Identification and Use of Plant Material for the Manufacture of New Zealand Indigenous Woven Objects

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Research

Abstract

Significant collections of objects manufactured by Māori (the indigenous people of New Zealand) are held, prized and exhibited internationally by cultural institutions including museums such as B.P. Bishop, British, Field and Pitt-Rivers Museums; and Te Papa Tongarewa (Museum of New Zealand). This article aims to assist with the identification of woven objects originating from New Zealand and with the plant material(s) typically used to construct them by gathering **mātauranga** Māori (traditional knowledge) and diverse interdisciplinary academic literature e.g., botany, textile science, anthropology, conservation science, museum studies. Plant descriptions, harvesting, processing and use are discussed; thereby informing the researcher and affording appropriate respect and representation to the plant from which the object is derived. Availability of such information informs museum collection and interpretation practices, and assists with material culture investigations.

Introduction

The primary author who writes from an auto-ethnographic perspective is Ngāi Tahu, a tribal group whose boundaries encompass much of Te Wai Pounamu (South Island of New Zealand). She is a contemporary practitioner and researcher of Māori cultural materials and their use. Some of the terminology and names used in this article are unique to Ngāi Tahu and the southern tribes who additionally claim a genealogical connection to Rapuwai, Hāwea, Waitaha, and Ngāti Māmoe. An insider approach has been adopted, thus emphasis has been placed on the Māori word usage and its primary placement, as opposed to English. Thus, where a Māori word appears textually for the first time, a parenthetical English translation will be provided in text; furthermore, a glossary is supplied at the end of the paper.

Māori are a tribal people indigenous to New Zealand having migrated from various islands in Polynesia approximately 1000 years ago. Toward the end of the eighteenth century European whalers and sealers arrived, followed by colonists mainly from Great Britain. A treaty was signed at Waitangi in 1840 between the Crown and Māori when sovereign rule under Queen Victoria and protection of the native population came into force. At that time intermarriage was not unknown between races and today there are very few full-blooded Māori living. Tribal lifeways were assimilated into Western culture, society and government. Although, treaty grievances have mostly been addressed and a cultural renaissance including the revival of Māori language has occurred, traditional Māori life will never be what it once was. Today, modern Māori have a lifestyle closely resembling their Pākehā (non-Māori) counterparts under Western law, but Māori continue to adhere to core traditions, customary practices, lore and the spiritual values of their ancestors.

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The Māori worldview is defined by a direct relationship through **whakapapa** (genealogy) with the environment which according to oral tradition was inherent at the beginning of the universe. Art motifs associated with their material culture are rooted in the natural world as are physical objects, tools, buildings and resources.

It is important for **iwi** Māori (Māori people) to preserve the past traditions of their people including both material artifacts and the non-material knowledge system that underpinns Māori beliefs and customs. All of this is at risk, and has been since New Zealand became home to more than one culture. There are developing strategies in New Zealand for museums and Māori to achieve a level of participation in the management, care, interpretation, presentation and preservation of **taonga** Māori (Māori treasures) (O'Regan 1997). It still remains that museum collections of Māori artifacts, nationally and internationally are poorly understood by the 'other' cultures working with them. This article therefore, addresses a small proportion of Māori cultural artifacts by exploring woven objects (including basketry, mats and clothing) and the plant material used to manufacture them.

Such items are manufactured from either strips of plant material or fiber extracted from plants using the processes of **raranga** (weaving using leaf strips) and **whatu** (weaving with fiber) respectively. The positive identification of **taonga** and the materials used to manufacture them is important with respect to their care and preservation within cultural institutions such as museums. Further, such appropriately assigned knowledge using the correct linguistic terminology provides a platform for informing employees and visitors to cultural institutions about the material culture of a society, and the preservation, enhancement, maintenance and revival of traditional knowledge (Balázsy & Eastop 1999, Florian *et al*. 1990, Hodges 1988).

The ability to identify plant material used to manufacture objects is acknowledged as difficult within many cultural contexts and especially holders of artifacts both domestic and foreign. For objects originating from New Zealand, such identification is further limited by a paucity of information easily accessible in the international literature. However, some efforts have been made to provide guides for the identification of plant material derived from New Zealand (Carr *et al*. 2009, Goulding 1971). In some instances identification of objects constructed from cultural materials originating from New Zealand may assist in distinguishing tribal ownership with respect to **rohe** (tribal areas). This may provide access to lost knowledge, thus enabling social inclusion by preserving, enhancing and maintaining the traditional knowledge and customs of cultural resource use for future generations. However, care is required with respect to both cultural materials and finished artefacts as these were widely traded nationally and internationally by both Pākeha and Māori. Further caution is advised, once tribal identification has been confirmed this can raise issues of ownership as opposed to **kaitiakitanga** and possible repatriation to tribal authorities, communities or individuals. The term **kaitiakitanga** is complex, it simply means guardianship, but at a deeper level includes trusteeship and possessing the authority over their **taonga**. From an **iwi** Māori perspective, **taonga** held within a cultural institutional context belong to them, they are connected to the objects, and the organization that often understand themselves to be the legal owner, they are holders of those artefacts. The fundamental difference is the perception of 'belonging and ownership' which in the Māori view is intrinsic; specific **taonga** may have been made by an ancestor and therefore analogous to a family heirloom.

Generally, objects are crafted from natural materials with due consideration to the **atua** (gods) as spiritual guardians of the environment and accompanied by ceremonial practice. The craftsperson works within the restrictions of these protocols using knowledge that has been handed down generationally as **taonga tuku iho** (treasures handed down), a legacy from the **atua**. The customs and rituals undertaken when producing a simple **rourou** (basket for eating from) are no less important than those for creating a precious artwork; all **taonga** are meaningful due to their origin, the respect for the natural materials used, the knowledge and craft applied in its making and the essence of its new form as having been transformed from its primal state. The ethos of these Māori values has remained unchanged throughout time.

