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# AN HISTORICAL ANALYSIS OF WAKA UNUA AND THE MĀORI SAIL

ATHOLL ANDERSON

*Kā Waimaero | Ngāi Tahu Research Centre, University of Canterbury  
Australian National University*

**ABSTRACT:** Waka unua, Māori ‘double-hulled canoes’ with rudimentary Oceanic spritsails, have long been considered the most devolved of sailing vessels in East Polynesia, compared to an assumed sophistication of voyaging canoes in the prehistoric colonising era. This traditionalist or conventional hypothesis is discussed with reference to early historical data from New Zealand, including both written descriptions and drawings, according to the conviction that neither is intrinsically more reliable or informative than the other. Analysis of these sources, particularly those that refer to the Moutohorā (Bay of Plenty) canoe observed in 1769, does not support the conventional model. Instead of expedient construction, waka unua hulls were built to a New Zealand-wide pattern. Similarly, instead of an Oceanic spritsail, the Māori sail was an Oceanic double spritsail which had independent spars rather than a fixed mast. It was deployed before the wind and struck in reaching conditions. There is no plausible historical evidence of the Oceanic spritsail or lateen in New Zealand before the 1820s and it is argued that the Oceanic double spritsail was the only sailing rig used in pre-European New Zealand. Some inferences for understanding early East Polynesian voyaging are noted.

*Keywords:* New Zealand Māori, waka unua hull and sail technology, historical analysis, ethnography, traditionalism, Oceanic spritsail, Oceanic double spritsail, Polynesian voyaging

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Debate about the nature of Polynesian voyaging is now in its fifth century and showing no sign of losing its impetus. If anything, there has been greater interest in the topic during the last 50 years than earlier, and that is largely the result of a methodological shift from ethnological and ethnographic exposition to analysis of sailing performance by computer or wind-tunnel simulation, or directly by Oceanic sailing. Early in this “experimental turn”, however, one of its pioneers (Finney 1976: 11), realising that ethnographic records required “more basic ‘armchair’ scholarship”, called for reappraisal of the work of Hornell and other early ethnographers of Pacific seafaring and for further examination of primary historical sources. There was no immediate response and nor has Finney’s point been addressed in any substantial way since. I take it up here in reference to Māori seafaring technology, specifically the *waka unua* ‘double-hulled sailing canoe’.

As Finney implied, the new experimental approaches (e.g., Finney 1979; Levison *et al.* 1973; Lewis 1972), directed initially at navigation more than naval architecture, were content with data about Polynesian canoes drawn from existing ethnographic commentary, notably by Haddon and Hornell (1975), that had been shaped by the conventional or traditionalist hypothesis of Polynesian voyaging. Traditionalists assumed, as Best (1925: 16–17) wrote, “that we have a more detailed account of the fittings and management of the deep-sea vessels used by the ancestors of the Maori five centuries ago than of the modern type used on these shores a hundred years since”. This reading of traditions embraced a Māori principle that ancestral exceeded contemporary capabilities, including in seafaring. Traditionalist propositions in that vein (Table 1) were derived, *inter alia*, by Barstow (1879), Best (1915, 1925), Smith (1910, 1915) and Buck (1954) from sources held as originating in Polynesian oral traditions (Anderson 2008: 240; Sorrenson 1979; 1992: 109). By the mid-twentieth century these constituted a widely accepted conventional narrative of Polynesian voyaging, its orthodoxy reinforced by acerbic responses to the alternate hypotheses of Sharp (1957, 1963) and Parsonson (1969).

Soon after, experimental voyaging was contextualised as an anthropological mission—“primarily a social movement” (Finney 2006a: 332)—which required “getting Hawaiians fully involved in retracing their ancestral migrations. The [*Hōkūle‘a* voyaging canoe] project would then have a dual significance, both for scientific research and for cultural revival” (Finney 1979: 20). The potential incompatibility of those two objectives was accommodated by focusing the project upon a core traditionalist assumption of cultural deterioration, in this case that Polynesian voyaging technology and practice had been advanced early and declined later. As cultural decline (Durrans 1979: 153) implied that historical observation was an unreliable guide to former seafaring technology, the voyaging “renaissance” (Finney 2006a) sought to recapture its supposed sophistication during the East Polynesian migration era by combining the most advanced attributes of historical canoe and rig design from throughout Polynesia (Finney 1994: 45; Kane 1991).<sup>1</sup> Experimental voyaging in these enhanced vessels then encouraged widespread acceptance of early superiority in voyaging technology, and still does (e.g., Eckstein and Schwarz 2018: 94–95; Matsuda 2012: 22; Thomas 2021: 167; Williams 2021: 40).

Early advance logically entailed later retreat, and “in some islands canoe technology had declined by the time of European contact” (Irwin 2006: 80, referring to Mangareva, Rapa Nui (Easter Island) and New Zealand (Niu Tiren); Finney added Hawai‘i, 2006b: 144. All are marginal islands). Decline was inferred broadly from archaeological and traditional evidence of less frequent long-distance voyaging and more specifically from the construction and performance of historical canoe hulls and sailing rigs.

Thus, in discussing archaeological remains of Māori canoe hulls Irwin *et al.* (2017: 42) conclude that changes in hull shape reduced hydrodynamic lift required for windward sailing, and that sailing capability had been in “more general decline ... with a shift from multi-hulls to monohulls, a loss of roll stability, more paddling and downwind sailing”. The changes were not random but constituted a trajectory of decline in sailing performance. That proposition has been attributed to bottlenecks in knowledge transmission (Taylor 1855: 6–9), cultural degeneration (noted by Dening 1963: 120), or adaptation to changes in sailing conditions (Irwin *et al.* 2017; Johns *et al.* 2014). The fundamental question remains, however, of whether or to what extent such decline actually occurred.

An alternative or “historicist” model (Anderson 2017, 2018a) rejects the conventional narrative of early technical sophistication (Table 1). It observes that building the elevated performance attributed to migration canoes into “experimental” canoes demonstrates little more than a circular argument and asserts that inferred long-term trends in Polynesian seafaring technology do not, in fact, conform to traditionalist assumptions (Anderson 2000, 2001, 2008; Parsonson 1969; Sharp 1957, 1963). Instead, East Polynesian seafaring is seen analogically as a palimpsest in which traces of early technology—hulls suited to both paddling and sailing and a mastless sail rig, the Oceanic double spritsail (ODS hereafter)—have been patchily overwritten by external influences, such as stayed masts and the Oceanic lateen; by ensuing development, e.g., of the Polynesian Oceanic spritsail; and by localised innovations, often adaptive, e.g., *waka taua* ‘war canoes’ (Anderson 2010: 7–8; 2018a; Parsonson 1969). In this perspective, seafaring technology began modestly and remained much the same or became progressively more varied and specialised.

The two voyaging models are not entirely opposed. There is agreement on some propositions while others remain debated (Table 1: 1–5 versus 6–11). Of the latter, propositions 6–8 (Table 1) are open to further consideration through the kind of historical analysis envisaged by Finney. The objective in doing so here is to see whether closer analysis of the New Zealand evidence than hitherto (Anderson 2001, 2017, 2018a) lends more support to one or the other of the hypotheses in contention. Attention is directed at double-hulled canoes because these have been regarded as the principal vessels of long-distance voyaging in East Polynesia and it is from arguments about continuity or change in their hulls and sails that inferences are drawn about East Polynesian seafaring capability. The New Zealand historical and ethnographic evidence is crucial to that debate because it is thought to document the technological decline envisaged in traditionalist perspectives with particular clarity. Following notice of the double-hulled canoes seen in 1642 by the Dutch, I focus upon *waka unua* hulls and sailing rigs observed in New Zealand ca. 1769–1840.

Table 1. Comparison of East and South Polynesian migration voyaging and colonisation characteristics from traditionalist and historicist perspectives (+ consensus, – no consensus).

| Traditionalist propositions                    |     | Historicist propositions                       |
|--|-----|--|
| <i>Migration voyaging</i>                      |     |  |
| 1. Initiated by strife in source islands       | +   | Initiated by strife in source islands          |
| 2. Multiple canoes, large colonising propagule | +   | Multiple canoes, large colonising propagule    |
| 3. Largely ended in fifteenth century          | +   | Largely ended in fifteenth century             |
| <i>Navigation and wind systems</i>             |     |  |
| 4. Astral navigation and routeing knowledge    | +/- | Astral navigation and dead reckoning           |
| 5. Similar wind systems past and present       | +/- | Periodically different wind systems in past    |
| <i>Sailing rig and performance</i>             |     |  |
| 6. Oceanic spritsail                           | -   | Oceanic double spritsail (ODS)                 |
| 7. Effective reaching and windward ability     | -   | Ineffective beam reaching; no windward ability |
| 8. Relatively fast passages                    | -   | Relatively slow passages                       |
| <i>Colonising strategy</i>                     |     |  |
| 9. Systematic strategic exploration            | -   | Mostly contingent exploration                  |
| 10. Frequent long-distance return voyaging     | -   | Seldom long-distance return voyaging           |
| 11. Often delayed colonisation                 | -   | Seldom delayed colonisation                    |

These are discussed independently because historical hulls and sails were not matched inseparably. In Remote Oceania there was usually one type of sailing rig used in each archipelago<sup>2</sup> and it was adapted to different types of hull. In addition, the same sail type could be rigged differently between regions or periods, e.g., the Oceanic lateen sail in shunting and tacking configurations (Doran 1981). In New Zealand, the ODS, and later the Oceanic spritsail and square sail, were observed on both double- and single-hulled canoes. From analysis of written and depicted sources it is argued that waka unua hulls were not devolved manifestations of higher technology earlier or elsewhere in East Polynesia but built, rather, to a pattern that could have arrived in New Zealand at the time of initial migration. It is argued also that the original Māori sail was not the Oceanic spritsail favoured in early exegesis of East Polynesian migration myths and traditions but an ODS rig that continued in use until the 1820s.

