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MEDITERRANEAN SEA

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INTRODUCTION

In a taxonomic guide to the Recent brachiopods of the Mediterranean Sea, LOGAN (1979) re-described and re-illustrated 11 species, all of which had been described and illustrated by DAVIDSON (1886-88) and others many years before. Later LOGAN & NOBLE (1983) described and figured six of these species from Malta. Subsequently BRUNTON (1989) identified specimens sent to him from Tel Aviv University and added *Neocrania* (now *Novocrania*, see LEE & BRUNTON, 2001) *turbinata* (Poli) to the list of extant Mediterranean brachiopods, separating this eastern Mediterranean form from the western Mediterranean and eastern Atlantic species *Novocrania anomala* (Müller). He also recognized *Megerlia monstrosa* (Scacchi), previously placed in the synonymy of *Megerlia truncata* (Linnaeus) by LOGAN (1979) and others, as a distinct species, and included *M. echinata* (Fischer & Oehlert) in its synonymy. In 1994 Logan (*in* LOGAN & ZIBROWIUS, 1994) described *Tethyrhynchia mediterranea*, a new species of rhynchonellid, from caves in southern France and Tunisia. Since then *Gwynia capsula* (Jeffreys), previously known only from the eastern Atlantic (LOGAN *et al.*, 1997), has been identified from the Adriatic Sea by SIMON & WILLEMS (1999). Recently

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LOGAN & LONG (2001) have confirmed Brunton's separation of *Novocrania turbinata* from *N. anomala*, but demonstrated that the former species is not confined to the eastern Mediterranean.

Historically the collecting of living brachiopods in the eastern Mediterranean has been less assiduous than in the western basin. Apart from early records by FORBES (1844), species of brachiopods are occasionally mentioned in papers reporting on molluscs or benthos in general (e.g. STURANY, 1896; PALLARY, 1912, 1938; STEUER, 1936, 1939; PÉRÈS & PICARD, 1958; KISSELEVA, 1983, KUZNETSOV *et al.*, 1993; SIMBOURA *et al.*, 1995, MORRI *et al.*, 1999), while brachiopods obtained by the French vessels *Calypso* in the Aegean Sea and adjacent areas between 1955 and 1960 (ZIBROWIUS, 1979), and *Jean Charcot* in 1967 were identified by LOGAN (1979) who recorded 10 species from the eastern Mediterranean.

The purpose of this paper is to list the identifications of more recently-collected specimens and specimens in older collections from the coasts of Israel, Cyprus, Lebanon, Egypt and islands in the Aegean Sea (Fig. 1) that were unavailable to Logan prior to the publication of his revision of the Mediterranean brachiopods in 1979. Included are previously-unstudied specimens from the fourth cruise of *Calypso* to the Aegean Sea in 1964 which were re-discovered by Zibrowius in 1994 at the Station Marine d'Endoume, Marseille. As far as more recent collecting by diving is concerned, brachiopod data have been obtained not only from live collected faunal assemblages but also by searching for bioclasts (shells) in sediment samples, especially those taken from inside submarine caves, as in Cyprus and Lebanon.

TAXONOMIC LIST OF EASTERN MEDITERRANEAN BRACHIOPODS

The results of this study provided nine brachiopod species. Taking into account previous records (PÉRÈS & PICARD, 1958); LOGAN, 1979; KISSELEVA, 1983; BRUNTON, 1988-89; KUZNETSOV *et al.*, 1993; SIMBOURA *et al.*, 1995; LOGAN & LONG, 2001), eleven species of the Phylum Brachiopoda have hitherto been recorded from the Aegean Sea and eastern Mediterranean coasts. In the following list, species are arranged according to the supra-ordinal classification by WILLIAMS *et al.* (1996). The asterisk * indicates a record based on only a single poorly-preserved example.



Fig. 1 - Map of the eastern Mediterranean showing the location of collecting localities mentioned in the text, grouped geographically in major areas (capital letters).

Subphylum Craniiformea

Class Craniata

Order Craniida

Family Craniidae

Novocrania anomala (Müller)

Ref.: PÉRÈS & PICARD (1958); LOGAN (1979); LOGAN & LONG (2001); present paper.

Novocrania turbinata (Poli)

Ref.: BRUNTON (1988-89); LOGAN & LONG (2001); present paper.

