

Experimental Crossing from Sumbawa to Komodo by Bamboo Raft

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Early Pleistocene Indonesians are assumed to have been the world's first seafarers, because the earliest crossings of sea barriers, proven archaeologically, are those from Bali through the islands of Nusa Tenggara (or Lesser Sunda Islands), and on to Timor. These islands of Wallacea were never connected to any other landmass, and in many cases not even to each other. The crossings were first made many hundreds of thousands of years ago, commencing well before 840,000 years BP. For many years, I have researched numerous aspects of these extremely early maritime achievements, and those elsewhere in the Pleistocene, including the means by which they might have been accomplished. In a series of experiments of replicative archaeology, with various teams I designed, constructed, and sailed primitive rafts not only within Indonesia, but also from Timor to Australia (almost 1000 kilometers, in 1998) and in the Mediterranean. Prior to the project described here I conducted six such experiments with rafts made by Paleolithic means.

All previous replicative experiments in seafaring were based on speculations of which crossings might have been made in the past. Mine proceeds in a strictly scientific framework: by the falsification of testable propositions concerning sea crossings that have already been demonstrated to have occurred at specific times. This work deals purely with archaeologically proven sea crossings, and its purpose is not to determine how these crossings of the Pleistocene were achieved, but rather how they could not be achieved. Hence the underlying rationale in each of these scientific experiments is to attempt to establish the minimum technological capability necessary to bring a group of people, large enough to become a colonizing population, across a sea barrier. This is then assumed to approximate the maximal technological capability at the times in question, i.e. at the times the particular crossings were first accomplished according to current archaeological evidence.

Described here is the seventh experiment in the First Mariners series, and is intended to establish the

minimum conditions necessary to cross from Sumbawa to Komodo, which at the time the first human crossing occurred was probably part of Flores, due to lower sea levels. The experiment was conducted against the background of the announcement, made shortly after its completion, that a new human species, *Homo floresiensis*, had just been discovered on Flores during 2004. This is thought to be a proposed dwarf species that evolved under endemic conditions locally. The find raised the issue of how its presumed ancestor, *Homo erectus*, originating from the then Asian mainland (presently Java and Bali), might have crossed the several sea barriers that always existed between Bali and Flores. Having previously shown that the treacherous Strait of Lombok can be crossed by a very simple platform of bamboo, made with Lower Paleolithic stone tools from naturally occurring materials, it had become essential to similarly investigate the first landfall on Komodo-Flores, where human presence at the beginning of the Middle Pleistocene was established by T. Verhoeven in 1958. Lombok Strait separates Bali from Lombok and forms part of the world's most important biogeographical division, the Wallace Line. No populations of eutherian terrestrial fauna larger than small rodents capable of surviving on vegetation drifts for many months or even