#### WAKA UNUA IN 1642

Canoes seen at Tai Tapu (Golden Bay) in December 1642 were described by Haelbos (Sharp 1968: 4) as hulls “bound together two and two”, but Abel Tasman wrote more explicitly that “their boats consisted of two long narrow prows side by side, over which a number of planks or other seats were placed in such a way that those above can look through the water underneath the vessel”, i.e., there was a space between the hulls (Sharp 1968: 122). Apart from a few single hulls shown on the shore in Witsen’s 1705 engraving (Mack 2006), all canoes appear to have been waka unua, of which up to 22 were seen at a time. Whether that apparent prevalence was matched elsewhere in mid-seventeenth-century New Zealand is unknown, but waka unua were certainly more common in the South than the North Island by the late eighteenth century (Anderson 1998: 124–27).

The waka unua were initially wary of the Dutch ships at anchor, but when a *praeutien* ‘small prau’, a small Indonesian canoe, was paddled between the ships it was attacked fiercely, its canoe form and propulsion perhaps convincing Māori that its crew were just ordinary people and vulnerable accordingly. Later, when 11 heavily crewed waka unua came within range, they were bombarded by ships’ cannon and “turned with speed for the land, two of the Same Setting a type of Tingang Sails” (Sharp 1968: 123).

Drawings complement the narrative. None of the originals from New Zealand survive, but some had been copied, and these pose questions about what was seen. Waka unua were drawn with their hulls attached, gunwale to gunwale and with hulls of equal length (Fig. 1), features not typical of waka unua in the eighteenth century. Most interestingly, the canoe leading the waka unua back to shore from bombardment is shown with a West

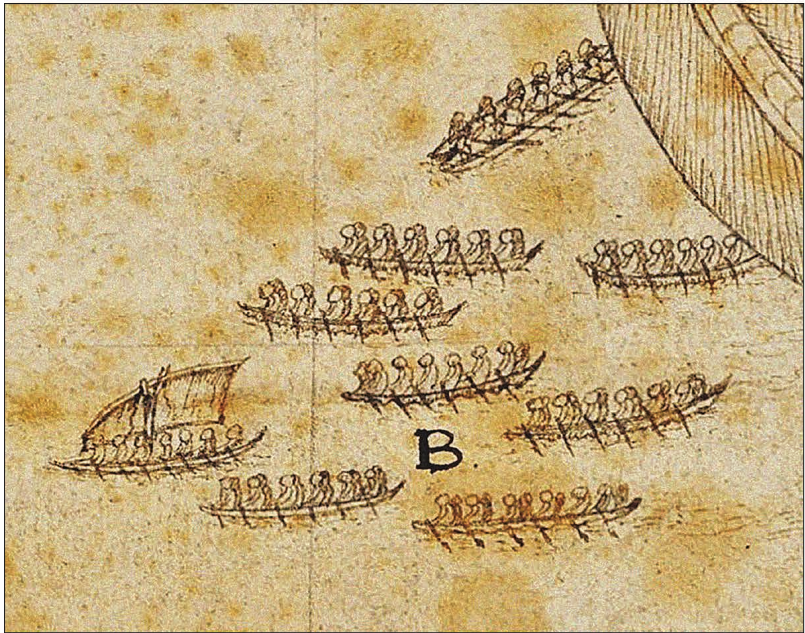


Figure 1. Above: Waka unua near Dutch ships, drawn by Frans Visscher of the *Heemskerck* and the first printed illustration of New Zealand (by Witsen in 1705: Mack 2006). Below: Waka unua fleeing Dutch cannon, Blok fragment, National Archive, The Hague: <http://abeltasman.org.nz>.

Polynesian “tongiaki” style of lateen rig (see Fig. 4) as the “tingang” sail. Tingangs (sampan) were shallow-drafted workboats in Southeast and East Asia (Anderson 2012). Tasman owned a trading “tenggang” in Java and he took two smaller examples on the expedition for ship-to-ship communication (Sharp 1968: 338), one of them being the boat attacked. Tingangs mostly used lugsails, slung by the yard from a short mast, in a way that resembled the seventeenth-century tongiaki rig shown in the Blok fragment (Collins 1987). Could the Māori example have been a lateen sail?

Except possibly in the current case no such evidence has been recorded in New Zealand apart from a late nineteenth-century observation (Best 1925: 260). A cautious approach to the Dutch evidence would note, first, that the attacking canoes got only just in range of ships’ cannon and the sailing rigs were raised while the canoes were being paddled rapidly back to shore—in other words the sails were seen only at a considerable distance with the naked eye, marine telescopes not then being available. Second, as the stayed mast and tongiaki sail could hardly have been erected rapidly it is more likely that the rig was of a type that remained fully assembled when lowered and could be raised or lowered by running stays, as was observed of the ODS in the eighteenth century (below). Thirdly, Isaac Gilseman’s narrative drawing (Fig. 1) could have used a tongiaki sail drawing from van Speilbergen’s 1616 Tongan visit as a model, or been made in early 1643 when the Dutch reached Tonga and sketched double canoes with equal-length hulls and tongiaki sails, or been drawn much later in the Netherlands. The Māori sail was probably not a lateen, but whether it was an Oceanic spritsail or ODS is beyond the reach of current evidence.

#### WAKA UNUA OF THE EIGHTEENTH CENTURY AND LATER

Double-hulled canoes occurred in New Zealand up to the early nineteenth century. They were known generally as *waka unua* (*hunua*, *hūhunu*) and possibly *waka māhanga* (Beattie 1939: 107; Best 1925: 30–32; Evans 2000: 38–40). The last example of *waka unua* seen afloat was in Akaroa Harbour in 1849 (Anderson 1998: 126). *Waka hourua* (or *taurua*), the term now common for modern double-hulled canoes, referred earlier to canoe hulls lashed together directly as fishing or construction platforms (Best 1925: 30; see also Nelson 1991: 26). In the North Island, *waka unua* were seldom recorded historically and coastal travel was almost entirely in single-hulled canoes, mainly *waka taua* and *waka tētē* ‘fishing and travelling canoes’. As early Pākehā ‘European’ observations were predominantly northern there are fewer historical records of *waka unua* than might have been expected.

The records that do exist are thought to indicate a decline in ocean-going technology compared to the double-hulled sailing canoes of Tahiti and Hawai‘i, as implied in Buck’s (1954: 290) comment that “when the seafaring men of the Pacific settled in New Zealand, they became landmen”. Haddon



and Hornell (1975: I: 195) asserted that waka unua were vessels of “simple and primitive construction” that lacked any apparent connection to the voyaging *pahi* ‘offshore sailing canoes’ of central East Polynesia. They were propelled by an Oceanic spritsail of an “extremely archaic and primitive design” (Haddon and Hornell 1975: I: 208) that was considered “the consequence of degradation and not a direct inheritance” and reflected by Māori abandoning overseas voyaging (Best 1925: 246; Haddon and Hornell 1975: III: 46). More recently, Finney (2006b: 144) regarded waka unua as inshore craft propelled by paddle and “auxiliary spritsails”, and Irwin (2006: 88–89) proposed that the “stable double-hulled sailing canoe” of migration voyaging had been replaced by coastal sailing vessels with the result that “the early historic Maori canoe under sail is not an appropriate model for the migration period” (see also Irwin *et al.* 2017: 42 on general decline). Historical Māori canoes, then, have been considered as devolved in relation to the assumed characteristics of prehistoric voyaging canoes in the traditionalist paradigm (Table 1: 6–8) and thus in long-range capability (Table 1: 9–11). This conventional view of changing canoe technology, opposed by Anderson (e.g., 2000, 2018b), can be compared with data from early historical records.

#### *Hulls of Waka Unua*

The Royal Society expedition in 1769 observed several types of Māori canoe and placed them in an implicit classification which assumed that single-hulled canoes, the most common type, were architecturally basic components of the less common double-hulled and outrigger canoes.<sup>3</sup> Thus Joseph Banks wrote in 1770 that, in addition to single-hulled fishing and war canoes, “they sometimes joint two small [single] canoes together and now and then made use of an outligger” (Beaglehole 1962: II: 23). In 1773, Tobias Furneaux saw “five Double canoes that is two lashed together by several sticks laid across the two Canoes, at the distance of two feet asunder” (Beaglehole 1961: 738). Johann Forster remarked that “sometimes 2 of these [single] canoes are lashed together by cross-sticks which makes them go stiffer [i.e., they are more stable to rolling]” (Hoare 1982: 300), and George Forster (2000: 124) that “some of the canoes were double, that is, fastened along side of each other, by means of transverse sticks, lashed on with ropes”. William Anderson observed in 1777 that while large single canoes could be beamy enough to sail without an outrigger, smaller canoes commonly had one, and “they often fasten two [single canoes] together by rafters which we then call a double canoe” (Beaglehole 1967: II: 811). In Northland, de Surville and du Fresne recorded no waka unua, but John Savage (1807: 62) saw single-hulled war canoes and said that Māori “sometimes lash two of them together”. In Queen Charlotte Sound, 1820, Nicolai Galkin wrote that “sometimes two ... [single-hulled] craft are bound together by stakes” (Barratt 1979: 65). These ambiguous references to single canoes fastened together,

despite contemporary evidence that in double canoes they were separated, might have contributed to a later impression of casual or hasty construction.

