

The halophilic fairy shrimp, *Phallocryptus spinosa* (Milne-Edwards, 1840) (Crustacea: Branchiopoda: Anostraca) from southeast, Iran

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Phallocryptus spinosa (Milne-Edwards, 1840) was previously recorded in Iran from a shallow salty pond close to Tabriz, occurring sympatrically with *Branchinecta orientalis* Sars, 1901; Second and third locations were reported from similar habitats in central area and south of Iran from Bafq and Lar, respectively. Here, a fourth population was found during sampling in a pool, about 2000 Km to the south of the first recorded locality. A global distribution map for *P. spinosa* is presented.

The common Lake Urmia branchiopod, *Artemia urmiana* Günther, 1899 was the first described anostracan species from Iran. Later, Brehm (1954) recorded some fairy shrimp species namely *Streptocephalus torvicornis* Waga, 1842 (Brtek, 1974) and *Branchipus schaefferi* Fischer, 1834 under *B. stagnalis* (Belk and Brtek, 1995). Mura and Azari-Takami (2000) reported another three species namely *Chirocephalus skorikovi* Daday, 1913, *Branchinecta orientalis* Sars, 1901 and *P. spinosa* under *Branchinella spinosa* (Milne-Edwards, 1840); in recent years, Atashbar et al., (2009) also reported *P. spinosa* from Bafq and Lar. The unpublished data by Agh and Noori (1997), added parthenogenetic *Artemia* sp. from lagoons around the Lake Urmia to the anostracan fauna of Iran; it was also found in the other localities later on and finally, an exotic species *Artemia franciscana* was introduced artificially to some localities in Iran (Abatzopoulos et al., 2006).

Milne-Edwards (1840) described *P. spinosa* as *Branchipus spinosus*, then Simon (1886) changed the name into *Branchinecta spinosa* but Daday (1910) transferred it to *Branchinella spinosa* and several authors like Gauthier (1933), Linder (1941), Margalef (1953), Cottarelli and Mura (1974), Saadi (1983), Alonso (1985), Mura (1985), Mura and Hadjistephanou (1987), Thiéry (1987), Mura and Del Cado (1993), Vekhoff (1993), Brtek and Thiéry (1995), Alonso (1996), Thiéry (1996), Brendonck and Riddoch (1997), Thiéry and Puff (1998), Hamer (1999), Mura (1999) Mura et al. (1999), Abatzopoulos et al. (1999) Mura and Azari-Takami (2000), Mura (2001), Moscatello et al. (2002), Thiéry and Puente (2002), Ben-Naceur et al. (2009) and Turki and Turki (2010) have used recent name for about one century. Pesta (1921) used it under *Branchinella media* and Rogers (2003) reported *Branchinema aculeata* Wolf as undescribed types deposited at Zoological Museum of Berlin (Forro and Brtek 1984). Rogers (2003 and 2006) revised the genus *Phallocryptus* of the thamocephalidae and categorized the case in this genus.

Subsequent to a sampling from a shallow, salty and temporary pool with a muddy bed and clear water in the vicinity of a solar saltwork in Chabahar, South East Iran (25°16' N, 60°37' E), *Phallocryptus spinosa* (Milne-Edwards, 1840) was found in the fourth locality in Iran. Several male and

female specimens and their eggs were collected in January 2010. These specimens were morphologically agreed with drawings and SEM studies of previous works (Alonso, 1985; Brtek and Mura, 2000; Thiery and Gasc, 1991; Brendonck and Riddoch, 1997; Linder 1941; Thiery, 1996; Rogers, 2003). Drawings of a male and female abdomen (Fig. 1) were carried out using a Camera Lucida fitted on compounded microscope.