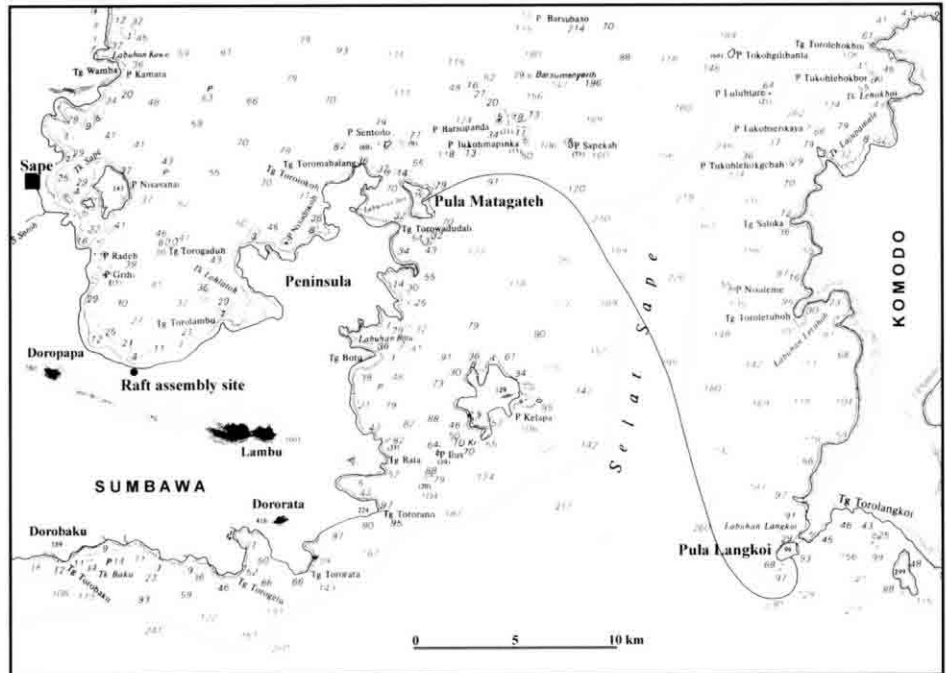


Fig. 1. Map of Sape Strait, between Sumbawa and Komodo, Indonesia, showing the raft assembly site, its launching site, its course, and its landfall site (depths in meters). Map: Robert Bednarik

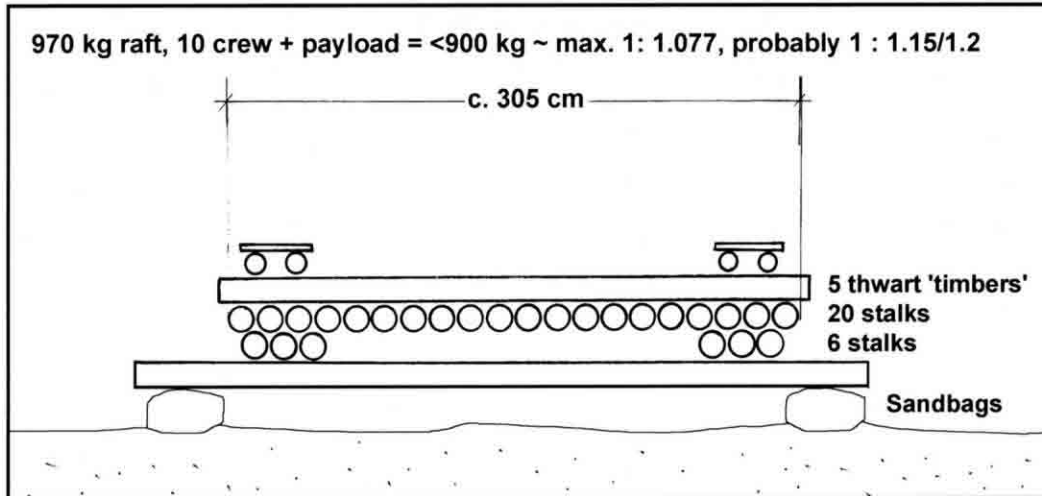


Fig. 2. Section drawing of the bamboo raft Rangki Papa. Drawing: Robert Bednarik

years managed to cross that line. The only exceptions are elephants and stegodonts, able to traverse more than 50 kilometers of sea, and hominins. The latter are known to be capable of island colonization without the help of watercraft.

Pleistocene seafaring has been demonstrated to about twenty islands worldwide, and to one continent, Australia. Previous sea crossing attempts of the First Mariners Project have in some cases failed, and others were successful. Using stone tools, my teams constructed primitive rafts, ranging in size up to more than 15 metric tons, from bamboo, cane, and inflated animal skins. The archaeological conditions for each experiment differ according to the time when the first crossings succeeded in establishing new populations. All projects have been conducted with the help and advice of local indigenous boat builders, fishermen, and sailors.

