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 TE MĀTAURANGA WHAKATERE WAKA

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**E**kapi ana te hautoru o te ao i te Moana nui a Kiwa. I ngā tau manomano ka huri, ka puea ake i Āhia ki te tonga mā rāwhiti, he iwi māia, he iwi matatau ki te hanga me te whakateri i ō rātou waka. Ka tupu ngātahi hoki i a rātou tētehi mātauranga whakateri i tarawhitia e rātou ngā tōpito katoa o te Moana nui a Kiwa. Koinei ngā tāngata tuatahi, nāna i kau ngā ara terenga waka onamata. Nō ngā tau maha i muri iho, ka whanake tēnei mātauranga me tō rātou hangarau waka, ā, ka tīmata ngā terenga whakawhiti roa e tau haeretia ana ngā moutere o Poronīhia, tatū mai ki Aotearoa.

## Kupu Whakataki

Hei tēnei tuhinga e whai ake nei, ka tirohia te hangarau waka a ngā tūpuna o Te Moana nui a Kiwa i whakawhiti ai rātou ki ō rātou moutere tae atu ki te mātauranga whakateri waka me te arotahi o te titiro ki te whakatinanatanga o aua mātauranga. Ka tāmutu i konā, ka pūhia te titiro i runga i ngā huarere o Poronīhia e kite ai tātou i ngā āhuatanga o Tāwhirimātea i ōna moutere me ngā wero ki te whakateri waka i ērā huarere.

## He Terenga Tāukiuki

Pūtaketake ai ngā terenga tuatahi o ngā iwi Poronīhia, i te takiwā o ngā tau e rima tekau mano kua pahemo, ka whanatu he iwi tāngata ki tua atu i te ripa o *Sunda*. E rua ngā wāhanga o ngā terenga nunui me te whakakāinga i ngā motu o Poronīhia, inā rā, ko tētehi i tīmata i te takiwā o ngā tau e rima tekau mano ki muri. Ko tētehi i tīmata i te takiwā o ngā tau e toru mano, e rima rau ki muri, ko te terenga tēnā o ngā iwi *Lapita* ki roto i te uru o Poronīhia.

Nō ngā tau e rima mano, e ono mano rānei, ka piki te tai o te moana ki tō tēnei rangi. I ngā tau e rima tekau mano i mua atu i tērā, kua mimiti, kei raro iho kē te tai, tēnā pea i pā tēnei āhuatanga ki ngā terenga ki roto o Poronīhia. I te wāhanga tuatahi o ngā terenga tuatahitanga, ko te whitinga tēnā ki waenganui o Sunda me Sahul, e mārama ana te kite atu, mai i Āhia matua ki ngā motu o *Bismarck* me ngā moutere o ngā *Solomon*. Nā te pātata mai o tērā motu ki tērā, kāore i tawhiti atu i te ono tekau māero mai i tētehi moutere ki tētehi (Howe, 2006, wh. 19-20).

Nā te whēkite i ngā motu, mai i tētehi ki tētehi, me te pātata o ngā motu, kāore i kaha matara, kāore hoki e kore, ka tutuki te whakateri mai i tētehi motu ki tētehi. He pai hoki ngā huarere me ngā roma i roto i ēnei ara terenga. Nō roto i taua wā, ko ngā tau e rima tekau mano i pahure, kua whakakoi, kua whakapakari ngā tūpuna nei i ō rātou pūkenga whakateri, i ō rātou hangarau waka hoki. Nō konā, ka tauria e rātou ngā motu o *Near Oceania*, *Melanesia* me ngā motu o ngā *Solomon* i roto i te takiwā 30,000BP ki te 50,000BP. Ko ngā moutere i waenganui o Āhia me ngā motu o ngā *Solomon*, ka noho ērā hei kāinga rua, i a rātou e whakamātautau ana kia tawhiti ake ngā terenga ki roto o Remote Oceania, e taea ai te hoki atu ki reira, mehemea te tūpono ki te raru (Green i roto o Sutton, 1994, wh. 25; Irwin, 1992, wh. 19-25). Ki tua atu i ngā moutere Solomon, he ririki ake ngā motu, ana, kia tauria atu ai ērā wāhi, me mātua whanake ngā hangarau waka me ngā rautaki whakateri, tiro-tiro tohu nō te taiao hoki. Mā reira i taea ai te kawē i ā rātou kararehe me ngā momo tipu. Nā ngā wero i aua wā, ka roa ngā tūpuna Poronīhia e whakapakari ana i a rātou me ā rātou hangarau i roto i ngā terenga ā-motu i ngā motu o Bismarck, i ngā motu o *Santa Cruz*, i Vanuatu me Meronīhia (Irwin, 1992, wh. 5-6, 31).



Ko ngā waka tawhito i aua wā, he waka noa i hangaia ai i runga i ngā hangarau, i ngā rawa me ngā rauemi o aua wā. Arā, he waka i hangaia ki te hiako, ki te rākau, he mōkihi inanga rānei. Ko te waka hiako, ahakoa tawhito rawa, koinei ngā waka i kitea whānuitia ki ētehi whitua o *Sunda*. Ko te waka eke noa i whakamahia ki roto o Āhia, ki roto o Initonīhia tae atu ki Poronīhia, koia tēnā ko te waka i hangaia ki te rākau me te inanga. Ā-hangarau nei, he māmā noa iho ki te hanga, he pakari ki te moana, he hohoro hoki me he paenga hau. Ko ētehi atu waka hoki i whakamahia pea, he mōkihi mānawa, he waka kākaho, he rākau noa, tae atu ki ngā waka kōpapa, arā, ngā waka i keria (Lewis, 1977, wh. 4-7).

Nō roto i te wā, ka whanake ētehi tupu hou o te waka, ko ētehi o aua āhuatanga, ko te hanga o ngā rā tae atu ki ngā pūkenga whakaterere, kia tere whakapae ai te ahunga o te waka. Hei tā Irwin (1992) koia tēnei tāna e mea ana mō ngā hanagrau:

During the development of maritime technology we can envisage several important innovations. An early one was the use of sails to increase the downwind speed of rafts or dugouts. The ability to sail across the wind was probably more important because it involved two further changes: a method of stopping the boat from just sailing sideways rather than forwards, and a way of preventing the wind from simply blowing it over onto its side. The solution to the first in Near Oceania was the use of the dugout canoe, which floated deep enough to provide lateral resistance to leeway, and this was increased by addition of the steering oar. Lateral resistance to capsizing was provided either by the use of an outrigger or a second dugout canoe (double canoe); both were efficient in providing leverage in addition to their intrinsic buoyancy or weight. Another important innovation was the ability to change direction in relation to the wind. Greater safety could be found in increased size and also by building up the topsides of canoes to keep out the sea...As boats gradually developed so too could coastal navigation. Finally, knowledge of how to explore at sea, out of sight of land, and to stay alive. (wh. 43)

Ko te rautaki whakaterere i whāia e ngā tūpuna Poronīhia, koia tēnā, he pai kē kia anga atu te waka ki te takiwā o te iho o te hau, e taea ai te huri ka hoki ki te kāinga, mō te tūpono i uru ki te raru, i kore ai rānei e pae ki tētehi whenua. He ara uaua, engari, he ara whai ora tēnā. Koinei pea te whakautu i tauria ai ngā motu o Poronīhia mā te whakaterere waka (Green i roto o Sutton, 1994, wh. 19-43).

### Ngā Waka o Poronīhia

Nui noa atu ngā waka o Poronīhia i mua i te taunga o Tauiwī ki ngā motu o Poronīhia. I kitea iho e te Pākehā ētehi waka, he roa atu i te toru tekau mita, he pūkenga, he tau, ka pahure ki muri ngā waka Tauiwī i ēnei momo (Irwin, 1992, wh. 43). He rerekē te rahi, te roa, te whānui me te āhua o ngā waka o Meronīhia, Maikorōnīhia me Poronīhia. Ko ētehi, he takere takirua, ko ētehi, kotahi te ama, ko ētehi, e rua ngā ama. Hei tāku, ngā take i rerekē ai ngā āhuatanga nei o ngā waka, kei te homaitanga o te huarere, te karawhiu o te moana, te matara o te haere me ngā rawa o te whenua hei hanga waka.

Rerekē ana hoki ngā āhua o te moana Īniana me te moana Initonīhia tēnā i te moana o Maikorōnīhia e pai ai te terenga o tētehi waka paku ake, he waka whai ama, kotahi te ama, e rua rānei i raro i ngā huarere o aua moana. Engari, mō te whakaterere waka i Poronīhia, arā noa atu te matara hei terenga, me nui ake te waka mō ngā haringa kai, haringa wai, haringa rauemi, haringa tāngata. Koirā pea i huri ai ngā iwi Poronīhia ki te hanga mai i tētehi waka rahi ake, inā te waka hourua. Ko tōna roa, he rima tekau pūtu ki te whitu tekau pūtu te roa, ā, ahakoa tai pūhoro, tai tūārangaranga rānei, tau ana te rere o te waka hourua (Hornell me Haddon, 1936, wh. 326).

Ko ngā momo waka hourua rarahi, pērā i ō Tahiti, i whakapaetia e Cook, e korekore e takahuritia, e pokea, ana karawhiua ki te huarere kikino (Beaglehole, 1962, wh. 366). Ko te hanga o te takere o

ngā waka i Maikoronīhia me Poronīhia, he hanga ‘V’ e taea te tere ki tawhiti. Engari, ko ētehi waka i Aotearoa, i Hawai’i, i Marquesas me ngā Kuki Airani, he hanga ‘U’ kē. Tō tēnei hanga, he pai noa hei terenga ki ngā tāwhangawhanga, haumiri ai te rere, piri ki uta, kaua ki tawhiti. Kei Whīti me Meronīhia noa ngā waka hourua, hanga ‘U’ te takere i pai ai ki ngā moana e tere ana te kārohirohi, ā, kāore hoki ēnei moana i kaha kāwhakina e ngā hau matua (Lewis, 1972, wh. 54-55).

Ko ngā waka roroa, rarahi o ngā iwi moutere nei, ko ērā e kīia ana ko te ‘pahī’, ko te ‘tongiaki’ me te ‘ndrua’. Kei Tonga, kei Hāmoa me Rotuma, ko te tongiaki tēnā. Ko te ndrua te waka matua i Whīti, engari, ko tōna rerekētanga i te tongiaki, he poto ake tētehi hiwi i tētehi, i rite ki te ama tiatia, otirā, he whanaketanga i ō Maikoronīhia waka (Lewis, 1994, wh. 57). Nā wai, ka riro te tongiaki ki te pō, ka ara ko te ndrua te waka eke noa i ēnei moutere. He kalia tō Tonga taurite ki te ndrua nei. I ngā moutere o Society me ngā moutere o Tuamotu, ko te pahī te waka matua (Lewis, 1972, wh. 56-58).

