

A collection of recent ctenophore sightings from the Maltese Islands

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Abstract

The only ctenophore reports from Maltese coastal waters ever published date back to over 40 years ago, with only two comb jelly species being previously recorded from such waters. A collection of recent ctenophore sightings from Maltese coastal waters, all substantiated through underwater photography or video footage and pertaining to *Leucothea multicornis*, *Beroe cucumis* and *Beroe forskalii*, is hereby reported. These sightings were submitted by members of the public as part of the citizen science initiative known as ‘Spot the Jellyfish’.

Keywords: ctenophore, Maltese Islands, *Leucothea multicornis*, *Beroe cucumis*, *Beroe forskalii*, citizen science

Introduction

Gelatinous plankton outbreaks, often considered as freak events in plankton ecology, with sudden, short-lasting and unpredictable effects, are increasingly frequent at a global scale (Boero *et al.* 2009). This has fuelled a considerable research effort on gelatinous plankton in recent years, with such an effort being selective, focusing almost exclusively on

harmful (stinging or impinging on fisheries) or non-native, invasive gelatinous species, including common jellyfish species (Scyphozoa and Hydrozoa) and *Mnemiopsis leidyi*. Other gelatinous plankters have consequently received very little research information. For instance, very few ad hoc ctenophore surveys have been conducted in the Mediterranean to date (e.g. Shiganova and Malej 2009; Mills *et al.* 1996), with many comb jelly species being omitted from jellyfish spotting citizen science programmes, whilst still being mainly reported as an offshoot of such programmes.

Existing comprehensive zooplankton surveys in Maltese waters date back more than forty years, with Evans (1968) not reporting any ctenophore species from Maltese waters. Just two ctenophore species (*Beroe ovata* and *Cestum veneris*) were recorded in a census of marine fauna of the Maltese Islands (Micallef and Evans 1968). Since then, only snapshot and temporally-isolated zooplankton surveys have been conducted in Maltese waters. For instance, in October 2009, snapshot sampling was conducted as part of the Tara Oceans expedition through the vertical hauling of a bongo net (300µm) at two offshore sites (at several kilometres from the Maltese coastline). No ctenophore adult individuals nor larvae were recorded during such a survey. This study aims to document comb jelly sightings made in Maltese coastal waters in recent years through anecdotal ways rather than through comprehensive scientific surveys.

Materials and Methods

Local SCUBA diving clubs and fishermen were recruited to participate in the reporting of uncommon gelatinous plankton species through the jellyfish-spotting initiative, based on citizen science, launched in May 2010 by the IOI-Malta Operational Centre of the University of Malta, known as Spot the Jellyfish (Deidun 2010) and run to date operationally on a continuous basis. Only those sightings substantiated by photographic evidence and thus eligible for tentative taxonomic identification are listed in this study. Numerous other sightings of gelatinous plankton, possibly attributable to the presence of comb jellies

but not concretised by at least photographic or video evidence, are not included in this study.

Results and Discussion

Table 1 lists all the confirmed comb jelly reports cited in this study, with the locations for such reports being illustrated in Figure 1. Voucher photos for each of the three listed comb jelly species are included as Figures 2-4. Comb jelly species recorded in this study were either observed as single individuals or in small numbers and never as swarms or dense aggregations. Since none of these individuals were collected, accurate measurements of length and other morphometric measurements could not be taken.

The sea temperature and salinity at the surface for Maltese coastal waters during the month of March 2011 ranged from 14.54°C to 14.69°C and from 37.901 to 37.981 psi, respectively

(<http://www.capemalta.net/MFSTEP/results.html>).

Leucothea multicornis (Quoy and Gaimard 1824), is one of three species of the ctenophore order Lobata recorded by Chun (Chun 1880) from the Mediterranean and being the largest of these species, reaching a maximum length of 25cm and is also known from the Atlantic Ocean, western Baltic Sea and the Black Sea. The representatives of the genus *Leucothea* are distinguished from all other Lobata by the two remarkable blind-ending sacs which form a pair of long narrow pits open to the exterior below and extending inward and upward above the tentacle-bulbs near to the level of the funnel. *Leucothea multicornis* is covered with distinctive papillae and its oral lobes are large and contain complex winding chymiferous tubes (Mayer 1912; Wrobel and Mills 1998).

