Welcome to the nineteenth issue of the Archaeo+Malacology Group Newsletter, which has now completed its tenth year of publication. The Coordinator would like to thank all past and present contributors – and to encourage more of you, especially new authors, to write short articles, abstracts, reviews, research reports, etc. for future issues. Your input is vital!

For the newsletter, archaeomalacology is interpreted in its widest sense: the interaction of man and molluscs from earliest times to the recent past; palaeoenvironmental reconstruction; studies on diet, ancient trade routes, ornaments and jewellery, ritual and symbolism. So please share your interests and research projects with the greater archaeomalacological community. The copy deadline for the next issue is 15 December 2011.

Current and previous issues of the newsletter are available at http://triton.anu.edu.au/ and http://home.earthlink.net/~aydinslibrary/AMGnews.htm, with thanks to Kat Szabó of the ICAZ Archaeomalacology Working Group and to Aydin Örstan, respectively.

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Shell artefacts in the Neolithic Pacific Islands:
the shell ornament assemblage from Bourewa, Fiji

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This article describes an exceptional shell assemblage excavated from the Lapita site of Bourewa (Viti Levu, Fiji) which has been analysed and interpreted in a postgraduate thesis (Perrette, 2011).

The island of Viti Levu is situated in the Fijian Archipelago, in Melanesia. Around 3000 years ago the first migrants, who belonged to an archaeologically-defined culture known as the Lapita Cultural Complex, settled in the Rove Peninsula (south-west coast of Viti Levu). The Lapita people are described as great seafarers who carried with them domesticated pigs,
chickens and dogs, commensal rats and the crops taro (*Colocasia* spp.) and yam (*Dioscorea* spp.). They colonized the great majority of the western and central Pacific Islands. As demonstrated through the archaeological sites excavated across Melanesia, for example Talepakemalai (3500-2500 BP) (Kirch, 2002), it appears that they lived in stilt-houses over the sea or in the back-beach zone. The midden deposits associated with Lapita contexts contain remains such as sherds of often highly-decorated pottery, shellfish, fish bones, animal bones and sometimes, as in the case at Bourewa, stone tools and/or shell artefacts.

The settlement of Bourewa (2089-550 BC) was discovered in 2003 by the University of the South Pacific and the Fiji Museum during surface collections in south-west Viti Levu Island (Fig. 1). The site was excavated between 2005 and 2008, and probably extended about 250-300 m along the coast and 40-70 m inland. A total of 260 stone artefacts and 529 non-lithic artefacts were discovered within a 127 m² area (Nunn et al., 2007: 166 and 170). The 529 non-lithic artefacts included 499 shell artefacts of which 175 were non-ornamental (perforated and/or fragmented valves and tools) and 324 were shell ornaments. The remaining 30 specimens belonged to different non-molluscan categories, such as branch coral and sea urchin spines.

The raw material identification, undertaken by Katherine Szabó, showed that 39 species were used at Bourewa for shell artefact production and three major taxa, *Conus* spp., *Tridacna* spp. and *Trochus niloticus*, were used to manufacture shell ornaments (Fig. 2). Of the 324 ornaments, formal types made from different species could be determined: barrel (1), beads (7), ground spire (1), square disc pendant (1), long units (25), mini-rings (14), narrow rings (142), broad rings (82), rings (19) and a possible *Trochus niloticus* ring (Fig. 3).
Fig. 3: (a) *Tridacna* sp. shell barrel (art. 111); (b) *Tridacna* sp. long unit double-perforated (art. 432); (c) *Conus* sp. shell bead (art. 144); (d) *Conus* sp. mini-ring (art. 375); (e) *Conus litteratus*/*leopardus* broad ring (art. 145); (f) *Conus* sp. narrow ring fragmented (art. 126); (g) *Conus* sp. ground spire (art. 143); (h) *Conus* sp. complete ring (art. 95); (i) *Conus* sp. square disc pendant (art. 142); (j) *Trochus niloticus* fragmented ring (art. 328) (photography, Szabó; photography and Adobe fireworks, Perrette)
The study of the 324 shell ornaments present in the Bourewa assemblage focused on four major facets of shell artefact production and consumption: (1) raw material choice, (2) shell-working techniques, (3) curation and (4) implications for value. These combined to provide insights into the role of shell ornaments and, more specifically, the role shell ornaments had as particular items of value and status in Lapita society.

The analysis demonstrated that there was a determined selection pattern for the shells (raw materials) during gathering. All the species of Conus selected are white, patterned with black spots (Conus litteratus, C. leopardus, C. eburneus) except for C. marmoreus which is black, patterned with white markings (Szabó, 2010: 5). Scrutiny of traces of taphonomic and natural damage showed that Conus spp. (Conidae/cone shells) and Tridacna spp. (Tridacniidae/giant clams) were very often gathered alive although they were sometimes collected dead and empty (especially when the particular species targeted were not easy to reach).

By assessing the complete and fragmented ornaments as well as the debitage from ornament manufacture found all across the site, it was possible to reconstruct the multiple chaîne opératoire used to manufacture the ornaments (the manufacturing processes are different according to species). Through such reconstructions, as well as metric analysis (for example standardisation of the measures (internal diameter and thickness) for the ring categories), the time spent in the manufacture of delicate ornaments could be approximated. Additionally, it was demonstrated that only particular types of shell ornament were curated (i.e. broad rings in Conus, where there are sometimes up to four curation episodes on the same artefact, and long units in Tridacna) when they broke. Artefacts targeted for curation were generally those that were most risky and time-consuming to produce. All of these details were compared to ethnographic models (i.e. the Kula trade ring as reported by Malinowski) and archaeological interpretations suggesting similarly-structured exchange networks between islands (e.g. Kirch, 1988, 2002). Whilst it is clear from the ethnographic record that particular types of shell ornament are highly esteemed in Melanesia, this study demonstrates that shell ornaments had a personal and economic value in Lapita society.

