

tion and speculations toward an adaptationist one. What I find poignant in this honest monograph is the author's evident struggle to reconcile finding no facts to support the currently popular idea that human populations (whether initially profligate or later growing too dense for their resources to sustain without damage) in the Pacific islands inevitably decreased environmental diversity through inappropriate farming methods, over-hunting of birds, and unrestrained marine resource procurement: "That resource depression and extinctions were not more visible archaeologically may signal that human populations, albeit quite low in number, lived in a sustainable manner—a unique situation amongst many Pacific islands studied thus far" (p. 128).

Weisler's solution to this self-inflicted dilemma, of having documented an actual case of Pacific islanders making a "sustainable living" for about two thousand years and counting, is the typical inductivist call for more data, using a "comparative approach" wherein "we may come to understand the breadth of atoll adaptations—technological, economic and social" (p. 128). With *On the Margins* as an example of the attention to detail in data collection and presentation required, a more economic approach would be for Pacific archaeologists to re-examine their already-collected "data" on allegedly human-caused environmental changes. The Marshallese case (and here I refer to this and other publications of Weisler's and others

cited in the text) shows there are more realistic models of prehistoric human behavior than those imagined by Steadman (1995 and others), and certainly warrants a call for incorporating physical causal factors, such as habitat fragmentation (Burkey 1995) and climatic and sea-level oscillations during the late Holocene (Nunn 1998; Dickinson 2001; Hunter-Anderson 2002) into our explanatory models.

#### REFERENCES CITED

- BURKEY, T. V.  
1995 Extinction rates in archipelagoes: Implications for populations in fragmented habitats. *Conservation Biology* 9(3):527–541.
- DICKINSON, W. R.  
2001 Paleoshoreline record of relative Holocene sea levels on Pacific islands. *Earth-Science Reviews* 55(2001):191–234.
- HUNTER-ANDERSON, R. L.  
2002 The effects of Holocene climatic oscillations upon human population radiations into Remote Oceania and consequences for cultural variation in the Marianas. Paper presented at the 17th Indo-Pacific Prehistory Association meetings in Taipei, Sept. 9–15.
- NUNN, P. D.  
1998 Sea-level changes over the past 1,000 years in the Pacific. *Journal of Coastal Research* 14:23–30.
- STEADMAN, D. W.  
1995 Prehistoric extinctions of Pacific island birds: Biodiversity meets zooarchaeology. *Science* 267:1123–1131.

*Ban Chiang, A Prehistoric Village Site in Northeast Thailand I: The Human Skeletal Remains.* Michael Pietrusewsky and Michele Toomay Douglas. Philadelphia: University of Pennsylvania, University Museum Monograph 111, 2002. 493 pp. \$100.00 (hardcover). ISBN 0-924171-92-8.

*Reviewed by* MARC OXENHAM, *School of Archaeology and Anthropology, Australian National University*

This is the first major publication on Asian assemblage to combine a bioarchaeological and more traditional quantitative-

qualitative morphological analysis. The result is a very well-integrated study of the inhabitants of Ban Chiang, who lived some 4100 to 800 years ago on the northern aspect of the Khorat Plateau. Pietrusewsky is a prominent biological anthropologist who has been researching in the Asia-Pacific region for over a quarter century. Douglas analyzed the Ban Chiang assemblage for her doctoral thesis under the supervision of Pietrusewsky.

The monograph is presented as 13 chapters of variable length with five extensive appendices and a CD-ROM that provides a wealth of data on various pathologies, skeletal completeness, nonmetric variation, and so forth. Moreover, a very useful index has also been included. The introductory chapter briefly reviews the history of archaeological work in Thailand previous to the Ban Chiang excavations in the 1970s. The site itself is then introduced followed by the chief aims of the monograph, which include the effects of sedentism and agricultural intensification, evidence for social hierarchy, and patterns of (and explanations for) differential health.

