

Checklists of Fish Species Infected with the Fish Lice Genus *Argulus* Müller O.F., 1785 (Crustacea: Argulidae) in Iraq

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Abstract

For preparing this article, 47 references dealing with the occurrence of species of the fish lice genus *Argulus* Müller O.F., 1785 infecting fish species in Iraq, until the end of 2024, were consulted. A total of 18 fish species were found to be infected with three species of this genus: *A. coregoni*, *A. foliaceus* and *A. japonicus*, in addition to some unidentified species of this genus. These *Argulus* species were recorded from one, 18 and three fish host species, respectively, in addition to unidentified *Argulus* species from four fish species. Such parasites were reported from the infected fishes in different water bodies (rivers, canals, lakes, marshes and drainage networks) and from some fishponds and hatchery in addition to some fishes from fish markets in different parts of Iraq. Ten of these fish species were infected with only one *Argulus* species, while eight fish species were infected with two *Argulus* species.

Keywords: Fish lice, *Argulus* species, Fishes, Distribution, Iraq.

Introduction

According to GBIF.org (2024), the genus *Argulus* Müller O.F., 1785 belongs to the family Argulidae, order Arguloidea, class Maxillipoda of the phylum Arthropoda. In WoRMS (2024), the class is considered as Ichthyostraca and a subphylum Crustacea is included with the phylum Arthropoda. This genus includes 139 species (GBIF.org, 2024), while (2024) listed 138 valid and 19 synonymous species. Species of this genus have a worldwide WoRMS distribution and have been found in Asia, Europe, Africa, Australia and North, Central, and South America (Radkhah, 2017). A detailed description of *Argulus* morphology is well explained by Roberts and Janovy (2009). *Argulus* species infect fish skin and fin surfaces as well as gills (Noaman *et al.*, 2010). These species are temporary parasites of fishes and cannot survive without a host for a long period (Radkhah, 2017). Some argulid species probably

spread with the trade in cyprinids such as carp *Cyprinus carpio* and goldfish *Carassius auratus* (Mills *et al.*, 1993; Walker, 2008).

Argulids cause mortalities of fishes in aquaria, fishponds, lakes and estuaries. Such mortalities are probably due to the breakdown of the epithelial integrity. Furthermore, open lesions in the dermis allow fungal and bacterial infections to be established, and these, together with anorexia, contribute to the mortality (Lester and Hayward, 2006). Many *Argulus* species have no host specificity and so they have been recorded from a large number of fish species (Roberts and Janovy, 2009).

The fish lice damage their hosts in a variety of ways. During feeding, direct damage to the host's skin is caused by the lice chewing and scraping holes as they try to access the blood beneath. Indirect effects on hosts include stress; in severe infestations, this can lead to the fish's immune response being compromised, although an inflammatory response is usually observed (Walker *et al.*, 2011). In addition, *A. coregoni*, which infects salmonid fishes, transmits some fungi and bacteria (Mehlhorn, 2008).

The life cycle of members of the genus *Argulus* (Figure 1) is summarized by Walker (2008). Copulation occurs on the host fish after which the female parasite detaches to deposit eggs in rows or clumps on a suitable substrate such as a rock, plant stem or glass sides of aquaria. The tiny larvae immediately become parasitic and upon locating a suitable host, they undertake several moults until the adult stage is achieved.

