ON THE ORIGIN OF DRIFT MATERIALS IN THE MARSHALL ISLANDS

BY

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Figure 1 Index map of the Marshall Islands showing the atolls mentioned in the text.
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The oceanic dispersal of plants and animals has been the focus of studies ever since organized natural history started in the Pacific, and the dispersal of terrestrial by sea rafting has been given due consideration. The finding of drift materials such as glass floats, tree trunks and seeds, is a common occurrence on the shores of Pacific Islands, but in most cases the origin of such material is unknown or at least equivocal. Thus while the principle of sea rafted dispersal is known and reported at length, there is a need to document those occasions where positive proof of origin can be furnished.

Recently a piece of pumice with a slab of obsidian (volcanic glass) attached to it was found on an atoll in the Marshall Islands—a coral atoll group devoid of volcanic materials (Spennemann & Ambrose 1997). It became necessary to review the archaeological and historical record of the nature and origin of drift materials washed up on the atolls of the Marshall Islands (Spennemann 1996). In view of the relevance of this information for biogeographical studies in general it seems prudent to furnish the salient points in a format accessible to a wider academic community.

THE MARSHALL ISLANDS

The Marshall Islands, comprising 29 atolls and 5 islands, are located in the north-west equatorial Pacific, about 3790km west of Honolulu, about 2700km north of Fiji and 1500km east of Ponape. With the exception of the two northwestern atolls, Enewetak and Ujelang, the Marshall Islands are arranged in two island chains running roughly NNW to SSE: the western Ralik Chain and the eastern Ratak Chain (figure 1).

The current patterns in the Marshall Islands are complex and material can float in from both the east and the west. Three current zones can be encountered, which are the south equatorial current, running from east to west, the equatorial counter current, running from west to east, and the northern equatorial current running from east to west. During the northern summer the atolls south of Mile are located within the north equatorial counter current, which runs against the tradewinds (west to east). In the following northern winter these atolls are at or near the interface between the north equatorial counter current and the northern equatorial current (running east to west) (Barnes et al. 1948). In addition, the El Niño effect changes the sea surface temperatures and hence the climatic belts. Further, typhoons, whose frequencies seem to be running in synchrony with the occurrence of the El Niño effect (Spennemann & Marschner 1995), bring material from other destinations to the Marshalls.

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The first European account of the occurrence of driftwood in the Marshall Islands was reported by Adalbert von Chamisso who noted that it was seen on Wotje in 1816 on occasion of the visit by the Russian Exploring Expedition commanded by Otto von Kotzebue (Chamisso 1910, p. 156). Driftwood is a common occurrence throughout the atolls of the Marshall Islands (Hager 1886, p. 57), and has been reported from the shoreline of many atolls, such as Majuro (Spennemann 1992); Arno (Wells 1951, p. 3); Mile (pers. obs.); Wotje (Chamisso 1910); Kwajalein (Fosberg 1956: plate 13A); Ebon (pers. obs.), Nadikdik (pers obs.); Maloelap (pers obs.); and Jaluit (Schneider 1891). It has also been found in the centre of other islets, such as on Wake (Eneen-Kio) Atoll (Grooch 1936, p. 92; 1938) or Bokak (Taongi) Atoll (Irmer 1895), both in the northern Marshalls.

HISTORIC EVIDENCE FOR THE ORIGIN OF DRIFT MATERIAL

Only a few of the drift items encountered on the shores of the Marshall Islands allow an accurate identification of their origin. References to these is scattered are the literature. These are discussed below and summarised in table 1.

Wells reported that driftwood trees arriving from North America (mainly California) and carried by the Northern Equatorial Current are not uncommon on the atolls of the Marshall Islands. He encountered a cut fir log measuring 1.5 by 16.5m (5 by 55 feet) and a trunk of a redwood tree on Arno Atoll (Wells 1951, p. 3). Grooch (1936) reported the presence of drift logs on Wake and the current author has seen large cut drift logs in various islands on Majuro, Mile and Nadikdik Atolls. Traditional Marshallese culture has several references to fir trees and their uses (compiled in Spennemann 1996).

