



On the occurrence of *Atys angustatus* E. A. Smith, 1872 and *Atys macandrewii* E. A. Smith, 1872 (Cephalaspidea: Haminoeidae) in the Mediterranean Sea

Sobre la presencia de *Atys angustatus* E. A. Smith, 1872 y *Atys macandrewii* E. A. Smith, 1872 (Cephalaspidea: Haminoeidae) en el Mediterráneo

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ABSTRACT

The occurrence of two cephalaspidean gastropods, *Atys angustatus* and *A. macandrewii*, in the Mediterranean Sea, is reviewed and their distribution updated. Recent findings confirm that both *A. angustatus* and *A. macandrewii* are present in the Eastern Mediterranean. The synonymy of *A. angustatus* with *Rhizorus ovulinus* (A. Adams, 1862) and *Aliculastrum debilis* (Pease, 1860) is discussed and considered erroneous.

RESUMEN

Se revisa la presencia y distribución en el Mediterráneo de los gasterópodos cefalaspídeos *Atys angustatus* y *A. macandrewii*. Recientes hallazgos indican que tanto *A. angustatus* como *A. macandrewii* están presentes en el Mediterráneo oriental. Se discute la sinonimia de *A. angustatus* con *Rhizorus ovulinus* (A. Adams, 1862) y *Aliculastrum debilis* (Pease, 1860), la cual se considera errónea.

INTRODUCTION

The taxonomic history of the haminoeid genus *Atys* Montfort, 1810, has been one of inclusion and exclusion of species: some 50 species have been described in the Indo-West Pacific (OBIS 2012), as against 29 listed in the World Register of Marine species (<<http://www.marinespecies.org>>, viewed February 7, 2015).

Atys macandrewii E. A. Smith, 1872, an amphi-Atlantic species, was first noted in the Mediterranean from shells collected in 1990 from Malta, and later from Messina, Sicily (CACHIA & MIFSUD,

2007) and Cyprus (DELONGUEVILLE & SCAILLET, 2010). CACHIA & MIFSUD (2007) expressed some doubt on the record of *A. angustatus* E. A. Smith, 1872, collected off the coast of Israel in 1974 (AARTSEN & GOUD, 2006): they examined a shell from Israel and concluded that it could be the same species they identified as *A. macandrewii*. We reviewed the literature, examined specimens of both species from diverse locations and considered diagnostic characters that may aid in distinguishing one from the other.

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MATERIAL AND METHODS

This work is based on the study of specimens of both species from different localities (indicated in the section of material examined for each species) and on reviewing existing records and descriptions in the literature.

Acronyms and abbreviations:

MHN, The Natural History Museum,
London,

CBL, Cesare Bogi collection, Leghorn,
PMF, Pasquale Micali collection, Fano,
SBF, Stefano Bartolini, Florence,
FSL, Franco Siragusa, Leghorn,
FCL, Francesco Chiriaco, Leghorn,
LRL, Luigi Romani, Lucca,
SMNH, Steinhardt Museum of Natural
History, Tel Aviv University, Israel,
Fig., figure,
live, live collected specimen,
L, length,
sh, shell,
W, width.

SYSTEMATICS

Atys angustatus Smith E. A., 1872 (Fig. 1A, C)

Atys angustatus Smith E. A., 1872: 346.

Atys angustatus – Aartsen & Goud, 2006: 29-31, figs 1-3.

Material examined: Turkey. Taşucu, September 2010, 8 m, 1 sh (FSL). Israel. Ashdod (31° 52.3563' N - 34° 39.5529' E), 10 October 2012, 13.4 m, 1 sh (CBL); (31° 51.3642' N - 34° 39.0670' E), 10 October 2012, 13.6 m, 1 sh (CBL); (31° 52.8488' N - 34° 39.8146' E), 10 October 2012, 12.9 m, 1 sh (CBL); Palmahim (32° 32.6147' N - 34° 53.5457' E), 31 July 2013, 12.5 m, 1 sh (CBL); Palmahim (31° 09.5724' N - 34° 47.5849' E), 20 May 2014, 19.6 m, 1 sh (CBL); Palmahim (32° 24.0288' N - 34° 51.3658' E), 7 August 2014, 13 m 1 sh (CBL), 1 sh (SMNH MO 79901); Palmahim (32° 16.2986' N - 34° 49.4154' E), 7 August 2014, 10.2 m 1 sh (CBL); Palmahim (32° 32.6078' N - 34° 53.5406' E), 7 August 2014, 13.1 m, 1 sh (CBL). Red Sea, northern Gulf of Suez, on shore, collection date between 1990 and 2008, 1 sh. (PMF).

