

THE DISTRIBUTION OF UNWORKED MOLLUSCS, WITH SPECIAL REFERENCE TO UNIONIDAE (FRESHWATER MUSSELS), IN MAINLAND SOUTHEAST ASIAN MORTUARY CONTEXTS

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ABSTRACT

Archaeological evidence demonstrates that molluscs, either as unworked or worked artefacts, have been deposited in burial settings as objects which speak to secular or various philosophical, religious or cosmological concerns. Those molluscs imbued with secular or cosmological significance are identified and selected with reference to the specific behaviour, characteristics or qualities of the mollusc itself within a given society's socio-cultural belief system. This paper examines data from mainland Southeast Asia to explore the distribution and potential significance of Unionidae bivalves in human burials from a range of large, later prehistoric burial sites. This family of bivalves was important in the mortuary tradition of the region from the Neolithic through to Iron Age, especially during the Bronze Age.

INTRODUCTION

The analysis of molluscan fauna within an archaeological context facilitates the exploration of the relationship between human agents and the environment they occupied (Butzer 1971: 227; Butzer 1982: 198; Karali 2005: 91; Quitmyer *et al.* 2005: 18). Through a non-exhaustive review of archaeological literature from the Southeast Asian mainland we discuss the presence and potential significance of unworked Unionidae shells, also referred to as freshwater pearl mussels or naiads, from the burial contexts of the sites of Man Bac, Non Nok Tha, Ban Non Wat, Ban Lum Khao and Noen U-Loke, representing occupation from the Neolithic (2000-1500 BCE) to the Iron Age (500 BCE-CE 500) (Higham and Higham 2009: 25).

Evidence supports a long relationship between humans and marine or freshwater molluscs extending back to the Pleistocene (Balme and Morse 2006: 802; Bouzouggar *et al.* 2007: 9964; Claassen 1998: 1-2; Henshilwood *et al.* 2004: 404; Holden 2004: 369; Kuhn *et al.* 2001: 7642). An understanding of the distribution and growth of different molluscan taxa provides an insight into the environment of prehistoric populations, primarily through the analysis of the interaction between mollusks and their ecosystems (Butzer 1971: 227; Claassen 1998: 142; Davis 1995: 60; Dincauze 2000: 434; Reitz and Wing 2008: 320).

In addition, study of molluscs facilitates examination of a range of features from prehistory, including subsistence strategies through their use as food or bait, and their role in economic (e.g. shellfish harvesting strategies) and/or technological development (e.g. artefact production, pottery temper) (e.g. Claassen 1998: 220; Trubitt 2003: 243-244). Moreover, the distribution of molluscs, whether as currency or as a resource for consumption, has provided evidence of extensive exchange networks (Andrews 1969: 41; Asato 1991: 282; Claassen 1998: 233; Kinoshita 2003: 71; Safer and Gill 1982: 97; Trubitt 2003: 244).

Anthropological and ethnographic research has demonstrated the significance of molluscan fauna, where socially sanctioned taxonomies have been selectively integrated into prehistoric or contemporary communities, as items imbued with secular or cosmological significance (Claassen 1998: 203; Kuijt 2008: 178; Malinowski 1920: 97; Malinowski 1922: 1; Morris 2012: 8; Safer and Gill 1982: 94, 121, 228-233; Saunders 1999: 247; Stix *et al.* 1978: 16; Trubitt 2003: 264-265;).

Molluscs have been recovered from a range of archaeological settings across insular and mainland Southeast Asia and in many instances it is clear that they formed an important element of local subsistence systems (Barker 2005: 97; Bellwood 2007: 163, 179; Higham 2002: 34, 160; Mudar and Anderson 2007: 306), and were used as a raw material for the production of artefacts (Ciarla 1992: 126; Higham 2002: 111, 138, 142; Moore and Pauk 2001: 40; Natapintu 1997: 46-47; Oxenham *et al.* 2008: 203; Sieveking 1954: 88; Szabó *et al.* 2008: 153). Unworked freshwater and marine molluscs of the Class Bivalvia and Gastropoda have been recorded in ancient cemetery settings from insular and mainland Southeast Asia (Bayard and Solheim II 2009: 447; Boriskovskii 1966: 363; Sørensen and Hatting 1967: 25; e.g. Higham 2012: 8, 52, 95, 126, 154, 208, 243, 260, 276, 298, 333, 363, 386; e.g. Higham 2012: 123, 153, 189, 208, 256, 286, 303; Higham and Bannanurag 1990: 257; Higham and Kijngam 1984: 429; Higham and Thosarat 2004: 68; Higham and Wiriyaromp 2010: 6-10, 26-77; Huffer and Hiep 2011: 148; Kress 2005: 261, 269; Moore and Pauk 2001: 40; Natapintu 1997: 47; Nguyen Lan Cuong 2007: 134; Pigott *et al.* 2007: 122,131; Oxenham *et al.* 2008: 199; Solheim II 2002: 90, 101, 133; Szabó *et al.* 2008: 157-158; Thosarat 2010: 183). We observed unworked molluscs of the families Unionidae, most

commonly, and also *Cypraea* (cowrie shell), to a lesser extent, were frequently deposited in burials on the Southeast Asian mainland (Bayard and Solheim II 2009: 411; Cuong 2007: 130; Thosarat 2010: 182).

