

ORIGINAL ARTICLE

Existence and Ecology of the Burrowing Isopod *Sphaeroma annandalei* Stebbing, 1911 (Crustacea; Isopoda; Sphaeromatidae) in Lake Razzaza, Kerbala Province, Central Iraq

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ABSTRACT

The isopod *Sphaeroma annandalei* is collected and identified from two sites, Razzaza lake and Dalmaj marsh. Description, discrimination between male and female, factors affecting ecology of the lake, habitats of this species in middle of Iraq, and data on populations are provided. The results are discussed with the pertinent literature. Keywords: ecology, burrowing isopod, *Sphaeroma annandalei*, Sphaeromatidae.

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INTRODUCTION

The Razzaza lake, formerly called "Bahr Al Milh", was formed in the 1970s as a second storage reservoir to control floods of the Euphrates [1]. The lakes in central Iraq were saline depressions that were converted to store water for flood control and to support the fish fauna [2]. The lake is with an area of 193,000 ha in the Arabian Desert and East Sahero-Xeric shrublands (PA1303). It is considered as important bird area (IBA Criteria:A1, A2, A3, A4i, and A4iii) and important plant area (IPA Criteria: Av, B1, and C) [3]. The lake now is characterized by very high salinity levels, which have increased during the past fifteen years due to the shortage in water it receives and increased evaporation during Iraq's very dry and hot summers. In addition, there is a canal brings sewage water to the lake resulting in the increase of pollution levels. These extreme ecological conditions leave no enough space for life components diversity.

On the other hand, *Sphaeroma* spp. (Sphaeromatidae) are known to tolerate a wide range of salinity degrees and found in near shore environments such as tide pools, rocks, docks or trees [4], they are also found nestling amongst fouling organisms, within empty barnacle tests, and under rocks [5] Until description of *S. khalijsarsis*[6], the present species was the only recorded species of genus *Sphaeroma*. The aims of this work are to confirm the identity of this crustacean and to define the ecology of the habitat that the organism surviving in.

MATERIALS AND METHODS

Sphaeroma annandalei Stebbingspecimens were collected every 3 months from the period Feb. 2013 to November 2013, at a fixed point (N 32° 38 03' , E 43° 52 53'), in the southeastern shore of Lake Razzaza, Kerbala Province, Central Iraq. The lake situated at (N 32' 41" , E 43' 40"), and altitude of around 30 m asl. The samples were removed by hand from the burrows and micro-tunnels made by them in the fragile shore rocks. At the laboratory, they were placed in a wide container filled with aerated lake water. Another site of collection is the Dalmaj lake shore at (N 32° 06' 291" , E 45° 28' 916") and 17m asl of elevation.

Brief description of the lake: the following brief description depends mainly on [3]. The lake comprises the 2nd largest lake in Iraq. It is located approximately 20 km northwest of Kerbala city. Razzaza Lake is connected to Habbaniya Lake by a narrow canal running through semi-desert, called Sin-Al-Thibban Canal. Razzaza used to be a large, deep lake but it is now characterized by very high salinity levels, which have increased during the past ten years due to the shortage in water it receives and increased evaporation during Iraq's very dry, hot summers. The water levels have declined and the lake now is only 5–10 m deep.

RESULTS AND DISCUSSION

Sphaeroma annandalei Stebbing (Crustacea, Isopoda; Flabellifera; Sphaeromatidae) (figs. 1,2).



Fig. 1: Dorsal view of *Sphaeroma annandalei*

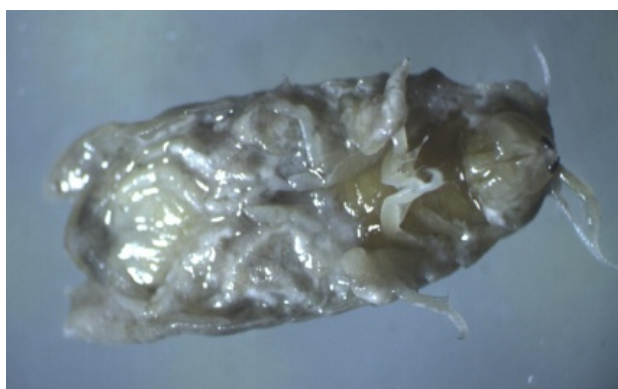


Fig. 2: Ventral view of *Sphaeroma annandalei*

Distribution in Iraq: it was known only from Shatt Al-Arab [7]. The present study extends its distribution northward to Razzaza lake and Dalmaj marsh both about 400km to the north of its first recording site at the extreme south.

