

On the Presence of *Heterocapsa pygmaea* A.R.Loeb. (*Peridinales*, *Dinophyceae*) in the Northern Levantine Basin (Eastern Mediterranean)

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Abstract: The presence of the dinoflagellate *Heterocapsa pygmaea* A.R.Loeb. in bloom quantity is reported for the first time from Mersin Bay (northern Levantine basin, eastern Mediterranean). Further, it is the only species of the family *Heterocapsaceae* reported from Turkish seas (southern Black Sea, the Sea of Marmara, Aegean Sea, and north-eastern Mediterranean). Our observations on the fine structure of the body scale of the specimen suggested that the scale morphology is identical to that of *H. pygmaea*.

Key Words: *Heterocapsa pygmaea*, bloom, northern Levantine basin.

Kuzey Levantin Baseninde (Doğu Akdeniz) *Heterocapsa pygmaea* A.R.Loebl.'nin (*Peridinales*, *Dinophyceae*) Varlığı Üzerine

Özet: Dinoflagellat *Heterocapsa pygmaea* A.R.Loeb. patlama düzeylerinde ve ilk kez Mersin Körfezi'nde (kuzey Levantin baseni, doğu Akdeniz) bulunurluğu rapor edilmektedir. Ayrıca, Türkiye denizlerinde (güney Karadeniz, Marmara, Ege ve kuzey-doğu Akdeniz) *Heterocapsaceae* familyasına ait rapor edilen ilk ve tek tür kayıdır. Örneğin vücut pullarının (scale) detaylı yapısı üzerine gözlemlerimiz pul morfolojisinin *H. pygmaea*'ninki ile aynı olduğunu göstermiştir.

Anahtar Sözcükler: *H. pygmaea*, patlama, kuzey Levantin baseni.

Introduction

The genus *Heterocapsa* Stein has long been well known as a delicate planktonic dinoflagellate found in neritic zones of oceans. Although it was first isolated by Wilson (1955 in: Loeblich III et al., 1981) as a gymnodinioid-shaped dinoflagellate, *Cachonina* A.R.Loeb. is the final taxonomic junior synonym of the genus (Loeblich III, 1968) after short term designations such as *Glenodinium* Ehrenb. and/or *Gymnodinium* Stein genera (e.g. Dodge & Crawford, 1971, Wilson & Collier, 1972 in: Loeblich et al., 1981).

Heterocapsa pygmaea A.R.Loeb. is one of the most important species of the genus and was identified as sp.

nov. by Loeblich III et al. (1981). *H. pygmaea* has been collected and reported from several areas of the world's oceans and seas and deposited in some culture collections, for example, CCMP1322 (Galveston, Texas USA) 1957; CCMP1490 (Ligurian Sea, Italy) pre-1975; Isolate 515 from Cinnamon Bay, St. Johns, Virgin Islands (Andersen et al., 1997). The species is also observed in samples collected from Florida and Japan. With this finding, we can conclude that the species is distributed along the eastern coast of the USA, in Japanese waters and in the Mediterranean Sea (both in the Ligurian Sea as well as in the northern Levantine basin). Evidence concerning its toxicity has not yet been confirmed.

This study reports the species for the first time from the eastern Mediterranean. Scanning electron microscope photomicrographs as well as transmission electron microscope pictures of the body scales of *H. pygmaea* are provided.

Materials and Methods

Sea water samples were collected from Kazanlı and Adanalıoğlu beaches during a bloom event by the technicians of the Provincial Branch (İçel) of the Ministry of the Environment on 22 August 2001. The location of the sampling site is given in Figure 1. Water samples were preserved with 4% borax-buffered formalin immediately after filling the bottles with sea water. Unfortunately, no surface water temperature or salinity measurements were taken during sampling. We estimated the surface temperature and salinity values to be 28 °C and 34.3 ‰, respectively using the results of a time-series study carried out in Mersin Bay. The surface temperature of the coastal waters in the region varies between 15.2 °C and 30.5 °C throughout the year with the maximum level attained in mid-August. In addition, surface salinity values of shallow coastal waters vary between 37.9 and 39.3 in the region.

Analysis of the thecal plate arrangements using the Fluorescent Brightener 28 (Sigma, F-3543, Lot 20K1578) under a fluorescence microscope is a commonly applied procedure (Frits & Triemer, 1985). For some fragile species, it is also recommended to fix specimens with glutaraldehyde or OsO₄ vapour. However, the tabulations do not vary much among the species of *Heterocapsa*, so additionally the ultrastructure of body scales has to be analysed for species identification. For observation of the body scales, whole mounts were

prepared. To do this, a drop of suspended material was placed on a polyvinyl Formvar coated grid. The cells were then dried and rinsed with distilled water and subsequently stained with 2% aqueous uranyl acetate for 1.5 min. The stained whole mount preparations were then examined on a transmission electron microscope (JEOL JEM1010).

Results and Discussion

When this monospecific bloom occurred along the coast, the ambient water colour turned reddish-brown and cell numbers reached 1.2×10^8 cells l⁻¹. The cells are elongate and more or less flattened dorso-ventrally (see Figure 2). The minimum and maximum length and width measurements for the preserved cells ranged from 9.8 to 15.8 µm and 6.1 to 10.0 µm, respectively. The average cell length (13.4 µm) and width (8.4 µm) measurements fall in the size range of *H. pygmaea* described by Loeblich et al. (1981). The length to width ratio was 1.45-1.5. Plastids seem to be numerous. The nucleus is post-cingular and the theca is fragile. Under a regular light microscope, we were able to observe only the plates 5' and 3a. Plate 2a has a hepta pattern in that it has seven sides and borders 3' and 4' at the anterior part.

