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FULL LENGTH ARTICLE

First record of *Coolia monotis* Meunier along Alexandria coast – Egypt

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KEYWORDS

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Abstract The distribution and abundance of epiphytic and planktonic *Coolia monotis* Meunier along the Alexandria coast were studied through five annual cycles; from summer 2005 to summer 2010 at four sites: Abu Qir Beach, Stanly, Eastern Harbour and Mex Beach. The morphology of *C. monotis* was characterised by noticeable small size specimens in the E.H., the D.V. diameter is not exceeding 20 μm and width between 10 and 15 μm. On the other hand, the epiphytic specimens showed a normal cell size. The species was most abundant as planktonic form in the E.H., reaching 15.2×10^3 cell l^{-1} during summer 2010. The epiphytic forms showed lower density, with a maximum of 454 cell g^{-1} fwm during autumn 2005, 2006 and summer from 2007 to 2010. The fluctuations of cell abundance of *C. monotis* showed a significant negative correlation with salinity and a weak positive correlation with temperature.

This study represents the first report of *Coolia monotis* Meunier in the Egyptian Mediterranean waters.

Introduction

In recent years, marine epiphytic dinoflagellates have been of growing concern, as most of their species are potentially toxic (Aligizaki et al., 2009). *Coolia monotis* is considered as a potential cause of seafood poisoning (Faust, 1995; Tamiyana et al., 2003; Lenoir et al., 2004). One strain of *C. monotis* was previously reported to produce a toxin named cooliatoxin (Holmes et al. 1995). Other strains of *C. monotis* however have been examined since, but with no toxins detected (Riobó et al., 2004). No toxic activity of *C. monotis* was reported so far in the Mediterranean Sea (Penna et al., 2005; Fraga et al., 2008). *Coolia* was a monospecific genus since the first description by Meunier (1919), with *C. monotis* as the type species. Recently, four new species were added to the *Coolia* genus namely; *C. areolata*, *C. canariensis*, *C. malayensis* and *C. tropicalis* (Faust, 1995; Ten-Hage et al., 2000; Fraga et al., 2008; Leaw et al., 2010). *Coolia* spp. shares their habitat with the ciguatoxic species *Gambierdiscus* Adachi and Fukuyo (Adachi and Fukuyo, 1979; Holmes, 1998; Fraga et al., 2008), *Ostreopsis* Schmidt (Fukuyo, 1981; Besada et al., 1982;

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Aligizaki and Nikolaidis, 2006) and *Prorocentrum* Ehrenberg (Morton et al., 1998; Ten-Hage et al., 2000).

C. monotis is a cosmopolitan species broadly distributed in temperate and tropical seas (Meunier, 1919; Balech, 1956; Dodge, 1982; Faust, 1992; Ten-Hage et al., 2000; Aligizaki et al., 2009). It is observed as an epiphytic species, attached to coral rubble, adhering to sediment or in plankton samples (Fukuyo, 1981; Norris et al., 1985; Faust, 1992; Ten-Hage et al., 2000; Aligizaki et al., 2009).

The species is well documented in the Western Mediterranean Sea both on macrophytes and in the water column (Meunier, 1919; Halim, 1960; Taylor 1979; Tognetto et al., 1995; Vila et al., 2001a, b; Sansoni et al., 2003; Penna et al., 2005; Armi and Turki, 2010). However there are limited records of *C. monotis* occurrence in the Eastern Mediterranean (Aligizaki and Nikolaidis, 2006) and no records to date of its presence in the Egyptian Mediterranean waters.

This study aims to investigate the distribution of *Coolia monotis* Meunier along Alexandria coastal waters in relation to some environmental conditions.

Material and methods

Study area

Four sites along Alexandria coast were surveyed seasonally from summer 2005 to summer 2010. The 4 sites were Mex Beach, Eastern Harbour (E.H.), Stanly and Abu Qir Beach (A.Q.), which represent different environments (Fig. 1).

AQ site is characterised by exposed rocks extending 100 m seaward from the coast. At the western edge the substrate consists of chains of natural rocks surrounded by pools (Ismael, 2012; El-Zayat, 2012). These rocks provide excellent substrata for a rich algal flora. This particular site is subjected to wave action. The Eastern Harbour of Alexandria (E.H.) is a shallow, semi-enclosed embayment covering an area of about 2.8 km^2, located along the central part of Alexandria (Fig. 1). The southern part of the harbour has been reinforced by concrete blocks; the northern side is protected by an artificial breakwater with eastern and western inlets. It is bordered to the east by a land projection, El-Silsila, and to the northwest by a long causeway (El Sayed and Khadr, 1999). El-Mex Bay extends about 15 km between El-Agamy headland to the west and the Western Harbour to the east, with a mean depth of 10 m. An exposed rocky area lies to the east of El-Umum-Drain outlet. As a result, this site is directly affected by the discharge of large volumes of drainage water via El-Umum Drain consisting of agricultural runoff mixed with polluted Lake Mariut overflow. Stanly is a semicircular embayment. The hard substratum is represented by a curved low wall of concrete blocks surrounding a part of the Beach, for protection and covered with sea water most of the time (El-Zayat, 2012).

Sampling and analysis

Macrophyte samples (100 g fresh weight) were hand collected from depths between 0.5 and 1.5 m; afterwards placed in plastic bags and filled to approximately 100 ml with local sea water. Whenever possible, three samples of three different macroalgal patches were collected. Additionally 1 L of sea water was collected from each sampling site for phytoplankton examination. Water temperature was determined *in situ* using digital thermometer HANNA model Hi 96127 and salinity was determined using Salitest HANNA model Hi 9820.

Macrophytes were vigorously shaken in order to detach the epiphytic cells and the water was fixed with 4% formaldehyde. Macrophyte samples were weighed in order to determine their fresh weight (GEOHAB, 2012). Samples were examined for the

Figure 1 Sample sites: (1) Abu Qir, (2) Stanly, (3) Eastern Harbour and (4) Mex Beach.