Subphylum Rhynchonelliformea

Class Rhynchonellata

Order Terebratulida

Family Terebratulidae

Gryphus vitreus (Born)Ref.: PÉRÈS & PICARD (1958); LOGAN (1979); BRUNTON (1988-89); KUZNETSOV *et al.* (1993); present paper.

Family Cancellothyrididae

Terebratulina retusa (Linnaeus) *

Ref.: LOGAN (1979)

Family Megathyrididae

Argyrotheca cistellula (Searles-Wood)

Ref.: LOGAN (1979); present paper.

Argyrotheca cordata (Risso)Ref.: LOGAN (1979); BRUNTON (1988-89); SIMBOURA *et al.* (1995); present paper.*Argyrotheca cuneata* (Risso)Ref.: PÉRÈS & PICARD (1958); LOGAN (1979); BRUNTON (1988-89); SIMBOURA *et al.* (1995); present paper.*Megathiris detruncata* (Gmelin)

Ref.: LOGAN (1979); KISSELEVA (1983); present paper.

Family Platidiidae

Platidia anomioides (Scacchi & Philippi)

Ref.: LOGAN (1979); present paper.

Platidia davidsoni (Eudes-Deslongchamps)

Ref.: LOGAN (1979).

Family Kraussinidae

Megerlia truncata (Linnaeus)

Ref.: PÉRÈS & PICARD (1958); LOGAN (1979); BRUNTON (1988-89); present paper.

BRACHIOPOD IDENTIFICATIONS

In the following section, collecting localities are arranged in geographical order by countries and roughly from west to east and from north to south. In addition to isolated samples, collections resulting from more intense local or regional sampling efforts have been studied. Small capital letters in the list refer to the map of Fig. 1.

GREECE

Calypso 1964. During the cruise of *Calypso* to the Aegean Sea and adjacent areas in 1964 benthos collections were made by J. Picard, mainly by dredging. The localities are along the South Aegean Arc from south of Kithira to east of Crete and in the Santorin archipelago in the southern Aegean Sea. Station data are from J. Picard's handwritten note book.

- A stat. 1: Kali Limines, south coast of Crete, 0.7 miles SE of Megalo Nisi, 80-135 m (4.4.1964): *Argyrotheca cuneata*, *Argyrotheca cordata*, *Megathiris detruncata*, *Megerlia truncata*, *Novocrania anomala*.
- A stat. 9: Kali Limines, south coast of Crete, 34°55' N, 24°50' E, 180-190 m (6.4.1964): *Gryphus vitreus*.
- A stat. 10: Kali Limines, south coast of Crete, 0.8 miles from Megalo Nisi, 170 m (6.4.1964): *Megerlia truncata*.
- A stat. 11: Kali Limines, south coast of Crete, 0.85 miles from Megalo Nisi, 145 m (6.4.1964): *Megerlia truncata*.
- A stat. 12: Kali Limines, south coast of Crete, 0.87 miles from Megalo Nisi, 115-120 m (6.5.1964): *Platidia anomioides*.
- A stat. 16: Kali Limines, south coast of Crete, 0.8 miles from Megalo Nisi, 85-90 m (7.5.1964) *Novocrania anomala*.
- B stat. 17: Kali Limines, south coast of Crete, 0.8 miles from Megalo Nisi, 75-80 m (7.5.1964): *Megerlia truncata*.
- B stat. 35: between Crete and Kassos, 35°10.3' N, 26°38.2' E, 65-120 m (15.5.1964): *Argyrotheca cuneata*, *Argyrotheca cordata*, *Megathiris detruncata*, *Megerlia truncata*, *Novocrania anomala*.
- B stat. 36A: between Crete and Kassos, 90-96 m (15.5.1964): *Argyrotheca cordata*, *Megathiris detruncata*.
- B stat. 36B: between Crete and Kassos, 85-93 m (15.5.1964): *Argyrotheca cordata*, *Megathiris detruncata*, *Megerlia truncata*.
- B stat. 37: between Crete and Kassos, 150 m (15.5.1964): *Megathiris detruncata*, *Megerlia truncata*, *Novocrania anomala*.

