Crossing the Luzon Strait: Archaeological Chronology in the Batanes Islands, Philippines and the Regional Sequence of Neolithic Dispersal

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ABSTRACT

Radiocarbon dating results from the Batanes archaeological project (2002–2004) are analysed and compared with similar data from northern Luzon. It is argued that the reef-shell and pottery residue ages are not as reliable as dates on charcoal, and that the latter show a relatively late colonization of the Batanes, beginning about 800 BC on charcoal ages. The two successive early phases originally proposed, Sunget and Naidi, are amalgamated into a single early period. As early neolithic sites in northern Luzon are significantly older, beginning about 1700 BC on charcoal dates, early neolithic movement from Taiwan might have bypassed the Batanes. Early Batanes material culture exhibits similarities with types and assemblages in both Taiwan and northern Luzon, and linguistic data cannot determine whether the conservative Batanic languages reflect colonisation earlier than settlement of Luzon, or isolation in the Batanes. Consideration of the geography of island Southeast Asia and of the general pattern of late Holocene island colonization does not offer support to simple stepping-stone models of neolithic dispersal. At least two phases of dispersal, one earlier from the southwest, and one later from the northeast, can be hypothesized. Their potential existence raises questions about the nature and interaction of late Holocene populations in the region, suggesting that neolithic cultural inventories may have been more partitioned, and relations more reticulate, than is sometimes envisaged. As expansion of farming is relatively poorly documented, its common demographic impact probably does not account for rapid neolithic expansion. The evolution of maritime technology and climatic change, especially around 2000 BC, suggest alternative avenues for further investigation of late Holocene movements in island Southeast Asia.

Key Words: Radiocarbon chronology, Luzon Strait, neolithic

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The early archaeology and environmental history of the Batanes Islands, Luzon Strait, is one aspect of a project on the northern Philippines, Taiwan and the southern Ryukyus, directed by Peter Bellwood and Atholl Anderson which is, in turn, part of the ANU Asian Fore-Arc Project on the prehistory of the islands along the western edge of Oceania from Japan to Timor. This encompasses various topics amongst which the dispersal of neolithic culture is prominent, and the major issue of the Batanes research.

The origins, timing and manner in which various traits of neolithic culture became dispersed through island Southeast Asia constitute a topic that has yet to command a consensus. The prevailing hypothesis emphasizes a concordant expansion of agriculture and Austronesian-speaking farmers from Taiwan (Bellwood 2002, 2004, Diamond and Bellwood 2004, Pawley 2002), while other opinions challenge the origin (Meacham 1988, Oppenheimer 1998), the culture-package assumptions (Szabo and O'Connor in press), the language-culture linkage (Terrell *et al.* 2001) and other aspects (Anderson 2003a) of the conventional model. A significant area of the debate concerns the chronology of neolithic dispersal, where the neolithic is defined minimally by the occurrence of pottery. That alone represents an important issue, but here the definition is accepted in order to discuss the chronology without additional complication.

I am going to look at three levels of the early chronology of the neolithic phase: the initial habitation of the Batanes islands, where we have conducted fieldwork since 2002 (Bellwood *et al.* 2003); the Batanes in relation to neolithic arrival in northern Luzon; and several matters concerning the sequence of neolithic expansion in island Southeast Asia generally. In taking up the wider contexts of the Batanes evidence I have relied upon recent syntheses of chronological and ceramic assemblage data by Bacus (2004), Bellwood (1997, 2004), Bellwood *et al.* (2003), Hung (2004), Paz (2003), and Spriggs (2003).

THE BATANES SEQUENCE

As at April 2005, twenty-seven radiocarbon dates had been obtained on samples from archaeological sites during the recent fieldwork. These are listed in Table 1 (expanded and corrected from Bellwood *et al.* 2003: Table 1). Excluding two modern results (ANU–11709, ANU–11711), the former of which is almost certainly an additional ANU laboratory error (others have been corrected: J. Chappell pers.comm. 12th May 2003), plus two late 2nd millennium AD results (Wk–13090 on shell, and ANU–11696 with a very large standard error) which were not worth calibrating, the distribution of dates at two standard deviations is shown in Figure 1. According to their association with pottery assemblages, the dates from Batan Island sites have been divided by Bellwood *et al.* (2003) into three phases: Sunget, Naidi and Rakwaydi. The late (Rakwaydi) phase is clearly separated chronologically, but the earlier two are not. On the face of the ages, they overlap by almost 50%. Furthermore, if the date with the smallest error in each case is regarded as the most precise (ANU–11693 in Sunget phase and ANU–11695 in Naidi phase), then the phases have virtually identical ages. Bellwood and Dizon (2004) have re-arranged exactly the same set of radiocarbon dates to make chronologically exclusive phases (Sunget 3700–2700 BP, Naidi 2700–1000/500 BP),

Table 1: Archaeological dates from Batanes Islands, Philippines.
Samples charcoal unless otherwise indicated. CRA=Conventional radiocarbon age. Calibration of dates by OxCal version 3.8, except Waikato marine dates by OxCal version 3.9, with South China Sea-Yaeyama offset to delta-R. Wk-13170 given as Wk-13091 in Bellwood *et al.* (2003).

LOCATION, SITE	CONTEXT	CRA	LAB No.	CAL. 2 Sigma
ITBAYAT ISLAND				
Torongan Cave	*Turbo* shell from inwashed topsoil cultural layer	3352±35	Wk 14641	1370–1160 BC
Torongan Cave	Cultural layer, sherd residue (AMS)	3320±40	Wk 14642	1740–1510 BC
Anaro hilltop site	Anaro site, Area 2A, 15–20 cm, sherd residue (AMS)	1876±41	Wk 14643	AD 50–240
Anaro hilltop site	Anaro site, Area 3, 90–95 cm, sherd residue (AMS)	1360±39	Wk 14645	AD 600–770
Siayan Island, Mitangeb	*Turbo* shell from Test Pit 1, 50–55 cm	1659±32	Wk 14646	AD 670–790
BATAN ISLAND				
	SUNGET PHASE			
Sunget Top Terrace	Layer 5 charcoal concentration	2630±30	ANU 11693	840–760 BC
Sunget Top Terrace	Squares A/D, layer 5, 20–30 cm within layer	2000±140	ANU 11707	400 BC–AD 350
Sunget Top Terrace	Layer 5, sherd residue (AMS)	2910±190	ANU 11817	1700–500 BC
Sunget Main Terrace	Layer 5, sherd residue (AMS)	2915±49	Wk 14640	1270–940 BC
	NAIDI PHASE			
Naidi	A2, 0–10 cm within layer	2240±140	ANU 11708	800 BC–AD 50
Naidi	South sample with pottery	1590±210	ANU 11694	50 BC–AD 900
Naidi	North sample with pottery	2620±30	ANU 11695	835–760 BC
Naidi	A1, 0–10 cm within layer	200±360	ANU 11709	Error too large
Mahatao Septic Tank	Cultural paleosol at 2.5 m below surface (AMS)	2090±60	ANU 11710	500 BC–AD 350
Mahatao town	Palaeosol in M5 below volcanic ash with sherds(AMS)	1829±180	ANU 12071	250 BC–AD 650
Payaman	North square, layer 3, 10–25 cm within layer	1988±47	Wk 13092	110 BC–AD 130
Payaman	South square, layer 3, 20–25 cm,	1486±185	ANU 12068	AD 100–1000
Tayid	Beneath main ash deposit, sherd residue (AMS)	1842±215	ANU 12069	400 BC–AD 650
	RAKWAYDI PHASE			
Mavatoy shelter	Square A, 25–30 cm below surface (Turbo shell)	682±49	Wk 13336	(not run)–Modern
Dios Dipun shelter	Test Pit 2 at 175 cm below surface	500±260	ANU 11696	Error too large
Dios Dipun shelter	Extension trench, south end, 120 cm below surface	590±110	ANU 11736	AD 1210–1530
Mavuyok a Ahchip cave	Square C, layer 2, 5–10 cm within layer	Modern	ANU 11711	Modern
Mavuyok a Ahchip cave	Square C, layer 3, 0–5 cm within layer	550±70	ANU 11712	AD 1290–1470
Mavuyok a Ahchip cave	Square B, layer 3, 25–30 cm within layer	750±80	ANU 11697	AD 1040–1400
Mavuyok a Ahchip cave	Square C, layer 3, 30–35 cm within layer	900±60	ANU 11713	AD 1020–1260
SABTANG ISLAND				
Pamayan shell midden	Square A, 100–105 cm below surface (AMS)	418±41	Wk 13170	AD 1420–1630
Savidug (Sabtang)	Below ijang, square C, 100–110 cm	760±190	ANU 12070	AD 850–1650

