

He Kōrero Kōrari

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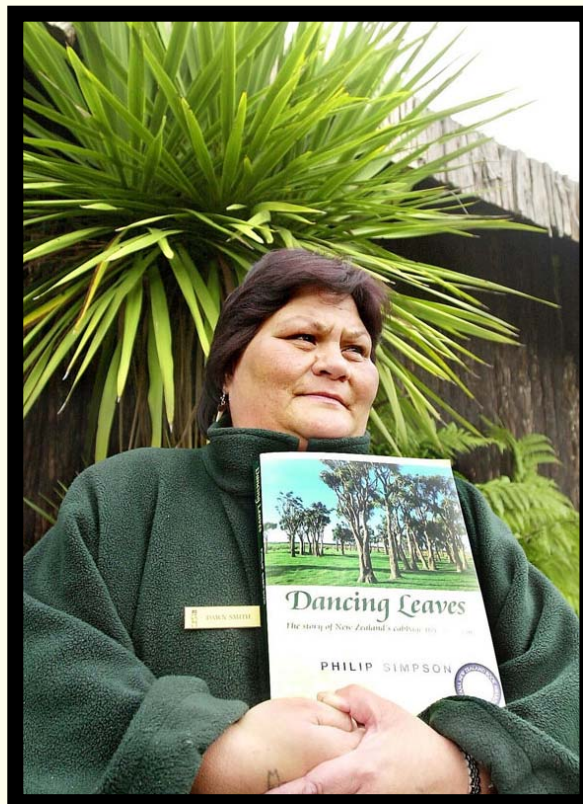
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Manaaki Whenua
Landcare Research



He poroporoaki Dawn Schuster-Smith

It is with great sadness that we begin this issue of He Kōrero Kōrari by farewelling Dawn Schuster-Smith, who died suddenly on 21 April 2001.

Just a couple of weeks previously, Dawn joined other weavers at Te Wānanga Tī Kōuka held at Ngāti Moki marae, and had a great time exploring the uses of tī leaves and fibre. Her twin sister Edna told me that Dawn really enjoyed the week, working with old colleagues like Eddie and Erenora and meeting new weavers. Shortly

before she died, Dawn was interviewed by the Daily Post, Rotorua about the hui.

For those of us at Manaaki Whenua, Dawn and Edna are a lovely continuation of our relationship with their Mum, Emily, who was such a strong supporter of our harakeke research. Dawn continued in her mother's footsteps as Tumu Raranga at Whakarewarewa and will be greatly missed there and by the whole community of weavers.

We extend our sympathy and aroha to Grant and Peter, her whānau and friends. Nō reira, haere, haere, haere atu rā.

We wondered whether we should rename this issue *Tī Times*, since cabbage tree stories dominate the following pages.

But we'll keep *tī* in its usual position at the back of the newsletter, and start with a brief catch-up on harakeke happenings, including the National Weavers Hui (pages 3–4).

Marcus King from Industrial Research is looking closely (very closely!) at what happens when you extract muka from a leaf. See the amazing photo of fibre being pulled from *Makaweroa* on page 5.

Both harakeke and *tī* flowered prolifically last summer. A long row of harakeke that I pass on the way to work is still bowed down with the weight of the *kōrari*. Warwick's observations on *tī* flowering and fruiting are on page 6–7.

In January a group of students of the Tu Mai Rakatahi-Putaiao me Hangarau programme, designed to encourage Māori to take up careers in science and technology, visited the *tī* and harakeke collections at Lincoln (page 8).

In April, to complement our studies on the growth characteristics of *tī*, we joined with Te Rōpū Raranga/Whatu o Aotearoa to host a hui on *tī* and its uses in weaving. It was a very enjoyable week and we all learnt heaps! You can read about it on pages 11–18. Included is a section on traditional uses of *tī* and some references for further information (pages 19–22).

Harakeke happenings

Sue Scheele

Now that we are not visiting the trial sites on a regular basis, we're really interested in your observations of plant health and whether the harakeke is proving to be a useful resource for weavers. Our contact details are on the last page.

Lincoln

While Cantabrians moaned about the very cool, wet summer, the harakeke lapped it up. Bushes in both the main collection and the evaluation trial are in excellent health. Readers may recall that the favoured variety *Kōhunga* does not usually strip well in this region – the para is inclined to adhere. We found that *Kōhunga* muka came away much more easily this autumn compared to the weavers' evaluation last April, an indication of the effect of moisture on the mechanics of fibre extraction.