Consequently, the plants discussed in this paper are significant to Māori both traditionally and in contemporary society; they are **taonga** species listed in the Ngāi Tahu Claims Settlement Act 1998 (New Zealand Government 1998) which acknowledges Ngāi Tahu's cultural and traditional use of native floral and faunal species. The Act identifies these species by name and acknowledges the cultural, spiritual, historical and traditional association of Ngāi Tahu with those species and the natural world.

> "Taoka embody powerful forces, and represent some of the genealogical identity and relationship to resources originating in the environment. The interconnectedness of humans to the natural world occurs through a whakapapa relationship, whereby all things trace their origins to the atua. All taoka are imbued with spiritual concepts such as mana, seen as authority, power, prestige, and is the source of energy transmitted through ancestors from the gods; tapu [under restriction] and rāraki kōrero [traditional stories]." (McCallum 2008:23).

This statement is echoed in the understandings of Māori across New Zealand, indeed Kawharu relates this relationship with health.

> "The interconnectedness of all things means that the welfare of any part of the environment will directly impact on the welfare of people. The health and well-being of natural resources will impact on the health

and well-being of Māori depending on these resources" (Kawharu 2000).

This is important in maintaining a holistic balance between environment and mankind, and for native conservation practices which are still undertaken by Māori today.

Traditionally and in modern society, strict **tikanga** (protocols) are adhered to when harvesting, gathering and working with plants. This is a lifeworld practice carried out as a normal function and is not confined to plants, but Māori customs in general. With specific regard to harvesting and gathering plant material, respect was afforded to the environment, and the health and sustainability of the plants were paramount to maintaining the longevity of the resources and craft generationally. Often the passive ritual of giving thanks offered by the harvester to the **atua**, will go unnoticed by onlookers and the distinction in **tikanga** vary across tribal boundaries and across species.

Traditional Māori were both hunter gatherers and agriculturalists. Their environmental knowledge and conservation ethic was transplanted into the New Zealand landscape from Polynesia, however the New Zealand climate was not ideal for several transported botanic species. Cultivating **kumara** (sweet potato) was not possible south of Banks Peninsula in the south and

> "no coconut, banana, breadfruit, or pandanus used for weaving survived. Taro, yam, gourd, tropical Cordyline, paper mulberry only grew in the North Island." (Anderson 2002)

Except for cultivated food plants, Māori did not practice a system of agriculture using garden plots, but developed areas through propagation where a plant might naturally be found. For example, a **pā harakeke** (flax plantation) might be extended in size simply by propagating fans from existing bushes in the plantation. These would within five years be fully grown bushes yielding a harvestable crop for weaving. A traditional 'garden' might be as large as a province, where the harvester would seasonally gather food and resources on an annual basis, often moving outside his or her province into neighboring areas. The latter practice was only done if the harvester had a genealogical right to harvest from other areas otherwise resources might be traded. This methodology applied to plants for food, medicine and weaving.

Generally harvesting methods have remained unchanged, but some modern tools have replaced traditional. The weaver is solely in charge of the materials he/she harvests, the processing and finally the weaving. This would differ in large communal projects such as sail making, house building, raft making, etc. Harvesting occurs mainly in warmer months and plant processing techniques were specific to each plant as can be seen under each plant heading.

Methods

The aim of this article is to describe objects and the plants used to manufacture them using the process of **raranga** or **whatu**, and focuses primarily on southern Māori sources. This article is a proportional result of the data collected for a cultural resource kit collated by the primary author, and from her personal knowledge as a user of cultural material. Some of the gathered facts were collected from other users of cultural information initially interviewed by the primary author; these informants include **kaumātua** (elders) and **tohunga** (skilled persons, chosen experts). Thus, the article combines **mātauranga** Māori with western academic literature from a number of disciplines including, but not limited to, botany, textile science, anthropology, conservation science and museum studies. This combination of knowledge sources acknowledges and combines information available within both world views.

The results of this transdisciplinary investigation commence with a summary table linking object type to plant. Specifically, data is tabulated by broad object type; this allows a cultural institution employee or member of the public to identify the likely plant origin based on the object presented to them (Table 1). Then, for each plant used by Māori, botanical descriptions, traditional harvesting and manufacturing practises and descriptions of objects manufactured from the plants, are provided. Provision of such information assists with museum collection, exhibition and interpretation practices, and material culture investigations.

It must be noted that the uses of the plants in this article are more diverse than just the manufacture of woven objects. The plants described in this article constituted a vital role in everyday life for traditional Māori. Plants were, and still are, used for buildings, artworks, tools, ornamentation, weapons, **rongoa** (medicines), **kai** (food), **waka** (canoes) **taonga pūoro** (musical instruments), and had spiritual uses in religious practice. Cultural practices have continued across time, but contemporary Māori predominantly live within a Western paradigm and weaving especially has become an art. Further, the range of plants and their function by Māori was and remains more prodigious than can be covered in this review. For information outside the scope of this article the reader is directed to the further reading list provided by the authors at the end of this article and other specialised texts (e.g., McCallum 2008, Riley 1994).

Table 1. Preliminary identification of woven objects from New Zealand.