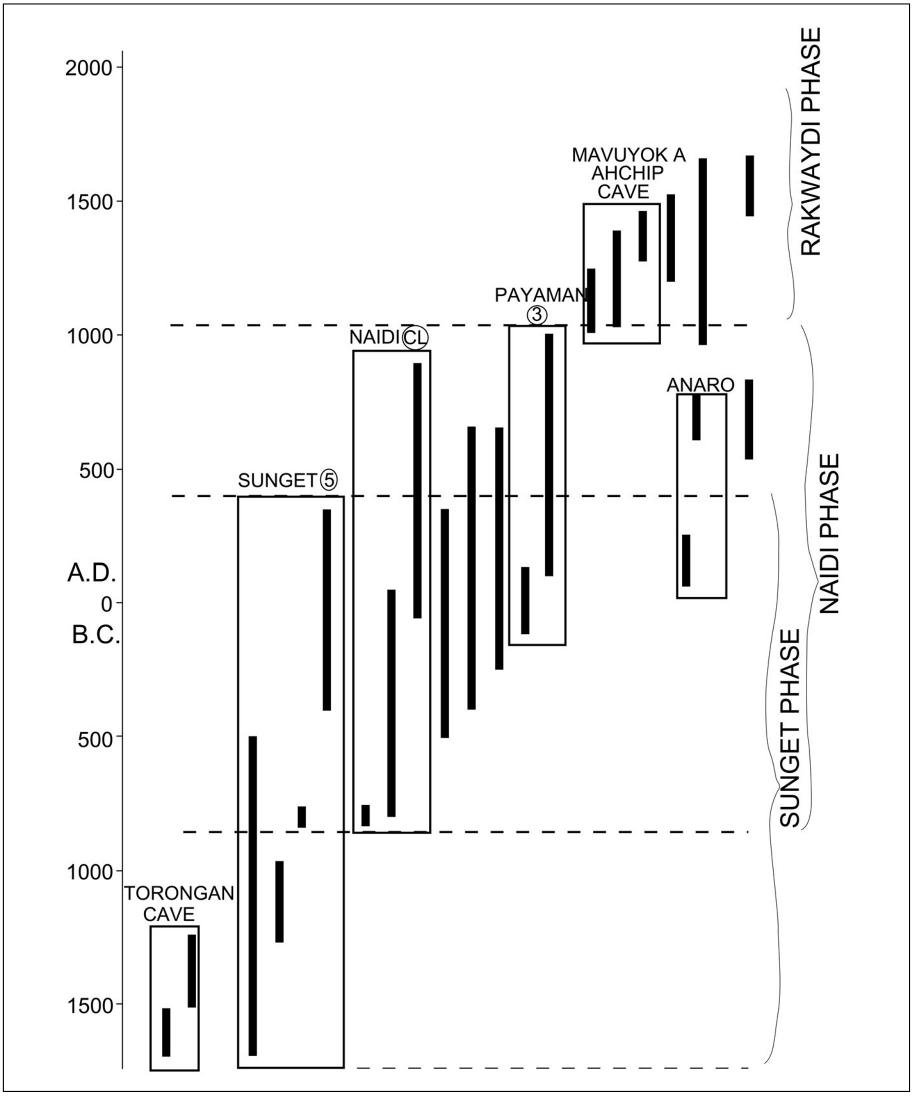

Figure 1: Radiocarbon dates at 2 S.D. from the Batanes (Table 1), **shown by phase** (Bellwood *et al.* 2003).

but the rationale of that revision is not disclosed. Some further analysis of the radiocarbon ages is warranted.

There is variation in the sample types. Most dates are on charcoal, unidentified to taxa; three are on *Turbo* shell and five are on assumed food residue from the interior surfaces of pottery sherds. The residues are unidentified and it is not certain that any or all are from cooking food; manufacture of glues, paints, resins, medicines or other substances might also have been involved. If the dates for the Sunget and Naidi phases are separated by sample type (Figure 2), it seems that there may be two chronologies within the data. On charcoal samples the Sunget and Naidi phases are essentially the same, and on the preponderance of

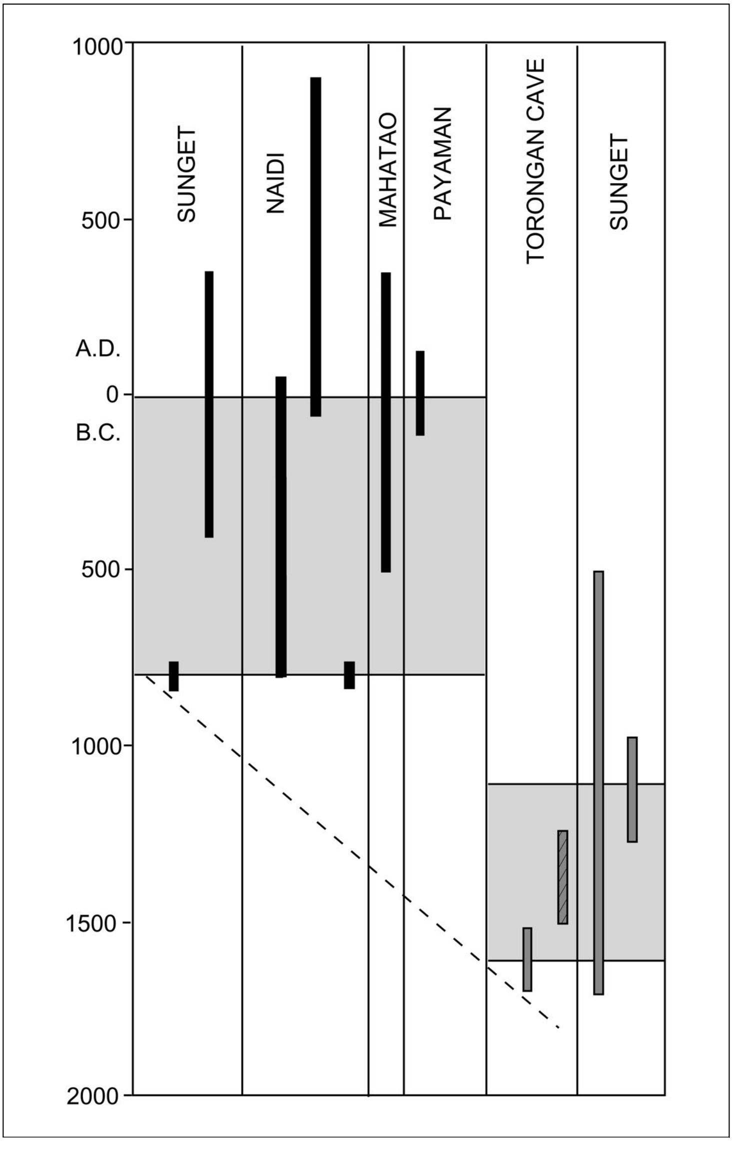

Figure 2: Radiocarbon dates at 2 S.D. from early contexts in the Batanes (Table 1), **shown by sample type: black bars = charcoal, grey bars = food residue on pottery, grey and shaded bar = marine shell.**

