

Taxonomical study on macroinvertebrates in Ain- Zayanah lagoon. Benghazi-Libya

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Abstract The taxonomical study of macroinvertebrates in Ain Zayana lagoon was shown four phyla: Nematoda, Annelida, Mollusca and Arthropoda, 28 families and 36 genera. Nematoda represent one species and three species of Annelida. Mollusca include eighteen species, three of them belong to Bivalvia and fifteen species to Gastropoda. Arthropoda which include thirteen families, six species of Insecta and eight species of Crustacea.

Keywords: Ain Zayanah, lagoon, Libya, Macroinvertebrates, Phyla.

دراسة تصنيفية للافقاريات الكبيرة في عين زيانة. بنغازي - ليبيا

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المخلص أظهرت الدراسة التصنيفية في بحيرة عين زيانة وجود أربع شعب تتمثل في الديدان الاسطوانية ، والديدان الحلقية ، والرخويات ، ومفصليات الارجل و ثمان وعشرون عائلة وثلاثون جنساً. مثلت الديدان الاسطوانية نوعاً واحداً ، كما وجدت ثلاثة أنواع من الديدان الحلقية ، و كذلك احتوت البحيرة ثمانية عشر نوعاً من الرخويات ثلاثة أنواع منها تنتمي لذوات المصراعين و خمسة عشر نوعاً منها تابعة للبطن قدميات، أما مفصليات الارجل فضممت ثلاث عشرة عائلة منها ستة أنواع من الحشرات وثمانية أنواع من القشريات.

الكلمات المفتاحية: بحيرة، عين زيانة ، ليبيا ، اللافقاريات الكبيرة ، شعب.

Introduction

Lagoon ecosystems are common feature around the Mediterranean southern coasts. Among other features, Libyan costal includes four big coastal lagoon systems: Farwa in the west, while Ain Zayanah, Khalige Al-Bomba lagoon and Ain Al-Ghazalah cove are present in the eastern region of Libya [1], Ain Zayanah being the largest [2]. Several studies have been conducted on the physic-chemical properties of Farwa lagoon [3-5], but only preliminary reports have been presented on Ain Zayanah [6], [2] and [7]. The objective of the present study is to classify and identify macroinvertebrates in Ain Zayanah Lagoon.

2. Materials and methods

2.1 Description of the study area

Ain-Zayanah is located at latitude 32° 06N and longitude at 20° 05E (Fig. 1) is a brackish water lagoon situated about 15 Km east of Benghazi city, covering an area of 50 ha with an average depth of 2 m, 5 Km long and some hundred meter width, It is connected to the sea by a canal made by the overflow of the water from underground springs in the lagoon. The underground springs discharge brackish water of 10% into the lagoon with a capacity of 4.5 m³/sec [2], [1] and [8]. This discharge capacity lowers the lagoon's water salinity giving it a range of 16-28‰. The lagoon water has a temperature range of 14-28°C and a pH of 7.8 [1] and [9].

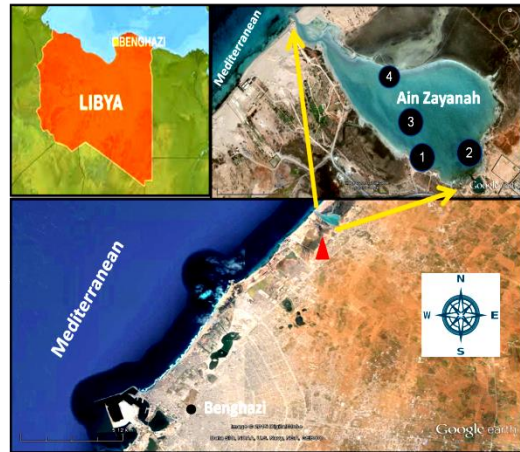


Fig. 1 Shows the location of Ain-Zayanah from Benghazi, Libya and sites for collecting samples.

2.2 Invertebrates samples Samples

of macroinvertebrates were collected from Ain Zayanah Lagoon at four station, Site1 on the southwestern of the lagoon; Site2 on its southeastern nearby the spring; Site 3 on the centre of the Lagoon, and Site 4 on the northwestern of the Lagoon (Fig. 1).

Invertebrate specimens were collected with a simple hand net and kept in plastic box. The samples preserved in bottles containing a 5% formalin solution. These samples separated and examined by binocular microscope (Model Zeiss

and Carl Zeiss) and identified using several taxonomic literature.