The eyewitness accounts indicate that waka unua were encountered fairly infrequently, and when the evidence was considered by traditionalist scholars a semantic shift occurred in which infrequent encounter, denoted by “sometimes”, “some”, “now and then”, etc., took on meanings of construction haste and transience of purpose. Elsdon Best (1925: 23) proposed that there had been two forms of Māori double canoe: those “connected by cross-beams securely lashed” which distinguished “the permanent double canoe of [tropical] Polynesia” from those “connected together in a more temporary manner for a coastal voyage or fishing expedition” (Best 1925: 35). His distinction was difficult to sustain, because the difference was largely about intention, and he accepted that waka unua used for coastal passages and fishing in the South Island in the eighteenth and nineteenth centuries “were indeed of a permanent type and not merely two single craft temporarily lashed together” (Best 1925: 31). In fact, his only example of a temporary waka unua referred to a vessel in 1873 that, nonetheless, had its cross-beams “securely lashed” (Best 1925: 35).

Absence of evidence notwithstanding, the idea that historical waka unua had been constructed expediently in New Zealand was soon adopted widely. Haddon and Hornell (1975: I: 195–97), in their evolutionary scheme of watercraft development, proposed that waka unua represented “the most primitive type of double canoe known”, and they followed Best in proposing that some were only single canoes “converted into double ones to meet a passing need or emergency”. Te Rangi Hiroa (Sir Peter Buck) (1950: 201) then elevated this conjecture into the generalisation that Māori “double canoes ... were usually single canoes lashed together temporarily for a particular occasion”, a conclusion that has continued into the present (e.g., Neich 2006: 240).

It is possible, of course, that this was sometimes the case, but no early historical data suggest expedient construction of waka unua, and all the canoes that came out to the European ships were involved in “particular occasions” that were extraordinary in the experience of everybody concerned. To consider this matter further it is useful to focus upon the case of the Moutohorā canoe.

*The Moutohorā Double Hull.* On the evening of 1 November 1769, a large waka unua paddled up to the *Endeavour*, anchored near Moutohorā (Whale Island) in the Bay of Plenty; it was the first seen in the Cook expedition. The next day, under sail, it ran alongside the *Endeavour* for an hour or more (Fig. 2). Recent reference to it follows the traditionalist consensus, Irwin (2006: 87, 89; see also Irwin and Flay 2015: 426) proposing that it consisted of a war canoe and a fishing or travelling canoe, and was representative of

“the double-hulled canoes still in use [in the eighteenth century that] were described as temporarily improvised by lashing two hulls together”. Finney (2006b: 132) declared the Moutohorā vessel an “ad hoc Maori ‘double war-canoe’ ... The ungainly craft had evidently been assembled for the occasion by temporarily lashing closely together, and planking over, the hulls of a long, elaborately carved war canoe and a shorter, plain canoe.”

The only contemporary reference to its construction is by Banks: “a large double canoe, or rather 2 canoes lash’d together at the distance of about a foot which was covered with boards so as to make a kind of deck” (Beaglehole 1962: I: 423). Familiar as he was with engravings from Gilseman’s 1642 sketch showing waka unua hulls joined at the gunwales (e.g., in Dalrymple’s 1767 book: Beaglehole 1962: II: 16), Banks appears to emphasise that the hulls he saw were separated. It is doubtful indeed that such a waka unua could have been constructed in the few hours between Māori sighting the *Endeavour* in the late afternoon and visiting it at 7 pm, or even a makeshift vessel with hulls fastened together directly. Besides, as most Māori visited the *Endeavour* in single canoes the expedient construction of a waka unua, not asserted at the time, would hardly seem necessary.

The Moutohorā canoe (Fig. 2) has a large hull set to starboard. It is in the general form of a waka taua, although the carved prow (*tau ihu*) does not project forward of the hull in the fashion common to waka taua historically, and feather work is absent. This hull has an estimated waterline length of 15–16 m

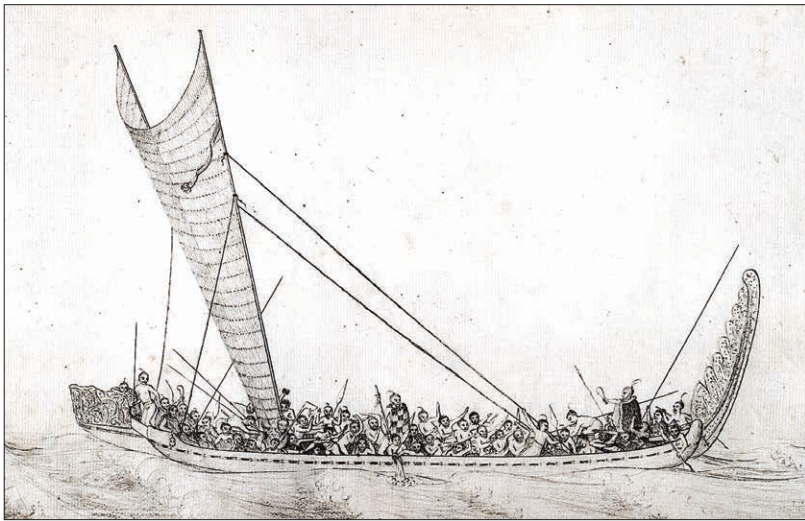


Figure 2. The Moutohorā waka unua under double spritsail, by Herman D. Spöring 1769. The British Library, London: Add.Ms.23920 f.48.

(Anderson 2008). There is a smaller, plain, hull to port. The starboard hull is 1.22 times the port hull in overall length, and about 1.1 times by waterline length. The connecting beams are not shown. The smaller hull is not in the form of other single canoes. It has an unusual prow shaped like a plain box, unlike the usual waka tētē prow with a carved head and extended tongue. The uncarved, rounded stump at the stern is equally unusual. The immediate question is whether the Moutohorā waka unua is *sui generis* or an example of construction to an established pattern. There are three other cases of waka unua for which there is comparable evidence: two from Queen Charlotte Sound and one from Dusky Sound (all identifying codes hereafter are British Library references to the items, as reproduced in Joppien and Smith 1985).

*The Queen Charlotte Sound and Dusky Sound Waka Unua.* Sydney Parkinson saw several waka unua, including the Moutohorā canoe. His pen-and-wash *A New Zealand War Canoe* (Add.Ms.23920 f.49) is suggested—from a human head included in it—as originating in Queen Charlotte Sound, but it may not be largely from direct observation (below). The vessel comprises, to starboard, a larger hull with carved prow and stern pieces and a smaller plain hull to port (Fig. 3). The starboard hull is 1.2 times the length of the port hull but waterline lengths are similar. As in the Moutohorā case, the tau ihu is largely within the hull, and the port hull has the same box-shaped prow and rounded stern.<sup>4</sup> The hulls are set close together and joined by seven beams.



Figure 3. Double canoe by Sydney Parkinson 1770. The British Library, London: Add.Ms.23920 f.49.

Hodges (Joppien and Smith 1985: II: 50) drew a waka unua containing 17 Māori men who visited the *Resolution* in Queen Charlotte Sound in June 1773 (this drawing might also be a composite of observations). The port hull has a long, carved prow and elevated stern, and there is a smaller, plain, hull to starboard. The larger hull is 1.3 times the smaller in overall length, but they are the same in waterline length.

In Dusky Sound, Captain Cook saw a small waka unua which he judged “just capable to transport the whole family [who had visited the *Resolution*] from place to place” (Beaglehole 1961: 117), and Hodges placed the canoe, poorly delineated, in his painting of *Resolution*’s watering place (Joppien and Smith 1985: II: 24). William Wales wrote that “the Canoe was composed of two small ones, hollowed out of a tree each, and fastened to one another about a foot asunder by cross pieces. The Stems and Stern-posts rose much higher than the body of the Canoe and the head was attempted to be carved like the upper parts of a man” (Beaglehole 1961: 777). Wales added that one hull “is considerably larger than the other, I think that on the starboard side [is longer than the other, they] being 18 feet & 14 ft respectively.” Therefore, the starboard hull was 1.3 times the port hull in overall length. Wales also wrote that the hulls had wash boards fitted closely above the dugout hulls and that the two hulls were set slightly closer forward than aft, “which is a useful precaution” (Beaglehole 1961: 780). The Forsters (Forster 2000: 83; Hoare 1982: 242) made similar remarks.

No other eighteenth-century Māori waka unua has been described or depicted in comparable detail, but double canoes were seen in southern New Zealand up to about 1850. Some had hulls of equal shape and size, as in Foveaux Strait examples sketched by John Boulton in 1827 (Starke 1986: 44, 83), but Teone Tikao recalled that South Island waka unua had a large and a small hull (Beattie 1994: 286–87). It is worth noting here that, in the Cook Islands, James Webber drew a small double canoe with hulls of dissimilar size and decoration at Atiu in April 1777, and that a double canoe, strikingly similar to the Webber example, was photographed on Atiu by Te Rangihiroa in 1925 (Dodd 1972: 110).