References

Molluscs from the PPNB site of Motza, Judean Hills, Israel

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The presence of Neolithic material near the village of Motza, which is situated along the highway from Tel Aviv to Jerusalem about halfway between Abu Gosh and Jerusalem in the Judean Hills, Israel, was first reported by Shalem (1928, 1937). However, he did not locate a habitation site. Similar material was also recognised by de Groot and Greenhut (1996) among
Iron Age material found near Motza. Eisenberg and Sklar (2005) discovered a Late Pre-Pottery Neolithic B stratum below the remains of a Byzantine building at Motza. This find triggered a salvage excavation in 2002 and 2003 carried out by H. Khalaily, Z. Greenhut and A. Eirikh-Rose, which resulted in the recognition of Early and Middle Pre-Pottery Neolithic B (EPPNB and MPPNB) living sites at Motza (Yizhaq et al., 2005; Khalaily et al., 2007a, b).

The zoological remains retrieved during the latter excavation were entrusted for study to Lidar Sapir-Hen (Sapir-Hen et al., 2009). The only archaeomalacological information given in that paper concerned the number of molluscs retrieved from EPPNB and MPPNB layers, i.e. 180 and 11 items, respectively. These molluscs are here treated in more detail.

**Material and Methods**

All the material excavated at the site had been dry sieved through 2 mm mesh or wet sieved through 1 mm mesh. All the archaeozoological items had been picked out from the sieved material and packed in separate bags that contained labels with the square, locus and basket numbers.

A single plastic bag often contained a mixture of molluscan shells belonging to several different species. All the remains were identified to species level. In a few cases the identity of the archaeomnacological specimens was checked by comparing them with recent material in the Mollusc Collection of the National Collections of Natural History at Tel Aviv University.

**Results**

The molluscs found in EPPNB and MPPNB contexts at Motza are listed separately, with notes on their origin, exploitation and environmental significance. (Abbreviations used: L = locus; B = basket.)

**A. The mollusc finds from the EPPNB**

**Catalogue**

**GASTROPODA**

**Family Neritidae**

*Nerita (Theliostyla) sanguinolenta* Menke, 1829

L. 4074, B. 41304: one shell.

**Family Melanopsidae**

*Melanopsis buccinoidea* (Olivier, 1801)

L. 4008, B. 40135: one complete and one damaged shell; L. 4040, B. 40744: one shell; L. 4059, B. 40988: one shell; L. 4062, B. 41024: one shell; L. 4071, B. 41238: one shell with a man-made hole behind the lip; L. 5006, B. 50032: one shell with a man-made hole behind the lip; L. 5009, B. 50044: one shell with a man-made hole behind the lip; L. 5018, B. 50287: one shell; L. 5019, B. 50371: one shell; L. 5020, B. 50248: one shell; L. 5023, B. 50141: two shells; L. 5023, B. 50226: one shell; L. 5025, B. 50216: one shell; L. 5034, B. 50446: one shell.

**Family Cypraeidae**

*Erosaria spurca* (Linnaeus, 1758)

L. 4025, B. 40529: one fragment of the labial lip.

*Luria lurida* (Linnaeus, 1758)

L. 5033, B. 50375: one fragment of the labial lip.

*Zonaria pyrum* (Gmelin, 1791)

L. 5033, B. 50375: one fragment of the labial lip.

**Family Nassariidae**

*Nassarius (Plicarcularia) gibbosulus* (Linnaeus, 1758)

L. 4050, B. 41000: one shell with a man-made hole behind the lip.

**Family Conidae**
Conus mediterraneus Hwass, 1792
L. 4020, B. 40365: one shell; L. 4029, B. 40593: one shell with a man-made hole in the top.

Family Enidae
Buliminus labrosus spirectinus (Bourguignat, 1876)
L. 4014, B. 40256: one damaged shell; L. 4025, B. 40334: one fragment of the top; L. 4040, B. 40689: two fragments; L. 4070, B. 41208: one fragment of the top; L. 4070, B. 41234: one fragment of the top; L. 4070, B. 41324: one shell; L. 4071, B. 41201: one damaged shell; L. 4071, B. 41230: three damaged shells; L. 4071, B. 41301: two damaged shells; L. 4071, B. 41328: one complete and two damaged shells; L. 4072, B. 41259: two damaged shells; L. 5016, B. 50222: 14 complete and six damaged shells; L. 5020, B. 50248: one shell; L. 5024, B. 50220: one complete and one damaged shell; L. 5024, B. 50299: one complete and two damaged shells; L. 5027, B. 50278: one shell; L. 5031, B. 50373: three complete and two damaged shells; L. 5031, B. 50416: one fragment; L. 5033, B. 50375: one shell; L. 5033, B. 50425: one shell; L. 5040, B. 50457: one complete and one damaged shell; L. 5043, B. 50463: one shell; L. 5046, B. 50469: three complete shells and one damaged shell; L. 5046, B. 50492: two shells; L. 5052, B. 50583: one shell; L. 5052, B. 50663: one fragment of the body whorl; L. 5053, B. 50529: two fragments; L. 5055, B. 50663: one fragment of the body whorl; L. 5060, B. 50584: four complete shells and one damaged shell; L. 5067, B. 50774: one shell; L. 5069, B. 50742: one complete and two damaged shells; L. 5069; B. 50758: two shells.

Euchondrus septemdentatus (Roth, 1839)
L. 4011, B. 40215: one shell; L. 4020, B. 40365: one shell; L. 4050, B. 41056: two shells; L. 4062, B. 41024: one shell; L. 4070, B. 41201: two shells; L. 4071, B. 41201: one shell; L. 5019, B. 50097: one shell; L. 5033, B. 50425: one shell; L. 5052, B. 50663: one shell.

Family Sphincterochilidae
Sphincterochila fimbriata (Bourguignat, 1852)
L. 5014, B. 50149: one shell.

Family Hygromiidae
Monacha crispulata (Mousson, 1861)
L. 5055, B. 50663: one shell.

Monacha obstructa (Pfeiffer, 1842)
L. 4070, B. 41208: one shell; L. 4070, B. 41322: one shell; L. 5033, B. 50375: one shell; L. 5033, B. 50425: one shell; L. 5037, B. 50461: one shell.