Object 'type'		Possible plant sources									
		harakeke	houi	kiekie	kōrari	kuta	pīngao	raupō	tī kōuka	tikumu	tōī
kākahu	cloaks	X	X							X	X
kete	baskets	X	X	X		X	X				
kopare	head bindings		X								
kupenga	nets	X	X								
manutukutuku	kites							X			
maro	loin cloths	X									
mokihi	rafts				X			X			
pāraerae	sandals	X							X		
poho taupā	chest shields									X	
poi	string balls		X					X			
rā	sails		X	X		X		X			
rāpaki, **piupiu**, **kinikini**, **pakipaki**	kilts	X	X						X		
tatua	belts	X	X								
tāupa-tāhau	leggings	X							X	X	
taura	cord, rope	X							X	X	X
tukutuku	decorative panels			X			X				
whariki	mats	X				X	X				
	carrying slings		X								

Results and discussion

HARAKEKE
COMMON NAME: Lowland flax, flax, New Zealand hemp
BOTANICAL NAME: *Phormium tenax* J.R.Forst. & G.Forst
FAMILY: Xanthorrhoeaceae

Habitat and distribution

Harakeke thrives in swamps and lowland flood areas. Stiff, erect fan-like leaves grow 1-3 m long and are 5-12 cm wide, the butt end of the leaf is thicker and stiffer (Moore & Edgar 1970). **Koladi** or **kōrari** (flower stalks, known botanically as infloresences) grow to 5 m in length; flowers (2-5 cm long) are (generally) dull red, while **uaka** (seed pods, capsules) are trigonous, dark and not-twisted (Moore & Edgar 1970). In comparison **whararikī** grows on coastal cliffs and in mountainous areas; has drooping, floppy leaves (2 m); short **koladi** (2 m); green / yellow flowers and twisted **uaka** (Moore & Edgar 1970). Bundles of sclerenchyma fibers lie parallel to the keel of the leaf, and are composed of elongated hollow cells (ultimate fibers) overlapping in a spiral manner (Carr *et al*. 2005, 2009, Cross 1912, Hutton 1869, Nottidge 1869). The ultimate fibers are bonded together by a combination of hemicelluloses and lignin that dissolve slowly in boiling water, and more rapidly in alkali solutions (Hutton 1869, 1870, 1871). The cellulose content has been reported as 51-55% (Carr *et al*. 2005) and 72-73% (Brandt 1937).

Harvesting (Pendergrast 1987, 2005, Puketapu-Hetet 1989, Te Kanawa 1992)

Harakeke is harvested after flowering (usually in spring) and before the first frost of winter. There are rigid protocols surrounding spiritual factors controlling the process of weaving, from the first leaf cut to the completion of the finished article. Custom determines that leaves are gathered in the correct weather conditions. Leaf blades other than the **rito** (center leaf in the fan) and the **awhi rito** (the two leaves on either side of the **rito**) are harvested. The maintenance of the three central leaves ensures that future growth of the fan is perpetuated and all disused leaf cuttings were traditionally returned to the plant, or **pā harakeke**. The latter is no longer practiced in some areas of New Zealand, where insect infestation among the mulch layer has become problematic to **harakeke** plants due to the loss of many native ground foraging birds.

Leaf preparation for raranga (Pendergrast 1987, 2005, Puketapu-Hetet 1989, Te Kanawa 1992).

The thumb-nail is used to split and remove the edges and midrib of leaves. The remaining leaf is sized by splitting lengthwise, creating **whenu** for **raranga**. **Whenu** are softened and residual leaf moisture is removed using the **hapine** method, which involves running **whenu** over the back of a knife, or similar surface. **Whenu** are then tied into bundles and boiled in water for approximately three minutes and can be woven immediately, or once hung and sun-dried, stored indefinitely in moisture free conditions. Additionally, **whenu** can be dyed either traditionally using preparations from various natural sources or with modern fabric dyes.

Fiber preparation for* whatu *(Pendergrast 1987, 2005, Puketapu-Hetet 1989, Te Kanawa 1992)

While **whenu** are in the green state, a cut is made on the dull or underside of the leaf, width wise, slicing only part way through. Using a mussel (*Mytilus* spp.) shell to **haro** (scrape) the leaf strips, the shell is pulled along the strip using a technique that separates the epidermis or the green **toreka** (refuse), also known as **para** among some North Island tribes, from the **whītau** additionally referred to as **muka**. Lengths of **whītau** are rolled into two-ply **whenu** (warp yarn) and **aho** (weft yarn), washed and beaten ready to be hand woven into **weruweru** (garment(s), clothing).

Use

> "[T]here is a plant which deserves notice here, as the natives make their garments of it, and it produces a fine, silky flax, superior in appearance to anything we have, and probably at least as strong. It grows everywhere . . ." (Cook 1785)

There are approximately 250 *Phormium* cultivars, many of which are ornamental (Heenan 1991). Not all **harakeke** cultivars are suitable for **raranga** due to brittle leaves, or for **whatu** because they possess minimal useful fiber. **Whararikí** (*Phormium cookianum* Le Jol., mountain flax) are not commonly used by Māori due to long, droopy leaves and coarse, fragile fibers (Hutton 1871). In the 1960s Rene Orchiston travelled through the North Island (NZ) collecting plants from Māori weavers; these cultivars, the Rene Orchiston Collection, form part of the (living) National New Zealand Flax Collection (Manaaki Whenua, Lincoln, South Island, NZ) (Scheele 2005). This assemblage of plants is important because they were cultivated by Māori specifically for **raranga** and **whatu** (Scheele 2005).