- B stat. 38: between Crete and Kassos, 35°10.2' N, 26°37.8' E, 250 m (15.5.1964): *Gryphus vitreus*.
- C stat. 44: Santorini, SW Simandiri Point, 36°26.1' N, 25°21.4' E, 100 m (20.4.1964) *Megerlia truncata*.
- C stat. 45: Santorini, SW Simandiri Point, 210 m (20.4.1964): *Argyrotheca cuneata*, *Megerlia truncata*.
- C stat. 51: Santorini, Kolombos Bank, 36°31.1' N, 25°29' E, 140 m (21.4.1964): *Argyrotheca cuneata*, *Megerlia truncata*.
- C stat. 52: Santorini, 36°30.9' N, 25°28.6' E, 95 m (21.5.1964): *Megerlia truncata*.
- C stat. 60: Santorini, 0.43 miles south of Cape Turlos, 329 m (22.4.1964): *Megerlia truncata*.
- D stat. 73: south of Antikithira, 35°45' N, 23°31.2' E, 219 m (31.4.1964): *Gryphus vitreus*.
- D stat. 76: south of Kithira, 5 miles west-northwest of Pori Island, 200 m (31.4.1964): *Gryphus vitreus*.

Milos. At this island in the south Aegean Sea, benthos samples were taken in June 1996 by diving to 44 m and by a box corer at 81 m (see MORRI *et al.*, 1999; COCITO *et al.*, 2000). In all cases brachiopods were living inside the interstices of concretionary slabs (*coralligène*) built by the coralline algae *Mesophyllum lichenoides* (Ellis) Lemoine in association with the bryozoan *Calpensia nobilis* (Esper).

- E stat. CR: 36°39.73' N, 24°31.24' E, 27 m: *Megathiris detruncata*.
- E stat. S: 36°38.14' N, 24°34.50' E, 38 m: *Argyrotheca cordata*, *Argyrotheca cuneata*.
- E stat. VS: 36°39.55' N, 24°31.37' E, 44 m: *Argyrotheca cordata*, *Argyrotheca cuneata*, *Novocrania anomala*.
- E stat. PL: 36°39.11' N, 24°31.90' E, 81 m: *Argyrotheca cordata*, *Argyrotheca cuneata*, *Megathiris detruncata*, *Novocrania anomala*.

Wider Greek waters.

- F Corfu (Ionian Sea), Kavos (5.1977, E. Gittenberger): *Argyrotheca cuneata*.
- G Gulf of Corinth, Aspra Spitia, Mt. Kefali, 2-30 m, attached to concretions, (26.9.1977, H. Zibrowius): *Argyrotheca cuneata*, *Novocrania anomala*.
- H Northern Evoikos (Aegean Sea), cave 40 m, *Calypso* stat. SME-1524 (22.5.1960, J. Laborel): *Argyrotheca cordata*, *Megathiris detruncata*.
- I West of Lesvos (= Mytilini; Aegean Sea), 100 m, *Calypso* stat. SME-1630 (6.6.1960): *Megathiris detruncata*.
- J Kastellorizo, off south-west coast of Turkey, attached to concretions from fisherman's net, (4.1981, M. Barbarin): *Argyrotheca cordata*, *Argyrotheca cuneata*.

CYPRUS

A series of samples collected in 1969 was available from the Scientific Collections, Section of Invertebrates, The Hebrew University of Jerusalem, Israel (HUJ). Dives in northern Cyprus by H. Zibrowius, in 1998, produced further benthos samples containing brachiopods (HZ).

- K Maremonte (10 km west of Girne = Keryneia), coarse sand, 5 m (18.11.1998, HZ): *Argyrotheca cuneata*.
- K Termik Santral (east of Girne = Keryneia) 1 km east of power station, small cave, 5 m (20.11.1998, HZ): *Argyrotheca cuneata*.
- L Dipkarpas (= Rizokarpason), north coast, coarse sand and small cave, 6 m (21.11.1998, HZ): *Argyrotheca cistellula*, *Argyrotheca cuneata*, *Novocrania anomala*.
- L Cape Andreas (I), 37 m (SLM 2025: 22.5.1969; HUJ-Brac 15): *Argyrotheca cuneata*.
- L Cape Andreas (II), 119 m (SLM 2027: 22.5.1969; HUJ-Brac 9 and 11, 2 subsamples): *Argyrotheca cordata*, *Argyrotheca cuneata*.
- M Famagusta, 35°0.8.5' N, 33°55.5' E, 92 m (SLM 789: 6.3.1969; HUJ-Brac 12): *Argyrotheca cuneata*.
- M Famagusta, 35°0.8.5' N, 33°55.5' E, 92 m (SLM 790: 6.3.1969; HUJ-Brac 13 and 14, 2 subsamples): *Argyrotheca cuneata*.
- M Famagusta, 35°08.5' N, 33°55.5' E, 73 m (SLM 795: 7.3.1969; HUJ-Brac 10 and 16, 2 subsamples): *Argyrotheca cordata*, *Argyrotheca cuneata*.
- N Akrotiri Bay, 110-128 m (SLM 6039: 9.11.1969; HUJ-Brac 8): *Argyrotheca cordata*.

