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# BOOK REVIEWS

## Samoan archaeology

THE TO'AGA SITE: THREE MILLENNIA OF POLYNESIAN OCCUPATION IN THE MANU'A ISLANDS, AMERICAN SAMOA. Patrick V. Kirch and Terry L. Hunt, Eds. Contributions of the University of California Archaeological Research Facility, No. 51. Univ. of Calif., Berkeley, 1993. xv + 248 pp. (Price: $24.00 plus $3.50 shipping/handling.)

In fifteen chapters of text, tables, graphs, line drawings and photographs, Kirch, Hunt and seven collaborators report the results of a multiphase archaeological project (reconnaissance survey and site discovery in 1986; systematic subsurface test excavations in 1987; further excavations in 1989) at the To'aga site in southern Ofu, an island in the Manu'a group (including also the islands of Olosega and Ta'u), in American Samoa. The project was conducted under contract with the Historic Preservation Office of American Samoa and funded by the U.S. National Park Service. A National Register nomination for the To'aga site was a direct result of this work.

The report's first two chapters present the research design and describe the contemporary "natural and cultural environment" of Ofu and some aspects of Samoan culture taken from Mead and others. Five vague "research issues" or topics guided data collection and analysis. The main constraint, as in most government-sponsored archaeological projects, was a small budget. This ruled out extensive subsurface excavations and exposures of large areas and limited the kinds of laboratory analysis performed. The research topics helped to organize descriptions of the finds, but no theories or explanatory hypotheses were tested other than a model for geomorphological development of the site.

According to Kirch, the present Ofu islanders live on the west coast—out of the wind and adjacent to a relatively wide, protected lagoon. Behind the beach is a series of gently sloping terraces which support agro-forest. Although not explicitly recognized by the author, the To'aga site contrasts greatly with the west coast area, presenting a much more difficult environment for subsistence farming and fishing. It faces prevailing winds, is vulnerable to tidal surges, has an actively eroding shoreline and a narrow fringing reef, offers a relatively narrow coastal strip for dwelling and gardens and very steep, rocky slopes behind. Occasionally large boulders become dislodged from the cliff face and roll onto the coastal terrace. A contemporary hazard experienced by the project archaeologists, falling rocks were a danger in the past as evidenced in local folklore. To'aga's coastal terrace is now used as an ancillary farming and collecting zone where *Cocos, Alocasia* and *Artocarpus* grow with little or no care. Also present are wild forms, *Cordyline fruticosum, Tacca leontopetaloides, Dioscorea bulbifera* and *Pueraria lobata,* which have edible roots and tubers. Contemporary fishing practices on the island are not described and it is not known if marine resources at To'aga are utilized by the west coast villagers.

The surface archaeological features at To'aga were recorded in a non-intensive transect survey, described in a short chapter by Hunt. They include stone-lined storage pits, gravel pavements and rock alignments (the apparent remains of households), a well and a ceremonial platform. These features are thought to have been in use within the last 1000 years, but none was dated and the time of site abandonment was not determined. The recorded surface features are listed with brief descriptions in a table. No analysis was performed on these data.

The bulk of the report is devoted to archaeological finds dating to the first two millennia of site occupation. Different categories of materials that were recovered in the test excavations are described by various specialists. Some of these studies contribute to an understanding of site geomorphology while others stand alone to elucidate the variability in their respective material or object categories. The chapter called "Morphodynamics of the Land-Sea Interface" is an illuminating discussion of site formation processes linked to changes in sea level, island subsidence and sediment budget over the last six thousand years. In the Marianas there are similarly complex site formation questions at roughly contemporary coastal "Pre-Latte" sites, and those familiar with the Marianas record will appreciate Kirch's contribution to an understanding of this topic.