Cook (Beaglehole 1955: 283) wrote that all Māori canoes were built to the same plan—and regional uniformity of design occurred elsewhere in East Polynesia (e.g., Haddon and Hornell 1975: I: 21, 112–20, 127–29). It is apparent, however, that while waka unua used hulls of the same general shape and size range as those used in single canoes, they were not exactly the same and may have been different in other ways not evident in historical evidence. Eighteenth-century waka unua seem to have been built according to a New Zealand pattern, just as there were distinctive patterns of naval architecture in Tahiti, Hawai‘i and the Marquesas. The Moutohorā, Queen Charlotte Sound and Dusky Sound canoes were spread over more than 2,000 km of sailing distance and numerous territorial boundaries apart, yet

they followed the same conventions, if not completely in each case: two hulls set close together, about 30 cm apart in two cases; one hull about 1.2 times the overall length of the other and having high carved ends, with the waterline length of the hulls being more nearly equal; the small hull plain with low ends and shaped differently from a waka tētē. The sample size is small, but these traits define, provisionally, a distinctive vessel in which the smaller hull differed from all other Māori hull forms. Under the traditionalist assumption that waka unua were cobbled together from whatever was immediately available, other hull combinations (waka taua plus waka tētē, two waka taua, two waka tētē), could have been expected. In fact, no such combinations were observed historically.

It is worth considering why a double canoe might have been constructed with more elaborate superstructures in one hull and with waterline lengths not precisely equal. In West Polynesia the shunting tactic of going about under an Oceanic lateen rig enabled the smaller hull of a double canoe—usually set to port, as in New Zealand—to be kept to windward in order to counteract the capsizing force of wind pressure on the sail. With a tacking rig (e.g., the Oceanic spritsail) each hull is alternately to windward, and hulls of different sizes would affect steerage and require frequent rig adjustments in reaching conditions. In sailing before the wind, however, such drawbacks are minimised and might have been tolerated for other reasons, *mana* ‘power, prestige, authority’ for example. In Spöring’s and Parkinson’s drawings, all but one of the chiefly figures in their fine cloaks appear to stand in the larger carved hull or on the platform, not in the smaller hull. Separating individuals and groups of different status was an abiding nautical concern, including in Austronesian boats (Appel 2012), and generally resolved by demarcating appropriate spaces from stem to stern. Multi-hulled vessels offer an additional opportunity; crew distribution in waka unua could have reflected the kinship dichotomy of *tuakana–teina* ‘older–younger’, with the senior line in the carved hull.

#### THE EARLY MĀORI SAIL

In East Polynesia, the eighteenth-century Oceanic spritsails in Hawai‘i, the Marquesas and the Societies and Oceanic lateens in the Tuamotus are well documented, but, in contrast, contemporary sail types remain unknown or uncertain across the entire southern half of East Polynesia: Southern Cooks, Australs, Gambiers, Rapa Nui and South Polynesia. Best (1925: 256) observed that “we have no data to show the actual form of sail employed by the Maori in his voyages from eastern Polynesia” but assumed that it was the Oceanic spritsail. That opinion has become “a general consensus that the East Polynesian sail was an Oceanic spritsail” (Irwin 2006: 88), which is thought the earliest sail in the region (Di Piazza *et al.* 2014; Finney 2006b; Irwin and Flay 2015: 423). This is debatable.

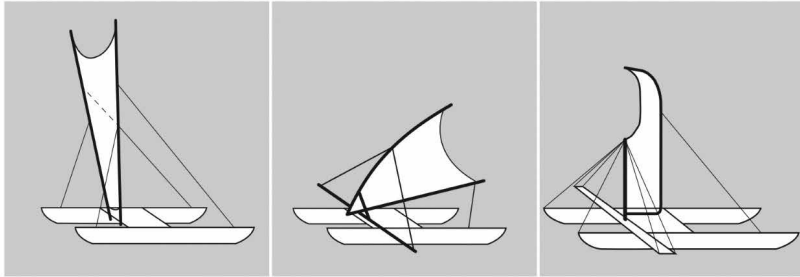


Figure 4. Three types of Polynesian sailing rigs. Left to right: Oceanic double spritsail (ODS), New Zealand; Oceanic lateen (tongiaki rig), Tonga; Oceanic spritsail, Tahitian form.

The terminology and typology of Indo-Pacific sails are fluid, but the focus here is upon two-spar rigs (Irwin 2006) where a triangular or trapezoidal sail, apex down, is fixed along both spars (Fig. 4), usually by lacing. In an Oceanic spritsail, one spar is also a mast fixed in position with stays (including shrouds), and the other, attached to the mast above the gunwales, is a boom that can swing to take the wind on either face of the sail, allowing the canoe to sail across the wind or closer. Conversely, when the spars are not joined, or joined only at the foot, they appear as “double sprits” (Fig. 4). An Indian Ocean form had sprits joined and a square sail attached only at the top of each sprit, but in Oceania there was a simpler form, the “Melanesian spritsail” (Horridge 2008), or “Melanesian double-mast sprit-sail” (Needham *et al.* 1971: 589). A tall rectangular sail was attached along each side to lateral spars that were not fixed together. Needham and colleagues (1971: 599) argued that this derived from an ancient Chinese sail that “seems clearly to depict the ‘double-mast sprit-sail’ now known only in Melanesia”. Its wider Pacific history is largely unknown. It is beginning to emerge archaeologically in west Pacific rock art (Lape *et al.* 2007: Fig. 4) but not yet in historical linguistics (e.g., Di Piazza 2015b), although amongst various Māori terms for spars or masts are *ua* or *hua* in southern New Zealand with the sense of a lever rather than a fixed mast (Harlow 1985: 91).

In western Oceania, a region where quadrilateral sails occur in various rigs, double spritsails are recorded historically from various localities around New Guinea (Haddon and Hornell 1975: II: 213, 219, 222, 280–81, 331). In summary:

each side of the sail ... was attached to a vertical spar or pole by a series of loops of a light rope, not by continuous lacing. There was no fixture for stepping the spars. When the sail was set the spars were simply allowed to stand in the

bottom of the hull. The use of the sails and spars was purely temporary and there was no fixed mast. (Haddon and Hornell 1975: III: 53)

The rigging of these sails varied. Those set on canoes which kept the outrigger constantly to windward had fixed stays, but, in New Zealand, the double spritsail rig occurred on double or single canoes (outrigger sails are not recorded) and was of a correspondingly simpler form.

The historical probability and implications of a Māori ODS are widely ignored in orthodox discussions of Polynesian seafaring (e.g., Doran 1981; Evans 1998; Finney 2003; Howe 2006; Thomas 2021), with only oblique concessions to its possible existence: a self-supporting “modified lateen” (Howe 2003: 109); a “double-mast sail” (Irwin *et al.* 2017: 42); an “archaic quadrangular form” (Irwin and Flay 2015: 425). Historical observations are more explicit.

#### *Eighteenth- and Early Nineteenth-Century Observations*

Māori sails were described enigmatically in the earliest observations. In the first single-hulled canoe encountered in 1769, Parkinson (1972: 88) saw “a lugsail [generally quadrilateral] made of matting”, and William Monkhouse recorded a fishing canoe that had “a roll of straw mat—It might be a sail” (Beaglehole 1955: 579). Once observations had accumulated, James Cook epitomised the case in 1770 (Table 2). Māori “hardly ever make use of sails at least that we saw and those they have are but ill-contrived being generally *a peice of netting spread between two poles which serve for both masts and yards*” (Beaglehole 1955: 284; my italics here and in further historical quotes. Eighteenth-century ships’ “yards” included sail yard and boom). As Cook is saying that both spars served the same function, rather than one as a mast and the other as a yard, his phrase is about as succinct a description of a ODS rig as might be wished. Banks wrote that Māori were very expert in paddling,

[b]ut in sailing they are not so expert, we very seldom saw them make use of Sails and *indeed never unless they were to go right before the wind.* They were made of mat and *instead of a mast were hoisted upon two sticks which were fastned one to each side, so that they requird two ropes which answerd the purpose of sheets and were fastned to the tops of these sticks;* in this clumsy manner they saild with a good deal of swiftness and were steerd by two men who sat in the stern with each a paddle in his hand. (Beaglehole 1962: II: 23–24)

Banks reinforces Cook’s point that there was no mast and boom, for which only a single sheet would be needed, but rather two spars, each of which required a sheet (indicating independently moving spars). Again, this is a very clear description of an ODS rig. Early French observations suggest



that sails were scarce in northern New Zealand. In 1772 du Clesmeur wrote of Bay of Islands canoes that “we have seen no sails in any of them, very light paddles being used” (McNab 1914: 477), while Jean Roux thought that Māori on board the *Marquis de Castries* were puzzled at the restricted movement of the ship under sail (p. 371).

George Forster (2000: 124) describes three canoes sailing in Queen Charlotte Sound in 1773, an activity “seldom seen among them. The sail consisted of a large triangular mat and was fixed to a mast, and a boom joining below in an acute angle, which could both be struck [i.e., the rig taken down] with the greatest facility.” This observation is one of two early descriptions thought “unambiguously of triangular Oceanic spritsails” by Irwin and Flay (2015: 425). It is not, however, from a known journal entry. It is in George’s 1777 book based on his father’s journals (Forster 2000: xxviii) where it attenuates Johann Forster’s journal entry, itself a recollection, that he once saw a canoe with “*a large mat instead of a sail ... fixed to a kind of mast & folds out, so that the other beam below forms an acute angle with the mast & the sail is in a triangular shape or nearly, tapering towards the bottom*” (Hoare 1982: 301). As Johann records a narrow and probably quadrilateral sail and is uncertain about whether the spars were joined, an Oceanic spritsail cannot be inferred. Anders Sparrman, a colleague of the Forsters, wrote that “sails are only used on smaller craft, such as double fishing and transport canoes. As this sail is only used stretched between two parallel horizontal [presumably he meant vertical] poles, *it can only be used when the wind is aft*” (Hansen 2007: 531). In 1777, William Anderson also noted that sails were seldom used and emphasised the importance of paddling (Beaglehole 1967: II: 811).

