UNION INTERNATIONALE DES SCIENCES PRÉHISTORIQUES ET PROTOHISTORIQUES
INTERNATIONAL UNION FOR PREHISTORIC AND PROTOHISTORIC SCIENCES

PROCEEDINGS OF THE XV WORLD CONGRESS (LISBON, 4-9 SEPTEMBER 2006)
ACTES DU XV CONGRÈS MONDIAL (LISBONNE, 4-9 SEPTEMBRE 2006)

Series Editor: Luiz Oosterbeek

VOL. 20

Session WS22

Theoretical and Methodological Issues in Evolutionary Archaeology

Toward an unified Darwinian paradigm

Questions théorétiques et méthodologiques en archéologie évolutive

Vers un paradigme Darwinien unifié

Edited by

Hernán Juan Muscio
Gabriel Eduardo José López

BAR International Series 1915
2009

This title published by

Archaeopress
Publishers of British Archaeological Reports
Gordon House
276 Banbury Road
Oxford OX2 7ED
England
bar@archaeopress.com
www.archaeopress.com

BAR S1915

Proceedings of the XV World Congress of the International Union for Prehistoric and Protohistoric Sciences
Actes du XV Congrès Mondial de l'Union Internationale des Sciences Préhistoriques et Protohistoriques

Outgoing President: Vítor Oliveira Jorge
Outgoing Secretary General: Jean Bourgeois
Congress Secretary General: Luiz Oosterbeek (Series Editor)
Incoming President: Pedro Ignacio Shmitz
Incoming Secretary General: Luiz Oosterbeek

Theoretical and Methodological Issues in Evolutionary Archaeology: toward an unified Darwinian paradigm / Questions théorétiques et méthodologiques en archéologie évolutive: vers un paradigme Darwinien unifié. Vol. 20, Session WS22.

ISBN 978 1 4073 0398 7

Contacts :
Secretary of U.I.S.P.P. – International Union for Prehistoric and Protohistoric Sciences
Instituto Politécnico de Tomar, Av. Dr. Cândido Madureira 13, 2300 TOMAR
Email: uispp@ipt.pt
www.uispp.ipt.pt

Printed in England by Blenheim Colour Ltd

All BAR titles are available from:

Hadrian Books Ltd
122 Banbury Road
Oxford
OX2 7BP
England
bar@hadrianbooks.co.uk

The current BAR catalogue with details of all titles in print, prices and means of payment is available free from Hadrian Books or may be downloaded from www.archaeopress.com

THE APPLICATION OF DARWINIAN CULTURAL EVOLUTIONARY THEORY TO CERAMICS: THE CASE OF "SOFT POTTERY" FROM LUWU, SOUTH SULAWESI, INDONESIA

David BULBECK
School of Archaeology and Anthropology, The Australian National University

***Abstract**: "Soft pottery" constitutes a distinctive class of earthenware at major habitation sites associated with the early Bugis state of Luwu. It has many unusual features such as low firing temperature, irregular surfaces, and textile impressions on the interior surface. The evidence from the shards, that this was makeshift pottery of poor quality, has been difficult to reconcile with the evolution of complex political organization in Luwu concomitant with the production of soft pottery. Application of a Darwinian perspective, however, allows the temporary popularity of soft pottery to be explained in terms of meeting a sudden hike in local society's demand for domestic ceramics.*
***Keywords**: Darwinian cultural evolution, market forces, ceramics, Luwu, Bugis*

***Resumé**: La "poterie molle" est une classe distinctife de las céramiques locales laquelle se rencuentre aux sites majeures lesquels appartenent au royaume ancien et Bugines de Luwu. Cette poterie-ci se fit cuire à feu doux, et montre beaucoup des traits peu commun comme las surfaces irrégulières et las impressions des textiles pour la surface intérieure. C'était difficil de réconcilier cet évidence de cette poterie improvisée, et de maigre qualité, avec l'évolution de la politique organisation complexe dans Luwu pendant la période de la fabrication de la poterie molle. Néanmoins, l'application d'une perspective darwinnième explique la popularité temporaire de la poterie molle sous l'angle de l'augmentation soudaine de la demande locale pour las céramiques domestiques.*
***Mots-clés**: l'évolution culturele darwinnième, forces du marché, las céramiques, Luwu, les Bugis*

INTRODUCTION

In his major book *Ceramic Theory and Cultural Process*, Arnold (1985) comprehensively reviewed the literature from experimental archaeology and ethnography on earthenware technology, production and use. Arnold recognized the role of the ecological prerequisites for earthenware production – suitable clay, combustible material, and spells of fine weather for firing vessels – which cultural ecology has emphasized. However, after developing a systems model built around society's demand for ceramics, and the role of land shortage in promoting specialist craft, Arnold focused on social complexity as the critical factor to explain the scale and scope of a traditional ceramic industry. His concluding advice to archaeologists combined theoretical admonitions, such as his rejection of culture history's tendency to detach ceramic attributes from their social context, with practical suggestions, such as his recommendations to focus on vessel shapes, the temporal persistence of vessel-forming techniques, and fabric analysis.

From the point of view of Darwinian archaeology, Arnold's (1985) systems approach, with its terminology of regulatory feedback and deviation amplifying mechanisms, is more a metaphor than a well-founded explanatory model. Darwinian evolutionary theory is based on the changes over time in the relative frequencies of heritable traits within a population, and the relative successes of populations, through natural selection. This "survival of the fittest" formula says nothing in particular on the generation of novel heritable traits, but a pure Darwinist perspective holds that novelties arise randomly with respect to the evolutionary trajectories that result from natural selection (Rindos, 1986). In Darwinian terms, Arnold's "regulatory feedback" would apply to heritable traits with an optimized expression, causing variation away from this optimal expression to be selected against, whereas "deviation amplification" would be expected in cases of traits whose expression has become sub-optimal due to change.