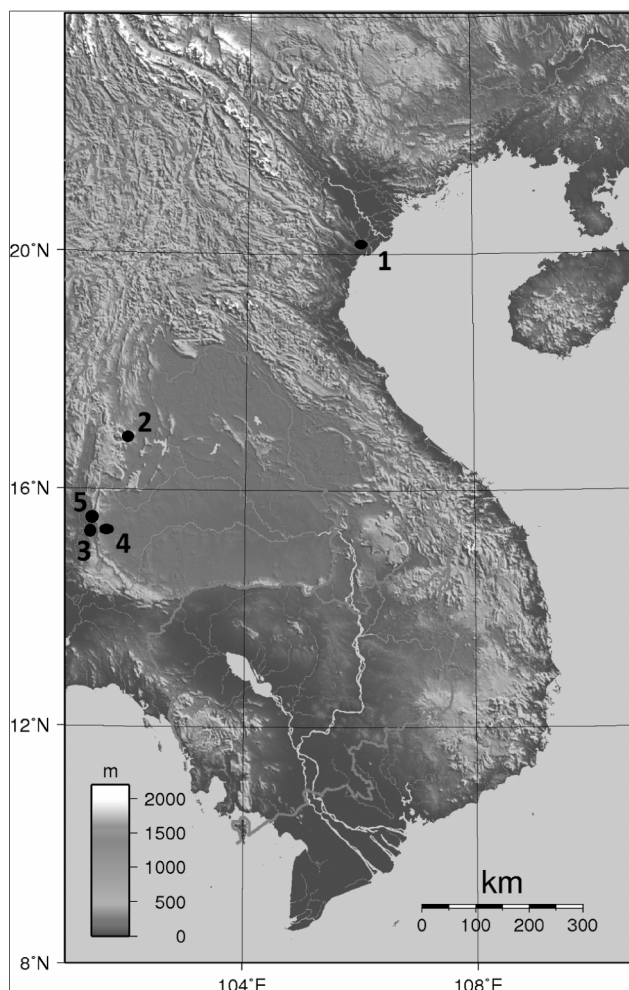


Figure 1: Figure 1 Locations of sites with *Unionidae* in burial contexts (Sadalmelik. nd. http://commons.wikimedia.org/wiki/File:Vietnam_Topography.png Sourced 26/10/2012)

1 – Man Bac; 2 – Non Nok Tha; 3 – Noen U-Loke; 4 – Ban Lum Khao; 5 – Ban Non Wat

Given the ostensibly wide distribution of molluscs in mortuary contexts on the Southeast Asian mainland, the chief purpose of this paper is to document the differential distribution of *Unionidae* in well-excavated and extensively published cemetery studies. An initial review has confirmed the presence of six taxa (at the genus and/or species level) of the Family *Unionidae* at the sites of Man Bac (*Lanceolaria* sp.), Non Nok Tha (*Hyriopsis* sp. or *Physunio* sp.), Ban Non Wat (*H. bialatus* and *Pseudodon* sp.), Ban Lum Khao (*H. bialatus*, *Pseudodon* sp., *Pilsbryconcha* sp. and *Cristaria plicata*) and Noen U-Loke (*H. bialatus*) (Bayard and Solheim II 2009: 447; Higham and Thosarat 2004: 25, 34, 43, 53; Talbot 2007: 320; Thosarat 2010:

183) (Figure 1). The inclusion of *Unionidae* in burial contexts, albeit of various genera and species across several major cemetery sites, suggests that this family of freshwater bivalve mollusc was an important element of the complex mortuary behaviour for certain individuals in each population. The burial assemblages in these five sites were examined in order to determine the geographic and temporal distribution of *Unionidae*, as well as any intra-site patterning by age-at-death, sex or other spatial patterning within each cemetery.

THE SITES AND SAMPLES

Published literature on the five identified cemetery sites was examined to identify those burials which included *Unionidae* as grave goods. Uncertain cases, or instances where the inclusion of Mollusca appeared to be incidental (*i.e.* grave fill), were excluded from the sample. *Unionidae* included in the sample were in direct association with the body (e.g. in the hand, under the pelvis, on the chest etc.) or clearly identified, by primary researchers, in the context of the subject's grave (*i.e.* in association with ceramic vessels above skull, deposited between the subject's legs etc.) (Higham 2009: 99; Higham 2012: 121; Huffer and Hiep 2011: 148)

Man Bac

The Neolithic site of Man Bac (*c.* 1800-1500 BCE) is situated in Ninh Binh Province, Vietnam (Oxenham and Matsumura 2011:2), excavated from 1999 to 2007 (Figure 1). Five squares were excavated, revealing occupation and burial layers. Material culture recovered from Man Bac shows similarities with the Phung Nguyen period culture (Oxenham and Matsumura 2011: 127). Man Bac represents a population in transition from a hunter-gatherer lifestyle to one with a significant reliance on farming (Domett and Oxenham 2011: 19; Oxenham and Domett 2011: 91). A total of 100 burials were excavated at the site (Huffer and Hiep 2011:135-168).

