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## SHORT COMMUNICATIONS

### EARLY COCONUT REMAINS FROM THE SOUTH PACIFIC

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Archaeological excavations on Aneityum Island have recovered coconut (*Cocos nucifera*) fragments which shed new light upon the species origin and dispersal mechanisms of this plant. Aneityum (20° 14' S, 169° 46' E) is the southernmost inhabited island of the Republic of Vanuatu, and is occupied by Melanesians speaking a language of the Oceanic branch of Austronesian.

#### *The Anawau Sequence*

Preliminary investigations were conducted in 1978 in the Anawau Swamp (site AT556) near the southern coastal village of Anelcauhat (Hope and Spriggs 1982; Spriggs 1981). The aim was to determine when the swamp had been formed and whether a pollen sequence could be obtained which might show changes in the vegetation as a result of human interference with the landscape. Anawau covers a 15 ha area behind a consolidated sandbar, approximately 80 m wide, upon which the village is partially situated. In an attempt to reduce mosquito populations during the 1920s, drainage channels were dug within the swamp and through the sandbar. Subsequent draining lowered the water-table and resulted in erosion or oxidisation of much of the swamp's fibrous peat deposits.

In 1978 a test trench was dug to 175 cm, at which point clear white sand with no noticeable coral fragments or shell within it grades into more consolidated beach rock (Table 1). This lack of shell or coral fragments is in contrast to the present beaches and sandy lagoon bottoms around the island. Dates from *in situ* coconut roots (*Cocos nucifera*) in the bottom layer (layer 6) and coconut endocarp from layers 4 and 5 gave ages of 5040 ± 370 BP (layer 6), 5420 ± 90 BP (layer 5) and 5410 ± 100 BP (layer 4) suggesting that the lagoon was transformed into back swamp at about 5500–5000 BP.<sup>1</sup> The *in situ* coconut roots show that the test pit was located at the edge of the former lagoon. During gardening operations elsewhere at the swamp edge, mangrove stumps have been recovered, and the presence of sulphates in the test trench deposits is also an indication of their presence as part of the lagoon-edge vegetation (Marc Latham, personal communication). The base of the test pit is at about present sea level, so the shallow lagoon was probably created by the post-glacial rise of the sea to its present level. Stabilisation of sea level in the region occurred between 6000 and 5000 years ago (Chappell 1982). The lagoon would have been open for only a short period before the sandbar was thrown up.

TABLE 1  
AT556, Anawau Swamp, Anelcauhat, Layer Description

Layer	Depth from Surface (cm)	Layer Description
1	0- 15	Black saturated peaty material, many roots and plant debris.
2	15- 35	Black and brown saturated clayey material, mottled, many roots. A date on the fine mud fraction from 20-30 cm depth gave an age of 2940 ± 80 BP (ANU-2421b).
3	35- 70	Saturated, mainly peaty layer, numerous roots. A C14 sample of wood and leaf fragments from 40-60 cm gave a date of 3740 ± 170 BP (ANU-2420).
4	70-100	Saturated slightly sandy material containing numerous roots and preserved plant material including <i>Cocos nucifera</i> endocarp fragments. A C14 sample of coconut endocarp found at 90-100 cm gave a date of 5410 ± 100 BP (ANU-2419).
5	100-145	Saturated sandy material with abundant preserved plant debris including <i>in situ</i> <i>Cocos nucifera</i> roots as well as endocarp fragments. Coconut endocarp at 115 cm gave a date of 5420 ± 90 BP (ANU-2418).
6	145-175	Saturated sand with some hard beachrock fragments and some <i>in situ</i> coconut roots. A C14 sample on coconut roots from 160-170 cm gave a date of 5040 ± 370 BP (ANU-2417).