These descriptions, and others below, are difficult to reconcile with the conventional assumption that eighteenth-century Māori sails were Oceanic spritsails, the latter being described quite differently when they were seen at that time. For example, Banks on the Māori sail (above) can be compared with his description of Oceanic spritsails in Tahiti (in Beaglehole 1962: I: 367) as attached to “one or two *masts ... made of a single stick*”. A sail was “*pointed at the top and the outside curved*” bordered by a frame about one-third longer than the mast, and “with these sails their Canoes go at a very good rate and *lay very near the wind*.”

Useful descriptions and depictions of Māori sails did not resume until the 1820s, despite references to sailing; John Nicholas (1817: II: 12) recorded the *Active* with six canoes nearby sailing before the wind off Northland in 1814. The Russians, however, “saw no craft with sails” at Queen Charlotte Sound in 1819 (Barratt 1979: 65). In 1820, Richard Cruise (1824: 35) recorded that carved (single) canoes in the Bay of Islands, each 60–80 feet long in a fleet of 50, “generally carried two sails each made of straw matting”, and in 1824, René Lesson, surgeon on *La Coquille*, wrote that such sails were triangular rush mats,

“quite useless for sailing close to the wind” (Sharp 1971: 93). In 1827 Augustus Earle painted the scene of *A War Speech Previous to a Naval Expedition* (Murray-Oliver 1968: 128–29) in which there is shown an ODS constructed, it seems, from bundles of rushes bound together in a vertical position and aligned for sailing downwind (Fig. 5). This mode of sail construction and its capability is described, about 1835, by Joel Polack (1838: II: 23):

[C]anoes in sailing are *only capable of going before the wind*; the natives do not understand any other method ... The sail is made of raupo flags [stems] or kiákiá [kiekie] grass, etc., of a triangular shape; it is fastened to two *small rickers or poles, which serve for both masts and yards* and fixed upright between the gunwales. *The sheets are made of plaited flax, fastened to the end of each pole*, but they are very clumsy. These vessels are safe in a brisk breeze, but from keeping in the trough of the sea are continually wet in windy weather.

Later, Polack (1840: I: 224–25) adds of single-hulled sailing canoes that “beating against a head sea or adverse wind [is] impossible, as these vessels have little hold from their shallowness in the water”. The sails are “most clumsy and heavy ... triangular, formed of bulrushes dried in the sun, and tacked together, the upper edge being cut into vandykes [pointed or zigzag shape]”.<sup>5</sup> Southern Māori recalled that canoes under the traditional sail were dangerously tender with the wind on the beam and had no windward capacity (Anderson 1998: 125). In the light of these accounts the evidence most often cited of a waka unua under sail can be considered.

*The Moutohorā Sail and Contemporary Drawings*. On 2 November 1769 the *Endeavour* was running before a breeze of 7–10 knots when “the Double Canoe ... follow’d us again today under sail and kept abreast of the Ship near an hour talking to Tupia” (Cook in Beaglehole 1955: 190). Banks wrote that “a Sailing canoe that had chased us ever since daybreak came up with us” (Beaglehole 1962: I: 423). This (Fig. 2) was the first Māori canoe seen under sail in the eighteenth century and, as the only case in which there exists both a specific description and a precise depiction of the sail, the two much at odds, it has been the subject of debate.

The description, most probably by midshipman James Magra (later, Matra) may have been based on a journal, but it is known only from a later book (*A Journal of a Voyage 1771*) in which original observations were rewritten into a narrative form.<sup>6</sup> The canoe

carried a sail of an odd construction, which was made from a kind of matting, and of a triangular figure; the hypotheneuse, or broadest part, being placed at the top of the mast, and ending in a point at the bottom. One of its angles [the sides of the sail] was marled [fastened with cord] to the mast, and another to a spar with which they altered its position according to the direction of the wind, by changing it from side to side. (*A Journal of a Voyage 1771*: 82–83)

Table 2. Early historical observations of sail rigs 1769–1839 (\* = same observation).

| Recorder             | Oceanic spritsail |             | Oceanic double spritsail (ODS) |                 |                  | Origin of evidence |
|----------------------|-------------------|-------------|--------------------------------|-----------------|------------------|--------------------|
|                      | Sailing on reach  | Mast & yard | Two sail spars                 | Sheet each spar | Sailing downwind |                    |
| Parkinson Nov. 1769  |                   |             | X                              |                 | X                | Journal            |
| Spöring Nov. 1769    |                   |             | X                              | X               | X                | Direct view*       |
| Matra Nov. 1771      |                   | X           |                                |                 |                  | Recollected?*      |
| Parkinson Jan. 1770  |                   |             | X                              | X               | X                | Journal            |
| Parkinson March 1770 |                   |             | X                              | X               | X                | Journal            |
| Cook 1770            |                   |             | X                              | X               | X                | Journal            |
| Banks 1770           |                   |             | X                              | X               | X                | Journal            |
| Sparman 1773         |                   |             | X                              |                 | X                | Journal            |
| J. Forster 1773      |                   | ?           | ?                              |                 |                  | Journal*           |

| Recorder        | Oceanic spritsail |             | Oceanic double spritsail (ODS) |                 |                  | Origin of evidence      |
|-----------------|-------------------|-------------|--------------------------------|-----------------|------------------|-------------------------|
|                 | Sailing on reach  | Mast & yard | Two sail spars                 | Sheet each spar | Sailing downwind |                         |
| G. Forster 1777 |                   | X           |                                |                 |                  | Reworked*               |
| Nicholas 1814   |                   |             |                                |                 | X                | Recollected             |
| Lesson 1824     |                   |             |                                |                 | X                | Recollected             |
| Earle 1827      |                   |             | X                              | X               | X                | Direct view?            |
| Lesson 1827     |                   | ?           | X                              |                 |                  | Journal                 |
| Pâris 1827      |                   | X           |                                |                 |                  | First Oceanic spritsail |
| Williams 1833   |                   |             | X                              | X               |                  | Recollected             |
| Polack ca. 1835 |                   |             | X                              | X               | X                | Last ODS                |
| Diefenbach 1839 | X                 | X           |                                |                 |                  | Recollected             |
| Wakefield 1839  | X                 | X           |                                |                 | X                | Recollected             |



Figure 5. Waka under double spritsail. Top left: Sydney Parkinson 1770 (The British Library, Add.MS.23920 f.44). Top right: Augustus Earle 1827 (Alexander Turnbull Library PUBL-0015-09). Below: Henry Williams [1832] 1835, who, to show their shape, drew the sails fore-and-aft.

This passage is often cited exclusively to define the Māori sail and it is taken as the principal historical reference to an Oceanic spritsail on Māori canoes (e.g., Beaglehole 1955: 190; Irwin 2006: 88–89; Irwin and Flay 2015; Johns *et al.* 2014). It is the other “unambiguous” description of an Oceanic spritsail cited by Irwin and Flay (2015: 425), who write that “Magra had the opportunity to see the whole sail and his description is consistent with an Oceanic spritsail”. No basis exists for asserting that Magra saw more of the sail than others on board, nor for arguing that eighteenth-century sail depictions are “less formal” attempts at the Oceanic spritsails drawn by Pâris in 1827 (Irwin and Flay 2015: 425). These points serve, rather, to support a broader contention that

early historical sketches can be ambiguous because they show sails and spars in different configurations according to the direction of the boat in relation to the wind, which makes it possible to misinterpret different *points* of sail as different *types* of sail ... [and] they may not accurately record every detail, particularly of ropes and rigging. (Irwin and Flay 2015: 428, their italics)

If valid—contemporary depictions are regarded elsewhere as especially useful in understanding former sails and rigging (Whitewright 2017)—the point cannot be confined to drawing. Written descriptions can be equally deficient or misleading, as indeed is Magra’s account, on several grounds.

First, a large mast would have to be fixed by shrouds or stays, and the boom would need to be attached to the mast and controlled by a sheet, but Magra, evidently puzzled by what he saw, wrote nothing at all about the rigging. Second, a triangular sail with its hypotenuse at the top would require spars splayed out at 90 degrees or more (as noted by Beaglehole 1962: II: 24). Such a “butterfly” rig occurred historically on some outrigger canoes in Vanuatu, but its sail shape and rigging are highly distinctive (Di Piazza 2015a) and do not occur in any eighteenth-century drawings of Māori or other Polynesian sails. Third, Magra’s muddled description of the sail head leaves his assertion that the sail foot was pointed also in question. Lastly, while the movement of spars might have recalled, for Magra, the trimming of Oceanic spritsails in Tahiti, the error in that view was exposed when the Moutohorā canoe left *Endeavour*. Turning away on a reaching course, the Māori seamen “doused the sail and stood back [to windward] under paddle” Parkinson ([1773] 1972: 102). The same procedure had been observed elsewhere by Monkhouse who noted that a canoe dropped her entire rig when she could not sail around the *Endeavour*’s pinnace, and then attempted to raise it (Beaglehole 1955: 568). The weaknesses in Magra’s description, and its questionable status as a primary observation, do not justify the modern consensus that it referred to an Oceanic spritsail, let alone unambiguously.