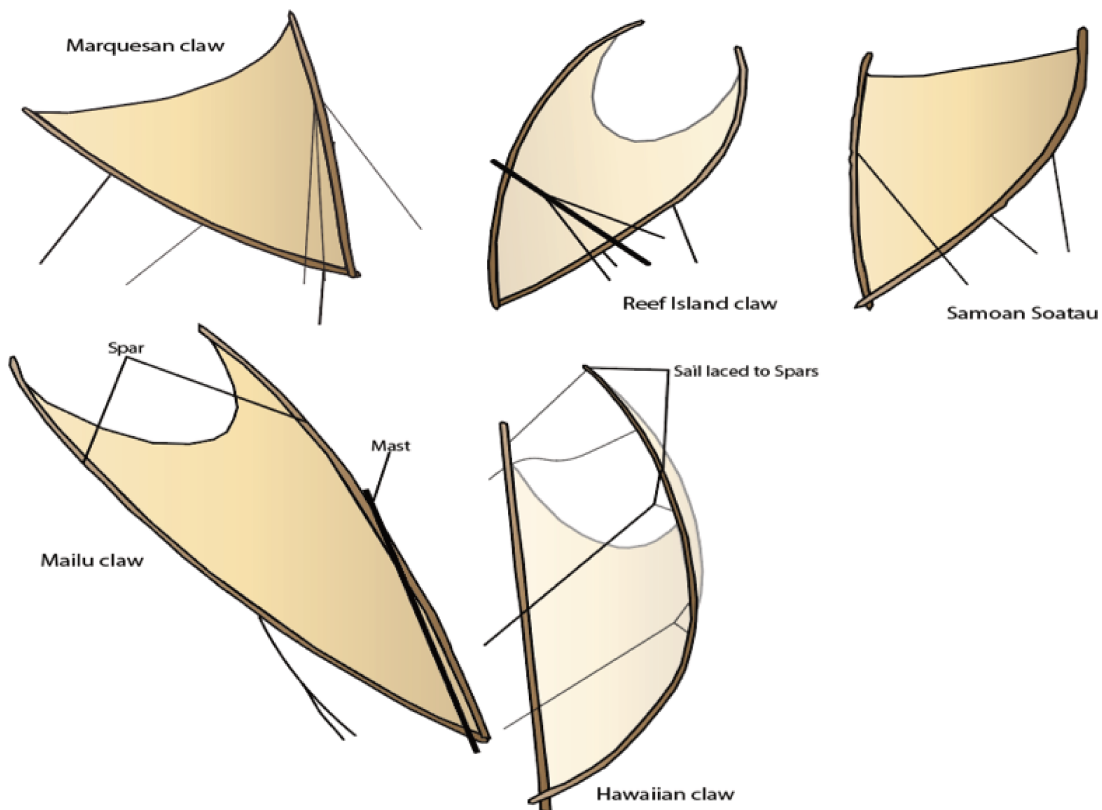
Ko tētehi o ngā rerekētanga nui o ngā waka o Poronīhia me ētehi moutere, inā rā, he mea hanga ngā waka o Poronīhia kia waihape ki mua i te ihu o te hau. Ki ētehi wāhi kē atu, ki roto o Maikoronīhia, he mea hanga kē ō rātou waka kia unuhia te tiratū e taea te whakawhitiwhiti mai i tētehi taha ki tētehi taha. Ko te ihu me te kei o tēnei momo waka, i hangaia kia taurite (Lewis, 1972, wh. 60-61).

Nō ngā tau e rua rau kua pahure, ko te hounga o te ndrua me te tiratū whakawhitiwhiti arā te ‘*raked mast*’. Koirā pea te wā i tīmata ai te tāheke o te whakatere waka ki tawhiti. Ko ngā waka tūtira whakawhitiwhiti, ka pai kē ērā mō ngā terenga ā-moutere ki waenganui i tētehi huinga motu, kaua ki tawhiti me ngā moana pukepuke, me te tere ki mua i te ihu o te hau matua.

E toru ngā rā matua o ngā waka i Poronīhia. Koia ko ēnei; te rā ‘*simple me te boomed lateen*’, te rā ‘*apex-down inverted triangular*’, me te rā ‘*crab-claw shaped*’. I kitea whānuitia te rā crab-claw ki roto o Marquesas me Hawai’i. Ki roto o Tahiti, ko tētehi rā *half-claw* i horapa whānui. E ai ki a Lewis (1994) mō te *crab-claw*:

The claw shape, which may at first site appear fanciful, reveals itself on analysis to be highly functional. The tapering off of the sail toward the claw tips ensures that the sail area to be supported by the marginal spars should decrease away from the point of attachment of those spars...The claw sail was used along the eastern margin of Eastern Polynesia, except in the Tuamotus. It reappears with different masting arrangements, at the extreme west of the Polynesian range - in the Polynesian Outliers, Taumako, and the Santa Cruise Reef Islands (wh. 62-63).

E ngātahi ana te rā *claw* nei me te taunga haeretanga o ngā iwi Poronīhia ki ō rātou motu. Tēnā pea i puta te momo rā ‘*lateen*’ i Maikoronīhia i ngā tau kua pahure noa me te hounga mai o te waka ndrua ki roto o Poronīhia ki te uru (Hornell me Haddon, 1936, wh. 122). Kei raro nei ētehi taurira o te rā ‘claw’.



*Whakaahua 1: Ngā rā 'Claw' (Nā L. Monu i waihanga hei whakaatu i roto i tēnei tuhinga kairangi, 2017)*

I Maikoronīhia, i Pukapuka me ngā motu o Marquesas, he waka whai ama i whakaterea ki reira. Ko te painga o tēnei momo waka, he tere ki ngā motu i roto i te huinga moutere, he hī ika, he terenga potu rānei. Ko ētehi atu waka roroa rawa, kei te āhua kotahi rau pūtu te roroa, he pai hei kawē haringa toimaha, hei hāpai i ngā kawenga rauemi. Engari, ko te waka matua whakatere moana o Poronīhia, koia ēnā ko te tongiaki, te pahī me te ndrūa. I ahu mai te ndrūa mai i Maikoronīhia ki te uru o Poronīhia.

He rā tawhito te hanga mai o te 'crab-claw', ā, kitea ai tērā momo rā ki ngā motu o Marquesas me ngā moutere o te uru o Poronīhia. Te āhua nei, koia tēnei ko te rā matua i roto i te uru o Poronīhia, kātahi ka tāheke te whakamahia i te houtanga mai o te rā 'lateen' mai i Maikoronīhia. Ā, te hanga nei, he whanaketanga anō te rā 'inverted triangular' i roto i ngā motu i te puku o Poronīhia.

#### Te Mātauranga Whakatere Waka

Ko te whakatere waka, koia tēnā tētehi wānanga i runga i ngā titiro me te whakakotahitanga a te tohunga whakatere waka ki te taiao e tau ai te waka i tētehi wāhi ki tētehi wāhi i runga i tōna mārāma me ōna pūkenga ki te pānui i ngā tohu o te taiao. Kia tīkina ake tā Lewis (1994) i whakapae ai mō te āhua o te whakatere waka hei whakatuwhera i ēnei whakamārama:

The first requirement of any system of navigation is to enable the voyager to take his departure and continue toward his objective in the right direction. The most accurate direction indicators for Pacific islanders, still used in many parts of Oceania, are stars low in the sky that have either just risen or about to set, that is, horizon or guiding stars. You steer toward whichever star rises or sets in the direction of the island you wish to visit. In more technical terms, the direction or the bearing of your objective, that is, the course you must follow, is the direction (azimuth

or bearing) of its guiding star, at rise if the course be an easterly one, at set if it be westerly. It seems appropriate to use the present tense in these descriptions, since the art is still a living one. (wh. 82)

Ki ngā iwi Poronīhia o mua, he mate, he ora rānei te whakaterere i ōna terenga tawhiti nunui. Kua oti kē te whakamārama ake, i āta whakamaheretia ngā terenga i runga i te hiahia kia tau atu ki tētehi wāhi, ahakoa tērā, inā kē ngā taero a Kupe hei kokoti iho mā ngā tohunga whakaterere waka o mua. Nā wai, ka tupu whanake ngā pūkenga pānui whetū o ngā iwi Poronīhia kia mātau rātou ki ā rātou mahi, ā, kua kapi kē tēnei āhua i a Lewis (1994) ki ngā rārangi kupu e whai ake nei:

The habitat of the Polynesians and the Micronesians is primarily aquatic. In the third of the Pacific where they dwell, the proportion of dry land, exclusive of New Zealand, is on the order of two units of land for every thousand of water. Few aspects of the history and culture of Oceania can therefore be separated from seagoing. Ocean spaces can inhabit contact, just as mountain ranges can on land, but they become highways rather than barriers when marine technology, especially navigation, becomes effective. (wh. 3)

Tērā ētehi moutere o te Moana nui a Kiwa i kīia ai, he moutere, taupeka noa ‘stop-over’ i ngā terenga roroa. E ai ki ngā kōrero a te Māori, ko Rangitahua tētehi o ērā moutere, e whakapaetia nei, i peka a Kurahaupō ki reira, ā, nā wai ka tau atu te waka Aotea ki te hāpai i ētehi o rātou. Kei Rangitahua hoki te tī pore e tupu ana, he mea kawē tēnā rākau e ngā iwi Poronīhia ki ngā motu, huri noa i te Moana nui a Kiwa (Prickett, 2001, wh. 21). Hāunga te rākau tī pore, kei reira hoki te kiore me ētehi kitenga o ngā maramara puia nō Aotearoa. Ko Rangitahua te moutere i peka ai ngā tūpuna ki reira, i ō rātou terenga ki Aotearoa, i ō rātou hokitanga rānei mai i Aotearoa ki Hawaiiki (Howe, 2008, wh. 178). Ehara ēnei kōrero i te hou ki te ao Māori, kua roa e mau ana i te hue kōrero tuku iho, ā, ko ēnei kitenga pūtaiao nei te whakaū noa nei.

### Ngā Pūnaha Whakaterere Waka

Uia mai rā te pātai, e whia ngā pūnaha mātauranga whakaterere waka a ngā iwi o te Moana nui a Kiwa? Kua whakatakotohia e Turnbull (2000), ko ōna whakaaro mō ngā pūnaha whakaterere waka, kotahi te pūnaha, e rua rānei:

...the Micronesian and the Polynesian, whether there is a variety of local systems based on island groups, and further, whether there is a significant difference between schools of navigation on particular islands...The evidence seems to me to suggest that there are significant differences between the systems precisely because they are local in that they incorporate environmental knowledge specific to the region in which they operate. However, they all have a common feature suggestive of a common origin; the use of the rising and setting points of stars to name divisions of the horizon. (wh. 135)

Hāunga ngā pūnaha e meatia nei, e mārāma ana ngā tuituinga kōrero whakaterere waka, i pūtake ēnei mātauranga i whea. Ko te whakatinanatanga o ēnei mātauranga, koia tēnā, ko te rā, ko ngā whetū, ko te kapua, ko ngā āhua o te moana, ko ngā hau, ko te rere a te manu, ko te taiao whānui tonu (Finney i roto o Howe, 2006, wh. 156).