median ages would date from about 800 BC to 0 AD. Median ages are not generally a very useful way of discussing chronological distribution, but they have a certain advantage in the present case. Some of the dates are from the ANU AMS Laboratory and have large standard errors, not as a measure of mixed fractionation or some other problem inherent in the samples, but merely because the ANU AMS Laboratory has been set up to suit research on older Quaternary samples for which error ranges of ±200 years or so represent acceptable precision. In other words, the same samples dated at a commercial AMS laboratory would have much narrower standard errors. For example, compare ANU–11817 (2910±190 BP) with Wk–14640 (2915±49 BP). These are both on the same material type and have almost identical conventional ages. Since they vary only in standard error for reasons of machine setting, we can assume that if both had been processed at Waikato Laboratory, for instance, then ANU–11817 would probably have looked almost identical to Wk–14640. In discussing them the more sensible comparison is either by conventional age or by the calibrated medians, than by the age ranges.

Pottery residue dates for Naidi Phase (Table 1) cannot be compared directly with charcoal ages from the same sites so whether they also show a consistent variation is unknown, although there is no reason to expect that variation by sample type will exhibit consistent results. On both shell and residue samples, however, Sunget phase dates are significantly earlier, about 1600–1100 BC on median ages, than those on charcoal samples from the same provenances. One or both of the chronologies evident in the Sunget data may be offset from the actual chronology by the influence of sample type.

Pottery residue and shell dates are likely to be more problematic than those of charcoal for several reasons. First, the most likely source of error in charcoal samples is inbuilt age, but that makes results older than they ought to be, which is not the potential problem at issue here. Incorporation of young carbon is possible, but all the charcoal samples were pretreated for humic acids and similar potential sources of contamination. In general, then, the charcoal dates should be fairly reliable in terms of the present discussion (*i.e.* they could be somewhat too old, but that would not affect the current issue).

Second, the stratigraphic context of the samples giving the oldest dates in the Batanes is dubious. The Torongan Cave samples are from in-washed material so there is no original stratigraphy and the initial depositional association, if any, between pottery and shell or charcoal samples is unknown. Further, much of the shell has been eroded and may be of subfossil age rather than midden remains. Molluscan shell specialist, Katherine Szabo (pers. comm. 4th August 2004) inspected the shell assemblage and could not rule out a subfossil origin for the *Turbo marmoratus* specimen of Wk–14641. Additional examination by Szabo showed that other specimens were heavily eroded and water-rolled and that most of the larger gastropod shells in the Torongan Cave assemblage had been damaged through use by hermit crabs; their relationship to human collection is therefore questionable. The Batanes shell dates have been corrected for marine reservoir effect, using averaged delta-R offset values from the Yaeyama Islands and South China Sea (Fiona Petchey, pers. comm. 26th July 2004) but there are no local values and, in addition, taxa inhabiting limestone reefs, such as *Turbo* on Itbayat Island, can date many centuries too old through the uptake of infinite-age carbon (Dye 1994, Anderson *et al.* 2001). Three new radiocarbon dates on marine shell from the lower levels at Torongan have yet to be evaluated, but they will produce calibrated median ages varying from about 2600 BP to 4300 BP (Anderson, unpublished; Bellwood pers. comm. 18th July 2005).

Residue samples have the virtue of an impeccable association with the pottery to which they adhered, but their carbon sources and proportions are usually unknown, as here. Recent research on food residues from pottery in neolithic Danish sites showed that some ages were more than 300 years too old (Fischer and Heinemeier 2003), as the result of cooking freshwater fish, and that even otherwise acceptable ^{13}C values of −26‰ might need to be corrected for marine reservoir effect. In addition, uptake of carbon of infinite age by freshwater and terrestrial taxa in limestone habitats can induce errors of many hundreds of years which compound the marine reservoir effect to create apparent ages that are vastly in error (Fischer and Heinemeier 2003). Batan is a volcanic island, but it has dissected remains of coral limestone in many places, including at Sunget where the site has accumulated around limestone blocks. Itbayat is an upraised coral island with minor basalt outcropping. Large, edible, landsnails are abundant in Batanes cave site faunas, and sugar cane (a C4 plant) is a common crop, so the possibility of error in food residue dates is more than just hypothetical. A new food residue date from the lowest level at Torongan, will calibrate to a median age of about 4300 BP (Bellwood pers. comm. 18th July 2005).

Where pottery residue dates are much older than those on charcoal, it is possible that younger charcoal samples have been introduced to the site by disturbance after occupation. This cannot be ruled out at Sunget and Naidi, but it seems unlikely. Material was taken from discrete patches of charcoal sealed within Sunget layer 5, as for ANU–11693, ANU–11695, ANU–11708 and ANU–11707, despite the relatively young age (it was true also of ANU–11709, but that sample was dated in a period when there were problems in the ANU Radiocarbon Laboratory).

Clearly, there are difficulties in interpreting the Batanes radiocarbon chronology. Where there is substantial variation in ages within sites, as here, at least two propositions come to mind. First, the dates might all be correct and refer to repeated occupations. Where dating samples are manifestly from different layers distinguishable by sedimentary or cultural evidence, and the ages are in stratigraphic order, that is highly probable, but stratigraphy was only weakly evident in Sunget, and regarded as originating by re-deposition at Torongan Cave. Second, for any of various reasons, including those raised here, the radiocarbon dates may not be faithfully recording the age or ages of deposition in the sites. I think the cautious approach is to favour this latter proposition as the null hypothesis until it can be confidently discarded, and that means setting aside the variable ages on marine shell and unidentified residues and their inconsistency with ages on charcoal, until the sources of variation are systematically addressed and understood. The stratigraphic difficulties notwithstanding, a useful step in this direction would be to obtain and radiocarbon date charcoal samples from the same Torongan Cave provenances as those producing the pottery residue and shell radiocarbon samples.

In the meantime, it can be proposed that the least problematic estimate of initial occupation in the Batanes Islands is represented currently by the oldest charcoal dates from Sunget and Naidi, 840–760 BC (ANU–11693) and 835–760 BC (ANU–11695) respectively. Broadly, this suggests initial colonization near the beginning of the 1st millennium BC. That conclusion would collapse the Sunget and Naidi phases into one period, about 800 BC to 0 AD (Figure 3). Pottery is mostly red-slipped and sometimes stamped-circle decorated in both phases, but the extent to which different types at Torongan, or the carinated wares at Naidi, represent temporal, geographical, functional or sampling variation still remains to be established. The pottery and other materials in the early period exhibit similarities with assemblages dated 1500–500 BC in both Taiwan and northern Luzon (Bellwood and Dizon 2004).