Remarks: HIGO, CALLOMON & GOTO (1999: 390) list *A. angustatus* as a synonym of *Volvulella ovulina* (A. Adams, 1850) and provide a photograph of a “possible syntype” of the latter [HIGO, CALLOMON & GOTO 2001: 139, fig. G4805, BMNH 1878.1.28.140, L 4.5 mm, as *Rhizorus ovalinus* (A. Adams, 1862)]. This specimen, as well as others illustrated elsewhere (VALDÉS, 2008: 748-749, from deep water off Indonesia; HORI, 2000: 748, pl. 372, fig. 20), differs greatly in shape from the lectotype of *A. angustatus* (AARTSEN & GOUD, 2006, fig. 1), e.g., in the acuminate posterior end and in the much less apparent spiral grooves. Therefore the synonymy of *A. angustatus* with *R. ovalinus* seems unwarranted and is here rejected.

Atys angustatus was considered as “nothing more than the very young form” of *A. cylindricus* (Helbling, 1779) [currently *Aliculastrum cylindricum*] by COOKE (1886: 132) and by PILSBRY (1895:

256). Yet, on comparing a juvenile specimen of *A. cylindricum* from the Gulf of Oman with the lectotype from Suez and with a specimen of *A. angustatus* from the Mediterranean coast of Israel, AARTSEN & GOUD (2006: 30, figs 1-3) noted: “In the first place the number of spiral incisions around the apex is about equal to the number of spirals at the base (both about 12) in *A. angustatus* whereas in *A. cylindricus* there are only five to seven spirals around the apex and double that number around the base. Secondly the columella of juvenile *A. cylindricus* is always oblique whereas in *A. angustatus* it is nearly vertical.” *Atys angustatus* is a smaller species, no larger than 5 mm in length, whereas *A. cylindricus* may reach length of 30 mm. In 2002 the latter was first collected off the Israeli coast (MIENIS, 2004, 2008).

TOO, CARLSON, HOFF & MALAQUIAS (2014: 362) considered SMITH’s (1872)



Figure 1. A, C. *Atys angustatus*, Palmahim, Israel, -13 m, height 3.2 mm. A: frontal view; C: apical view. B, D. *Atys macandrewii*, Protaras, Cyprus, -25 m, height 3.5 mm. B: frontal view; D: apical view.
Figura 1. A, C. Atys angustatus, Palmahim, Israel, -13 m, altura 3,2 mm. A: vista frontal; C: vista apical. B, D. Atys macandrewii, Protaras, Chipre, -25 m, altura 3.5 mm. B: vista frontal; D: vista apical.

description of *A. angustatus* as more similar to *Aliculastrum debilis* (Pease, 1860) than to *A. cylindricum*, and listed *A. angustatus* as synonym of *A. debilis*. The paratype of *A. debilis* (TOO ET AL. 2014: fig. 7; L 10.13 mm), as well as a juvenile specimen (TOO ET AL. 2014: figs 2C; L 4.5 mm), differ markedly from *A. angustatus* in the outline much more

truncated anteriorly, so that this synonymy is also rejected here. We therefore support using the name *Atys angustatus* for the Mediterranean species reported on by AARTSEN & GOUD (2006).

CACHIA & MIFSUD (2007: 46) suggested that the Mediterranean record of *A. angustatus* was based on misidentification of *A. macandrewii*. On comparing

specimens of equal size (L approx. 3.5 mm) of *A. angustatus* and *A. macandrewii* we found the former distinguished in its more globose outline (L/W = 0.48 against 0.45), number of adapical spiral incisions (7 against 4), wider aperture, adapically more tapered profile and of uniform semitransparent white colour, lacking the characteristic opaque spiral band typical of the latter species.

Three shells of *Atys angustatus* collected off Israel in 1974 supported the first record of the species in the Mediterranean, and additional shells were found in Mersin, Turkey, in 1986 (AARTSEN & GOUD, 2006). The material presented here triplicates this and indicates that the species is now established in the Eastern Mediterranean, where it is broadly sympatric with *A. macandrewii*.