To be sure, the application of Darwinian theory is very broad and can focus on the lineages (and their relationships) along which traits are transmitted (e.g., Cameron and Groves, 2004), the development of complex structures through evolutionary tinkering (e.g., Lieberman, 2006: Chapter 6), cumulative change independent of fitness as the result of drift, the creation of a daughter population very different from its parent owing to the founder effect (Wright, 1968-1978), or niche construction (Odling-Smee *et al*., 2003). Cultural evolutionary theory not only shares these perspectives with biological evolutionary theory, but also needs to fully consider the potential for heritable traits to transmit horizontally across lineages (Boyd and Richerson, 1985). Culture historians working in a phylogenetic paradigm, culture-contact theorists who stress reticulation, cultural ecologists who focus on adaptation, cultural materialists, multilinear cultural evolutionists and of course cultural selectionists can all take heart from Darwinian theory, and continue their unresolved, theoretical disputes with each other.

What is the point of a Darwinian perspective if it doesn't change archaeologists' theoretical penchants? My response would be that a Darwinian perspective counsels archaeologists to be both more disciplined and more inclusive in the narrative explanations (i.e., cause and effect scenarios; see Hausman, 1998) which they develop for their case studies.

The discipline comes from restricting explanations for change to transmittable traits. Ideas and "cultural baggage" no doubt exist, in some sense, but their transmission is problematic. Practices on the other hand are eminently transmittable, being conveyable through the spoken word and especially through demonstration, most effectively when tied to the contexts where they apply. Bourdieu's concept of habitus neatly encapsulates the appropriate bounds for culture history, both in terms of the patterned practices that people become accustomed to, and their collective scope for sharing (transmitting) these practices (Whittle, 2003). Similarly, artefacts do not constitute lineages in their own right; the real lineages are the practices involved in making artefacts, even when these practices are transmitted horizontally through instruction or emulation. However, if a Darwinian perspective eschews idealist theoretical positions for their lack of an anchor in the material world, it would be equally critical of systems theory and adaptationist agendas (which I call "abstract materialism"). How a society holds together and how particular practices prosper are the outcomes of natural selection, not the pre-ordained goals of some nameless social engineer.

The inclusiveness of Darwinism comes from the recognition that social continuity and social change are dynamically interwoven. Ethnography and archaeology both strongly indicate that some populations grow while others decline, communities invariably interact, practices are passed on with varying degrees of authenticity and persistence, innovation (within social and technological limits) is chronic, and people adapt to their environment but imperfectly so. Any archaeological explanation that fails to attend to these factors tells us more about the archaeologist's personal agenda than the case study the archaeologist is supposedly addressing. I suggest that the strong promulgation of either an idealist or an abstract materialist theoretical model presupposes "purification" of the available information to force fit the case study into a partial and partisan world view. To summarize, if the archaeologist focuses on cultural traits that can be both practised and transmitted, then the explanation for change will naturally move to a broad-based, holistic account.

Systems theorists may well contend that their goal is precisely a broad-based, holistic account, and they could point to Arnold's (1985) study in that context. My objection is that useful archaeological frameworks are very rarely systems, in the sense understood by engineers or information technologists. D.H. Thomas's (1972) computer simulation of the Western Shoshone economic cycle may well be a true system, but the textbook examples of "systems" in archaeology, featuring diagrams with captioned boxes linked together by arrows (e.g., Renfrew and Bahn, 2000: 471-485), are not. Exemplary archaeological frameworks, yes, but not systems. For Darwinism to contribute to the future development of archaeological theory, it should be able to start with the cause-and-effect frameworks of the sort depicted by Renfrew and Bahn (2000: 471-485) and sharpen their explanatory value. An important concept here is market mechanisms, whose importance for traditional ceramics is specifically recognized by Arnold (1985), and which should act as a vehicle for natural selection in any industry with distinct producers and consumers.

The scope for market mechanisms to fine-tune production in a viable industry, quash an industry which is non-viable, and link product diversity to consumer power, should be obvious. Pottery production, for instance, involves considerable costs in labour, materials and storage, while potters who meet their subsistence needs by trading their pots will be only too aware of product lines that fail to attract customers. An economy hardly needs to conform to the canons of classic microeconomic theory for wasted effort to bite hard into poor production schedules, or for unsatisfied demand to stimulate new entrants. Attention to market mechanisms is arguably a very underdeveloped component of current cultural Darwinian theory. In one of the few papers addressing the topic, Boyd and Richerson (2005) explain how Darwinian theory can provide a deep theoretical basis to microeconomic theory, which is fair enough, but there should be a complementary recognition of market mechanisms as an efficient vehicle of natural selection.

This paper addresses a peculiar feature of the archaeological record of Luwu, in South Sulawesi (Figure 1.1), during its "pre-Islamic period" between the thirteenth and early seventeenth centuries CE. This feature, "soft pottery", is temporally and spatially associated with the expansion of Bugis speakers along the northern rim of the Gulf of Bone, and their establishment of a state-level organization which, during its heyday, was the most powerful polity in South Sulawesi (Bulbeck and Caldwell, 2000; Bulbeck *et al*., 2006). From a naïve culture history viewpoint, the association of soft pottery with a dominant immigrant population might suggest its introduction by the Bugis. From a similarly naïve multilinear cultural evolutionary perspective, soft pottery's association with the formation of a complex society would hint at craft specialization or an advanced technological capacity. The available information, however, strongly suggests that the soft pottery had local origins, and that it was second-rate, makeshift pottery. These counter-intuitive findings can be explained, as suggested here, in terms of the stimulated production of an inferior product to meet demand that was not otherwise being satisfied through ceramic production.

