

FIRST RECORD OF *TANYMASTIGITES AJJERI* THIÉRY & ROGERS 2022 (CRUSTACEA: BRANCHIOPODA: ANOSTRACA) IN ALGERIA, WITH AN UPDATED CHECKLIST OF ALGERIAN LARGE BRANCHIOPODS

Isslam Chergui^{a, b, c}, Khaled Koulali^{a, b, c}, Abdelhakim Bouzid^{a, b, c} and Boudjéma Samraoui^{b, d}

^aLaboratoire de Bioressources Sahariennes: préservation et valorisation, Faculté des sciences de la nature et de la vie Ouargla, Ouargla, Algeria;

^bLaboratoire de Conservation des Zones Humides, Université 8 Mai 1945 Guelma, Guelma, Algeria;

^cDépartement des Sciences Biologiques, Université de Ouargla, Ouargla, Algeria;

^dDepartment of Biology, University Badji Mokhtar Annaba, Annaba, Algeria

*Corresponding author. Email: charguiislam@yahoo.com

 Isslam Chergui: <https://orcid.org/0009-0003-8095-0806>

 Khaled Koulali: <https://orcid.org/0009-0007-9736-8491>

 Abdelhakim Bouzid: <https://orcid.org/0000-0002-3793-3432>

 Boudjema Samraoui: <https://orcid.org/0000-0002-0608-9021>

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Abstract. This paper documents the presence of *Tanymastigites ajjeri* Thiéry & Rogers 2022, a large branchiopod belonging to the order Anostraca, in Algeria for the first time, representing the second record of the species worldwide since its discovery in Libya in 2022. Specimens were collected in October 2023 from a residual pool (guelta) in the intermittent riverbed of the Wadi Tabakat valley on the Tassili N'Ajjer plateau, following a refilling due to flooding. This discovery not only expands the list of large branchiopods in Algeria to twenty-four species, but also enriches our understanding of the distribution range of the hypothetically microendemic *T. ajjeri*, a species on which little information is currently available, in the Sahara.

INTRODUCTION

Anostraca or fairy shrimps are characterized by an elongated body without a carapace. They have 11 to 19 thoracic segments, each bearing a pair of simple foliaceous limbs, and a pair of stalked eyes. The first antennae are small; however, the second ones are large and modified into claspers in males to hold the females (Dumont and Negrea 2002). They have a thin, flexible exoskeleton and do not have a carapace. They swim ventral side up except when they are feeding by scraping the surfaces to collect algae and other organic materials. They typically feed using filtered particles from the water as they swim (Carlton 2007), albeit some species could be obligate or facultative predators (e.g., Lukić et al. 2018). The order Anostraca includes ten valid families, two of which are extinct and eight are extant (Rogers 2013).

Tanymastigidae is one of the families belonging to the Order Anostraca as recently revised by Weekers et al. (2002) through molecular analysis. It contains two

genera *Tanymastix* Simon 1886 and *Tanymastigites* Brtek 1972. An updated identification key to the species of the genus *Tanymastigites* was provided by Thiéry and Rogers (2022). So far, *Tanymastigites* has six recorded species: *T. perrieri* (Daday 1910) occurs in Tunisia (Gauthier 1928b; Marrone et al. 2016), Morocco (Thiéry 1986a; Roux and Thiéry 1988; Kadi Hamman et al. 2011) and Algeria (Daday 1910; Beladjal et al. 1995a, b; Chergui et al. 2023), *T. mzabica* (Gauthier 1928), which is endemic to the Algerian Sahara (Gauthier 1928a; Beladjal et al. 1995b), *T. cyrenaica* Brtek, 1972 recorded from Libya and Saudi Arabia (Brtek 1972; Thiéry 1996), *T. brteki* Thiéry 1986 from Morocco (Thiéry 1986b), *T. lusitanica* Machado & Sala 2013 from Portugal (Machado and Sala 2013), and, finally, *T. ajjeri* Thiéry and Rogers 2022, the most recent addition to the genus *Tanymastigites* from the Libyan Sahara. *Tanymastigites ajjeri* was described based on specimens collected from a Guelta in Ghât Ouadi Loulou (Jabal Akakus) on the Libyan side of the Tassili N'Ajjer plateau.