### Te Whakatau i te Ahunga o te Waka ki te Whenua

Manomano ngā tau i pahure, e rapu ana, e tauhokohoko ana, e whakaterere ana, ka tupu whanake te pūnaha mātauranga whakaterere waka nei. E toru āna take matua. Tuatahi, ko te āhehi ki te whakatakoto i tētehi mahere whakaterere mai i te whenua. Tuarua, ko te āhehi ki te whakaterere mā te taiao ki runga i te moana, kia ū te waka ki te whenua e tauria ai, kia tika ngā whiriwhiri o tōu taunga ki te moana, kia tika hoki ngā whakapae o te tawhiti i pahure ki muri. Tuatoru, ko te ū pai o te waka ki te whenua i whakamaheretia ai



kia tae ki reira i tōna whakarewanga tīmatanga.

Arā noa atu ngā kohinga kōrero a David Lewis mō ngā ‘signposts of nature’, i tautoko ai i te whakapae a Denning i roto o Golson (1962) mō te painga o te rere a te manu pūkahu moana, pēnei me te *boobie* hei tohu i te ara, kei raro rā te whenua e tau ana (Lewis, 1972, pwh 209). Ka oti ana te whakatau i te ara e ahu ai ki te whenua, kātahi ka whakamaui ngā tohu whenua, pērā i te rākau, i te maunga rānei, nā te teitei o taua taonga rā, kua noho tērā hei tohu mau nawenawe ki te whenua e taea te whakaterere mā te tiro whakamuri ki taua taonga rā (Irwin, 1992, wh. 45). Nō roto i te ahiahipō i rere ai te waka, kua puta ētehi whetū tīramarama, ana, ka whakamahia taua tīramarama hei whakakotahi i ngā tohu whenua ki ētehi whetū o te rangi, ka pō ana, kua tika te haere i ērā whetū i whakatauria ai i mua. Tērā rānei, mō te ata hāpara kē rere ai i runga i aua āhuatanga tonu (Parsonson, 1962, wh. 43). I ngā motu o *Gilbert*, o Tonga, o ngā Kuki Airani, i tū i a rātou he kōwhatu tohu whenua hei whakamaui, hei āwhina i te tohunga whakaterere waka, i a ia ka wehe, ka hoki rānei (Hilder i roto o Golson, 1962, wh. 84-88).

### Ngā Whetū Rere Pae

Mahuta mai ai te whetū rere pae i te rāwhiti ka tō ai ki te uru, ki te nunumitanga i te pae, huri ngā tau, huri ngā tau. Ko te rerenga kētanga noa, ko te wā i tōna mahutatanga ki te tōnga; e whā mēneti te rerenga kētanga i muri i tō te rangi i mua noa nei. Whakamaheretia ai ngā ara whakaterere waka mā te āta whai i te rere o ngā whetū e mahuta hāngai mai ai me te takoto o te whenua e manakotia ana.

Ko te wā i tīkina atu ai ngā whetū hei āwhina i te terenga o te waka, ko te aranga paku mai i te pae kia kore ai te titiro e rangirua i te kapua me te kōrehu. I tōna mahutatanga ka rere whakapae i te rangi, kātahi ka tīkina he whetū anō i taua wāhi tonu i mahuta mai ai te mea tuatahi i mua i a ia. Te nuinga o te wā, i taea te whakamahi i ngā whetū ekuatoria me ōna kāhui i te wā e whā tekau mā rima tākiri tōna taunga ki runga i te pae. Ka whakamahia ētehi atu whetū tae noa ki te wā, tekau mā rima tākiri tōna taunga ki te pae nā runga i tōna heke mai i te weheruatanga o te ao.

Ko ngā whetū kei ngā ahopae teitei ake e mahuta mai ana, e tō atu ana hoki i waenganui i te poutūmārōtanga me te weheruatanga o te ao, he uaua ake te whakamahi.<sup>1</sup>

Ko te maha, te iti rānei o ngā whetū, me puaki mai i te rangi hei āwhina i te waka, kei te āhua o te ahopae i tōna mahutanga ake. Kei te weheruatanga o te ao, koia tēnā ko Tautoru e piki rā i tōna piki, he tata ki te tākiri kore, hāunga tērā, e pai tonu ana tērā kāhui hei whetū āwhina i te waka mō tētehi wā roa tonu. Mō tētehi pō e tere ana te waka i tētehi ahunga kotahi, e taea te whakatutuki i taua terenga i runga i ngā whetū tekau mā rua te maha, ā, i ētehi terenga, i runga i ngā whetū e rima noa iho. Kāore e neke atu i te tekau hāora te roa e whai hua ai taua whetū ki te terenga o te waka, ā, ki te ngaro tētehi whetū i te kākahu o te kapua ki ētehi wāhanga o te rangi, kua tīkina ētehi whetū kei mua kē, kei te tauihu, kei te kei rānei, kei ngā wāhi katoa rānei o te waka. Kua taea hoki te tiki atu i ētehi whetū maha tonu ka whakahāngai ai ki tētehi wāhanga o te waka tonu. I whai hua tēnei momo whakamahi i aua whetū i ngā terenga rapu whenua, nā te mea, kua mārāma ki ngā whetū ki mua, ki muri hoki, tērā rānei mō te tūpono, me hoki whakamuri te waka ki te whenua i ahu mai ai (Irwin, 1992, wh. 45).

Mo ngā whetū e pou titi nei ki te rangi, ahakoa kei te tuakoi tonga, kei te tuakoi raki rānei, kāore e tino whakararu i te tohunga whakaterere. Inā rā, ka mau a Māhutonga ki te pou tonga, ka mau hoki a Hōkūpa’a (*Polaris*) ki te pou tūāraki. Rere ai a Tautoru i te rāwhiti ki te uru i tōna kātata ki te weheruatanga o te ao. Nā, ki te piki whakateraki, ki te heke whakatetonga rānei te tangata, ka teitei ake, ka heke iho rānei a Māhutonga, a Hōkūpa’a rānei ki tō te ahopae o te tangata e whakamaui atu ana ki te rangi (Kyselka, 1987, wh. 42-44). He āwhinatanga nui hoki tō ngā whetū, mēnā he teitei ake tōna hekenga i te weheruatanga o te ao, pērā i tō Māhutonga, e mea ana a Irwin (1992) “The Southern Cross, for example, rises inclined on one side, appears vertical when directly south, and then inclines on its other side when setting” (wh. 45).

I te wā e tere ana te waka, kāore e tino rerekē te neke o te whetū rere pae, ki tā te tohunga whakatere tiki atu i taua whetū rere pae hei āwhinatanga mai. Inā rā, ko te whakamau atu i te whetū e tō ana i te rua rau, e rua tekau mā rima te tākiri, i tētehi terenga e rua mano māero te tawhiti mai i Tahiti ki Aotearoa. Ko tōna rerenga kētanga i tā te tohunga whakamau atu i a ia, ko te toru noa te tākiri i te roanga atu o taua terenga (Lewis, 1964, wh. 366-367).

Ahakoā kāore anō i kitea iho tētehi kāpehu tawhito puta noa i roto o Poronīhia, tērā ētehi kōrero e mea ana, he kāpehu anō ā ngā iwi Poronīhia, engari, kāore i rite ki tā te Pākehā. E mea ana a Finney i roto o Howe (2006):

Navigators from the atolls of the Caroline Islands of the Federated States of Micronesia employ a conceptual construct of stars and bearings called naang in the language of Satawal, a term that literally means ‘heaven’ or ‘sky’. This is generally known in English as a ‘star compass’, though unlike the mariner’s magnetic compass it is not an instrument...it is an abstract image of the horizon star bearings that navigators carry in their minds. (wh. 160)

Ko te tino tikanga o te whai i te whetū rere pae ki tā te pūnaha whakatere waka o Poronīhia, koia tēnā, ko te whakatakoto i te ahunga hei whakamahere, hei whakaū hoki i te tika o te terenga o te waka.

### Ngā Whetū Kōmata o te Rangi

Whakamaua atu ai ngā whetū kōmata o te rangi i tōna pikinga ki te poutūmārōtanga o te pō. E taea ana te whakamau atu i ēnei hei tohu i te ahopae, nā te mea, he tata te rite o tōna heke i te weheruatanga o te rangi, o tōna *azimuth* rānei ki tō te whakaaro Tauīwi mō te ahopae. He tino whai hua ēnei momo whetū, mehemea rā, ka piki te whetū ki tōna poutūmārōtanga i runga ake i tētehi moutere. Mehemea ka pērā te whakamau i aua whetū, he toru tekau ki te ono tekau māero rānei te tika o taua whetū ki te takoto o taua moutere. Ko te mahi tino nui, ko te whakatau, he pēwhea te tawhiti o te waka ki te rāwhiti, ki te uru rānei. Engari, ka mārama haere tēnei āhuatanga, inā ka kitea ake ngā whetū kōmata o te rangi i runga i tētehi whenua kei raro e tau ana. Nā te pātata ki taua whenua tae atu ki ētehi tohu kē hei āwhina i te tohunga whakatere ki te tiki atu i aua tohu e puta ai te māramatanga, kei whea tōna waka e tau ana (Gatty, 1943, wh. 98; Frankel, 1962, wh. 43).

### Te Rā me te Marama

He āhua rite te whakamahi i te rā me te marama, pērā i te whakamahi i te rere o te whetū rere pae. Ko te rerenga kētanga o te aranga me te tōnga o te rā mai i te rāwhiti me te uru, koia tēnā ko te rua tekau mā toru, irakati rima te tākiri ki te raki me te tonga i ia tau. Engari, tō te marama kia tō te rā, ko tōna rerekē, he rima te tākiri ki te raki me te tonga, nā te mea, tāna mahi, he huri taiāwhio i te ao kia tekau mā rua āna huringa i te tau. Ahakoā, kāore te rā i ū pūmau ki te raki, ki te tonga rānei, hāunga ngā wā o te pahore o Rehua, ko te hua o te rā, kei tōna aranga mai me tōna tōnga iho me te whakahāngai i a ia ki ngā whetū.

### He Manu

He uaua te kite ake i ngā moutere ‘*Low coral islands*’, ahakoā ngā rauemi hou whakatere waka e whakamahia ana i te rangi nei. Ko ngā motu iti nei, kāore e teitei ake i te rua mita ki runga ake i te kahu o te moana, ahakoā pēwhea, te teitei o te kōuka, e whitu tekau mita e tū whakatiketike ana, ka nui te rehurehu o te titiro kia kitea ai taua mea rā, ahakoā tekau māero, neke atu rānei te matara o te waka ki te moana, e anga atu ana ki tētehi motu iti. Engari, ko ōna tohu nui, ko āna taonga, nō te taiao, pērā i te manu noho mātārae ki taua motu. Tā te momo manu nei, he tohu i ngā ara e tau rā ki te whenua, arā tāna mahi i te ata, he rapu kai, i te ahiahi pō, he hoki ki te whenua. Koia tēnā, he whakaatu, kei whea ngā ara ki te whenua.

