Bioécologie

ÉTUDE BIOLOGIQUE ET ÉCOLOGIQUE
DU BRANCHIOPODE ARTEMIA SALINA
DE LA SALINE DE SAHLINE, TUNISIE

par

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Le branchiopode Artemia est le macrozooplancton le plus abondant et le plus adapté aux environnements hostiles (salinité élevée, faible taux d’oxygène, grande exposition aux radiations UV…). Dans ce travail, l’impact du milieu sur la faculté d’adaptation biologique (densité de population, mode de reproduction, nombre de cystes ou de nauplii par femelle, sex-ratio…) d’Artemia salina au niveau de la saline de Sahline (située près de l’aéroport de Monastir en Tunisie) a été étudié. La température, la salinité, le pH, l’oxygène dissous et les sels nutritifs (orthophosphate, nitrée, nitrate et ammonium) de l’eau ont été enregistrés mensuellement entre octobre 2005 et juin 2006. Artemia salina a été observée au niveau du site dans des salinités allant de 77,3 à 276,7 g.L-1 et une température qui varie de 11,7 à 25,2°C. L’analyse des sels nutritifs montre que le nitrate et l’ammonium ont constitué les nutriments les plus abondants durant la période d’investigation. La densité d’Artemia salina au niveau de la saline de Sahline fluctuait entre 1,75 et 169,35 individus par litre. Le sex-ratio a été dominé par les mâles avec un maximum de 1,0,53. L’étude du mode de reproduction a montré que l’oviparité domine l’ovoviviparité durant toute la période du suivi. La fécondité moyenne des femelles étudiées variait de 30,9 à 70,3 cystes par femelle et de 55,3 à 73,3 nauplii par femelle. L’étude de la corrélation entre les paramètres du milieu et le cycle de vie de l’Artemia salina montre une forte corrélation entre la température de l’eau, la salinité et le pH et le mode de reproduction et la fécondité des femelles, alors que la densité totale d’Artemia salina n’a montrée de corrélation qu’avec le pH et le taux du nitrite.

Mots clés : Artemia salina, éco-biologie, physicochimie, saline de Sahline.

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Studies on the biology and ecology of the branchiopod *Artemia salina* from the Sahline saltwork, Tunisia

Many saline lakes in endorheic basins of arid or subarid regions are very shallow and usually temporary. They are strongly dependent on the hydrological budget, with the result that limnological, ecological and physicochemical parameters have a large interannual variability from one year to another. These lakes are likely to undergo complete desiccation and are rarely permanent. Saline habitats are important natural assets of considerable economic, ecological, scientific and conservation value. Most notably, their unique physical and chemical features and distinctive biota set them apart from other aquatic or semi-aquatic ecosystems. The brine shrimp *Artemia* is a typical halophilic species of brackish, saline and hypersaline waters, found in a variety of harsh environments in many parts of the world. This branchiopod has acquired adaptive mechanisms to survive and evolve in habitats with large and often abrupt fluctuations in salinity, UV irradiation, temperature and oxygen concentration.

In order to provide a better characterization and understanding of the life-cycle of the brine shrimp *Artemia salina*, different ecological and biological parameters were measured monthly between November 2005 and June 2006 in the Sahline saltwork (35°45'58.7"N, 10°46'58.3"E). Three stations were chosen at the extremity of the saltwork, two of which were dried up between July and September. All data were taken in the morning, between 07:00 and 11:00 am. During these visits, water temperature, salinity and pH were measured in situ using a portable multiprobe. Dissolved oxygen concentration was determined following the chemical method of Winkler. Water samples were stored for laboratory analysis of orthophosphate, nitrates, nitrates and ammonium (colorimetric method). *Artemia* samples were collected after filtration of 100 litres of water at each station with plankton net (120 mm mesh size) and fixed *in situ* to determine the *Artemia* population density, expressed as number of individual per 100 litres, and population composition (nauplii, metanauplii, juveniles and adults), expressed as percentage of total number. Sex-ratio, fecundity and type of offspring output were also analysed. The effects of the measured environmental parameters on *Artemia* life cycle were analysed using Pearson’s correlation coefficient (P<0.05) to determine the relationship between them, using the computer program XLSTAT-Pro 7.5.

*Artemia* were present in the site with salinity between 77.3 ± 35.3 and 276.7 ± 15.3 g L⁻¹ and water temperature between 11.7 ± 0.3 and 25.2 ± 0.3°C. The pH ranged from 7.6 ± 0.2 to 8.7 ± 0.1 and dissolved oxygen concentration from 4.0 ± 0.2 to 11.2 ± 0.3 mg L⁻¹. In addition, the nutrient analysis showed that nitrate and ammonium represent the major nutrients. The *Artemia* population density fluctuated between 175 ± 303 and 16935 ± 7031 individuals per 100 litres. The male:female ratio was dominated by the males. *Artemia* from the Sahline saltwork showed variability in fecundity (total offspring and brood size), as well as in the ratio encystment/oviparity. The average individual fecundity fluctuated between 30.9 and 70.3 cysts and between 55.4 and 73.4 nauplii. Pearson’s correlation coefficient shows the existence of relationships between physicochemical parameters and some biological parameters of *Artemia*. The most important of these were between temperature and nauplii percentage ($r_{w} = -0.863$), salinity and adults percentage ($r_{w} = 0.845$), pH and percentage of adults and ovoviviparity ($r_{w} = -0.841$ and 0.760, respectively), and between ammonium concentration and oviparity ($r_{w} = -0.914$). In contrast, no significant relationship was demonstrated between dissolved oxygen and *Artemia* life cycle.

**Key words:** *Artemia salina*, ecobiology, physicochemical parameters, Sahline saltwork.