Most importantly, Magra's description is contradicted by a detailed pencil drawing, made on the day it was observed, of the same canoe (Fig. 2). *New Zealand War Canoe: The Crew Bidding Defiance to the Ships Company* (Add. Ms.23920 f.48) is titled and dated in the handwriting of Herman Spöring, a 35-year-old Swedish draughtsman of natural history who was personal secretary to Joseph Banks. Spöring was employed mainly in botanical drawing, but after the death in Tahiti of Alexander Buchan, one of the original artists on the *Endeavour*, Spöring stepped into his role. Lysaght (1979: 10, 24) describes Spöring as a brilliant and talented draughtsman whose pencil sketches were exquisitely detailed, sensitive and accurate. Bernard Smith (1992: 63) wrote that Spöring's drawing of a Tahitian canoe showed "his eye was for construction; it is, you might say, an engineer's drawing. When he draws, Spöring does not look for the visual effect as Parkinson does, but for a linear description." He was a documentary draughtsman, in Smith's (1992: 54) terms, and his drawings of watercraft are precisely representational (the most accurate modern depiction (Kane 1991: 19) also shows the canoe rigged as Spöring drew it, but from astern).

As reading of descriptive ethnography through the lens of the conventional voyaging model largely fails to recognise the ODS, it is important to emphasise the complementary legitimacy of analysing historical depiction. European drawing of Oceanic boats, sometimes wildly inaccurate earlier, improved considerably on Dutch voyages in the seventeenth century (Purdue 2002). Later, as Smith (1979: 84; see also Joppien and Smith 1985: I: 1–8) argues, a "steady, relentless, and continuing rise of empirical naturalism", 1750–1890, got off to a fast start in "the visual arts programme" of Cook's three voyages, and "under his command the value of visual records was for the first time fully recognized and adequately provided for". Given Spöring's acknowledged skill and, implicit in the detailed drawing, his lengthy observation of the Moutohorā canoe, greater confidence can be reposed in the depiction than the description. The difference between what he shows and what Magra wrote more probably reflects Magra's uncertainty about the "odd construction" he saw, and perhaps Magra's youthfully careless ways (Cook described him as "good for nothing" (Beaglehole 1955: 323)), than a lapse in Spöring's practice. The sailing rig drawn by Spöring is a full and precise depiction of an ODS, the first recorded in Remote Oceania.

The shape and set of the sail in Spöring's drawing are duplicated by Parkinson (Salmond 2006: 265) in three background canoes of *New Zealanders Fishing* (Fig. 5) in Queen Charlotte Sound (Add.Ms.23920 f.44), and one in his drawing (Add.Ms.23920 f.41) of Motuarohia, Bay of Islands. In addition, there is a working sketch of a similar sail in Tolaga Bay by Spöring (Joppien and Smith 1985: I: 176). Secondary depictions of ODS occur in engravings, about 1772, by John Barralet (Joppien and Smith 1985: I: 198–201).

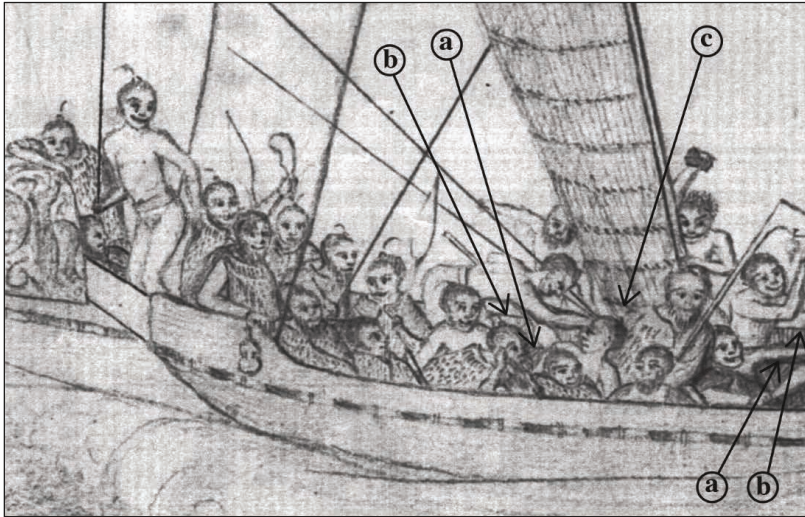


Figure 6. Moutohorā waka unua. Above: Straight spars and sail foot extending close to canoe gunwales. A spearman and another with rock stand in the larger hull. Below: Sheets being handled in each hull and two steersmen with small paddles. The British Library, London: Add. Ms.23920 f.48.



Parkinson's main depiction of a sail, in *A New Zealand War Canoe* (Add. Ms.23920 f.49), shows (Fig. 3) a waka unua and its crew—drawn out of proportion to each other—carrying what could be seen as a masted rig with spars joined at the base. However, the Tahitian mast style is improbable (Irwin and Flay 2015), and from the angle of view the spars would appear to converge whether they did or not. The stays are feasible for reaching with a masted sail but, in what appears to be Parkinson's preliminary sketch *New Zealand Canoe, the Crew Peaceable* (Add.Ms.23920 f.51), no "mast" or stays are shown, only the same crew holding sheets as in Add.Ms.23920 f.49 (Fig. 3). It is thought that the latter was drawn in March–April 1770 (Joppien and Smith 1985: I: 199), a period when the *Endeavour* was coasting around the southern South Island and then on passage to Australia. As no sailing canoes were encountered during that period—in fact none had been seen since January 1770—the drawing was not made from direct observation.

It seems to be one of many drawings in which Parkinson was experimenting with his material to create different scenarios. His double canoe is very like his single canoe without a sail (*New Zealand War Canoe: Bidding Defiance to the Ship* Add.Ms.23920 f.50); the tau ihu, small dog, man in a striped cloak, unclothed man in the bow and other features are in common. There are also similarities between Parkinson's double canoe and that drawn earlier by Spöring (two men handling sheets, one partly clothed, the other almost naked, and a small dog nearby). It seems that Parkinson was combining various sources on the *Endeavour* and that his waka unua does not represent a particular vessel. As evidence, it must be regarded as secondary, but his drawing Add.Ms.23920 f.44 (Fig. 5) confirms the existence of an ODS in Queen Charlotte Sound.

*The Moutohorā and British Museum Sails.* The Spöring drawing shows a tall, narrow and approximately triangular sail. It seems to be an example of laced-rush construction (probably *raupō* 'bulrush' (*Typha orientalis*)), with vertical sections of dried reed tied together in panels; this would produce a lighter sail than woven-flax matting, especially when wet. The sail is attached to straight spars angled forward, neither of which is stayed as a mast. Each spar has a sheet and forestay attached and if the latter are running stays, then the spars could be moved back and forward separately to trim the sail. The forward raking of both spars with the centre of effort of the sail above the bow of the small canoe is consistent with running before the wind, as was the case. Some further insight might be gained from the geometry of the sail.

The Spöring drawing does not show the foot of the sail, but almost. There is a panel seam behind the right shoulder of the man carrying the *tewhatewha* 'axe-shaped club', and beneath the horizontal left arm of the man sitting aft of him can be seen the starboard gunwale of the small hull (Fig. 6a) and,

above it, of the large hull (Fig. 6b). Therefore, the lowest seam and part of the panel beneath it (Fig. 6c) must be the basal panel because an additional panel would fall below the level of crossbeams and gunwales. Toward the stern are four crew handling the sheets, and there is one steersman with a small, handheld paddle in each hull (Fig. 6, below). Many of the 56 men and two dogs have crowded into the small hull, closest to the *Endeavour*.

To grasp the shape of the sail more precisely I measured it on a large photographic image (305 × 471 mm) provided by the British Library of the original drawing (which measures 267 × 416 mm). The curve of the sail head (Fig. 7, left) can be measured in two parts: (a) around the forward (leeward) face of the sail from where it is attached to the port spar to where it disappears at the left edge of the sail drawing (i.e., where the leeward sail face appears to meet the second seam below the head on the aft (windward) face of the sail), and from that point, (b) the length of the head on the aft face of the sail as it curves around to meet the starboard spar. The length of (a) being twice that of (b), I assumed that a 2:1 ratio of (a) to (b) pertains down the sail, so that if the length of (a) is measured along any of the 25 visible seams on the forward face of the sail then the length of (b) can be estimated, and therefore the total width of the sail at that seam. Digital measurement would be more precise, but the general shape is sufficiently accurate (Fig. 7, right). Measurements of the sail head and the second, fifth, eighth, sixteenth and twenty-fourth seams below the sail top were used to establish the width of the sail down its length. It can be seen that, from its foot, the lateral edges of the sail diverge at an acute angle (10°) from the centreline up to the fifth seam where the divergence increases toward the head. This represents curvature which was either built into the sail or caused by increased sagging as the sail broadens toward the head. In other words, with its straight spars, the sail is flatter toward the foot, and bellies out toward the head, working to some extent like a spinnaker.

In the original drawing and Figure 7 (right), it can be seen that if the sail spars remained straight they could not have joined at the approximate position of the sail foot, which must have been above the starboard gunwale of the small hull (Fig. 6a). The convergence angle of the sail sides below the fifth sail seam indicates that the spars would have to meet, if they did, well below the gunwales. If the length overall of the main hull is 18.3 m (Anderson 2008), then the maximum sail length is 9.2 m down to the small hull gunwale, and the spars would project an additional 2 m below that, meeting 1.25 m below the waterline; clearly impossible (Fig. 7, right). The proposition that one spar curved to meet the other below the foot of the sail is practically impossible in Spöring's drawing and there is no historical evidence to suggest that this spar form occurred in eighteenth-century New Zealand, or later for that matter. It is more probable that the spars remained

straight but terminated well before they could have been fixed together and were, therefore, attached separately to the canoe to form an ODS rig.