Of the estimated 21,000–35,000 square meters of the site area, only 31 square meters were excavated. The data recovered from these probes form the basis for the interpretation of To'aga's depositional history. The test units were dug to depths varying from one to three and a half meters. The units were arrayed along a series of six widely spaced transects extending inland from, and perpendicular to, the shore. All the units were located inland of the modern beach ridge in the northwestern part of the site. After detailed presentation of the stratigraphy of the various excavation units, this information is synthesized into several depositional stages of differing lengths for three provenances—the 1987 Main Trench, Transect 5 and Transect 9. Three "key points" are made: that the excavations established the areal extent of the site and indicate where the cultural deposits are concentrated; that the "morphodynamic model of coastal terrace formation" was found to be supported by the excavation data; and that the excavations provide a "basis for outlining the cultural sequence for Ofu island" (p. 83).

According to this sequence, Ofu Island was continuously occupied from 3000–1900 cal B.P. by people with a material culture similar to early Eastern Lapita as known from Tonga and Fiji. After initial settlement, about a thousand years passed while the beach ridge built up from storm events and people began to occupy its surface. By 1900 cal B.P. the beach ridge was abandoned. The latter date is an important one in the site developmental history, for its marks the onset of major shoreline progradation, a lowering of the sea level (between 1 and 2 meters from previous mid-Holocene high levels) and the deposition of terrigenous rocks and clay upon the sandy coastal terrace.

In the Main Trench area just prior to the onset of these events (the end of Stage 4) "the beach ridge was abandoned as an occupation locus, and the accumulation of the beach ridge continued" (p. 56). Thus it appears that the To'aga site occupation was not continuous. The other two provenances for which the authors provide a stadial sequence yielded sparse archaeological evidence for occupation at a comparable time. In Transect 5, "significant seaward progradation [occurred] late in this phase, and a second occupational phase resulted in a midden deposit" (p. 67) described as a "very non-concentrated occupation deposit ... indicated by its slightly darker color and the presence of some marine shell midden" (p. 65). In the transect 9 provenance at this time, "the shoreline prograded substantially, and active accumulation of calcareous sediments ... ceased" (p. 78). At about 1900 cal. B.P., a thin, "stable paleosol surface covered by vegetation" (p. 78) formed. This surface overlies a deep layer, IIb, which was found to be culturally sterile. Here, as at the Main Trench, evidence for human occupation is missing and the period just prior to the onset of massive erosion, beach progradation and sea level drop was one of light use of the To'aga site. From this we can reasonably infer that a relatively small population was present.

In the stage beginning just after 1900 cal B.P., the deposits at Transect 9 are interpreted as providing evidence for "subsistence gardening and dispersed habitation" on the coastal terrace. At this and the other two provenances, the sediments contain charcoal flecks and terrigenous material thought to have eroded from the cliff behind the site. At the Main Trench ca. 1900 cal B.P. there was "brief occupation event" (p. 56) indicated by the presence of ceramics and an earth oven feature. Subsequent use of the coastal terrace for habitation and agriculture is inferred from the presence of fine-grained terrigenous sediments and the reworking of these deposits, and from the variety of domestic debris found.

The above occupational sequence contradicts the claim made several times in the report that "shifting agriculture" in the steep cliff zone behind the site caused massive erosion and deposition of rocks and clay onto the coastal terrace. The evidence for relatively intense occupation of To'aga comes after, not before, the terrigenous deposition. Yet "forest clearance" of the cliff face for farming purposes—which might be expected to be undertaken in response to population pressure, if ever—supposedly occurred when the data indicate very light occupation and a small population. A more plausible scenario is that once the geo-climatic processes causing sea level drop, beach progradation, and terrigenous deposition began to provide a suitable medium and a flat land surface of a suitable size for gardening and habitation, the human population at To'aga increased and the nature of the occupation at the site changed from small and ephemeral to larger and more extensive.

Other chapters include a detailed discussion of the radiocarbon samples taken, their most probable dates and a proposed site chronology based on them (Kirch). Sediment samples are analyzed

for geological composition by Kirch, E. Manning and J. Tyler. Their analysis largely supports the depositional sequences proposed for the three provenances discussed above. Non-marine mollusks are described in a brief chapter by Kirch; he interprets the presence of synanthropic land snails as signaling the practice of agriculture at the site, and the increasing density of these organisms in the total assemblage of non-marine mollusks as evidence of the development of an anthropogenic vegetation cover during the last two thousand years.

