza Beladi, Mohammad Tarahomi. *Lernaea cyprinacea* linnaeus, 1758 (Cyclopoida: Lernaeidae) in grass carp (*Ctenopharyngodon idella*) from a commercial fish farm in the rearing ponds of Shushtar, Khuzestan province. J Altern Vet Med. 2024; 7(20): 1161-1167.

* Corresponding Author

Department of Aquatic Animal Health, Faculty of Veterinary Medicine, Kazerun Branch, Islamic Azad University, Kazerun, Iran.

E-mail: golchinalireza@yahoo.com, Orcid: <https://orcid.org/0000-0002-2627-3491>



Introduction

The Lernaeidae family comprises crustacean parasites with global distribution among freshwater and marine fish. Approximately 110 species of Lernaeids have been divided into 14 genera (Ho, 1998). The genus *Lernaea* belongs to phylum of Arthropoda, Crustacean class, order of Copepoda and Lernaeidae family (Hoffman, 1967). The most common species of Lernaeids is *Lernaea cyprinacea* that has been transmitted to ornamental fish in several countries such as North America, Europe, Asia, South Africa, and East Australia (Ho, 1998). The economic importance of *Lernaea* is increasing because of the epidemic caused by the parasite in most ornamental fish breeding centers in different parts of the world (Kir, 2007). The parasite affects its host's health, decreases growth rate, and causes abnormal metabolic activity. Accumulation of these parasites in some parts of the body makes painful points and has harmful outcomes for the functioning and survival of the host (Klinger & Floyd, 1998). The adult female *L. cyprinacea* attaches to the skin of some parts of fish, including the head, back, stomach, and tail-related areas. However, they frequently accumulate in the fin (Adams, 1984). Certain species of *L. cyprinacea* aggregate around the eyes and cause the destruction of the eye lens, thereby resulting in blindness. Gill infection causes the localized hyperplasia of the mucosal epithelial tissue and also the stiffening of the proliferous mucosal tissue that may seriously disturb breathing and provide the ground for bacterial and viral infections (Jalali & Barzegar, 2006). *Lernaea* is not limited to a specific host; however, it belongs to a wide range of various species of fish, including the families of angelfish, cyprinidae, salmon, and catfish (Robinson & Avenant-Oldewage, 1996). The host's size is effective in determining the structure of this parasite. Among fish, the frequency and severity of *Lernaea* infection increase with the age and size of hosts. Older fish provide larger space for the parasite as they grow; consequently, the infection increases (Des Clers, 1991). Different species of *Lernaea* genus are currently among the most important freshwater parasites in Iran and the world, and by the expansion of intensive fish farming, their importance has become more noticeable, especially in temperate and tropical regions. At high temperatures between 25-30 °C, due to the shortening of the life cycle of the *Lernaea*, infection increases and can cause even death

in fish (Hoffman, 1967; Mokhayer, 1983; Jazebizadeh, 1995). The male of these parasites have a free life and only the female have a parasitic life. Temperature is the most important factor on the life cycle and pathogenicity of these parasites, so their life cycle cannot be completed at a temperature lower than 15°C. Forty species of this parasite have been identified and 32 species have been named. *L. cyprinacea* is the most important species of *Lernaea* genus and has a wide host of fishes, especially carp fish. Salmonidae is also infected with this parasite, although in salmon farms until 2013, this parasite was has not been observed, which is most likely related to the use of water with a temperature of 14 °C or less, especially spring water for breeding, and the only reported case was related to the population of breeding trout in floating cages in Hamon lagoon. (Jalali, 1998). For the first time in Iran, this parasite was reported by Mokhayer (1983) from common carp (Mokhayer, 1983), then, infection with this parasite has been reported in different parts of the Iran (Jalali, 1998; Abdi, 1995; Alishahi & Peighan, 1999). Jalali (1987) observed this parasite in Bream, Grass carp, Crucian carp and Common carp (Jalali, 1987). Jazebizadeh (1983) reports heavy infection of *L. elegans* in Zarivar Lake in Kurdistan province (Jazebizadeh, 1983). In a rare report by Alishahi and Peighan (1999), 1462 parasites were isolated from silver carp (Alishahi & Peighan, 1999). Since many native and exotic cyprinids, collected from the Kor River Basin (Kor River and Dorudzan Reservoir), Southwest of Iran in 2010 and 2011 were infected to *Lernaea* sp. (Sayyadzadeh et al., 2016). This study was performed in order to survey on the incidence of *Lernaea cyprinacea* on the grass carp (*Ctenopharyngodon idella*), in the rearing ponds of Shushtar, in Khuzestan province.