THE BATANES AND NORTHERN LUZON

How would initial occupation at around 800 BC in the Batanes compare with the advent of the neolithic in northern Luzon? In the latter area, as well, there are some questions to be raised about the radiocarbon chronologies. Luzon is a more difficult case because there were people living there before the neolithic, so arguments for stratigraphic association of dating samples and neolithic indicators have to be more certain than in the Batanes where, given the absence of any remains of pre-neolithic occupation, any demonstrated cultural context of samples is probably enough. Not only is this a higher requirement of association but, as Spriggs (2003:60) points out, the northern Luzon chronological database is afflicted by problems: most of the shell samples are of estuarine or freshwater taxa so conventional ages are dubious at best and cannot be safely calibrated. Some important neolithic sites, such as Pamittan, Dimolit, Pintu Cave, Rabel Cave and Arku Cave were dated unreliably, although not necessarily wrongly, by the Gakushuin Laboratory, and cave sites are prone to disturbance which can shift pottery into originally aceramic layers, as perhaps has happened at Miguel Supnet where the single charcoal date in association with pottery has a median age close to 3000 BC (Spriggs 2003:67). If the Gakushuin dates are accurate, then some of them, notably at Rabel Cave, would support that age. My inclination, however, is to regard unreliable data as effectively worthless and not to use them.

There are some more useful sequences. One is at Nagsabaran, where a series of excavations by Cheng-hwa Tsang and colleagues (Tsang and Santiago 2001, Hung 2004) has resulted in a broadly consistent chronological sequence. There is one estuarine shell date of 3450 ±40 uncal. BP (NTU–3799), which should be regarded cautiously, and six charcoal dates in association with red-slipped pottery. Of these, one date in excess of 5000 BC (NTU–26705), from within the sequence is clearly an outlier and there is some variation amongst results from the same levels which could suggest alternative estimates for early red-slipped pottery of around 1200–1300 BC or around 1700 BC. Dates in association with red-slipped pottery at Irigayen, and possibly Magapit, conform with the former estimate, and those from Andarayen, with the latter (Figure 4). The most useful date, directly on remains of rice from

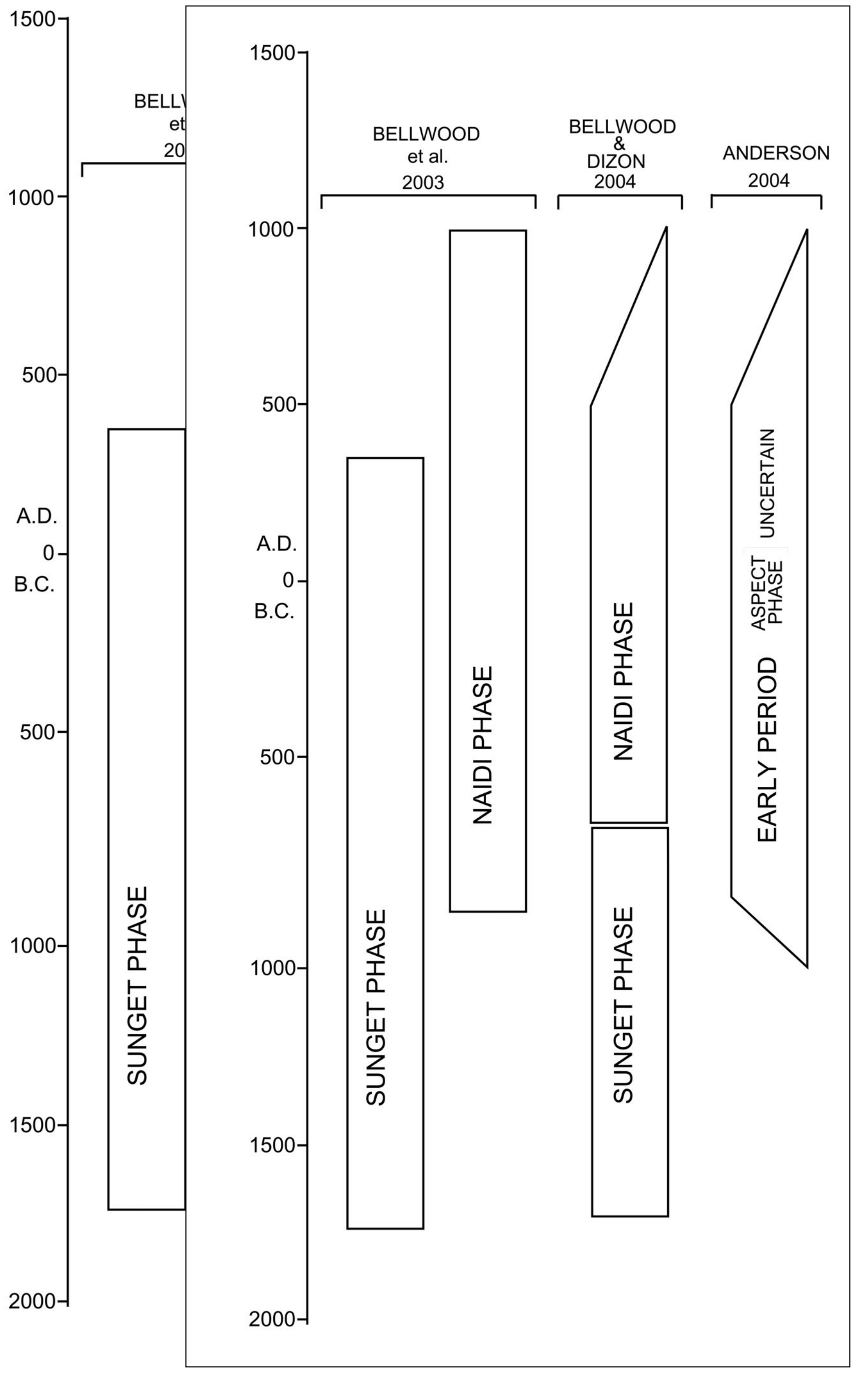

Figure 3: Three models of periodization of the early sites in the Batanes.