Ceramics are described by Hunt and C. Erkelens. Their chapter presents several kinds of data, including excavation unit layer provenance for sherds classified as either thick or thin, whether a rim or not and according to three convenient temporal divisions, early, middle or late. Sherds are analyzed for color, hardness, thickness, temper type, orientation of inclusions relative to vessel walls, oxidation-reduction pattern in cross-section, surface treatment and clay composition. The early period ceramics (1250–500 B.C.) show the most compositional variety, evidently only one clay source is from To'aga. The middle period ceramics (500 B.C.–O A.D.) do not include To'aga clay, and the late period ceramics (A.D. 0–300?) are made only from To'aga clay. Over time there is a decline in frequency of thinware sherds and an increased frequency of thickware sherds. The authors generalize that the apparent decline in compositional variation reflects the "general simplification and homogenization of the total To'aga assemblage with time" (p. 145). What this might mean is not explained. Citing the small samples from the middle and late periods the authors qualify this as a tentative conclusion. The non-local clay ceramics are interpreted as possibly deriving from "inter-island exchange" so that the late period absence of exotic clay wares would be a sign of "decline in exchange." This interpretation is unaccompanied by any delineation of the expected structure or function of pottery exchange systems within Manu'a or Samoa and is at odds with the adze sourcing results (see below) which found the opposite pattern.

The big question of why ceramics finally ceased being made ca. A.D. 300 is also left open; the authors offer only the suggestion that the local raw material was so poor in quality that people may simply have given up pottery altogether (p. 147). Yet the cessation of pottery-making is a general pattern throughout much of the Lapita-derived cultures of Polynesia and also occurs in the eastern high islands of Micronesia at about the same time. One hopes that archaeological ceramicists will attend to such regional patterning in trying to solve this important problem with implications for understanding large-scale cultural changes. In a separate chapter sand temper in pottery is analyzed by W. Dickinson, who concludes that the To'aga pottery appears to be from Samoa. About half the To'aga sherds analyzed have broken sherd temper, interpreted as a sign that there was a paucity of suitable local tempering sands.

Non-ceramic portable artifacts are described by Kirch. These include six stone adzes, a shell adze, two hammerstones, fishing gear (*Turbo* fishhooks and fishhook tabs and three *Cypraea* dorsa—possibly parts of octopus lures), abrading tools of coral and echinoid spines, ornaments (*Conus* beads and rings, an unfinished *Tridacna* ring, nerite beads, a gastropod bead and an echionid spine bead), a drilled shark's tooth, worked shell pieces and unretouched lithics—basalt and obsidian flakes. One obsidian core may derive from another island but the other lithics were deemed of local origin. The *Turbo* fishing gear is seen as well adapted to the local fishing conditions, and the formal similarity to early Eastern Polynesian hooks is noted. Kirch identifies the To'aga hooks "as a 'prototype' stage from which the greater diversity of Eastern Polynesian forms are subsequently developed" (p. 240). One has to wonder why "prototypes" are needed in order to explain formal variability in such a clearly functional class of items—which the To'aga case so effectively shows.

In a "preliminary effort to document inter-island communication during the prehistory of the Manu'a islands" (p. 168), M. Weisler used an experimental, non-destructive technique, x-ray fluorescence analysis. The practical aim was to source stone adze material from To'aga and to compare it with stone from elsewhere in the Nau'a group. Weisler's analyses indicate that most of the archaeological specimens from To'aga are probably of local origin. However, in the adzes found on the surface, he found evidence for "an interaction sphere during late prehistory that links habitation complexes on [Ta'u and Ofu] with the large adz quarry complex at Tatagamatau, Tutuila Island, some 100 km to the west" (p. 185). No explication of this sphere of interaction, or communication, is offered.