> "Flax, that invaluable asset in the Maori economy . . . is indifferently called harakeke or harareke, while the dressed flax is whitau (pronounced "feetow")." (Beattie 2002:95)

Both the prepared strips of **harakeke** leaf and prepared **whītau** (processed fiber extracted from **harakeke**) have the same terminology in Māori, therefore in this article, the authors have distinguished these for the reader by referring to them as **whenu harakeke** (strands of flax leaf) and **whenu whītau** (strands of flax fiber) respectively. Both types of **whenu** are still used by contemporary Māori for manufacturing a wide range of objects including apparel, footwear, baskets, mats, belts, fishing nets, sails and cordage.

Kete (baskets, bags) and **whariki** (mats) are woven by interlacing **whenu harakeke** using **raranga** techniques. **Kete** and **whariki** may be intricately woven with various patterns of dyed or natural strands (Pendergrast 1987, 2005). However, some **kete** are made entirely from **whenu whītau**. **Kupenga** (nets) are also made from **whenu**, but rather than employing a **raranga** method knots are used (Pendergrast 2005, Te Rangi Hiroa 1926).

A wide range of **weruweru** (clothing) were and are still produced, and are discussed in following paragraphs to aid the identification of the likely cultural materials used. Probably the most familiar Māori garments are cloaks or capes. There is divergent literature regarding the terminology for cloaks and capes in **te reo** Māori (language); tribal cloak nomenclature varies across New Zealand. However, the words **kākahu**, and **kahu** are commonly used, as well as other names for specific classes of cloak / cape (see below). The English definitions of these two garments is also confusing e.g., The Oxford English Dictionary states that a cloak is a sleeveless outdoor overgarment hanging loosely from shoulders, whilst a cape is a sleeveless cloak especially a short one or a part of a longer cloak falling loosely from a neckband. In this article the authors will refer to cloaks and / or capes as **kākahu**, which is widely used in southern New Zealand. **Whenu whītau** are the main weaving material used in nearly all **kākahu** with other ornamental and / or functional materials worked into the **kaupapa** (foundation) of these garments, which often include intricate **tāniko** (finger weaving using chevron motifs) woven borders (Hirini Moko Mead 1999). However, several other kinds of decoration are used on **kākahu**; the most common decorative attachments are **hukahuka** (tags, tassels) and **huruhuru** (feathers) (Evans & Ngarimu 2005, Pendergrast 1987). **Hukahuka** are diverse, the most widely found are those on **korowai** which are cloaks incorporating black dyed twisted thrums of **whītau**. Other **hukahuka** include several if not all of the flora utilized in weaving, more especially those that shed water being used for the manufacture of **pōkeka** (rain capes / cloaks) (Evans & Ngarimu 2005, Pendergrast 1987). **Pōkeka** is a southern word, elsewhere in New Zealand rain capes / cloaks are referred to as **pākē**. Other specific types of **kākahu** Māori include **kākahu tāniko** - plain cloak with **tāniko** border; **kākahu ihupuni** - dogskin cloak; **kākahu tōpuni** - feather cloak of **kiwi** (*Apteryx* spp.) or **toroa** (*Diomedea* spp., albatross), however other feathers can be used; **kākahu** and / or

pōkeka tikumu - **kaupapa** of **whītau** with **wharawhara** (the white fluffy underside of the *Celmisia* leaf, botanically termed tomentum) extracted from **tikumu** (mountain daisy); and **kākahu houi** - cloak made from the inner bark of the lacewood (Beattie 1994). When manufacturing cloaks the work was traditionally suspended between two **turuturu** (weaving pegs). Nowadays a simple frame is used.

Rāpaki are garments akin to a kilt (in that it crosses over itself and wraps around the wearers waist) made from **whītau** they extended from the waist to the knees and traditionally worn over **maro** (loin cloths) (Beattie 1994, Williams 1971). **Maro** are often anthropologically referred to as aprons, and made of soft **whītau** (Beattie 1994). More commonly observed "kilts" are **piupiu**, made from specific **harakeke** cultivars (Beattie 1994, Hopa 1975, Scheele & Walls 1994). **Whenu** are prepared similarly to **raranga**, excluding **hapine** which is the process of softening the **whenu**. While green these strips are marked out in a pattern and portions of each **whenu** are scraped to reveal the leaf fiber. Once dry the **whenu** curl width-wise in a cylindrical fashion, resembling porcupine quills. One end of each strand is stripped exposing the **whītau**, and then strands are plaited together forming the waistband. **Piupiu** are dyed black, the dye adhering only to the fibrous material with the curled leaf remaining its natural color. Other kilts include **kinikini**, made from alternating strips of **harakeke**, some 'dressed' while the remainder are left to curl. In the south, **kinikini** were often manufactured from **houī** bark (Beattie 1994).

Whenu whītau are used to manufacture **taura** (cord, rope) by a process called **whiri**. Māori used a huge variety of cordage and ropes while travelling to gather **mahinga kai** (food resources) e.g., in housing and lashing of canoes (Pendergrast 2005, Te Rangi Hiroa 1924). **Taura** vary in width and length depending on the purpose, the braiding being named from the number of **whenu whītau** contained in each whiri e.g., three-ply, four-ply etc. **Tatua** (belts) were constructed using similar methods.

Pāraerae (sandals) were made of **whenu harakeke** and were commonly worn in conjunction with **tāupa-tāhau** (leggings) to protect the wearer against inclement weather and the prolific thorn bearing shrubs that grow inland (Beattie 1994, Te Rangi Hiroa 1924).

Not only the green leaves of the **harakeke** were used to make objects, but often the **koka** or fallen dead or dried leaves from the plant were also used.

> "'Koka' would be cut and beaten (patu) between two stones (pōhatu) and then steeped in water for two to three days – ka potia roto wai. It was then washed (horoi) and then spread out (horahia) in the sun until dried sufficiently, when it was taken and woven (whatu) into a garment" (Beattie 1994:47).