PRE-ISLAMIC LUWU

Based on research by the "Origin of Complex Society in South Sulawesi" (OXIS) project, Malangke (Figure 1.1) can be identified as the pre-Islamic capital of the Bugis kingdom of Luwu. Luwu was the first South Sulawesi kingdom to officially convert to Islam, in 1605, and the tombs of Luwu's first two sultans are located in Malangke. During the preceding centuries the Luwu

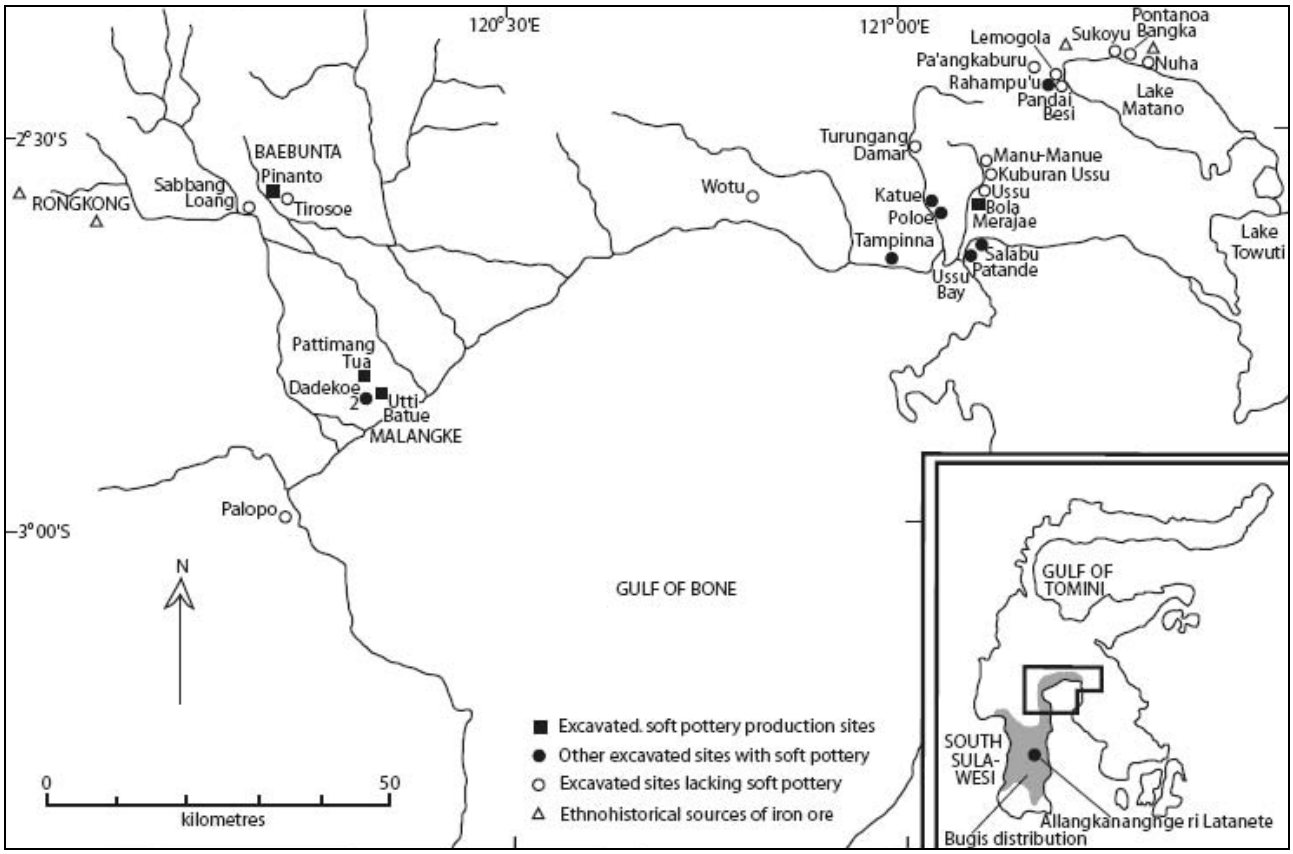

Fig. 1.1. Luwu, South Sulawesi, and sites mentioned in the text

Bugis had cremated the deceased and buried the ashes inside large jars along with a wealth of metallic and ceramic goods. Malangke's pre-Islamic cemeteries have all been thoroughly looted, but locals remember the location and extent of the looted areas, while the age of the burials can be gauged from the imported ceramics (Chinese, Thai and Vietnamese) still held in villagers' homes or represented by surface sherdage. Based on the archaeological survey of looted burial grounds, the population of Malangke is estimated to have risen from approximately 2.700 to 14.500 persons between the fourteenth and sixteenth centuries. A maximum population size over 10.000 is supported by the recorded areas of 5.3 and 4 hectares for Malangke's two main settlements, Pattimang Tua and Utti Batue. In the early seventeenth century the Luwu royalty relocated the capital to Palopo, and Malangke then lay abandoned until its re-occupation in the last few decades by cash croppers growing mandarins and cacao (Bulbeck, 2000; Bulbeck and Caldwell, 2000).

