
**RECORDS OF CEPHALOPODS (MOLLUSCA: CEPHALOPODA)
FROM MALTESE AND SURROUNDING WATERS (CENTRAL
MEDITERRANEAN)**

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ABSTRACT

Based on an examination of several collections made in Maltese waters, 20 cephalopods are recorded of which three genera and seven species are reported for the first time from Maltese waters. The identity of some previously dubious records is clarified. Information is given on the material examined during the present study as well as on geographical distribution and habitat preferences of the species. Notes on the diagnostic characters required for accurate identification and details of important diagnostic features are included. All the species recorded are also known from the Strait of Sicily and other areas in the Central Mediterranean. There are very few Maltese records of pelagic species. This is partly a result of the fishing techniques used by local fishermen and partly because cephalopods are only a by-catch in Malta.

INTRODUCTION

Although many species of cephalopod molluscs are sold commercially and they are invariably present in fish markets, little valid scientific information has been published about the Maltese species. In his *Repertorio di Storia Naturale*, Gavino Gulia (1858–1859) mentions two species of cephalopods but offers no information other than the local names. A. A. Caruana, editor of the *Enumerato Ordinata Molluscorum Gaulo-Melitensium* of the deceased G. Mamo, lists nine cephalopods (Mamo in Caruana, 1867). A review of the fauna of the Maltese Islands by Giovanni Gulia (1914) mentions three new records of cephalopods for the Maltese Islands. This work is very interesting in that it includes *Tremoctopus violaceus*, a pelagic species similar in ecology to *Argonauta argo* and *Ocythoe tuberculata*, which is rarely encountered. It has never been recorded since and the possibility that it could have been misidentified is not excluded. Micallef & Evans (1968) record six cephalopods. Some of their records are dubious as the reference work used by these authors to identify their specimens is not a reliable one for identification of cephalopods. Cachia (1973) deals with shelled molluscs collected from local shores and only records *Argonauta argo*, referring to the calcified egg-case of this species that is often washed ashore.

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The most recent work is that of Cachia *et al.* (1993) who published a list of molluscs present in the Maltese Islands, including 12 species of cephalopods. That *Spirula spirula* is included in this list is interesting. This is a mesopelagic species that inhabits the Atlantic, but which has not yet been recorded live from the Central Mediterranean. The only Central Mediterranean records are of shells that often float for some distance after the organism is dead (Guerra, 1993).

Most of the above publications lack essential taxonomic information about the species mentioned; none include illustrations of diagnostic features or guidelines for identification. Some of the records are actually suspect as the identification was based on literature that is not detailed enough for accurate taxonomic study. It is thus clear that a revised, detailed account of the cephalopod fauna of Maltese waters is now due.

Apart from providing such an account, the present work serves to highlight gaps in the knowledge of the Maltese cephalopod fauna and it is hoped that it will serve as a basis for future studies leading to a deeper understanding of the cephalopods of the Maltese Islands.

MATERIALS

The majority of specimens of the smaller and rarer species were obtained from the private collections of amateur and professional researchers. Most of the remaining specimens examined were obtained during visits to the fish markets at Marsaxlokk and at Valletta. Some divers and local amateur fishermen supplied live specimens, egg cases or clusters, and parts from specimens that could not be collected whole. The male hectocotylised arm and the beak were obtained when the whole specimen was not available. Beach combing produced an assorted array of different cuttlebones belonging to the genus *Sepia*.

The collections on which the older published records are based could not be traced and probably no longer exist. The 'previous records' cited here are therefore taken entirely from these publications, none of which contain illustrations.

In total, 114 specimens were examined together with numerous cuttlebones, beaks and eggs. The specimens obtained from the collection of Mr C. Mifsud are coded CM in the species list below. The rest were collected by the authors and are coded TS and PJS.