Building Rangki Papa (Father of all Rafts)

I was requested by *National Geographic* to demonstrate how humans of the Lower Paleolithic period, prior to 840,000 years ago, might have managed to cross from Sumbawa to Flores, I agreed to conduct an experiment at Sape Strait, separating Sumbawa from Komodo (Fig. 1). A simple 12-meter-long bamboo raft was constructed from traditionally available materials on the east coast of Sumbawa, and an attempt was made to paddle it to the rocky west coast of Komodo. A construction site was chosen at a long sandy beach 12 kilometers south of the town of Sape, called Papa Beach. This is the point where the Macassan ancestors of the present population of Bugis first landed about three centuries ago. Intending to make repairs to their ships they decided to settle there—hence the name “Father’s Beach.”

Due to the strong and entirely unpredictable

transverse currents that occur in all sea straits it is impossible to cross any of them without some means of propulsion. Making the reasonable assumption that 840,000 years ago the available technology did not include the use of sails, I decided that the vessel would need to be propelled by paddles. The clear advice of local fishermen and sailors was that the project could not succeed in paddling a simple bamboo platform to Komodo, due to the powerful currents in the strait. Although two experienced sailors and traditional boat-builders were involved in the raft’s construction, they both refused to participate in the actual crossing attempt, considering it to be a futile and dangerous exercise. Based on my previous experience in terms of the optimum ratio of number of paddlers versus total mass of the vessel, I decided to use ten paddlers. This decision was based on several considerations: the amount of space needed between paddlers to allow them to work determines the required length, while the width is determined by the required number of bamboo floaters to keep the payload just above the water line. Therefore the payload stipulates the total weight of the vessel, bearing in mind that large-diameter bamboo carries about 95% of its own weight. These factors ascertain that the optimum ratio of payload versus cross-section (which determines resistance) favors ten or twelve paddlers. The consequent payload of ten paddlers, paddles and drinking water translates into a raft made of high-quality, large-diameter bamboo weighing about 970 kilograms. This in turn demanded twenty-six 12-meter lengths of bamboo floaters to keep the raft’s floor just a few centimeters above the water line. To reduce the width to around three meters, I placed six lengths below the others (Fig. 2). These two groups of three lengths of bamboo was placed along each long side, rather than centrally as a “keel” in order to prevent the raft from flipping. A platform raft is significantly

stabilized by the added lateral weight.

The construction of the raft commenced on October 3, 2004 at the chosen site at Papa Beach, located at S 08° 38.668', E 119° 02.355'. The members of the construction crew, ranging in size between twenty-five and thirty-five local men over the subsequent days, were given individual copies of the section drawing I had prepared (Fig. 2), to ensure that every man was familiar with the intended end product.

The work of constructing the vessel proceeded at a fairly leisurely pace (Fig. 3). After noticing that the bamboo was rapidly developing longitudinal cracks in the hot sun, we covered it with palm fronds and sprayed it with water, while the construction of a substantial sunroof of palm fronds was expedited. Each length of bamboo was carefully checked for beetle holes and cracks, and when we found these they were sealed with heated triodia resin. This dark-brown resin occurs naturally and is collected by raiding

the structures of an ant species that uses it to reinforce its mounds. The cracking of the bamboo can be avoided by skinning it whilst green, but this has the significant drawback of weakening the stalks mechanically. It is relevant to note that any hominins who may have used bamboo for floatation must have been aware not only of the need to cure the stalks by drying them for several months; they must have also understood the need to prevent its cracking from solar radiation. They must have also been aware of the effect of bamboo borers, which can be quite significant.

The Crossing

The *Rangki Papa*, as the crew named the raft, left the east coast of Pula Matagateh at 6:50 am on October 7, 2004, having been towed there the night before. The full crew consisted of Burhanudin Abdullah, Ruslam Ahmad, Saleh Ahmed, Ibrahim Akadir, Junaidin Ali, Kamirudin Arsyad, Robert G. Bednarik, Usman Gani, Ibrahim Habeb, Mike Morwood, Hadji Suaeb Nonci, Bert Roberts, Subhan Solo, Thomas Sutikna and Ali Tahril. Only ten paddled, while the other five were replacements. During the last two hours of the crossing attempt additional rowers were added starboard to counter the strong current. Only about one half of the above men paddled the whole distance, the others were on the three escort boats for much of the time.