Both *Beroe cucumis* (Fabricius 1780) and *Beroe forskalii* (Milne Edwards 1841) are Beroida (Order) species native to the Mediterranean Sea. Ctenophore species belonging to the Beroidae family are specialized predators on zooplanktivorous ctenophores and, occasionally, on salps

(Agassiz 1860). *Beroe* species eat their prey by engulfing it if size allows or, if it is too large, by biting pieces out with the use of macrocilia, compound ciliary-feeding organelles found inside the mouth opening (Shiganova and Malej 2009). *B. cucumis* is frequently mistaken for *B. ovata*, which also occurs in the Mediterranean, despite being native to the western Atlantic Ocean, with the former species having also invaded the Black Sea. A detailed morphological description of both *Beroe* species is given by Shiganova and Malej (2009).

Table 1. List of comb jelly reports from Maltese coastal waters.

Species	Date of observation	Location	Geographic coordinates	Reference in Figure 1	Depth
<i>Leucothea multicornis</i>	21. 04. 2008	Cirkewwa, Malta	35°59'11''N 14°19'41''E	1	25m
	17.05.2010	Cirkewwa, Malta	35°59'11''N 14°19'41''E	1	20m
	16.01.2011	Bahar ic-Caghaq, Malta	35°56'17''N 14°27'33''E	2	<5m
	16.01.2011	Ghar Lapsi, Malta	35°50'02''N 14°24'55''E	3	<5m
	16.01.2011	Zurrieq, Malta	35°49'17''N 14°27'28''E	4	5m
	09.02.2011	Reqqa Point, Gozo	36°04'51''N 14°14'04''E	5	15m
<i>Beroe cucumis</i>	15. 06. 2010	Fomm ir-Rih, Malta	35°54'22''N 14°20'28''E	6	25m
	10. 08. 2009	Ta Cenc, Gozo	36°01'06''N 14°15'05''E	7	15m
	21.06. 2010	Ghar Lapsi, Malta	35°50'02''N 14°24'55''E	3	15m
<i>Beroe forskalii</i>	19.01.2011	Reqqa Point, Gozo	36°04'51''N 14°14'04''E	5	5m

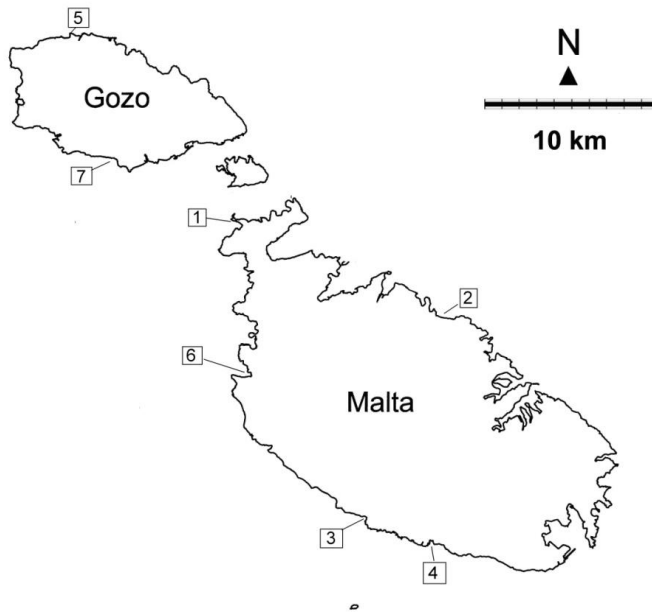


Figure 1. Map of the locations for the comb jelly reported listed in this study.