LEBANON

Two field trips in 1999 and 2001 (HZ) provided brachiopods from benthos samples (corals and other concretionary fauna) taken by diving mainly from under overhangs and in caves. Brachiopod shells were also sorted out from some sediment samples. One additional brachiopod was found on a coral received in 2001. The Lebanese localities are here arranged from north to south.

- O Ramkine Island off Tripoli, overhangs, 13-14 m (22.10.1999): *Argyrotheca cuneata*, *Novocrania turbinata*; coarse sand, 13 m (22.10.1999): *Novocrania anomala*; cave, 5-7 m (31.5.2000): *Argyrotheca cordata*, *Argyrotheca cuneata*, *Novocrania turbinata*; coarse sand, 13 m (31.5.2000): *Argyrotheca cuneata*, *Novocrania turbinata*.

- El Heri, overhang, 2-3 m (3.6.2000): *Novocrania* sp.; muddy sediment next to small cliff, 3 m, (3.6.2000): *Argyrotheca cordata*, *Argyrotheca cuneata*, *Novocrania* sp.; sandy sediment in *Cymodocea* meadow, 4 m (3.6.2000): *Argyrotheca cuneata*.
- Ras El Chakaa, cave 3-5 m (19.10.1999): *Argyrotheca cuneata*, *Novocrania turbinata*; cliff, 5-8 m (19.10.1999): *Argyrotheca cordata*, *Argyrotheca cuneata*; cave, 5-6 m (4.6.2000): *Argyrotheca cordata*, *Argyrotheca cuneata*, *Novocrania* sp.; cave sediment, 3-4 m (4.6.2000): *Argyrotheca cordata*, *Argyrotheca cuneata*.
- Chak El Hattab, cave, 5 m (4.6.2000): *Argyrotheca cordata*, *Argyrotheca cuneata*, *Novocrania turbinata*.
- Selaata, small caves, 5-8 m (18.10.1999): *Argyrotheca cordata*, *Argyrotheca cuneata*, *Novocrania anomala*, *Novocrania turbinata*; cave sediment, 9 m (18.10.1999): *Argyrotheca cuneata*, *Novocrania* sp.; overhang, 7 m (23.10.1999): *Novocrania turbinata*; tunnel-cave, 6-7 m (23.10.1999): *Argyrotheca cordata*, *Argyrotheca cuneata*, *Novocrania* sp.; tunnel-cave sediment, 7-8 m (23.10.1999): *Argyrotheca cuneata*, *Novocrania anomala*; overhang, 30 m, on coral *Phyllangia mouchezii* (2.5.2001, J. G. Harmelin): *Argyrotheca cuneata*.
- Kfar Abida, tunnel-small cave, 7-8 m (30.5.2000): *Argyrotheca cordata*, *Argyrotheca cuneata*, *Novocrania turbinata*.
- Jbail (= Byblos), offshore shoal Tabliah, small cave, 16 m (17.10.1999): *Argyrotheca cuneata*, *Novocrania turbinata*; cave sediment, 16 m (17.10.1999): *Argyrotheca cistellula*, *Argyrotheca cordata*, *Argyrotheca cuneata*, *Novocrania anomala*.
- Beyrouth, Harf El Kalb, overhang, 34 m (21.10.1999): *Argyrotheca cuneata*, *Argyrotheca cordata*.
- N Saida, off Nahr El Ouali, coarse sand, 31 m (5.6.2000): *Argyrotheca cuneata*, *Novocrania turbinata*.
- El Zahrani, Harf Shbak, coarse sand, 24 m (6.6.2000): *Argyrotheca cuneata*.
- El Zahrani, Harf El Jouani, overhang, 14 m (6.6.2000): *Argyrotheca cordata*, *Argyrotheca cuneata*.
- El Kassmieh, muddy sand at bottom of cliff, 44 m (25.10.1999): *Argyrotheca cuneata*, *Argyrotheca cordata*, *Novocrania anomala*.
- Sour (= Tyr), rocky shoal, from coarse sand between rocks, 12 m (25.10.1999): *Argyrotheca cuneata*.