3. Results

3.1 Macroinvertebrate Fauna in Ain Zayanah Lagoon

Macroinvertebrates in Ain Zayanah Lagoon are widely distributed (Table 1). They represent four phyla: Nematoda, Annelida, Mollusca, and Arthropoda, comprising 28 families, 36 genera and 29 species. Nematoda includes one species, *Rhabdolaimus aquaticus* which was abundant during the whole period of sampling.

Annelida includes two classes: Polychaeta and Oligochaeta. Polychaeta is represented by two families, includes two species: *Serpula vermicularis* (Linnaeus, 1758), and *Nereis pelagica* (Linnaeus, 1758). One belonging to the class Oligochaeta, *Tubifex* sp. This Lagoon widely inhabited by population of Mollusca. Gastropoda includes 10 families, 12 genera, and 14 species. The most common families are: Trochidae was comprising of abundant species, particularly *Margarites olivaceus* (Dall, 1913), are more abundant than other two species, *Calliostoma nepheloide* (Dall, 1919), and *Gibbula adansoni* (Payraudeau). Truncatellidae species: *Truncatella pulchella* (Pfeiffer, 1839) and *Truncatella subcylindria* (Linnaeus, 1758) are a widely distributed in the spring and summer seasons. Only one species reported as winter visitor *Nassarius mutabilis* (Linnaeus, 1758). On the other hand 1758), *Pseudomnicola confusa* (Ffranefeld) and *Conus mediterraneus* (Bruguère). The Summer-Autumn species are *Bittium attenuatum* (Carpenter, 1864) and *Turritella* spring species, are *Euthria cornea* (Linnaeus,

communis (Risso). Pyramidellidae including *Odostomia altina* (Dall & Bartsch, 1909), *Odostomia killisnooensis* (Dall & Bartsch, 1909) and *Odostomia youngi* (Dall & Bartsch, 1910) collected the whole period of the present study between seaweed, at the coastal line of the Lagoon. *Phytia myosotis* (Draparnaud) collected in winter. Bivalvia includes one family Cardiidae and three species. *Cardium edule* (Linnaeus, 1758), *Cardium fasciatum* (Mont) and *Cardium tubercalatum* (Linnaeus, 1758) have been collected through the whole months of the study period(2000) . Arthropoda inhabiting Ain Zayanah Lagoon is represented by two classes: Crustacea and Insecta (Hexapoda). Crustacea is divided into five important groups: Ostracoda has one species *Condona rawsoni* (Tressler, 1957) which was dominant specimen during all the months of the study. Mysidacea, with one species *Mysis oculata* (Fabricius, 1780). Tanaidacea includes one species *Tanais cavolinii* (Miln-Edwards). Isopoda represented two families: Anthuridae and Sphaeromatidae, *Cyanthura carinata* (Kröyer) (Cleret, 1960) of family Anthuridae is abundant in spring season and *Sphaeroma serratum* (Fabricius) (Lejuez, 1966) of family Sphaeromatidae occurred in all months of study. Amphipoda includes three families: Gammaridae, Orchestiidae and Corophiidae represented by three species *Gammarus locusta* (Linnaeus, 1758), *Orchestia gammarella* (Pallas) and *Corophium volutator* (Pallas 1766). Arthropoda are divided into two groups: Diptera and Coeloptera. Diptera includes two families and two species.

Table 1. Taxa of Macroinvertebrates identified from Ain Zayanah Lagoon

Taxa	References
Nematoda	
Family: Rhabdiasidae	
<i>Rhabdolaimus aquaticus</i>	[10]
Annelida	
Polychaeta	
Family : Serpulidae	
<i>Serpula vermicularis</i> (Linnaeus, 1758).	[11-13]
Family: Nereidae	
<i>Nereis pelagica</i> (Linnaeus, 1758).	[11] and [14-15]
Oligochaeta	[10]
Family: Tubificidae	
<i>Tubifex</i> sp.	
Mollusca	
Gastropoda	
Family : Trochidae	
<i>Calliostoma nepheloide</i> (Dall, 1919).	[16]
<i>Gibbula adansoni</i> (Payraudeau).	[13] and [15]
<i>Margarites olivaceus</i> (Dall, 1913).	[16]
Family: Truncatellidae	
<i>Truncatella pulchella</i> (Pfeiffer, 1839).	[16]
<i>Truncatella subcylindria</i> (Linnaeus, 1758).	[13] and [15]
Family: Cerithidae	
<i>Bittium attenuatum</i> (Carpenter, 1864).	[16]
Family: Turritellidae	
<i>Turritella communis</i> (Risso).	[15]
Family: Nassariidae	
<i>Nassarius mutabilis</i> (Linnaeus, 1758).	[13] and [17]
Family: Buccinide	
<i>Euthria cornea</i> (Linnaeus, 1758).	[17]
Family: Hydrobiidae	
<i>Pseudamnicola confusa</i> (Ffranefeld).	[18]

