

Checklists of Species of *Ergasilus* von Nordmann, 1832 (Copepoda: Ergasilidae) Parasitic on Fishes of Iraq

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Abstract

Surveying of 144 literature concerning occurrence of the copepod parasites of the genus *Ergasilus* parasitizing fishes of Iraq, indicated that there are 11 identified species of *Ergasilus* von Nordmann, 1832 as well as some unidentified species of this genus infecting 38 fish species. The infections were distributed in fishes from Tigris, Euphrates and Shatt Al-Arab rivers and some of their tributaries, as well as in some lakes, marshes, drainage networks, many fish ponds and floating cages in different parts of Iraq, in addition to marine waters of the Arab Gulf. Among the infected fishes, the mugilid fish *Planiliza subviridis* was infected with the highest number of *Ergasilus* species (eight species), followed by *Carasobarbus luteus*, *Cyprinus carpio*, *Leuciscus vorax* and *Planiliza abu* (seven parasite species each), while seven fish species were infected with only one *Ergasilus* species each. Among *Ergasilus* species, *E. sieboldi* was infecting a total of 25 different fish species, while each of *E. iraquensis*, *E. lizae* and *E. synanceiensis* were detected from one fish host species.

Keywords: Copepoda, *Ergasilus* species, Gills, Distribution, Fishes, Iraq

Introduction

Ergasilus von Nordmann, 1832 of the family Ergasilidae, order Cyclopoida, class Copepoda of the phylum Arthropoda, represents the type and most speciose genus with 161 valid species and 34 synonyms worldwide (WoRMS, 2023). *Ergasilus* is a species-rich genus with a wide distribution in freshwater, marine and brackish environments (Míč *et al.*, 2023). *Ergasilus* species are ectoparasites that infect many species of fishes (Roberts, 1970). Eggs of these species are in external

egg sacs attached to the parasitic female. They go through several copepodid stages and after reaching maturity, the adults mate and, while males remain free-living, females become parasitic (Hudson and Lesko, 2003). Figure 1, which is extracted from the Institute of Fisheries Management (2018), demonstrates the life cycle of *E. sieboldi*.

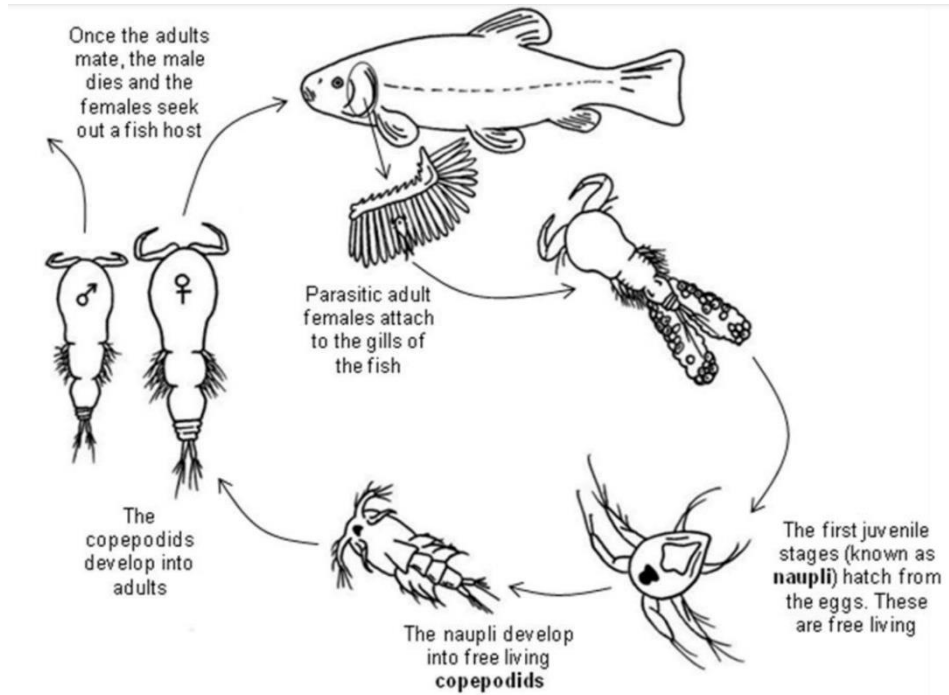


Figure 1: Illustration of the life cycle of *E. sieboldi*.

The high occurrence of *Ergasilus coatiarus* Araujo & Varella, 1998 in two species of cichlid fishes (*Cichla monoculus* and *Chaetobranchus semifasciatus*) of economic importance for aquaculture in the Amazon region points out the need to improve the strategies of parasitic prevention and control in order to better prevent future disease outbreaks (Mathews *et al.*, 2018). In a recent review, Ahmed *et al.* (2022) demonstrated the major crustaceans that parasitize on fishes by describing their corresponding harms to the hosting fishes, factors affecting the prevalence of the crustacean parasites and some of their hazardous effects on the infected fishes as well as trials for the chemical and biological control of the crustacean infestations.

In Iraq, Herzog (1969) was the first one to report the first *Ergasilus* species (*E. sieboldi*) from *Leuciscus vorax* (reported as *Aspius vorax*). After that, ten different species of that genus were reported or described from some fish species, in addition to some unidentified species of this genus (Mhaisen, 2023).

The present article is designed to revise all records on *Ergasilus* species from fishes of Iraq and provide updated lists of them and their host species in Iraq. It is a continuation of some recent checklists on some groups of fish parasites of Iraq, such as 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) and fish parasites of floating cages (Mhaisen, 2022).

Sources and Methods

A total of 144 references (84 published research papers, 34 unpublished M. Sc. theses, three M. Tech. theses, 14 unpublished Ph. D. theses and nine abstracts) dealing with records on *Ergasilus* 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 on fishes from different water bodies and fish farms in Iraq as well as the fish-*Ergasilus* list. For fishes, the scientific names were reported as they appeared in their original references. Fish valid scientific names and their authorities were corrected according to Fricke *et al.* (2023), Froese and Pauly (2023), GBIF.org (2023) and WoRMS (2023). For each alphabetically listed *Ergasilus* species, valid fish host species are also alphabetically arranged together with their synonyms (if any) and their chronologically arranged references.