In addition to the above observations, we analysed the morphology of the body scales. Photomicrographs of the body scales are shown in Figure 3. Body scales consisted of the basal plate and three-dimensional ornamentations. The basal plate was finely reticulated and circular in outline, about 400 nm in diameter. The scale structure resembled that of the genus *Heterocapsa* due to its triradiate appearance in plan view. However, the basal plate was relatively circular; spines on the plate were shorter than those of *H. circularisquama* T.Horig. Our

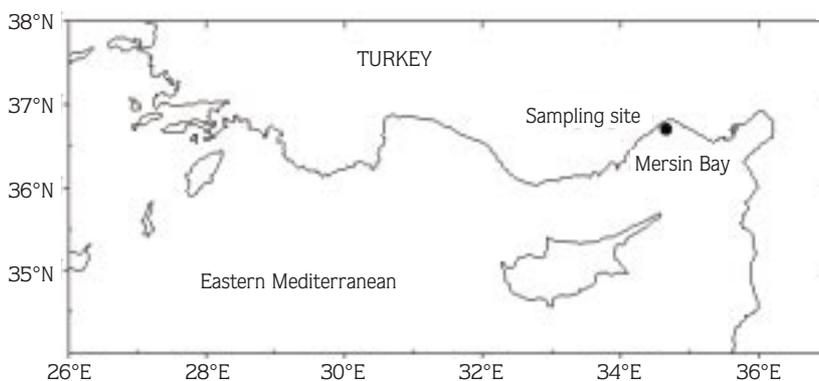


Figure 1. Location of sampling station in the eastern Mediterranean.

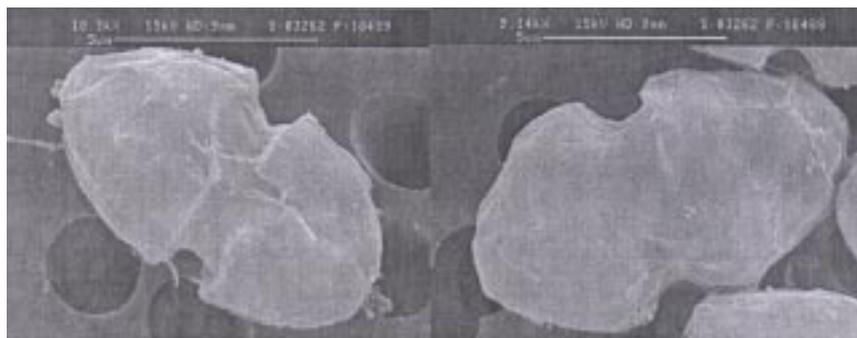


Figure 2. Ventral (left) and dorsal (right) views of *H. pygmaea* collected in Mersin Bay.

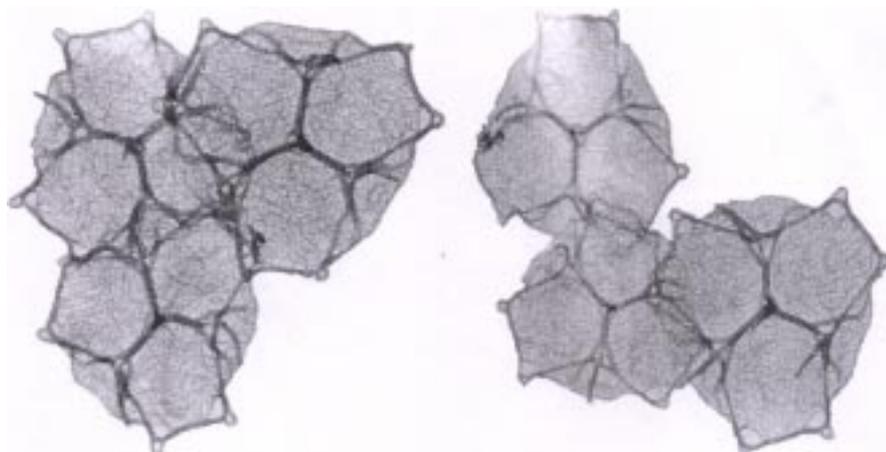


Figure 3. Morphology of body scales of *H. pygmaea* collected in Mersin Bay.

observations on the fine structure of the body scale of the specimen suggested that the scale morphology is identical to that of *H. pygmaea*. This kind of body scale has been reported earlier by Morrill and Loeblich (1981).

Body scales are the cell coverings located just above the plasma membrane and are characteristic for the *Heterocapsa* species (Morrill & Loeblich, 1981). In *Heterocapsa*, seven species, *H. arctica* T.Horig., *H. circularisquama*, *H. triquetra* (Ehrenb.) Stein, *H. niei* (A.R.Loeb.) Morrill & Loeblich, *H. pygmaea* A.R.Loeb., *H. illdefina* Herman & Sweeney and *H. rotundata* (Lohmann) Hansen, have been demonstrated to possess three-dimensional body scales. The scales of species of *Heterocapsa* differ from each other either in morphology or in size (Pennick & Clarke, 1977; Morrill & Loeblich, 1981; Hansen, 1989, 1995; Horiguchi, 1995, 1997). It

is suggested by Horiguchi (1995) that the morphological characteristics of body scales can be used as taxonomic criteria at the species level of dinoflagellates. Twelve kinds of *Heterocapsa* species have been investigated by one of the authors (Iwataki, 2002) so far, including seven described species and five new species, and almost all species are differentiated by the ultrastructure of the body scales.

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