Materials and Methods

Sampling was done from fish farms in Shushtar city. They were near the Garge branch of the Karun River. Sampling from three farms and in the four geographical directions of the pools performed using a hand net (Mashk) and using a random cluster method (10 samples from each farm) by the weight of fish was above 150 grams. It was tried to make the number of throwing nets equal in each of the ponds of the farm. After sampling, 10% formalin was used in 20 liter barrels to fix the fish, and the barrels were

closed well and transferred to the laboratory of the Faculty of Veterinary Medicine, Islamic Azad University, Kazerun branch. In the parasitology laboratory, at first, some of parasites were isolated from the surface of fishes for microscopic identification, which were identified with parasite keys (Hoffman, 1967). Then the fishes were weighed with a digital scale and the total length and the number of lesions created by the parasite on the fish body were counted and the data were recorded in a table. Data analyses were done using SPSS Package, version 18 to determine mean abundance. Pearson's

correlation coefficient test was used to determine relationship between total length and weight with the number of *Lernaea* parasite.

Results

The results of the infection of grass carp to *Lernaea cyprinacea* showed that this fish is infected with *Lernaea cyprinacea* parasite. Out of a total of 275 fish, 63 fish were infected to *Lernaea* and 212 fish were not infected to it (22.9% of grass carp were infected and 77.1% were not infected).



Figure 1. Grass carp infected to *Lernaea cyprinacea*.

In order to show whether there is a relationship between the length and weight of the fish and the parasitic lesions, at first the mean of total length,

weight and the number of lesions were examined (Table 1).

Parameter	Fish(N)	Minimum	Maximum	Mean±(SD)
Total length	63	28	44	36.4±4.2
Weight	63	500	1020	1.4±0.73
Number of lesion	63	1	32	5.53±2.8

Table 1. Total Length, Weight and Number of lesions in infected grass carp to *Lernaea cyprinacea*. Statistical analysis based on Pearson's correlation coefficient test showed that there was no significant relationship between the total length of fish and the number of parasite's lesions (sig=0.667). Also, no significant relationship was found between weight and number of lesions (sig=0.916).

Discussion

Lernaeidae occupies a unique position owing to their extraordinary pathogenic effect and financial damages in fish farming. Specifically, the *L. cyprinacea* (Linnaeus, 1758) is the primary causative agent of lernaeosis in Indian Major carps and Chinese carps and turns the saleable fisheries

products nonsalable because it inflicts severe tegumentary lesions (Tavares-Dias & Martins, 2017). It is a highly adapted crustacean that penetrates the host's skin to form an extremely strong and damaging attachment. The adult females are usually attached to the surface of the such as observed in the present study (Gervasoni *et al.*, 2018). The *Lernaea* species

are cosmopolitan parasites of several freshwater fish species reported from all the countries famous for fish culture. However, their classification and identification are controversial due to morphological intraspecific variability and interspecific similarities (Hua et al., 2019). *Lernaea* has been reported in common carp from many parts of Iran (Jalali, 1998). There were many reports of this parasite in other regions of the world. Freshwater fishes of Iran are generally faced with *lernaea* all over the year, but severe infection of parasites along with losses can be seen only during the hot months of the year and this is because ecologically, the evolution of parasite life occurs at high temperatures. The spread of the disease in cold areas occurs only during the summer, but in hot areas, there is a possibility of dangerous epidemics throughout the year (Gutierrez-Galindo & Lacasa-Millan, 2005; Tasawar et al., 2007). Bilal et al. showed the highest prevalence occurred from December to January (Bilal et al., 2024). Besides, Iqbal et al. detected the highest incidence of the parasite till late winter (December to April) where the water temperature remained in the range of 13-23 °C and low parasite incidence during the summer (Iqbal et al., 2012). Ullah et al. reported heavy infestation during summer and low during winter (Ullah et al., 2018). In Iran, due to the fact that it is located in a temperate geographical latitude, the disease has been seen in a large part of it, especially in the south and the waters of the central plains, in spring, summer and autumn. Therefore, the most important factor that affects the life cycle of the parasite it is the temperature, so that their life cycle is not completed at temperatures below 15 °C. Metanaoplus do not metamorphose at temperatures below 8 °C, and it takes 100 days to complete the parasite cycle at 14-15 °C. In hot areas, up to ten generations of progeny can be done during the year (Jalali, 1998). Some researchers like Abbas et al. and Moghadam et al. presented that small-sized fishes have shown higher parasitic infection rates (Abbas et al., 2014; Moghadam et al., 2009). Still, others believed the infection rate increases with increasing fish body weight and length. Mirzaei cited that anchor worms readily infected the small fish (Mirzaei, 2015). Bilal et al. showed that the prevalence of *Lernaea* was more significant in younger fishes but decreased with the increase of body weight (Bilal et al., 2024).

