

First record of the Alien sea slug *Elysia grandifolia* Kelaart, 1858 (Mollusca, Opisthobranchia, Elysiidae) in the Iskenderun Bay

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Abstract. This paper presents the first report of *Elysia grandifolia* Kelaart, 1858 in the Iskenderun Bay (the northeast end of the Levantine Sea (EM), the southeastern coast of Turkey). It is also, the second record of *E. grandifolia* in the Turkish Levantine coast.

Key words: *Elysia grandifolia*, Alien species, Mollusca, Iskenderun Bay, Levantine Sea, Turkey.

The alien Sacoglossan Opisthobranchia *Elysia grandifolia* Kelaart, 1858 was first reported in the Mediterranean in Uç Adalar, Antalya (Turkey) in 2001 (Yokes 2001); and subsequently reported from the same location in August 2003 and June 2004 (Yokes & Rudman 2004, Yokes 2005). Later on, several specimens were found along the Israeli coasts in September 2005, October 2009, and August, 2012 (Pasternak & Galil 2012) on the Lebanese coasts in 2013 (Crocetta et al. 2013).

The southern coast of Turkey, where Iskenderun Bay is located has been invaded by the Red Sea species which moved to the Mediterranean with the opening of the Suez Canal (Çınar et al. 2011).

Many alien species, mostly of the Red Sea origin were recorded in the Iskenderun Bay, among these species; the molluscs constitute the largest group (Çınar et al. 2011, Bakır et al. 2012, Öztürk et al. 2015).

E. grandifolia, although detected in the Iskenderun Bay in 2006, was not reported until now; consequently this article presents the first report of the *E. grandifolia* in this locality.

In a benthic survey in the Yumurtalik (Iskenderun Bay) (36°44' N 35°37' E) on 29 August 2006, two *E. grandifolia* species were encountered on a rocky surface at a depth of 5 m from sea level (Fig. 1), since there was no underwater camera available, one of the specie was taken out of water by putting it in a sample box and photographed in a Petri dish and thereafter was released back to the location where it was caught.

Later, on 03 September, 2011, another species was encountered at Cevlik coast (Keldag), (35°57' N 35°55' E), on a rocky habitat at a depth of 7 m from sea level (Fig. 2). Thereafter, a systematic ecological monitoring was conducted between 2012 and 2013, in which the species was observed several times in the Iskenderun Bay. These observations indicate that *E. grandifolia* is expanding its distribution to the northeastward Levantine Sea successfully (Fig. 3).

One of the specimens was sampled and fixed in 70% ethanol which was deposited in the collection of Dr. C. Çevik, with catalogue number CSFM-GAS/13-10 at Çukurova University, Faculty of Fisheries, Adana, Turkey.

E. grandifolia that was first detected and photographed in the Mediterranean in 2001, after examining its morphological and color characteristics; it was reported that it might be *Elysia ornata* (Swainson, 1840). To further ascertain the species, its photograph was sent to Bill Rudmann for confirmation (Yokes 2001).

Rudman confirmed that the specimen was *E. grandifolia*, although he stated clearly that *E. ornata* and *E. grandifolia*



Figure 1. Dorsal view of *Elysia grandifolia* [Photo: Cem Çevik]



Figure 2. *Elysia grandifolia* from Cevlik coast (Keldag) (TL; 5 cm) [Photo: Cemal Turan]

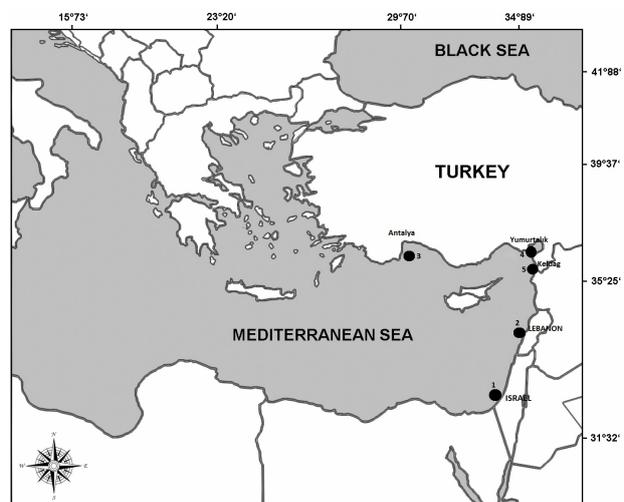


Figure 3. Locations for the reports of *Elysia grandifolia* in the Levantine Sea. Black circle (numbers) indicate location of the migration.

were similar to each other and that they might even be the same species.