Malangke lies in the floodplain created by the Rongkong and Baebunta rivers which originate in rugged highland country (Figure 1.1). These rivers meet the coastal plain in a region traditionally inhabited by the Lemolang, whose language is very different from Bugis (Grimes and Grimes, 1987). In contrast to Malangke, which appears to have been vacant before the fourteenth century, Baebunta (as the Lemolang polity was called) has witnessed two millennia of occupation. Habitation debris including iron artefacts at the site of Sabbang Loang are firmly dated to the early centuries CE. The source of iron is not known but may have been the Rongkong highlands where "weapons grade" iron ore was quarried and smelted in historical times. During the pre-Islamic period, the major Lemolang settlement was Pinanto, which extended 0.6 hectares along a ridge overlooking a looted area approximately one hectare in area. The close relationship between Baebunta and Malangke is reflected, *inter alia*, by Baebunta's adoption of Islam in the same year that Luwu converted (Bulbeck, 2000; Bulbeck and Caldwell, 2000).

OXIS also focussed on Ussu Bay, at the northeast of the Gulf of Bone, where several rivers converge on tidal mangrove forest. Linguistically the mainstream language of this area is Padoe, whose speakers extend eastward to the Matano and Towuti lakes (Grimes and Grimes, 1987), but the *To Ussu'* (Ussu people) constitute a distinctive Bugis enclave. Numerous sites along the Ussu River, and the Cerekang River immediately to the west, have mythical associations with the origins of the Bugis and are barred from entry. These forbidden sites probably coincide with pre-Islamic sites because extensive exploration along the Ussu and Cerekang rivers found pre-Islamic sites to be elusive, whereas they were readily located in the near environs. However, excavations adjacent to two sacred sites proved to be unexpectedly

rewarding. The two test pits at Bola Merajae yielded little else than pottery, but the radiocarbon dates indicate two periods of habitation, corresponding to the first millennium CE and the fourteenth to seventeenth centuries respectively. Katue has been interpreted as a riverside settlement inhabited during the first millennium CE, but my subsequent analysis of the potshards in two test pits abutting the main site indicates light occupation during the pre-Islamic period (Bulbeck and Caldwell, 2000; Bulbeck, in prep.).

Local history (e.g., Pelras, 1996) intimately links the *To Ussu'* to the trade of iron wares from Lake Matano, the source of the *pamor luwu'* prized for kris (dagger) production in medieval Java. The excavations performed by OXIS investigated five iron smelting sites identified by their concentrated debris of iron ore waste, iron slag, charcoal and baked sediment. Iron smelting had commenced by 900-1000 years ago at Sukoyu and Nuha, on the northern shore of Lake Matano, and continued till the eighteenth century at Nuha. The major smelting deposit was found at Matano, on the lake's western corner, where it is dated to between the fifteenth and seventeenth centuries at two sites (Rahampu'u and Pandai Besi); the focus of iron smelting then moved a short distance north to Lemogola. Bulbeck and Caldwell (2000) suggest that iron from Matano's northern shore was exported northwards via the Gulf of Tomini in the early second millennium CE, before being exported eastwards through Matano (and Ussu) by the fourteenth century, after which Matano became the major smelting centre.

The plans by OXIS to excavate at Rongkong were unfortunately scuttled by the destruction of the road up to Rongkong, but it would be reasonable to assume that its iron industry followed a similar pattern of development to that at Lake Matano. Thus, the combined historical and archaeological evidence strongly implies that the iron trade underpinned Malangke's (Luwu's) burgeoning prosperity between the fourteenth and early seventeenth centuries. Malangke flourished as the entrepôt for iron transported downriver from Rongkong and coastally from Ussu Bay. Indeed, the decision by the Luwu royalty to relocate the capital to Palopo in the early seventeenth century would appear to reflect the economic decline in the importance of Luwu iron, owing to factors such as the late sixteenth century introduction of firearms to South Sulawesi, and the growth of organized iron-working operations in the major population centres south of Luwu (Bulbeck and Caldwell, 2000).

SOFT POTTERY IN LUWU

Luwu's soft pottery is identified by the low-fired status of the vessels, the rounded edges of the shards, and a fabric that looks silty to sandy in texture and seems low in inclusions (around 0 – 3% of the fabric). The shape of the pores resembles stalks and irregular granules, suggesting the inclusion of soft vegetable matter that had burnt out during firing (see Figure 1.2(d) and 1.2(f)). Except at Pinanto (see below), gleaming specks which look micaceous are the most common mineral inclusion, followed by rounded, white and black grains. Both the interior and exterior surfaces tend to be irregular, with dimples, creases, gashes and asymmetric bosses. A common feature is a thin greasy covering that occurs irregularly on the exterior and/or interior surface (see Figure 1.2(a)). Lampert's (2003: 213) chemical analysis of this slip on the Bola Merajae shards suggests the trace inclusion of dammar gum from the *Agathis* pine which occurs in the Luwu highlands.

Soft pottery has Munsell colours which are quite distinct from the standard browns and reddish browns of most Luwu pottery. Based on Munsell colour, soft pottery can be subdivided into "soft white", with white to light grey coloration, "soft pink", with pink, pinkish grey and light reddish brown coloration, and "soft orange", where the Munsell colours are typically reddish yellow and yellowish red. The more comminuted, rounded, malformed or lower fired shards of soft pottery can be difficult to distinguish from sediment clods, particularly the lumps of baked sediment frequently excavated in Luwu sites. At the other extreme, soft pottery grades into higher fired pottery of similar colour (except for the lack of a white variant), fabric and shape, such as the two examples illustrated in Figure 1.2(e) and 1.2(k). The higher firing correlates with a lesser propensity for the shard walls to be rounded, and the occasional presence of a reduced core contrasting with the vessel's oxidized walls.