Non Nok Tha

Non Nok Tha is an occupation and cemetery mound site, occupied through the Neolithic and Bronze Ages (*c.* 1770-600 BCE), located in the Phu Wiang region of the upper Chi River valley on the Khorat Plateau (Higham 1996-97: 882; Higham 2002: 92) (Figure 1). Excavations took place at Non Nok Tha in 1966 and 1968. Post-excavation analysis identified a total of 180 burials (Douglas, 1996: 301) with 17 distinct mortuary levels, classified as Early Period 1-3, Middle Period 1-8 and Later Period 1-6 (Bayard 1972:15-23). The Early Period contains distinctive pottery vessels and no bronze, the Middle Period saw the introduction of bronze, and smelting and casting technology, and the Late Period witnessed the cessation of inhumation burials and the occurrence of cremation with placement of remains in funerary urns (Bayard 1972: 31; Bayard and Solheim II 2009: 81).

Table 1: Burials with Unionidae at sites under review

Assemblage	Period	Total ^a	SA ^b Obs./N	(%)	Adult - M Obs./N	(%)	Adult - F Obs./N	(%)	U/kn (15+) Obs./N	(%)
Man Bac	Neolithic	100	10/57	(17.5)	3/18	(16.7)	1/15	(6.7)	0/9	-
Non Nok Tha	Neolithic-BA	180	5/49	(10.2)	7/60	(11.7)	4/67	(6.0)	0/4	-
Ban Non Wat	Neolithic-IA	635	49/164	(29.9)	53/163	(32.5)	51/148	(34.5)	21/160	(13.1)
Ban Lum Khao	BA	110	10/51	(19.6)	3/26	(11.5)	3/30	(10.0)	0/3	-
Noen U-Loke	IA	120	3/53	(5.7)	0/26	-	1/21	(4.8)	0/20	-
Total			77/374	(20.6)	66/293	(22.5)	60/281	(21.4)	21/196	(10.7)
Multiple Unionidae^c										
Assemblage			SA Obs./N	(%)	Adult - M Obs./N	(%)	Adult - F Obs./N	(%)	U/kn (15+) Obs./N	(%)
Man Bac			4/10	(40.0)	1/3	(33.3)	-	-	-	-
Non Nok Tha			1/5	(20.0)	3/7	(42.9)	1/4	(25.0)	-	-
Ban Non Wat			14/49	(29.9)	18/53	(33.9)	17/51	(33.3)	5/21	(23.8)
Ban Lum Khao			2/10	(20.0)	1/3	(33.3)	-	-	-	-
Noen U-Loke			-	-	-	-	-	-	-	-

a Includes sex and age-at-death of indeterminate adults
 b Includes SA=subadults (<14.9 years), M=Male; F=Female 15-40+ years of identified age
 c Includes instances of 2+ Unionidae deposited in burials
 Man Bac: Oxenham and Matsumura 2011: 4; Domett and Oxenham 2011: 9; Huffer and Hiep 2011: 135-168
 Non Nok Tha: Douglas 1996: 301; Higham 1996-97: 882; Higham 2002: 92
 Ban Non Wat: Higham 2009: 252-254; Higham and Higham 2009a: 21
 Ban Lum Khao: Domett 2004: 114; Higham and Thosarat 2004: 7
 Noen U-Loke: Higham and Thosarat 2007: 596-597; Tayles, Halcrow and Domett 2007: 244

Ban Non Wat

Ban Non Wat (c. 1750 BCE-CE 200), with 635 burials excavated to date, spans the Neolithic through to the Iron Age (Higham and Higham 2009: 137; Higham 2011: 368). The site is in a modern village, situated in the Huai Yai valley on a tributary of the Lam Prasat, which flows into the Mun River. Excavation were executed over seven seasons between 2002-2007 as part of ‘The Origins of the Civilizations of Angkor’ research program (Cawte *et al.* 2009:1) (Figure 1). Twelve cultural phases separated into ten mortuary phases (Neolithic 1 and 2; Bronze Age 1, 2, 3A, 3B, 4 and 5; Iron Age 1 and 2) and site occupation layers have been identified (Higham 2009: 153-183).

Ban Lum Khao

Ban Lum Khao (c. 1500-500 BCE), with 110 burials (Domett 2004: 114), spans the early Bronze Age through to the beginning of the Iron Age (Higham 2002: 142; Higham and Thosarat 2004: 5-7). The site underlies the modern village of Ban Lum Khao and is located in Amphon Non Sung, Nakhon Ratchasima Province, beside two small streams, the Laem Tam Prasat and Laem Tam Gleu, on the Khorat Plateau, and is in the upper regions of the Mun River valley system (Higham and Thosarat 2004: 1) (Figure 1). Excavations in 1995-1996 were undertaken as part of ‘The Origins of the Civilizations of Angkor’ research program to investigate the development and transition of social, technological and cultural phenomena in the Mun River Valley system, where autonomous communities eventually became hierarchal societies (Higham, Thosarat and O’Reilly 2004: 333). Excavations to a depth of 1.7m occurred but only three layers could be identified due to extensive bioturbation (Domett 2001:20).

Noen U-Loke

The moated site of Noen U-Loke (c. 600 BCE – CE 400) is located near Ban Non Wat and Ban Lum Khao (Figure 1), at Amphon Non Sung, Nakhon Ratchasima Province on the Khorat Plateau (Higham and Thosarat 2007: 75). Excavations were undertaken in 1991 and 1997-1998 as part of ‘The Origins of the Civilizations of Angkor’ (Higham and Thosarat 2007: 75). Five mortuary phases containing 120 burials have been recorded from this site (Tayles *et al.* 2007: 244).