Results and Discussion

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

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

Class Actinopteri

Order Clupeiformes

Family Clupeidae

- Tenualosa ilisha* (Hamilton, 1822)
- 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
- Garra rufa* (Heckel, 1843)
- Luciobarbus barbulus* (Heckel, 1847)
- Luciobarbus esocinus* Heckel, 1843
- Luciobarbus kersin* (Heckel, 1843)
- Luciobarbus xanthopterus* Heckel, 1843
- Mesopotamichthys sharpeyi* (Günther, 1874)
- Family Xenocyprididae²
- Ctenopharyngodon idella* (Valenciennes, 1844)
- Hemiculter leucisculus* (Basilewsky, 1855)
- Hypophthalmichthys molitrix* (Valenciennes, 1844)
- Family Leuciscidae
- Acanthobrama centisquama* Heckel, 1843³
- Acanthobrama marmid* Heckel, 1843
- Alburnus sellal* Heckel, 1843
- Chondrostoma regium* (Heckel, 1843)
- Leuciscus vorax* (Heckel, 1843)
- Squalius lepidus* Heckel, 1843
- Squalius spurius* Heckel, 1843
- Order Siluriformes
- Family Bagridae
- Mystus pelusius* (Solander, 1794)
- Family Sisoridae
- Glyptothorax cavia* (Hamilton, 1822)⁴
- Glyptothorax steindachneri* (Pietschmann, 1913)
- Family Siluridae
- Silurus glanis* Linnaeus, 1758
- Silurus triostegus* Heckel, 1843
- Family Heteropneustidae
- Heteropneustes fossilis* (Bloch, 1794)

Order Gobiiformes

Family Gobiidae

Bathygobius fuscus (Rüppell, 1830)

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)

Order Perciformes

Family Synanceiidae

Pseudosynanceia melanostigma Day, 1875⁵

Family Sparidae

Acanthopagrus arabicus Iwatsuki, 2013

In addition to the above fish list, some unspecified fish hosts were reported to be infected with some *Ergasilus* species by Al-Niaeem *et al.* (2015). Through a correspondence with Dr. Khalidah S. Al-Niaeem, she declared that these fishes were in fact the same as those reported by her M. Sc. student (Ahmed, 2015).

¹ The specific name of this fish is spelled as *macrostomus* according to Fricke *et al.* (2023), Froese and Pauly (2023) and WoRMS (2023), but as *macrostomum* in some Iraqi references.

² All references so far concerning the occurrence of *Ergasilus* species in Iraq referred to the grass carp *Ctenopharyngodon idella*, sharpbelly *Hemiculter leucisculus* and the silver carp *Hypophthalmichthys molitrix* as belonging to the family Cyprinidae. However, Tan and Armbruster (2018) in their phylogenetic classification placed these three species within the family Xenocyprididae. This is also followed by both Fricke *et al.* (2023) and Froese and Pauly (2023), but not yet by both GBIF.org (2023) and WoRMS (2023).

³ According to Coad (2010), Freyhof *et al.* (2021), Fricke *et al.* (2023) and Froese and Pauly (2023), *Acanthobrama centisquama* does not

occur in Iraq, but it is distributed in Syria and Turkey. Hence, in this article it is considered as *Acanthobrama* sp.

⁴ *Glyptothorax cavia* is distributed in South Asia (Fricke et al., 2023; Froese and Pauly, 2023), so, its report from Iraq by Ali (1989) may be considered as *Glyptothorax* sp. as *G. cavia* is unknown in Iraq (Coad, 2010).

⁵ According to both Froese and Pauly (2023) and WoRMS (2023), *Pseudosynanceia melanostigma* belongs to the order Perciformes, but to the order Scorpaeniformes according to GBIF.org (2023).

Localities of collection of fishes of Iraq infected with *Ergasilus* species

The record of available literature concerning the occurrence of different species of *Ergasilus* from fishes of Iraq can be grouped into nine major categories according to the localities of collection of the infected fishes. These are:

- 1- Tigris River in Nineveh Province (Fattohy, 1975; Al-Niaemi, 1997; Rahemo, 2011), Salah Al-Din Province (Abdul-Ameer, 1989; Al-Jawda et al., 2000; Al-Jubori, 2013) and Baghdad Province (Balasem et al., 1993; Mhaisen et al., 1995; Adday et al., 1999; Asmar et al., 2003; Mansor et al., 2012; Rasheed, 2016; Hammood, 2017; Bdair, 2018; Bdair and Al-Rudainy, 2018; Abbas, 2019; Sheyaa, 2019; Abbood, 2022), as well as some tributaries of Tigris River which included: Greater Zab River (Rashed and Hussain, 1988; Ali, 1989; Abdullah, 2002; Abdullah and Mhaisen, 2003, 2006, Shwani, 2009; Abdullah and Shwani, 2010; Abdullah and Mhaisen, 2011; Al-Marjan, 2016; Bilal, 2016), Lesser Zab River (Rashid et al., 1989; Abdullah, 2002; Abdullah and Mhaisen, 2006; Abdullah and Mhaisen, 2011), Bahdinan River in Erbil Province (Bilal, 2006; Bilal and Abdullah, 2008) and Diyala River (Ali et al., 1987; Al-Shaikh et al., 1995; Balasem et al., 2001; Al-Rubaie et al., 2003; Mohammed, 2017).
- 2- Euphrates River and its branches in Al-Anbar Province (Al-Alusi, 1998, 2010; Al-Salmany, 2015, 2022), Babylon Province (Al-Sa'adi, 2007; Al-Zubaidy, 2007; Hussain, 2007, 2009; Mhaisen et al., 2015), Karbala Province (Al-Saadi, 2007; Al-Saadi et al., 2010, 2011), Al-Diwaniah province (Al-Jadoaa, 2002; Al-Waaly, 2005), Thi Qar Province (Al-Abbadie, 2006) and Al-Muthanna Province (Al-Helli, 2019).