In Algeria, there are records of other *Tanymastigites* species, namely, *T. perrieri* and *T. mzabica* (Daday 1910; Gauthier 1928a; Beladjal et al. 1995a, b; Samraoui and Dumont 2002; Samraoui et al. 2006; Thiéry and Rogers 2022; Beladjal and Amarouyache 2023; Chergui et al. 2023). Yet, despite the proximity of Algeria to the Libyan locality of the species, there are no records of *T. ajjeri*. In this study, we report the first record of *Tanymastigites ajjeri* in Algeria, expanding the distributional range of this species to the Algerian territories.

MATERIALS AND METHODS

Tassili N'Ajjer is a high sandstone plateau located on the southeastern side of Algeria–Central Sahara. It has an area of approximately 72.000 km². It contains the Valley of Ihrire, classified as a wetland of international importance in 2001 (Mercier et al. 2012). It has an altitude that ranges from 535 m to 2158 m above sea level. Annual rainfall ranges from 25 mm to 150 mm (Hughes and Hughes 1992). It is characterized by two main seasons: temperate season in between October and April, where temperature ranges from –1 to 35°C, and dry season between May and September, where temperature ranges from 15 to 47°C (Hammiche and Maiza 2006).

The sampling took place on October 13th, 2023 in the locality which is named Intihai by the locals (a series of Gueltas located in Wadi Tabakat) and has the following

GPS coordinates 24°55'N, 8°12'E. The waterbody is located in Wadi Tabakat, approximately 185 km west from the Libyan border. The pool was formed as a result of recent rains. The interrupted water flow through the wadi has led to the formation of residual pools. It is noteworthy that no vegetation was observed in the water body during sampling, which is due to the massive rocks surrounding the area (Figure 1).

The sample was collected using a plankton net with a mesh size of 1 mm. After the collection, the specimens were preserved in 90% ethanol until their taxonomical identification, which was carried out under a microscope using the identification keys and taxonomic drawings from the literature (Machado and Sala 2013; Rogers et al. 2019; Thiéry and Rogers 2022).

RESULTS

Following the morphological examination, two male specimens of *Tanymastigites ajjeri* were identified. The specimens are located approximately 200 km from the location where the species was first discovered.

Compared to similar species such as *Tanymastigites perrieri* and *T. mzabica*, *Tanymastigites ajjeri* differs mainly in the morphology of the proximal antennomere of the second antenna and the medial lamellar process distal lobe. These differences make it easy to distinguish