METHODS

Once burials containing Unionidae were identified, a database was developed to capture information on the number of Unionidae included in any given burial, age-at-death, biological sex, and temporal period and/or phase. The spatial location of the burials with Unionidae within each cemetery was also explored by overlaying these burials onto published site-appropriate burial distribution maps. Intra-grave Unionidae distribution or placement was also examined. Unionidae placement positions identified included: the skull (including at or beyond the skull), torso (including the chest, spine and abdomen), arms, hands, pelvis, legs and feet (including at or beyond the feet).

RESULTS

Of the five assemblages examined, 298/1145 (26.0%) burials were identified as including one or more Unionidae as deliberate grave inclusions (Table 1). The highest frequency of burials with Unionidae as grave goods occurs at Ban Non Wat (174/635 (27.4%)), and the lowest frequency at Noen U-Loke (3.3%). Table 1 indicates evidence of differentiation by age-at-death and sex. In terms of age (subadults (<15) as compared to adults (15+)) have a higher frequency of association with Unionidae at three of

Table 2: Statistical comparisons by Age-at-death, Sex and Multiple Unionidae.

Site	Comparison	Age ^a χ ²	p	Comparison	Sex ^b χ ²	p	Comparison	Multiple ^c χ ²	p
Man Bac	SA>A	0.706*	0.401	M>F	0.116*	0.733	SA>A	0.000*	1.000
Non Nok Tha	A>SA	0.007*	0.932	M>F	0.678*	0.410	A>SA	0.005*	0.942
Ban Non Wat	A>SA	1.151	0.283	M>F	0.132	0.717	A>SA	0.193	0.660
Ban Lum Khao	SA>A	1.960	0.161	M>F	0.000*	1.000	SA>A	0.000*	1.000
Noen U-Loke	SA>A	0.564*	0.453	F>M	N/A	N/A	SA>A	N/A	N/A
Combined Sites	A>SA	0.371	0.543	M>F	0.115	0.734	A>SA	0.177	0.674

*Yates corrected (Source: Rosner 2005 - <http://statpages.org/ctab2x2.html>)

a Includes Subadult (SA-0-14.9 years), Adult (A-15+ years)

b Includes Male (M) and Female (F) of identified sex

c Includes instances of 2+ Unionidae deposited in burials

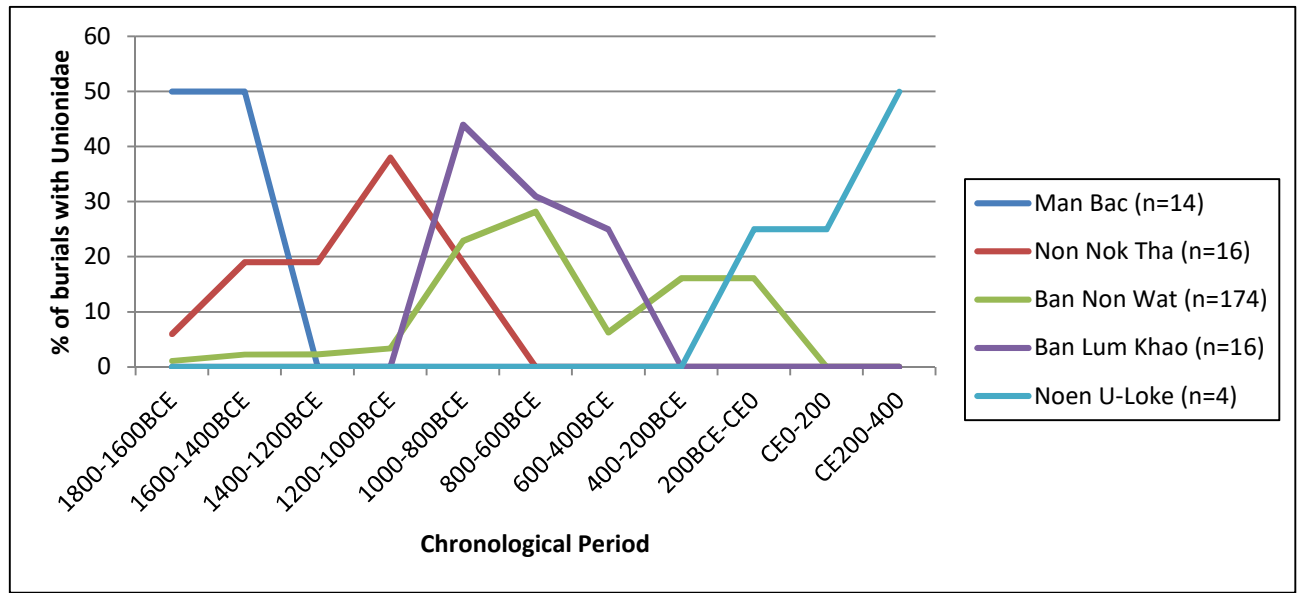


Figure 2: Frequency of deposition across time (n=224).