Identifications were made using the published keys and guides by Guerra (1992) and Bello (1995). Beaks were identified using Clarke's (1986) keys. Some

specimens of Sepiolidae were dissected to examine the light organs as described by Bello (1995).

Specimens are housed in the reference collections of the Department of Biology of the University of Malta and in the private collection of Mr C. Mifsud, Rabat, Malta.

SPECIES LIST

In the following list, each species is followed by previous records from the Maltese Islands, a catalogue of the material examined during the present study, and taxonomic and ecological notes where appropriate, in that order. All localities are situated in the island of Malta unless otherwise stated. Sex of the specimens examined, when known, is indicated by M for males and F for females. The list presented follows the systematic arrangement given by Guerra (1992).

SEPIIDAE Keferstein, 1866.

Sepia officinalis Linnaeus, 1758 [Figures 1G,1P]

Sepia officinalis, L.; Mamo in Caruana, 1867

Sepia officinalis, L.; Micallef & Evans, 1968

Sepia officinalis Linnaeus, 1758; Cachia *et al.*, 1993

1M,2F: Marsaxlokk Fish Market, summer 1995 (TS); several cuttlebones (PJS, CM); 1F: Dahlet il-Fekruna, July 1974 (PJS).

Sepia elegans Blainville, 1827 [Figures 1E,1M]

Sepia elegans Blainville, 1827; Cachia *et al.*, 1993

30 (juv.): Valletta Fish Market, summer 1995 (TS); several cuttlebones (PJS, CM); 4 (juv.): trawled by fishermen at 100/200m, November 1993 (CM).

Sepia orbignyana Ferussac, 1826 [Figures 1A,1F,1N]

New record.

1M: 2 miles off Gnejna (Gozo), 200m (CM); 1 (cuttlebone): 60 miles off SE Lampedusa, 100m, August 1977 (PJS); 1 (cuttlebone): Valletta Fishmarket, February 1988 (PJS); several cuttlebones: Malta, no other data (CM).

SEPIOLIDAE Leach, 1817.

Single individuals of species belonging to the genus *Sepiola* were not dissected to examine the internal structures described by Bello (1995) in his key. This was done to avoid destroying the only available specimens of these species. However, all the specimens were males and their identification, based on the hectocotyliised arm, is considered conclusive.

Rossia macrostoma (Delle Chiaje, 1830) [Figures 1B,1O]

New record.

1F: 60 miles off SE Lampedusa, 100m, August 1977 (PJS).

Sepiola ligulata Naef, 1912 [Figures 1C,1H]

New record.

2M: Mdina Bank, 70m, July 1977 (CM).

Sepiola robusta Naef, 1912 [Figure 1I]

New record.

1M: Mdina Bank, 70m, July 1977 (CM).

Sepiola rondeleti Leach, 1817 [Figures 1D,1J]

Sepiola rondeleti, Leach.; Mamo in Caruana, 1867

Sepiola rondeleti Gesner; Micallef & Evans, 1968

Sepiola rondeletii Leach, 1817; Cachia *et al.*, 1993

3 (juv.): Ta' Kanini, January 1976 (CM); 2M: Mdina Bank, 70m, July 1977 (CM); 6?: 60 miles off SE Lampedusa, 100m, August 1977 (PJS); 1 (juv.): Blata Steps, 170m, May 1990 (CM); 1 (juv.): Qammieh, 60m, October 1990 (CM); 2?: trawled by fishermen, 100/200m, November 1993 (CM); Eggs: *Posidonia* meadow, off White Tower, 21m, January 1994 (TS); Eggs: Anchor Bay, April 1995 (CM).