Distinctive characters: It has a distinct tuberculation begins on the seventh segment of the pereaeon. At the anterior of the pleon there are two strongly marked submedian tubercles, to the posterior there are two submedian pairs followed by a single median tubercle. On each side, there is a longitudinal row of three tubercles in addition to other lateral ones. Telson apex obtuse. There are two antennae, the first, the longer, with elongate third joint, while the second antenna is short with third joint the shortest. The second maxilla is broad subquadrate. The present material agrees well with the original description of Stebbing [8].

Ecological factors in Razzaza lake: These include:

- 1- Fluctuation of water level: this quantitative factor resulted from the shortage of water input due to closing the channel connected between Al-Habbaniya lake and razzaza lake which constitutes the major water resource of water to the lake. In addition, annual precipitation during recent years was very low and this made the amounts of water provided by desert valleys like Wadi Ubaiedh going down. The wadis at the area constitute relatively small part of water resources for the lake especially during the rainy season.
- 2- Salinity level: this factor seems the most important one that affect the richness of the aquatic biodiversity in this almost closed lake. Levels of salinity during 2008-2010 were double of sea water except for a limited area near that receives a sewage water from Kerbala city mixed with drainage water from farms nearby. Bimonthly analysis of water samples during March 2009 to March 2010

showed that salt content averages 7.86-8.49 % with pH values of 7.8-8.5 for the same period. The areas with high salinity encourage presence of estuarine origin animals such as the barnacle *Balanus amphitrite* *Amphitrite* (Crustacea) and *Corbicula* sp. (Pelecypoda). Only salinity tolerated fish of sea and estuarine origin like *Acanthopagrus berda* could live in the lake with relatively limited number.

- 3- Pollution: the main source of pollution is the sewage channel from Kerbala city. This water is mixed with drainage water of the agricultural areas around Kerbala city. It is also constitutes now the only important water resource for the lake which dilutes or decreases the salinity especially near the connection point with the channel. The noticeable presence of the frog *Rana ridibunda* near this site is an indicator of salinity dilution. The complete effect of pollution on the lake biodiversity is not known for certain and needs more studies.
- 4- Human activities: these activities are rather of minor effect on the ecological situation of the lake. Such activities include fishing and bird hunting. A limited number of motorized and traditional boats are used for either fishing or transport from the shore to the newly emerged islands inside the lake as a result of water level decrease.

Habitats of *S. annadalei*:

The Razzaza lake site: In Razzaza site they live in a muddy fine sandstone that derived from exposed Injana Formation on the eastern rim of the lake. The mentioned formation comprises sandstone, mudstone, claystone, marls, thin limy marlstone and secondary gypsum/anhydrite [3,9]. This result coincides with Davidson [10] who found that *Sphaeroma* spp. individuals create networks of burrows in a variety of intertidal and subtidal substrata including marsh banks (composed of peat, mud, or clay), wood, friable rock (sandstone, mudstone, claystone), Styrofoam floats, and more.

The mean temperature of water during Feb. 2013 is 17°C while in October is 22°C at 12:00 noon. In June it is almost 29°C in the near shore shallow water. The animals make a very complicated network of burrows and micro-tunnels (figs. 3,4) mostly for sheltering and avoiding predators making the rock intensely perforated and friable resulting in formation of large amounts of sand which may contributes in the acceleration of desertification in the area. This is in agreement with [10,11,12,13] who found that *Sphaeroma* spp. are a bioeroding species, capable of accelerating erosion and damaging maritime structures and in some heavily infested Californian marshes, erosion can exceed one meter per year.



Fig. 3: a rock on the shore of Razzaza lake with heavy presence of *S. annadalei*.



Fig. 4: another rock on the shore of Razzaza lake with heavy presence of *S. annadalei*

Another type of habitat for this crustacean is the wood. The presence of wooden pieces near the shore of the lake is rather limited. The effect on the substrate is similar to that in the rocks (figs. 5,6).