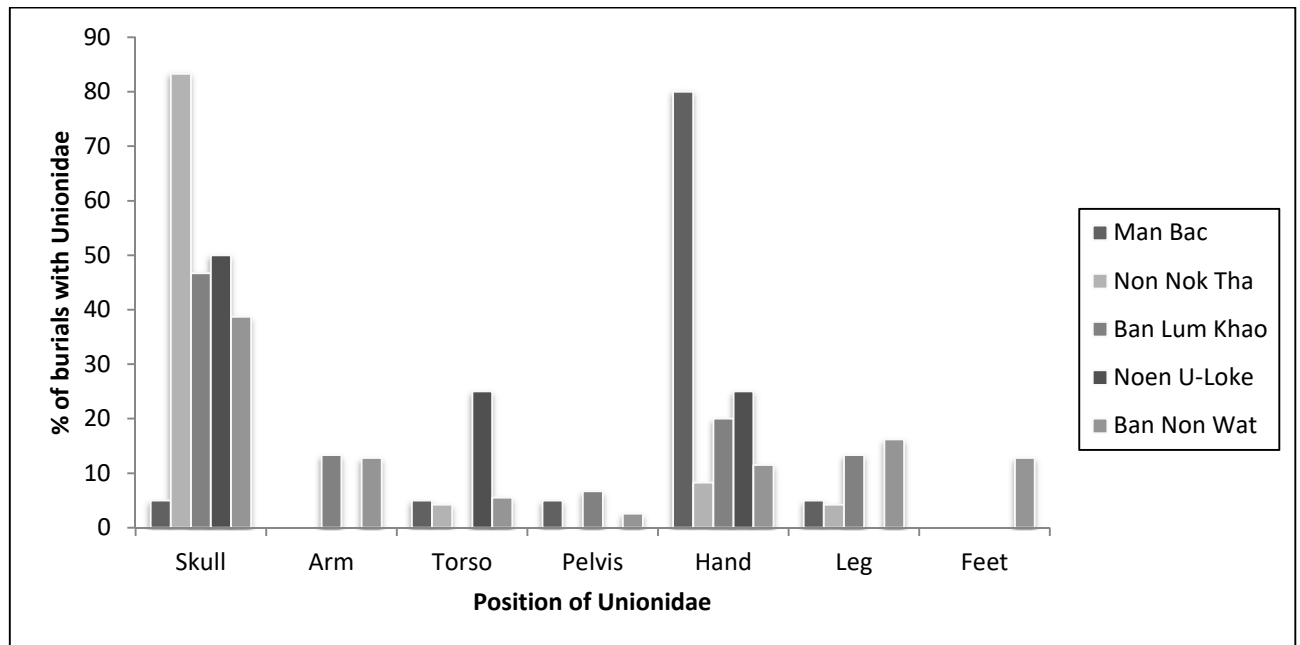


Figure 3: Intra-grave position of Unionidae.

are the exceptions to this trend. None of these differences by age are statistically significant (Table 2). The prevalence of subadult (20.6%) and adult (19.1%) burials with Unionidae is essentially equivalent for the combined assemblages.

Regarding sex, a higher frequency of adult male burials have Unionidae as grave goods than adult female burials in the Man Bac (16.7%), Non Nok Tha (11.7%) and Ban Lum Khao (11.5%) assemblages, while females display a higher prevalence at Noen U-Loke (4.8%), and Ban Non Wat (34.5%). Again, none of these differences by sex were seen to be statistically significant (Table 2).

When the use of Unionidae as grave goods is examined by time some clear patterns emerge. Data presented in Figure 2 suggest that when the cemeteries of Non Nok Tha, Ban Non Wat and Ban Lum Khao were in simultaneous use, the greatest frequency of burials containing Unionidae occurred between 1200-600 BCE. Periods of highest frequency at Ban Non Wat occur in Bronze Age period two (27/39, 69.2%) but Unionidae inclusion in burials ranges from 25-69% across the Bronze Age and in the initial phase in the Iron Age. No evidence for a continuation of including Unionidae in burials follows the conclusion of Iron Age period one. Man Bac shows a consistent deposition of Unionidae over time and the small sample (n=4) from Noen U-Loke demonstrates a minor increase in inclusion through time.

When looking at the number of Unionidae in any given burial, all sites with the exception of Noen U-Loke have individuals interred with two or more Unionidae (Table 1). Rates of inclusion at Man Bac, Non Nok Tha and Ban Non Wat range from 31-35.7% with 18.8% at Ban Lum. Based on age-at-death these rates are not statistically significant (Table 2). A smaller proportion of subadult burials than adult have multiple Unionidae at Man Bac and Ban Lum Khao. The reverse pattern is seen at Non Nok Tha and Ban Non Wat. Consistent with the generally greater frequency of male graves including Unionidae, a greater proportion of male than female graves include multiple shells for the assemblages examined.

Turning to the intra-grave distribution, it can be seen from Figure 3 that the most popular position for placement of Unionidae in graves was in proximity to the skull (121/298 Unionidae 3.9% of all burials). In descending order the next most popular positions were close to the hands (16.4%), legs (14.1%), arms (10.7%), and feet (10.1%) followed by torso and pelvis.

There are also some rather distinct differences between the five cemeteries regarding within-grave placement of shell. The very small number of relevant burials from Noen U-Loke only have Unionidae shell placed by the torso and legs, while the vast majority (accounting for most cases) of Unionidae shell at Man Bac was placed by the hands (80.0%). At Non Nok Tha the majority was placed close to the skull (83.3%), with a smaller frequency of burials with shell by the hands (8.3%), then feet and torso (4.2% each). In three instances at Non Nok Tha, and only in association with adults (burials 1966-24, 1966-63 and 1968-32), the individual's cranium was either relocated to the pelvis or

missing, and Unionidae shell was deposited in the normal anatomical location of the skull (Douglas 1996: 908, 949, 999). Both Ban Lum Khao (46.7%) and Ban Non Wat (38.7%) display a high percentage of burials with Unionidae placed by the cranium, with smaller frequencies of graves with shell at all other identified positions at Ban Non Wat. Ban Non Wat is the only site under review demonstrating the deposition of Unionidae in all positions outlined in this study.