Attachment of the spars to the canoe is not shown, but probably each was lashed to a crossbeam or to a thwart in each hull. The two men in front of the sail—possibly adjusting running stays led back to the spars—stand in different hulls, and the port spar is behind two lines of men in the small hull and held by a man (about to throw a rock) in the large hull, indicating that

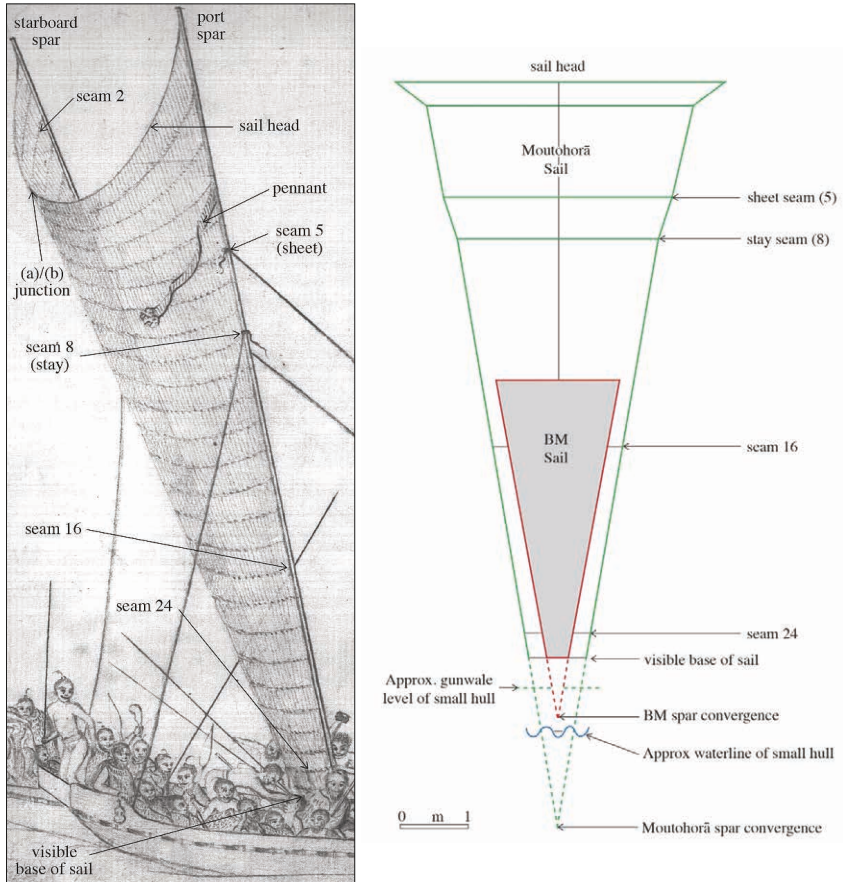


Figure 7. Left: Moutohorā sail by Herman D. Spöring. Right: Plan shape of the British Museum Māori sail upon plan shape of the Moutohorā sail.

it is attached near the starboard gunwale of the small hull. This Moutohorā rig, like early square sails and others used historically in sailing before the wind, is bilaterally symmetrical and in that respect differentiated from Tahitian and Hawaiian claw sails (Lewis 1972).

The Moutohorā sail can be compared with the Māori sail in the British Museum. The latter sail does not have impeccable provenance, but evidence indicates that it was collected in the eighteenth century and was probably in the Cook collection (Starzecka *et al.* 2010: 31). I measured and photographed the sail in 2009. My measurements (length of woven flax sail = 4.21 m; width at head = 1.91 m; width at foot = 0.34 m) are similar to those obtained by others, and the variations amongst us seem to depend on whether the measurements include the feathers at the head (Starzecka *et al.* 2010: 31 have the maximum length as 4.35 m) or the cord loops at the sides (file notes for NZ 147 in the British Museum have width at head as 1.98 m, and at foot as 0.38 m). The sail, excluding loops, feathers, cords and pennant, is shown in Figure 7 at the same scale as the Moutohorā sail, assuming the latter was 9.2 m long (above). The plan similarity is striking, suggesting that eighteenth-century Māori sails might have been constructed to a template from which they varied mainly by size and “cloth” (i.e., laced or bound rush, or woven flax construction). The loops for fixing the sail onto its spars recall those on the Melanesian double spritsail (above).

### *The Oceanic Spritsail in New Zealand*

The Oceanic spritsail is the rig preferred in conventional opinion for colonisation voyaging to New Zealand (Best 1925: 251–55), and Irwin *et al.* (2017: 42) add a functional conjecture that “the Maori sail was generally set as an Oceanic spritsail in pre-European times ... because it was easier to manage and less prone to capsize.” If that preference had existed, however, then the Oceanic spritsail should have been more obviously in use in the historical data ca. 1769–1825 (Table 2, Fig. 8). My reading of the evidence is that there was no Oceanic spritsail recorded in New Zealand until the 1820s.

Māori had shown a lively interest in foreign sailing technology since the eighteenth century, and similar observations continued into the 1820s, for example by the *Astrolabe* artist, de Sainson, that for Māori, “our masts and the handling of the sails aroused the keenest interest” (Wright 1950: 205). Māori travel on European ships, migration of Polynesians to New Zealand and early European settlement all added their influences. Thus, the adoption of European square sails, oars and steering oars on waka unua can be traced back to at least 1827, in Foveaux Strait (Starke 1986). In the same year, Pierre-Adolphe Lesson (2022: 420–21) on the *Astrolabe* described, enigmatically, a triangular sail at Tolaga Bay for which

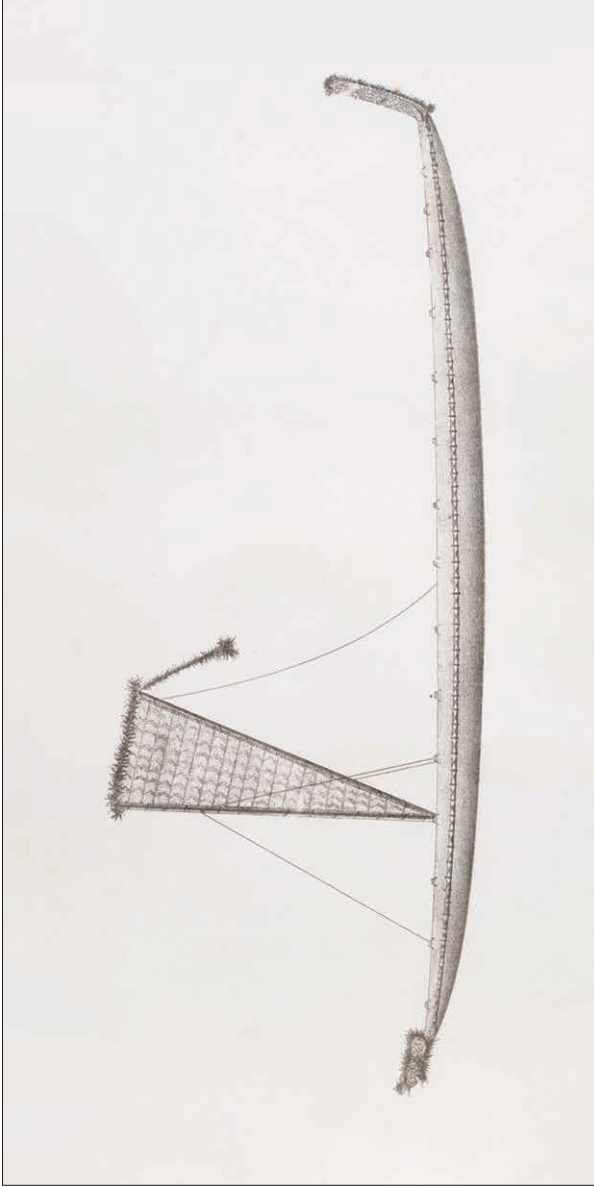


Figure 8. Māori canoe in 1827 with Oceanic spritsail, showing forestay, shrouds and single sheet (Pâris 1841).

two masts are therefore necessary to hold it in the air. The masts or spars meet at the bottom of the canoe, where they are held vertically by shrouds, and they are lowered by making them pivot downward. It should hardly be possible to keep these sails up when the wind is strong.

Two contemporary drawings of single-hulled canoes at Tolaga Bay by François-Edmond Pâris (1841) show somewhat different rigs. Small sails of pointed triangular shape were fixed to masts with forestays and shrouds, but the booms are attached above the gunwales. These are clearly Oceanic spritsails. The lateral edges of the sails are of equal length, suggesting they were intended mainly for offwind use. Asymmetrical plan shapes are otherwise common in Oceanic spritsails used for reaching.

It is difficult to tell how widely the Oceanic spritsail was used in New Zealand, or for how long, because it was seldom identified specifically amongst a predominance of contemporary European rigs with stayed masts and trailing booms. Judging by the drawn evidence in particular, however, Māori sails were almost entirely in European styles and materials by the 1840s (e.g., Wakefield 1845: 233). Thus the Oceanic spritsail had only late and brief currency in New Zealand.

#### ARCHAEOLOGICAL AND EXPERIMENTAL EVIDENCE

Debate about interpreting historical evidence of Māori sails aside, scholars agree that resolution is most likely to be achieved through discovery of archaeological remains (preserved wood and fibre artefacts, rock art) that bear directly on technical points in contention, but the evidence needs to be evaluated critically. As a case in point, waterlogged wooden pieces from Huahine (French Polynesia) are often cited as evidence of an early voyaging canoe (Sinoto 2016), but renewed excavations (Anderson *et al.* 2019) question the stratigraphic position, integrity of association and interpretation of the material. Similarly, whether the Anaweka plank (Irwin *et al.* 2017; Johns *et al.* 2014) is from a single- or double-hulled canoe is uncertain, and reconstruction of the vessel with an Oceanic spritsail and a large, curved, West Polynesian steering oar is conjectural (Irwin and Flay 2015: 439; Johns *et al.* 2014: 14732); only small, straight-shafted steering paddles are attested historically and archaeologically (e.g., Irwin 2004: 97–98).