Fig. 5: a cross section of a piece of wood with moderate presence of *S. annandalei*.



Fig. 6: another piece of wood with moderate presence of *S. annandalei*.

The Dalmaj marsh site:

In the Dalmaj site, 40 km east of Diwaniya city and 40 km southwest of Kut city, split between Al-Qadissiya and Wasit provinces, Central Iraq, they live in mud sediment that composed of silty clay sediments contain fine sand. These sediments deposited from floodplain of Tigris and Euphrates rivers [9]. Only limited number of specimens were collected from one point at the shore of the marsh.

Further investigations in two sites and other potential sites at different areas of Iraq are needed to get a complete picture of the presence and distribution of this crustacean and to assess its possible role in the erosion in view of the fact that *Sphaeroma* spp. are significant agents of erosion and can have detrimental impacts on the integrity of saltmarsh ecosystems and marine structures

Population: The male specimen has a small penis between pereopods 7. Moreover apendis masculina is the other main difference and the male specimen has an appendix masculina attached the peleopod 2 [14]. The females have shallower and wider heads whereas the males have longer and narrower heads [15].

The number of males and females in the random sample taken from rocks in February 2013 were 559 and 158 respectively. Male measurements are: Length 7.47, range (standard deviation) :4-11 (1.23); Width 3.56, 2-5 (0.64), while for females were L 7.68, 2-5 (1.19); W 3.73, 2.5-5 (0.61). The number of males and females in the random sample taken from wood in October 2013 were 24 and 7 respectively. Male measurements collected on October 2013 were L 6.71, 4-10 (1.61) W 3.23, 2-5 (0.82) while females were L 7.21, 6-8.5 (0.81), W 3.94, 3-4.5 (0.53), the female/male ratio is 3.43. Figs. 7,8,9 and 10 show comparisons between male and female specimens collected in February and October 2013. This may indicates that this crustacean has one season of reproduction during summer (June-August) at which the water temperature reaches 30°C. This conclusion based on the figures given above which show that specimens of February are larger than October specimens, both for males and females, and means that the animal spend the period between the end of reproduction season to the beginning of the next season in feeding, growing of juveniles and maturation.

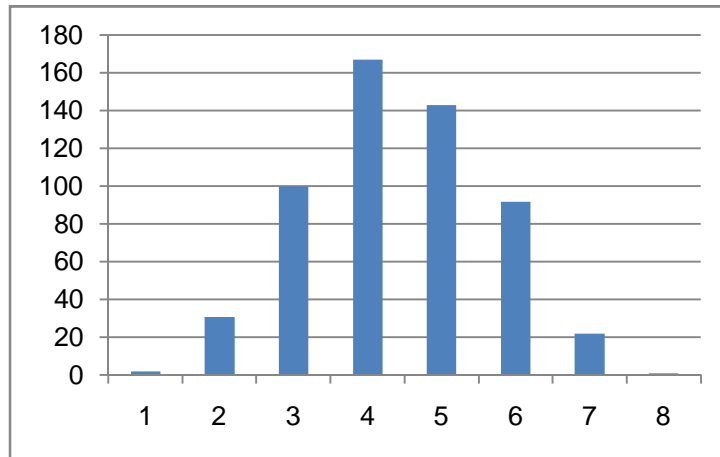


Fig. 7 : *Sphaeroma annandalei*, the length of males collected on February 2013. (1: >5mm, 2: 5->6mm, 3: 6->7mm, 4: 7->8mm, 5: 8->9mm, 6: 9->10mm, 7: 10->11mm, 8: 11mm)