The macroscopic differences between the shards at the four sites with the highest concentration of soft pottery suggest local manufacture.[1] Utti Batue is the only site to yield soft white, and soft pink is approximately ten times more common than soft orange. Textile impressions, whether pointillist (Figure 1.2(e)) or cross-hatched in appearance (Figure 1.2(c), (d) and (f)), commonly occur on the interior surface of the Utti Batue examples.[2] The Bola Merajae soft pottery resembles its Utti Batue counterparts in the frequent occurrence of internal textile impressions (Figure 1.2(a)), but the colours are very different, with soft orange about seven times more common than soft pink, and no soft white. The Pattimang Tua soft pottery is also distinct from the Utti Batue soft pottery, despite these sites' proximity (Figure 1.1). Internal textile impressions occur very rarely (see Figure 1.2(b) for one of the few examples), and the pottery is evenly divided between soft pink and soft orange. Finally, at Pinanto, no textile impressions were observed, soft orange was approximately four times more common than soft pink, porous pseudomorphs from burnt-out vegetable matter were not observed, and the most common inclusions were reddish granules dissolving into the general matrix. The higher fired counterparts of the soft

[1] Chemical analysis of the fabric is yet to be performed.

[2] See Bulbeck *et al*. (2006) for details. Note that the classification of the Utti Batue earthenware has been updated since that paper was written.

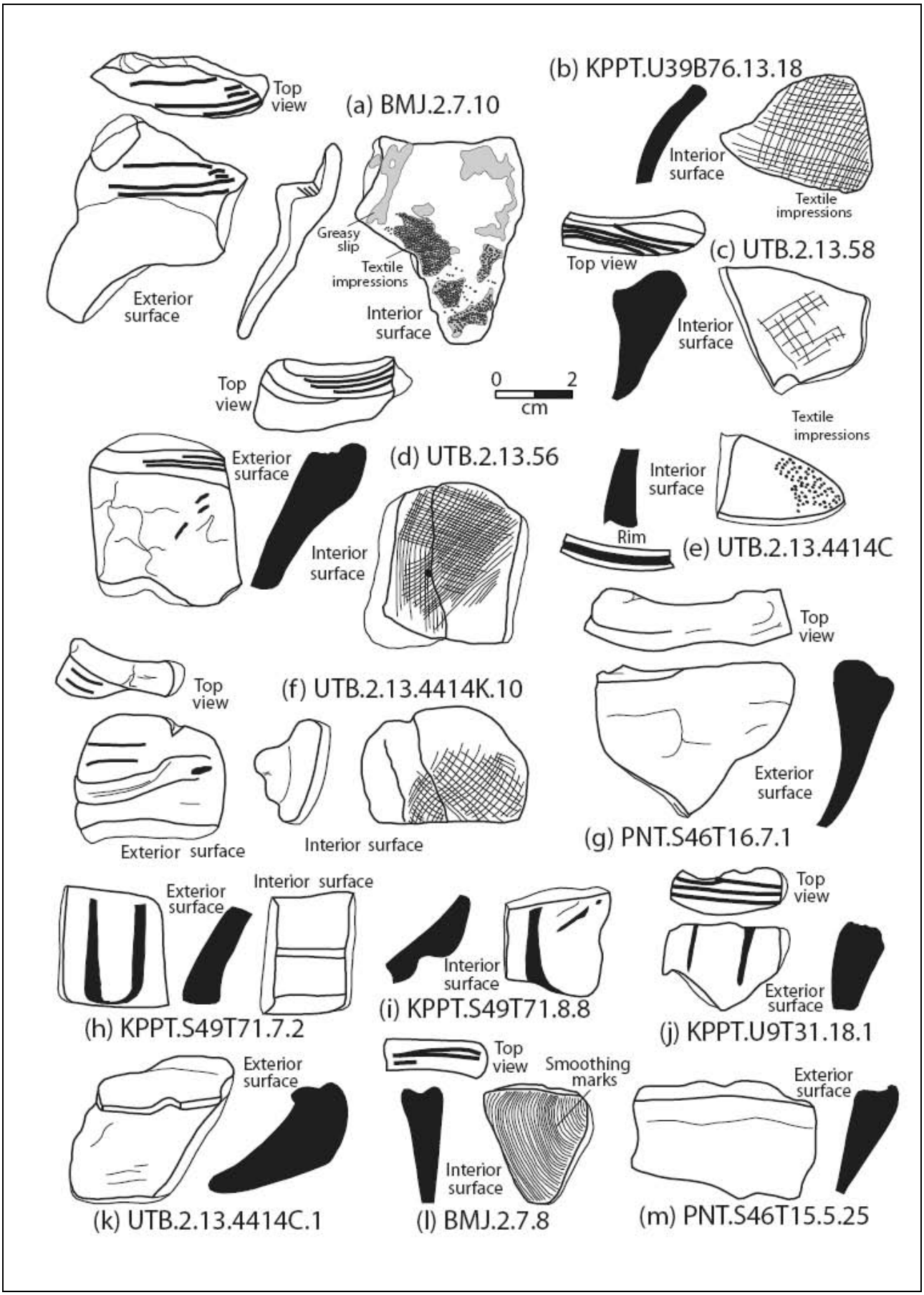

Fig. 1.2. Luwu soft pottery rims

Table 1.1. Differences between sites in their proportions of higher-fired "Pink" and "Orange", and the ratio (by weight) of higher-fired shards to soft pottery.