Family: Conidae	
<i>Conus mediterraneus</i> (Bruguière).	[13 and [17]]
Family: Pyramidellidae	
<i>Odostomia altina</i> (Dall & Bartsch, 1909).	[16]
<i>Odostomia killisnooensis</i> (Dall & Bartsch,1909).	[16]
<i>Odostomia youngi</i> (Dall & Bartsch,1910).	[16]
Family: Ellobiidae	
<i>Phytia myosotis</i> (Draparnaud).	[13] and [18]
Bivalvia	
Family: Cardiidae	
<i>Cardium edule</i> (Linnaeus, 1758).	[13], [15] and [17]
<i>Cardium fasciatum</i> (Mont).	[17]
<i>Cardium tuberculatum</i> (Linnaeus, 1758).	[17]
Arthropoda	
Crustacea	
Ostracoda	
Family: Candonidae	
<i>Condona rawsoni</i> : (Tressler,1957).	[19]
Mysidacea	
Family: Mysidae	
<i>Mysis oculata</i> (Fabricius, 1780).	[20]
Tanaidacea	
Family: Tanaidae	
<i>Tanais cavolinii</i> (Miln-Edwards).	[11]
Isopoda	
Family: Antharidae	
<i>Cyathura carinata</i> (Kröyer) (Cleret, 1960).	[11] and [21]
Family: Sphaeromatidae	
<i>Sphaeroma serratum</i> (Fabricius) (Lejuez, 1966).	[13], [21], [22] and [23]
Amphipoda	
Family: Corophiidae	
<i>Corophium volutator</i> (Pallas).	[15]
Family: Gammaridae	
<i>Gammarus locusta</i> (Linnaeus, 1758).	[14], [15] and [24]
Family: Orchestiidae	
<i>Orchestia gammarella</i> (Pallas).	[13], [15] and [24]
Insecta	
Diptera	
Family: Chironomidae	
<i>Stictochironomus</i> sp (Walker), larvae.	[25]
Family: Syrphidae	
<i>Eristalis</i> sp (Linnaeus, 1758), larvae.	[25]
Coleoptera	
Family: Hydrophilidae	
<i>Chaetartia seminulum</i> , larvae.	[26]
<i>Philydrus</i> sp	[10]
Family: Carabidae	
<i>Pterostichus</i> sp, Larvae.	[25]
Family: Staphylinidae	
<i>Philonthus</i> sp	[27]

Stictochironomus sp. (Walker) belonging to the family chironomidae, and *Eristalis* sp. (Linnaeus, 1758), belonging to the family Syrphidae. The other important group of Insecta belonging to Coleoptera comprise three families: Hydrophilidae, includes two genera: *Chaetartia seminulum* (at a larva stage, and the species *Phidydrus* sp. (an adult specimen. Carabidae has one genera *Pterostichus* sp. Staphylinidae includes one genera, *Philonthus* sp. (at adult stage).

4. Discussion

4.1 Macroinvertebrates in Ain Zayanah

Invertebrates play an important role in the transfer of energy and materials in the aquatic ecosystem. The dominant species in any aquatic ecosystem is a complex of interacting biotic and a biotic factors, where the biotic factors appear to be important in determining the invertebrate

community composition and dynamics as well as the concentration gradient of nutrient and other chemicals in these ecosystem [28]. The benthic macroinvertebrates communities are considered very important in inflecting the quality of water [29]. *Rhabdolaimus aquaticus* is the only nematode species found in Ain Zayanah, however, few reports about this species were collected from dystrophic lakes in the Polish Tatras, especially on muddy regions [30-31]. *Rhabdolaimus* called microbiovore usually found in high density in the sediments of the littoral zone [32]. Abundance of this species in Ain Zayanah is certainly due to the high level of dissolved organic matters and the diversity of microorganisms in the sediment of this lake. The three genera of Annelida, *N. pelagica*, *S. vermicular*, and *Tubifex* sp. were found during the entire study period. Increased nitrates by