Monacha syriaca (Ehrenberg, 1831)
L. 4050, B. 40990: one shell; L. 4050, B. 41000: one shell; L. 4050, B. 41052: one shell; L. 4062, B. 41024: two shells; L. 4063, B. 41226: one damaged shell; L. 4070, B. 41183: two tiny fragments; L. 4070, B. 41322: one fragment of the top; L. 4071, B. 41263: one shell; L. 5006, B. 50032: three shells; L. 5016, B. 50222: one shell; L. 5020, B. 50103: one shell; L. 5027, B. 50203: one damaged shell; L. 5052, B. 50545: one shell; L. 5059, B. 50601: one shell; L. 5059, B. 50737: three shells; L. 5069, B. 50751: one shell.

Xeropicta vestalis joppensis (Schmidt, 1855)
L. 4011, B. 40215: one shell; L. 4040, B. 40774: one shell; L. 4071, B. 41263: one shell; L. 5059, B. 50737: three shells.

Family Helicidae
Helix (Pelasga) engaddensis Bourguignat, 1852
L. 4020, B. 40371: one small fragment; L. 4025, B. 40529: one fragment; L. 4040, B. 40689: four fragments of one shell; L. 5016, B. 50143: one fragment; L. 5055, B. 50663: one fragment of the top.

Levantina spiriplana hierosolyma (Mousson, 1854)
L. 5009, B. 50044: one fragment of the aperture; L. 5019, B. 50097: one fragment of the body whorl; L. 5034, B. 50446: two fragments; L. 5046, B. 50469: three fragments; L. 5051, B. 50560: one fragment of the body whorl; L. 5055, B. 50663: one fragment of the aperture; L. 5062, B. 50715: one damaged shell.

BIVALVIA
Family Glycymerididae
Glycymeris bimaculata (Poli 1795)
L. 4054, B. 40915: one valve with a man-made hole in the umbo.
**Glycymeris insubrica** (Brocchi, 1814)
L. 4020, B. 40371: one fragment; L. 4029, B. 40593: one fragment of the ventral margin; L. 5006, B. 50032: one valve with a man-made hole in the umbo; L. 5012, B. 50057: one valve with a man-made hole in the umbo; L. 5016, B. 50143: one damaged valve with a man-made hole in the umbo; L. 5017, B. 50289: one fragment of the ventral margin; L. 5023, B. 50226: one valve with a man-made hole in the umbo; L. 5031, B. 50416: two fragments; L. 5036, B. 50418: one fragment of the ventral margin; L. 5040, B. 50457: one fragment of the ventral margin; L. 5046, B. 50505: one fragment.

**Family Cardiidae**

*Acanthocardia tuberculata* (Linnaeus, 1758)
L. 5031, B. 50416: one damaged valve; L. 5065, B. 50642: one fragment of the ventral margin.

**Origin of the shells**
The shells encountered in the EPPNB context originated from three different biotopes: terrestrial, freshwater and marine. The land and freshwater molluscs are most likely all of local origin, while the marine molluscs are either from the Mediterranean or the Red Sea. The EPPNB mollusc material may be categorised as follows:

<table>
<thead>
<tr>
<th>Classification</th>
<th>Species</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local land snails:</td>
<td><em>Buliminus labrosus spirectinus</em></td>
<td>78</td>
</tr>
<tr>
<td></td>
<td><em>Euchondrus septemdentatus</em></td>
<td>13</td>
</tr>
<tr>
<td></td>
<td><em>Sphincterchila fimbriata</em></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><em>Monacha crispulata</em></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><em>Monacha obstructa</em></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td><em>Monacha syriaca</em></td>
<td>22</td>
</tr>
<tr>
<td></td>
<td><em>Xeropicta vestalis joppensis</em></td>
<td>7</td>
</tr>
<tr>
<td></td>
<td><em>Helix engaddensis</em></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td><em>Levantina spiriplana hierosolyma</em></td>
<td>10</td>
</tr>
<tr>
<td>Local freshwater:</td>
<td><em>Melanopsis buccinoidea</em></td>
<td>16</td>
</tr>
<tr>
<td>Mediterranean Sea:</td>
<td><em>Erosaria spurca</em></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><em>Luria lurida</em></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><em>Zonaria pyrum</em></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><em>Nassarius gibbosulus</em></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><em>Conus mediterraneus</em></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><em>Glycymeris bimaculata</em></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><em>Glycymeris insubrica</em></td>
<td>12</td>
</tr>
<tr>
<td></td>
<td><em>Acanthocardia tuberculata</em></td>
<td>2</td>
</tr>
<tr>
<td>Red Sea</td>
<td><em>Nerita sanguinolenta</em></td>
<td>1</td>
</tr>
</tbody>
</table>

**Exploitation**
Only ten shells among the 180 recovered during the excavation of the EPPNB layers showed traces of manipulation. Five gastropod shells belonging to three different species were turned into shell beads by making a hole either behind the lip of the aperture, as in *Melanopsis buccinoidea* (3) and *Nassarius gibbosulus* (1) or in the apex, as in *Conus mediterraneus* (1).

The shell pendants made of *Glycymeris bimaculata* (1) and *Glycymeris insubrica* (4) valves all show a man made hole in the umbo.

**Environment**
All nine land snail species encountered among the EPPNB material are still living in the vicinity of Motza. They are typical representatives of the terrestrial molluscan fauna of mountainous regions in Israel characterised by a Mediterranean climate. Yet they occupy
different niches in that area. \textit{Buliminus labrosus spirectinus} and \textit{Levantina spiriplana hierosolyma} are inhabitants of rocks; \textit{Monacha obducta}, \textit{Monacha syriaca} and \textit{Xeropicta vestalis jopennis} prefer areas covered by shrubs and grasses; open areas are preferred by \textit{Sphincterochila fimbriata} and \textit{Helix engaddensis}; leaf litter is the exclusive biotope of \textit{Monacha crispulata}; while \textit{Euchondrus septemdentatus} may occur in any biotope. Some of the species (especially \textit{Helix engaddensis}) aestivate while buried in the ground and if these do not survive the long hot summers, recent shells may contaminate much older levels.