The type locality of *P. spinosa* is in Ukraine (Daday, 1910; Linder, 1941; Vekhoff, 1993; Brtek and Thiery, 1995; Ketmaier et al., 2008). Furthermore, this is reported mainly from coastal salt waters of the Mediterranean basin (Thiery, 1996); Spain (Alonso, 1985); Morocco (Thiery, 1986); Algeria (Gauthier, 1928; Samraoui et al., 2006; Amarouayache and Derbal, 2011); Tunisia (Turki and Turki, 2010); France (Thiery and Gasc, 1991); Sardinia and Italy (Tagliasacchi-Masala, 1969; Mura, 1986 and Mura et al., 1999), Cyprus (Mura and Hadjstephanou, 1987); Greece (Abatzopoulos et al., 1999) and through Asian Turkey (Cottarelli and Mura, 1974) and the Black, Caspian and Aral Seas eastwards to Afghanistan and Pakistan (Brtek and Thiery, 1995); Kazakhstan (Belk and Brtek, 1995); Uzbekistan (Ketmaier et al., 2008); Arabian Peninsula (Thiery, 1996); Botswana, south Africa (Brendonck and Riddoch, 1997; Belk and Brtek, 1995) and Iran (Mura and Azari-Takami, 2000). Consequently, due to distribution and extension pattern of this species, mainly along southern half of the Palearctic region (Abatzopoulos et al. 1999; Ketmaier et al., 2008) (Fig. 2), its presence in the vicinity of Gulf of Oman in southeast Iran would not be surprising. Since the closest site to recent locality is Wadi pond at Shaqq, Oman (Thiery, 1996), further investigations on the affinity of these two populations are suggested.

There are several factors involved in dispersal of aquatic animals like water birds and other animals (Samraoui et al., 2006; Thiery and Puff, 1998; Thiery and Gasc, 1991; Figuerola and Green, 2002; Lowcock and Murphy, 1990), rain (Jenkins and Underwood, 1998), men (Reise et al., 1999) and wind (Brendonck and Riddoch 1999). Here, presence of *P. spinosa* in Bafq, Lar and Chabahar Bay coast from Iran and in the Arabian Peninsula, coastal pools of Oman and Afghanistan seems to be related to common migrating invertebrate feeding birds around these areas. Several authors pointed out the migratory routes and feeding habits of flamingoes and other birds of mentioned areas (see Javed et al., 2006; Britton and Johnson, 1987; Scott and Adhami, 2006; Khan, 2006; Ketmaier et al., 2008; Atashbar et al., 2009).

Many researchers have reported *P. spinosa* in co-occurrence with other anostracans (Mura and Azari-Takami, 2000; Samraoui et al., 2006; Thiery and Gasc, 1991; Thiery and Puente 2002; Thiery and Puff 1998; Abatzopoulos et al., 1999; Moscatello et al., 2002 and Brendonck and Riddoch, 1997). More sampling efforts might lead to discover other co-existing anostracans at the reported locations.

Ketmaier et al. (2008) study on phylogeography of *P. spinosa* revealed valuable genetic relationships among sampled populations and in their work, the migratory routes of the greater flamingo on the most spotted areas for the fairy shrimp is considered. But, in this study, Afghanistan, Oman as well as new reported areas from Iran were not included. Therefore, with regard to the presence of common migratory birds, the same molecular work on mentioned areas will be helpful to open up the genetic relationships of *P. spinosa* in these areas and other reported populations.

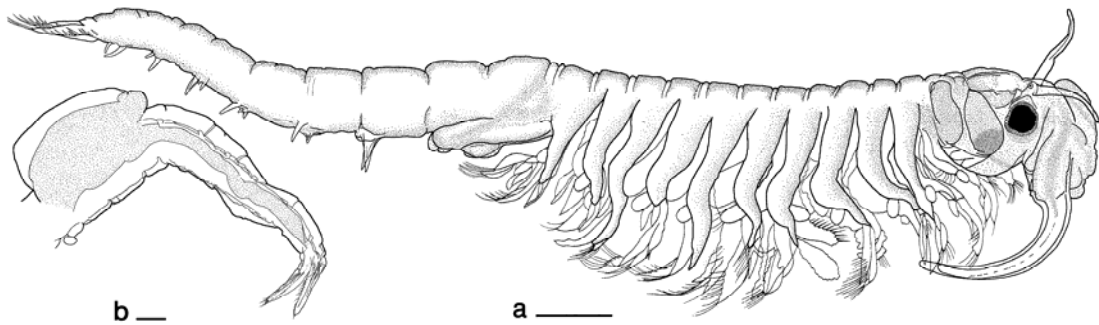


FIGURE 1. a- Side view of a male *Phallocryptus spinosa* and b- female abdomen, scales 1mm.



FIGURE 2. World distribution of *Phallocryptus spinosa*. ■previous world records, ●locality in current study

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