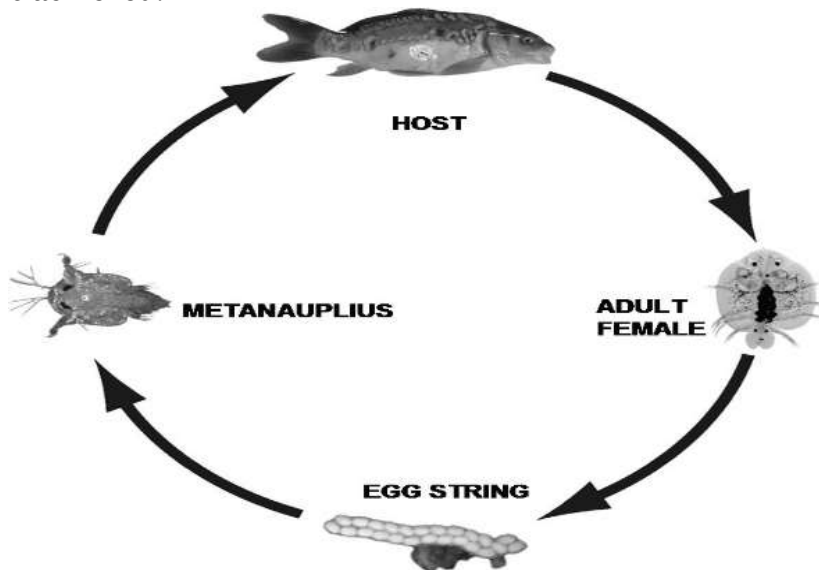


Figure 1: General life cycle of *Argulus* (from Walker, 2008).

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Concerning the first records of argulid species in Iraq, *A. foliaceus* was reported by Herzog (1969) from both *Carasobarbus luteus* (reported as *Barbus luteus*) and *Cyprinus carpio*. *A. japonicus* was reported from *Silurus glanis* by Al-Niaeemi (1997) and *A. coregoni* was reported from *Luciobarbus xanthopterus* (as *Barbus xanthopterus*) by Al-Nasiri (2000). In addition, unidentified *Argulus* species was reported for the first time in Iraq from *Planiliza abu* (reported as *Liza abu*) by Khamees (1983).

The present article aims to revise all records on *Argulus* species from fishes of Iraq. It is a continuation of some recent checklists on fish parasites in Iraq, which included those on *Trichodina* species (Mhaisen and Abdul-Ameer, 2020), *Myxobolus* species (Mhaisen and Al-Jawda, 2020), *Lernaea* species (Mhaisen and Abdul-Ameer, 2021a), *Contracaecum* species (Mhaisen and Abdul-Ameer, 2021b), fish parasites of floating cages (Mhaisen, 2022), *Ichthyophthirius multifiliis* (Mhaisen, 2023a), *Ergasilus* species (Mhaisen and Al-Daraji, 2023) and *Neoechinorhynchus* species (Mhaisen and Abdul-Ameer, 2024).

Sources and Methods

Depending on the Index-catalogue of parasites and disease agents of fishes of Iraq (Mhaisen, 2023b), a total of 47 references (25 published articles, 13 unpublished M. Sc. theses, one M. Technol. thesis, three unpublished Ph. D. theses, one book and four abstracts) dealing with records of *Argulus* species from fishes of Iraq were used to prepare the present article. Data from such references were gathered to provide reliable information on the distribution of such parasites in fishes from different water bodies, one hatchery and fish farms and fish markets in Iraq. Also, fish-*Argulus* list was prepared. For fishes, the scientific names were reported as they appeared in their original references. Fish and parasite valid scientific names and their authorities were updated according to Fricke *et al.* (2024), Froese and Pauly (2024), GBIF.org (2024) and WoRMS (2024). For each alphabetically listed *Argulus* species, valid fish host species are also alphabetically arranged together with their synonyms (if any) and their chronologically arranged references. Names of authors of such references were quoted as they appeared in their original references, although some of such names were clearly different in their spellings even for the same author.

Results and Discussion

List of fish species infected with *Argulus* species in Iraq

The following list includes the scientific names of all Iraq fish species infected with *Argulus* species with their full authorities and their orders and families, based on Froese and Pauly (2023) and Fricke *et al.* (2024).

Class Actinopteri

Order Cypriniformes

Family Cyprinidae

Arabibarbus grypus (Heckel, 1843)

Carasobarbus luteus (Heckel, 1843)

Carassius auratus (Linnaeus, 1758)

Carassius carassius (Linnaeus, 1758)

Cyprinion kais Heckel, 1843

Cyprinion macrostomus Heckel, 1843¹

Cyprinus carpio Linnaeus, 1758

Luciobarbus esocinus Heckel, 1843

Luciobarbus xanthopterus Heckel, 1843

Family Xenocyprididae²

Ctenopharyngodon idella (Valenciennes, 1844)