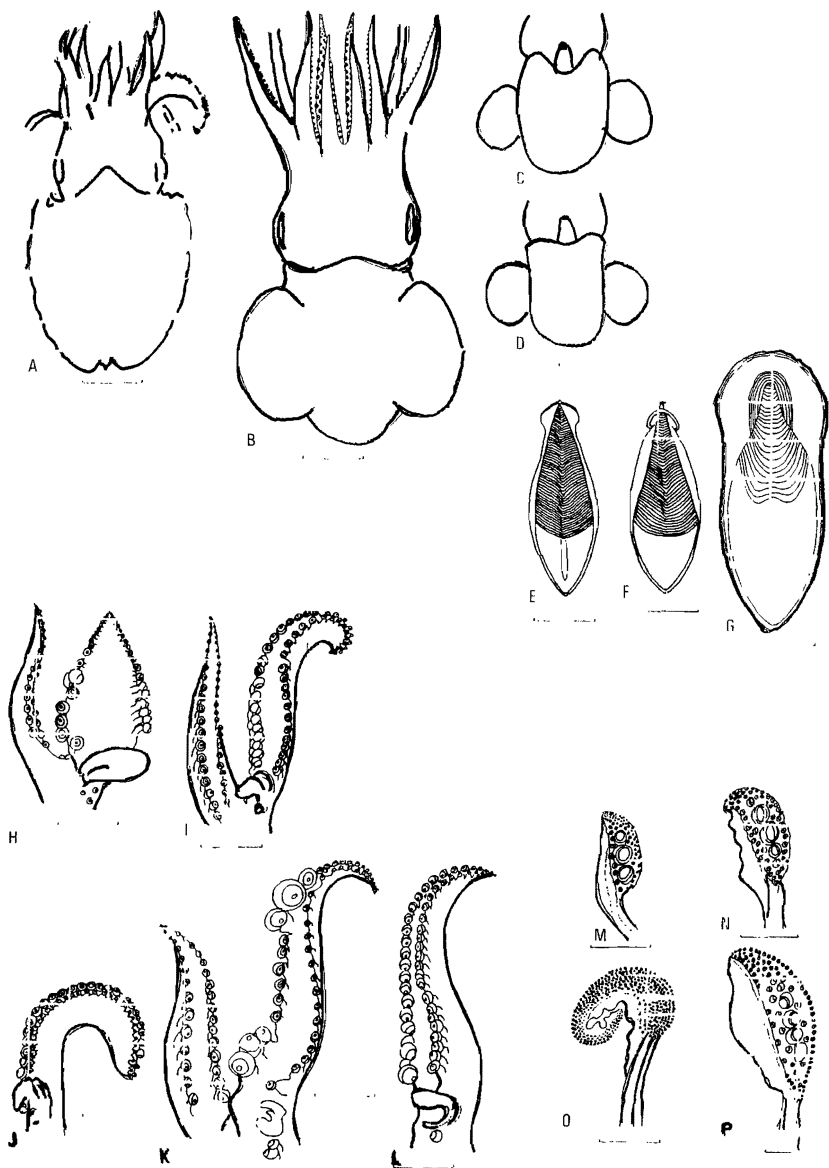


Fig. 1: (Scale bar length in brackets) A, *Sepia orbignyana* (20mm); B, *Rossia macrostoma* (20mm); C, *Sepiolo ligulata*: mantle (20mm); D, *S. rondeleti*: mantle (20mm); E, *Sepia elegans*: cuttlebone (20mm); F, *S. orbignyana*: cuttlebone (20mm); G, *S. officinalis*: cuttlebone (20mm); H, *Sepiolo ligulata*: ligula (8mm); I, *S. robusta*: ligula (8mm); J, *S. rondeleti*: ligula (8mm); K, *S. atlantica*: ligula (8mm); L, *S. intermedia* : ligula (8mm); M, *Sepia elegans*: tentacle club (10mm); N, *S. orbignyana*: tentacle club (10mm); O, *Rossia macrostoma* : tentacle club (10mm); P, *Sepia officinalis*: tentacle club (10mm). (All drawn from life)

Sepiola intermedia Naef, 1912 [Figure 1L]

New record.

1M: Mdina Bank, 70m, July 1977 (CM).