Another report on drift material coming from the east is the case of a rubber dinghy. On 27 May 1943 a Consolidated B-24 'Liberator' bomber crashed into the sea 225m NW of Palmyra Atoll (crash site approx 8°32'N 164°20'W). The three survivors of the US crew drifted for 47 days in an inflatable life raft and eventually arrived on Japanese-held Maloelap Atoll, having floated across the reef into the lagoon (JICPOA 1944).

In a similar case, a small fishing vessel went missing in 1979 off Hana, Maui, Hawaiian Islands and was eventually found washed up on Bokak Atoll in 1989 (Thomas 1989, p. 33).

Drift voyages by canoes from the west are also documented: Lamotrekese are reported on Arno (Chamisso 1986, p. 264; Kotzebue 1821, p. II 89), Pingelapese arrived on Jaluit (Krämer & Nevermann 1938, p. 35) and on different occasions, Yapese drifted to Aur Atoll (18th century, Chamisso 1986, p. 264) and Kili Island (Hezel 1979, p. 127; entry for 1868, Bark Syringia). In addition canoes from Woleai arrived in the Marshalls (Chamisso 1986; Erdland 1914, p. 315).

Before the introduction of bamboo plants to the Marshalls by the Japanese colonial administration, sea rafted bamboo was much sought after for use as bamboo containers and the like (Krämer & Nevermann 1938; Knappe collection Erfurt, unpubl.). The rafted bamboo came from sources in South East Asia, most likely Indonesia or the Philippines.
Table 1 Known points of origin for drift materials encountered on atolls of the Marshall Islands

<table>
<thead>
<tr>
<th>Locality</th>
<th>Target</th>
<th>Item floated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apaiang, Kiribati</td>
<td>Mile, Wotje</td>
<td>canoe hull</td>
</tr>
<tr>
<td>California, North America</td>
<td>Arno, Majuro, Mile, cut fir logs, Nadikdik, Wake</td>
<td>boats</td>
</tr>
<tr>
<td>Central Solomons</td>
<td>Mile</td>
<td>canoe load of people</td>
</tr>
<tr>
<td>Japan</td>
<td>Ebon, Namorik</td>
<td>canoe load of people</td>
</tr>
<tr>
<td>Kiribati (general)</td>
<td>Mile</td>
<td>sailboat hull</td>
</tr>
<tr>
<td>Krakatau, Indonesia</td>
<td>Ailuk etc.</td>
<td>pumice</td>
</tr>
<tr>
<td>Lamotrek Atoll, FSM</td>
<td>Arno</td>
<td>canoe load of people</td>
</tr>
<tr>
<td>Maui, Hawaii</td>
<td>Bokak</td>
<td>skiff</td>
</tr>
<tr>
<td>Palmyra Atoll (225 nmNW of...)</td>
<td>Maloelap</td>
<td>rubber dinghy from crashed B-24</td>
</tr>
<tr>
<td>Philippines (?)</td>
<td></td>
<td>bamboo</td>
</tr>
<tr>
<td>Pingelap Atoll, FSM</td>
<td>Jaluit</td>
<td>canoe load of people</td>
</tr>
<tr>
<td>Tuluman I., Bismarcks, PNG</td>
<td>Nadikdik</td>
<td>piece of pumice/obsidian</td>
</tr>
<tr>
<td>Woleai Atoll, FSM</td>
<td>Kili</td>
<td>canoe load of people</td>
</tr>
<tr>
<td>Yap, FSM</td>
<td>Kili, Aur</td>
<td>canoe load of people</td>
</tr>
</tbody>
</table>

Similarly, following the explosion of Krakatau in 1883 large amounts of pumice were produced which were washed ashore in the Marshall Islands (Grundemann 1887, p. 442; Sachet 1955).