The rock snail \textit{Buliminus labrosus spirectinus} (78 shells) seems to be over-represented among the material. I rule out the possibility that it had been collected as food because none of the shells show any damage. Typical edible snails, like \textit{Helix engaddensis} and \textit{Levantina spiriplana hierosolyma}, are represented by, respectively, five and ten highly fragmented shells only.

Micro land snails (0.5-2 mm) are completely absent from the material, probably because sieving was carried out using too large a mesh size.

The presence of 16 well preserved shells of the freshwater snail \textit{Melanopsis buccinoidea} is most interesting. None of the springs and the Soreq River, currently an intermittent stream, in the neighbourhood of Motza are currently inhabited by \textit{Melanopsis}. Either the climate was more humid during the EPPNB period or the aquatic biotopes in the vicinity of Motza have deteriorated to such an extent by pollution or over pumping of the aquifer that this freshwater snail has disappeared from the area.

**B. The mollusc finds from the MPPNB**

**Catalogue**

**GASTROPODA**  
Family Hygromiidae  
\textit{Monacha syriaca} (Ehrenberg, 1831)  
L. 2109, B. 33233: one fragment of the body whorl including the lip of the aperture.

Family Helicidae  
\textit{Helix (Pelasga) engaddensis} Bourguignat, 1852  
L. 2141, B. 33533: one fragment of the body whorl including part of the columella.

\textit{Levantina spiriplana hierosolyma} (Mousson, 1854)  
L. 2109, B. 33233: three fragments of at least two body whorls; L. 2141, B. 33520: one fragment of the body whorl; L. 2141, B. 33531: one fragment of the body whorl.

**BIVALVIA**  
Family Glycymerididae  
\textit{Glycymeris insubrica} (Brocchi, 1814)  
L. 2141, B. 33520: one fragment including part of the ventral margin; L. 2141, B. 33531: two fragments both including part of the ventral margin; L. 2141, B. 33576: one fragment including part of the ventral margin.

**Origin of the shells**  
Seven shells are of local, terrestrial origin, while four fragments of a Mediterranean bivalve species were also recovered:

| Local land snails: | \textit{Monacha syriaca} | 1 |
| \textit{Helix engaddensis} | 1 |
| \textit{Levantina spiriplana hierosolyma} | 5 |
| Mediterranean Sea: | \textit{Glycymeris insubrica} | 4 |
Exploitation
The preservation of the shells is so poor that their possible exploitation during the MPPNB cannot be determined.

Acknowledgements
I would like to thank Dr Hamoudy Khalaily (Israel Antiquities Authority) and Mrs Lidar Sapir-Hen (Tel Aviv University) for allowing me to study the shell material recovered during the excavation of the Pre-Pottery Neolithic B site of Motza.

References

Postgrads in a non-postgrad world

Brent Koppel is a PhD student working on fracture mechanics in archaeological shell remains. At a recent post-graduate retreat within the School of Earth and Environmental Sciences at the University of Wollongong, Australia, students were asked to prepare a comic strip or cartoon about their research and Brent won first prize for his contribution:

Let Brent explain: “I am currently doing my PhD entitled ‘Archaeological shell use in the Kimberley, Western Australia’ under Dr Katherine Szabó. After completing a BSc majoring in Geology, I approached Kat looking for honours projects in a field that, let’s face it, everyone has wanted to study at some point in their life. What followed was a thesis describing the
contemporary stance towards the role of shell in archaeological study, but more importantly presenting the morphological difference between taphonomic fracture and anthropogenic modification. The inspiration for the comic strip came from trying to explain what I was doing to my non-science centred friends, which I think a lot of you can relate to.”

Abstracts


ABSTRACT: The recent discovery that the North Atlantic marine bivalve *Arctica islandica* is extremely long-lived, coupled with the fact that the shell shows annual and variable growth rings that reflect the prevailing conditions, has presented palaeoenvironmentalists with a precisely dated high-resolution archive for the non-tropical marine environment. This burrowing infaunal bivalve is widely distributed on shelf seas from North America to Iceland to the north-west European shelf between the UK and Norway. Individuals frequently live in excess of 250 years, with the current record standing at 507 years from the north coast of Iceland. By crossdating the growth rings on living and dead shells it has been possible so far to extend the sequence back for 1350 years for northern Iceland and 500 years for the Irish Sea. Not only does the width of any growth ring reflect the available food supply, but its oxygen and carbon isotopes can be measured to provide information on the seawater temperature and salinity at the time of shell deposition.


ABSTRACT: Archaeomalacological assemblages from three predominantly Bronze Age sites in the Aegean were studied to reveal palaeoenvironmental factors, and cultural and economic stimuli that may have affected the role and nature of shellfishing and the contribution of shellfish to the human diet. Methods included calculations of relative taxon abundance, and chronological, taphonomic, contextual and morphometric analyses, sampling of modern mollusc populations, stable isotope analysis, and use of ethnographic analogies. Gathering and processing techniques are discussed. Changes in the size of *Cerastoderma glaucum* shells at Troia and *Patella caerulea* at Yenibademli indicate chronological changes in mollusc exploitation modes and the consequences of human pressure. Seasonal incremental analyses of *Cerastoderma glaucum* populations revealed that harvesting took place year round with increased activity during warmer months. A morphological difference between archaeological and modern populations of *Cerastoderma glaucum* in the Troad is attributed to environmental changes. The evidence for purple dye production in Troia is evaluated.


ABSTRACT: Marine molluscs have been recovered from sites around the Mediterranean Sea dating as far back as the Lower Palaeolithic, when hominins might have started consuming them (ca. 300 ka). During the Middle Palaeolithic and the early Upper Palaeolithic, humans (*Homo neanderthalensis* and *Homo sapiens*) ate molluscs at many sites across the Mediterranean at least as early as the Last Interglacial, although the scale of this exploitation is still unclear, due to biases produced in the coastal archaeological record by Late Glacial and post-Glacial sea level rise. The exploitation of marine molluscs apparently increased in the Late Glacial and Early Holocene, when humans collected them in relatively large quantities.
and from all available ecosystems. The consumption of shellfish, and of other small animals (aquatic and continental), probably contributed to the success of the flexible and opportunistic subsistence strategies adopted by Mediterranean hunter-gatherers for much of prehistory. This is particularly evident in later foraging economic systems (i.e. late Upper Palaeolithic and Mesolithic), in which coastal resources probably acted as buffers against the negative outcomes of environmental and anthropogenic impacts on available resources.


