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Short Communication

An established population of the alien sea slug *Elysia grandifolia* Kelaart, 1858 (Mollusca, Opisthobranchia, Elysiidae) off the Mediterranean coast of Israel

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Abstract

The alien sacoglossan opisthobranch *Elysia grandifolia*, first recorded in the Levantine basin, eastern Mediterranean Sea, in 2001, has established a flourishing population along the Mediterranean coast of Israel. In August 2012 large numbers were observed on bryopsidacean-covered rocky outcrops off the central Mediterranean coast of Israel. Pairs of specimens and clusters of several individuals with extended penes may be copulatory aggregations.

Key words: *Elysia grandifolia*; Mollusca; Opisthobranchia; Bryopsidaceae; Mediterranean; invasive alien

Introduction

Elysia grandifolia Kelaart, 1858 has a wide distribution in the Indo-West Pacific Ocean, (Kelaart 1858; O'Donoghue 1932; Carlson and Hoff 1978; Jensen 1992). The species was first recorded in the Mediterranean Sea in September 2001, from Uç Adalar, Antalya, Turkey, where it was subsequently recorded in August 2003 and June 2004 (Yokeş and Rudman 2004; Yokeş 2005). In September 2005 a specimen was photographed off Nahariya, Israel, in 22 m depth (Firer 2005), and several specimens were reported from Akhziv, north of the town of Nahariya, the following month (Halevy 2005). In October 2009, a specimen was photographed off Tel Aviv (Kanzen 2009). The records from Israel, Lebanon (Yokes and Rudman 2004) and Turkey confirm that a self-sustaining population of *E. grandifolia* exists in the Levantine Basin of the Mediterranean Sea. Over the past five years the population of *E. grandifolia* along the Israeli coast was observed to have greatly increased its abundance and spread.

Material and methods

Large numbers of *E. grandifolia* were noted by the senior author (GP) on rocky outcrops 200 m offshore off the central Mediterranean coast of Israel. Two specimens (approximately 8 and 5 cm length alive) were collected at Mikhmoret (Israel), 32.414526N, 34.8687E, on 13 August, 2012, at a depth of 2.5 m on a rocky ledge densely covered with delicately branching alga. The specimens are deposited in the National Collections, Tel Aviv University (TAU Mo-76490). The alga was not preserved.

Results and discussion

Both specimens were leaf green in color with conspicuous black spots, their large, thin, frilled parapodia were bordered in submarginal carrot-orange and marginal black bands, their rhinophores distally orange and blue (Figure 1). It bears noting that sightings of the species in the Mediterranean, both in Israel and Turkey, occur in the summer months (June – October).

Figure 1. *Elysia grandifolia* Kelaart, 1857 specimen, 8 cm long, collected off Mikhmoret, Israel, August 2012, by G. Pasternak. Photo: Bella Galil.

Figure 2. *Elysia grandifolia* Kelaart, 1857 Same specimen with extended penis. Photo: Bella Galil.

Jensen (1992, 2009: 221) discussed the "confused state of the *Elysia* species with black and orange marginal band on the parapodia", especially the similarity of *E. grandifolia* to the circumtropical *E. ornata* (Swainson, 1840). The size of the Levantine specimens, the thin, expanded wing-like parapodia and their color pattern, places them with the latter species, though resolution awaits clarification by molecular means.

The specimens collected were observed to arrange themselves facing in opposite directions with their penes extended (Figure 2), holding position for several minutes. Pairs of specimens and tight groupings of several individuals were previously observed at sea, the latter may be copulatory aggregations. *Elysia* species are simultaneous hermaphrodites and possess complex reproductive systems for internal cross-fertilization (Reid 1964; Jensen 1986, 1999; Schmitt et al 2007), they typically donate and receive sperm reciprocally in a head-to-tail position. Hypodermic insemination, in which sperm is injected through the partner's body surface, is widespread, and can be unilateral or bilateral.

Though identification of the alga requires microscopic investigation and reproductive organs, it is clearly a bryopsidacean, possibly *Bryopsis* J.V. Lamouroux, 1809, *Pseudobryopsis* Berthold in Oltmanns, 1904, or *Trichosolen* Montagne, 1861 (Verlaque, pers. comm.). Jensen (2001) mentioned that Indian specimens, tentatively identified as *E. grandifolia,* had been collected from *Bryopsis*. Indeed, the trophic associations between *Elysia* spp and Bryopsidaceae have been established through extensive feeding preference experiments (Trowbridge et al 2010).

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