Chapter 2 is a very brief review of methods employed in excavation, skeletal preparation, recording, sex and age-at-death determination, stature estimation, and nonmetric trait pathology recording. While much of these data are summarized in the appendixes, the specific details, including the frequent problems and solutions that arise with fragmentary material concerning age and sex determination, are not reviewed. This is a troubling oversight given skeletal preservation problems detailed in Chapter 3 and reliance on accurate constitutive data in the subsequent palaeodemographic analysis in Chapter 4. Chapter 3 goes on to review aspects of skeletal completeness, mortuary behavior, and general taphonomic factors that can affect skeletal preservation and notes some that have impacted the Ban Chiang assemblage specifically.

Detailed data analysis begins in Chapter 4 with an investigation of the demographic makeup of the assemblage. They note that, overall, the age-at-death distribution approaches that observed in general for ar-

chaeological populations. The sex ratios were slightly dissimilar between the temporally earlier and later subsamples of the assemblage, although they suggest this to be more artifactual than indicative of actual demographic sex ratio differences. The mortality profiles differed by sex and this was attributed to increased female mortality during their principle reproductive life stage. The authors also employ a number of demographic formulae that have been demonstrated to be robust to age-at-death estimation and sampling biases. A combination of the juvenile-adult ratio and measure of mean childhood mortality suggested that the Ban Chiang population had low levels of fertility and was likely static or even slightly declining. However, a measure of the proportion of juvenile and old dependents was extremely low and suggested to the authors that life was relatively "easy" in terms of this measure at least.

Chapter 5 describes the sample in terms of qualitative and quantitative measures of cranial morphology. Pietrusewsky has published extensively on morphological variation, microevolutionary change, and migratory patterns within the East Asian and Pacific region. The chief findings in this chapter were that the sample is morphologically consistent with an East Asian and/or Pacific ancestry. Moreover, the study seems to suggest the practice of exogamy at Ban Chiang, with males clustering in terms of specific sets of nonmetric traits. A concise examination of dental morphology notes the relative small size of the Ban Chiang molar dentition and finds some evidence for genetic continuity within the temporally earlier grouping and possible genetic discontinuity between the two samples. The authors also suggest the series, as a whole, is allied with the Sundadont dental pattern. However, the results of this particular analysis can only be provisional given the restricted number of traits examined.

Most dental pathologies examined by bioarchaeologists are reviewed in Chapter 7. This section is somewhat anomalously titled "Dental Paleopathology" given the extensive treatment of oral traits that are not strictly pathological, such as dental

enamel hypoplasia, and culturally mediated alterations to the teeth, task-wear facets for example. While the authors are very thorough in identifying and enumerating the various dental conditions, the discussion of their findings is not as comprehensive as it could have been. For instance, the frequency and distribution of carious lesions (by tooth class and location) is provided in detail but the subsequent discussion is superficial. Reference is made to the relatively low caries rate indicating a mixed economy but no mention is made of the argument for rice having an extremely low cariogenicity (e.g., Krasse 1985; Sreebny 1983; Tayles et al. 2000). Moreover, a more detailed discussion of the specific locations of lesions would have contributed to an understanding on the diet of this sample (see following discussion of Chapter 11). Notwithstanding these comments however, this section and the appended tables are a mine of information that future scholars will find indispensable in studying the past inhabitants of Thailand.

It is worth mentioning their analysis of enamel hypoplasia given the enormous comparative literature available on this indicator of metabolic/physiologic state in childhood. Again, the authors are to be commended on their thorough and detailed presentation of data on this condition by sex and tooth class. However, discussion of the results lacks depth and this is also true of the comparative section on enamel hypoplasia in Chapter 11. It is interesting that their results on the timing of hypoplastic events by tooth class were consistent with many such studies globally. Given their familiarity with the following study it might have been useful to point out that their results provide further evidence in support of Skinner and Goodman's (1992) work that what is being measured in such instances are not peak periods of stress associated with weaning, or whatever, but rather the time of peak enamel formation. This observation, incidentally, provides a reason why the observed frequency of enamel hypoplasia increases over time (between the two temporally discrete subsamples; see Chapter 11) while the peak peri-