Atys macandrewii Smith E. A., 1872 (Fig. 1B, D)

Atys M'Andrewii Smith E. A., 1872: 346.

Atys macandrewii – Martínez & Ortea, 1998: 133-138, figs 1-5; Cachia & Mifsud, 2007: 43-48, fig. 1-5; Delongueville & Scaillet, 2010: 51-53, fig. 2; Templado, Malaquias & Garcia 2011: 421, figure.

Material examined: Spain. Malaga, Cala de los Cañuelos, 12 m, on *Zostera*, 1 sh. figured in Templado *et al.* (2011); Granada, Motril, May 2008, 120 m (FSL); Canary Is., Lanzarote I., Porto del Carmen, July 1998, 50 m, 1 sh. (FSL). Italy. Lampedusa I., 6 m, 1 sh. (PMF); Lampedusa I., 30m, 2 sh. (FCL); Pantelleria I., Scauri, 3 m, 1 sh. (FCL). Malta. Off Wied Iz-Zurried (35.92776° N - 14.33136° E), October 2012, 60 m, 1 sh (FCL); Gnejna Bay, 40 m, 1 sh. (CBL); Gozo, Off Dwejra Bay (36.05301° N - 14.18618° E), October 2012, 66 m, 1 sh. (FSL). Greece. Elafonissi, beach, 1 sh. (PMF). Cyprus. Protaras, 25 m, 1 sh. (CBL); 20/25 m, 5 sh. (SBF); 20 m, 2 sh. (LRL); 50 km east of Girne, 6 m, 1 sh. (PMF).

Remarks: MARTÍNEZ & ORTEA (1998: 134) examined the syntypes at NHM, redescribed *Atys macandrewii* with details on shell variability and described the radula, jaws, and gizzard plates. The W/L ratio of their specimens, from the Western and Eastern Atlantic, ranges between 0.45 and 0.54/0.55. The shell characters given by them agree with the Mediterranean specimens here studied. A good illustration of the living animal is given by CACHIA & MIFSUD (2007). MARTÍNEZ & ORTEA (1998: 134) described live specimens as “– pellucid white with irregular dots and spots of white opaque pigment”. COLLIN, DÍAZ, NORENBURG, ROCHA, SÁNCHEZ, SCHULZE, SCHWARTZ & VALDÉS

(2005: 689, colour photo) described Panamanian specimens as “variable, whitish with black pigment of cephalic shield and parapodia, viscera brownish”. Only one of the living Maltese specimens had black spots over its cephalic shield, though both specimens had a black spot on the posterior mantle flap.

Atys macandrewii is widespread in the tropical Atlantic, from the Caribbean to Brazil (MARCUS, 1970) and from the Azores (NORDSIECK, 1972), Madeira and Selvagens Islands (MALAQUIAS, MARTÍNEZ & ABREU (2002), Canary Islands and Cape Verde Archipelago (MARTÍNEZ & ORTEA, 1998), and throughout the Mediterranean Sea.