Sepiola atalantica Orbigny, 1840 [Figure 1K]

New record.

1M: Mdina Bank, 70m, July 1977 (CM).

LOLIGINIDAE Orbigny, 1848.

Loligo vulgaris Lamarck, 1798 [Figures 2B,2D]

Loligo vulgaris, Lamk.; Mamo in Caruana, 1867

Loligo vulgaris Lam.; Micallef & Evans, 1968

Loligo vulgaris Lamarck, 1798; Cachia *et al.*, 1993

1 (juv.): 2 miles off Gozo, November 1976 (CM); 4 (juv.): trawled by fishermen, 100/200m, November 1993 (CM); 3F: Marsaxlokk Fishmarket, summer 1995 (TS); 2F: Valletta Fishmarket, summer 1995 (TS).

OMMASTREPHIDAE Steenstrup, 1857.

Illex coindetii (Verany, 1839) [Figures 2F,2G]

Loligo sagittata Lamk.; Mamo in Caruana, 1867

Loligo sagittatus; Gulia, 1912

Illex coindetii (Verany, 1839); Cachia *et al.*, 1993

2M,1F: Valletta Fishmarket, summer 1995 (TS); 2M: Marsaxlokk Fishmarket, summer 1995 (TS).

Todaropsis eblanae (Bell, 1841) [Figures 2E,2G]

New record.

1M: 60 miles off SE Lampedusa, 100m, August 1977 (PJS).

Todarodes sagittatus (Lamarck, 1798) [Figures 2A,2C]

Loligo todarus Delle Chiaje; Mamo in Caruana, 1867.

Todarodes sagittatus (Lamarck, 1798); Cachia *et al.*, 1993

3M: Malta (no other data), November 1993 (CM).

OCTOPODIDAE Orbigny, 1840

Octopus vulgaris Cuvier, 1797 [Figures 2I,2O]

Octopus tuberculatus Blain.; Gulia, 1859

Octopus vulgaris, Lamk.; Mamo in Caruana, 1867

Octopus vulgaris Lam.; Micallef & Evans, 1968

Octopus vulgaris Cuvier, 1798; Cachia *et al.*, 1993

1F: Malta (no other data) (PJS); 1F: Gnejna Bay, 3m, August 1988 (CM); 4F: Marsaxlokk Fishmarket, summer 1995 (TS); 2 (hectocotylus): Valletta Fishmarket, summer 1995 (TS); 10 (hectocotylus, beak): (no other data), summer 1995 (TS).

Octopus macropus Risso, 1826 [Figures 2J,2P]

Octopus ruber Rafinesque.; Mamo in Caruana, 1867

Octopus macropus Risso, 1826; Cachia *et al.*, 1993

2 (hectocotylus): Valletta Fishmarket, summer 1995 (TS).

Scaevurgus unicolor (Delle Chiaje, 1840) [Figure 2H]

New record.

1M: Malta (No other data); ?1F: Mdina Bank, 70m, July 1977 (CM).

One adult male specimen wrongly identified as *Octopus vulgaris* was housed in the collection of the Department of Biology of the University of Malta. While it is certain that this specimen was captured in Maltese waters, no other data is available. The other specimen examined was in a bad state of preservation and could not be identified with certainty.