- 3- Shatt Al-Arab River (Ho *et al.*, 1996; Al-Janabi, 2010; Eassa *et al.*, 2014; Ahmed, 2015; Al-Niaeem *et al.*, 2015; Khamees and Mhaisen, 1995, 2001) and some of its branches in Basrah Province which included: Garmat Ali River (Khamees, 1996; Jori, 1998; Khamees and Mhaisen, 1998; Abdul-Rahman, 1999; Adday, 2001; Al-Salim and Jori, 2002; Adday *et al.*, 2006a, b; Al-Niaeem, 2006; Al-Salim *et al.*, 2007; Al-Janae'e, 2010; Adday, 2013), Al-Majidiah River (Mehdi, 1989; Khudhair *et al.*, 1992; Mehdi *et al.*, 2009), Al-Salihiya River (Al-Janae'e, 2010), Ashar Canal (Ahmed, 2015; Al-Niaeem *et al.*, 2015) and Mehajieran Creek (Khamees, 1983; Mhaisen *et al.*, 1986; Khamees and Mhaisen, 1988; Mhaisen *et al.*, 1988).
- 4- Some lakes, depressions and marshes: These included Darbandikhan Lake (Abdullah, 2013, Abdullah and Abdullah, 2015a, b, c), Dokan Lake (Abdullah, 1990; Abdullah and Rasheed, 2004), Al-Qadisiya Dam Lake (Asmar *et al.*, 1999; Balasem *et al.*, 2003), Al-Habbaniyah Lake (Herzog, 1969; Ali *et al.*, 1988a; Mhaisen *et al.*, 1999), Al-Tharthar- Tigris Canal in Salah Al-Din Province (Ali and Shaaban, 1984, Khalifa, 1989), Ibn-Najim Marsh in Al-Najaf Al-Ashraf Province (Al-Azebawe, 2010), Al-Dalmaj Marsh of Al-Diwaniyah Province (Al-Khenifsawy, 2022; Al-Khenifsawy and Al-Mayli, 2022) and Al-Hammar Marsh in Basrah Province (Al-Daraji, 1986; Mohamad, 1989; Al-Salim and Mohamad, 1993a, b; Jori, 2006; Abbas, 2007; Awad *et al.*, 2007a, b, c).
- 5- Some drainage networks in Baghdad Province (Balasem *et al.*, 2002a, b; Asmar *et al.*, 2003; Mhaisen *et al.*, 2003), Babylon Province (Kadim, 2003; Al-Musawi, 2016), Karbala Province (Al-Hajimi, 2021) and Al-Diwaniyah Province (Al-Waaly, 2005; Al-Jadoaa, 2008) in addition to Shatt Al-Basrah Canal (Adday and Ali, 2011).
- 6- Fish hatcheries in Wasit Province (Mhaisen and Abul-Eis, 1993) as well as some fish aquaria in Basrah Province (Al-Niaeem, 2006).
- 7- Fish ponds and farms which included some in Nineveh Province (Al-Hamdane and Azziz, 2006), Erbil Province (Abdullah, 2004), Salah Al-Dean Province (Khalifa, 1989), Baghdad Province (Ali and Shaaban, 1984; Khalifa, 1989; Mhaisen *et al.*, 1995; Mohammad-Ali *et al.*, 1999; Al-Nasiri, 2000; Salih *et al.*, 2000; Asmar *et al.*, 2001; Al-Nasiri *et al.*, 2002, 2003; Asmar *et al.*, 2004), Babylon Province (Ali and Shaaban, 1984; Ali *et al.*, 1988b; Mhaisen and Abul-Eis, 1991; Al-Zubaidy, 1998; Asmar *et al.*, 2001; Al-Jadoaa, 2002; Kadim

- , 2003; Al-Dulaimi *et al.*, 2006; Al-Rubaie *et al.*, 2007; Al-Musawi, 2016), Wasit Province (Ali *et al.*, 1988b) and Basrah Province (Abed, 2005; Al-Niaem, 2006; Al-Salim *et al.*, 2007; Hussein *et al.*, 2011) in addition to some floating cages at Al-Habbaniya Lake (Ali *et al.*, 1988a).
- 8- Fish markets in Baghdad Province (Mansoor, 2009; Mansoor and Al-Shaikh, 2011) and Basrah Province (Mhaisen, 1986).
 - 9- Marine waters of Iraq, which included those from Khor Al-Zubair (Piasecki *et al.*, 1993; Al-Daraji, 1995; Amado *et al.*, 2001; Al-Daraji, 2002a, b, c) and Khor Abdullah (Bannai, 2002).

***Ergasilus* species from fishes of Iraq**

The following is an alphabetical listing of *Ergasilus* species so far recorded from fish species of Iraq with their authorities.

- 1- *Ergasilus barbi* Rahemo, 1982.
- 2- *Ergasilus boleophthalmi* Adday & Ali, 2011.
- 3- *Ergasilus iraquensis* Amado, in Amado, da Rocha, Piasecki, Al-Daraji & Mhaisen, 2001.
- 4- *Ergasilus lizae* Krøyer, 1863.
- 5- *Ergasilus mosulensis* Rahemo, 1982.
- 6- *Ergasilus ogawai* Kabata, 1992.
- 7- *Ergasilus pararostralis* Amado, in Amado, da Rocha, Piasecki, Al-Daraji & Mhaisen, 2001.
- 8- *Ergasilus peregrinus* Heller, 1865.
- 9- *Ergasilus rostralis* Ho, Jayarajan & Radhakrishnan, 1992.
- 10- *Ergasilus sieboldi* von Nordmann, 1832.
- 11- *Ergasilus synanceiensis* Amado, in Amado, da Rocha, Piasecki, Al-Daraji & Mhaisen, 2001.
- 12- Unidentified *Ergasilus* species.