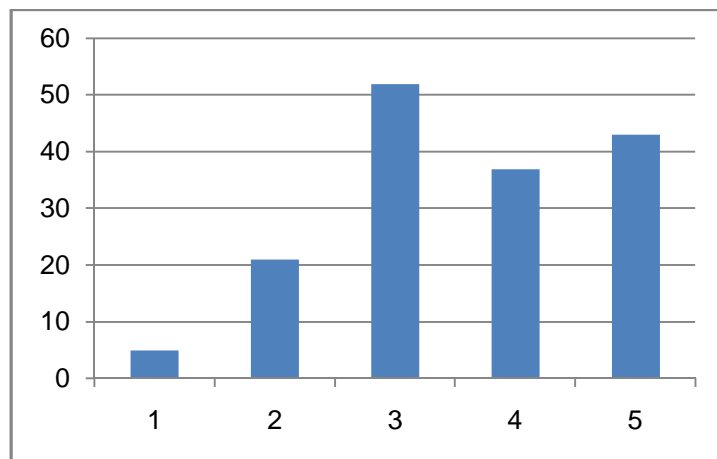


Fig.8: *Sphaeroma annandalei*, the length of females collected on February 2013. (1:5->6mm, 2: 6->7mm, 3: 7->8mm, 4: 8->9mm, 5: 9-10 mm)

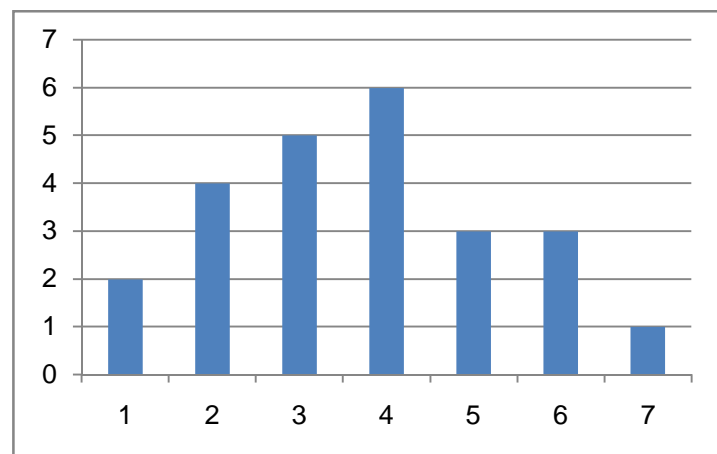


Fig.9: *Sphaeroma annandalei*, the length of males collected on October 2013. (1: <4mm, 2: 5->6mm, 3: 6->7mm, 4: 7->8mm, 5: 8->9mm, 6: 9->10mm, 7: 10mm)

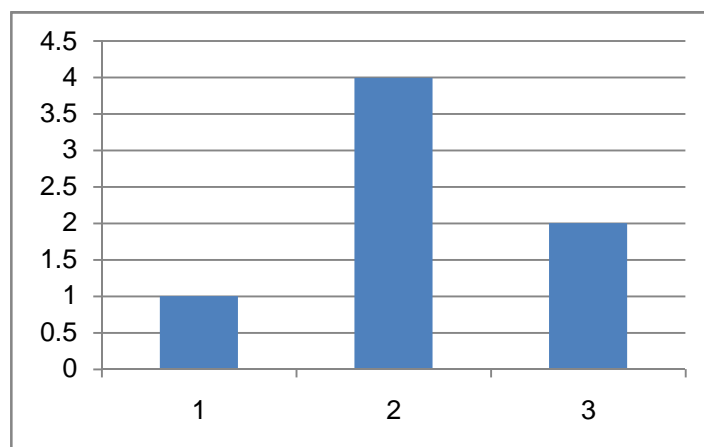


Fig. 10: *Sphaeroma annandalei*, the length of females collected on October 2013.
(1: 6mm, 2: 7mm, 3: 8-8.5mm)

Remarks: the author observed presence of this crustacean within the sandstone rocks of the Razzaza lake shores during the field trips arranged by the Iraq Natural history Research Center and Museum, University of Baghdad since the 70th decade of the last century and he noted its continuous presence up to 1995. He collected many specimens from the shores of the southern part of the lake, but unfortunately that collections were destroyed and lost during the events of Baghdad in April, 2003. Between 2004-2012, many field trips were organized to the area and it was noted that this isopod was absent. This absence was accompanied with remarkable increase in salinity that exceeds sea salinity by twice especially through the period 2006-2010. After that it seems the lake recovered some of its freshwater nature. During 2012 two field trips were arranged to the area without noticing this crustacean, but on February 2013 visit this isopod was noticed in large numbers and its effects on the sandstone shore rocks are observed. It seems that the rocky shores of the lake offer a good habitat for these crustaceans to survive, with rather dense populations, in the core of a desert area.

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