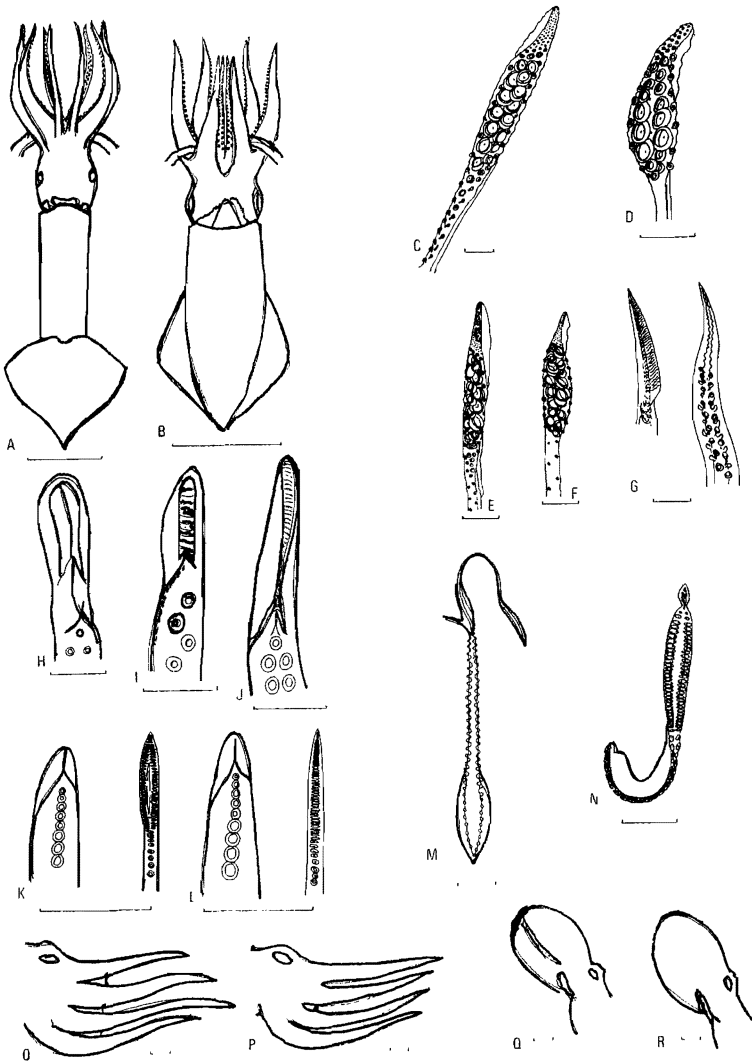


Fig. 2: (scale bar length in brackets) A, *Todarodes sagittatus* (130mm); B, *Loligo vulgaris* (130mm); C, *T. sagittatus*: tentacle club (10mm); D, *Loligo vulgaris*: tentacle club (10mm); E, *Todaropsis eblanae*: tentacle club (10mm); F, *Illex coindetii*: tentacle club (10mm); G, *T. eblanae* (left) and *I. coindetii* (right): hectocotylus (10mm); H, *Scaevurgus uniccirrhus*: ligula (10mm); I, *Octopus vulgaris*: ligula (10mm); J, *Octopus macropus*: ligula (10mm); K, *Eledone moschata*: hectocotylus and tentacle (10mm); L, *Eledone cirrhosa*, hectocotylus and tentacle (10mm); M, *Argonauta argo*: hectocotylus (10mm); N, *Ocythoe tuberculata*: hectocotylus (10mm); O, *Octopus vulgaris*: arm length (10mm); P, *O. macropus*: arm length (10mm); Q, *E. cirrhosa*: mantle shape (10mm); R, *E. moschata*: mantle shape (10mm). (All drawn from life except M and N which are after Guerra, 1992)

Eledone cirrhosa (Lamarck, 1798) [Figures 2L,2Q]

New record.

1: 60 miles off SE Lampedusa, 100m, August, 1977 (PJS); 6: trawled by fishermen, March 1995 (CM).

Eledone moschata (Lamarck, 1798) [Figures 2K,2R]

Eledone moschata, Lamk.; Mamo in Caruana, 1867

Eledone moschata (Lamarck, 1798); Cachia *et al.*, 1993

1: Anchor Bay, 60m, July 1993 (CM).

OCYTHOIDAE Gray, 1849

Ocythoe tuberculata Rafinesque, 1814 [Figure 2N]

Philonexis atlanticus; Gulia, 1913

Ocythoë tuberculata Rafinesque; Micallef & Evans, 1968

Ocythoe tuberculata Rafinesque, 1814; Cachia *et al.*, 1993

2F: Malta (no other data) (PJS); 1(juv.): 60 miles off SE Lampedusa, 100m, August 1977 (PJS).