I roto o Poronīhia, ko ngā momo manu hei whai, ko ngā *noddies* me ngā tara pīrohe. Ērā manu, e rua tekau nuku atu ngā māero tana rere ki tai, ka hoki ki uta. Tērā hoki ngā *boobie* e kitea ki waho, mai i te



toru tekau ki te rima tekau ngā māero te tawhiti i te whenua. Engari, me whai i te kāhui *boobie*, kaua i te takitahi. Ina kitea ai ngā kōpū kura, kua mōhiotia, kei te āhua toru tekau māero te tawhiti i te whenua; ko ngā *boobie* waewae whero me ngā *boobie* kanohi kikorangi, neke atu i te rima tekau māero ki te kotahi rau māero tana rere ki tai; ko ngā manu tahi, ko ia te manawa roa o ngā manu tere moana, neke atu i te kotahi rau, e rima tekau māero te tawhiti i a ia ka rere ki tai. Ko ētehi manu, pēnei i te *boobie*, e ai te kōrero, he mea rere ki tai ki te titiro mahira ki ngā kaupuke. Tērā pea he manu hoki i ngā wā o mua i ākona ki te rapu whenua. Heoi anō, hei tā Lewis, tūturu, i ākona ngā manu ki te kawē kōrero, nuku atu i te kotahi rau, e ono tekau māero te tawhiti i waenga nui i te moutere o Nauru me Banada (Lewis, 1972, wh. 208).

Ko ngā manu e rere i Poronīhia ki Aotearoa, i tō rātou hekenga ā-tau ki te tonga o Poronīhia, ko te pīpīwharaua, te kuaka, te huahou, te hākoakoa me te hākēkeke (Lewis, 1972, wh. 214-215). Heoi anō, i kōrerohia e au ētehi whakatūpatotanga mō te pīpīwharaua i te wāhanga o te upoko tuarua.

O ngā manu e horahia ake nei, ko te pātai a te ngākau e pēnei ana, he aha ngā momo manu o uki, i rērere i uta ki tai, i tai ki uta i mua i te kani mīhini a Tauiwī? I mua noa i te ōhanga ngāherehere, hokohoko rākau o te ao? Nō te patunga o ngā ngāherehere e te tangata i Aotearoa mō te ōhanga te take, kua pēwheatia ngā manu rere tawhiti i kitea e ngā tūpuna i tō rātou wā. Koinei te aroha ake ki te taiao, ngā pānga tapuwae o te iwi tāngata ki te whenua me ōna taonga. He wā anō pea, he rangahau kē tērā.

### He Kapua

Ko te hanga me te tae o ngā kapua tētehi tohu anō hoki ki te takoto o tētehi whenua. Ko ngā kapua i tau ki runga i tētehi motu iti, tērā e rerekē te tae o aua kapua, nā te ātārangi o te motu i pā ki te papa o te kapua. Inā e pātata haere ana te waka ki te whenua kei raro i te pae, tērā e mārama haere te mura o te tae o te kapua, e taea te kite i taua mura o te tae, mai i te tekau mā rima ki te tekau mā whitu māero te matara i waho, kei te moana e tau ana. Tērā e āhua kākāriki, māwhero rānei te tae o te wāhanga whakarunga o te kapua i runga i te tae o te ākau. Mehemea he mā rawa, he mārama rawa rānei te mura o te kapua, kei raro te one mā, te ngaru whawhati rānei. Mehemea, kei runga te kapua i tētehi whenua e maroke ana ngā ākau, ngā mānawa rānei, kua mura te mārama o te kapua, mehemea rānei, kei runga ake te kapua i tētehi whenua e muia ana ki te tupu o te rākau, he uriuri kē te āhua. Heoi anō, tērā rānei he kaha ake te mārama o taua kapua, tēnā i tana tae (Lewis, 1972, wh. 216-221).

Tētehi āhuatanga anō o te kapua uhi whenua, tēnā i te kapua uhi moana, he pōturi ake tana rere i te rangi. Inā whakamau te titiro ki te kapua uhi whenua, anō nei, kua tū noa iho ki te rangi, kua wāhia rānei, ka whakakotahi anō ai i tōna wā. Ana pūkerikeri ai te hau, ko te otinga, he kapua i hora, tērā e kitea iho he kapua hanga ‘V’ nei e tau ana ki runga i tētehi motu iti. Engari, ana paki te rā, kua hanga rerekē, he hanga tukemata kē tōna āhua. Ahakoa ka memeha, ka rerekē rānei te hanga o te kapua ‘V’, mau tonu iho te wāhanga whakararo o taua hanga kapua ki runga i te whenua, kei raro e takoto ana. Ki ētehi rangi paki, tērā e kitea te ‘loom’<sup>2</sup> mai i te toru tekau māero te matara kei te moana, e puta mai ana taua ‘loom’ ki runga i te motu iti me tōna hāpua (Lewis, 1972, wh. 222-223).

### He Amotai

Tā te amotai, tāna kaupapa e pā nei ki te tere o te waka, e taea e te tohunga whakaterere te whakaū i te ahunga o te waka mā te ritenga o te amotai. Ka pupuhi ana te hau matua o Poronīhia, ka pupū ake ai ngā amotai matua, inā rā, he ngaru nō te rāwhiti, nō te raki mā rāwhiti rānei, nō te tonga mā rāwhiti rānei. Ko tētehi mea anō, kei te Moana tāpokopoko ā-Tāwhaki, ka rokohina ko ngā hau ā-uru e karawhiu ana i ngā amotai nō te tonga ka horapa whakateraki, whakawhiti ai i te weheruatanga o te ao. Ehara te amotai i te ngaru. Tō te ngaru, tōna āhua, he hua nō tētehi/ētehi momo hau rānei, ā, he whati hoki tāna mahi. Engari, ko te amotai, he nui, he iti rānei, he poto, he roa rānei, he hanga kē rānei, he tere, he pōturi rānei, ā, mā te āta mātakitaki i ōna āhuatanga e puta ai he tikanga e taea te kite me te rongō. Ana tuki mai ai te amotai ki te tinana o te waka, ka neke te waka i ētehi neke, arā, ka tikoki, ka tiripou, ka kōpekapeka

rānei (Lewis 1972, wh. 124-130).

### He Amotai Whenua

Tētehi tikanga whakahirahira hei tohu i te takoto o tētehi whenua, koia tēnā ko ngā amotai whenua e hua ai he māramatanga mō te pātata te matara rānei o te whenua. Ko tā Lewis (1972) e mea ana “...whereas deep sea navigation, with reference to ocean swell, relies largely upon the swells being constant and free from interference the technique of interpreting land swells is dependent upon patterns of landmass interference” (wh. 181). Tērā ētehi huanga e rua ka puta, ana wāhia ngā amotai e te takoto o te whenua. Tuatahi ake, ka whakahakoko te amotai i te tuki ki te whenua, ka huri whakapae ai te rere o te amotai me te whenua. I konā, ka wāhia te amotai, ka rere, ka ngātahi anō te amotai ki te taha hau kore o te motu. Tuarua, ana tuki ai te amotai ki te whenua, i tōna tuinga ka takahuri whakatemoana ai taua amotai ki te amotai matua e pari mai ana. He nui ngā rerekētanga o ēnei āhua e rua i runga i te rahi me te hanga o te whenua me te ahunga o ngā amotai. Ahakoa ēnei wero, mōhio tonu ngā tohunga whakaterere ki ngā iarere matua me te pānui i ēnei āhua e mārama ai te titiro i tōna pātata ki te whenua (Lewis, 1972; Kāne, 1984).

### Te Urungi i te Waka

Kei ā te ata hāpara me te ahiahi pō ngā wā whai hua hei whakawhirinaki atu ki ngā homaitanga o Tamānui-te-rā. Heoi anō, ki te piki ake te rā ki tētehi pikinga teitei, kāore e tino whai hua te tiki atu i a ia hei tohu papai mō te waka, kua tīkina kē ngā amotai, ā, me te rere o te hau. Kia whai hua ai ngā homaitanga o te rā me te hau, me mātua mātakitaki tahi i te hononga o ngā taonga katoa, inā rā ngā whetū, te rā, ngā hau me ngā amotai (Finney i roto o Howe, 2006, wh. 158).

Tētehi titiro anō, hei tā Diaz (2012) he whakatakoto i tētehi tikanga iwi taketake moana, tā ngā tūpuna i whai ai, i taea ai e rātou ō rātou moutere o Poronīhia. Ko te tikanga nei, he hongī mā te ihu:

In order to augment if not challenge canonical methods still heavily reliant on literacy and visuality and on other commonplace rhetorical and aesthetic conventions. For if Bernard Smith helped us to understand the extent to which Western art and evolutionary sciences relied on, even pioneered, visual conventions in their efforts to comprehend and represent that specific type of landscape called the Pacific Island – including its flora, its fauna, and its inhabitants and their cultures – then perhaps it is time we ask ourselves just what kinds of memories might be triggered, and what kinds of fights must be waged with whom, by learning to smell Islander cultural and political pasts as a form of politicized historiographical practice. (wh. 326)

Hei tāpiritanga, ki tā Diaz anō (2012) ki ngā tikanga whakaterere waka a ngā iwi *Carolinian*, tērā te kōrero e mea ana, e taea e te tohunga whakaterere te hongī i te moutere i mua noa atu i te kite ake i taua moutere. Hei tauira, e taea e te tohunga whakaterere te hongī ake i te momo kakara o tētehi moutere i ōna tupu, i ōna hua rākau rānei. E mea ana ia “...the Polowatese navigators have claimed the ability to identify Nama because of its papayas. The pungent scent of ripened breadfruit is another traditional clue to the presence of land” (wh. 33).

He titiro taketake tēnei e kawea ana e Diaz e whakatauirā ana i te kaha o ngā rongō i whakangungua e ngā tūpuna, pēnei me te whakakoi i te ihu. Ki ētehi motu ririki, ka kore he pae maunga, he rae whenua, he puke taumata hei whakamau ake, mai i te moana, ka riro mā te kakara o te moutere e tohu mai, kei whea rā te whenua e tau ana.

Te taha ki te wahine i runga i te waka, ki ngā iwi *Carolinian* anō, he whai take matua te kakara o te wahine, i a ia ka pāngia ki tana mate ā-marama. Mē tūpato te waka ki tēnei āhuatanga, nā te mea, ko taua kakara, he kukume i ngā wairua toimaha, i ngā wairua kikino ki te aroaro o te waka.

Tērā ētehi tauira anō o te ‘hongī i te kakara o te moutere’, kāore i tino pā ki te hongī o te ihu, engari, e



pā tonu ana ki te wāhanga o te tinana e puta ai tētehi kakara, ā, ko te hāngai tēnei ki ngā raho o te tāne. Hei tā David Lewis, i āta noho ia i te taha o tētehi tohunga whakaterere waka nō Kiribati, tāna e mea ana mō te tohunga nei “...in deducing the clues of the calmest of seas, where the most sensitive balance was his testicles, and that when at night or when the horizon was obscured, or inside the cabin this was the method used to find the focus of the swells off an island” (Lewis, 1994, wh.127). Ko tētehi anō, me ngākau tapatahi te tohunga me te waka. Tērā te uiui a Raymond de Brum i tana Pāpā, he tohunga whakaterere nō ngā moutere o Marshall, e āta whakamārama ana i tēnei āhuatanga i roto o Howe (2006):

We older Marshallese people navigate our boats both by feel and sight, but I think it is knowing the feel of the vessel that is the most important. The skipper who understands the motion or feel of the boat can sail in the dark as well as in the daytime.