ABSTRACT: This paper compares stable isotope (δ¹⁸O and δ¹³C) records of Early–Middle Holocene land snail shells from the archaeological deposits of Grotta di Latronico 3 (LTR3; southern Italy) with modern shell isotopic data. No substantial interspecific variability was observed in shell δ¹⁸O (δ¹⁸Os) of modern specimens (Pomatias elegans, Cornu aspersum, Eobania vermiculata, Helix ligata and Marmorana fuscolabiata). In contrast, interspecific shell δ¹³C (δ¹³Cs) variability was significant, probably due to different feeding behaviour among species. The δ¹⁸Os values of living land snails suggest that species hibernate for a long period during colder months, so that the signal of ¹⁸O-depleted winter rainfall in their δ¹⁸Os is lost. This suggests that δ¹⁸Os and δ¹³Cs values of Pomatias elegans from this archaeological succession provide valuable clues for seasonal (spring–autumn) climatic conditions during the Early–Middle Holocene. The δ¹⁸Os values of fossil specimens are significantly lower than in modern shells and in agreement with other palaeoclimatic records, suggesting a substantial increase of precipitation and/or persistent changes in air mass source trajectories over this region between ca. 8.8 cal ka BP and 6.2–6.7 ka ago. The δ¹³Cs trend suggests a transition from a slightly ¹³C-enriched to a ¹³C-depleted diet between Early and Middle Holocene compared to present conditions. We postulate that this δ¹³Cs trend might reflect changes in the C3 vegetation community, potentially combined with other environmental factors such as regional moisture increase and the progressive decrease of atmospheric CO₂ concentration.

Colonese, A.C., Zanchetta, G., Drysdale, R.N., Fallick, A.E., Manganelli, G., Lo Vetro, D., Martini, F., Di Giuseppe, Z. In press. Stable isotope composition of Late Pleistocene-Holocene Eobania vermiculata shells (Müller, 1774) (Pulmonata, Stylommatophora) from the Central Mediterranean basin: data from Grotta d’Oriente (Favignana, Sicily). Quaternary International (Special Issue: Gastropods and humans in the Late Palaeolithic and Mesolithic of the western Mediterranean basin). [See p. 16.]

ABSTRACT: This paper presents stable isotopic results (oxygen and carbon) from both modern and Late Pleistocene-Holocene shells of the land snail Eobania vermiculata from Favignana Island (Sicily). It aims to contribute to the understanding of climate and vegetation history of this region during formation of Upper Palaeolithic, Mesolithic and Meso-Neolithic deposits of Grotta d’Oriente. Results from both an evaporative model (FBM) and an empirical regional isotopic model (i.e. linear relation between oxygen isotopic composition of shells (δ¹⁸Os) and those of local precipitation (δ¹⁸Op)) indicate that the δ¹⁸Os values of modern specimens are mainly controlled by local temperature, relative humidity and δ¹⁸Op at the time of snail activity. Data also suggest that the modern snails are nocturnally active almost year round in the study area. The carbon isotopic compositions of shells (δ¹³Cs) of the same specimens indicate a diet prevalently (or exclusively) composed of C3 vegetation. The δ¹⁸Os values of Late Pleistocene specimens suggest that climate conditions at 14.2 ka cal BP were similar to the present day, in agreement with additional δ¹⁸Os records from southern Italy. By contrast, Early-Middle Holocene shells are notably ¹⁸O-depleted and suggest wetter conditions, possibly combined with a decrease in isotopic composition of precipitation source, compared to the present day. When compared with regional palaeoclimatic records a large-
scale isotopic response to millennial-scale changes in atmospheric and hydrological conditions (e.g. enhanced rainfall) in the central-eastern Mediterranean is observed during the Early-Middle Holocene. The $\delta^{13}C_s$ of Late Pleistocene and Holocene specimens are consistently higher than those of modern ones. For the Late Pleistocene, this could be reasonably explained in terms of water-stressed vegetation. On the other hand, this seems to be less valid for Holocene counterparts when the climate was wetter. Probably $\delta^{13}C_s$ values result from the combination of distinct competing factors, involving atmospheric CO$_2$ concentration, seasonal water budget, vegetation type-cover and other carbon sources. Results reveal coherent relationships between regional $\delta^{18}O$ and $\delta^{13}C_s$, demonstrating that Late Pleistocene-Holocene land snail shell remains from archaeological sites may provide useful snapshots of past seasonal climate conditions.


ABSTRACT: Carbon and oxygen isotope ratios were measured in fossil and recent shells of the land snail Helix ligata. Fossil shells were recovered from the archaeological excavations of Grotta della Serratura and recent specimens were collected adjacent to the cave. The record is discontinuous and spans from ca. 14 to 7 ka cal BP. The oxygen isotope composition of the fossil shells suggests they were grown from environmental waters (e.g. precipitation) isotopically similar to the present during the recorded part of the Late Glacial. A notable exception is represented by a layer at ca. 13.4 ka cal BP, with shells characterised by $^{18}O$-enriched values, suggesting drier conditions, with rainfall perhaps reduced by 25% compared to the present day. This layer could correspond in part with the GI-1b event of the Greenland ice-core records. The onset of the Holocene was marked by a decrease of $\delta^{18}O$, suggesting an increase in humidity. Significantly lower $\delta^{18}O$ values occur at ca. 7.4 ka cal BP, in agreement with other stable isotope records, which suggests enhanced rainfall over the Mediterranean region at that time.

Gordillo, S., 2009. Quaternary marine mollusks in Tierra del Fuego: insights from integrated taphonomic and paleoecologic analysis of shell assemblages in raised deposits. Anales Instituto Patagonia (Chile), 37 (2): 5-16. [In English with Spanish summary.]