Even though the Marshall Islands' atolls are in the zone of the north equatorial counter current, the origin of objects from Japan cannot be excluded. There are abundant examples of Japanese Junks drifting to Siberia, Alaska, Canada, mainland USA, Hawaii, the Marianas and Guam, Palau and even the Marshall Islands (Kakubayashi 1983).

In addition, material from sources south of the equator has been documented. During a pedestrian survey on Nadikdik Atoll (5°45'N, 172°10'E) the author found a piece of pumice with a slab of obsidian attached to it. As the atoll had been completely water washed with a 12m high storm surge and devastated with a large loss of life during a typhoon in 1905, it was very likely that the deposition of the pumice occurred after that time. Quantitative chemical analysis of major elements in the obsidian showed that Tuluman Island in the Bismarck Archipelago is the most probable source of the material (Spennemann & Ambrose in press). Tuluman Island emerged from the sea in 1953 and produced massive amounts of pumice and obsidian in periodic eruptions until around 1957 (Reynolds et al. 1980).
Washed up canoe hulls are other indicators of drift materials in the Marshall Islands. The author has seen two canoe hulls which appear to be Solomon Islands canoes. One was seen on Mile Atoll, the other, a Binabina-style canoe from the central Solomon Islands, on Wotje Atoll (Spennemann 1996).

Figure 2. Map of the Pacific Ocean showing the origin of the drift materials encountered in the Marshalls. The greyed dot indicates the location of the southern atolls of the Marshall Islands

I-Kiribati canoes (with or without crew) were often found adrift. A sail boat hull of a modern Kiribati design drifted ashore in Mile in the late 1980s and has been refurbished since (own obs.) I-Kiribati canoes were often stranded on the southern Marshalls, especially Arno and Mile, and these atolls have several genealogical links with the northern and central atolls of Kiribati. Shipwrecked i-Kiribati crew were picked up by the brig Mercury south of Ebon in 1858 (Hezel 1979, p. 121). In 1882 other i-Kiribati were found drifting south of Ebon by the American vessel Northern Light (Hezel 1979, p. 139). During the 19th century dispersed i-Kiribati were also living on Namorik (1851; Hezel 1979, p. 121; 1868; ibid. 127) and Jaluit (1871; ibid. 129; 1879 ibid. 136). Two Catholic missionaries together with fourteen Gilbertese left Apaiang Atoll en route to Marakei in early September 1942. The canoe eventually wrecked on Mile Atoll in the Marshalls (Richard 1957, p. 401). Even today, i-Kiribati fishermen occasionally drift to the shores of the southern Marshall Islands.

In addition, there is evidence for internal drift in the Marshall Islands archipelago. Following the 1905 typhoon that hit the southern atolls of Nadikdik, Mile, Arno and
Jaluit, the remains of canoes, wooden bowls, houses and corpses were washed ashore on Enewetak Atoll (Jeschke 1906). Following a devastating typhoon in 1840 survivors from Mejit Island were washed ashore on Likiep Atoll (Erdland 1914, p. 18). Both of these cases of east to west drift are well within the range of expectations given the overall current pattern.

Figure 3. Map of the Marshall Islands showing the direction from where drift materials came from. Small letters designate drift within the Marshalls.
IMPLICATIONS

The locations of confirmed origin of sea rafted materials have been plotted in figure 2. It becomes evident that material from all areas of the Pacific (with the exception—so far—of South America and Australia proper) has arrived in the Marshall Islands. The distribution of the origin of sourced materials on the various Marshall Islands atolls has been plotted in figure 3 which shows that the southern atolls are more favoured in this respect than the northern locales.

The perusal of current pattern charts provides are too coarse a resolution and does not allow to assess micro variations, a scale that is required to make useful predictions. For example, a mere perusal of the current charts would not have made likely for example the dispersal of material from the Solomons or the Bismarck Archipelago.

As this small compilation has shown, there is still a need to systematically compile and draw on the historic literature and make use other contemporary material and sources. Coupled with a reassessment of the Holocene sea-level curve this observation may have a bearing on the interpretation of the distribution of mangrove species in Eastern Micronesia.

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