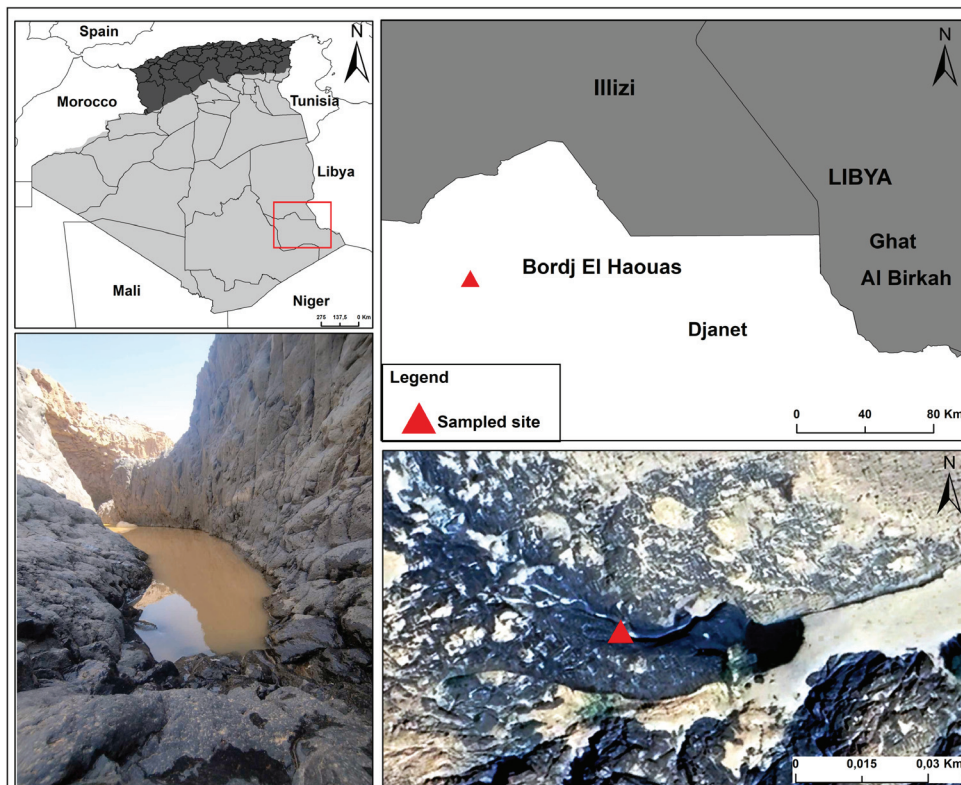


Figure 1. The map and the photograph of the *Tanymastigites ajjeri* sampling location.

it from other congeneric species. Some characteristics of this species are presented in Figure 2. This record increases the number of large branchiopods in Algeria to twenty-five species, including, 17 Anostraca, four Notostraca and four Spinicaudata (Chergui et al. 2023).

Other species of large branchiopods, i.e., the anostracan *Branchipus schaefferi* Fischer von Waldheim, 1834, *Streptocephalus torvicornis* (Waga 1842), the notostracan *Triops granarius* (Lucas 1846) *sensu lato*, and the spinicaudatan *Leptestheria mayeti* (Simon 1885) were recorded in the same location. No information about other co-occurring crustaceans is available, due to the mesh-size of the net used for the samplings.

DISCUSSION

Anostraca is the most diverse group of large branchiopods in Algeria (Beladjal and Amarouyache 2023) and, while *Tanymastigites perrieri* and *T. mzabica* were already recorded to occur in Algeria before (Table 1), *T. ajjeri* is a new record for the country, despite its presence in the neighboring Libya.

Four species of large branchiopods were found to co-occur with *T. ajjeri*. Conversely, no co-occurrence of other large branchiopods was mentioned by Thiéry and Rogers (2022) despite the presence of insects and aquatic snails. This difference may be due to distinct ecological conditions possibly associated with sampling time. In Libya, the species was recorded in January

1990, while in the frame of this study, it was recorded in October 2023, extending the distribution range of this species as well as the list of large branchiopods occurring in Algeria.

The discovery of *T. ajjeri* extends the range of this microendemic Saharan species, which now covers both Libya and Algeria. However, it was detected at the same latitude as the original locality (24° North) and despite extensive sampling in the Algerian Sahara (Chergui et al. 2023), it was found in a single location. This suggests that the species may have a limited geographic range, possibly restricted to the Tassili N'Ajjer region, and a short life cycle, which makes it difficult to find active individuals of the species.

Various factors can limit the distribution of a particular species to a specific location or area, including environmental constraints and habitat specialization. In particular, habitat specialization is one of the most important factors contributing to species endangerment. This is primarily due to the potential risks of habitat loss and fragmentation and the role they play in determining a species' ability to disperse. The degree of populations isolation is directly related to the species' rarity status (Püttker et al. 2013). Here, *T. ajjeri* is documented for the first time in Algeria and for the second time ever. The present study highlights the need for more comprehensive research to expand our knowledge regarding this microendemic Saharan species of significant conservation interest.