ABSTRACT: During the Quaternary the southern tip of South America was affected by several glaciations with the consequent interruption of the connection between the Atlantic and Pacific Oceans. Fossil marine molluscs recovered from interglacial (Pleistocene) and postglacial (Holocene) Quaternary deposits in Tierra del Fuego provide a key for the reconstruction of palaeocommunities and the evaluation of changes in faunal composition over time. A palaeontological database was compiled from previously published studies, showing a diverse fauna which includes 91 different species (61.5% gastropods, 31.9% bivalves and 6.6% chitons). Quaternary time-averaged mollusc assemblages from Tierra del Fuego give a good picture of the overall coastal benthic biodiversity patterns in the region. The composition of mollusc species showed remarkable similarities with the present-day fauna, which reinforces the hypothesis that climatic conditions have been maintained without significant changes since at least the Middle Pleistocene. However, taphonomic and paleoecological analysis of shell assemblages shows the existence of different shallow benthic communities, representing spatial and temporal variations among regions and sites.


ABSTRACT: The question of the anthropic or natural origin of land snail deposits within the archaeological record is the subject of debate all over the world. In the Cantabrian region of
northern Spain land snail middens are routinely identified in the Early Holocene archaeological record. La Fragua Cave, which contains an Early Holocene layer dated to 9600 +/- 140 BP (10,932 +/- 196 cal BP), offers the opportunity to address this debate through the examination of *Cepaea nemoralis* land snails recovered in direct association with mammal bones, charcoal, lithic artefacts and other materials. It is therefore believed that their presence at the site is clearly anthropic in origin. In addition, the exploitation patterns indicate an occasional collection and consumption of land snails, which confirms the complementary character of these resources in the diet of hunter-gatherers in Cantabrian Spain during the Pleistocene-Holocene transition.

ABSTRACT: The archaeomalacological material recovered from five Late Chalcolithic burial caves at Sha’ar Efrayim in the Sharon Plain, Israel, comprised only two species: *Conus flavidus* (11 shells, all with a perforated apex, from four loci in Cave 1) and *Glycymeris insubrica* (two valves with perforated umbo, one each from Caves 1 and 3). The latter is a common bivalve from the Mediterranean Sea; both valves had been converted into pendants by piercing the umbo. The cone shells, in contrast, are native to the Red Sea and Indo-Pacific. Only a single species, *Conus flavidus*, was represented in spite of the fact that 23 species of cone shells can be found in the Gulf of Aqaba. All the shells had been processed in the same way, by gripping the top of the shell flat before perforating it where the apex had been in order to make beads. The presence of this species indicates trade with populations living farther to the south, perhaps in Eritrea. All the shells had apparently served as grave goods.

Mienis, H.K. and Ashkenazi, S., 2011. Lentic Basommatophora molluscs and hygrophilous land snails as indicators of habitat and climate in the Early-Middle Pleistocene (0.78 Ma) at the site of Gesher Benot Ya’aqov (GBY), Israel. *Journal of Human Evolution*, 60: 328-340. (Doi: 10.1016/j.jhevol.2010.03.009.)
ABSTRACT: About 2000 specimens of 21 lentic and hygrophilous species belonging to five families (Planorbidae, Lymnaeidae, Acroloxidae, Carychiidae and Succineidae) were recovered from the Early-Middle Pleistocene site of Gesher Benot Ya’aqov, which is crossed by the Matuyama-Brunhes Boundary (MBB). Samples of equal size from 27 of the 46 layers along the 100 ka timespan of the site were studied to reconstruct their specific habitats and possible reactions to climate change during this timespan. The Planorbidae and Lymnaeidae reached greater abundance (90 and 80% of their assemblages, respectively) pre-MBB, while Acroloxidae, Succineidae and Carychiidae were more abundant (74, 64 and 90%) post-MBB. The data indicate a two-phase pattern of shallow and deep water in each of five defined cycles. Mollusc numbers increased during the shallow water phases. The site climate changed from cold and humid in the oldest layers, to dry and cold up to the MBB and a few succeeding layers. Between post-MBB cycles 2 and 3 there was a short period of warm and humid climate that enabled the influx of African and Asian elements and cold climate Euro-Siberian and Palaearctic species disappeared. Succeeding layers indicate a cooler and humid climate.

ABSTRACT: Age, growth and length frequency data of the subantarctic intertidal limpets *Nacella (Patinigera) magellanica* and *Nacella (Patinigera) deaurata* were investigated at Bahía Laredo in the eastern part of the Straits of Magellan, Chile. Data were obtained from both recent populations and shells of the same species excavated from a nearby shell midden deposit. Conventional C14 age determination showed that the shells of both limpet species from this midden were about 1400 years old (S.D. +/- 75 years). The growth rates of recent
and ancient populations were in the same range, but higher than determined in previous studies conducted in the Magellan region. The absence of both large-sized limpets and the smallest size classes from the ancient deposit may indicate considerable exploitation of limpet populations by Patagonian inhabitants about 1400 years ago.


ABSTRACT: A standard method was devised for recording up to 25 measurable and objective features, including epibionts, and subjective descriptive characteristics of oyster (*Ostrea edulis*) shells from 60 archaeological sites in the UK. The frequency of occurrence of each characteristic in a given sample is used to compare samples on an intra- and inter-site basis, and between contexts and different periods. Principal component analysis was used to differentiate between oysters from different regions based on the epibiont infestation characteristics. Roman sites throughout the UK are renowned for massive quantities of oysters, which were widely distributed via the excellent transport system, but there is no evidence to show that they were cultivated at that time. In contrast, Saxon sites with oysters tend to be near the coast, reflecting the post-Roman deterioration of the road network. By Medieval times oysters were again widely distributed but were smaller, suggesting that they were being cultivated on intertidal beds which is known to reduce their growth rate.

**Shells from a Chalcolithic site in Nahal Refaim, Jerusalem**

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During the excavation of a Chalcolithic site in Nahal Refaim, Jerusalem, Israel, by Ianir Milevski (Permit A-4985) in 2006, three shells were preserved for further study. This material represented three different species:

GASTROPODA
Family Enidae
*Buliminus labrosus spirectinus* (Bourguignat, 1876)
Locus 216, Basket 2030: one complete shell.