microorganisms may affect invertebrates and their production through the maintenance of high quality food [33]. Dissolved nutrients and organic matters accumulating in the soft muddy sediment should be a good source of energy for deposit-feeding benthic invertebrates, including annelids [34-35]. These worms are primarily deposit feeding detritivores [36-38], the method of deposit feeding causes rapid mixing of lake sediment [39]. Tubificids is known to be very tolerant to low oxygen concentration, because the hemoglobin of this genus is saturated with oxygen even at very oxygen tension. Tubificids are known to inhabit pollutant water rich with nutrients [39-42]. The molluscan groups represent the major percentage of macroinvertebrates in Ain Zayanah. The nature of this lagoon which characterized by the abundance of calcium carbonate probably provided the favourable environment for both growth and increase of these animals. Mollusca contain 50% of the total calcium carbonate within their shells and tissues [43]. The activities and the population dynamics of these molluscs therefore, may play a big role in the concentration and the cycling of calcium in this lake. Most species of gastropods of Ain Zayanah were found between sediment and seaweed. This result is in agreement with Doremus and Harman, (1977) [44] and Glazier *et al.*, (1987) [45] who reported the occurrence of these species associated with algal growth, which probably a major food source for these species. The *Cardium* species, however were found associated with fine organic matters in the bottom of the lake [45]. Ostracoda are small bivalved crustacean that live in sediment and vegetation in lakes and streams, some species, however can burrow. into the substratum [39]. The species *Candona* collected from Ain Zayanah having correlated with high alkalinity and calcium ion concentration. The same result given by [19] and [46], where they found that Ostracods deposited calcium carbonate in their shells, and thus many species required hardwater habitat. On the other hand the species, *M. oculata* was collected from Ain Zayanah in January only at daytime and low temperature. This finding is in agreement with Meglitsch, (1972) [47] who reported that this animal was found in the few meters from the bottom of the lakes at daytime, then they swim to the surface at night time as the temperature of water become cooler. Daly and Holmquist [20] mentioned that this species was very important source of food for fishes and shrimps. *T. cavolinii* crustacea was the other species collected in the present required soft materials in the bottom of lakes and between seaweeds [11]. Isopoda are very common groups in Ain Zayanah lagoon where the two species, *C. crainata* was abundant in summer, while *S. serratum* was collected in all months. It lives between seaweed and under stones feeding on organic matters [22], occurrence of *S. serratum* may have been effected by high amount of sewage during the sampling period, resulting in a high decomposition of organic matters, which considered food for isopoda. Two species of Amphipoda were collected from Ain Zayanah

Gammarus locusta and *Orchestia gammarella* were abundant at all months of sampling whereas, *Corophium volutator* was collected during spring and summer months only. The level of hydrogen-ion concentration as well as the water temperature in the lagoon may have been the reason for *C. volutator* to migrate in and out of temporarily submerged area in response to these fluctuating water levels [48]. The drop in water level coincided with an increase of some shallow water animal, in deeper portion of lake. The behaviour of *C. volutator* has already been shown to be affected by light and tides, also it is affected by salinity and it seems to preferred salinity between 10 - 30‰ [49]. Report has shown that this animal emerge at the ebb tide at night, but do not so during day light [49], *C. volutator* is mud-dwelling preferring a substratum which has been maintained under anaerobic condition [50]. Six genera of aquatic and semi-aquatic insects were found in Ain Zayanah, some in the larval stage while the other in adults stage. *Eristalis* sp. and *Stictochironomus* sp. both found living in decaying organic matters, dung, liquid mud, and dirt water of the decayed wet foliage [25]. These larva were found highly specialized and tolerant to many harsh environmental conditions [20] and [51-52]. Chironomids are an important food for many species of fishes and thus form an important trophic link between the microflora and vertebrates. The burrowing and feeding activities of chironomid larvae affect the exchange of nutrients across sediment, water interface, and after sediment stratigraphy. Chironomids have had important role in the lake classification as these species feed on detritus, bacteria, phytoplankton, benthic algae, macrophytes, as well as many small animals [39]. The larvae of family Chironomidae are unusually adapted to their muddy habitat. It is these attributes which allowed the chironomidae to successfully occupy the large diversity of niches in the streams [29]. The genus *Stictochironomus* sp. was found in the Holarctic, Afrotropical, and oriental regions [53-54]. Int Panis *et al.* [55] referred that chironomid species living in the deep sediment had higher [Hb] than surface dwelling species. The hemoglobin gradually releases oxygen when the larvae return to the deeper sediment layers. Hemoglobin will be used to pump oxygen out of poorly oxygenated water. Oxygen consumption by the sediment microorganisms can reduce the amount of oxygen available to chironomid larvae [56]. The occurrence of *Stictochironomus* sp. in Ain Zayanah is probably associated with the increase of water temperature a situation similar to the finding of [57-58] who reported that the increase of temperature is often associated with the growth and activity of this insect. The carabids and staphylinids are an important part of the diet of the fishes in lakes [59]. The species *Pterostichus* sp., and *Philonthus* sp. are not aquatic insects.

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