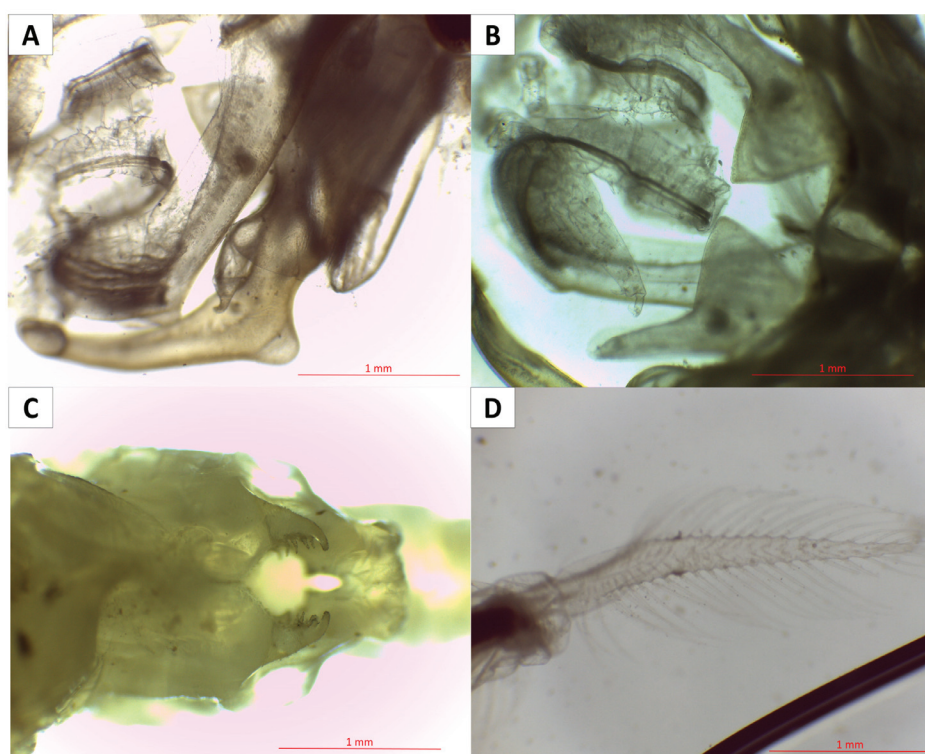


Figure 2. *Tanymastigites ajjeri*. A, male right second antenna; B, male second antenna medial laminar process; C, male gonopods; D, cercopods.

Table 1. Records of large branchiopods from Algeria.

Order and Family	Species	Reference
Order Anostraca Sars 1867 Family Artemiidae Grochowski 1896	<i>Artemia salina</i> (Linnaeus 1758)	Vanhaecke et al. 1987; Zemmouri 1991; Samraoui et al. 2006; Amarouayache et al. 2010; Ghomari et al. 2011; De Los Ríos-Escalante and Amarouayache 2016; Chergui et al. 2023
	<i>Artemia parthenogenetica</i> Bowen & Sterling 1978	Blanchard and Richard 1890; Gauthier 1928b; Beladjal et al. 1995a, b; Amarouayache and Belakri 2015; De Los Ríos-Escalante and Amarouayache 2016
Family Branchinectidae Daday 1910	<i>Branchinecta ferox</i> (Milne-Edwards 1840)	Gauthier 1928b; Ouahioune Rais 2019; Beladjal and Amarouayache 2023
	<i>Branchinecta orientalis</i> Sars 1901	Ouahioune Rais 2019; Beladjal and Amarouayache 2023; Chergui et al. 2023
Family Branchipodidae Baird 1852	<i>Branchipus schaefferi</i> Fischer von Waldheim 1834	Gurney 1909; Daday 1910, 1911; Gauthier 1928a, b, 1930, 1933, 1934b; Beladjal et al. 1995a, b; Ouahioune Rais 2019; Thiéry and Rogers 2022; Beladjal and Amarouayache 2023; Chergui et al. 2023; This study
Family Tanyastigidae Brtek 1972	<i>Tanyastigites mzabica</i> (Gauthier 1928)	Gauthier 1928a; Beladjal et al. 1995a, b;
	<i>Tanyastigites perrieri</i> (Daday 1910)	Daday 1910; Beladjal et al. 1995a, b; Ouahioune Rais 2019; Beladjal and Amarouayache 2023; Chergui et al. 2023
	<i>Tanyastigites ajjeri</i> (Thiéry & Rogers 2022)	This study
	<i>Tanyastix stagnalis</i> (Linnaeus 1758)	Gauthier 1928b; Samraoui and Dumont 2002; Ghaouaci 2018
Family Thamnocephalidae Packard 1883	<i>Phallocryptus spinosus</i> (Milne Edwards 1840)	Gauthier 1928a; Beladjal et al. 1995a, b; Samraoui et al. 2006; Amarouayache 2014; De Los Ríos-Escalante and Amarouayache 2016; Rais and Amarouayache 2018; Chergui et al. 2023
Family Chirocephalidae Daday 1910	<i>Chirocephalus diaphanus</i> Prévost 1803	Simon 1885; Gauthier 1928b, 1934b; Samraoui & Dumont 2002; Samraoui et al. 2006;
	<i>Chirocephalus salinus</i> Daday 1910	Samraoui et al. 2006; Ghaouaci 2018; Nouuiat Boumendjel 2019;
	<i>Chirocephalus sanhadjaensis</i> Boumendjel, Rabet, & Amarouayache 2018	Boumendjel et al. 2018, 2023; Nouuiat Boumendjel 2019;
	<i>Chirocephalus algeriensis</i> Boumendjel, Amarouayache & Bonillo 2023	Boumendjel et al. 2023