BIVALVIA
Family Mutelidae
*Chambardia rubens arcuata* (Cailliaud, 1823)
Locus 212, Basket 2034: one very small part of the ligament area, which forms part of the dorsal margin.

Family Cardiidae
*Cerastoderma glaucum* (Poiret, 1789)
Locus 209, Basket 2012: one valve with a man-made hole in the umbo.

These three species originated from as many different geographical areas. *Buliminus labrosus spirectinus* is a local terrestrial snail. The specimen recovered at the site is in a perfect state of preservation and gives the impression that it is of recent origin. It is most probably a recent intruder, which was living among rocks at the site.

*Chambardia rubens arcuata* is a large freshwater mussel from the River Nile in Egypt. This species has been exploited by man throughout history and in the Levant at least since the Natufian period. It is an important component of archaeomalacological material, especially in
sites dating back to the Chalcolithic and Early Bronze periods. The fragment from Nahal Refaim is too small to interpret its usage; however, the presence of part of a mussel living exclusively in the Nile forms an indication that the people maintained contacts with Egypt.

*Cerastoderma glaucum* is an edible species from the Mediterranean Sea. Along the coast of the Levant it lives in lagoons with changing levels of salinity and in the estuaries of rivers characterised by brackish water. The valve found at the site had a man-made hole in the umbo and had been used most probably as a pendant.

Only the two bivalves found at the excavated site in Nahal Refaim may be considered as archaeomalacological remains. These shells show that people living during the Chalcolithic period in the Nahal Refaim area maintained contacts with regions as far away as the Mediterranean Sea and the River Nile, Egypt.

I would like to thank Dr Ianir Milevski (Israel Antiquities Authority) and Dr Liora Kolska Horwitz (Jerusalem) for entrusting me with the discussed material.

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**Stray finds from archaeological sites in Israel**

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A shell of *Stramonita haemastoma* forma *consul* at Tel Shiqmona  
Not so long ago Dr Ehud (Udi) Galili brought me a large shell of a gastropod, which he had confiscated from a person illegally excavating at the site of Tel Shiqmona near the Mediterranean coast south of Haifa, Israel.

This shell had a height of just over 9 cm and was immediately recognised as a fine specimen of *Stramonita haemastoma* (Linnaeus, 1767) forma *consul*, Fam. Muricidae. Specimens belonging to the forma *consul* are characterised by the very high and wide shell and the large knobs on the periphery of the last whorl. Such specimens may reach a height of 13 cm and a width of 10 cm and are relatively heavy. This form is nowhere common in the Mediterranean Sea. Now and then an old empty shell is found along the Mediterranean coast of Israel. However, most specimens I have seen (less than a dozen) were from archaeological sites dating to the Roman-Byzantine period.

At Tel Shiqmona material has been recovered from the Late Bronze, Iron and Persian periods, while remains of Roman and Byzantine dwellings have been found in the vicinity. Unfortunately it is impossible to place this specimen in a particular archaeological period, although we may register Tel Shiqmona as another locality where this interesting form of the common red-mouthed rock shell has been found in Israel.

I would like to thank Dr Ehud Galili of the Israel Antiquities Authority for donating the discussed shell to the Mollusc Collection of Tel Aviv University.

A shell fragment from a Nabatean-Byzantine or Early Islamic pool north of Yotvata  
A shell fragment was found during an excavation of a Nabatean-Byzantine or possibly Early Islamic pool north of Yotvata (Israel Grid: 1560/9249) carried out by Uzi Avner (Israel Antiquities Authority) on 19 September 2006.
This shell fragment, now consisting of seven tiny subfragments, belonged to a valve of the freshwater mussel *Corbicula fluminalis* (Müller, 1774), Fam. Corbiculidae. I have no idea how this mussel reached Yotvata in the Arava Valley. In Israel its distribution is confined to the Jordan River, the Sea of Galilee and the former Lake Hula. The spot nearest to Yotvata where it occurs today is the Lower Jordan River north of the Dead Sea.

In principal it is an edible species. However, if the people near Yotvata were eating *Corbicula*, then the remains of numerous valves should have been found. More likely an aquatic bird, which had fed on mussels, may have voided the remains in the pool when it was migrating south.

I would like to thank Uzi Avner for showing me the discussed mussel remains.

**A surface find of a shell bead made of a *Conus parvatus sharmiensis* at Giv'at Mrar**

Giv'at Mrar is situated in the southern coastal plain of Israel, west of the road between Rehovot and Gedera (Israel Grid 179.5/638.7). It consists of a kurkar (= local sandstone) hill, the most southerly one of a range of hills rising above the surrounding plain. The site is considered a National Park. The hill is named after the Arabic village Mrar or Mūghār, which covered the south-eastern flanks of the hill until it was destroyed during the War of Independence. On the hill remains have been found from the Chalcolithic period onwards. Some of the more impressive remains of former occupation of the hill are burial caves dating from the Middle Bronze and Roman-Byzantine periods.

On 26 February 2011 the author and his colleague Oz Rittner of the Tel Aviv University visited Giv'at Mrar in order to collect, respectively, land snails and caterpillars of Lepidoptera. At numerous points on the slopes marine molluscs were seen, especially at places where remains of buildings were still scattered among the vegetation. Among these valves of *Glycymeris insubrica* (Brocchi, 1814) were quite numerous. Throughout history these shells have been used as building material, especially in the form of shell mortar.

A more interesting shell was found at an open place: a small cone shell measuring 13.29 x 8.68 mm with a small man-made hole in the apex (TAU MO 72502). It turned out to be a highly abraded but still easily recognisable shell of *Conus parvatus sharmiensis* Wils, 1986, a tiny species restricted in its distribution to the waters bordering the Arabian Peninsula. The nearest place where this species occurs is some 400 km south-east of Giva't Mrar in the northern part of the Gulf of Aqaba.

Unfortunately it is impossible to place this interesting shell within the context of one of the archaeological periods recognised at Giv'at Mrar.