Over 165 kg of faunal remains were analyzed by L. Nagoaka. In perhaps the most careful and insightful chapter of the report, Nagaoka presents the To'aga faunal data in three categories, fish and non-fish vertebrates and invertebrates, and she makes limited comparisons with other faunal assemblages. Five families (Acanthuridae, Diodontidae, Holocentridae, Serranidae and Scaridae) comprise 78% of the fish remains. Half the non-fish vertebrate bones were from *Rattus exulans* (bird bones were second most abundant), and invertebrates dominated the entire faunal assemblage. Most common among the invertebrates (76%) were three marine shell families, Turbinidae, Trochidae and Tridacnidae. Because of a lack of baseline information about the To'aga marine environment, Nagaoka was unable to address such questions as whether the limited number of fish and invertebrate taxa reflect natural or cultural factors at To'aga. She concludes, "methodological biases introduced during excavation and analysis can severely affect the data, reducing its robustness . . . variability in and among data sets may be attributed to differences in recovery or analytical techniques rather than prehistoric cultural patterning . . . [the utility of faunal analysis] . . . depends upon the commitment of faunal analysts and archaeologists to create quality faunal data" (p. 214).

The 74 bird bone fragments found during the excavations are described in a chapter by D. Steadman. According to Table 14.1, eleven taxa of seabirds and five taxa of land birds (including *Gallus gallus*) are represented. Of the sea birds, three species of *Puffinus*, two of *Pterodroma* and one of *Sula* are now extinct on Ofu. Of the birds, only *Megapodius* is extinct on the island. Steadman states that "three millennia of human occupation" were the cause of this pattern. Given the paucity of the prehistoric and historic records, he must be indefinite about the timing of the extinctions but he clearly implies that they occurred prehistorically and were human-caused. The main problem with this is that no other causes are considered. Island biogeographers are well aware of naturally occurring extinctions associated with small land mass and relative isolation (see M. M. Williamson's *Island Populations*, Oxford Univ. Press, New York, 1981). Over time in such settings extinction, replacement, recolonization and rapid evolution are normal and expected. Human actions have little effect on these overall patterns but may have specific effects, particularly if the environmental conditions with which a species must cope are altered by human actions, for example, the introduction of an avian disease via domestic fowl or an uncontrolled predator such as the Polynesian rat.

Steadman offers no specific human behavioral reason(s) for the extinctions evidenced at To'aga, such as over-hunting. Later in the report, however, Kirch and Hunt come right out and say, with regard to the now-extinct megapode, "it is likely that this species was rapidly overexploited—to the point of extinction—by the early colonizers of Ofu" (p. 241). This interpretation is offered in spite of the fact that Steadman, citing Bennett writing in 1862, notes that elsewhere in Samoa "the nesting grounds of *Megapodius pritchardi* were 'under the protection of the king or chief, and by his permission only can the birds or eggs be procured' " (p. 223). Chiefly taboos are a common way vulnerable species are protected throughout the Pacific and this practice shows an awareness of the relation between predation and extinction. One wonders, did the ancients only learn this lesson in the 1800s?

Could there have been other agents of extinction operating in the past? Why was it not at least acknowledged that *Rattus exulans*, present throughout the To'aga cultural deposits, may have been as devastating a predator as it has been documented to be elsewhere in the Pacific (T. Storer, 1962, *Pacific Rat Ecology*. Bishop Mus. Bull. 225, Honolulu)? This human commensal is simply mentioned in passing as "another adventive species introduced (presumably as an inadvertent 'stowaway' on voyaging canoes [why "presumably"? why not as a deliberate food item? If people did not want rats that had "stowed away" on their canoes, surely they would have noticed them before long and jettisoned them along the way; did they not realize rats are destructive to gardens?]) at the time of initial colonization" (p. 241, parentheses in original, comments in brackets added). *Gallus gallus* bones (some of whose ends appear to have been gnawed by rats) are present throughout the deposits as well.