Jensen (1992, 2001 and 2009) also reported the similarities between the two above mentioned species and the existence of some confusion in their classification. However, the author underlined that *E. grandifolia* is larger than *E. ornata*, having parapodia larger and thicker, and with black and orange bands at the edge, not separated by a white band. Based on this information, the species detected in the Mediterranean in 2001 were identified as *E. grandifolia*.

The species collected and observed in this study were similar to those reported from Antalya, Turkey and Israel coast by Yokes & Rudman (2004) and Pasternak & Galil (2012).

Examination of these species showed that it had a green body with black spots, large and extremely thin, with parapodia having black and orange parapodial margins and orange bands at the edge, being separated by a white band. This findings and previous studies support the conclusion that the species encountered in the Iskenderun Bay was *E. grandifolia*.

It can be clearly stated that *E. grandifolia*, entered the Iskenderun Bay via the Suez Canal, and established its population on the Israeli and Lebanon coasts, and later moved to the Turkish Levantine coast, which led to its first report in the Iskenderun Bay. Since *E. grandifolia* was reported first from the Antalya Bay (Levantine coast of Turkey) which is a location relatively far from the Suez Canal, it can be assume that this species was possibly overlooked during the intensive monitoring studies performed in the Iskenderun Bay.

The report of *E. grandifolia* in the Iskenderun Bay increases the number of recorded alien molluscs to 78 species, and the number of Opisthobranch molluscs to 12, respectively.

Due to the hydrographical characteristics of the Iskenderun Bay, its location to the Suez Canal and its intensive maritime traffic, it can be expected that the entrance of species especially of Red Sea origin would continue. Moreover, the opening of the canal parallel to the Suez Canal which is currently under construction by the Egyptian government will probably increase the speed of

entrance of alien species to the Mediterranean. As a result, a continuous monitoring study in the Iskenderun Bay and keeping track of the effects of alien species on local biota is critically recommended.

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References

- Bakır, B.B., Öztürk, B., Doğan A., Önen, M. (2012): Mollusc fauna of Iskenderun Bay with a checklist of the region. Turkish Journal of Fisheries and Aquatic Sciences 12: 171-184.
- Crocetta, F., Zibrowius, H., Bitar, G., Templado, J., Oliverio, M. (2013): Biogeographical homogeneity in the eastern Mediterranean Sea - I: The Opisthobranchs (Mollusca: Gastropoda) from Lebanon. Mediterranean Marine Science 14(2): 403-408.
- Çınar, M.E., Bilecenoglu, M., Öztürk, B., Kayağan, T., Yokes, M.B., Aysel, V., Dağlı, E., Açıık, S., Özcan T., Erdoğan, H. (2011): An updated review of alien species on the coasts of Turkey. Mediterranean Marine Science 12: 257-315.
- Jensen, K.R. (1992): Anatomy of some Indo-Pacific Elysiidae (Opisthobranchia: Sacoglossa (=Ascoglossa)), with a discussion of the generic division and phylogeny. Journal of Molluscan Studies 58: 257-296.
- Jensen, K.R. (2001): *Elysia ornata* and *E. grandifolia*. Sea Slug Forum. Australian Museum, Sydney. <http://www.seaslug_forum.net/find/5727>, accessed at: 2015.06.20.
- Jensen, K.R. (2009): Sacoglossa (Mollusca: Gastropoda: Opisthobranchia) from Singapore. Raffles Bulletin of Zoology Suppl. 22: 207-223.
- Öztürk, B., Doğan, A., Bitlis-Bakır, B., Salman, A. (2014): Marine molluscs of the Turkish coasts: an updated checklist. Turkish Journal of Zoology 38: 832-879.
- Pasternak, G., Galil, B.S. (2012): An established population of the alien sea slug *Elysia grandifolia* Kelaart, 1858 (Mollusca, Opisthobranchia, Elysiidae) off the Mediterranean coast of Israel. BioInvasions Records 1(3): 221-223.
- Yokes, B. (2001): *Elysia ornata?* from Turkey. Sea Slug Forum. Australian Museum, Sydney. <<http://www.seaslugforum.net/find/5676>>, accessed at: 2015.06.20.
- Yokes, B., Rudman, W.B. (2004): Lessepsian Opisthobranchs from southwestern coast of Turkey; Five new records for Mediterranean. Rapport Commission International pour l'explorationscientifique de la Mer Méditerranee 37: 557.
- Yokes, B. (2005): *Elysia grandifolia?* from Mediterranean Israel. Sea Slug Forum. Australian Museum, Sydney. <<http://www.seaslugforum.net/find/15019>>, accessed at: 2015.06.20.