Hypophthalmichthys molitrix (Valenciennes, 1844)

Family Leuciscidae

Leuciscus vorax (Heckel, 1843)

Order Siluriformes

Family Siluridae

Silurus glanis Linnaeus, 1758

Order Gobiiformes

Family Gobiidae

Boleophthalmus dussumieri Valenciennes, 1837

Order Synbranchiformes

Family Mastacembelidae

Mastacembelus mastacembelus (Banks & Solander, 1794)

Order Cichliformes

Family Cichlidae

Coptodon zillii (Gervais, 1848)

Order Mugiliformes

Family Mugilidae

Planiliza abu (Heckel, 1843)

Planiliza subviridis (Valenciennes, 1836)

In addition to the above fish list, some unspecified fish hosts were reported to be infected with *A. foliaceus* by Khalifa (1986).

¹ The specific name of this fish is spelled as *macrostomus* according to Fricke *et al.* (2024), Froese and Pauly (2024) and WoRMS (2024), but as *macrostomum* by both Hussain (2007) and Al-Azebawe (2010).

² All references so far concerning the occurrence of *Argulus* species in Iraq referred to the grass carp *C. idella* and the silver carp *H. molitrix* as belonging to the family Cyprinidae. However, they belong to the family Xenocyprididae according to Tan and Armbruster (2018). This is also followed by both Fricke *et al.* (2024) and Froese and Pauly (2024) but not yet by both GBIF.org (2024) and WoRMS (2024).

Localities of collection of the infected fishes of Iraq with *Argulus* species

Eight major groups of localities of fish species infected with different *Argulus* species are given in the following list:

- 1- Tigris River in Nineveh Province (Al-Niaeemi, 1997; Rahemo and Al-Niaeemi, 2001), Salah Al-Din Province (Al-Jawda *et al.*, 2000) and Baghdad Province (Adday *et al.*; 1999; Al-Janabi, 2010a; Bdair, 2018; Bdair and Al-Rudainy, 2018) as well as from Greater Zab River (Bashê, 2008; Bashê and Abdullah, 2010; Hasan, 2020).
- 2- Euphrates River and its branches in Al-Anbar Province (Al-Salmany, 2022) and Babylon Province (Al-Zubaidy, 2007; Hussain, 2007).
- 3- Shatt Al-Arab River (Mhaisen, 1986; Al-Janabi, 2010b) and one of its branches at Basrah Province: Mehajeran Canal (Khamees, 1983; Mhaisen *et al.*, 1986).
- 4- Some lakes, canals and marshes: These included Al-Qadisiya Dam Lake (Asmar *et al.*, 1999), Al-Habbaniyah Lake (Herzog, 1969), man-made lakes in Salah Al-Din Province (Ali *et al.*, 1988a, b), Al-Tharthar-Tigris Canal in Salah Al-Din Province (Khalifa, 1989), Ibn-Najim Marsh in Al-Najaf Al-Ashraf Province (Al-Azebawe, 2010; Hamadi *et al.*, 2011) and Al-Hammar Marsh in Basrah Province (Al-Daraji, 1986).
- 5- Some drainage networks in Babylon Province (Al-Musawi, 2016) and Al-Diwaniyah Province (Al-Waaly, 2005).
- 6- Fish hatchery at Ainkawa of Erbil Province (Al-Marjan, 2007; Al-Marjan and Abdullah, 2009).
- 7- Fish ponds and farms in Nineveh Province (Al-Hamdanne and Al-Tae, 1995; Al-Hamdane and Azziz, 2006), Erbil Province (Mustafa,

2016; Mala, 2022), Sulaimaniya Province (Abdulrahman *et al.*, 2020), Salah Al-Dean Province (Khalifa, 1989), Baghdad Province (Herzog, 1969; Ali and Hussien, 1986; Khalifa, 1989; Hussien and Al-Hamdane, 1992; Al-Ani and Abdul-Sattar, 1993; Al-Nasiri, 2000), Babylon Province (Mhaisen and Abul-Eis, 1991; Al-Zubaidy, 1998; Al-Dulaimi, 2010; Al-Musawi, 2016), Al-Diwaniyah Province (Abd and Abdul wahab, 2011) and Basrah Province (Al-Niaem, 2006).