***Ergasilus*-host list**

The different *Ergasilus* species infecting fishes of Iraq are alphabetically arranged here. Under each parasite species, valid fish host species (and synonyms when applicable) are alphabetically listed. Concerned references on records of each host species are chronologically arranged. The reference of the first record of each *Ergasilus* species in Iraq is underlined.

Ergasilus barbi was reported from 15 fish species. These were: *Arabibarbus grypus* (reported as *Barbus grypus*) by Fattohy (1975), Rahemo (1982), Abdullah (1990) and Abdullah and Rasheed (2004), *Carasobarbus luteus* (also reported as *Barbus luteus*) by Ali (1989), Al-Nasiri (2000), Abdullah (2002), Abdullah and Mhaisen (2003), Balasem *et al.* (2003), Abdullah and Mhaisen (2006), Al-Saadi (2007), Al-Saadi *et al.* (2010) and Al-Salmany (2015, 2022), *Carassius auratus* by Mohammed (2017), *Carassius carassius* by Al-Salmany (2022), *Cyprinion macrostomus* by Ali (1989), Abdullah (1990), Abdullah and Rasheed (2004), Bilal (2006), Bilal and Abdullah (2008) and Al-Salmany (2015), *Cyprinus carpio* by Abdullah (2004), Al-Saadi (2007), Al-Saadi *et al.* (2010) and Mohammed (2017), *Glyptothorax* sp. (as *Euglyptosternum lineatum*) by Ali (1989), *Leuciscus vorax* (as *Aspius vorax*) by Al-Saadi (2007) and Al-Saadi *et al.* (2010), *Luciobarbus barbulus* (as *Barbus barbulus*) by Ali (1989), Bilal (2006) and Bilal and Abdullah (2008), *Luciobarbus esocinus* (as *Barbus esocinus*) by Abdullah (1990) and Abdullah and Rasheed (2004), *Luciobarbus kersin* (as *Barbus kersin*) by Bilal (2006) and Bilal and Abdullah (2008), *Planiliza abu* (also reported as *Liza abu*) by Al-Nasiri (2000), Abdullah (2002), Balasem *et al.* (2002b), Al-Nasiri *et al.* (2003), Kadim (2003), Abdullah and Mhaisen (2006), Al-Dulaimi *et al.* (2006), Al-Saadi (2007), Al-Saadi *et al.* (2010), Abdullah and Mhaisen (2011), Al-Saadi *et al.* (2011), Al-Musawi (2016), Mohammed (2017) and Al-Salmany (2022), *Silurus glanis* by Abdullah (2002) and Abdullah and Mhaisen (2006), *Squalius lepidus* (as *Leuciscus lepidus*) by Ali (1989) and *Squalius spurius* (as *Leuciscus spurius*) by Ali (1989).

Ergasilus boleophthalmi was reported only from two fish species: *Bathygobius fuscus* and *Boleophthalmus dussumieri*, both by Adday and Ali (2011).

Ergasilus iraquensis was also reported as *Ergasilus irakiensis* by Al-Daraji (2002a) and Bannai (2002). However, according to WoRMS (2023), it is considered as a synonym of *E. iraquensis* Amado, in Amado, da Rocha, Piasecki, Al-Daraji & Mhaisen (2001). This parasite was reported only from *Planiliza subviridis* (as *Liza subviridis*) by Amado *et al.* (2001), Al-Daraji (2002c) and Bannai (2002).

Ergasilus lizae was reported only from *Planiliza subviridis* (as *Chelon subviridis*) by Adday (2013).

Ergasilus mosulensis was reported from 24 fish species: *Acanthobrama marmid* by Rahemo (2011), *Acanthopagrus arabicus* by Ahmed (2015), *Alburnus sellal* (as *Alburnus mossulensis* and

Chalcalburnus sellal) by Abdul-Rahman (1999) and Ahmed (2015), *Carasobarbus luteus* (also as *Barbus luteus*) by Khamees (1983), Al-Daraji (1986), Mhaisen (1986), Mhaisen *et al.* (1986), Khamees and Mhaisen (1988), Abdul-Ameer (1989), Abdullah (1990), Abdul-Rahman (1999), Balasem *et al.* (2002b), Al-Rubaie *et al.* (2003), Balasem *et al.* (2003), Al-Waaly (2005), Al-Saadi (2007), Al-Saadi *et al.* (2010), Ahmed (2015) and Al-Hajimi (2021), *Carassius auratus* by Ahmed (2015), *Carassius carassius* by Abdul-Rahman (1999), *Coptodon zillii* (as *Tilapia zillii*) by Al-Azebawe (2010), *Ctenopharyngodon idella* by Al-Zubaidy (1998), Abdul-Rahman (1999) and Asmar *et al.* (2004), *Cyprinion kais* by Al-Azebawe (2010), *Cyprinion macrostomus* by Rahemo (1982) and Al-Azebawe (2010), *Cyprinus carpio* by Abdullah (1990), Al-Zubaidy (1998), Abdul-Rahman (1999), Abed (2005), Hussein *et al.* (2011), Ahmed (2015), Rasheed (2016) and Al-Salmamy (2022), *Glyptothorax steindachneri* by Al-Sa'adi (2007) and Mhaisen *et al.* (2015), *Heteropneustes fossilis* by Abdul-Rahman (1999), *Hypophthalmichthys molitrix* by Al-Zubaidy (1998), *Leuciscus vorax* (also as *Aspius vorax*) by Al-Daraji (1986), Abdul-Rahman (1999), Al-Saadi (2007), Al-Saadi *et al.* (2010), Rasheed (2016) and Al-Salmamy (2022), *Luciobarbus barbulus* by Sheyaa (2019), *Mastacembelus mastacembelus* by Abdul-Rahman (1999), *Mesopotamichthys sharpeyi* (also as *Barbus sharpeyi*) by Al-Daraji (1986) and Abdul-Rahman (1999), *Mystus pelusius* by Abdul-Rahman (1999), *Planiliza abu* (also as *Liza abu*) by Fattohy (1975), Khamees (1983), Al-Daraji (1986), Mhaisen (1986), Mhaisen *et al.* (1986, 1988), Ho *et al.* (1996), Khamees (1996), Al-Alusi (1998), Jori (1998), Khamees and Mhaisen (1998), Abdul-Rahman (1999), Mohammad-Ali *et al.* (1999), Balasem *et al.* (2001), Mhaisen and Khamees (2001), Balasem *et al.* (2002b, 2003), Kadim (2003), Abed (2005), Al-Dulaimi *et al.* (2006), Al-Niaeem (2006), Al-Saadi (2007), Hussain (2007), Al-Alusi (2010), Al-Saadi *et al.* (2010, 2011), Hussein *et al.* (2011), Ahmed (2015), Al-Salmamy (2015), Al-Musawi (2016), Rasheed (2016), Mohammed (2017), Abbas (2019), Al-Hajimi (2021), Al-Khenifsawy (2022), Al-Khenifsawy and Al-Mayli (2022) and Al-Salmamy (2022), *Planiliza subviridis* (as *Chelon subviridis* and *Liza subviridis*) by Jori (1998), Abdul-Rahman (1999) and Ahmed (2015), *Silurus glanis* by Al-Niaeemi (1997), Rahemo and Al-Neemi (1999), Rahemo and Al-Niaeemi (2001), *Silurus triostegus* (also as *Parasilurus triostegus*) by Al-Daraji (1986), Abdul-Rahman (1999), Jori (2006), Abbas (2007), Awad *et al.* (2007b, 2007c), Shwani (2009)