Initially, a weak southerly current was not resisted because, based on observation and consultation, I expected a strong northerly current in the main channel, so I aimed to keep just to the south of Pula Sapekah (Fig. 1). The speed began at 1.7 knots, then improving to 2.5–2.8 knots after 45 minutes. For the first two hours the course aimed generally at the very central part of the Komodo coastline,

Fig. 4. The *Rangki Papa* approaches the coast of south-western Komodo. Pula Lankoi is visible on the right. Photo: Robert Bednarik



Fig. 3. Construction of *Rangki Papa* under a sun shelter. Photo: Robert Bednarik





Fig. 5. The landing site on the southern ramparts of Pula Lankoi. Photo: Robert Bednarik

faintly visible in the distance. Waves were very moderate, about 70 centimeters, with a slight SW breeze. However, towards midday the southerly drift became increasingly apparent as the deeper channel was approached. By the time the 200 meters isobath was reached, the speed was consistently above 3 knots, peaking at 3.6 knots; however, this was largely attributable to the strong northern current. Efforts to cut across it were only of limited success, and at the cost of lower speed, of 2.0 to 2.5 knots. It seemed still feasible to reach the southernmost bay of the Komodo west coast, Labuhan Langkoi, north of a very prominent spur formed by Pula Lankoi, by trying to maintain as much latitude as possible (Fig. 4). However, most of the inexperienced crew was very tired by then, and the raft continued to drift southwards. I decided to allow the vessel to drift to south of the Komodo coast, that way we could take advantage of the expected weakening in the current where it fans out. By staying in the lee of Pula Lankoi, we could turn north and try for the sheltered southern coast.

Thus much of the afternoon our course followed a narrowing spiral centered on that steep and rugged island. Making as little as 0.8 knots, the *Rangki Papa* eventually headed straight for the southern ramparts of Pula Lankoi. The strategy of aiming for its lee side paid off at last and as the rock towers were approached, a landing site was found on this entirely precipitous coastline. At 4:12 pm the raft touched the rocks of Komodo (Fig. 5).

Discussion

The *Rangki Papa* traveled about 36.4 kilometers, taking 9 hours and 22 minutes. The result of this experiment was impressive since the raft was built by a crew which, with the exception of two fishermen, lacked any experience; and it was sailed by a crew bereft of maritime experience. All my previous similar experiments were conducted with crews experienced in vessel construction and sailing. These expeditions had no standby paddlers, and in one case traveled for two weeks without any escort vessel.

Archaeologists lacking maritime understanding have sometimes suggested that hominins might have crossed sea barriers by drifting on floating vegetation mats. The accumulations of vegetation materials one can encounter in Indonesian waters can measure up to some hundreds of meters, but they are generally much too thin to support a person. Certainly they may facilitate the travel of small animals, such as rodents, lizards, snakes, and insects. Natural rafts capable of supporting humans occur occasionally near the mouths of major tropical rivers, such as the Ganges, the Amazon, the Orinoco or the Zaire, but they have not been reported from Indonesia. More importantly the use of debris caused by tsunamis, to ferry humans across sea narrows is impossible, because such straits are always dominated by strong transverse currents. No sea strait in the world can be crossed in a reasonable time by mere drifting. The experiment described here vividly illustrates this point, as have all previous such experiments. Moreover, if hominins were able to cross Lombok Strait (or any such barrier) in this way, then hundreds of other mammalian species of the rich

Sundan fauna would have been able to do the same. The fact that no mammal larger than Muridae managed to do so speaks for itself. Hippos, tapirs, rhinos, deer, pigs and many others can certainly swim considerable distances and were plentiful in Sunda, but none managed to cross Wallace's Line. Objectors to my proposition that hominins had at their disposal a means of traversing the sea that was not available to these other species need to explain why only animals capable of swimming in herd formation for over 50 kilometers crossed the Wallace Line, besides hominins, or demonstrate by experiment that Lombok or Sape Strait can be crossed on natural vegetation rafts.

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Suggested Readings

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