od(s) of occurrence remains stable. While the authors examined enamel hypoplasia with respect to subadults and adults they did not look at this condition in relation to their reconstructed age-at-death profiles. This is an unfortunate omission as a number of studies have found a correlation between mortality and evidence for enamel hypoplasia (e.g., Duray 1996; Goodman and Armelagos 1988; Saunders and Keenleyside 1999).

A small chapter (8) follows on postcranial morphology, variation, and stature. Interesting findings included evidence for differential use of the upper and lower limbs by sex. Females tended to use their upper limbs and males their legs more in strenuous activities. The section on non-metric variation tended to support their view of genetic continuity between the earlier and later skeletal series at the site. This is important when considering intra-sample differences in biology. Overall, their work on nonmetric variation makes a positive contribution to the otherwise poor global and regional database on this aspect of skeletal biology.

Chapter 9 focuses on pathological conditions in the samples and forms the largest single section in this monograph. The authors begin with a competent review and descriptions of the evidence for traumatic injury in the sample. Their cautious conclusion that the patterning of trauma in the sample is consistent with everyday injuries, falls, and general misadventure, is commendable. However, I would have liked to see a more detailed review of the literature examining patterns of trauma and behavior. Regarding the skeletal evidence for infectious disease the authors describe and discuss the material element by element. Given the low frequency of evidence for infectious disease it may have been more appropriate, and certainly more useful in terms of differential diagnoses, to look at appropriate individuals in a series of case studies. One interesting differential diagnosis of a neonate included a compelling argument for Caffey's disease. This would make it the first such case observed in Southeast Asia to date.

The frequency of cribra orbitalia is presented with 15.2 percent of adults and 41.7 percent of subadults displaying some form of cribrotic lesion. These results are moderate with respect to other Southeast Asian samples. Again, as with the omission with respect to their study of enamel hypoplasia, the authors did not examine the distribution of cribra orbitalia by age-at-death. Some detail is given to enumerating the various skeletal malformations present in this series. While an important contribution to the regional and global database of such conditions, it is of limited relevance to the health and question of sample genetic homogeneity/heterogeneity.

The authors also summarize the nature and prevalence of osteoarthritis (or degenerative joint disease) in the sample. They found the overall frequency of osteoarthritis to be relatively low, with less than 6 percent of the sample showing evidence of moderate to severe forms. Consistent with other bioarchaeological studies, the frequency of male appendicular OA was higher than that for females, which they interpret as suggestive of a division of labor: "males performing more strenuous physical labor than females" (p. 144). However, a more prosaic reason for this difference is available when examining the demographic profile of the sample. Their sample is slightly biased toward males and is strongly biased toward older males. Furthermore, a more critical engagement with the literature would have shown that in clinical studies of modern populations males tend to have a generally higher prevalence of OA up to about age fifty and thereafter it is women who are more at risk (Roberts and Burch 1966, cited in Moskowitz 1993). Furthermore, Rogers et al. (1997) show a positive correlation between osteophyte development, age, and being male. Osteoarthritis is an extremely complex multifactorial condition with behavior being only one of numerous potentially contributing factors to its occurrence and distribution by joint, age, sex, and so forth. Overall, the authors are to be commended for providing an invaluable series of descriptions and illustrations of the more

severe forms of OA in a skeletal series representing an extremely underresearched region of the globe.

Following the section on osteoarthritis the authors detail what they term activity-induced indicators. For the most part this involves describing and illustrating morphological variants, squatting facets for example, or various enthesial and syndesmosal developments. This section is useful in documenting these features, although a more supportive and literature-based discussion of their conclusions regarding inferred behaviors would have been useful. This is particularly pertinent in light of the almost complete lack of clinical supporting literature for occupational and activity-related claims often made by bioarchaeologists (Jurmain 1999; Stirland 1998).