ISRAEL

Only shells from sediment samples were available for this study.

- P Haifa Bay, 7.4 m, 25 m (grab samples E3 and G7, 19.5.1997 and 1.9.1997, B. Galil): *Argyrotheca cuneata*.
- P Cape Shikmona south of Haifa, 7 m (grab sample E7, 9.3.1995 B. Galil): *Novocrania anomala*, *Argyrotheca cuneata*.

EGYPT

As in the case of Cyprus (above) material collected in 1969 was available from The Hebrew University of Jerusalem, Israel (HUJ).

Q Sinai, Katib el Gallss, 137 m (SLM 779:4.2.1969; HUJ-Brac 17): *Megerlia truncata*

FINAL REMARKS

The eleven species presently known from the eastern Mediterranean constitute 79 % of the 14 unequivocal species living in the Mediterranean Sea (LOGAN, 1979; BENIGNI & CORSELLI, 1981; BRUNTON, 1989; LOGAN & ZIBROWIUS, 1994; BALDUZZI & EMIG, 1995; SIMON & WILLEMS, 1999). Of these 14 species *Terebratulina retusa* (Linnaeus) is known only from a single poorly-preserved example and may be regarded as rare (LOGAN, 1979). Of the three absent species, the record of *Lacazella mediterranea* (Risso) for the Aegean Sea by PÉRÈS & PICARD (1958) is considered incorrect (see LOGAN, 1979: 74), while the diminutive forms *Tethyrhynchia mediterranea* (Logan) and *Gwynia capsula* (Jeffreys) have only recently been discovered in the western Mediterranean by diligent searching and may possibly be found in the eastern basin in the future. Whether there is faunal impoverishment in brachiopods, as suggested in the past for bivalves (ZENETOS, 1997), from west to east in the Mediterranean Sea, or under-representation due to insufficient collecting will only be resolved by further investigations. There is, as yet, a dearth of material from the coasts of Turkey, Syria, Lebanon, Israel, Egypt and Libya. Hopefully this paper will revive interest in brachiopods by workers in these regions.

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ABSTRACT

The relative paucity of Recent brachiopod records from the eastern Mediterranean compared to the western basin warrants the publication of new records from Greece, Cyprus, Lebanon, Israel, and Egypt. These records include more recently-collected specimens and specimens in older collections that were unavailable to Logan prior to the publication of his revision of the Mediterranean brachiopods in 1979. These specimens also include brachiopods from the *Calypso* 1964 cruise to the Aegean Sea and adjacent areas that had never previously been studied. The combined species count from all sources is now 11, i.e. 79 % of the overall Mediterranean brachiopod fauna.

RIASSUNTO

Nuove segnalazioni di brachiopodi attuali nel Mediterraneo orientale.

Le raccolte di brachiopodi attuali nel Mediterraneo orientale sono relativamente scarse, se comparate a quelle del Mediterraneo occidentale, e rendono pertanto opportuna la pubblicazione di nuovi rinvenimenti da Grecia, Cipro, Libano, Israele ed Egitto. Questi rinvenimenti comprendono sia materiale proveniente da nuove raccolte, sia materiale presente in precedenti collezioni ma non studiato da Logan nel corso della sua revisione dei brachiopodi mediterranei pubblicata nel 1979. Di quest'ultimo materiale fanno parte anche alcuni campioni, raccolti dalla nave da ricerca *Calypso* nel corso della sua crociera del 1964 in Mar Egeo ed aree limitrofe, che non erano ancora stati studiati. L'insieme di questi rinvenimenti porta ad 11 il totale delle specie di brachiopodi note per il Mediterraneo orientale, pari al 79 % dell'intera fauna di brachiopodi del Mar Mediterraneo.