A radiocarbon sample from the highly organic layer 3 was dated to 3740 ± 170 BP, and thus the rate of accumulation of swamp sediments appears to have been very slow at first. Layer 2 is a deposit of a different nature, being much more inorganic in composition, and would appear to have been laid down more rapidly than the underlying material. Clearance of the adjacent hillsides for agriculture appears to have initiated erosion, whose products were then washed into the swamp as layer 2. A date of 2940 ± 80 BP was obtained from this layer. The upper layers of the swamp are no longer present as a result of recent drainage activities.

A second test pit a further 50 m towards the middle of the swamp confirmed the sequence. No coconut remains were found, and a single piece of marine shell was recovered from the lowest level. No equivalent to layer 2 of the first test pit was found, the washing in of this sediment only affecting the swamp edge.

Samples for pollen and carbon particle analysis were collected from the first test pit. The pollen sequence (Hope and Spriggs 1982) showed that in samples older than 2900 BP the vegetation was dominated by dicotyledonous trees and some shrubs. A few grains possibly attributable to palms, including *Cocos*, were present but their identification is uncertain. In these levels carbonised particles were virtually absent. At about 2900 BP a major vegetation change took place from swampy forest to open grassland with scattered shrubs and trees. There was

a massive increase in carbonised particles at this time, pointing to clearance by fire.

In summary, the sequence from the Anawau Swamp shows that sea level was stable at about its present level around 5500-5000 BP, and coconuts were an established part of the strand vegetation of the island at that time. After closure of the lagoon natural erosion rates, as represented by deposition in the swamp, appear to have been slow until at least 3700 BP. Human colonisation appears to have taken place after that time and initial clearance and burning of hillsides in the catchment, presumably for agriculture, led to a more rapid phase of deposition in the swamp dating to about 2900 BP.

Previous research in Melanesia has failed to turn up convincing evidence for human occupation south-east of the Bismarck Archipelago of Papua New Guinea before the Lapita expansion of 3500-2500 BP (White and Allen 1980). The Anawau Swamp sequence suggests that people are unlikely to have been in southern Melanesia before that expansion.

#### Other Early Coconuts

The *Cocos nucifera* dates from Aneityum (5040 ± 370 BP, 5420 ± 90 BP and 5410 ± 100 BP) are currently the earliest in the world, the next earliest being a date on coconut from Aitape on the north coast of Papua New Guinea of 4555 ± 80 BP, associated with human skeletal remains (Hossfeld 1965).<sup>2</sup>

From Tikopia in the South East Solomon Islands, Kirch and Yen (1982) obtained radiocarbon dates on charcoal and coconut fragments of 3360 ± 130 BP and 2695 ± 90 BP. The earlier date was based on scattered carbonised fragments and was difficult to interpret. The authors offer three alternative hypotheses: the charcoal resulted from natural burning induced by lightning before human settlement, or from burning of old wood by the initial inhabitants, or there was human activity on the island in the mid-second millennium BC for which no other evidence has been found. All three hypotheses would be consistent with the presence of coconut as a natural part of the island's strand vegetation at initial settlement. The presence of carbonised coconut endocarp in early occupation layers on the nearby island of Anuta, dated to 2830 ± 90 BP, is similarly interpreted by Yen as evidence for natural distribution before human settlement (1973:143).

Other possibly early coconut remains have been recovered from Pagan in the Northern Marianas Islands of Micronesia, in the form of a leaf impression of a coconut seedling located in undated pyroclastic deposits (Fosberg and Corwin 1958). Stratigraphically higher in the Pre-Caldera tuff sequence were found impressions of *Alocasia macrorrhiza* petiole fragments, which suggested to the authors that human occupation of the island had already begun by this time. *Alocasia* is extremely unlikely to have reached Pagan without human help and so a date within the last 4000 years seems likely. Evidence that sea cliffs were later cut back into the volcanic deposits and reefs deposited on the wave-cut platform at about 1.5 m above present sea level has been used to suggest a pre-colonisation date for the Pagan coconut specimen (Sauer 1971). However, the possibility of a higher stand of the sea in the post-glacial period cannot be so easily dismissed and

the possibility of recent tectonic uplift on this still volcanically active island also needs consideration.