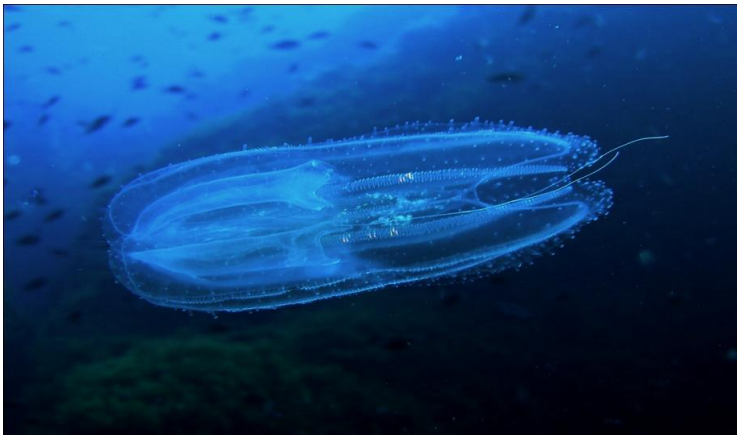


Figure 2. *Leucothea multicornis* (photographed on the 09.02.11, at a depth of 20m). Photo courtesy of Mick Hollis.



Figure 3. *Beroe cucumis* (photographed in June 2010 at a depth of 5m). Photo courtesy of Edward Vella, Atlam Diving Club.



Figure 4. *Beroe forskalii* (photographed on the 19.01.2011 at a depth of 5m). Photo courtesy of Roland Vella.

Close scrutiny of the tabulated results indicates that comb jelly sightings were concentrated over two main periods of the year – January and the April-August period, with the January sightings being reported only during 2011. This might suggest a gradual warming of the marine area of interest which might induce blooming conditions in the comb jelly species of interest (T. Shiganova, personal communication). In order to explore such a possibility, the mean surface temperatures for the months of December and January for the 2007-2011 period, as gleaned from a surface temperature monitoring station operated by the Physical Oceanography Unit of the IOI-Malta Operational Centre of the University of Malta, were compared. It transpires that the mean surface temperature for December 2010 and January 2011 was higher than that for the corresponding months in previous years, with the discrepancy being especially pronounced for the month of December 2010 for which recorded SST's were ca. 4⁰C higher than those for the December 2007, December 2008 and December 2009 months (Aldo Drago, unpublished data).

The mid-winter month of January also coincides with a peak in surface chlorophyll a values for Maltese coastal waters, as indicated by analysis of the relevant MODIS platform data for the Maltese marine area (reported in Figure 5). Such a peak is consistent with the situation in the Mediterranean Sea in general, with several studies (e.g. Claustre *et al.* 1994) documenting a winter diatom bloom in such a basin, labelling these blooms as 'oasis' in the Mediterranean desert.

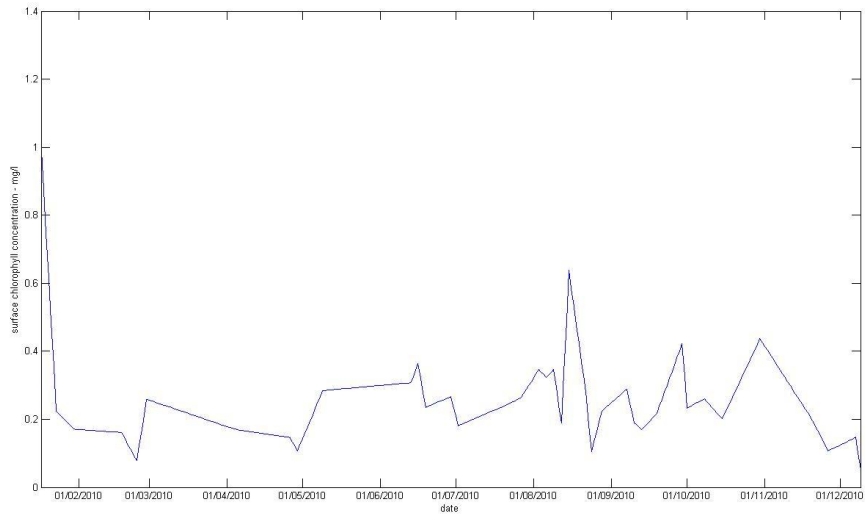


Figure 5. Temporal variation in ocean colour values for a coastal site off the north-east coast of the island of Malta, during the December 2009-December 2010 period (source: Deidun *et al.* in preparation).