There are many different kinds of waves. When a man understands them, they will help him find his way over the ocean in any kind of vessel. First, he is guided by the feeling he gets as the boat moves along; then the look of the waves verifies what he has learned from the vessel's motion. The slightest difference in the movement of a boat has significance in indicating proximity to land and the direction where it lies.

By the boat motion and the wave pattern a Marshallese sailor who has been trained in this kind of navigation may know if he is thirty miles, twenty or ten, or even closer, to an atoll or island. He also knows if he has lost his way, and by looking for a certain joining of the waves, he will be able to get back on his course. (wh. 174)

Nā reira, ehara mā te rā me te hoe peperu noa iho e urungi te rere o te waka, i kō atu i tēnā, ka whirinaki atu ki ngā āhuatanga Māori nei i horahia ake rā.

#### Te Ahupou me te *Dead Reckoning*

Ko te tikanga o ngā rārangi whakarara, he tohu i te tawhiti taurite o ngā takarangi ki te pou tūāraki me te pou tonga hoki, ā, ka heke te tawhiti ki ngā kōmata ahopou i te neke matara atu i te weheruatanga o te ao ka pūtahi ki te pou tūāraki me te pou tonga. Ko te wā te take matua, tēnā te ine i te ahopou. I puta te taputapu ine ahopou i te wā i a *Cook*, engari, i mua atu i te taputapu nei, mā te ine kē i te marama me ētehi whetū e mōhio ai te kaumoana ki te ahopou. Ki te reo Pākehā “...the resultant angle gives an estimate of elapsed time based on the moons progress through the stars of about thirteen degrees every twenty four hours. This method was, however, notoriously inaccurate among European navigators” (Hilder, 1962, wh. 95-96).

Kāore e kore i tutuki ēnei uauatanga i ngā iwi Poronīhia mā te whai i ngā homaitanga o ngā whetū rere pae, ā, kia puta rawa he hīnātoe i ngā whetū kōmata o te rangi me te ahopae tika ka huri ai ki te ara whakaterere kei raro rā te whenua e tau ana (Frankel, 1962, wh. 43). E mea ana a Lewis (1964):

...the smaller island destinations were enhanced in size as targets because landfall over long distances took place on ‘island groups’ rather than individually smaller targets. Possibly the main point is that precise location is less important than leaving and arriving. (wh. 367)

Tētehi atu huarahi hei whakatau i te ahopou, koia tēnā ko te ‘*dead reckoning*’. Ko tā te mātauranga whakaterere waka, he whai i ngā tohu o ngā whetū, i te rā, i ngā hau me ngā tikanga amotai. Mā tērā pūnaha whakaterere, ka puta ko te marama ki te ‘*directional maintenance of a course or heading*’. Engari, ko tētehi whakapōrearea i te pūnaha nei, ko te reti tītaha o te waka i runga i te ‘*current set*’, i te ‘*leeway*’ i te ‘wind drift’ rānei. Ko ngā tikanga hei whakatika i tēnei reti tītaha, koia tēnā e kīia nei ko te ‘*dead reckoning*’ (Lewis, 1972, wh. 139-141). Hei tā Irwin (1992), e rua ngā wāhanga o te tikanga nei, “... dead reckoning has two elements; direction and distance. Direction is the maintenance of a controlled

course taking into account set and leeway, while distance is calculated by estimates of speed and time” (wh. 46).

I āta tirohia e ngā tohunga whakatere waka ngā iarere me ōna tini āhua, me tōna pānga ki ngā tikanga hau ki roto i ō rātou ake moutere me ngā huinga moutere e pātata mai ana ki a rātou. E whai ake nei tā Lewis (1972) whakamārama ake i te tino tohunga whakatere, ki tāna titiro:

...familiar with such home centred observations and trained also in more general deep sea lore like the relationship between currents and prevailing winds, would be well able to couple together the two sets of data. His deductions would enable him to head out across unfamiliar waters with a reasonable idea of the current set likely to be encountered. In this he would be aided in no small measure by the aforementioned tendency for heading errors due to short term current fluctuations to neutralise each other. (wh. 104-105)

He nui ngā kōrero kua horahia nei e mea ana, i āta whakamaheretia ngā ara whakatere i mua noa atu i te puta ki te moana, kua whai whakaaro hoki te tohunga whakatere ki te reti tītaha i hua ai i ngā iarere. Ko te kiko o aua whai whakaaro, he whiriwhiri pea rānei i ētehi tohu whenua e taea te tiro whakamuri ki aua toanga, he whiriwhiri rānei i ētehi ara whetū, me te whai whakaaro mō te reti tītaha o te waka.

#### Te ū ki te Whenua

Ko tā ngā tohunga whakatere waka mā te taiao, he whai i ngā tohu o te taiao, ā, mehemea e whāia ana ko ngā motu iti, kua whakamahia ngā motu iti e karapoti ana i taua motu e manakotia ana, koia tēnei he ‘*expanded target*’. Nā ēnei ‘*expanded targets*’ ka hua ko ētehi āhuatanga kē e kīia nei he ‘*island block*’, he ‘*screen*’ hoki.

Kia tirohia ngā motu iti nei, he uaua rawa e rokohina ai, engari, e taea te whakarahi i taua motu iti mā te whai i ētehi tohu taiao, kei te āhua toru tekau māero te tawhiti mai i taua motu iti rā. He uaua kē te rapu me te kite i ngā motu nui otirā, kua korekore ngā ‘*screens*’ hei tautoko i te arotake a te tohunga i ngā tohu taiao kei mua i a ia (Lewis, 1972, wh. 198-199).

#### Te Lapa

Ko te ingoa ‘te lapa’, i puta mai i ngā moutere o *Santa Cruz*. I roto o Maikoronīhia, ko te ‘mata’, i Tonga ko te ‘ulo eetahi’ rānei tēnei āhuatanga. Hei tā te tohunga whakatere o *Santa Cruz* a Te Vake ki a Lewis (1994), ko te lapa:

Tevake described te lapa as “underwater lightning,” and I think this is an excellent analogy. It comprises streaks, flashes, and momentarily glowing paques of light, all well beneath the surface. Exactly like lightning, it flickers and darts and is in constant motion. It occurs a good deal deeper down than common luminescence, at anything from a foot or two to more than a fathom. The phenomenon acts all the same as a compass to show where land is, for it flashes dart out from the directions in which islands lie, or else flicker to and fro in line with these bearings. As you approach land, it becomes scanty and finally disappears by the time the island if an atoll is well in sight. (wh. 253)

Ko tōna āhua, mehemea kei tawhiti te waka e haere ana, he kaha ake te puta mai o tōna hikohiko, tēnā i te pātata mai ki te whenua, kāore e pērā rawa te kaha hikohiko mai. Hei tauira ake, mehemea kei waho te waka, nuku atu i te kotahi rau māero i te whenua, ka nui te mārama o te hikohiko, ā, e āta haere ana i roto i te wai. Engari, kia pātata mai ki te whenua, tekau ki te rua tekau māero rānei te pātata mai, ka rerekē tōna whakaatu mai, he hohoro, he tītahataha haere (Lewis, 1972, wh. 253-254).



## Etak

Mai anō, tairanga te rongō mō te pūkenga o ngā tohunga whakaterere waka nō Maikoronīhia. Hei tā Diaz (2015), “Since the 1970s, navigators from Polowat and Satawal have become famous for continuing to carve and sail outrigger canoes using ancient methods that continue to illustrate radical cultural alterity.” (wh. 97)

E whai ake nei ngā tauira e rua o ēnei pūnana Maikoronīhia e kīia nei ko etak me pookof. He pūnaha tūturu taketake te etak, ā, ko tāna, he whakatau i te tawhiti o te haere kua pahure, i te taunga rānei o te waka ki tai. Kia tīkina ake te tauira a Diaz (2015) nō roto i te kura wānanga mō ēnei mātauranga, ko tāna whakamārama ake i te pūnaha etak e mea ana:

Typically translated as “moving islands”, etak is the technique for calculating distance travelled, or “position at sea” by triangulating the speed of the islands of departure and destination with that of a third reference island. This is accomplished, furthermore, by plotting their positions in the celestial sky as a veritable map for the world below. A map and time piece, a way of negotiating emplotment in time/space or more precisely, a way of conceptualizing time/space in order to fix one’s place, etak was a critical technological development, along with outrigger design and technology, asymmetrical hulls, and the inverted lateen sail, that permitted humans to traverse over four fifths of the globe’s Southern Hemisphere millennia before Europeans ventured from sight of their shores. In theory and practice, it works like this. First you steer toward the stars that mark the island of your destination. While doing so, you also back sight your island of departure until you can no longer see it. At the same time, you also calculate the rate at which a third island, off to the side, moves from beneath the stars where it sat when you left your island of departure toward the stars under which it should sit if you were standing in the island of your destination. (wh. 97-98)

Kia whakarāpopotohia te pūnaha etak, ka tirohia te tauira i raro nei hei tāpiritanga mai, ko tā Lewis (1994) e kī ana:

The canoe is conceived as stationary beneath the star points, whose position is also regarded as fixed. The sea flows past and the island astern recedes while the destination comes nearer and the reference island moves back beneath the navigating stars until it comes abeam, and then moves abaft the beam. (wh. 175)

Nō reira, ko te etak, he whakamatua i te hiranga o te maumahara o te hinengaro iwi Poronīhia. E taea ai tēnei pūnaha i runga i te kaha, i te rahi, i te whānui o te pātaka whetū e putu nei ki te ihomatua o te tohunga whakaterere. Hei tuitui i ngā whakamārama mō etak, kia tīkina ake te kupu whakamutunga a Gladwin (1970) hei whakaū i te matū mō etak, ko tana tino kaupapa:

...to provide a framework into which the navigator’s knowledge of rate, time, geography and astronomy can be integrated to provide a conveniently expressed and comprehended statement of distance travelled. It is a useful and deliberate logical tool for bringing together raw information and converting it into the solution of an essential navigational question, “How far away is our destination”. (wh. 186)

## Pookof

Ko te tikanga tuarua nō Maikoronīhia, ko *pookof*. Hei tā Diaz (2011) ko te *pookof* te:

...inventory of creatures indigenous to a given island, as well as their travel habits and behaviour. When you see a given species of bird or fish, and you know who belongs where and most especially, their travel habits - the pookof of an island - you also know into whose island home

you have sailed. Thus are islands known by distance of the furthest travels of their indigenous creatures. (wh. 27)

Ko te whānuitanga ake o *pookof*, koia tēnā ko te toro o ētehi atu taonga nō te taiao, pēnei i tā Diaz (2011) e mea ana:

The notion of expanding an island includes knowing things, like the distinct look of clouds above and around an island, the character of currents and waves as they deflect around islands, and of course, the group of stars associated with an island and the range of stars under which an island can travel, as for instance, in *etak*. (wh. 27)

Nō reira, mai i te whakaaro whakatiketike o *etak* me *pookof*, ka mea a Diaz (2011):

...we might say that 1) islands are mobile, 2) that they expand and contract, and 3) that their coordinates in time and space are emplotted via the farthest reaches of their indigenous creatures. From this vantage point, we cannot say that islands are isolated, tiny, and remote, regardless of how they have been defined, and thus marginalized, in western historical and cultural and natural cartography. (wh. 28)

Whakamīharo ana ki a au ngā pūnaha Maikoronīhia nei, he māori, he taketake. E kite ake nei i te tūturu whakakotahitanga o te iwi ki tō rātou taiao me ōna taonga, ōna tohu. Ki tōku whakaaro, koinei te āhua o ngā mahi a ngā tūpuna Māori i te wā e tōpū ana rātou i te mātotorutanga o tō rātou mātauranga whakaterere.