Site	Dominant Munsell colour class (none is whitish)	Ratio compared to soft pottery
Utti Batue	"Pink" twice as common as "Orange"	~ 1:4
Pattimang Tua	"Pink" slightly more common than "Orange"	~ 1:2
Pinanto	Almost entirely "Orange"	~ 1:10
Bola Merajae	Almost entirely "Orange"	~ 1:12

pottery also appear to differ between manufacturing sites (Table 1.1).

Both the soft pottery and its higher-fired counterparts can be dated to between the fourteenth and seventeenth centuries (Bulbeck and Caldwell, 2000; Bulbeck, in prep.). This is the age range of the great majority of the imported ceramics from Utti Batue, Pattimang Tua and Pinanto, supported by a radiocarbon date of 390±90 BP (AD 1400 – 1670 cal. at two sigma) from Pinanto. This is also the inferred age of the Bola Merajae examples, which occur above a date of 1260±60 BP (AD 980 – 1260 cal.), and in association with dates of 580±70 (AD 1284 – 1438 cal.) and 310±40 BP (AD 1480 – 1670 cal.). Similarly, at Luwu sites where soft pottery occurs at low amounts (1 – 3% of sherdage by weight), the assemblage is usually dated to between the fourteenth and seventeenth centuries by the associated imported ceramics, radiocarbon dates, or both. This is the case at Dadekoe 2, Tampinna, Patande, Salabu, and Rahampu'u (Figure 1.1). Katue and Poloe are the sole exceptions: the Katue test pits with soft orange (adjacent to the main site) are undated; and the imported ceramics at Poloe date to between the seventeenth and nineteenth centuries, though in this case they appear to have been deposited as complete vessels in an older habitation deposit. Overall, soft pottery's regular recurrence in habitation deposits dated to between the fourteenth and seventeenth centuries, and its effective absence from earlier or later habitation deposits, recommend soft pottery itself as a chronological marker of Luwu's pre-Islamic period.

The possibility of chronological change in the frequency of soft pottery, during the pre-Islamic period, was raised by my observation in two of the Pinanto test pits (S46T16 and U46B7). Here, the lowest spits included more or less equal amounts of soft and non-soft pottery, whereas non-soft pottery was dominant in every other Pinanto context. To test the hypothesis of a decrease in the frequency of soft pottery over time, I divided the excavated test pits with soft pottery into upper and lower halves. The higher-fired counterparts of soft pottery were excluded from analysis because, for some of the Pattimang Tua and Pinanto test pits, time permitted only a rough and ready classification of the shards into soft and non-soft. Where an odd number of spits in a test pit were included in the analysis, the middle spit was assigned to the upper or lower half depending on which assignment most evenly distributed the pottery between the two halves. Body weights rather than shard counts were used for pottery quantification because the soft pottery shards tend to be smaller and lighter than the other shards. The shard weights (soft and non-soft pottery) for the upper and lower spits of each test pit at a site were then aggregated to represent the "upper" and "lower" shard weights for the site as a whole.

As indicated in Table 1.2, soft pottery constitutes a larger proportion of all pottery in the lower half of all four analysed sites. This holds true whether the ceramic assemblage is dominated by soft pottery (as at Bola Merajae), or whether soft pottery constitutes less than ten percent of the assemblage (as at Pattimang Tua). Overall, soft pottery appears to have played a decreasing role in Luwu earthenware assemblages during the pre-Islamic period, a trend that continued with its disappearance following Luwu's abandonment of Malangke as its capital.

What role did soft pottery play in the Luwu earthenware assemblages? The sharp concentration of soft pottery at four sites, and the differences between these sites, suggest that, in accord with the vessels' fragility, consumption was largely restricted to manufacturing location.[3] Moreover, analysis of the vessels' form and use context (cf. Arnold, 1985: 234-237) suggests a primary use in a domestic context, probably for serving food which could then be distributed amongst the diners.

As regards form, Bulbeck *et al*. (2006) identified inverted jars (Figure 1.2(a), (b), (c), (d), (f), (g) (k)), lids (Figure 1.2(e), (h), (i)), and possible boxes (Figure 1.2(l)) as the dominant vessels. Indeed, there may have been only a single vessel form – inverted jars, often with lids. The curvature of the rim tends to be irregular (see Figure 1.2(a), (c), (d), (f), (g), (j)), and this irregularity could make a short segment from a curved rim appear straight. This is particularly true because the aperture diameter, whilst never measurable, probably tended to be large (over 20 cm) given the typically modest degree of rim curvature. A wide rim aperture would also have let the potters impart textile impressions on the interior surface;

[3] Bulbeck *et al*. (2006) suggested the use of soft pottery in transporting goods across the landscape of Luwu, but that paper was written prior to thorough study of the relevant assemblages.

Table 1.2. Recorded weights (in grams) of soft and non-soft pottery at Luwu soft pottery manufacturing sites. The upper half at Utti Batue includes spits 5 – 10, and the lower half includes spits 13 and 14 (time did not permit analysis of the other excavated spits).