Intra-grave Unionidae placement was also explored in terms of side (left, right and midline) as well as upper (i.e. above pelvis) versus lower (i.e. pelvis and below) body. Figure 5 shows that the upper body was preferred for the positioning of Unionidae at all sites under review. In terms of side, the small Noen U-Loke sample has shell only placed on the right side or the midline. Man Bac displays minimal side preference to the left and very little placement of Unionidae shells along the midline in opposition to the other sites being explored. The remaining four sites demonstrate preference for Unionidae being positioned along the midline.

Consideration was also given to the intra-cemetery spatial location of Unionidae to determine if there was a concentration, or aggregation, of burials which contained these artefacts within any of the cemeteries examined. Limited aggregation could be observed at Man Bac and Ban Lum Khao at the southern aspect of the cemetery, and in higher proportions (47.1%) at row three in mortuary phase two, respectively. However, burials containing Unionidae were also identified from the northern aspect of the cemetery at Man Bac and were identified from all mortuary phases from Ban Lum Khao, including four of the five rows identified from mortuary phase two (Higham and O'Reilly 2004: 302). Unionidae is present in all mortuary phases excluding Iron Age two onwards, and all clustered groups identified, under review with no evidence of aggregation at this site. There was no evidence from Non Nok Tha or Noen U-Loke that burials containing Unionidae were concentrated within a specific area of each cemetery.

DISCUSSION

Archaeological and anthropological evidence indicates that molluscs are frequently imbued with secular or cosmological significance within specific socio-cultural environments which are dependent on the complex human relationships with, and perceptions of, certain species of molluscs. This relationship is influenced by the appearance, characteristics or even natural behaviour of the mollusc in the context of a given population's socio-cultural belief system (Claassen 1998: 203-209, 228-233; Malinowski 1920: 97; Malinowski 1922: 1; Morris 2012: 8; Safer and Gill 1982: 94, 121, 138; Saunders 1999: 247; Stix *et al.* 1978: 16, 94, 121, 138; Trubitt 2003: 244-245). Within a secular context, molluscs may be representative of artefacts which, sanctioned by the social group, identify an individual's status (e.g. political, marital, sexual) or identity (e.g. gender, personhood) (Claassen 1998: 228-233; Safer and Gill 1982: 85-107; Trubitt 2003: 244-248). Cosmologically, molluscs may be imbued with symbolic significance



Figure 4: Juvenile burial at Man Bac (MB07H2M8: 18 months +/-5 months old) with Unionidae in both hands (Photo: Tilley 2007)