These dates support the now generally accepted Indo-Pacific as opposed to Central American origin for *Cocos nucifera* (Child 1964; Harries 1978). Heyerdahl is now probably alone in his constant reiteration of a Central American origin with human dispersal as the agent for its spread in the Pacific (Heyerdahl 1979). Child (1964) suggested an original home for the coconut between New Guinea and Fiji, a position accepted by several other authorities (Dennis and Gunn 1971; Purseglove 1972; Sauer 1971).

#### *Pioneer or Passenger*

The Aneityumese evidence is crucial in consideration of the much-debated question of human or natural dispersal of the coconut in the Pacific. Harries (1978) has suggested that two distinct coconut types are present in the Pacific: a naturally disseminated long and angular-fruited, thick-husked type (*niu kafa*) and a round, larger-fruited, thinner-husked type (*niu vai*) selected for greater endosperm content and dispersed by humans. Solomon Islands, Vanuatu and Fiji coconuts conform generally to his naturally disseminated *niu kafa* type. Possible warping under pressure and the small size of the endocarp fragments from Aneityum do not allow accurate assessment of original nut size but they are likely to fall within Harries' *niu kafa* type. The largest endocarp fragments, including parts of the intercarpellary ridge and basal eyes, are less than 35 mm in length and 20 mm in width (Fig. 1).

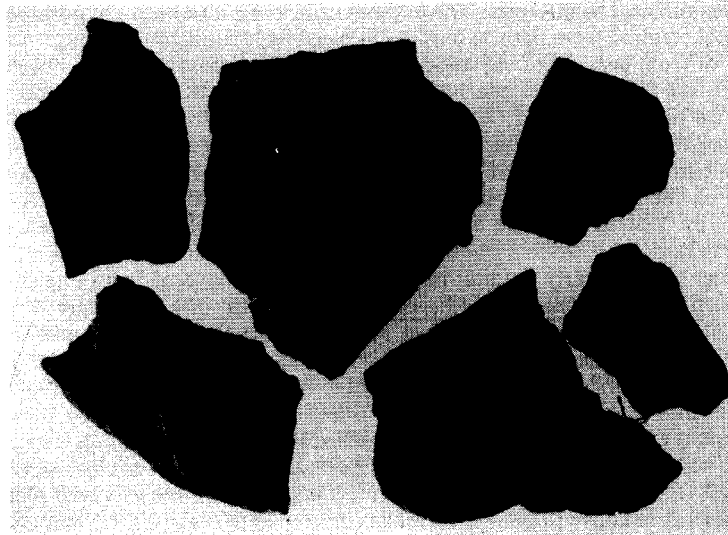


FIGURE 1. Coconut endocarp fragments from layer 5, Anawau Swamp, Aneityum, dated to  $5420 \pm 90$  BP. The piece in the upper left hand corner is  $18 \times 27$  mm.

In conclusion, natural dispersal seems clearly to have been the mechanism for the establishment of coconuts on Aneityum and by extension other suitable Melanesian and western Polynesian islands. The coconut would thus have formed a valuable, perhaps critical, food resource for the first human colonists of these areas. The question of whether human or natural dispersal was the mechanism which took the coconut across the greater distances of Eastern Polynesia and between Eastern Polynesia and Central America cannot yet be answered. Computer simulations now being undertaken (Ward and Allen 1980) can assess the probability of natural dispersal, but only further early coconut remains in securely dated contexts will constitute proof.

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#### NOTES

1. All carbon-14 dates (half-life  $5570 \pm 30$  years) are reported uncalibrated. The identification of the coconut remains was confirmed by Dr D. E. Yen of the Australian National University.
2. The significance of Hossfeld's coconut find was first recognised by Green (1973:109) and shortly thereafter by Bellwood (1976:154).

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