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BIBLIOGRAPHY

- AARTSEN J. J. VAN AND GOUD J. 2006. Indo-Pacific migrants into the Mediterranean. 3. *Atys angustatus* Smith, 1872 (Gastropoda, Opisthobranchia). *Basteria* 70, 29-31.
- CACHIA C. & MIFSUD C. 2007. On the occurrence of *Atys macandrewii* E. A. Smith, 1872 (Gastropoda: Haminoeidae) in the Mediterranean. *Iberus* 25(1), 43-48.
- COLLIN R., DÍAZ M.C., NORENBURG J., ROCHA R.M., SÁNCHEZ J.A., SCHULZE A., SCHWARTZ M. & VALDÉS A. 2005. Photographic Identification Guide to Some Common Marine Invertebrates of Bocas Del Toro, Panama. *Caribbean Journal of Science* 41(3), 638-707.
- COOKE A.H. 1886. Report on the testaceous mollusca obtained during a dredging-excursion in the Gulf of Suez in the months of February and March 1869. By Robert MacAndrew. Republished with additions and corrections. *Annals and Magazine of Natural History, Series 5*, 17 (98): 128-142.
- DELONGUEVILLE C. & SCAILLET R. 2010. Première signalisation d' *Atys macandrewii* Smith E. A., 1872 sur les côtes de Chypre Nord. *Novapex* 11 (2), 51-52.
- HIGO S., CALLOMON P. & GOTO Y. 1999. *Catalogue and bibliography of the marine shell-bearing mollusca of Japan. Gastropoda, Bivalvia, Polyplacophora, Scaphopoda*. Osaka: Elle Scientific Publications. 208 pp.
- HIGO S., CALLOMON P. & GOTO Y. 2001. *Catalogue and bibliography of the marine shell-bearing mollusca of Japan. Gastropoda, Bivalvia, Polyplacophora, Scaphopoda. Type Figures*. Osaka: Elle Scientific Publications. 749 pp.
- HORI S. 2000. Family Retusidae. In Okutani T. (ed.): *Marine Mollusks in Japan*. Tokyo: Tokai University Press. Pp 746-748.
- MALAQUIAS M.A.F., MARTÍNEZ E. & ABREU A.D. 2002. Cephalaspidea s. l. (Mollusca: Opisthobranchia) of the Madeira Archipelago and Selvagens Islands, northeast Atlantic, Portugal. *American Malacological Bulletin* 17 (1/2), 65-83.
- MARCUS, Ev. 1970. Opisthobranchs from northern Brazil. *Bulletin of Marine Science*, 20(4): 922-951.
- MARTÍNEZ E. AND ORTEA J. 1998. Redescription of *Atys macandrewii* E. A. Smith, 1872, An Amphiatlantic Cephalaspidean. *American Malacological Bulletin* 14 (2), 133-138.
- MIENIS H.K. 2004. New data concerning the presence of Lessepsian and other Indo-Pacific migrants among the mollusks in the Mediterranean Sea with emphasize on the situation in Israel. In Öztürk B., Salman A. (eds.): *Proceedings 1st National Malacology Congress*, 1-3 September 2004, Izmir. *Turkish Journal of Aquatic Life* 2(2), 117-131.
- MIENIS H.K. 2008. New or little known marine molluscs of Red Sea or Indo-Pacific origin from the Mediterranean coast of Israel. *Triton* 17, 5-6.
- NORDSIECK F. 1972. *Die europäischen Meeresschnecken (Opisthobranchia mit Pyramidellidae; Rissoacea)*. Gustav Fischer, Stuttgart, 327 pp.
- OBIS 2012. *Atys* species. Accessed through: OBIS Indo Pacific Molluscan Database. Available from: <http://clade.ansp.org/obis/search.php/67954> (accessed 5 July 2012)
- PEASE W.H. 1860. Descriptions of new species of Mollusca from the Sandwich Islands. *Proceedings of the Zoological Society of London* 28, 18-36.
- PILSBRY H.A. 1895. *Manual of Conchology*. Vol. 15 (60), 181-436, pls. 43-50, 59-61. Academy of Natural Sciences of Philadelphia, Philadelphia.
- SMITH E.A. 1872. Remarks on several species of Bullidae, with descriptions of some hitherto undescribed forms, and of a new species of *Planaxis*. *Annals and Magazine of Natural History* 4(9), 344-355.
- TEMPLADO J., MALAQUIAS M.A.E. & GARCIA F.G. 2011. Familia Haminoeidae. In Gofas S., Moreno D. & Salas C. (coord.): *Moluscos marinos de Andalucía*. Málaga: Servicio de Publicaciones e Intercambio Científico, Universidad de Málaga. Pp. 417- 421.
- TOO C.C., CARLSON C., HOFF P.J. & MALAQUIAS A.E. 2014. Diversity and systematics of Haminoeidae gastropods (Heterobranchia: Cephalaspidea) in the tropical West Pacific Ocean: new data on the genera *Aliculastrum*, *Atys*, *Diniatys* and *Liloa*. *Zootaxa* 3794 (3): 355-392.
- VALDÉS A. 2008. Deep sea "cephalaspidean" heterobranchs (Gastropoda) from the tropical southwest Pacific, In Heros V., Cowie R. H. & Bouchet P. (eds): *Tropical Deep-Sea Benthos 25. Mémoires du Muséum National d'Histoire Naturelle* 196, 587-792.