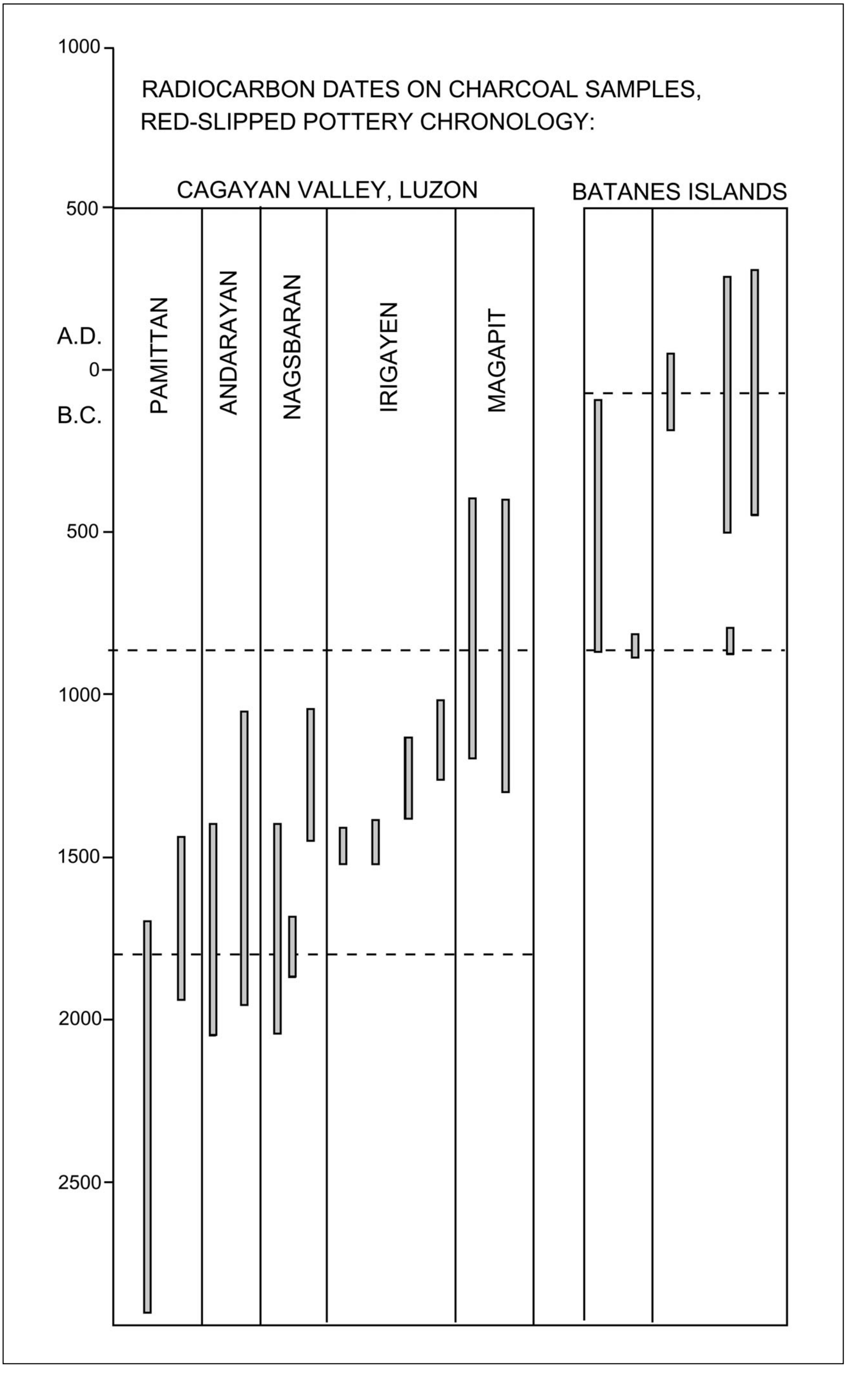

Figure 4: Charcoal dates for the advent of red-slipped pottery in the northern Philippines (for sources, see text).

Andarayen, calibrates to about 2000–1400 BC, with a median age around 1700 BC (Spriggs 2003:67), which suggests that the older chronology for the neolithic, beginning 1700–2000 BC, may be the more accurate. This is broadly consistent with dispersal from Taiwan during the later part of the fine cord-marked pottery phase, about 1500–2000 BC (Tsang 2000) when there was a marked increase in the prevalence of red-slipped pottery.

If the Batanes chronology based on charcoal samples is preferred at present, then it is apparent that something close to a millennium elapsed between the initial arrival of red-slipped pottery in northern Luzon, most probably from Taiwan, and the first human occupation of the Batanes. In other words, the initial neolithic dispersal route from Taiwan to the Philippines may not have passed through the Batanes. Whether the Batanes were reached later from Taiwan, or from Luzon, or at about the same time from both, is also unclear. Bellwood and Dizon (2004) point to the Taiwan parallels of slate implements in the Sunget phase, and if these are of Taiwan slate (which needs to be established by sourcing, since there are slate sources in Luzon as well) then there is an argument for initial migration to the Batanes from Taiwan. However, that does not mean that the Batanes were settled from Taiwan at the same age as the neolithic colonisation of northern Luzon because slate points occur into the first millennium BC in Taiwan (Tsang 2000). Besides, they are not common in the Sunget phase of the Batanes, so their absence in northern Luzon, where rather different kinds of sites have been excavated in the Cagayan Valley (essentially riverine shell middens), does not guarantee the impossibility of an origin there. The early Batanes ceramics are similar to those in northern Luzon and Taiwanese jade in the Batanes was fashioned into forms of Philippine type (Bellwood and Dizon 2004). Linguistically, the conservatism of Batanic cannot be attributed unequivocally to either an early direct origin from Taiwan or later dispersal from Luzon followed by relative isolation (Ross 2004). None of these data offer any certainty but they might suggest that the Batanes neolithic assemblages are of possible mixed origin.

One point potentially in favour of colonization from Luzon is that it is easier to sail north than south in the Luzon Strait (Solheim 1984–1985). We do not know how early sailing began in island Southeast Asia, but the general consensus (*e.g.* McGrail 2001) is that it developed in China after 5000 BP. As such, it was probably an important factor in the late Holocene population dispersals, including out of Taiwan. In that case, the Kuroshio Current, which flows northward through the Batanes along the Pacific side of the Bashi Channel (Xue *et al.* 2004), was a potentially significant obstacle. The Kuroshio Current is not wind-driven and when there are fair winds for sailing south it has wind against tide, creating dangerous seas for small vessels. A safer route south across the Luzon Strait would be further west, out of the main Kuroshio Current, from southern Taiwan to Ilocos Norte, but passing more than 100 km to the west of the Batanes. On these data, the first neolithic dispersal from Taiwan, seemingly baulked already for several thousand years on the Taiwan shore of the Luzon Strait, was more likely to have found the larger and easier target of Luzon before the small and awkwardly placed Batanes.

EXPANSION OF THE ISLAND SOUTH EAST ASIAN NEOLITHIC

The dispersal of neolithic elements across the Luzon Strait, as it is known currently from research in the Batanes and northern Luzon, prompts consideration of several issues relevant to neolithic dispersal in Island Southeast Asia generally. One is whether neolithic dispersal was likely to have followed a simple island-hopping movement, in each case between nearest neighbours. This proposition, though it has a common sense appeal in regard to the earliest phases of Indo-Pacific seafaring is, in fact, widely contradicted by evidence from late Holocene island colonisation generally. Madagascar was first settled from Indonesia, not from Africa through the Comorro Islands; the earliest settlement in the Caribbean seems to have arisen not from island hopping along the West Indies chain from Venezuela, but by a direct passage from Yucatan; the Faeroes were colonised before Iceland, but the first Norse passages to Iceland bypassed them; the earliest Lapita settlement of the Reef islands does not appear to have been from Makira or anywhere else in the western Solomons; the earliest Lapita sites in Tonga and Fiji were probably reached directly from the Reefs or nearby rather than through Vanuatu or New Caledonia which, incidentally, would have provided better sailing angles; Hawaii does not seem to have been colonised initially by island hopping through the Line archipelago, but directly by a much longer passage from the Marquesas, and the Kermadec islands, between the Cooks and New Zealand were reached first by people who had already been to mainland New Zealand (see references in Anderson 2000, 2003). The Batanes case adds one more possible instance to this list which, regarded as a whole, suggests strongly that at a modest geographic scale the age-proximity proposition is of limited utility, *i.e.* the assumption that patterns of dispersal followed apparently obvious stepping-stone routes is frequently contradicted by archaeological evidence.