TĪ KŌUKA
COMMON NAME: Cabbage tree, palm lily, Cornish palm
BOTANICAL NAME: Cordyline australis (Forst. f.) Hook. f.
FAMILY: Asparagaceae

Habitat and distribution

Tī kōuka grows well in wide ranging environments e.g., open spaces, forest margins, and in swamps. Trees can grow to 20 m tall, but are typically 12 m tall (Moore & Edgar 1970). The stem of young trees is typically 5-10 cm in diameter and for older trees, which are generally many-branched, up to 1.5 m (Moore & Edgar 1970). Leaves are typically 30-100 cm x 3-6 cm (Moore & Edgar 1970). Stiffness and color of leaves varies across provenance. Clusters of small, white flowers (~5 mm long) form on multi-branched penduncles (Moore & Edgar 1970).

Harvesting and processing (Beattie 1994, Puketapu-Hetet 1989, Simpson 2000)

Green leaf was cut, the strong midrib removed, and then leaves were sized similarly to **whenu harakeke**. No other procedure except for boiling the **whenu** was undertaken and the leaf was woven immediately least it dry. Unlike **harakeke whenu**, **tī** cannot be rehydrated.

Tī fiber can be obtained by fresh water retting dead leaves that have fallen from trees. After approximately one year of steeping the epidermis is removed by gentle hand rubbing of the leaf material exposing the fibers. Alternatively, leaves were beaten to release the fiber.

Use

Tī kōuka is extremely durable in both leaf and fiber form; the strong fiber does not shrink in either fresh or saline water. **Pakipaki** was a kilt made of **tī** leaves predominantly worn by women. However, the fiber was also woven into **tāpahu** (cloaks used for protection in war), which were normally constructed entirely from dogskin (Best 1899, Simpson 2000). **Tī** was preferred over **harakeke** for the manufacture of **tāupa tāhau** and **pāraerae** due to increased strength often weaving double soles and called **torua**. Additionally, **tī** fiber was employed in making **taura** and for sewing sails together.

HOUĪ, **HOUHERE**
COMMON NAME: Lacebark, Long-leaved lacebark, Narrow-leaved lacebark, Mountain ribbonwood
BOTANICAL NAME: *Hoheria populnea* A. Cunn., *Hoheria lyallii* Hook. f., *Hoheria glabrata* Sprague & Summerh..
FAMILY: Malvaceae

Habitat and distribution

H. populnea (10 m) is endemic north of the Waikato (North Island, NZ), but is naturalized throughout New Zealand

and grows in coastal and montane habitats in association with **kauri** (*Agathis australis* (D. Don) Loudon) and **pōhutukawa** (*Metrosideros excelsa* Gaertn.) (Allan 1982, The New Zealand Plant Conservation Index 2009). *H. lyallii* is a subalpine and montane tree (6 m) growing on Mt. Taranaki (North Island) and east of the main divide in the South Island (Allan 1982, The New Zealand Plant Conservation Index 2009). *H. glabrata* (10 m) thrives in sunny, damp sites west of the main divide in the South Island and in Central Otago (South Island) (Allan 1982, The New Zealand Plant Conservation Index 2009).

Harvesting and processing

Weavers harvest **houī** cork cambium or **kiri houī** which Beattie discusses along with

> "The kauheke . . . is a small tree like an apple tree and its bark could be used the same as houi (ribbonwood) to make kopare (head bindings) and piupiu." (Beattie 1994:122)

Houī has a lacy appearance; hence, the common name lacebark. The inner bark of **houī** is harvested from the sunny side of living trees: two horizontal cuts are made in the outer bark; a vertical cut made half way along the length of these; the bark peeled away and the inner **houī** bark removed in layers; and the outer layer is then closed like shutters on windows (Williams 2005). Additional to this sustainable practice is the method of

> "rub[bing] soil from the base of the tree into the scar to seal the sap and close the bark shutter doors. Wrap a bandage around the tree trunk holding the outer bark in place and this will naturally seal over time." (McCallum 2008:55)

Use

Monro commented on the great tenacity (strength) of strips of **houī**, although no actual data was provided (Monro 1868); this observation may explain the use of **houī** in sails (Beattie 1994). Weavers harvest **kiri houī** as a resource for clothing, including **kinikini**. Other objects traditionally manufactured include **kete**, fishing nets, ropes, linings of **kākahu** and **pōkeka**; **kākahu-houī**, **kopare** (fillets: hair-binding or head-band), **kopare-pōtae** (mourning hats also known as **parepare** and **kopare-taki**) and **tatau** (Beattie 1994, Te Rangi Hiroa 1923). Tuhoe people (North Island tribe) used lacebark to manufacture slings for carrying babies (Best 1907).

TIKUMU
COMMON NAME: Mountain daisy, Cotton plant, Shepherd's daisy, Leather plant.
BOTANICAL NAME: *Celmisia* spp.
FAMILY: Asteraceae

Habitat and distribution

Tikumu is used to describe a number of large-leaved *Celmisia* spp. which are found in sub-alpine and alpine regions (Moore & Edgar 1970). A number of species were and are still used by Māori. These species have recently been described (Lord *et al*. 2010). The large mountain daisies that are commonly used include the three subspecies of *Celmisia semicordata* Petrie (25-70 cm x 230-420 cm), *Celmisia coriacea* Hook. f. (35-55 cm x 28-400 cm) and *Celmisia monroi* Hook. f. (25-32 cm x 220-550 cm); leaves are typically elongated ellipses silver-grey in color (Lord *et al*. 2010).