Tō te *Carolinian* Mātauranga Whakaterere Waka mā te Taiao

Ko ngā tohunga whakaterere waka o ngā motu iti o ngā moutere *Carolinian*, ko tā rātou, he hanga i tētehi whare whetū ki roto i te hinengaro tonu e kīia nei ki te reo o *Satawal*, he naang. Inā rā e horapa ana ngā whetū ki te uhi o Ranginui, ko tā rātou, he whakatakoto pērā tonu me i tāiri ki te rangi, engari, ki te oneone me te kōwhatu e toru tekau mā rua e kapi ana i te kāpehu o te hinengaro. Ka takoto porowhita aua kōwhatu hei tohu i te aranga me te tōnga o te whetū me ngā kāhui, anō e whakamau atu ana ki te rangi. Nā, e ai ki a Finney i roto o Howe (2006):

...these are named after the stars and constellations that rise and set at or near those points. The exceptions are the north point, which is marked by Polaris because this otherwise inconspicuous star appears to stand virtually still as it makes a tiny circle around the Celestial North Pole, and the five most southerly points denoted by stages in the rotation of the Southern Cross around the South celestial Pole (opposite). (wh. 160)

Tahiti

Ko Tupaia te tohunga whakaterere waka nō Tahiti i riro i a Cook i ōna terenga ki roto o Poronīhia. I kitea ake nei e Cook te hinengaro māhorahora i a Tupaia ki te whāngai i a Tauwiwi ki ōna mōhiotanga. He tūturu ahurewa whakaterere waka a Tupaia, i mau tēnei āhua i ngā tuhituhi a Joseph Banks, te hoa o Cook, kaimātai huaota, tipu nō Ingarangi e mea ana, he tohunga, he mātau a Tupaia ki te whakaterere. Nāna a Cook i ārahi ki Aotearoa, ki ētehi moutere o Poronīhia. E ai ki te kōrero a ngā Tauwiwi, i mate a Tupaia i te māuiui kāwei i mua noa i te hokitanga ki Tahiti (Druett, 2011). Hei tā Cook, neke atu i te kotahi rau, e toru tekau ngā moutere i Poronīhia i mōhiotia e Tupaia te takoto o aua moutere, engari, i runga i te pepa i tāngia e ia mā Cook, e whitu tekau mā whā kē ērā e tau ana (i roto o Druett, 2011, wh. 225).

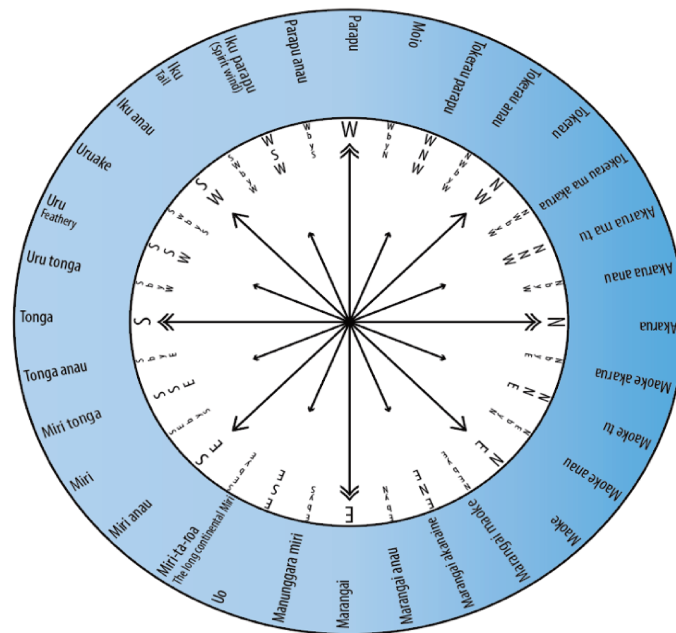
He aha kē ia te tohu o tēnei tānga a Tupaia? Ki ōku nei whakaaro, e tohu ana te tānga nei i te tino tohungatanga o tētehi iwi i whakangungua ki tōna taiao, he iwi ngaio, he iwi mōhio ki tōna mātauranga. Koinei hoki te mataaho o te mana i kawea e te kōrero tuku iho, kua oti kē te whakamārama i te upoko



Ngā Moutere o ngā Kuki Airani

*Hue Matangi*

E ai ki a William Wyatt Gill, nāna i kōhi ētehi pitopito kōrero mō te whakaterere waka i ngā moutere o ngā Kuki Airani, tērā te hue matangi ‘wind gourd’ i whakamahia e te tohunga whakaterere waka o reira kia homai e Raka (tō rātou atua o ngā hau) he matangi papai e hiahiaitia ana e te tohunga (Howe, 2006, wh. 163). Anei tētehi tauira i raro nei.



Whakaahua 3: Hue Matangi (Nā L. Monu i waihanga hei whakaatu i roto i tēnei tuhinga, 2017)

Initonīhia

*Kāpehu hau*

Ka huri te titiro ki Bugis i Initonīhia, kua kitea he kāpehu hau e whakamahia tonutia ana e rātou i ēnei rangi (Ammarell, Gene, Bugis, 1999, i roto o Howe, 2006, wh. 164). Anei tētehi tauira i raro nei.



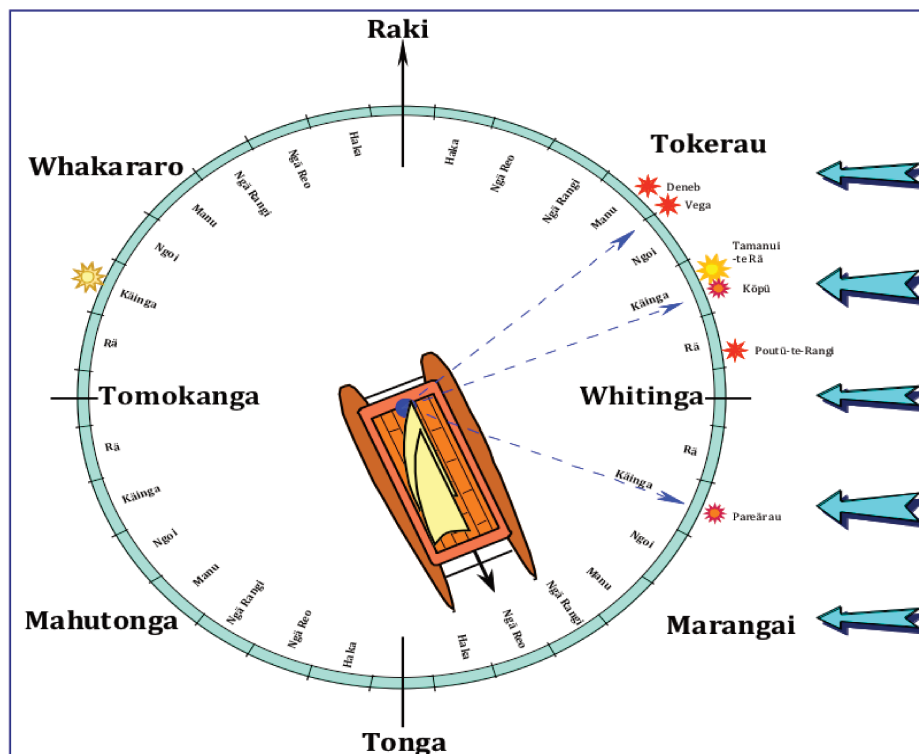
Whakaahua 4: Kāpehu hau (Nā L. Monu i waihanga hei whakaatu i roto i tēnei tuhinga, 2017)



## Aotearoa

### Kāpehu Whetū

I ahua mai te kāpehu whetū nei e Nainoa Thomson i runga i te taura kāpehu a Pius Mau Piailug o Maikoronīhia. I muri iho, ka whakamāoritia e Jack Thatcher mō tātou o Aotearoa (J. Thatcher, kōrero ā-waha, Tīhema 8, 2016). He taura noa iho tēnei hei whakaatu i te kāpehu Māori e whakamahia ana i roto i te rangi nei.



Whakaahua 5: Kāpehu whetū (Nā: Keegan, 1996)

## Matariki

Hāunga tōna paku rerekē ā-tuhi nei, e whai take whakahirahira ana te kāhui whetū o Matariki ki te tini o ngā iwi huri noa i Poronīhia. Hei tā Matamua (2017) “Pleiades is an institution throughout Polynesia, and while the cultural practices surrounding its observation vary from island to island, the philosophical underpinnings and beliefs are much the same. Similar to the rest of Polynesia, Māori refer to Pleiades as Matariki; its influence over traditional Māori society was immense” (wh. 15).

He nui ngā toronga o Matariki ki runga i te iwi Māori o mua, ki roto i ana whakahaere tikanga me ōna whakapono. I whai take hoki a Matariki ki te whakatere waka. Hei tā Best (1927) e kitea ake nei i tētahi o ngā kōrero tohutohu a Kupe mō ngā ara terenga e ū ai te waka ki Aotearoa, “Let it be directed to the left of the rising sun and until it is well up the heavens, and so continue until Pleiades rise above the ocean surge, that you may reach the land” (wh. 266).

## Maramataka Māori

I a au e rangahau ana i te kaupapa nei, ka taka te whakaaro ki te maramataka Māori me tōna hāngai ki ngā mahi whakatere waka me tōna mātauranga. Hei tā Eruera, tētahi o aku manu kōrero mō tēnei rangahau, i tino whai wāhi te maramataka Māori i tōna kāinga, i Hokianga, ki tāna mahi ārahi waka i runga i Te Aurere (H. Eruera, kōrero ā-waha, Noema 1, 2016). E kitea ai ēnei ingoa i roto i te maramataka Māori a ētehi iwi, pērā i tā Te Whānau a Apanui maramataka (Tāwhai, 2013, wh. 16).

Huri noa i te motu, he iwi, he maramataka, he iwi, he maramataka e hāngai pū ana ki tō rātou ake takiwā, āna kai me tōna taiao. Kei raro nei tētehi tauira o te maramataka Māori i homai ai e Matamua (2017).



*Whakaahua 6: Te Maramataka Māori (Nā: Tuna i roto o Matamua, 2017)*

### Te Pūnaha Whakatere Waka o Poronīhia

E toru ngā wāhanga matua o te pūnaha whakatere waka Poronīhia, inā rā, he whakamahere i ngā ara whakatere, he whakatere mā te taiao ki te moana, he ū ki te uta. Ko te whakatutuki i aua wāhanga matua e toru nei, kei runga rānei i te tika o te arotake i ngā homaitanga o te taiao, arā o ngā whetū, o te rā, o te marama, o ngā hau, o ngā amotai, o ngā manu, o ngā kapua me ētehi atu tohu. Ka tino eke tēnei pūnaha, mehemea ka arotake ngātahitia ngā momo tohu i te wā kotahi. Ki ngā tikanga whakatere waka o mua, he kounga tonu aua tikanga kia ū te waka ki te whenua i waenganui i te toru tekau ki te waru tekau māero te tawhiti ki te whenua e manakotia ana.