- 8- Fish markets in Baghdad Province (Mansoor, 2009; Mansoor and Al-Shaikh, 2011), Al-Diwaniyah Province (Abd and Abdul wahab, 2011), Al-Najaf Al-Ashraf Province (Al-Darwesh *et al.*, 2014) and Basrah Province (Mhaisen, 1986).

In addition, Khalifa (1986), in his textbook on fish diseases, referred to heavy mortality in carp caused by *A. foliaceus*, especially during May, but he did not state the infected fish species and the their exact locality.

List of *Argulus* species from fishes of Iraq

The following is an alphabetical listing of valid species of *Argulus* so far recorded from fish species of Iraq with their authorities according to GBIF.org (2024).

- 1- *Argulus coregoni* Thorell, 1865
- 2- *Argulus foliaceus* (Linnaeus, 1758)
- 3- *Argulus japonicus* Thiele, 1900
- 4- Unspecified *Argulus* species

***Argulus*-fish host list**

The different *Argulus* species infecting fishes of Iraq are alphabetically arranged. The authorities of these parasites are not given here as such authorities are given above. Valid fish host species (and their synonyms when applicable) for each *Argulus* species are alphabetically listed. Concerned references on records from each host species are chronologically arranged. The reference of the first record of each *Argulus* species in Iraq is underlined here.

Argulus coregoni: This parasite was reported only from *Luciobarbus xanthopterus* (as *Barbus xanthopterus*) by Al-Nasiri (2000), who erroneously reported the year of authority as 1864 instead of 1865.

Argulus foliaceus: This parasite was reported from 18 fish species. These were *Arabibarbus grypus* (as *Barbus grypus*) by Ali and Hussien 1986) and Hussien and Al-Hamdane (1992), *Boleo-*

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phthalmus dussumieri (misidentified as *Pseudapocrypte dentatus*) by Al-Janabi (2010b), *Carasobarbus luteus* (also as *Barbus luteus*) by Herzog (1969), Ali *et al.* (1988a, b), Al-Waaly (2005) and Al-Zubaidy (2007), *Carassius auratus* by Al-Ani and Abdul-Sattar (1993), Al-Niaeem (2006), Al-Azebawe (2010), Al-Dulaimi (2010), Bdair (2018) and Bdair and Al-Rudainy (2018), *Carassius carassius* by Hasan (2020), *Coptodon zillii* (as *Tilapia zillii*) by Hamadi *et al.* (2011), *Ctenopharyngodon idella* by Al-Zubaidy (1998), *Cyprinion kais* by Al-Azebawe (2010), *Cyprinion macrostomus* (misspelled as *C. macrostomum*) by Hussain (2007) and Al-Azebawe (2010), *Cyprinus carpio* by Herzog (1969), Ali and Hussien (1986), Khalifa (1989), Mhaisen and Abul-Eis (1991), Hussien and Al-Hamdane (1992), Al-Hamdane and Al-Tae (1995), Al-Zubaidy (1998), Asmar *et al.* (1999), Al-Jawda *et al.* (2000), Al-Hamdane and Azziz (2006), Al-Marjan (2007), Al-Zubaidy (2007), Al-Marjan and Abdullah (2009), Mansoor (2009), Mansoor and Al-Shaikh (2011), Mustafa (2016) and Mala (2022), *Hypophthalmichthys molitrix* by Al-Zubaidy (1998), *Leuciscus vorax* by Al-Salmany (2022), *Luciobarbus esocinus* (as *Barbus esocinus*) by Ali and Hussien (1986) and Hussien and Al-Hamdane (1992), *Luciobarbus xanthopterus* (as *Barbus xanthopterus*) by Khalifa (1989) and Al-Nasiri (2000), *Mastacembelus mastacembelus* by Bashê (2008), Al-Janabi (2010a) and Bashê and Abdullah (2010), *Planiliza abu* (also as *Liza abu*) by Mhaisen (1986), Mhaisen *et al.* (1986), Al-Hamdane and Al-Tae (1995), Adday *et al.* (1999), Al-Zubaidy (2007) and Al-Musawi (2016), *Planiliza subviridis* (as *Liza dussumieri*) by Mhaisen (1986) and *Silurus glanis* by Al-Niaeemi (1997) and Rahemo and Al-Niaeemi (2001). Unspecified host species was reported by Khalifa (1986).

