

Short communication

Occurrence of the alien sea hare *Aplysia dactylomela* Rang, 1828 (Opisthobranchia, Aplysiidae) in Israel

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Received: 8 November 2010 / Accepted: 17 November 2010 / Published online: 22 November 2010

Abstract

The alien sea hare *Aplysia dactylomela*, established in the central and eastern Mediterranean, is recorded for the first time from Israel on the basis of two specimens photographed at Akhziv, northern Israel. A map of its spread in the Mediterranean Sea is supplied. The species is able to sequester secondary metabolites from its algal diet, mobilize them into its skin and digestive gland, and convert photosynthetic pigments into chemical deterrents. The role of anti-predatory defense in the invasion success of *A. dactylomela* remains to be studied.

Key words: *Aplysia dactylomela*, Mollusca, Opisthobranchia, Mediterranean, invasive alien

Two specimens of *Aplysia dactylomela* Rang, 1828 (approximately 20 and 12 cm length alive) were recorded and photographed at the head of the Akhziv submarine canyon (Israel), 33°3'38"N 35°5'31"E, on 25 September, 2010, at a depth of 10 m on a rocky ledge sparsely covered with algae, next to specimens of *Conomurex persicus* Swainson, 1821 – a well established invasive strombid gastropod. Both specimens were pale in color with conspicuous black rings and a web of fine black lines (Figure 1). Akhziv submarine canyon is one of the most popular dive sites along the Mediterranean coast of Israel and it is doubtful that a conspicuously patterned, slow moving and large mollusk would have escaped attention had it been present earlier. It is therefore assumed that *A. dactylomela* is a recent addition to the fast expanding list of alien biota off the Israeli coast (Galil 2007).

Aplysia dactylomela has a circumglobal distribution in shallow tropical and warm temperate waters, including the Red Sea (Eales 1960; Bebbington 1974, 1977; Dekker and Orlin 2000). The species was first recorded in the Mediterranean Sea in 2002, from Lampedusa Island, but has since spread to Sicily, Calabria and the Gulf of Taranto (Trainito 2003; Scuderi and Russo 2005; Greco 2006; Crocetta and

Colamonaco 2008; Crocetta et al 2009). In the summer of 2004 it was sighted in Girne, on the northern coast of Cyprus (Yokeş 2005), and a year later in Akrotiri on the southern coast (Cooke 2005). It may have been present as early as 2004 along the Mediterranean coast of Turkey (Yokes 2005), but the first live specimen was collected in 2005 off Meydankoy, near the border with Syria (Çinar et al. 2006). It has since expanded along the Mediterranean coast of Turkey and is commonly found from the Gulf of Iskenderun to Kaş (Yokeş 2006, 2009; Yokeş et al. 2010). In 2005 it was recorded both off Rhodes and in Messiniakos Gulf, Greece (Sterniuk-Gronek 2005; David 2005), in 2006 off Chania, Crete, Paros Island and the Gulf of Saronikos (Andersson 2006; Zenetos et al. 2007), and in 2007 off Kalamaki, Zakynthos (Jaux 2007). In 2006 the species was recorded off Sušac and Mljet islands, Croatia (Turk 2006; Despalatović et al. 2008). In 2008 a specimen was photographed off Cirkewwa, Malta (Schembri 2008) (Figure 2, Appendix 1). The species occurs west and east of the Mediterranean: along the central African coast, Cape Verde, Canary and Madeira islands and in the Red Sea. As its distribution has limited to the central and eastern basins, it may have an Indo-

Figure 1. *Aplysia dactylomela* Rang, 1828 specimens photographed at Akhziv, Israel, September 2010, by G. Pasternak. Specimens 20 and 12 cm long.