Order and Family	Species	Reference
Family Chirocephalidae Daday 1910	<i>Branchinectella media</i> (Schmankewitsch 1873)	Blanchard & Richard 1890; Daday 1910; Gauthier 1928b; Samraoui et al. 2006; De Los Ríos-Escalante and Amarouayache 2016; Rais and Amarouayache 2018; Ouahioune Rais 2019; Chergui et al. 2023
Family Streptocephalidae Daday 1910	<i>Streptocephalus rubricaudatus</i> (Klunzinger 1867)	Simon 1885; Gurney 1909; Daday 1911; Gauthier 1930; Beladjal et al. 1995a, b; Thiéry and Rogers 2022
	<i>Streptocephalus torvicornis</i> (Waga 1842)	Daday 1910; Gauthier 1928b, 1930, 1933; Dumont et al. 1991; Beladjal et al. 1995a,b; Samraoui et al. 2006; Ouahioune Rais 2019; Thiéry and Rogers 2022; Beladjal and Amarouayache 2023; Chergui et al. 2023; This study
Order Notostraca Sars 1867 Family Triopsidae Keilhack 1909	<i>Triops cancriformis</i> (Bosc 1801)	Lucas 1846
	<i>Triops simplex</i> Ghigi 1921	Simon 1885; Blanchard 1891; Gauthier 1928b, 1934a; Samraoui et al. 2006; Korn et al. 2006, 2010; Ouahioune Rais 2019; Thiéry and Rogers 2022; Beladjal and Amarouayache 2023; Chergui et al. 2023
	<i>Triops granarius</i> (Lucas 1864) <i>sensu lato</i>	Gauthier 1933; Ouahioune Rais 2019; Beladjal and Amarouayache 2023; Chergui et al. 2023; This study
	<i>Lepidurus apus lubbocki</i> Brauer 1873	Gurney 1909; Gauthier 1928b; Samraoui and Dumont 2002
Order Spinicaudata Linder 1945 Family Cyzicidae Stebbing 1910	<i>Cyzicus tetracerus</i> (Krynicky 1830)	Lucas 1846; Simon 1885; Gauthier 1934b; Samraoui and Dumont 2002; Samraoui et al. 2006; Ghaouaci 2018
	<i>Cyzicus algericus</i> (Daday 1914)	Daday 1915; Beladjal and Amarouayache 2023;
Family Eocycticidae Schwentner et al. 2020	<i>Eocycticus saharicus</i> (Gauthier 1937)	Chergui et al. 2023
Family Leptestheriidae Daday 1923	<i>Leptestheria mayeti</i> (Simon 1885)	Blanchard 1891; Seurat 1930; Gauthier 1928b, 1930, 1933; Ouahioune Rais 2019; Beladjal and Amarouayache 2023; Chergui et al. 2023; This study

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