### Ngā Huarere o Poronīhia

Mehemea ka whakatere waka te tangata ki roto o Poronīhia, me mārāma pū ki ngā huarere matua o aua moutere, o aua moana hoki. E tutuki ai tēnei terenga, me mātua mārāma ki ngā hau, ki ngā amotai me ngā iarere me te āhei ki te ārahi i te ahu o te waka, ahakoa pēweha ngā tini huri rerekē o ngā huarere ka puta ki mua i te waka. I ngā rā o ngā tūpuna Poronīhia, kua kore he ipurangi e taea te tiro whakamua, te tiro whakamuri rānei ki ngā āhua o te huarere, engari, i roto i ngā tau, he waimarie, kei roto, kei ngā ringaringa o ngā tohunga whakatere waka o tēnei rā ngā hangarau o te ao hou, me pēweha e kore ai e mārāma ki ngā huarere. I mua noa, nā te heke o te mātauranga whakatere waka nei, ko te rehurehu o te mārāma ki ēnei mōhiotanga, ā, kua ara anō ki roto i ngā reanga tohunga whakatere o te wā nei. E whai ake nei ētehi whakamārāma mō ngā huarere i roto o Poronīhia kia hono ai te taura here ki ngā upoko e whai mai nei (Lindo, 1986).

### Ngā Huarere Matua

Ko te Moana nui a Kiwa te moana whānui, whārahi, hōhonu o ngā moana huri noa i te ao. He 61,800,000 square miles tōna whānuitanga, ā, kei tōna 14,000 pūtu tōna hōnonu (Lindo, 1986, wh. 80).

Ko ngā hau matua ki roto o Poronīhia tae atu ki ngā hau ā-uru ki Aotearoa, he hua nō te whakamahanatanga



o te ao e te rā, puta noa i te ao. Kei te pito o te weheruatanga o te ao, kei reira tētehi whakamahanatanga kaha e piki ai te hau mahana ka wāhi rua ai i runga, ko tētehi ka rere whakarunga, ko tētehi ka rere whakararo. Ahu ai aua hau e rua ki te tōpito whakarunga me te tōpito whakararo ka mātao haere ai kātahi ka heke ki ngā ahopae e toru tekau ki te raki, ā, e toru tekau ki te tonga.

Ko ētehi wāhanga o ēnei hau, ka hoki ki ngā wāhi hau māmā o te weheruatanga o te ao. Nā te takahuri whakaterāwhiti o te ao (*Coriolis force*), me te huri haere o te ao ki te weheruatanga o te ao ka huri whakateuru kē te ahu o te hau. Ki te taha whakararo o te ao, ka puta te hau raki mā rāwhiti e ahu atu ana ki te weheruatanga o te ao, ā, ki te taha whakarunga o te ao, ka puta te hau tonga mā rāwhiti e ahu ana ki te weheruatanga o te ao. E kīia nei ēnei hau e rua, ko ngā hau matua, arā, ko ngā ‘trade winds’ (Lewis, 1972, wh. 11-13).

Ko te ahu o te hau huri noa i te ao, ka wehea ki ētehi rōpū hau e piki ai, e memeha ai rānei ngā pūnaha huarere. Ka neke ēnei rōpū hau i runga i te neke o te rā ki ia kaupeka o te tau. Nā ēnei āhua, te whakamahana me te whakamātao o te hau ki runga i ngā whenua rarahi me ētehi āhuatanga ā-takiwā, ka puta ko te huarere. Kei tua atu i tēnā, nā te rere o te hau, te huri o te ao me te takoto o te whenua, hui ngātahi katoa ēnei āhuatanga ka puta ko ngā momo iarere (Irwin, 1992, wh. 9-10).

Ka rere whakateuru ngā iarere i hua ai i te whakararo me te whakarunga o te weheruatanga o te ao, ā, ka wehea ēnei e te iarere tukituki e ū ai ki te rāwhiti o te weheruatanga o te ao. Ā, ka ahu te iarere whakarunga ki tua atu i te whakararo o te weheruatanga o te ao. Nā konā, ka memeha te kaha o ngā hau matua ki ngā ahopae teitei, ā, ko te meatanga ake, ka memeha haere te kaha o ngā iarere e ahu whakateuru ana ki te tōpito whakararo me te tōpito whakarunga. Nō reira, he kaha ake ngā iarere e pātata ana ki te weheruatanga o te ao, ā, he kaha ake te rite tonu o tana ahu. Ka pupuhi te iarere whakararo i hua ai i te weheruatanga o te ao ki te raki mā uru me te tonga mā uru. He ahu pērā anō tō te iarere whakarunga i hua ai i te weheruatanga o te ao, ā, i ōna wā ka kotiti kē. He wā hoki tōna ka kotiti haere te iarere tukituki nō te rāwhiti. Tae atu ki ngā iarere ā-motu, ā-takiwā hoki, ka ahu ōna iarere ki ōna anō ahu. Te nuinga o te wā, he kaha ake ngā iarere o te moana uriuri (Akerblom, 1968, wh. 56).

#### Ngā Huarere Matua ki te Raki o Te Moana Nui a Kiwa

Tērā ētehi huarere matua, kotahi rau e rima tekau māero te whānuitanga o ōna parirau, kāore e kitea ki tua atu o Poronīhia e kīia nei ko te *Doldrums*, te *Equatorial Trough*, te *Intertropical Convergence Zone* rānei (*ITCZ*). Ka ū whakararo ēnei huarere i te weheruatanga o te ao, e rima ki te tekau tākiri ki te raki o te weheruatanga o te ao, engari, ka rerekē anō tōna ūnga, inā, ka heke whakarunga i te raumati o te tonga, ka whakararo ai i te raumati o te raki. Ko te tawhiti o tōna neke, kei runga i te kaha, te ngoikore rānei o te whitinga o te rā ka pā ki ia tuakoi o te ao, ana, nā te tītaha o tō te ao pokapū, ka piki, ka heke rānei i runga i te takoto o te ao i a ia ka huri taiāwhio i te rā. Ko ngā huarere o te *ITCZ* nei, he māmā me ōna hau rerekē, i ōna wā ohore, he paki, he pōkākā, he marangai, he rau tupu. Nā ēnei huarere, ka uaua haere te whakaterere waka ki tēnei takiwā o te Moana nui a Kiwa (Irwin, 1992, wh. 11, 13, 24).

#### Ngā Huarere Matua ki te Tonga o te Moana nui a Kiwa

Ki te raumati, ka ahu ngā hau tonga mā rawhiti matua mā te taha raki o ngā takiwā e kaha ana te pēhanga kōhauhau, he rua tekau ki te rua tekau mā rima tākiri te ahopae ki te tonga, ā, ki te takurua, he tekau mā rima ki te rua tekau tākiri te ahopae ki te tonga. Kei te doldrums te remu ki te raki te horanga whakateraro o ēnei hau. I konei, mātau haere ai te hau, ā, ka rahi haere ai ngā kapua me ngā heke ua tihengi, ā, kotahi, e rua rānei ngā wā o te marama, ka puta te hau pūkeri. Te nuinga o te wā, he paki ngā huarere me te tini kapua whakapipi ki te rangi. Heoi anō, ki te wāhi e pūtahi ai te *South Pacific Convergence Zone* (*SPCZ*) me te *ITCZ* ki te rāwhiti o Poronīhia, kei reira, kua memeha te heke o te ua, engari, kua kaha ake te puta mai o te kapua (Irwin, 1992, wh. 11).

Kei te taha tonga o ngā hau matua e takoto ana ētehi hau kotiti. Ki te takurua, he toru tekau tākiri tōna

toronga ki te tonga, ā, ki te raumati, he whā tekau tākiri ki te tonga. Ko ngā āhua o te huarere i konei, he pēhanga kōhauhau e ahu whakaterāwhiti ana me ngā low troughs, mā konā e paki ai, e kino ai rānei ngā huarere. He hau ā-uru te hau matua ki tua i te tonga o ēnei huarere nei. I ōna wā, he rerekē te ahu me te kaha pupuhi o te hau, ā, rite tonu te āwhā ki ēnei wāhi. Ko te pānga mai o ēnei huarere ki te whakaterere waka, hei tā Irwin (1992) “...in terms of Polynesian navigation these only affect New Zealand and the Chathams. The currents in the Southern Pacific move in an anti-clockwise direction. The prevailing direction through Polynesia is east to west in support of the dominant trade winds” (wh. 12).

### Ngā Huringa Rerekē ki ēnei Huarere Matua

Hei te raumati o te tonga, ngā marama mai i te Whiringa ā-rangi tae atu ki te Pou-tū-te-rangi, ka puta te wāhanga huripari o te tuakoī tonga. Tupu whanake ai ēnei huripari ki te takiwā o te waru tākiri te ahopae ki te tonga, ka rere whakateuru, ka huri whakatetonga, kātahi ka ahu whakaterāwhiti. Pua ake ai ēnei āhua ki te raki o Aotearoa, ā, ki taua wā tonu, kei te raki o Ahiterēria te ITCZ, ki tētehi takiwā e māmā ana te huarere i tōia ai e te rā ki te taha tonga. Nā tērā, pupū whakarunga ake ai te hau mahana i te kiko o te whenua o Ahiterēria ka puta te hau raki mā rāwhiti matua mai i te taha uru o te raki o Poronīhia ka ahu whakawhiti i te weheruatanga o te ao, ka takahuri te ahu ki te taha raki mā uru. He kaha te pupuhi o ēnei tūpararā nō te raki mā uru, ki te takiwā raki o Ahiterēria, ki Meronīhia hoki. Nā te huringa kētanga o te tūpararā nei e pai ai te whakaterere waka e ahu atu ana ki te hauāuru, engari, ki tua o te rāwhiti ka māmā haere ngā hau raki mā uru. Nā ēnei hau ka pā ki ngā tikanga whakaterere waka ki te taha hau ā-uru rā anō, ki Tahiti tonu (Irwin, 1992, wh. 12, 24).

Inā ka whakaterere ki te rāwhiti e tuki atu ai ki te ihu o ngā hau matua, tērā tētehi hau ā-uru e pupuhi ai i ōna wā mai i te uru ki te rāwhiti, ki te taha tonga o te weheruatanga o te ao. Tērā anō ētehi pūnaha huarere e taea ai te whakawhirinaki atu, e mea ana a Irwin (1992):

...southern low pressure systems may also have accompanying troughs reaching north of the SPCZ enough to cause changes in the prevailing easterly wind pattern. These troughs lie in the deep south during the southern winter. The pattern known as El Nino also brings westerlies into the tropics. (wh. 13)

Kotahi te wā, e rua rānei i roto i ngā tau tekau, pupuhi ai ngā hau mahana o te weheruatanga o te ao ki te taha rāwhiti o Perū. I konei, kua whakahaumate i te wai mātao, whai oranga e takoto ana i a ia. Koia tēnei te kaipatu i te ora o te moana, i ngā tini a Tangaroa me ngā manu ā-tai. Hei te takiwā o te Kirihimete ēnei āhua whakahaumate puta mai ai, ā, e kīia nei ko te *El Nino*. E pā kau nei ēnei huringa ki roto o Poronīhia e mōhiotia nei ko te ‘southern oscillation’.