Harvesting and processing

After the flowering period, leaves are gathered from the base of the plant; the central growing floret is left (McCallum 2008). Whole leaves are dried for use, or alternatively **wharawhara** is peeled off from freshly harvested leaves and used (the green residue is rejected) (Beattie 1994).

Use

Tikumu was an important weaving plant used by southern Māori (McCallum 2008). A **pōkeka tikumu** is a rainproof cloak of **whītau** and **tikumu** leaves; **whenu whītau** are woven with rows of **tikumu** leaves attached with **aho** (Beattie 1994). Traditionally, **wharawhara** was plaited into the **kaupapa**. **Poho taupā** (chest shields) and **tāhau taupā** were made of **tikumu**, and were reputed to offer excellent protection (Beattie 1994). Twisted **wharawhara** were used to make fishing line and moccasins (Monro 1868).

TŌĪ
COMMON NAME: Mountain cabbage tree, broad leaf cabbage tree
BOTANICAL NAME: *Cordyline indivisa* (Forst.f.) Steud.
FAMILY: Asparagaceae

Habitat and distribution

Tōī grows in wet, open spaces in forests in the north-west and west mountainous regions of the South Island of New Zealand. **Tōī** grow to 8 m tall and are rarely branched (Moore & Edgar 1970). Typical leaf size is 10-15 cm x 1-2 m with a prominent red midrib (Moore & Edgar 1970). The penducle is hidden under the leaves and is typically ~30 cm x 60-160 cm, flowers are ~6 mm long and bluish in color (Moore & Edgar 1970).

Harvesting and processing

Generally only enough growing **tōī** leaf is harvested for one days weaving as once the leaf dries the vegetable matter is not so easily disengaged from the fiber (Best 1899). This is obtained by first removing the midrib then beating the leaves with a stone pounder to soften and re-

move the fiber. In a more contemporary context the authors have extracted fiber from fallen dry leaves after steeping in water.

Use

The uses of **tōī** are analogous to that of **tī kōuka**, although **kākahu** and other articles woven from **tōī** possess a much coarser fiber. This was the preferred fiber for constructing warrior cloaks, which were dyed entirely black on completion (Pendergrast 1987).

KIEKIE
BOTANICAL NAME: *Freycinetia banksii* A.Cunn.
FAMILY: Pandanaceae

Habitat and distribution

Kiekie is a densely branched, woody climber of rain-forest and coastal-scrub trees; the stems are up to 4 cm in diameter, and the leaves are tufted and arranged spirally (2-2.5 cm x 150 cm) (Moore & Edgar 1970, The New Zealand Plant Conservation Index 2009). Leaf bases are pale while leaves are pleated and triangular in cross-section (The New Zealand Plant Conservation Index 2009).

Harvesting and processing (McCallum 2008, Pendergrast 1987)

Growing clumps are twisted and broken off from the main stem. The correct time to do this varies, however, **kiekie** will not detach from its stem unless it is 'ready' to be harvested. Leaves for weaving are separated from the clump and sorted into lengths. The midrib removed by piercing the blade on either side then run the fingers along the length of the leaf. Lengths of material are tied together, boiled in water for five minutes, left in running water overnight and hung in the sun until bleached. The bundles are often dyed then stored ready for future use. **Kiekie** fiber is obtained by retting in water until it is soft enough to **miri** (rub) the leaf removing the refuse green leaf matter or **toreka**. By placing the leaves in an **umu** or **hangi** (earth oven that cooks using steam) it hastened the rotting of the epidermal layer.

Use

Kiekie is a much sought after weaving plant as it requires little preparation and dries white. **Kiekie** fiber was used for **tāniko** and in **whatu** for making garments. Leaf strips were used for making **tukutuku**, which are the decorative lattice work panels that adorn many meeting houses; making sails that were constructed of leaf woven similarly to a **whariki** and of several pieces joined together and in basketwork (Best 1976).

PĪNGAO
COMMON NAME: Cutty grass, Golden Sand Sedge, Tumbleweed
BOTANICAL NAME: *Ficinia spiralis* (A.Rich.) Muasya & de Lange
FAMILY: Cyperaceae

Habitat and distribution

Pīngao is a coastal sedge that binds unstable sand dunes (Kirk 1873, The New Zealand Plant Conservation Index 2009). **Pīngao** clums are yellow-green and stiff, golden yellow-orange when dry and have dimensions ranging 2-4 mm x 300-900 mm (Allan 1982). Size and length vary across New Zealand, leaf lengths are much shorter on the West Coast of the South Island and often much longer and wider than in the North Island.

Harvesting and processing

Fiber and leaves are prepared for weaving.

> "Pingao was used for its orange color, but was only procurable in certain localities on the sandhills near the coast. The long leaves of these plants were shredded with the thumb-nail into strips of from a tenth to an eighth of an inch in width. The strips were placed in hot water and then scraped (kaku) with a shell, to remove part of the outer epidermis covering the fiber. They were then doubled over, tied into hanks, and hung up to dry… the pingao retained its rich orange color." (Te Rangi Hiroa 1921)

Leaves are softened in a solution of water and tree bark (which prevents curling), and then scraped with a shell (Riley 1994). Only a small number are scraped at a time so that the leaves do not curl before being used.

Use

Thin strips of **pīngao** (in combination with **harakeke** and **kiekie**) are used for the construction of **tukutuku** that adorn the inside walls of **whare nui** (meeting house) (Colenso 1881, Te Rangi Hiroa 1921, 1923). There are numerous **tukutuku** patterns and the reader is referred to a standard text (Te Rangi Hiroa 1921). **Pīngao** is also used for manufacturing highly decorated **whariki** and **kete** (Colenso 1881, Te Rangi Hiroa 1923).