Except as fragments, no pre-European Māori sail, rigging or mast is known archaeologically. The existence of a single mast-step in a canoe hull could suggest a fixed mast (but note Best 1925: 258), although ODS spars could have been loosely stepped or free-standing. A possible mast-step was found in a hull of European age, but no formal mast-step, as noted by Barstow (1879), has been seen in the current range of remains. A hole through the

butt of a pre-European dugout end section (*haumi*) could have been used to step a mast (Irwin *et al.* 2017: 38, 41), but the primary purpose of the feature was doubtless to join the section to the main hull (Best 1925: 112–16).

The sailing performance of the ODS has not been measured precisely. During the “Lapita Voyage”, Anderson and Boon (2011) constructed a small double-hulled canoe with a makeshift ODS. In a light breeze it worked from running to broad-reaching, but stalled at a beam reach. Irwin *et al.* (2017: 42) rigged a model of the British Museum Māori sail successively as an ODS and Oceanic spritsail and tested them in a wind tunnel. Forward of a broad reach both rigs produced similar driving force, but the ODS was harder to trim, and heavy wind loading high in the sail threatened the roll stability of the canoe. The ODS seems workably stable and effective in running, but otherwise has characteristics that compromise sailing ability and safety (Irwin *et al.* 2017). These data need to be refined by full-scale trials at sea.

#### CONCLUDING REMARKS

A century ago, traditionalist narratives of colonisation argued that Māori had ancient Eurasian origins, were preceded by non-agricultural Polynesians or non-Polynesian “Maruiwi”, migrated as a “Great Fleet” and arrived in large, sophisticated voyaging canoes that were soon no longer constructed. All but the last of these propositions has been revised under scholarly critique since the mid-twentieth century (Anderson *et al.* 2014: 43–67; Sorrenson 1979). The persistence of the last is not easily explained but it lies, in part at least, in its connection to mid-twentieth-century ethnographic and historical views of Polynesian voyaging that were translated into an “a-historical social anthropology” (Salmond 1991: 432) which gave rise to the Polynesian voyaging movement. Participants in that were “not trying to replicate ancient seafaring exactly. They [were] selecting cultural elements from their past to symbolize ancient achievements and virtues and to affirm their own identity as heirs to a great seafaring tradition” (Finney 2006c: 388). Selection of canoe technology to create specialised sailing vessels with advanced Oceanic spritsails reinforced a conviction of early maritime sophistication and its implication that subsequent technological history had nowhere to go but into material decline.

The perspective is essentialist: ethnicity and advanced seafaring are taken as reciprocally constitutive of ancestral East Polynesian identity, technology and performance that declined with migration dispersal. Recent suggestions that “the ancestors of Polynesians invented blue water sailing” (Salmond 2021: 278) or that early Polynesian seafarers achieved technological superiority through independent invention (e.g., by Thomas 2021: 167) articulate related assumptions of Polynesian exceptionalism. If, however, as Plubins (2021: 440) points out, “Polynesian sailing skills and achievements simply overshadowed everybody else’s ... [then given] ...

the material simplicity of their society[,] superb sailing technologies were theoretically available for discovery to most world peoples, and yet never materialized except in this community.” Exceptionalism, at the very least, is in want of demonstration.

Several conclusions of the Māori case outlined here indicate that substantial reconsideration of such ideas is in order. First, it is apparent that the proposition of initial, sophisticated sailing technology declining into its historical manifestations issues from no persuasive body of evidence. Nor was early technical advancement necessary for colonising dispersal. East Polynesian voyaging canoes did not need to be large, specialised sailing vessels with high freeboard. Eighteenth-century Tahitians preferred small double canoes of low freeboard around 10–11 m long<sup>7</sup> for offshore seafaring (Banks in Beaglehole 1962: I: 366), outrigger canoes were used in the Tuamotus and even seagoing sailing rafts are in Marquesan voyaging traditions and were recorded in Mangareva, albeit with a former tradition of canoes (Haddon and Hornell 1975: I: 49, 93).

Second, Māori canoe technology exhibits no overall trajectory of decline, only of change, regarded as adaptive, that is inferred from fragmentary archaeological data and regional patterns of variation (Anderson *et al.* 2014: 28; Irwin *et al.* 2017). At European contact *waka unua* were scarce to the north but common to the south where their multi-hull stability, also of outriggers, was needed in the relatively demanding sailing conditions and long passages involved in the seasonal rounds of low-density foraging populations. Conversely, *waka taua* were common to the north and scarce to the south, probably representing in New Zealand, as worldwide (e.g., Anderson 2010: 7–8), the endemic expeditionary warfare associated with clan rivalries in higher-density, complex foraging and agricultural populations. *Waka unua*, outrigger and single-hulled canoes can be assumed as continuously present since Māori arrival. There is no evidence of lost or degenerated technology, but rather of functional specialisation in single-hulled *waka tīwai* ‘river canoes’, *waka tētē* and *waka taua*, and of innovation in reed boats (*mōkihi*) and the Moriiori *waka korari*, based on a double-hulled frame.

Third, the idea that *waka unua* were generally constructed expediently from whichever single canoes were at hand has no historical basis other than in its frequent repetition. The possibility that it happened from time to time cannot be rejected, and distinguishing expedient from pre-planned construction is difficult on the relatively slim data available. Nevertheless, the unusual characteristics of the smaller hull relative to those on other types of single canoe suggest a class of canoe constructed similarly throughout New Zealand. If so, the Māori case conforms with circumstances elsewhere in East Polynesia where each archipelago had its particular style of double-hulled canoe (two styles in Tahiti).



Fourth, historical analysis of written and drawn evidence does not support the conventional conclusion that the Māori sail was, or was derived from, an Oceanic spritsail. Historical observations up to the 1820s were describing a different sail, found elsewhere in Oceania but unrecorded previously in East Polynesia, which is clearly recognisable as an ODS. Its dissimilarities with an Oceanic spritsail are multiple: until the 1820s the Māori sail was seen with two spars of the same length and diameter, no mast was distinguished, the spars were not joined, there was a forestay and sheet to each spar but no shrouds or other stays, the sail was set athwart the hull and it was deployed off the wind. The ODS was used on waka unua, waka taua and probably other canoes as well. There were numerous situations between 1769 and the 1820s when an Oceanic spritsail could have been observed on Māori canoes—and for its performance might well have been preferred—yet no explicit observation exists. That the earliest unequivocal record is in 1827, by which time other foreign sail types occurred on Māori canoes, suggests that it was recently adopted.

Last, the pre-European existence in New Zealand of an ODS unaffected by lateen rigs raises the distinct possibility that it was the original East Polynesian migration sail and, therefore, probably of Remote Oceanic colonisation generally. Its comparative limitations in performance would have made migration voyaging under sail alone more difficult than is conventionally assumed, with implications for thinking about prehistoric long-distance interaction (Anderson 2000, 2018b). East Polynesian double canoes historically, however, had low freeboard that enabled a combination of paddle propulsion with sailing. Canoes of such moderate design were quite suitable for long passages if their crew had the skills and determination demonstrated historically by Polynesian seafarers. Passage-making by combined sail and paddle (or oar), which enlisted the flexibility and safety of planned redundancy in propulsion, was a strategy common in seafaring history worldwide, from the North Atlantic to the Indian Ocean and across the Pacific.

In summary, it is contended that the technological history of Māori seafaring was not one of decline, but rather of continuity, innovation and regional variation. In particular, historical waka unua with the ODS rig represented voyaging technology which had been retained since the migration era, unaffected by later technological changes in tropical East Polynesia. If that hypothesis is valid, then multiple migrations from “Hawaiki” and similarly early migration from New Zealand to the Chatham, Auckland, Kermadec and Norfolk islands (and contact with Australia) indicate the exceptional Oceanic voyaging capability of the waka unua and ODS in the hands of accomplished seamen.

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## NOTES

1. Finney’s first experimental canoe, *Nalehia*, was built to an historical plan.
2. Pâris (in Rieth 2008) attributed this to adaptational pressure.
3. “Canoes” in these observations referred to vessels inclusive of superstructures, spars, rigging, etc., not simply to hull form (see Best 1925: 18).
4. Carving conventions in tau ihu seem to have followed general forms for waka taua and waka tētē for the main hulls of larger and smaller waka unua respectively, but whether there were consistent differences in waka unua requires specific research.
5. Polack (see also Shortland 1856: 44) thought single canoes were sailed along troughs to reduce wind exposure, but as they would be exposed as each swell passed beneath, the greater concern might have been for the integrity of compound dugout keels caught across wave peaks.
6. The Magra narrative varies from journal entries by Cook and Banks. They say the canoe was with them for about an hour, Magra says “several hours”. They say it broke off contact upon a musket shot. Magra says that occurred only when a cannon was aimed, but misfired.
7. In 2009, I crewed on an 11 m double canoe that took a stormy passage from Makira to Santa Cruz in her stride as part of a voyage from the Philippines.

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#### AUTHOR CONTACT DETAILS

Atholl Anderson, Department of Archaeology and Natural History, Australian National University, Canberra, ACT 2601, Australia. Email: atholl.anderson@anu.edu.au