, Abdullah and Shwani (2010) and Bilal (2016) and *Squalius lepidus* by Abdullah (2013) and Abdullah and Abdullah (2015a, b, c).

Ergasilus ogawai was also misidentified as *E. ovatus* by Abdul-Rahman (1999). It was reported from 17 fish species: *Acanthobrama marmid* by Al-Janae'e (2010), *Acanthopagrus arabicus* (also as *Acanthopagrus latus*) by Adday (2001), Adday *et al.* (2006a), Al-Janae'e (2010) and Ahmed (2015), *Alburnus sellal* (as *Alburnus mossulensis*) by Al-Janae'e (2010), *Carasobarbus luteus* (as *Barbus luteus*) by Al-Janae'e (2010), *Carassius auratus* by Al-Janae'e (2010), *Coptodon zillii* (as *Tilapia zillii*) by Al-Janae'e (2010), *Cyprinus carpio* by Al-Janae'e (2010) and Eassa *et al.* (2014), *Hemiculter leucisculus* by Al-Janae'e (2010), *Heteropneustes fossilis* by Abdul-Rahman (1999) (reported as *E. ovatus*), *Leuciscus vorax* (as *Aspius vorax*) by Al-Janae'e (2010), *Luciobarbus xanthopterus* (as *Barbus xanthopterus*) by Al-Janae'e (2010), *Mastacembelus mastacembelus* by Abdul-Rahman (1999) (reported as *E. ovatus*), Adday (2001) and Adday *et al.* (2006a), *Mystus pelusius* by Adday (2001) and Adday *et al.* (2006a), *Planiliza abu* (as *Liza abu*) by Al-Janae'e (2010), *Planiliza subviridis* (as *Chelon subviridis* and *Liza subviridis*) by Al-Janae'e (2010) and Ahmed (2015), *Silurus triostegus* by Abdul-Rahman (1999) (reported as *E. ovatus*), Adday (2001), Adday *et al.* (2006a, 2006b) and Al-Janae'e (2010) and *Tenualosa ilisha* by Al-Janae'e (2010).

Ergasilus pararostralis was also reported as *Ergasilus pararostralis* by Al-Daraji (2002b), but according to WoRMS (2003), it was considered as a synonym of *E. pararostralis* Amado, in Amado, da Rocha, Piasecki, Al-Daraji & Mhaisen (2001). This parasite was reported from two fish species: *Planiliza subviridis* (as *Liza subviridis*) by Amado *et al.* (2001), Al-Daraji (2002b) and Bannai (2002) and *Silurus triostegus* by Jori (2006) and Awad *et al.* (2007a).

Ergasilus peregrinus was reported from nine fish species: *Acanthobrama* sp. (as *A. centisquama*) by Balasem *et al.* (2003), *Arabibarbus grypus* (also as *Barbus grypus*) by Balasem *et al.* (2003), Bdair (2018) and Bdair and Al-Rudainy (2018), *Carasobarbus luteus* (also as *Barbus luteus*) by Al-Saadi (2007), Al-Sa'adi (2007), Al-Saadi *et al.* (2010), Al-Jubori (2013) and Mhaisen *et al.* (2015), *Chondrostoma regium* by Bdair (2018) and Bdair and Al-Rudainy (2018), *Cyprinus carpio* by Balasem *et al.* (2003), *Glyptothorax steindachneri* by Al-Sa'adi (2007) and Mhaisen *et al.* (2015), *Leuciscus vorax* (as *Aspius vorax*) by Abdul-Ameer (1989), Al-Saadi (2007) and Al-Saadi *et al.* (2010), *Mesopotamichthys sharpeyi* (as *Barbus sharpeyi*) by Al-Saadi (2007) and Al-Saadi *et al.* (2010) and *Planiliza*

abu (as *Liza abu*) by Abdul-Ameer (1989), Balasem *et al.* (2003), Al-Saa'di (2007), Mhaisen *et al.* (2015), Al-Hajimi (2021). It is appropriate to mention here that the year of authority of this ergasilid was erroneously given as 1868 instead of 1865 by Abdul-Ameer (1989), Al-Saadi (2007), Al-Sa'adi (2007) and Al-Saadi *et al.* (2010).

