



First record of the tropical scyphomedusa *Phyllorhiza punctata* von Lendenfeld, 1884 (Cnidaria: Rhizostomeae) in the Central Mediterranean Sea

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Abstract

Ephyrae and adult medusae of *Phyllorhiza punctata* were found in 2005 and 2006 in the Ionian Sea, Greece. The youngest ephyrae had a diameter of 1.5 mm and already contained symbiotic zooxanthellae. The biggest medusae, with 45 cm bell diameter, were found in September 2005 in the Bay of Vlyho on the Ionian Island Lefkada. There they occurred simultaneously with ephyrae and young medusae. Adult medusae were also observed in September 2006 in the harbour of Igoumenitsa. In a laboratory maintenance trial, collected ephyrae grew to an umbrella diameter of 4.6 cm in 60 days. This is the first record of a reproducing population of tropical medusae in the Central Mediterranean Sea.

Key words: invasive species, Neobiota, central-mediterranean, tropicalisation, jellyfish

Introduction

Phyllorhiza punctata von Lendenfeld, 1884 (Cnidaria: Scyphozoa: Rhizostomeae) is a tropical jellyfish with a distribution range from Australia to Japan (Heeger et al. 1992). Invasive migrations to several other tropical seas outside its main habitat are recorded (Garcia 1990, Perry et al. 2000, Silveira and Cornelius 2000, Graham et al. 2003, NAS 2006). In the Mediterranean Sea, *P. punctata* medusae have to date only been

recorded for the eastern Levantine province (Galil et al. 1990, Atta 1991). Its morphology is described in detail by v. Lendenfeld (1884, 1888), Mayer (1910) and Kramp (1961); further literature is available for its swimming and foraging behaviour (Garcia and Durbin 1993, D'Ambra et al. 2001), reproduction (Rippingale and Kelly 1995), ephyrae (Tronelone et al. 2002), and its culture in aquaria (Lange and Kaiser 1995). Here we report on the occurrence of a reproducing *P. punctata* population in the central Mediterranean Sea.

Material and Methods

The Bay of Vlyho (N 38°41'04", E 20°42'23") is situated on the east coast of the Ionian Island Lefkada. The small sheltered bay is 1.9 km long and 1.2 km wide, its maximum depth is 7 m, and the bottom is formed by a muddy sediment. Water exchange is provided by the tides through a narrow entrance. The Secchi depth of the seston rich water is 3 to 4 m, salinities vary annually between 34 and 37 psu, whereas the surface water temperature ranges from 13 to 30°C. Observations were made in September 2005 and 2006. Adult medusae were spotted from a boat and collected with a bucket for bell diameter measurements.

Small medusae and ephyrae were collected with a conical plankton net (mouth opening 50 cm, mesh size 200 µm) in horizontal tows between 1 and 4 m depth. Tows were performed with a speed of 1 knot for 10 min in the morning and afternoon.

To confidently identify the ephyrae, four living ephyrae with diameters from 1.5-3.0 mm were brought to Vienna where they were maintained in the Haus des Meeres – Aqua-Terra Zoo Vienna, until they showed post-larval traits. A plankton-kreisel with a diameter of 30 cm was used to suspend the ephyrae in the water (Raskoff et al. 2003). Salinity was kept at 35 psu, water temperature at 24°C and light was provided by fluorescent tubes at 50 µE m⁻² s⁻¹ for 16 h day⁻¹. Nutritionally enriched *Artemia*-nauplii were fed to the medusae twice a day (AF Artemia and DHA-Selco, INVE Inc.); after three hours, uneaten nauplii were flushed out the system and replaced by fresh *Artemia*. Every other day, a ration of frozen cyclopoid copepods (*Cyclop-Eeze*, Sargent Inc.) was supplied to the medusae. The material is deposited in the Museum of Natural History in Vienna. Acquisition number: NHMW-EV-ZOO 19921. 4 specimens. Vlyho Bay, Island of Lefkada, Ionian Sea, Greece. R. Kikinger coll. September 2006.

Results

In September 2005, two big specimens of *Phyllorhiza punctata* were spotted in the Bay of Vlyho. Both medusae had a bell diameter of 45 cm (Figure 1). A single plankton haul yielded more than 20 ephyrae and young medusae up to 1.5 cm. The ephyrae were identified as *P. punctata* by characteristic white warts on the



Figure 1. *Phyllorhiza punctata* together with snorkeler in the Bay of Vlyho (Lefkada, Greece) on September 25 2005. Author: Michael Auer



Figure 2. Juvenile *Phyllorhiza punctata* specimen which was grown from an ephyra from Vlyho Bay (Lefkada, Greece) in 60 days. Umbrella diameter is 4.6 cm. Author: Daniel Abed-Navandi

exumbrella and by the presence of zooxanthellae. The eight lobes had rounded ends. In the centre of the gastrovascular cavity gastric filaments were developed. The manubrium of older ephyrae was elongated and bifurcation of the oral arms became obvious. The ephyrae simultaneously occurred with the large specimens, which were several months old based on their size. Seawater temperature was 23°C at the bottom (6.7 m depth) and 25°C at the surface.

In September 2006, nine further plankton hauls yielded 27 *P. punctata* ephyrae from 1.5 to 3.0 mm diameter. All of them contained zooxanthellae; the larger ones had warts on their exumbrella. This time no adult *P. punctata* medusae were found in the bay, however, adult *P. punctata* specimens were present in the harbour of

Igoumenitsa. More than 50 specimens were swimming near the sea surface where they were aggregated with drifting sea grass. Their bell diameters were estimated from 5 to 30 cm.

The four ephyrae which were subjected to the maintenance trial displayed numerous white dots on the umbrella and developed the moutharm system within 20 days. After 60 days the largest medusa reached a diameter of 4.6 cm and developed all morphological attributes characteristic for *P. punctata* (Figure 2).

Discussion

It is unknown how the tropical jellyfish *Phyllorhiza punctata* invaded the Mediterranean Sea. The records from the eastern Levantine province suggest entry from the Red Sea through the Suez Canal (Galil 1990, Jarms 2003), whether by drift or transported by vessels (ephyrae with ballast water, scyphistomae attached to hulls). Long-distance ferry boats frequent the harbour of Igoumenitsa, where the highest number of *P. punctata* was found. Nothing is known about *P. punctata*'s life history in the Mediterranean Sea. The semi-enclosed Bay of Vlyho hosts a stationary population of *Cotylorhiza tuberculata* (Cnidaria: Rhizostomeae) with a seasonal life-cycle (Kikinger 1992). *P. punctata* has apparently occurred there for a number of years as well (pers. comm. R.K. by local fishermen). According to the fishermen, young *P. punctata* medusae appear in autumn, big specimens can be seen during the winter months, and they vanish at the latest in April and May. This life history could be explained by strobilation in September, which was confirmed by the presence of young ephyrae in the plankton samples from September 2005 and 2006. The two big *P. punctata* specimens found in September 2005 probably reflect unusual strobilation in spring or an exceptionally long life span. The size distribution of *P. punctata* medusae in the harbour of Igoumenitsa in September 2006, however, is in contradiction to this life-cycle theory for the Bay population. Future observations will show whether *Phyllorhiza punctata* can establish stable populations in its new habitats and whether, over the long term, it will contribute to the further tropicalisation of the Mediterranean fauna.

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