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-Short Communication-

Different salinities effect on biometry of nauplii and meta-nauplii of two *Artemia* (Crustacea; Anostraca) populations from Urmia Lake basin

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The brine shrimp *Artemia* is a small crustacean that can be found in saline waters in all over the world in natural habitats or commercial farms. The brine shrimp is a unique aquatic animal which is used in aquaculture systems (Bengtson & Sorgeloos, 1991). The Urmia Lake is one of the largest hyper-saline lakes in the world with a total surface area between 4750 km^2 and 6100 km^2 (Azari Takami, 1987; Eimanifar & Mohebbi, 2007); this range depends on different seasonal conditions during the year round. The Urmia Lake and its temporary lagoons are territory of three main populations of *Artemia*: *Artemia urmiana* and the two parthenogenetic populations: one of which is occurs in the Urmia Lake and the other in the surrounding lagoons (Abatzopoulos *et al*., 2006).

Two samples cysts of *Artemia urmiana* and the parthenogenetic *Artemia* populations were used for this survey. The cyst of *A. urmiana* was harvested from its natural habitat (the Urmia Lake in 2001) and the parthenogenetic populations cyst had been cultured in industrial lagoons from Fesendooz region, near Miandoab city, in southeast of the Urmia Lake. Cysts batch were hatched in three different salinities (25 ppt, 35 ppt and 45 ppt). After 24h and 48h, 80 nauplii and 80 meta-nauplii were harvested and measured. For statistical analysis, the ANOVA (Tukey test), T-test were used via SPPS 11.5.

All biometrical results are summarized in Table 1. These results show that:

1. In each population different salinities cause biometrical variation ($p<0.05$).
2. In *A. urmiana* the largest biometry of nauplii and meta-nauplii belong to treatment of 25 ppt and the smallest to 45 ppt. The 35 ppt doesn't show significant difference in comparison with other treatments.
3. In the commercial parthenogenetic population, the largest biometry of nauplii was obtained in 25 and 45 ppt and the smallest was belonging to 35 ppt. As well, the largest meta-nauplii were harvested in 25 and 35 ppt and the smallest size in 45 ppt.

In addition biometrical comparisons of larvae prove high significant difference between the two different populations: *A. urmiana* and the parthenogenetic population ($p<0.000$). It means that the larvae of the parthenogenetic population are smaller than those of *A. urmiana*. Generally the largest biometry of larvae in *A. urmiana* and the parthenogenetic population was found in 25

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ppt. Also, the smallest nauplii and meta-nauplii were dependent on 35 and 45 ppt respectively.

The nauplii and meta-nauplii are undoubtedly the most widely used from adult *Artemia* in aquaculture (Dhont & Sorgeloos, 2002), As well, the size of the *Artemia* larvae is one of the most important characters in aquaculture when it is used as live food or bioencapsulation; specially if it used in the early life cycle of aquatic animals. The biometry of nauplii often does not pose a problem to its using by the crustacean larvae. On the other hand, for the fish larvae, especially marine fish this character is essential for feeding because the marine fish larvae have a very small mouth hence the size of the nauplii could be particularly critical (Bengtson & Sorgeloos, 1991). For at least one species, the marine silverside *Menidia menidia*, there is a high relationship between larval fish mortality during the first five days of its life cycle and the nauplii length of *Artemia* which their cysts harvested from seven geographical sources. According to this study when the largest strains of *Artemia* used (nauplii with 520 µm size), up to 50% of the fish could not ingest their prey and starved to death whereas feeding of small *Artemia* (430 µm) resulted in only 10% mortality (Beck & Bengtson, 1982). Therefore, irrespective of the nutrition value of the larvae, the smallest size of nauplii or meta-nauplii is an important character for increasing the quality of the larvae. In conclusion, salinity is a very momentous factor to consider biological characters of *Artemia*. Different salinities can influence the hatching percent (Shams Lahijani *et al*., 2002) and growth rate of *Artemia* during its life cycle (Triantaphyllidis *et al*., 1995; El-Bermawi *et al*., 2004; Abatzopoulos *et al*., 2006b). Moreover, the above-mentioned facts are confirmed by the results of present study because meta-nauplii of each population showing size variety in different salinity treatments (Tab.1). This is indicative of the influence of different concentrations on growth of *Artemia*. The biometry of *Artemia* nauplii (Instar 1) in the two populations show statistical differences when their cyst hatched in disparate salinities. Nowadays, biometry of nauplii is used in addition to the other biometrical tools for taxonomical studies on *Artemia* (Abatzopoulos *et al*., 2006a,b; Castro *et al*., 2006). So, the biometrical differentiation of nauplii in different salinities can be used as an additional character in demographics and taxonomical researches on *Artemia.*

Table 1: Biometry of nauplii and meta-nauplii in *Artemia urmiana* and the commercial parthenogenetic population (all values in mm).

Salinity	Group1 (nauplii)		Group2 (metanauplii)	
	A. urmiana	Parthenogenetic p.	*A. urmiana*	Parthenogenetic p.
25 ppt	503.12 (28.08)ab	446.00 (23.52)a	831.19 (37.72)a	721.06 (40.57)a
35 ppt	484.75 (27.19)a	432.13 (29.91)ab	817.63 (46.83)	714.00 (45.56)b
45 ppt	478.63 (22.35)b	448.56 (24.26)b	812.13 (50.37)a	653.25 (42.14)ab

-same letters in each column show significant difference ($p<0.05$).

As well, the size of nauplii shows a wide variation among different species as well as different strains belonging to same species in *Artemia* (Vanhaecke & Sorgeloos, 1980). According to some studies, there are statistical variations on biometry of nauplii of *Artemia* in different sites from the same geographical location such as Urmia Lake (Abatzopoulos *et al*., 2006a,b). Although biometrical variation in the *Artemia* nauplii has already been reported but this is the first report that elucidates the effect of salinity on the nauplii size. According to aquaculture concepts, the size of nauplii is prominent to use of *Artemia* as live food. However, there is only one optimum salinity to obtain high hatching percent, and the other salinities decrease its percentage. But if the nauplii size of *Artemia* harvested in optimal salinity not being suitable for live food, therefore it is desirable to use a different salinity to harvest nauplii with small size for feeding provided that the decreasing of hatch percentage having economical explanation. In short, it is concluded that the different salinities can affect the growth of *Artemia* embryos during the hatching period to cyst and into the nauplii (Instar 1) stage.

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