Both adult specimens originally housed in the collection of the Department of Biology of the University of Malta are now lost.

ARGONAUTIDAE Caintraine, 1841

Argonauta argo Linnaeus, 1758 [Figure 2M]

Argonauta argo, L.; Mamo in Caruana, 1867

Argonauta argo L.; Micallef & Evans, 1968

Argonauta argo (Linn.); Cachia, 1973

Argonauta argo Linnaeus, 1758; Cachia *et al.*, 1993

1: Malta (no other data) (PJS).

DISCUSSION

This report confirms the presence of 11 species of cephalopods previously recorded from the Maltese Islands and their surrounding waters (Gulia, 1859; Mamo in Caruana, 1867; Gulia, 1913; Micallef & Evans, 1968; Cachia, 1973; Cachia *et al.*, 1993). Another nine species are recorded here for the first time, increasing the total number of cephalopods known from the Maltese area to 20. We do not consider it appropriate to include *Spirula spirula* (Cachia *et al.*, 1993) in the Maltese list until a whole specimen has been collected from Maltese waters, as the empty internal shell of this species is known to remain afloat and to travel for long distances. *Spirula spirula* is a mesopelagic Atlantic species that only occasionally enters the Mediterranean; whole specimens are sometimes encountered in Moroccan waters, however, the empty shell may be carried by currents as far as the Levantine Sea (Bello, 1990; 1992).

Of the 60 species of cephalopods recorded from the Mediterranean (Bello, 1986; 1992), about 59 are known from the Western Mediterranean, 38 from the Adriatic, and 47 from the Eastern Mediterranean (Mangold & Boletzky, 1988). The Maltese cephalopod fauna includes about 33% of the total cephalopod species present in the Mediterranean. This is quite a low figure when one considers that the islands are situated close to the boundary between the two main basins of the Mediterranean. In the Central Mediterranean, 38 species have been recorded in a census of the cephalopod fauna of the Strait of Sicily (Jereb & Ragonese, 1994); only 12 of these are known from the Maltese Islands. Corresponding figures for the Gulf of Taranto are 28 species recorded (Bello, 1986) of which 16 occur also in Malta, and for the Gulf of Castellamare, 27 species recorded (Bello *et al.*, 1994), of which 12 occur in Malta. Therefore, the Maltese cephalopod fauna includes roughly 45% of the fauna of the Central Mediterranean.

It is thus evident that many of the species known from the Strait of Sicily could also be present in Maltese waters but have not yet been discovered or documented. One reason for this could be the way cephalopods are exploited locally. Cephalopods are captured as by-catches of the commercially important fish species caught by pelagic and bottom trawling and by purse seines. The by-catch is often sold or used by the fishermen themselves without being exhibited at the local fishmarkets, hence it is difficult to monitor these catches. Secondly, comparison of the species list from Maltese waters with that from the surrounding area shows that the local list lacks those species which frequent waters deeper than 100m. One exception is *Todarodes sagittatus* which inhabits depths ranging from 350 to 540 m. However, all the recorded species are known to migrate to shallower waters to reproduce and the greatest catch biomass of cephalopods sold at the Valletta fishmarket each year corresponds to the reproductive seasons for

the various species. Octopuses are generally caught mainly from March to June and, lately, from November to December. Cuttlefish are caught from November to April, and squid from June to August and from November to January. Species not rising to surface waters to spawn are not represented. It is also possible that some species no longer occur in shallow areas perhaps due to over-exploitation. Catch statistics in fact show a decreasing catch-biomass, but this could be due to other reasons, such as the reduction in fishing effort.

The species list provided here is therefore by no means exhaustive. The present work should be considered as a starting point and it will hopefully be improved upon by further research.

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