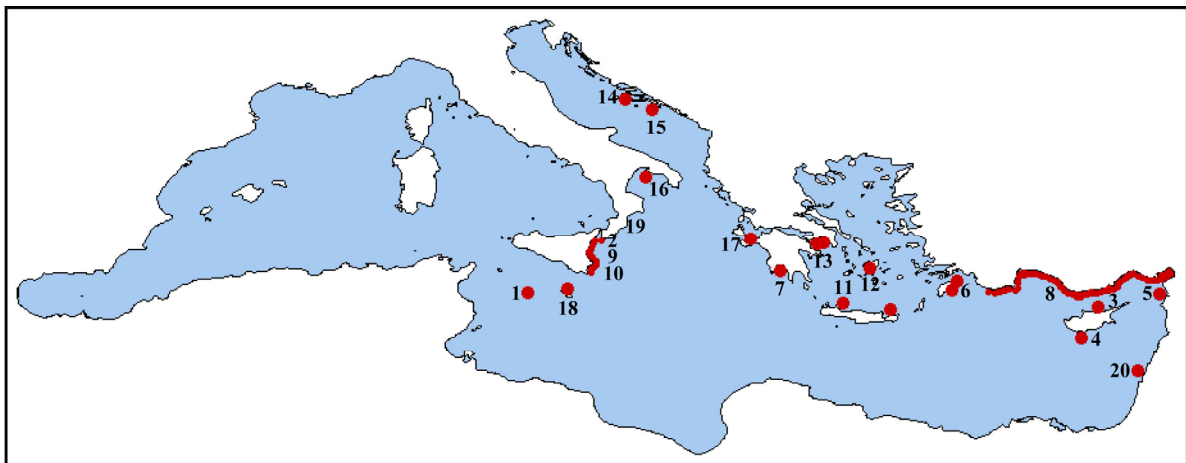


Figure 2. Map of records of *Aplysia dactylomela* Rang, 1828 in the Mediterranean Sea (for details see Appendix 1).

Pacific origin. The provenance of the Mediterranean population of *A. dactylomela* is unclear (Rudman 2005) and awaits clarification by molecular means.

Chemically mediated interactions play an important role in the life history of aplysiid opithobranchs (Derby 2007; Nusbaum and Derby 2010; Sammarco and Coll 1988). *Aplysia dactylomela* has an array of passive and active defenses: highly effective deterrent and toxic molecules in the skin, mucus and gut and ink secretion (Carefoot 1987; DiMatteo 1981; Carefoot et al 1999). It is able to sequester secondary

metabolites from its algal diet, mobilize them into its skin and digestive gland, and convert photosynthetic pigments into chemical deterrents (Bezerra et al 2004; Kamio et al. 2010). Efficient chemical defense may be expected to promote or facilitate an invasion due to the lack of co-evolved tolerance of resident predators to the bioactive molecules produced by the newly arrived alien, and allow the latter to establish local populations and expand. The role of anti-predatory defense in the invasion success of the soft-bodied and slow-moving *A. dactylomela* remains to be scrutinized experimentally.

As the likelihood of encountering a stray vagrant is minuscule, it is assumed that those specimens are part of a small but local population that may have avoided detection thus far due the species' nocturnal habits. However, only a succession of records will establish whether a self-sustaining population does exist in the southeastern Mediterranean Sea.

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Appendix 1. Records of *Aplysia dactylomela* Rang, 1828 in the Mediterranean Sea.

Record No. (map ref.)	Location	Record coordinates		Record date	Reference
		Latitude, N	Longitude, E		
1	Lampedusa Island, Italy	35°31'24"	12°35'24"	2002	Trainito 2003
2	Acitrezza, Catania, Italy	37°33'58"	15°09'53"	2003	Scuderi and Russo 2005
3	Girne, Cyprus	35°22'35"	33°15'27"	2004	Yokeş 2005
4	Akrotiri, Cyprus	34°33'57"	32°57'20"	2005	Cooke 2005
5	Meydankoy, Turkey	36°00'36"	35°58'34"	2005	Çinar et al. 2006
6	Rhodes, Greece	36°27'17"	28°15'26"	2005	Sterniuk-Gronek 2005
7	Messiniakos Gulf, Greece	36°55'38"	22°02'16"	2005	David 2005
8	Gulf of Iskenderun to Kaş, Turkey	36°08'33"- 36°49'28"	29°33'27"- 36°07'07"	2005 - 2010	Yokeş 2006, 2009; Yokeş et al. 2010
9	Giardini Naxos, Sicily, Italy	37°49'32"	15°16'20"	2006	Greco 2006
10	Messina to Syracuse, Sicily, Italy	37°10'36"- 38°13'47"	15°16'12"- 15°35'58"	2006	Crocetta and Colamonaco 2008
11	Chania, Crete	35°30'58"	24°01'07"	2006	Andersson 2006
12	Paros Island, Greece	24°01'07"	25°17'43"	2006	Zenetos et al. 2007
13	Gulf of Saronikos, Greece	37°49'55"	23°22'38"	2006	Zenetos et al. 2007
14	Sušac, Croatia	42°45'29"	16°44'06"	2006	Turk 2006
15	Mljet islands, Croatia	42°43'49"	17°30'27"	2006	Despalatović et al. 2008
16	Gulf of Taranto, Italy	39°44'20"	16°34'15"	2007	Crocetta and Colamonaco 2008
17	Kalamaki, Zakynthos, Greece	37°42'51"	20°56'06"	2007	Jaux 2007
18	Cirkewwa, Malta	35°59'18"	14°19'43"	2008	Schembri 2008
19	Messina Strait, Calabria, Italy	38°12'29"	15°38'08"	2009	Crocetta et al. 2009
20	Akhziv, Israel	33°03'38"	35°05'31"	2010	Present study