The potential for inadvertent prehistoric introduction of an easily transmitted avian disease is not considered by Steadman although this is a well-studied phenomenon among Hawaiian birds (see R. Warner, "The Role of Introduced Diseases in the Extinction of the Endemic Hawaiian Avifauna", *The Condor* 70: 101–120, 1968). If it could happen now it could have happened prehistorically when domestic fowl were first brought

to Samoa and other small, essentially predator-free tropical islands without prior human inhabitants. In Samoa as in Hawaii, after initial European contact there was about a two hundred year-long lag in reliable natural history writing, much less adequate bird censuses. Clearly some extinctions could have occurred during this period; there is no evidence that they did not. The same period encompasses the Little Ice Age, when tropical islands, particularly ones at high latitudes within the tropics, such as Manu'a, would have experienced biologically significant decreases in temperature and rainfall that could have altered local plant and animal communities and reduced primary production and biomass (see N. Roberts, *The Holocene,* Basil Blackwell, New York, 1989). Such considerations are ignored in the To'aga report and generally in the literature of prehistoric human catastrophism which it represents.

As for the seabirds apparently extirpated sometime during the three millennia of human occupation at To'aga, Kirch and Hunt suggest, without elaboration, "the loss of these species [*Puffinus pacificus, P. lherminiere, P. griseus, Pterodroma rostrata, Pt.* sp. and *Sula sula*] from the island . . . most likely reflects both direct predation by humans and habitat disturbance" (p. 241, brackets added). Why these factors and not others are "most likely" reflected by species loss is not indicated, and we are left to imagine what kinds of bird harvesting strategies and habitat changes could have been effected by human activities that would have resulted in the extinction of seabirds. Did the islanders remove their nesting sites as they hunted them? Burned them, perhaps?

The chapter bibliographies are convenient in this long work. An annoying omission is the lack of bibliographic information for the sources listed in the legend on Fig. 4.4, a map of the southwestern Pacific showing locations with evidence for a mid- to late-Holocene high sea stand and associated radiocarbon ages. More careful editorial review would have caught inconsistent use of singular and plural ("a total . . . was . . ."; "a total . . . were . . .; "none . . . were"; "studies . . . was"), some mis-spellings (e.g., "devestated" and some scientific names of plants ("*Hibicus tiliaceous", Erythrina varigata"* (pp. 19–20)) and the mis-stating of Unit 28 for Unit 23 in a crucial discussion of charcoal and marine shell radiocarbon dating (p. 87). Puzzling is the lack of the stratigraphic profile for Unit 28, since it yielded "the oldest date for unquestionably *in-situ* cultural material obtained from the To'aga site" (p. 60) and since the layer with the early date (IIc) has a complex stratigraphic relationship with layer IIId in nearby but seaward units 15-29-30 (p. 66). Similarly, the missing Unit 28 profile belongs with those of Units 15, 16 and 17 in Fig. 5.16, which purports to show stratigraphic correlations along Transect 5 from its inland to its seaward ends (which faces of these units are shown has to be guessed as they are not labeled).

Notwithstanding the attempts to inflate the significance of the project—with a title that suggests the To'aga site is a complete representation ("encapsulation") of "Three Millenia" of occupation of the Manua Island group of American Samoa and frequent use of superlatives such as "the oldest," "the deepest," "the largest," "the most diverse," "unique and highly significant"—the archaeological data reported in this volume do not accurately represent the site's overall structure nor its occupational history, much less that of the Manu'a group. As a report of contract research *The To'aga Site* is useful, particularly in predicting where the earliest cultural deposits are likely to be found in islands like Ofu. And, because of the relative dearth of observations on prehistoric cultural materials in Samoan sites, its empirical content is welcome. But as a contribution to a scientific understanding of cultural evolution or of the prehistory of Polynesia, it falls well short of the mark.

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## Ecological disasters

Plundering Paradise. The Struggle for the Environment in the Philippines. Robin Broad with John Cavanagh. University of California Press, Berkeley. 197 pp., hardcover, illus. ISBN 0-520-08081-5. US$25.

And No Birds Sing: The Story of an Ecological Disaster in a Tropical Paradise. Mark Jaffe. Simon & Schuster, New York. 283 pp., hardcover. ISBN 0-671-75107-7. US$ 23.

Human impacts on the environment are graphically described in these two very readable books about very different situations in this region.