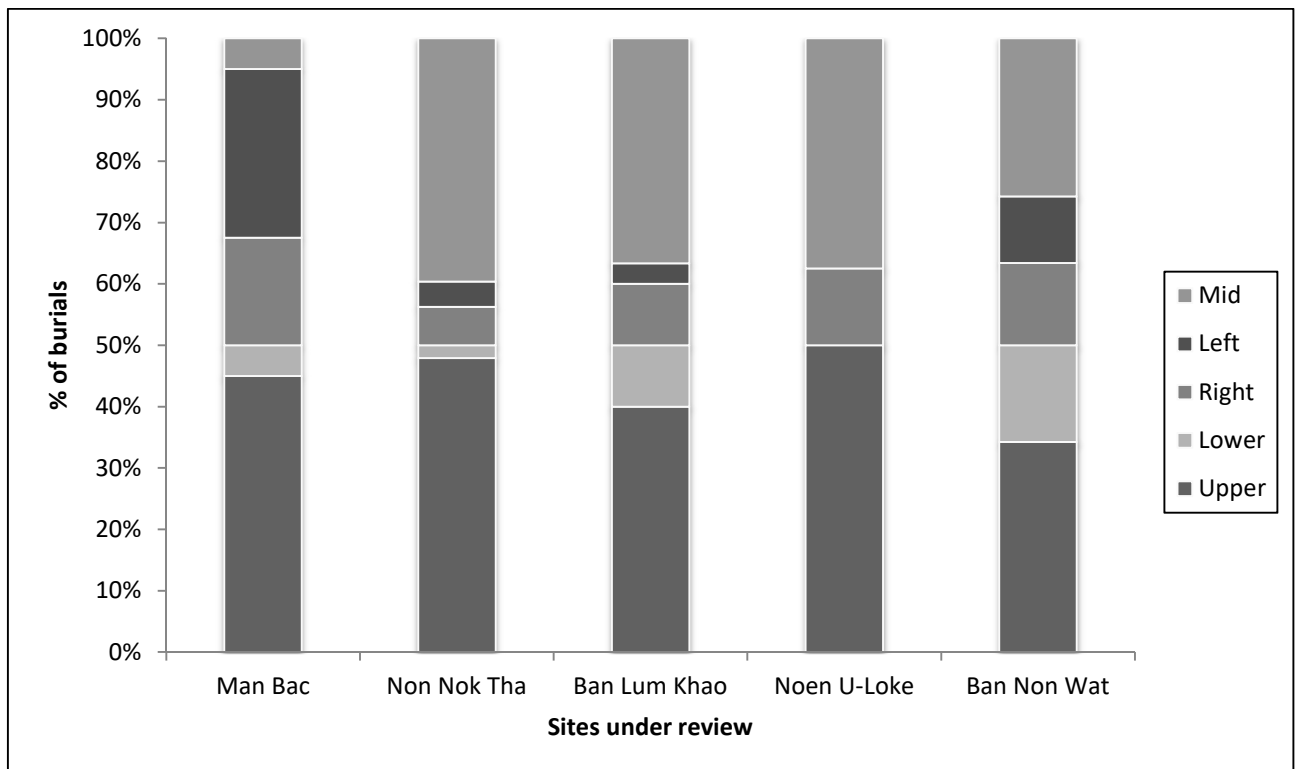


Figure 5: Intra-grave sidedness of Unionidae.

in reference to representations of, for example, water, sex, fertility, the supernatural, light or purity (Claassen 1998: 203-209; Safer and Gill 1982: 121-143; Trubitt 2003: 262). Similarly, the nacreous layer of molluscs has also been seen to represent, dependent on socio-cultural context, life, spirituality, the supernatural, or lightning from storm activity (Claassen 1998: 203-209; Saunders 1999: 248-249; Trubitt 2003: 262)

What is the potential significance of including Unionidae in a select range of burials on the Southeast Asian mainland? Perhaps unworked Unionidae can be considered as a prestige food item, as an artefact which communicates an individual's secular identity or status, or as an item imbued with a symbolic significance which has a shared meaning within each site, or even across disparate communities separated by time and space.

Barring one instance of worked Unionidae (*Pilsbryoconcha erosa*) in the grave fill of a burial from the initial mortuary sequence at Ban Lum Khao (Higham and Thosarat 2004: 30), only unworked Unionidae were recovered from burial contexts at each site, with other shell taxa being selected and exploited for other purposes relating to diet or the manufacture of artefacts (Bayard and Solheim II 2009: 446-448; Chang 2004: 217, 2007: 379; Higham 2009: 225, 243; Huffer and Hiep 2011: 135-168; McCaw 2007: 520; Thosarat 2010: 182-183;). Unworked, or unfinished, shell artefacts of different taxonomies have been recovered from burial contexts across insular, such as Leta Leta (Szabó 2009: 158) or Lobang Tulang (Szabó et al. 2008: 158), and mainland, Nong Nor (Higham and Thosarat 1998: 430) or Phia Via Cave (Cuong 2007: 130), Southeast Asia. We suggest that, just as observed from the inclusion of different shell taxon in burials across Southeast Asia that specific populations attached meaning to some species that went beyond origin, production and completion of the artifact or the quantity of shell objects as potential markers of wealth or status. While we recognize that faunal remains included in burial contexts may have both 'functional and ritual significance,' the evidence suggests, in the context of considering Unionidae from the sites under review, that this taxon was deliberately separated from everyday activities (i.e. subsistence, technological development) and used almost exclusively for ritual purposes (Morris 2012: 11-13).

Through our analysis of the literature we observed that five additional sites on the mainland also indicate the inclusion of unidentified bivalves in burial settings in positions (i.e. at the skull, in association with other artefacts) which resemble our own pilot-study. The sites are Nyaung-gan (Moore and Pauk 2001: 40), Ban Kao (Sørensen and Hatting 1967: 25), Khok Charoen (Ho 1984: 168, 186), Phu Noi (Natapintu 1997: 47) and Tha Kae (Ciarla 1992: 117, plate 5). Consideration of, as yet, unidentified bivalves through future research from other locations on the Southeast Asian mainland may yield further evidence that Unionidae in mortuary contexts is more widespread than currently realized and suggest a broader tradition of this mortuary behavior across mainland Southeast Asia. In this context it is intriguing to note that unworked bivalves

of the Family Corbiculidae, specifically *Polymesoda erosa*, have been recovered from burials at the island setting of Kain Hitam, Niah Cave, in Sarawak, Malaysia. Although limited, this provides evidence of the potential significance of including unworked bivalves in mortuary contexts beyond the Southeast Asian mainland (Szabó et al. 2008: 157).

While there is a general pattern of the inclusion of Unionidae in male, female and subadult mortuary contexts, a consideration of the distribution of Unionidae by site and/or temporal period shows some marked variation. For instance, in the early burial periods spanning the Neolithic to the middle of the Bronze Age at Non Nok Tha only adult females (n=4) were interred with Unionidae, whereas only adult males (n=7) were exposed to this treatment in the later burial periods. This suggests that reasons for including Unionidae with particular burials may have been predicated on perceptions or rules relating to biological sex or gendered identity within a given cultural period, at least at this site.

The intra-grave patterning of Unionidae placement also suggests the presence of local mortuary rules concerning this particular mortuary artifact. While in general Unionidae are most frequently deposited by the cranium, hands or legs, it is equally apparent (see Figure 3) that specific patterns of placement occur at various sites. The clearest examples of this occur at Man Bac and Non Nok Tha where Unionidae shells are frequently associated with the hands or skull, respectively. The sites of Ban Non Wat and Ban Lum Khao, although located in close proximity to one another and contemporaneous across select mortuary phases, shows differences in the preferred position most frequently associated with Unionidae. At Ban Non Wat (Figure 3) Unionidae are most frequently associated with the cranium, but also associated with other body positions, relatively evenly, across the cemetery. Unionidae at Ban Lum Khao, on the other hand, are most frequently found associated with jar burials and the cranium, and not found with other areas of the body. It would appear that differential placement of Unionidae by site, and within sites, indicates diversity in interpretation of artifact significance and engagement with the deceased (i.e. in some instances the head is prioritized, while in others it is the hands, etc.).