KUTA
COMMON NAME: Bamboo spike sedge, Lake club-rush
BOTANICAL NAME: *Eleocharis sphacelata* R.Br., *Schoenoplectus tabernaemontani* (C.C.Gmel.) Palla
FAMILY: Cyperaceae

Habitat and distribution

Kuta is a word used to describe two plants: *E. sphacelata* and *S. tabernaemontani* (Ngā Tipu Whakaoranga

database 2007). In some tribal areas these two plants are distinguished by different names. Both plants grow in wet places and standing water e.g., edges of lakes, their rhizomes and lower portions of stems are immersed below water (Moore & Edgar 1970, The New Zealand Plant Conservation Index 2009). The stem of *E. sphacelata* is typically 4-12 mm diameter and 30-90 cm tall, the stem has internal transverse compartments similar in appearance to split bamboo, these can often be observed when the stem is held up to the light, but are not visible on the outside of the stem (Moore & Edgar 1970), which has a spikelet of approximate dimension 2-7 cm long (Moore & Edgar 1970). In comparison, *S. tabernaemontani* has stems 3-10 mm in diameter and between 0.6 and 3 m long, with a spongy pith and spikelets that are 6-11 mm long (The New Zealand Plant Conservation Index 2009).

Harvesting and processing

Kuta is harvested during summer by cutting the growing stems below the water level at the base of the shoot. Processing of this plant depends on if it is used whole or made into **whenu**. According to contemporary weaver, Erenora Puketapu-Hetet, fully grown **kuta** stems are

> "spread out and covered with old mats to flatten them. They are usually left for three days, but are frequently inspected and turned to obtain an even shade of brownish red. They are then hung to dry." (Puketapu-Hetet 1989:15)

Use

"Sails are said to have occasionally been made from stems of the **kuwawa** (syn. **kuta** and **kutakuta**)" (Best 1976:258). Although there is scant literature pertaining to **kuta** being used for baskets, there is a small **kete**, housed at the Otago Museum (Dunedin, New Zealand) made from this material. Te Rangi Hiroa (1923) states that **kuta** was used to make floor mats.

RAUPŌ
COMMON NAME: Bulrush
BOTANICAL NAME: *Typha orientalis* C.Presl
FAMILY: Typhaceae

Although not used strictly as a weaving resource, **raupō** played an important role in southern cultural heritage.

Habitat and distribution

Raupō is an emergent species, that is, it grows in marshy area and standing water with its roots in the sediment and leaves and flower heads emerging above the water surface. It can form large mono-specific stands or colonies (i.e., can be the dominant species in a wetland). **Raupō** grows actively in summer, with slow growth or dormancy in winter. The plant is found throughout New Zealand and grows 1-3 m tall, the leaves can be 30 cm long and have a spongy interior (Moore & Edgar 1970).

Harvesting and processing

Raupō was traditionally harvested during the active growth period, more so in autumn when **mokihi** (water rafts) would be built to carry foodstuffs that had been gathered from the hinterland. Growing shoots are cut at the base beneath the water level and leaves are spread out on racks in order for them to dry evenly.

Fiber preparation

> "A peculiar process was employed in some parts in order to bleach or whiten fiber to be used in the manufacture of superior garments. Roots of **raupo** bulrush (*Typha*) were procured, washed, then placed in a wooden vessel with water, in which they were crushed and pounded with a pestle of stone or hardwood. The hanks of fiber were then put in and the whole worked and pounded, a process that is said to have produced a kind of lather (**pahuka**). This process is said to have much improved the appearance of the fiber, some property of the bulrush root having a bleaching or cleansing effect." (Best 2005:500)

Use

The uses of **raupō** are wide and varied, housing, food, **rongoa**, making **poi** (string balls often seen as part of a Māori dance troupe), **manutukutuku** (kites) and **rā** (sails)

> "Raupo could be used for making ra = sails. The sails were square as a rule and had a pole across the top and were hauled up the mast." (Beattie 1994:287).

Although not woven, Best comments that sails are "formed of bulrushes dried in the sun and tacked together" and that

> "leaves were two- ply,—that is, a double layer of such bulrush-leaves was employed, inasmuch as that leaf is of somewhat fragile nature. The long lines or series of leaves were laid parallel to the sprit side of the sail, where the weaving commenced. The process, however, can scarcely be described as weaving, but is the one termed nati by the Maori—a method of lacing" (Best 1976:254, 260-261).

The most common use in the south was for building **mokihi**. These boats were made from buoyant material, such as the **raupō** excellent for traversing and navigating southern lakes and rivers. Accounts in Best discuss the **mokihi** as being built in other materials such as **houama** or **whau** (*Entelea arborescens* R.Br.) using **pirita** (*Rhipogonum scandens* J.R. Forst. & G. Forst.) as lashing (Best 1976).

NEINEI
BOTANICAL NAME: *Dracophyllum traversii* Hook.f., *Dracophyllum elegantissimum* S.Venter
FAMILY: Ericaceae

Habitat and distribution

There are many names for the various *Dracophyllum* spp. used by Māori, the reader is directed to specialised literature (e.g., McCallum 2008). However, the leaves of two trees - mountain **neinei** (*D. traversii*) and **neinei** (*D. elegantissimum*) are commonly used by weavers (McCallum 2008, Ngā Tipu Whakaoranga database 2007). The leaves form a candelabrum-shaped crown (The New Zealand Plant Conservation Index 2009). *D. traversii* typically grows 10-13 m in sub-alpine forests, in comparison *D. elegantissimum* grows to 14 m (The New Zealand Plant Conservation Index 2009).

Harvesting and processing

Neinei leaves are not cut, but dropped leaves are gathered from the base of the tree and are usually quite plentiful. Leaves are used whole and require no processing, therefore making them useful as a weaving material.