Ergasilus rostralis was reported from 19 fish species: *Acanthobrama marmid* by Al-Janae'e (2010), *Acanthopagrus arabicus* (also as *Acanthopagrus latus*) by Al-Janae'e (2010) and Ahmed (2015), *Alburnus sellal* (as *Alburnus mossulensis*) by Al-Janae'e (2010), *Arabibarbus grypus* (also as *Barbus grypus*) by Al-Saadi (2007) and Al-Saadi *et al.* (2010), *Carasobarbus luteus* (also as *Barbus luteus*) by Abdul-Rahman (1999), Al-Saadi (2007), Al-Janae'e (2010), Al-Saadi *et al.* (2010), Ahmed (2015) and Al-Helli (2019), *Carassius auratus* by Al-Janae'e (2010), Ahmed (2015) and Mohammed (2017), *Coptodon zillii* (as *Tilapia zillii*) by Al-Janae'e (2010), *Ctenopharyngodon idella* by Abdul-Rahman (1999), *Cyprinus carpio* by Abdul-Rahman (1999), Al-Niaeem (2006), Al-Salim *et al.* (2007), Al-Janae'e (2010) and Ahmed (2015), *Hemiculter leucisculus* by Al-Janae'e (2010), *Heteropneustes fossilis* by Abdul-Rahman (1999), *Leuciscus vorax* (also as *Aspius vorax*) by Abdul-Rahman (1999), Al-Saadi (2007), Al-Janae'e (2010), Al-Saadi *et al.* (2010) and Ahmed (2015), *Luciobarbus xanthopterus* (as *Barbus xanthopterus*) by Al-Janae'e (2010), *Mesopotamichthys sharpeyi* (as *Barbus sharpeyi*) by Al-Saadi (2007) and Al-Saadi *et al.* (2010), *Mystus pelusius* by Abdul-Rahman (1999), *Planiliza abu* (also as *Liza abu*) by Khamees and Mhaisen (1995), Ho *et al.* (1996), Khamees (1996), Jori (1998), Khamees and Mhaisen (1998), Abdul-Rahman (1999), Khamees and Mhaisen (2001), Mhaisen and Khamees (2001), Al-Salim and Jori (2002), Abed (2005), Al-Niaeem (2006), Al-Salim *et al.* (2007), Al-Alusi (2010), Al-Janae'e (2010), Hussein *et al.* (2011), Ahmed (2015) and Al-Helli (2019), *Planiliza subviridis* (as *Chelon subviridis* and *Liza subviridis*) by Al-Daraji (1995), Jori (1998), Al-Salim and Jori (2002), Al-Janae'e (2010) and Ahmed (2015), *Silurus triostegus* by Abdul-Rahman (1999), Jori (2006) and Al-Janae'e (2010) and *Tenualosa ilisha* by Al-Janae'e (2010).

Ergasilus sieboldi was reported from 25 fish species, namely: *Acanthobrama* sp. (as *A. centisquama*) by Balasem *et al.* (2003), *Acanthobrama marmid* by Rashid *et al.* (1989), Al-Nasiri (2000), Al-Jawda *et al.* (2003) and Al-Janae'e (2010), *Acanthopagrus arabicus* (as *Acanthopagrus latus*) by Al-Janae'e (2010), *Alburnus sellal* (also as *Alburnus capito*) by Al-Nasiri, 2000 and Balasem *et al.*, 2002b) by

Al-Nasiri (2000), Balasem *et al.* (2002b) and Al-Janae'e (2010), *Arabibarbus grypus* (as *Barbus grypus*) by Ali *et al.* (1987), Al-Nasiri (2000), Balasem *et al.* (2003), Al-Saadi (2007), Al-Zubaidy (2007) and Al-Saadi *et al.* (2010), *Boleophthalmus dussumieri* (misidentified as *Pseudopocrypte dentatus*) by Al-Janabi (2010), *Carasobarbus luteus* (also as *Barbus luteus*) by Ali *et al.* (1987), Rashed and Hussain (1988), Asmar *et al.* (1999), Al-Jawda *et al.* (2000), Al-Nasiri (2000), Balasem *et al.* (2002a, 2003), Al-Abbadie (2006), Al-Saadi (2007), Al-Zubaidy (2007), Al-Janae'e (2010), Al-Saadi *et al.* (2010) and Mohammed (2017), *Carassius auratus* by Al-Janae'e (2010) and Mohammed (2017), *Carassius carassius* by Mhaisen *et al.* (1999), *Chondrostoma regium* by Ali *et al.* (1987), Mhaisen *et al.* (1995), Bilal (2006) and Bilal and Abdullah (2008), *Coptodon zillii* (as *Tilapia zillii*) by Al-Janae'e (2010), *Ctenopharyngodon idella* by Ali *et al.* (1988a), Al-Zubaidy (1998), Al-Jadoaa (2002), *Cyprinus carpio* by Ali *et al.* (1988a, 1988b), Mhaisen and Abul-Eis (1991), Al-Zubaidy (1998), Asmar *et al.* (1999), Mohammad-Ali *et al.* (1999), Al-Nasiri (2000), Al-Jadoaa (2002), Al-Nasiri *et al.* (2002), Balasem *et al.* (2003), Asmar *et al.* (2004), Al-Rubaie *et al.* (2007), Al-Saadi (2007), Al-Zubaidy (2007), Mansoor (2009), Al-Janae'e (2010), Al-Saadi *et al.* (2010), Mansoor and Al-Shaikh (2011), Rasheed (2016), Mohammed (2017), Al-Khenifsawy (2022), Al-Khenifsawy and Al-Mayli (2022) and Al-Salmany (2022), *Garra rufa* by Ali *et al.* (1987) and Al-Jadoaa (2002), *Hemiculter leucisculus* by Al-Janae'e (2010), *Heteropneustes fossilis* by Al-Nasiri (2000), *Hypophthalmichthys molitrix* by Ali *et al.* (1988a), Al-Zubaidy (1998), Asmar *et al.* (2001) and Al-Jadoaa (2002), *Leuciscus vorax* (also as *Aspius vorax*) by Herzog (1969), Al-Abbadie (2006), Al-Saadi (2007), Al-Janae'e (2010), Al-Saadi *et al.* (2010), Rasheed (2016) and Al-Salmany (2022), *Luciobarbus xanthopterus* (as *Barbus xanthopterus*) by Khalifa (1989), Salih *et al.* (2000), Al-Janae'e (2010), Bdair (2018), Bdair and Al-Rudainy (2018) and Al-Salmany (2022), *Mesopotamichthys sharpeyi* (as *Barbus sharpeyi*) by Balasem *et al.* (2003), Al-Saadi (2007) and Al-Saadi *et al.* (2010), *Mystus pelusius* (also as *Mystus halepensis*) by Ali *et al.* (1988a) and Al-Jadoaa (2002), *Planiliza abu* (also as *Liza abu*) by Ali *et al.* (1987), Abdullah (1990), Balasem *et al.* (1993), Mhaisen and Abul-Eis (1993), Al-Shaikh *et al.* (1995), Adday *et al.* (1999), Asmar *et al.* (1999), Mhaisen *et al.* (1999), Al-Nasiri (2000), Al-Jadoaa (2002), Balasem *et al.* (2002a, 2002b), Al-Nasiri *et al.* (2003), Al-Rubaie *et al.* (2003), Asmar *et al.* (2003), Balasem *et al.* (2003), Mhaisen *et al.* (2003), Asmar *et al.* (2004), Al-Abbadie (2006), Al-Saadi (2007), Al-