It is worth acknowledging here that successful passages across the Luzon Strait imply that routes of about the same length might have been possible elsewhere in the region at the same time, such as directly from Malaya to Borneo, or between Halmahera and Mindanao. Around twice that distance, a relatively small increase in effort for vessels under sail, would allow passages directly between Hong Kong and Luzon or Vietnam and Sabah. As yet, there has been no systematic analysis of the possible routes in relation to sailing conditions and maritime technology, but once passages of several hundred kilometres were possible, the South China Sea was potentially on the verge of becoming a ‘Mediterranean’ in terms of the complexity of sources, sea-routes and destinations by which neolithic populations, assemblages and ideas might have been fragmented, re-combined, and dispersed.

To the general point about seafaring may be added another. Island Southeast Asia was one of the two world centres of insularity. Scandinavia, which counts over 90,000 islands is the most insular by that index, but nearly all of its islands are tiny and few habitable permanently or in isolation. The second centre is Southeast Asia with at least 25,000 late Holocene islands, most of them readily habitable. From a human settlement perspective, South East Asia is the most insular region in the world, indeed far more so even than Oceania. For example, in comparison with Polynesia, it has 83 times the number of islands and 230 times the island density distribution. Data for Near Oceania and the Caribbean would fall in between and no other sea or ocean would come close.

Putting these two points together; the density distribution of islands and the general scarcity of demonstrated age-proximity migration in late Holocene cases, could lead us to expect that expanding neolithicization was less likely to follow a simple linear or expanding front model, and more likely to exhibit partitioning of cultural assemblages and reticularity of pattern. Linear expansion is documented in some Oceanic cases, such as the general movement of Lapita culture, but where islands are distributed in a non-linear fashion and are reasonably accessible from continental margins, as in the case of Southeast Asia, the Mediterranean model might be more appropriate. It is apparent in the Mediterranean that neolithic elements such as pottery and domestic plants and animals reached different islands at quite different times throughout the mid-Holocene and from varying mainland and island sources (Patton 1996:59–62; Broodbank 2000; Cherry 2004). There was no linear dispersal from east to west. But are there archaeological observations which might be consistent with a similar proposition in regard to Southeast Asia?

In reviewing the chronological data in relation to linguistic and archaeological evidence, the existence of at least two neolithic dispersals can be proposed (Figure 5). Neolithic I, if it can be called that, may be represented by expansion from South China through Thailand and Vietnam then through Malaya to Borneo, if not more widely, of basket or cord-marked ceramics amongst other types (but amongst which red-slipped pottery is scarce or absent). This seems to have occurred relatively early and it has been associated, in part at least, with the expansion of Austroasiatic languages (Higham 2004). It is not necessarily a neolithic defined exclusively by agricultural expansion. At Gua Sireh, in Borneo there is rice at about 2500 BC but at Nong Nor, in coastal Thailand, and quite widely in coastal Vietnam, there are middle-Holocene sites containing polished stone tools and pottery, but no sign of food production (Higham 2004, Su 1997).

Neolithic II can be proposed as the characteristically red-slipped pottery expansion in the Philippines and elsewhere in the eastern islands of Southeast Asia, and later into Malaya and Vietnam. It is associated with the expansion of Austronesian languages and with farming, although Paz (2002:279) notes the general scarcity of cereal remains in the sites. Neolithic I and II are, of course, both hypothetical constructs and potentially representative of a larger number of neolithic dispersals between and amongst the mainland and islands in Southeast Asia in a manner more similar to Neolithic expansion in the Mediterranean than in Remote Oceania. Some of those Neolithic dispersals in Southeast Asia may have represented expansion into areas where it had occurred already, several centuries earlier; for example, quite possibly through all of Indonesia from Borneo to the west. This is a point which has implications concerning models of cultural contact and hybridity for theorising cultural interaction. It is important but lies beyond the scope of this paper.

I should emphasize that proposing a Neolithic I and II, or indeed additional such

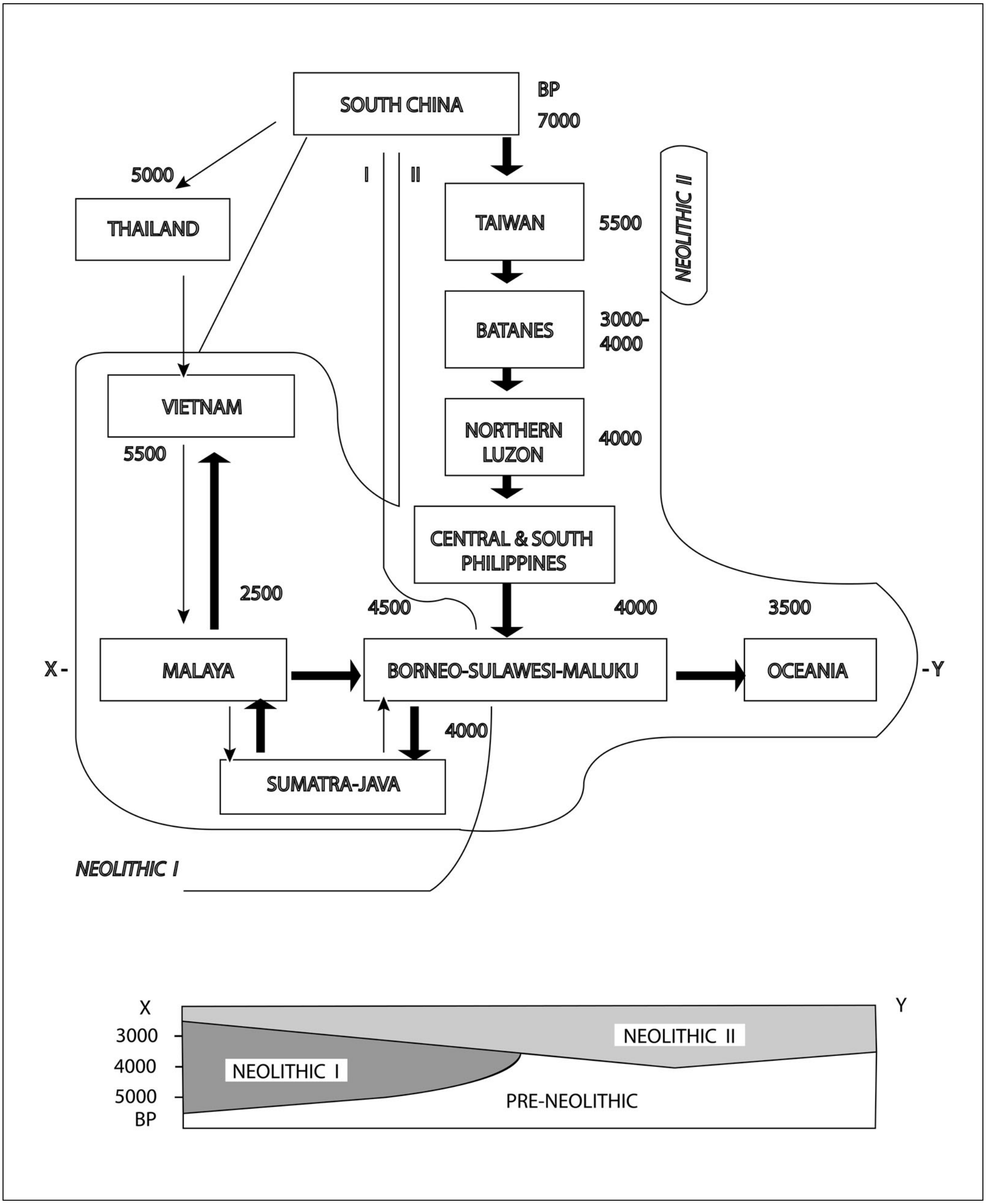

Figure 5: (above) **a schematic model of possible distribution and movement of neolithic I** (thin arrows) **and neolithic II** (thick arrows) **in Southeast Asia, showing approximate radiocarbon ages** (cal BP), **and** (below) **a transect of temporal relationships at x-y.**