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**Past conferences**

Three volumes of archaeomalacological conference proceedings are expected to be published in the near future:

**Gastropods and humans in the Late Palaeolithic and Mesolithic of the western Mediterranean basin**

The proceedings of this session, which was held at the MESO 2010 conference in Santander, Spain, in September 2010, are to be published as a Special Issue of *Quaternary International*, co-edited by David Lubell and Nick Barton.
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D. Lubell, N. Barton: Preface.
V. Taylor, R.N.E. Barton, M. Bell, A. Bouzouggar, S. Colcutt, S. Black, J.T. Hogue: The Epipalaeolithic (Iberomaurusian) at Grotte des Pigeons (Taforalt), Morocco. A preliminary study of the land Mollusca.
J. Jordá, B. Avezuela, J.E. Aura, C. Martín-Escorza: The gastropod fauna of the Epipalaeolithic shell midden in the Vestibulo Chamber of Nerja Cave (Málaga, southern Spain).
L. Lloveras, J. Nadal, P. Garcia-Argiíelles, J.M. Fullola, A. Estrada: The land snail midden from Balma del Gai (Barcelona, Spain) and the evolution of terrestrial gastropod consumption during the Late Palaeolithic and Mesolithic in eastern Iberia.
J. Fernandez-Lopez de Pablo, M. Gomez-Puche, A. Martinez-Ortí: Systematic consumption of non-marine gastropods at open-air Mesolithic sites in the Iberian Mediterranean Region.
Igor Gutiérrez: Coastal resource intensification across the Pleistocene-Holocene transition in northern Spain: evidence from shell size and age distributions of marine gastropods.
A. Girod: Land snails from Late Glacial and Early Holocene Italian sites.
D. Komso, N. Vukosavljević: Connecting coast and inland - perforated marine and freshwater snail shells in the Croatian Mesolithic.

Archaeomalacology: shells in the archaeological record
The four-yearly International Council for Archaeozoology (ICAZ) conference was held in August 2010 in Paris, and a whole day was reserved for papers focused on archaeological shell. Papers were divided across three thematic subsessions: Acquisition and use of shell raw materials in prehistory, coordinated by Nathalie Serrand, Catherine Dupont and Vesna Dimitrijevic; Shell middens and shells as a food resource, coordinated by Luis Gómez Gastélum; and Shells as indicators of palaeoenvironment, site formation and transformation, coordinated by Kat Szabó. The proceedings are currently being prepared for publication, and all the 19 papers and 15 posters presented will be published as a BAR International Series volume, which hopefully will become a valuable book for archaeomalacologists, covering many parts of the world and different time periods.

Archaeomalacology revisited: non-diетery use of molluscs in archaeological settings
This volume, to be published by Oxbow Books and edited by Canan Çakırlar, will include ten papers from the archaeomalacology sessions held at the ICAZ 2006 conference in Mexico City. [This book is currently ‘at the printers’ and will be reviewed in the next newsletter.]

Table of contents
Esteban Álvarez-Fernández: Personal ornaments made from mollusc shells in Europe during the Upper Palaeolithic and Mesolithic: news and views.
Alfredo Carannante: Purple-dye industry shell waste recycling in Bronze Age Aegean? Stoves and murex shells at Minoan Monastiraki (Crete, Greece).
Diana Rocío Carvajal Contreras: Shell artefacts from the Gold Museum in Colombia: a view from the intermediate area.
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Kirsty Murphy: ‘She drills seashells on the seashore’: an experimental study – manufacture-wear vs. use-wear using Palaeolithic technologies for the perforation of whole shell beads.

Clara Paz Bautista: Adorning the dead: shell embroidery from the Temple of Quetzalcoatl, Teotihuacan, Mexico.

Alicia Reyes Espinosa: Mesoamerica: a shell pendant from Yaxchilán, Chiapas, Mexico.

Adrián Velázquez Castro, Pedro Jiménez Lara, Belem Zúñiga Arellano, Norma Valentín Maldonado: The Oliva shell necklace from Tlacojalpan, Veracruz, Mexico.

Future conferences

UK Archaeological Sciences 2011
UKAS is a biennial international conference which aims to bring together archaeological scientists from all areas within the field. This year’s meeting will be hosted by the Department of Archaeology at the University of Reading, on 15-18 September 2011. The programme can be found at www.reading.ac.uk/ukas-2011

Papers and posters will be presented in the following sessions: Scientific approaches to artefacts and ancient materials; Biomolecular approaches to animal-human relationships; Mobility, migration and culture contact; Palaeodiet: questions of marine resource consumption; Palaeodiet: new approaches to methodological problems; New directions; Humans and environmental change. The last session will include a paper by A. Prendergast, R.E. Stevens, T.C. O’Connell, C. Hunt and G. Barker entitled ‘Marine and terrestrial palaeoclimate proxies from the stable isotope analysis of North African molluscs’.

Ancient maritime communities along the European Atlantic coast
This is the theme of the HOMER 2011 conference to be held at Vannes in Brittany, France, from 27 September to 1 October 2011. For further information, see the conference website at http://homer2011.univ-rennes1.fr/index.php

This conference aims to bring together the many researchers interested in questions of coastal archaeology, maritime communities, and the interactions between people and the marine environment within the Channel, North Sea and Atlantic areas of Europe. Sessions will consider the cultural identities of coasts and islands, the characters and evolution of maritime landscapes, and the production and transformation of marine resources.

Subsistence and surplus production
The autumn meeting of the Association for Environmental Archaeology will be held at the VU University in Amsterdam on 21-22 October 2011. Further details and abstracts of papers can be found at http://www.acvu.nl/aea2011.html

The first paper of the first session of this meeting is by James Walker of Durham University, UK. ‘Finding the famine? An integrated approach to testing hypotheses of shellfish as a starvation food’ will present the results of his research on Littorina littorea from Mesolithic shell middens on the island of Oronsay, Inner Hebrides, Scotland. In the second paper, Canan Çakırlar will be ‘Rethinking Neolithic subsistence at the gateway to Europe in the light of new archaeozoological evidence from Istanbul (Yenikapi-Marmaray site, ca. 6500-5500 BC)’.