Sa'adi (2007), Al-Zubaidy (2007), Al-Jadoaa (2008), Hussain (2009), Al-Janae'e (2010), Al-Saadi *et al.* (2010, 2011), Al-Salmamy (2015), Mhaisen *et al.* (2015), Al-Musawi (2016), Rasheed (2016), Hammood (2017), Mohammed (2017), Al-Hajimi (2021) and Abbood (2022), *Planiliza subviridis* (as *Liza subviridis*) by Al-Janae'e (2010), *Silurus triostegus* by Shwani (2009), Abdullah and Shwani (2010), Al-Janae'e (2010) and Al-Salmamy (2022) and *Tenualosa ilisha* by Al-Janae'e (2010). It is appropriate to indicate here that Mansor *et al.* (2012) reported *E. sieboldi* from unspecified fish species.

Ergasilus synanceiensis was also reported as *Ergasilus synanceiensis* by Al-Daraji (2002c) However, according to WoRMS (2023), it was considered as a synonym of *E. synanceiensis* Amado, in Amado, da Rocha, Piasecki, Al-Daraji & Mhaisen (2001). It was reported only from *Pseudosynanceia melanostigma* by Amado *et al.* (2001) and Al-Daraji (2002c).

Unidentified *Ergasilus* species were reported from 13 fish species: *Acanthobrama marmid* by Ahmed (2015), *Carasobarbus luteus* (also as *Barbus luteus*) by Al-Daraji (1986), Rashed and Hussain (1988) and Ahmed (2015), *Chondrostoma regium* by Al-Marjan (2016), *Cyprinion macrostomus* by Al-Jadoaa (2002), *Cyprinus carpio* by Al-Hamdane and Azziz (2006), *Heteropneustes fossilis* by Mohamad (1989) and Al-Salim and Mohamad (1993a, b), *Hypophthalmichthys molitrix* by Asmar *et al.* (2004), *Leuciscus vorax* (as *Aspius vorax*) by Al-Daraji (1986), *Mesopotamichthys sharpeyi* (as *Barbus sharpeyi*) by Rashed and Hussain (1988), *Planiliza abu* (as *Liza abu*) by Ali and Shaaban (1984), Al-Daraji (1986), Mehdi (1989), Al-Hadithi *et al.* (1990), Khudhair *et al.* (1992) and Mehdi *et al.* (2009), *Planiliza subviridis* (as *Liza subviridis*) by Piasecki *et al.* (1993), *Silurus triostegus* (as *Parasilurus triostegus*) by Al-Daraji (1986) and *Tenualosa ilisha* by Adday (2013).

Finally, it is appropriate to indicate here that three *Ergasilus* species were considered as synonyms: *Ergasilus irakiensis* Al-Daraji, 2002c, *Ergasilus pararostralis* Al-Daraji, 2002b and *Ergasilus synanceiensis* Al-Daraji, 2002a, are synonyms with *Ergasilus iraquensis* Amado, in Amado, da Rocha, Piasecki, Al-Daraji and Mhaisen, 2001; *Ergasilus pararostralis* Amado, in Amado, da Rocha, Piasecki, Al-Daraji and Mhaisen, 2001 and *Ergasilus synanceiensis* Amado, in Amado, da Rocha, Piasecki, Al-Daraji and Mhaisen, 2001, respectively. according to both GBIF.org (2023) and WoRMS (2023). On the other hand, *Ergasilus amplexens* Dogiel & Akhmerov, 1952,

which was reported from *Planiliza abu* (as *Liza abu*) by Zangana (2008) from Al-Khazir River in Ninevah Province is considered as a synonym of *Dermoergasilus amplexans* (Dogiel and Akhmerov, 1952) according to GBIF.org (2023) and WoRMS (2023). Based on confirmation by Dr. Ju-shey Ho of California State University, Khamees *et al.* (2015) indicated that *Ergasilus ovatus* Shen, 1957, reported by Abdul-Rahman (1999) from *H. fossilis*, *M. mastacembelus* and *S. triostegus* from Garmat Ali River, Basrah Province was erroneously identified as *Ergasilus ovatus* Shen, 1957 and it belongs to *E. ogawai* Kabata, 1992.

Host-parasite list

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

Acanthobrama marmid: *Ergasilus mosulensis*, *E. ogawai*, *E. rostralis*, *E. sieboldi*, *Ergasilus* sp.

Acanthobrama sp. (as *A. centisquama*): *Ergasilus peregrinus*, *E. sieboldi*.

Acanthopagrus arabicus: *Ergasilus mosulensis*, *E. ogawai*, *E. rostralis*, *E. sieboldi*.

Alburnus sellal: *Ergasilus mosulensis*, *E. ogawai*, *E. rostralis*, *E. sieboldi*.