phases, is not an assertion about the way in which neolithicization actually occurred. The proposition merely sketches an alternative perspective that is worth some detailed consideration beyond the few lines of evidence noted here. The point about different neolithic expansions along the two most obvious routes of entry, through Taiwan and from Malaya to Sumatra, has been made before but perhaps not sufficiently emphatically as to draw out its potential implications, some of which I will list here as a series of questions: could neolithic I have dispersed sufficiently far eastward to have been connected to possible mid-Holocene pottery in northern New Guinea, and possibly in an interaction that took tuber cultivation back into island South East Asia? There are genetic data indicative of Southeast Asian human lineages spreading into lowland Melanesia from before the mid-Holocene (Oppenheimer and Richards 2002:295). Could neolithic I have extended from Borneo into Sulawesi, the Philippines and Maluku, and thereby have facilitated in some way the later and rapid expansion of neolithic II? To what extent does neolithic I represent a dispersal of farmers, as opposed to the movement of fragmented neolithic technologies and ideas to resident island populations; a 'halo of interaction' beyond the farming frontier, to borrow Bellwood and Glover's phrase (2004:17)?

EXPLAINING RAPID EXPANSION

This raises the issue of how the rapidity of a red-slipped pottery or neolithic II expansion, especially across the Luzon Strait, through the Philippines and eastern Indonesia and on to New Guinea, can be explained. The conventional proposition, one of the demic-diffusion class of arguments (Cavalli-Sforza 2002:81), is that agricultural productivity fuelled levels of population increase which, in turn, propelled continuing dispersal (Diamond and Bellwood 2003). There are several problems here. One is the scarcity of evidence for early neolithic cereal agriculture in island Southeast Asia and the plausibility of arguments which suggest that it would have been difficult to transplant (Paz 2002). Another is that current evidence of the neolithic II expansion, suggests that at a regional level it occurred almost instantaneously in archaeological time, from about 1700 BC in the Philippines to 1500 BC in Maluku and New Guinea, and what is more, through a series of very large islands with diverse agricultural possibilities. Unless the initial neolithic population was huge then the rate of growth cannot have been sufficient to drive dispersal so rapidly by the demographic mechanism inferred. That is to say, it cannot be proposed that the assumed demographic effect of agricultural production had operated in the absence of its stated cause. In this conclusion, lies a large and complex problem which needs to be examined further; theoretically, by simulation, and by additional archaeological data, and only two points are canvassed briefly here.

First, the logic of agriculturally-driven island colonisation is muddled by equifinality. Rapidly moving farmers needed effective boats, which puts two propositions within the same explanatory frame. Was it the arrival of sailing after 5000 BP or the arrival of agriculture, perhaps about the same time, which promoted otherwise unusual mobility in the late Holocene island world? My views on the role of sailing are known and I will not expound them here, except to point out that the advent of effective boats also promoted extensive and rapid mobility in hunter-gatherer situations; as in the early Holocene Aleutians, the early Jomon and the Thule Inuit expansion across the Arctic islands (Anderson 2000, 2003a). Effective maritime technology is by no means tied to the expansion of farmers.

Second, climatic change may have played a substantial role in late Holocene migrations. One particularly important matter worldwide is a major shift toward strong climatic variability, probably associated with the onset of modern periodicities and amplitudes in ENSO, around 4000 BP. In some places it is dated 4200–3700 BP, in others it is seen to begin about 4500 BP and to reach a peak at 4200–4000 BP. This created massive drought in the Near East which has been linked to the collapse of a number of complex societies there. Recently it has been associated with the widespread collapse of neolithic cultures on the central plain of China, the result of simultaneous catastrophes of northern drought and southern flooding (Wu and Liu 2004). If the same deleterious impacts were being felt in Taiwan then expansion of people into island South East Asia, into the southern Ryukyus and possibly into western Micronesia at the same time, might be more than coincidental (Anderson *et al*., n.d.)

CONCLUSIONS

Research on neolithic dispersal to the Batanes Islands, and the implications of its results for thinking about wider issues concerning the advent of the neolithic in island Southeast Asia, is still in progress, and clearly one continuing objective must be to resolve the current problems in the Batanes chronology and archaeological sequence, especially by obtaining more radiocarbon dates on more reliable samples; a project which is underway and producing new results outlined above. At present, however, the most reliable data suggest that the age of initial human colonisation in the Batanes islands was probably later than it appears upon a cursory inspection of the radiocarbon dates, and that the Batanes were colonized later than northern Luzon and possibly from there as well as directly from Taiwan.

The Batanes case, in the context of the Holocene geography of island Southeast Asia, does not encourage an hypothesis of simple linear or expanding front neolithic colonisation. In fact, archaeological data can be used to suggest at least two neolithic dispersals, at different times and possibly of different character. Similarly, the case for neolithic dispersal being driven by agriculturally-propelled population growth is questionable in its own terms and takes insufficient account of the potential significance of developing maritime technology, such as the mid-Holocene advent of sailing vessels, and of more or less contemporaneous climatic change, amongst other possible factors.

These arguments are open to analysis by future archaeology and will certainly be debated. I do not claim that they yet constitute robust hypotheses, but they may foreshadow alternative perspectives on mid- to late Holocene cultural and population mobility in island Southeast Asia that reflect more of the actual complexity of the events and processes that were involved.

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REFERENCES CITED

Anderson, Atholl

2000 Slow boats from China: Issues in the prehistory of Indo-Pacific seafaring. *In* East of Wallace's Line: Studies of past and present maritime cultures of the Indo-Pacific region. S. O'Connor and P. Veth, eds. Pp. 13–50. Rotterdam: Balkema.

2003a Different mechanisms of Holocene expansion. Science, 9 May 2003 www.sciencemag.org/cgi/eletters/300/5619/597#686

2003b Initial human dispersal in remote Oceania: Pattern and explanation. *In* Pacific Archaeology: Assessments and prospects. Christophe Sand, ed. Pp. 71–84. Noumea, Le Cahiers de l'Archeologie en Nouvelle-Caledonie 15.

Anderson, Atholl, John Chappell, Michael Gagan and Richard Grove

2005 Prehistoric maritime migration in the Pacific islands: An hypothesis of ENSO forcing. The Holocene, in press.

Anderson, Atholl, Tom Higham and Rod Wallace

2001 The radiocarbon chronology of the Norfolk Island archaeological sites. *In* The Prehistoric Archaeology of Norfolk Island, Southwest Pacific. Atholl Anderson and Peter White, eds. Pp. 33–42.

Bacus, Elizabeth

2002 The archaeology of the Philippine archipelago. *In* Southeast Asia: From prehistory to history. Ian Glover and Peter Bellwood, eds. Pp. 257–281. London: Routledge-Curzon.