The following short chapter, titled "Noteworthy Burials," details the disposition, burial goods, and biology of a number of individuals and collections of individuals. It is a very interesting and useful addition to the monograph that provides more personal insights into the people of Ban Chiang. It is also a section that may have been better placed near the beginning of this volume in giving the reader a glimpse of things to come later on.

Chapter 11 examines intrasample variability in terms of genetic homogeneity and differential health. In the former case the authors address the questions (1) "is there evidence of a new, morphologically distinct population moving into the area during the second half of the second millennium B.C.?" (p. 190) and (2) does health change with the archeologically visible change in subsistence orientation in the first half of the first millennium B.C.? While the question of genetic continuity between the two skeletal series represented at Ban Chiang needed to be dealt with much earlier in the monograph the authors do conclude, based on nonmetric analyses of cranial, postcranial, and dental traits, that the collective samples are likely genetically homogeneous or in other words display genetic continuity over time.

The remainder of this chapter deals with the second question regarding health in

terms of a select number of indicators: demographic profiles, carious lesions, enamel hypoplasia, cribra orbitalia, attained stature, trauma, and infections lesions. The demographic analyses of the subsamples support the hypothesis for a correlation between changes in health and subsistence orientations. For instance, there appears to be a clear increase in mortality, decrease in average age-at-death, and an increase in fertility with the move to agriculture.

The evidence from their analysis of oral health does not, at face value, support the archaeological evidence for a change to an emphasis on cereal grains in the latter temporal span of the assemblage. One obvious reason for this that is not explored by the authors is the demonstrated extremely low cariogenicity of rice (see discussion of Chapter 7) as compared to other cereals such as maize for which a correlation with increased dental disease is normally associated in bioarchaeological studies. Further, a closer examination of the patterning of caries in the two temporally separate samples (using data from the appendices and CD-ROM supplied with the monograph) shows a marked increase in the proportion of both those lesions affecting the anterior teeth and those affecting noncrown areas of the teeth in the temporally later agricultural sample. These observations are entirely consistent with a move to softer carbohydrate-rich foods in the latter part of the temporal sequence, although not necessarily boiled rice. In concluding this section the authors note that, with a few exceptions such as the demographic results and an observed increase in the frequency of enamel hypoplasia over time, the majority of health indicators examined suggest little health costs associated with a move to agriculture in Ban Chiang.

The chapter finishes with an examination of spatial variation in the site (that portion excavated in the second season only) with the first objective being to define lineally distinct groups. Having accomplished this, albeit only suggestively as they point out, the authors then look for variability between these identified lineally close groups in terms of health markers.

The results indicate the possibility of rank or status differences in terms of this analysis, although problems with identifying lineally distinct groups, particularly given the lack of corroborative archaeological evidence (differential distribution of grave goods for example) brings the entire endeavor into question. Nonetheless, it is an innovative approach that may prove useful in other bioarchaeological analyses with greater sample sizes.

The penultimate chapter serves to comparatively place aspects of the Ban Chiang results into a regional context. The first section of this chapter is essentially a further development of Chapter 5 and it is unclear why these two parts were not combined. Who these people were in terms of their evolutionary and/or migratory history is something that needed to be established at the beginning of the study, which was in fact one of the aims of Chapter 5. The remainder of this chapter provides a useful, albeit perfunctory, comparison of the Ban Chiang palaeopathological findings with a number of other studies of assemblages from Thailand, but also, curiously, a study from South Asia, Harappa. Because the authors' intent seems to be to provide summarized comparisons without detailed discussion, it may have been more effective to incorporate the respective regional comparisons of each pathological condition within the appropriate preceding chapters.