	Bola Merajae	**Pinanto**	**Utti Batue**	**Pattimang Tua**	**All four sites**
Upper half – soft pottery	32.5 g (67.3%)	1,004 g (12.7%)	310.1 g (6.6 %)	296.3 g (2.3%)	1,642.9 g (6.5%)
Upper half – non-soft pottery	15.8 g (32.7%)	6,888 g (87.3%)	4,354,7 g (93.4%)	12,357.7 g (97.7%)	23,616.2 g (93.5%)
Lower half – soft pottery	501.8 g (84.2%)	1,124 g (14.7%)	608.4 g (12.9%)	910 g (10.5%)	3,144.2 g (15.2%)
Lower half – non-soft pottery	94.4 g (15.8%)	6,532.8 g (85.3%)	4,123.6 g (87.1%)	6,832 g (89.5%)	17,582.8 g (84.8%)

for instance, by wrapping cloth around the anvils to cushion their effect on the soft pottery during paddle and anvil finishing. The rims are typically thickened compared to the shoulder, and often have grooves or furrows along their top surface (Figure 1.2(b), (j), (l)), or exteriorly lateral flanges which carry irregular sets of grooves (Figure 1.2(a) and (f)). These rim elaborations would have helped lock the lid onto the rim. At the Utti Batue test pit, in spit 8, two flanged and furrowed rim and lid shards, locking into each other, were recorded. Traces of decoration are sparse, with only two identified examples (Figure 1.2(h) and (k)), and even these cases could be manufacturing defects that mimic decoration. Finally, given the rim thickening and weak constitution of the fabric, it is likely that the jars were squat, because if the jars were tall, the thickened rims would have tended to collapse under their own weight. In summary, the soft pottery vessels were probably wide-mouthed jars with weakly inverted rims, and oblate in overall shape when furnished with lids.

As regards use context, the Utti Batue excavation sampled household debris (Bulbeck *et al.*, 2006), the Pattimang Tua and Pinanto excavations yielded some iron-working as well as domestic debris (Bulbeck and Caldwell, 2000), while Bola Merajae is poorly understood. Certainly, use of the vessels for cooking or holding heavy contents (such as water) can be ruled out given the unsuitability of the fabric for heavy-duty tasks, and the persistent association of soft pottery shards with shards from stronger, more serviceable vessels. The soft pottery vessels could conceivably have performed a ritual function, but this would imply that Bola Merajae was essentially a ritual site, based on its dominance of soft pottery (Table 1.2). It would be more reasonable to assume that the soft pottery at Bola Merajae probably had a wider array of functions than at the other three manufacturing sites.[4] Until further analysis may correct this impression, I infer that soft pottery had a domestic function. The wide-mouthed jars would have been ideal for serving food (e.g., fruits, sago gruel, or cooked rice) to groups of diners; the contents would have been held secure by the inverted rim, while the wide aperture would have assisted serving or taking individual portions.

Finally, where do the origins of Luwu's soft pottery lie? Evidently, not in the Bugis heartland of the Cenrana Valley, to the southwest, which Bulbeck and Caldwell (2000) argue to have been the source of the Malangke Bugis immigrants. Over 5.5 kilograms of pottery dating to between the fourteenth and seventeenth centuries have been studied from the Bugis palace centre of Allang-kanangnge ri Latanete (Figure 1.1), which in many ways was Malangke's southern counterpart, and only a single shard of soft pottery has been identified (Bulbeck and Hakim, 2005). The most plausible source is Bola Merajae. The first millennium levels in Test Pit 1 yielded a small collection (19.7 grams) of shards very different from any contemporary pottery at Katue. The fabric (of Munsell brown coloration) resembles soft pottery in appearing porous and sandy, and speckled with gleaming inclusions (mica?), while the pottery is soft and low-fired. Indeed, soft pottery would appear to have been a specialty of the Bola Merajae potters, based on its prehistoric occurrence at the site, and the dominance of Soft Orange/Pink in the pre-Islamic levels. Either the Malangke and Pinanto potters imitated soft pottery vessels they had acquired from Bola Merajae, or Bola Merajae potters migrated to work in these population centres in Luwu's south. The latter development seems more likely, at least for Malangke, whose impressive population growth during the pre-Islamic period was associated with a multi-ethnic composition (Bulbeck and Caldwell, 2000).

A DARWINIAN EXPLANATION FOR THE RISE AND DECLINE OF LUWU'S SOFT POTTERY

As discussed above, market mechanisms are a suitable vehicle for natural selection in the case of artefacts where few consumers are also producers. The spectacular growth of Malangke's population, from an archaeolo-

[4] This observation holds even though the fragility of the soft pottery would lead to its over-representation in an assemblage of shards compared to the proportion of vessels in a household, at any time, that would have been soft pottery vessels.

gically invisible presence in the thirteenth century to over 10.000 in the sixteenth century, would have created a burgeoning demand for domestic pottery. Whether or not the Bugis settlers in Luwu had brought potters with them, there would have been considerable scope for diverse potters to ply their trade at Malangke, and other population centres (such as Pinanto) whose fortunes were tied to Malangke's. The producers of soft pottery appear to have specialized in making food holding and distribution vessels, which presumably replaced containers of metal, wood, or more durable earthenware previously used for that purpose. A chief advantage of the soft pottery is the basic nature of the technology. All that was required was suitable clay, not of high potting quality (hence, widely available), with a minimum of added temper and modest firing requirements. Soft pottery was evidently not only cheap but also fragile, further stoking its demand (cf. Arnold, 1985: 152-153).

The use of soft pottery evidently declined as the centuries passed (Table 1.2). Despite any attempts to improve the pottery's appearance with brownish slips or, in the case of Utti Batue, a whitish appearance, the misshapen appearance of the vessels would have been unmistakable.[5] Soft pottery, despite its cheapness, would have always been vulnerable to competition from other containers that looked more regular and aesthetic, and lasted longer, particularly in the well-off communities that evidently flourished at Malangke and Pinanto. This suggestion can be tested archaeologically based on the prediction that serving vessels of superior ceramic quality should have increased at Malangke and Pinanto concomitantly with the decline in soft pottery.