The first report of parasite infection in Iran was done by Mokhayer in carp fish (Mokhayer, 1983). There were many other reports. Abdi in a study on the fishes of Mahabad dam lake isolated this parasite from *Capoeta capoeta* and grass carp (Abdi, 1995). Fadaei Fard et al. also reported this parasite from *Capoeta capoeta*. The disease enters the breeding centers of the country in a latent form during the stocking of water resources and causes a lot of spread and casualties (Fadaei Fard et al., 2001). The most important report in this case is related to Jazebizadeh in Zarivar lake of Kurdistan province, the intensity of pollution in this lake was such that the caught fish were found unsellable (Jazebizadeh, 1983). *Lernaea* sp. was also collected and identified from nostrils, fins, gills, operculum, eye, lips and body of *Capoeta saadii*, *Capoeta aculeata*, *Alburnus mossulensis* (all native cyprinids), *Carassius auratus* and *Cyprinus carpio* (exotic cyprinids) collected from the Kor River Basin (Kor River and Dorudzan Reservoir), Southwest of Iran in 2010 and 2011 (Sayyadzadeh et al., 2016). Although the most infections are seen in Khuzestan, due to having the right temperature all year round, there is a possibility of breeding parasites in it. Among these infections, report of Moghinemi can be mentioned (Moghinemi, 1995). In another study conducted by Alishahi and Peighan, a severe and rare infection with the *L. cyprinaceae* was reported in a carp, and 1462 parasites were counted in different parts of the fish's body (Alishahi & Peighan, 1999). In the present study, which was conducted on grass carp, out of 257 fish caught, 63 fish were infected with *Lernaea*, which is 22.9% of the total fish caught. In this research, there was no relationship between the number of parasites and the length and weight of the fish. Ananda Raja et al. proved that the emamectin benzoate (EMB) was 100% effective after 10th day of treatment against a crustacean parasite, *Lernaea* sp. in Asian Seabass juvenile (Ananda Raja et al., 2023). EMB treatment was not attributed to any fish mortalities and/or adverse reactions since the control group was also fed with EMB treated feed (Ananda Raja et al., 2020) which can be scientifically recommended with 100% efficacy and safety to use against lernaecosis in the aquaculture ponds.

Conclusion

In ntcurre study *L. cyprinacea* was record in a natural population of Grass carp (*C. idella*) from

Shushtar, Khuzestan province. The parasitic prevalence was categorized as 23%. Generally, prevention and transmission control of these parasites is difficult and requires good management and efficient approaches. Control strategies should include training of traders and farmers in order to monitor the health condition of imported and weed fish.

Conflict of interest

There is no conflict of interest between the authors.