Despite the sea walnut – *Mnemiopsis leidyi* – undergoing a veritable population explosion in the western Mediterranean (off Spain – Fuentes *et al.* 2009; Ligurian, Tyrrhenian and Ionian Seas – Boero *et al.* 2009) in the summer of 2009, after colonising vast tracts of the eastern Mediterranean, it has not been recorded to date from Maltese waters. This paucity is also evident for at least one other species of gelatinous plankton - *Phyllorhiza punctata* - also widely recorded in eastern Mediterranean areas and in waters contiguous to the Italian peninsula (Boero *et al.* 2009). One can only speculate for the reasons behind such an absence, which might include ones related to the prevailing advection currents in the larger central Mediterranean area, to a disparity in the effort invested in jellyfish sampling/spotting in different regions of the Mediterranean or, more simply, to stochasticity. Since the comb jelly reports listed in this study were gleaned through anecdotal means, they should be supplemented by an ad hoc, targeted survey within Maltese coastal waters. To date, the hydrozoan and scyphozoan species recorded from Maltese coastal waters include *Pelagia noctiluca*, *Velella velella*,

Cotylorhiza tuberculata, *Carybdea marsupialis*, *Olindias phosphorica*, *Physalia physalis*, *Porpita porpita* and *Aequorea* sp. (Deidun 2010).

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References

Agassiz, L. (1860) Contribution to the Natural History of the United States of America. Vol. 3. Little, Brown, 1-301, Boston.

Boero, F., Putti, M., Trainito, E., Prontera, E., Piraino, S., and Shiganova, T. (2009) First records of *Mnemiopsis leidyi* (Ctenophora) from the Ligurian, Thyrrenian and Ionian Seas (Western Mediterranean) and First Record of *Phyllorhiza punctata* (Cnidaria) from the Western Mediterranean. *Aquatic Invasions* 4(4): 675-680.

Claustre, H., Kerherve, P., Marty, J. C., Prieur, L., Videau, C., and Hecq, J.H. (1994) Phytoplankton Dynamics Associated with a Geostrophic front: Ecological and Biogeochemical Implications. *J. Mar. Res.* 52: 711–742.

Chun, C. (1880) Die Ctenophoren des Golfes von Neapel. Fauna und Flora des Golfes von Neapel, 1: 1–313.

Deidun, A. (2010) Notes on the Recent Occurrence of Uncommon Pelagic “jellyfish” Species in Maltese Coastal Waters. *Naturalista Siciliano* S. IV, XXXIV (3-4): 375-284.

Deidun, A., Drago, A., Galea, A., Azzopardi, J., Gauci, A., and Melin, F. (in preparation). A first attempt at testing correlation between MODIS ocean colour data and in situ chlorophyll a measurements within Maltese coastal waters.

Evans, F. (1968) Le zooplankton de Malte. *Pelagos*, 9: 5-20.

Fuentes, V.L, Atienza D, Gili, J-M, and Purcell, J.E. (2009) First Record of *Mnemiopsis leidyi* A. Agassiz 1865 off the NW Mediterranean Coast of Spain. *Aquatic Invasions* 4: 671- 674, doi:10.3391/ai.2009.4.4.12

Mayer, A. G. (1912) Ctenophores of the Atlantic Coast of North America. *Publs. Carnegie Inst.*, 162, 1–58.

Micallef, H. and Evans, F. (1968) The Marine Fauna of Malta. *Marine Science Royal University, Malta*, 1: 143-172.

Mills, C.E., Hugh, P.R., Harbison, G.R., and Haddock, S.H.D. (1996) Medusae, Siphonophores and Ctenophores of the Alboran Sea, South Western Mediterranean Source. *Scientia Marina* 60(1):145 -163.

Shiganova, T.A, and Malej, A. (2009) Native and Non-native Ctenophores in the Gulf of Trieste, Northern Adriatic Sea. *Journal of Plankton Research* 31 (1): 61-71, doi:10.1093/ plankt/fbn102

Wrobel, D. and Mills, C. (1998) Pacific Coast Pelagic Invertebrates. A Guide to the Common Gelatinous Animals. Monterey Bay Aquarium, Monterey, pp. 108.