In summary, the unusual attributes of Luwu's soft pottery, and its chronological association with the period when Luwu's capital was based at Malangke, might entice explanations that appeal to introduced technology, advanced craftwork, or even ideological connotations. Analysis within a Darwinian framework, however, suggests a more prosaic explanation. Soft pottery was cheap and simple earthenware that filled a temporary niche in local society's demand at a time when population was burgeoning. This explanation is not only parsimonious but also hopefully inclusive, in the sense described in my Introduction. Attention has been paid to the Bugis pre-Islamic expansion into Luwu and the incorporation of an originally pre-Bugis technology into the Bugis-ruled economy. Inexact transmission of the technology is clear from the differences between the four known manufacturing sites in terms of their soft pottery, and adaptation to the environment is implied by the (suspected) use of local clay sources at these four sites. Now that a useful explanation for Luwu's enigmatic soft pottery is available, it will be possible to incorporate it into a scientific explanation of social change, more generally, in pre-Islamic Luwu.

[5] Given the qualities of soft pottery, the vessels could have lost their shape during use, and certain features such as rim grooves could be use-wear marks, so some of the shards' strange attributes may well reflect a different appearance of the worn-out wares compared to new vessels. Even then, however, it would hardly be an advertisement for a pot for it to sag and disfigure during use.

Acknowledgements

The "Origin of Complex Society in South Sulawesi" (OXIS) project was funded by the Australian Research Council, with supplementary support from the Wenner-Gren Foundation for Anthropological Research, the Australian National University, the University of Hull, and the Australian Institute of Nuclear Science and Engineering. The Australia-Indonesia Council funded my two trips to Makassar, South Sulawesi, to record the Luwu earthenware. Budianto Hakim of the Makassar Archaeology Office assisted in recording the earthenware. My attendance at the UISPP XV Congress was supported by a conference travel grant from the Faculty of Arts at the Australian National University.

References

ARNOLD, D.E. (1985) – *Ceramic Theory and Cultural Process*. Cambridge: Cambridge University Press. 237 p.

BOYD, R; RICHERSON, P.J. (1985) – *Culture and the Evolutionary Process*. Chicago: University of Chicago Press. 311 p.

BOYD, R; RICHERSON, P.J. (2005) – Rationality, imitation and tradition. In *The Origin and Evolution of Cultures*. Oxford: Oxford University Press. p. 379-396.

BULBECK, D. (2000) – Economy, military and ideology in pre-Islamic Luwu, South Sulawesi, Indonesia. *Australasian Historical Archaeology*. Sydney. S. 18, p. 3-15.

BULBECK, D. (In prep) – Early Metal Phase trade and craft in the Bone Gulf, Luwu, South Sulawesi, Indonesia.

BULBECK, D.; CALDWELL, I. (2000) – *Land of Iron: The Historical Archaeology of Luwu and the Cenrana Valley*. Hull: University of Hull. 141 p.

BULBECK, D.; HAKIM, B. (2005) – The earthenware from Allangkanangnge ri Latanete excavated in 1999. Accessible at WWW: URL: http://arts.anu.edu.au/bullda/Sarepao_pottery.html.

BULBECK, F.D.; BOWDERY, D.; FIELD, J.; PRASETYO, B. (2006) – The palace centre of sago city: Utti Batue site, Luwu, South Sulawesi, Indonesia. In Lilley M.; Ellis S., eds. lits. – *Wetland Archaeology & Environments: Regional Issues, Global Perspectives*. Oxford: Oxbow Books. p. 119-140.

CAMERON, D.W.; GROVES, C.P. (2004) – *Bones, Stones and Molecules: "Out of Africa" and Human*

Origins. Burlington, MA: Elsevier Academic Press. 402 p.

GRIMES, C.E; GRIMES, B.D. (1987) – *Languages of South Sulawesi*. Canberra: The Australian National University. 208 p. Pacific Linguistics Series D – No. 78.

HAUSMAN, D.M. (1998) – *Causal Asymmetries*. Cambridge: Cambridge University Press. 300 p.

LAMPERT, C.D. (2003) – The Characterisation and Radiocarbon Dating of Archaeological Resins on Southeast Asian Ceramics. Bradford: University of Bradford Department of Archaeological Sciences. 350 p. PhD thesis.

LIEBERMAN, P. (2006) – *Toward an Evolutionary Biology of Language*. Cambridge, MA: Belknap Press. 427 p.

ODLING-SMEE, F.J.; FELDMAN, M.W.; LALAND, K.N. (2003) – *Niche Construction: The neglected Process in Evolution*. Princeton: Princeton University Press. 395 p.

PELRAS, C. (1996) – *The Bugis*. Oxford: Basil Blackwell. 353 p.

RENFREW, C.; BAHN, P. (2000) – *Archaeology: Theories Methods and Practice*. Third edition. London: Thames & Hudson. 640 p.

RINDOS, D. (1986) – The evolution of the capacity for culture: sociobiology, structuralism, and cultural selectionism. *Current Anthropology*, S. 27, p. 315-333.

THOMAS, D.H. (1972) – A computer simulation model of Great Basin Shoshone subsistence and settlement patterns. In Clarke, D.L., ed. lit., *Models in Archaeology*. London: Methuen. p. 671-704.

WHITTLE, A.W.R. (2003) – *The Archaeology of People: Dimensions of Neolithic Life*. New York: Routledge. 199 p.

WRIGHT, S. (1968 – 1978) – *Evolution and the Genetics of Populations*. Chicago: University of Chicago Press. 4 volumes