References

- Abbas F., Ashraf M. and Rehman, MH. *Lernaea* susceptibility, infestation and its treatment in indigenous major and exotic Chinese carps under polyculture system. Pak J Zool, 2014; 46(5): 1215-1222.
- Abdi K. Identification and investigation of crustacean parasites and leeches of fishes of Mahabad Lake. Thesis of D.V.M. Urmia Azad University, 1995; 219: 11-43.
- Adams AM. Infestation of *Fundulus kansae* (Garman) (Pisces: Cyprinodontidae) by the Copepod *Lernaea cyprinacea* Linnaeus, 1758, in the South Platte River. Am Midl Nat, 1984; 131-137.
- Alishahi M. and Peighan RA. Report of severe and rare infection with *Lernaea cyprinaceae* in a carp fish. Irani Vet J, 1999; 4: 122-128.
- Ananda Raja R., Patil PK., Avunje S., Aravind RP., Alavandi SV., Vijayan KK. Biosafety, withdrawal and efficacy of anti-parasitic drug emamectin benzoate in Asian Seabass (*Lates calcarifer*). Aquaculture, 2020; 525: 735335.
- Ananda Raja R., Patil PK., Avunje S., Kumaran M., Anand P., Kondusamy A., et al. Natural infestation of an anchor worm, *Lernaea* sp. in cage culture of Asian Seabass, *Lates calcarifer* juveniles and its control using an anti-parasitic drug, emamectin benzoate. J Parasit Dis, 2023; 47(2): 306-318.
- Bilal M., Abbas F., Atique U., Rehman M., Hafeez-ur, Inayat M., et al. *Lernaeid* parasites prevalence in commercial freshwater fish species at various fish farms in Pakistan. Braz J Biol, 2024; 84:2024.
- Des Clers S. Functional relationship between sealworm (*Pseudoterranova decipiens*, Nematoda, Ascaridoidea) burden and host size in Atlantic cod (*Gadus morhua*). Proc Biol Sci, 1991; 245: 85-89.
- Fadaei Fard F., Mokhayer B. and Ghorbani H. Research on the identification of parasites in fishes of Chaghakhor lagoon in Chaharmahal and Bakhtiari province. J Vet Med, 2001; 59: 109-114.
- Gervasoni SH., Chemes SB., Scaglione MC. and Cerutti RD. First report of *Lernaea cyprinacea* (Crustacea: Lernaeidae) parasiting *Rhamdia quelen* (Pisces: Heptapteridae) in Santa Fe (Argentina) under hatchery conditions. Rev Colomb Cienc Pecu, 2018; 31(3): 229-234.
- Gutierrez-Galindo JF. and Lacasa-Millan MI. Population dynamics of *Lernaea cyprinacea* on four cyprinid species. Diseases of Aquatic Organisms, 2005; 67 :111-114.
- Ho J. Cladistics of the Lernaeidae (Cyclopoida), a major family of freshwater fish parasites. J Mar Syst, 1998; 15: 177-183.
- Hoffman G. Parasites of north american freshwater fishes. Berkeley and Los Angeles. University of California Press, 1967; 22:11-14 .
- Hua CJ., Zhang D., Zou H., Li M., Jakovlić I., Wu SG., et al. Morphology is not a reliable taxonomic tool for the genus *Lernaea*: Molecular data and experimental infection reveal that *L. cyprinacea* and *L. cruciata* are conspecific. Parasites and Vectors, 2019; 12(1): 579.
- Iqbal Z., Shafqat A. and Haroon F. *Lernaea* diversity and infection in Indian and Chinese carps under semi-intensive culture conditions in Lahore, Punjab. J Anim Plant Sci, 2012; 22(4): 923-926.

- Jalali B. Lernaeasis in Cyprinid cultured Fish in Iran (Master thesis). University of Godolo, Hungary, 1987; 17.
- Jalali B. Parasites and Parasitic Diseases of Iranian Freshwater Fishes. Aquatic Breeding and Rearing. Iranian Fisheries Company, Tehran, 1998; PP: 112-143.
- Jalali B. and Barzegar M. Fish parasites in Zarivar lake. JAST, 2006; 8: 47-58.
- Jazebizadeh K. Study on parasitic diseases of fishes of Zarivar lake. Environmental Protection Organization of Iran Publication, 1983; PP: 19-43. (In Persian)
- Jazebizadeh K. Identification of fishes in the northern catchment area of the Karun River. Master thesis, Tehran University of Natural Resources, 1995; PP: 5-122. (In Persian)
- Kır I. The Effects of parasites on the growth of the crucian carp (*Carassius carassius* L., 1758) inhabiting the Kovada lake. Turkiye Parazitol Derg, 2007; 31: 162-166.
- Klinger RE. and Floyd RF. Introduction to freshwater fish parasites: University of Florida Cooperative Extension Service, Institute of Food and Agriculture Sciences, EDIS; 1998.
- Mirzaei M. Prevalence and histopathologic study of *Lernaea cyprinacea* in two species of ornamental fish (*Poecilia latipinna* and *Xiphophorus helleri*) in Kerman, South-East Iran. Turkiye Parazitol Derg, 2015; 39(3): 222-226.
- Moghadam SB., Mokhayer B. and Masouleh AS. Parasite infection among larvae and fingerling of the Persian sturgeon (*Acipenser persicus*) in Vitro tank and earthen ponds. Iran. J Fish Sci, 2009; 9: 342-351.
- Moghinemi R. Final report of the project on the study of parasitic contamination in native fishes of Horul Azim wetland, Azadegan Plain. IFSRI, 1995; 71-98.
- Mokhayer B. Parasites and parasitic diseases of fish. The first international symposium of Ichthyoparasitology, Ceske Budejovice, 1983.
- Robinson J. and Avenant-Oldewage A. Aspects of the morphology of the parasitic copepod *Lernaea cyprinacea* Linnaeus, 1758 and notes on its distribution in Africa. Crustaceana, 1996: 610-626.
- Sayyadzadeh G., Esmacili HR., Ghasemian S., Mirghiyasi S., Parsi B., Zamanpoore M., et al. Co-invasion of anchor worms *Lernaea cyprinacea* (Copepoda: Lernaeidae) in some freshwater fishes of the Kor River Basin, Southwest of Iran with some remarks on the ecological aspects of lernaeosis in the country. Iran. J Fish Sci, 2016; 15(1): 369-389.
- Tasawar Z., Umerand K. and Hayat CS. *Lernaea* parasites of *Catla catla* from a fish hatchery in mozaffargarh. Pak Vet J, 2007; 27:17-19.
- Tavares-dias M. and Martins ML. An overall estimation of losses caused by diseases in the Brazilian fish farms. J Parasit Dis, 2017; 41(4): 913-918.
- Ullah I., Khan MF., Khan MS., Khan, SU., Hussain S. and Javid M. Copepod ecto-parasites of *Labeo rohita* from Dera Ismail Khan, Khyber Pakhtunkhwa Pakistan. J Entomol Zool Stud, 2018; 6(5); 1077-1076.