Use

The leaves of the **neinei** are tan in color and have the appearance of being polished or varnished. **Neinei** is not only decorative, but highly functional as a weatherproof cloak more popular in the South Island.

Conclusion

This article provides information on the use of plants by Māori for the manufacture of a disparate range of objects. The usual starting point of a research project for many employees of cultural institutions and members of the public is an object. Therefore, a Table is provided to assist in the identification of the likely plant used to manufacture objects, including those not commonly found (or maybe not correctly identified) in cultural institutions. Information on each of these plants is then provided; this information includes Māori and Latin names, habitat, growth characteristics, harvesting protocols, processing and a description of objects linked to that plant.

The article is written from the perspective of Māori with respect to protocol and naming of both objects and plants. In writing this article the predominant aim was to discuss selected New Zealand indigenous plants with respect to the identification of objects and their manufacture. The authors have made available information to an international audience that upholds the cultural and social identity of Māori through the interdisciplinary nature of this article. It achieves this by embracing indigenous and western knowledges and contributes to research within cultural institutions, but also the broader discipline of anthropology. The article aims to inform, assist and educate a wide range of museum staff providing further information for the discerning visitor to heritage institutions. Thus makes a significant contribution to the field of museum studies.

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Glossary

aho	weft yarn, thread
atua	god/s
awhi rito	two leaves either side of the center leaf in a fan of flax
hangi (see **umu**)	earth oven
hapine	process to soften whenu and remove moisture
harakeke	*Phormium tenax*, New Zealand lowland flax
haro	scrape
hauma (see **whau**)	*Entelea arborescens*
Hāwea	a southern tribal group
horahia	spread out
horoi	wash
houī, **houhere**	*Hoheria* spp., lacebark
hukahuka	tags
huruhuru	feathers
iwi	tribe, bone, people
iwi Māori	Māori people, Māori tribes
ka potia roto wai	steeped in water
kahu	cloak / cape
kaitiaki	caretaker
kaitiakitanga	guardianship
kākahu	cloak / cape
kākahu houi	cloak made from the inner bark of the lacewood
kākahu ihupuni	dogskin cloak
kākahu Māori	Māori cloaks
kākahu tāniko	chevron motif bordered cloak
kākahu tōpuni	feather cloak
kaku	scrape
kaumātua	elders
kauri	*Agathis australis*
kaupapa	foundation
kete	bag, basket/s
kiekie	*Freycinetia banksii*
kinikini	type of kilt
kiri houī	inner bark of the *Hoheria* spp.
kiwi	*Apteryx* spp.
koka	fallen dead or dried flax leaves
koladi, **kōrari**	flax flower stalk

kopare	head band
kopare pōtae	mourning hat/s
korowai	cloak with twisted black thrums
kupenga	net/s
kuta, **kuwawa**, **kutakuta**	*Eleocharis sphacelata*, *Schoenoplectus tabernaemontani*
mahinga kai	cultural resources, food resources
mana	prestige
manutukutuku	kites
Māori	indigenous population of New Zealand
maro	loin cloth/s
mātauranga Māori	traditional knowledge
miri	rub, massage
mokihi	temporary rafts
neinei	*Dracophyllum elegantissimum*
Ngāi Tahu	a southern tribal group
Ngāti Māmoe	a southern tribal group
pā harakeke	flax plantation
pāhuka	froth, foam, lather
pākē	rain cloaks / capes
Pākehā	non-Māori
pakipaki	a type of kilt
pāraerae	sandles
patu	beat
pīngao	*Desmoschoenus spiralis*, sand sedge
pirita	*Rhipogonum scandens*, supplejack
piupiu	type of kilt
pōhatu	stone/s
poho taupā	chest shield/s
pohutukawa	*Metrosideros excelsa*
poi	string balls
pōkeka	rain cloaks
pōkeka tikumu	rain cloaks made from the *Cemisia* spp.
rā	sails
rāpaki	a kilt
Rapuwai	a southern tribal group
rāraki kōrero	traditional stories

raranga	weaving using leaf strips
raupō	*Typha orientalis*, bulrush
rito	center leaf in the fan
rohe	tribal areas
rongoa	medicine/s
rourou	basket used for eating from e.g., a plate
tāhau taupā	forearm guards
tāniko	finger weaving employing chevron motifs
taonga, taoka	treasure/s, treasured objects
taonga tuku iho	treasures handed down
tāpahu	cloak used for protection during war
tapu	under restriction
tatua	belt/s
tāupa-tāhau	leggings
taura	cordage
te reo Māori	language
Te Wai Pounamu	South Island of New Zealand
tikanga	custom/s, protocol/s
tī kōuka	*Cordyline australis*
tikumu	*Clemisia* spp., mountain daisy
tohunga	Skilled person/s
tōī	*Cordyline indivisa*, mountain cabbage tree
toreka	leaf refuse
toroa	*Diomedea* spp.
torua	double sole of footwear
Tuhoe	a North Island tribal group
tukutuku	decrorative lattice work panel
turuturu	weaving pegs
uaka	a southern term for seed pods
umu (see **hangi**)	earth oven
Waitaha	a southern tribal group
weruweru	garment/s, clothing
whakapapa	genealogy
whararikí	*Phormium cookianum*, New Zealand mountain flax
wharawhara	white fluffy underside of **tikumu** leaf, tomentum
whare nui	meeting house
whariki	mats
whatu	weaving with fiber
whau (see **hauma**)	Entelea arborescens
whenu	strand/s, warp yarn
whiri	braid
whītau	southern Māori name for the processed fiber extracted from **harakeke**