Given the long tradition of animism in Southeast Asia (Jungwiwattanaporn 2006: 382; Spiro 1967: 67; Wessing 2006: 207), extant in the region today, it is worth exploring any potential link between animistic beliefs and the use of Unionidae as mortuary inclusions. In general, animism includes the belief that natural objects or other natural phenomena contain a soul or life-force (Benjamin 1979: 11; Morris 1987: 100). Animists see two conjoined planes of existence, the physical and spiritual, which are interdependent (Benjamin 1979: 10; Swatos Jr. 1998), with some traditions subscribing to a fundamental duality in the cosmos (Benjamin 1979: 11). Animistic shamans, acting as intermediaries between the physical and spiritual planes, seek to maintain a balance and mitigate the risk of danger or pollution brought about by an aggrieved spirit (Bertrand 1996: 279; Jungwiwattanaporn 2006: 382; Spiro 1967:

238-245; Swatos Jr. 1998;). Shamans, such as the *Thây Dong Ho* of Vietnam, are also viewed as healers (Bertrand 1996: 281). Jungwiwattanaporn (2006: 383) notes that a belief in animism creates an environment for the establishment and maintenance of positive relationships between the physical and spiritual planes, especially with family ancestors who have the ability to protect or, if aggrieved, take punitive action against the living. While a belief in rebirth predominates, it is argued that some spirits elect to remain in the spirit world to monitor and protect living descendants (Jungwiwattanaporn 2006: 383).

In regards to the potential significance of Unionidae we suggest that some, if not all, of the characteristics of this mollusc may have been key factors in determining its importance to prehistoric populations in Southeast Asia. Firstly, these characteristics include the bivalve's freshwater origin, which may be significant for the essential life-giving properties of fresh water or perhaps for the belief in the link between water and the underworld, origins, or in relation to amniotic fluid, as observed in other Southeast Asian locales (Wessing 2006: 208). An additional consideration in relation to the bivalve's freshwater origin is that water, and specifically its reflective qualities, can be seen as a mirror or doorway between the realms of the physical and spiritual worlds, which may be of significance in an animistic universe (Saunders 1999: 245). Secondly, it is possible that Unionidae's nacreous appearance was imbued with the symbolic qualities of spirituality or light within local belief systems. Finally, it is suggested that the animal's structure, namely as a mollusc composed of two valves, may also be significant as a reification of the animistic belief in the dual nature of existence: the physical and spiritual planes. While differential frequencies for placement to the left, right or along the midline of individual burials was observed (Figure 5), it was clear that Unionidae was invariably more likely to be deposited about an individual's upper body. While only limited, this may support contentions regarding local population's beliefs centred on the duality of the individual's soul or spirit.

Ethnographic evidence demonstrates that molluscan species are frequently important drivers, or contributors towards, socio-cultural interactive spheres. While shell species provide critical information on palaeoenvironments, subsistence strategies and economic (i.e. exchange of marine types) and technological development (i.e. shell knives for rice cultivation etc.) they also provide insight into the potentiality of prehistoric philosophical-religious behavior for archaeological research. While not unique (i.e. *Conus* sp., *Cypraea* sp. etc.) in its significance and association with human burials across the region, our own research demonstrates within the suite of burial activity, that the inclusion of unworked Unionidae were key elements in the burial of some individuals. Although a majority of our sites are located in northeast Thailand (primarily in the Mun River Valley) the evidence shows that Unionidae, in unworked form, was valued across a broad area. Evidence also shows that unworked bivalves (potentially Unionidae on the mainland and confirmed in island Southeast Asia) are meaningful, in burial contexts, across the region and,

where research opportunities allow, require greater consideration towards exploring and understanding mortuary behavior across the region.

CONCLUSION

The purpose of this study was to both document the distribution of Unionidae in Southeast Asian cemetery sites and explore possible reasons for the use of this mollusc as a deliberate grave inclusion. Freshwater bivalves of the family Unionidae have been recovered from at least five archaeological sites ranging from northern Vietnam to central Thailand, from the Neolithic to the Iron Age, with the greatest frequency of use as a deliberately placed grave good occurring in the Bronze Age between 1200-600 BCE.

Looking at the distribution of Unionidae by demographic variables, it is apparent that all age and sex categories were exposed to this mortuary behavior. We suggest that socially prescribed beliefs (mortuary rules) and/or socio-cultural perceptions of sex or gender, and age-at-death, may have influenced the choice to include or exclude this unworked artifact in specific burial suites in Southeast Asian antiquity. While the use of Unionidae in Southeast Asian mortuary contexts was widespread, it is also clear that differential use of this burial artifact relates to localized interpretations of the significance, or qualities, of the shell itself. Given that there are other cemetery sites where as yet unidentified freshwater bivalves have been described, we predict that future research may confirm a much more widespread tradition of the incorporation of Unionidae in mortuary contexts in mainland Southeast Asian than hitherto realized.

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