Argulus japonicus: This parasite was reported from three fish species. These were *Carassius auratus* by Al-Darwesh *et al.* (2014) who misspelled the parasite as *A. japonicas*, *Leuciscus vorax* (as *Aspius vorax*) by Al-Zubaidy (2007) and *Silurus glanis* by Al-Niaeemi (1997) and Rahemo and Al-Niaeemi (2001).

Unidentified *Argulus* species were reported from four fish species, namely *Carasobarbus luteus* by Al-Daraji (1986), *Cyprinus carpio* by Abd and Abdul wahab (2011) and Abdulrahman *et al.* (2020), *Hypophthalmichthys molitrix* by Abd and Abdul wahab (2011) and *Planiliza abu* (as *Liza abu*) by Khamees (1983).

Host-parasite list

The following list of infected fishes with *Argulus* species is alphabetically arranged. For each fish species, names of *Argulus* species are also alphabetically listed.

Arabibarbus grypus: *Argulus foliaceus*
Boleophthalmus dussumieri: *Argulus foliaceus*
Carasobarbus luteus: *Argulus foliaceus*, *Argulus* sp.
Carassius auratus: *Argulus foliaceus*, *A. japonicus*
Carassius carassius: *Argulus foliaceus*
Coptodon zillii: *Argulus foliaceus*
Ctenopharyngodon idella: *Argulus foliaceus*
Cyprinion kais: *Argulus foliaceus*
Cyprinion macrostomus: *Argulus foliaceus*
Cyprinus carpio: *Argulus foliaceus*, *Argulus* sp.
Hypophthalmichthys molitrix: *Argulus foliaceus*, *Argulus* sp.
Leuciscus vorax: *Argulus foliaceus*, *A. japonicus*
Luciobarbus esocinus: *Argulus foliaceus*
Luciobarbus xanthopterus: *Argulus coregoni*, *A. foliaceus*
Mastacembelus mastacembelus: *Argulus foliaceus*
Planiliza abu: *Argulus foliaceus*, *Argulus* sp.
Planiliza subviridis: *Argulus foliaceus*
Silurus glanis: *Argulus foliaceus*, *A. japonicus*

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قوائم مرجعية لأنواع الأسماك المصابة بقمل الأسماك
Argulus Müller O.F., 1785
(القشريات: عائلة اركوليدي) في العراق

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المستخلص

لغرض تهيئة هذا البحث، تم الركون إلى 47 من المصادر المعنية بظهور أنواع جنس قمل الأسماك *Argulus Müller O.F.*، 1785 التي تصيب أنواع الأسماك في العراق، لغاية نهاية 2023. وجد أن 18 نوعا من الأسماك كانت مصابة بثلاثة أنواع من هذا الجنس وهي *A. coregoni*، *A. foliaceus* و *A. japonicus* إضافة إلى بعض الأنواع غير المشخصة من هذا الجنس. تم تسجيل هذه الأنواع الثلاثة من القمل من نوع واحد، 18 نوعا وثلاثة أنواع من أنواع الأسماك المضيفة، على التوالي، إضافة لبعض الأنواع غير المشخصة من هذا الجنس من أربعة أنواع من الأسماك. سجلت هذه الطفيليات من الأسماك المصابة من مختلف المسطحات المائية (أنهار، قنوات، بحيرات، أهوار وشبكات مازل)، ومن بعض أحواض الأسماك ومفقس إضافة إلى بعض الأسماك من أسواق بيع الأسماك في أرجاء مختلفة من العراق. تبينت إصابة عشرة أنواع من هذه الأسماك بنوع واحد من قمل الأسماك في حين أن ثمانية أنواع منها كانت مصابة بنوعين من قمل الأسماك.

الكلمات المفتاحية: قمل الأسماك، أنواع الجنس *Argulus*، أسماك، التوزيع، العراق.