Bellwood, Peter

1997 Prehistory of the Indo-Malaysian Archipelago. Honolulu: University of Hawaii.

2002 Farmers, Foragers, Languages, Genes: The genesis of agricultural societies. *In* Examining the Farming/Language Dispersal Hypothesis. P. Bellwood and C. Renfrew, eds. Pp. 17–28. Cambridge: MacDonald Institute Monograph.

2004 The origins and dispersals of agricultural communities in Southeast Asia. *In* Southeast Asia: From prehistory to history. Ian Glover and Peter Bellwood, eds. Pp. 21–40. London: Routledge-Curzon.

Bellwood, Peter and Eusebio Dizon
2004 The Batanes archaeological project and the 'out of Taiwan' hypothesis for Austronesian dispersal. Paper for the Asian Fore-Arc Project Workshop: Results and prospects from the Philippines and Taiwan. ANU 5–6 August 2004.

Bellwood, Peter and Ian Glover
2004 Southeast Asia. Foundations for an archaeological history. *In* Southeast Asia: From prehistory to history. Ian Glover and Peter Bellwood, eds. Pp. 4–19. London: Routledge-Curzon.

Bellwood, Peter, Janelle Stevenson, Atholl Anderson, and Eusebio Dizon
2003 Archaeological and paleoenvironmental research in Batanes and Ilocos Norte provinces, northern Philippines. Bulletin of the Indo-Pacific Prehistory Association 23:141–161.

Broodbank, C.
2000 An Island Archaeology of the Early Cyclades. Cambridge: Cambridge University Press.

Cavalli-Sforza, L.
2002 Demic diffusion as the basic process of human expansions. *In* Examining the Farming/Language Dispersal Hypothesis. P. Bellwood and C. Renfrew, eds. Pp. 79–88. Cambridge: MacDonald Institute Monograph.

Cherry, J.
2004 Mediterranean island prehistory: What's different and what's new. *In* Voyages of Discovery: The Archaeology of Islands. S. Fitzpatrick, ed. Pp. 233–248. London: Praeger.

Diamond, Jared and Peter Bellwood
2003 Farmers and the Languages: The first expansions. Science 300:597–603.

Dye, Tom
1994 Apparent ages of marine shells: Implications for archaeological dating in Hawaii. Radiocarbon 36:51–57.

Fischer A. and J. Heinemeier
2003 Freshwater reservoir effect in ^{14}C dates of food residue on pottery. Radiocarbon 45:449–466.

Higham, Charles
2004 Mainland Southeast Asia from the Neolithic to the Bronze Age *In* Southeast Asia: From prehistory to history. Ian Glover and Peter Bellwood, eds. Pp. 41–67. London:

Routledge-Curzon.

Hung, Hsiao-chun

2003 Taiwan and northern Luzon Interaction. The pottery and jade evidences from Cagayan valley. Unpublished manuscript, ANH, RSPAS, ANU.

McGrail, S.

2001 Boats of the World; from the Stone Age to Medieval Times. Oxford: Oxford University Press.

Meacham, William

1988 On the improbability of Austronesian origins in South China. Asian Perspectives 26:89–106.

Oppenheimer, Stephen

1998 Eden in the East: The drowned continent of Southeast Asia. London: Weidenfeld and Nicholson.

Oppenheimer, Stephen and Martin Richards

2002 Polynesians: Devolved Taiwanese rice farmers or Wallacean maritime traders with fishing, foraging and horticultural skills? *In* Examining the Farming/Language Dispersal Hypothesis. P. Bellwood and C. Renfrew, eds. Pp. 287–297. Cambridge: MacDonald Institute Monograph.

Patton, M.

1996 Islands in Time: Island Sociogeography and Mediterranean Prehistory. London: Routledge.

Pawley, Andrew

2002 The Austronesian dispersal: Languages, technologies and people. *In* Examining the Farming/Language Dispersal Hypothesis. P. Bellwood and C. Renfrew, eds. Pp. 251–273. Cambridge: MacDonald Institute Monograph.

Paz, Victor

2002 Island Southeast Asia: Spread or friction zone? *In* Examining the Farming/Language Dispersal Hypothesis. P. Bellwood and C. Renfrew, eds. Pp. 275–285. Cambridge: MacDonald Institute Monograph.

Ross, Malcolm

2004 The Batanic languages in relation to the early history of the Malayo-Polynesian family. Unpublished paper in the Asian Fore-Arc workshop, ANU 5–6 August 2004.

Solheim, W. G. II

1984–85 The Nusantao hypothesis. Asian Perspectives 26:77–88.

Spriggs, Matthew
2004 Chronology of the Neolithic transition in island Southeast Asia and the western Pacific. The Review of Archaeology 24:57–80.

Su, Nguyen Khac
1997 In the framework of the maritime culture of Vietnam: The prehistoric maritime culture of the Northeast. Vietnamese Studies 1:87–116.

Szabo, Katherine and Susan O'Connor
2004 Migration and complexity in Holocene island Southeast Asia. World Archaeology, in press.

Terrell, J. E., K. M. Kelly and P. Rainbird
2001 Foregone conclusions? In search of 'Papuans' and 'Austronesians'. Current Anthropology 42:97–124.

Tsang, Cheng-hwa
2000 The Archaeology of Taiwan. Council for Cultural Affairs, Executive Yuan, ROC.

Tsang, Cheng-hwa and Rey Santiago
2001 Recent archaeological studies in northern Luzon and their implication for the prehistoric relationship between Taiwan and the Philippines. Paper for International Conference on Austronesian Cultures, Academia Sinica, Taipei.

Wu, W. and T. Liu
2004 Possible role of the "Holocene Event 3" on the collapse of neolithic cultures around the central plain of China. Quaternary International 117:153–166.

Xue, H., F. Chai, N. Pettigrew and D. Xu
2004 Kuroshio intrusion and the circulation in the South China Sea. Journal of Geophysical Research 109, CO2017, doi 10.1029/2002JC001724.

穿越呂宋海峽：菲律賓巴丹島之考古年代學和新石器擴散的地區順序

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本文將2002–2004年巴丹考古計畫的放射性斷年結果，與呂宋島北部類似的資料予以分析比對。由於礁灘貝與陶器破片斷年被認為不若木炭標本可靠，根據木炭標本的年代，顯示出巴丹島的移民是在相對來說較晚的西元前800年。木炭斷年把原本早期的Sunget和Naidi階段合併成一個時期。由於呂宋島北部的新石器遺址較古老（西元前1700年，木炭斷年），早期從台灣出發的新石器文化遷移可能繞過了巴丹島。早期巴丹物質文化顯示出與台灣和呂宋島北部的相似性，而語言學的資料無法斷定保守的巴丹語是反映出它比呂宋島北部的移民早，或者是巴丹島的與世隔絕。我們對東南亞地區島嶼的地理環境，以及晚期全新世島嶼移民類型的考量，並不支持新石器文化的傳布是跨島而行的單一路線。至少應有兩階段的傳布；也就是假設有一個較早的西南地區及較晚的東北地區。這種假設導引出晚期全新世這個地區的自然環境和互動情形，並指向新石器文化的「目錄」可能可以再分割更細，各文化間的關係比想像中的複雜。由於有關農業擴張情形的研究相對稀少，它一般所造成的人口成長，還不被納入新石器文化快速擴張的因素。特別是從紀元前2000年前之航海技術演進和氣候變遷來看，關於全新世晚期東南亞海島地區的人類移動，還可以有其他進一步探討的途徑。

關鍵字：放射性碳素年代表，呂宋海峽，新石器時代