بررسی آلودگی کپور علفخوار (*Ctenopharyngodon idella*) به انگل لرنه آ سپریناسه آ (*Linnaeus, 1758; Cyclopoida: Lernaecidae*) در استخرهای پرورشی منطقه شوشتر استان خوزستان

علیرضا گلچین منشادی^{۱*}، سید محمد رضا بلادی^۲، محمد ترحمی^۱

^۱گروه بهداشت و بیماری های آبزیان، دانشکده دامپزشکی، واحد کازرون، دانشگاه آزاد اسلامی، کازرون، ایران
^۲دانش آموخته دانشکده دامپزشکی، واحد کازرون، دانشگاه آزاد اسلامی، کازرون، ایران

تاریخ دریافت: ۱۴۰۲/۱۰/۰۲ اصلاح نهایی: ۱۴۰۲/۱۱/۱۶ تاریخ پذیرش: ۱۴۰۲/۱۲/۰۱

چکیده

زمینه و هدف: *Lernaea cyprinacea* یکی از انگل های خارجی کوبه پودی است که با نام انگل قلاب دار شناخته می شود. این انگل غالباً بومی آسیاست و در ایران نیز شیوع دارد اما دارای گسترش جهانی در اروپا، آفریقا، استرالیا، شمال و جنوب آمریکا می باشد. این انگل می تواند بیش از صد گونه ماهیان استخوانی و دوزیستان را آلوده نماید. این مطالعه به منظور بررسی میزان بروز انگل *Lernaea cyprinacea* در ماهی کپور علفخوار (*Ctenopharyngodon idella*)، در استخرهای پرورش شوشتر، استان خوزستان صورت گرفت.

مواد و روش ها: دویست و هفتاد و پنج قطعه ماهی از چهار استخر با تور ماهیگیری صید و بوسیله ظروف حاوی فرمالدئید ۱۰ درصد به آزمایشگاه دامپزشکی دانشگاه آزاد اسلامی واحد کازرون منتقل شدند. پس از شناسایی *Lernaea cyprinacea* با کلید شناسایی، عملیات بیومتری بر روی ماهیان انجام شد.

یافته ها: نتایج نشان داد که از ۲۷۵ ماهی، ۶۳ ماهی آلوده به *Lernaea cyprinacea* بودند که ۲۳ درصد از ماهیان صید شده را تشکیل داد. نتایج آماری نشان داد براساس همبستگی پیرسون، بین طول یا وزن کل و تعداد ضایعات روی بدن رابطه معنی داری وجود نداشت ($p > 0.05$).

نتیجه گیری: *Lernaea cyprinacea* جمعیت ماهی کپور علف خوار منطقه شوشتر استان خوزستان را آلوده کرد. با توجه به آسیب های زیستی و اقتصادی، لازم است اقدامات مناسب برای ریشه کنی انگل انجام گیرد.

واژه های کلیدی: لرنه آ، کپور علفخوار، شوشتر، ایران

علیرضا گلچین منشادی، سید محمد رضا بلادی، محمد ترحمی. بررسی آلودگی کپور علفخوار (*Ctenopharyngodon idella*) به انگل لرنه آ سپریناسه آ (*Linnaeus, 1758; Cyclopoida: Lernaecidae*) در استخرهای پرورشی منطقه شوشتر استان خوزستان. مجله طب دامپزشکی جایگزین. ۱۴۰۳؛ ۷(۲۰): ۱۱۶۱-۱۱۶۷.

* نویسنده مسئول: گروه بهداشت و بیماری های آبزیان، دانشکده دامپزشکی، واحد کازرون، دانشگاه آزاد اسلامی، کازرون، ایران.