Arabibarbus grypus: *Ergasilus barbi*, *E. peregrinus*, *E. rostralis*, *E. sieboldi*.

Bathygobius fuscus: *Ergasilus boleophthalmi*.

Boleophthalmus dussumieri: *Ergasilus boleophthalmi*, *E. sieboldi*.

Carasobarbus luteus: *Ergasilus barbi*, *E. mosulensis*, *E. ogawai*, *E. peregrinus*, *E. rostralis*, *E. sieboldi*, *Ergasilus* sp.

Carassius auratus: *Ergasilus barbi*, *E. mosulensis*, *E. ogawai*, *E. rostralis*, *E. sieboldi*.

Carassius carassius: *Ergasilus barbi*, *E. mosulensis*, *E. sieboldi*.

Chondrostoma regium: *Ergasilus peregrinus*, *E. sieboldi*, *Ergasilus* sp.

Coptodon zillii: *Ergasilus mosulensis*, *E. ogawai*, *E. rostralis*, *E. sieboldi*.

Ctenopharyngodon idella: *Ergasilus mosulensis*, *E. rostralis*, *E. sieboldi*.

Cyprinion kais: *Ergasilus mosulensis*.

- Cyprinion macrostomus*: *Ergasilus barbi*, *E. mosulensis*, *Ergasilus* sp.
- Cyprinus carpio*: *Ergasilus barbi*, *E. mosulensis*, *E. ogawai*, *E. peregrinus*, *E. rostralis*, *E. sieboldi*, *Ergasilus* sp.
- Garra rufa*: *Ergasilus sieboldi*.
- Glyptothorax steindachneri*: *Ergasilus mosulensis*, *E. peregrinus*.
- Glyptothorax* sp. (as *G. cavia*): *Ergasilus barbi*, *E. mosulensis*.
- Hemiculter leucisculus*: *Ergasilus ogawai*, *E. rostralis*, *E. sieboldi*.
- Heteropneustes fossilis*: *Ergasilus mosulensis*, *E. ogawai*, *E. rostralis*, *E. sieboldi*, *Ergasilus* sp.
- Hypophthalmichthys molitrix*: *Ergasilus mosulensis*, *E. sieboldi*, *Ergasilus* sp.
- Leuciscus vorax*: *Ergasilus barbi*, *E. mosulensis*, *E. ogawai*, *E. peregrinus*, *E. rostralis*, *E. sieboldi*, *Ergasilus* sp.
- Luciobarbus barbulus*: *Ergasilus barbi*, *E. mosulensis*.
- Luciobarbus esocinus*: *Ergasilus barbi*.
- Luciobarbus kersin*: *Ergasilus barbi*.
- Luciobarbus xanthopterus*: *Ergasilus ogawai*, *E. rostralis*, *E. sieboldi*.
- Mastacembelus mastacembelus*: *Ergasilus mosulensis*, *E. ogawai*.
- Mesopotamichthys sharpeyi*: *Ergasilus mosulensis*, *E. peregrinus*, *E. rostralis*, *E. sieboldi*, *Ergasilus* sp.
- Mystus pelusius*: *Ergasilus mosulensis*, *E. ogawai*, *E. rostralis*, *E. sieboldi*.
- Planiliza abu*: *Ergasilus barbi*, *E. mosulensis*, *E. ogawai*, *E. peregrinus*, *E. rostralis*, *E. sieboldi*, *Ergasilus* sp.
- Planiliza subviridis*: *Ergasilus iraquensis*, *E. lizae*, *E. mosulensis*, *E. ogawai*, *E. pararostralis*, *E. rostralis*, *E. sieboldi*, *Ergasilus* sp.
- Pseudosynanceia melanostigma*: *Ergasilus synanceiensis*.
- Silurus glanis*: *Ergasilus barbi*, *E. mosulensis*.
- Silurus triostegus*: *Ergasilus mosulensis*, *E. ogawai*, *E. pararostralis*, *E. rostralis*, *E. sieboldi*, *Ergasilus* sp.
- Squalius lepidus*: *Ergasilus barbi*, *E. mosulensis*.
- Squalius spurius*: *Ergasilus barbi*.
- Tenualosa ilisha*: *Ergasilus ogawai*, *E. rostralis*, *E. sieboldi*, *Ergasilus* sp.

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قوائم مرجعية لأنواع الجنس *Ergasilus* von Nordmann, 1832 (صنف مجدافية الأرجل: عائلة أركاسيليدي) المتطفلة على أسماك العراق

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المستخلص

من خلال مسح 144 من المصادر المعنية بتواجد مجدافيات الأقدام من الجنس *Ergasilus* المتطفلة على أسماك العراق، تبين أن هناك 11 نوعاً، إضافة إلى بعض الأنواع غير المشخصة من هذا الجنس تصيب 38 نوعاً من الأسماك. توزعت الإصابات في الأسماك في أنهار دجلة، الفرات وشط العرب مع بعض روافدها، البحيرات، الأهوار، شبكات الميازل، العديد من أحواض الأسماك والأقفاص العائمة في أجزاء مختلفة من العراق، فضلاً عن المياه البحرية في الخليج العربي. من بين الأسماك المصابة، كانت أسماك البياح الأخضر مصابة بأكبر عدد من أنواع هذا الجنس (ثمانية أنواع)، تلتها أسماك الحمري، الكارب الإعتيادي، الشلك والخشني (سبعة أنواع متطفلة على كل منها)، في حين كانت سبعة أنواع من الأسماك مصابة بنوع واحد فقط من هذه لطفيليات. من بين أنواع هذا الجنس، كان النوع *E. sieboldi* متطفلاً على ما مجموعه 25 نوعاً مختلفاً من هذه الأسماك، في حين تم عزل كل من النوع *E. iraquensis* والنوع *E. lizae* والنوع *E. synanciensis* من نوع واحد فقط من الأسماك المضيفة.

الكلمات المفتاحية: مجدافيات الأقدام، أنواع الجنس *Ergasilus*، غلاصم، التوزيع، أسماك، العراق