I roto i te El Nino nei, kua hurikōaro ngā huarere horapa whānui i te Moana nui a Kiwa, inā rā, he pēhanga kōhauhau ki te rāwhiti me tētehi *low pressure system* ki te uru. Ko te memehatanga o ngā hau matua me te pupuhi roa o te hau ā-uru te whakatinanatanga o ēnei āhua. Nā te haumate haere o ngā hau matua, ko te māmā o te moana ki te uru, engari kē, ko te pikitanga ake ki te rāwhiti. Nā konā i mahana ai te wai ki Perū. Ko ngā hau ā-uru i roto i te *El Nino* nei, ka puta tōna pupuhi kaha ki te uru me te pokapū o te Moana nui a Kiwa. Nō te tau 1987 i hua ai tētehi *El Nino* ngāwari, te otinga ake, ka tae ngā hau ā-uru ki te rāwhiti rā anō o Poronīhia. Heoi anō, i te tau 1982 ki te tau 1983, tērā tētehi *El Nino* nunui i horapa ai ki roto i te whānuitanga o Poronīhia ki te rāwhiti ki tua atu (Finney 1991, wh. VIII, 10-11). Nō reira, kia mārāma ai ki ngā momo huarere o te Moana nui a Kiwa me ōna whai pānga ki ngā tikanga whakaterere waka mā te taiao, me rangahau ētehi o ngā ara whakaterere i taea ai e ngā tūpuna Poronīhia ki ngā moutere o Poronīhia.

### Poronīhia ki te Uru me ngā Moutere Ririki o Poronīhia

Tērā tētehi motu iti ki te raki mā rāwhiti o *New Guinea*, kei waenganui pū o *New Britain* me *Bougainville*, koia tēnei ko te moutere kei te pito whakateuru o Poronīhia, ko Nukuria. Kei waho tawhiti o Tonga me



Hāmoa, e takoto ana ētehi moutere pēnei i a Kapingamairangi, ko Nukuoro, ko *Rennell* me *Bellona*. Hāunga te tapatoru o Poronīhia, ko te rohe tūturu o Poronīhia, ko tōna rahi, he tata te hautoru o te ao. Inā rā, tīmata ai i Nukuria i te kotahi rau, e rima tekau mā rima tākiri te ahopou ki te uru, whakawhiti atu ki Rapanui rā anō i te kotahi rau mā iwa tākiri te ahopou ki te rāwhiti. Ana, e rua ngā tohe e pā ana ki te whakanohoanga o ngā moutere moroiti o Poronīhia e ngā iwi o Poronīhia. Tuatahi, he mea whakaterere ki te uru i tā rātou i manako ai, ā, tuarua, he pōteretere kau ki te moana, ka tūpono noa ki reira (Finney 1991, wh. VIII; 34-35). Ēnei tohe e rua, e taea ana, nā te mea, e pupuhi pērā ana te ahu o ngā hau matua, kei raro iho ngā moutere ririki e tau ana. Heoi anō, e korekore e māmā te hoki atu mai i aua moutere ririki, kei ngā ripa o Poronīhia, nā te uaua ki te waihape ki te ihu tonu o ngā hau matua, tērā rānei ka huri, he hau kē i ōna wā i mōhiotia ai e rātou ki te whai.

#### Poronīhia ki te Uru me Aotearoa

Kei ā te Whiringa ā-rangi ki te Pou-tū-te-rangi e ū ai ngā huarere papai kia whakawhiti ki Aotearoa. I taua wā, kua heke ngā āwhā me ngā rau tupu, ā, kua memeha haere ngā iarere whakakotiti i te waka. E taea noatia te whakaterere whakapae mā ngā hau matua tonga mā rāwhiti tae atu ki ngā hau ā-uru o ngā ahopae ki te tonga (Heyen 1962, wh. 74-75). Ahakoa, e taea ana mai i Tonga ki Aotearoa, ā, tutuki noa, kāore e pērā mai i Whītī ki Aotearoa, he take anō tērā. Nā te mea hoki, he whakaterere tika tonu ki te tonga ki roto tonu i te hau ā-uru e pā nei te hau ki te taha nui o te waka, tērā rānei e pūhia rawatia te rere o te waka kia kotiti i tōna ahu. Heoi anō, me he waihape whakatetonga mā uru, kua riro rawa te waka i te uru (Heyen, 1962, wh. 75).

#### Poronīhia ki te Uru me Poronīhia ki te Rāwhiti

Me uaua kē e oti ai ngā whakawhitinga mai i Hāmoa me Hawai'i. Ko te terenga tuatahi, he ahu ki roto i ngā hau matua tonga mā rāwhiti, te meatanga ake, kua whakateuru rawa, kua kore hoki e oti he aha, ki te ihu o ngā hau raki mā rāwhiti o te tuakoi raki. Engari, e taea noatia mai i Hawai'i ki Hāmoa. Ka heke whakatetonga te waka mā ngā hau matua raki mā rāwhiti ka huri whakaterāwhiti ai mā ngā hau matua tonga mā rāwhiti. Te nuinga o te wā, he māmā ake ngā ara whakaterere mai i te rāwhiti ki te uru, tēnā i te uru ki te rāwhiti. Nā te mea hoki, ko aua terenga mai i te uru ki te rāwhiti, he whānui ake te tawhiti e waihape ana, kua ngana rānei ki te whai i ngā huringa hau ā-uru ki ngā huarere matua o taua takiwā (Heyen, 1962, wh. 75).

#### Poronīhia ki te Rāwhiti me Aotearoa

He nui ngā taero a Kupe ki te whakaterere atu i Poronīhia ki te rāwhiti kia ū ki Aotearoa, tēnā i te whakaterere i taua pito ki Hawai'i, te whakaterere rānei i ētehi atu moutere kei te uru o Poronīhia ki Aotearoa. Ko te taero a Kupe nunui, he whakarere i ngā hau matua ka anga atu ai ki te nguha o ngā hau ā-uru o te tuakoi tonga. I tua atu i tēnā, kua mātao rawa atu ngā huarere, ngā moana me ngā hau. Tērā hoki ngā manu, nāna i tohu te huarahi ki Aotearoa, engari, he uaua tonu te whakaterere ki te kaupeka takurua, mō te raumati rā anō e tutuki ai i te huri o te hau matua o te uru, ka pupuhi kē, he hau raki mā rāwhiti (Heyen 1962, wh. 74; Finney, 1991, wh. VIII, 32-34).

#### Marquesas me Hawai'i

He kotahi mano e waru rau māero te tawhiti i Marquesas ki Hawai'i, ā, he korekore noa ngā motu e marara ana hei tohu i ngā ara whakaterere mō te waka. Hāunga tērā, he hau matua e pupuhi ana ki ēnei ara whakaterere hei āwhina i te waka. Kei konā ngā hau matua nō te tonga mā rāwhiti kātahi ka rokohina ngā hau matua nō te raki mā rāwhiti. Heoi anō, he uaua tonu ngā huarere o ēnei ara (Heyen, 1962, wh. 73; Finney, 1991, wh. VIII, 27-28).

#### Rapanui me Poronīhia ki te Rāwhiti

He rua mano e toru rau māero te tawhiti i Rapanui ki Amerika ki te tonga. Me uaua kē e ū tika ai te waka ki Rapanui hei te kaupeka o te takurua, ahakoa te pupuhi mai o te hau ā-uru, inā hoki te mōrearea o ngā huarere i taua wā. Tērā i whakamāramatia te El Nino i mua nei, ōna pānga āwhina e tutuki ai tēnei terenga, i Poronīhia ki te Rāwhiti kia ū ki Rapanui. Kua whāia rānei ngā hau ā-uru o ngā ahopae

whakarunga. Kei reira ngā huarere e kīia nei, ko ngā ‘*roaring forties*’, kei te whā tekau ki te rima tekau whakatetonga, koinei ngā ara i whāia e ngā kaupuke Tauwiwi kia tae ki Hiri (*Chile*). Engari, he mōrearea rawa ēnei huarere ki te waka hourua. Tēnā pea, kua ngana kē ngā tūpuna Poronīhia ki te whakaterere i te toru tekau ki te whā tekau tākiri te ahopae, ahakoa, he hau huri kē i ētehi wā (Finney, 1991, wh. VIII, 21-23).

### Poronīhia me ngā Amerika

He nui ngā kitenga ā-kiko nō te takiwā o Ahiterēria, o Amerika ki te raki me te tonga i hono ki roto i te ahurea Poronīhia, pēnei i ngā matau, i ngā toki, i ngā paopao kai me ngā momo patu (Finney 1991, wh. VIII, 35-36). Ko te rere a ngā manu *Pacific golden-plover*, te *bristle-thighed curlew* me te *ruddy turnstone*, katoa ēnei manu, he mea hokihoki ā-kāhui i Hawai’i me ētehi takiwā o Poronīhia ki *Alaska*, ā, ka peka ētehi ki ngā motu o Marquesas. Tā Finney anō e mea nei, mehemea i ahu ngā tūpuna Poronīhia i Amerika ki te Tonga ki roto o Poronīhia e rua ngā tohe hei whriwhiritanga. Tuatahi, he pōteretere noa mā runga i ngā waka rākau *balsa*. Ko te *Kon Tiki* te whakatinanatanga o tērā taurua. Tuarua, kua whāia rānei te *El Nino*, engari, me uaua kē e puea mai ai tēnā āhuatanga (Finney, 1991, wh. VIII, 39-42).

### He whakakapi

Ko te kaupapa o tēnei tuhinga, he whakatakoto iho i te mātauranga whakaterere waka o Te Moana nui a Kiwa. Tuatahi, i horahia iho ngā kōrero mō runga i te whanaketanga o te hangarau waka o ngā tūpuna me te mātauranga i haere tahi ai me ērā waka. Hei whakatauiria i te whakatinanatanga o te mātauranga nei, i whakatakotohia ētehi pūnaha whakaterere, arā, te etak me te *pookof*. Kua takoto hoki ngā huarere matua o Poronīhia tae atu ki ngā huarere i pā ki ōna moutere. I konei, kua mārāma te titiro ki ngā taero a Kupe i mua i ngā iwi Poronīhia i ō rātou terenga whakawhitihiti, tauhokihoki. He mātauranga tūpuna, he mana, he tapu.

### Kupu āpiti

<sup>1</sup> Me whakarāpopoto ake i ēnei kōrero ki te reo Pākehā...at higher latitudes stars, rising and setting between the meridian and equator, are more difficult to maintain bearings from because they appear to move more in relation to the celestial poles than directly east to west. If the observer is situated in the southern hemisphere, the path of the star appears to bend toward the north, and if situated in the northern hemisphere, toward the south. If a suitable substitute was not available then the heading was maintained by allowing for the displacement of the original star (Lewis, 1972; Irwin, 1992).

<sup>2</sup> A pale shimmering column of projected glare, is reflected into the air.

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