Read in conjunction with Domett's (2001) recent monograph that compares most of the significant ancient skeletal assemblages in Thailand (with the exception of Ban Chiang and Non Nok Tha) the reader will be well armed in understanding the health and behavior of the inhabitants of this fascinating and underresearched region. The authors conclude their monograph in five pages highlighting the chief aims of their work but without any attempt at a detailed synthesis.

This is an invaluable piece of published scholarly work that forms the third (after Tayles 1999 and Domett 2001) comprehensive and important thesis examining issues of ancient human skeletal biology in Southeast Asia. This book is professionally

fashioned with clear tabulated summaries of data and well-produced photographic illustrations. This volume will form an important resource for students of the prehistory of East Asia and tropical human biology in general for many years to come. Moreover, any one interested in physical anthropology or bioarchaeology needs a copy of this volume on their shelf.

## REFERENCES CITED

- DOMETT, K. M.  
2001 *Health in Late Prehistoric Thailand*. BAR International Series 946. Oxford: Archaeopress.
- DURAY, S. M.  
1996 Dental indicators of stress and reduced age at death in prehistoric Native Americans. *American Journal of Physical Anthropology* 99:275–286.
- JURMAIN, R. D.  
1999 *Stories from the Skeleton: Behavioral Reconstruction in Human Osteology*. Australia: Gordon and Breach Publishers.
- GOODMAN, A. H., AND G. J. ARMELAGOS  
1988 Childhood stress and decreased longevity in a prehistoric population. *American Anthropologist* 90:936–944.
- MOSKOWITZ, R. W.  
1993 Clinical and laboratory findings in osteoarthritis, in *Arthritis and Allied Conditions: 1735–1760*, ed. D. M. McCarty and W. J. Koopman. Philadelphia: Lea and Febiger.
- ROGERS, J., L. SHEPSTONE, AND P. DIEPPE  
1997 Bone formers: osteophyte and enthesophyte formation are positively associated. *Annals of the Rheumatic Diseases* 56:85–90.
- SAUNDERS, S. R., AND A. KEENLEYSIDE  
1999 Enamel hypoplasia in a Canadian historic sample. *American Journal of Human Biology* 11:513–524.
- SREEBNY, L. M.  
1983 Cereal availability and dental caries. *Community Dentistry and Oral Epidemiology* 11(3):148–155.
- SKINNER, M., AND A. H. GOODMAN  
1992 Anthropological uses of developmental defects of enamel, in *Skeletal Biology of Past Peoples: Research Methods: 153–174*, ed. S. R. Saunders and M. A. Katzenberg. New York: Wiley-Liss.
- STIRLAND, A. J.  
1998 Musculoskeletal evidence for activity: Problems for evaluation. *International Journal of Osteoarchaeology* 8:354–362.
- TAYLES, N.  
1999 *The Excavation of Khok Phanom Di: A Prehistoric Site in Central Thailand*, vol. 4: *The People*. The Society of Antiquaries of London: Oxbow Books.
- TAYLES, N., K. DOMETT, AND K. NELSON  
2000 Agriculture and dental caries? The case of rice in prehistoric Southeast Asia. *World Archaeology* 32(1):68–83.

*Southeast Asian Archaeology 1998. Proceedings of the 7th International Conference of the European Association of Southeast Asian Archaeologists. Berlin, 31 August–4 September 1998.* Wibke Lobo and Stefanie Reimann, eds. Hull: Centre for South-East Asian Studies, University of Hull, 2002. viii + 288 pp., many B&W photos, maps, tables and site plans, bibliography. ISBN 0-903122-10-3.

*Reviewed by* JOHN N. MIKSIC, *Southeast Asian Studies Programme, National University of Singapore*

This volume, like its antecedents in the series, contains something for everyone: prehistory, historical studies, site reports, and discussions of analytical techniques. Arrangement is by author's last name rather

than topic, so one must scan the table of contents to locate chapters relevant to one's specialty. On the other hand, most articles are of a sufficient degree of interest and breadth of coverage that nonspecialists in a