At about this time we start filling orders for harakeke divisions. It can be hard work and we're grateful to Grounds Manager Stuart Oliver for

digging and packaging the plants. Stuart finds a crowbar one of the most useful tools. The crowbar can be inserted easily at the back of the fan and loosens up the soil to a good depth to enable the division to be lifted without too much damage.

Kaitaia

The planting at Kaitaia has not thrived as well as elsewhere, in part because of poorer soil conditions. This provided useful information for us, but now that the trial is over, Lydia Smith is digging up most of the plants to distribute to good homes among five Northland iwi. It is good to know that these harakeke will provide a weaving resource throughout the North. Kia ora, Lydia, for taking the trouble to organise the distribution of the plants.

Ruamata Marae and Forest Research, Rotorua

Some of the important harakeke sites in Rotorua have a guardian angel called Diana Anderson! Diana has taken up the challenge of cleaning the Orchiston Collection growing at Forest Research, which has been rather neglected in recent



Stuart Oliver, Grounds Manager, organises the digging and delivery of harakeke orders.





Diana Anderson selecting pīngao at National Hui.

years. As well as trimming the bushes, Diana has planted out divisions of the harakeke in a more accessible site. She brought lots of spare fans to the Weavers National Hui in October – they didn't last long. Diana has also been trimming back the bushes and blackberry at the evaluation site at Ruamata. The plantation looked very tidy when I visited in October.

It's always great to have a chat to Diana on flax management issues. Many thanks, Diana, for all the time and energy you spend in ensuring there's a healthy weaving resource for community use.

Weavers National Hui

It was a pleasure and a privilege (as a non-weaver) to be invited to attend the national hui at Kokohinau Marae, Te Teko, last October. In many ways, coming to Te Teko felt like completing a circle, or continuing a spiral, since it was here in 1983 that the involvement of science staff with the weavers association started. What a lot has happened since then!

Warwick Harris, as Director of DSIR Botany Division, attended the 1983 hui and took up the challenge to

help weavers in their quest for ready access to good quality harakeke and other fibre plants. The decision to study native fibre plants and their uses was helped enormously when Rene

Orchiston donated her collection of harakeke to the DSIR in 1987. The Orchiston Collection has provided the basis for the harakeke evaluation trial and other projects, as well as being a major source of high quality harakeke for weavers.

Whatever the source of the harakeke, the weaving work displayed at the hui was stunning – both at the marae and at the special museum display organised by Edward Maxwell and staff of the Whakatane and Districts Museum. Standards appear to be getting higher and higher – a reflection perhaps of materials used and the degree of inspiration and shared learning going on in wananga throughout Aotearoa. Several artists at the hui were given awards for excellence and innovation, with senior weavers Whaipooti Hitchiner, Edward Maxwell and Monty Thompson receiving awards of Special Merit. Other distinguished elders in weaving were acknowledged with awards for lifetime service and dedication.

The hui managed to be both very relaxing and thoroughly stimulating. As well as the many, varied weaving projects taking place in every spare space, a good number

of the participants attended the presentations: Saana Murray, as eloquent as ever on the Flora and Fauna Claim (Wai 262), Te Rangi Kaihoro, Rangi Kipa and Manu Neho on he moko; Patricia Wallace on her research into traditional Māori clothing; Judith Dod and June Grant on marketing art; and myself with an update on fibre research. Outside, Greg Jenks, David Bergin and Mark Dean gave a very practical demonstration on propagating pingao for weaving use.



Anaru Rondon. The patu muka is made from ōnewa (greywacke) and took Anaru two weeks to make.

Among artists participating in the hui was Anaru Rondon, from Matata on the Eastern Bay of Plenty. Anaru is one of a group of Māori involved in the revival of traditional Māori arts and crafts using methods and techniques that were used before European contact. He makes and uses traditional stone tools used in carving, weaving and other forms of art, and his work is the focus of much interest. At the hui he displayed various stone tools.



Weavers National Hui, Te Teko. October 2001.





Ria Davis.

After the hui, I spent an interesting morning with Ria Davis, who showed me some of the fine muka harakeke growing near Edgecumbe. No wonder the Bay of Plenty weavers produce such wonderful work.

Visit to Rene

I took the opportunity after the hui to travel to Gisborne and catch up with Rene Orchiston. It was a pleasure to find Rene in good health and we had a lively afternoon chatting about this and that. Rene has a studio full of her paintings, many of places she has visited in travels around New Zealand.

She still retains her interest in harakeke, however. I took away an interesting little wharariki from Whangaokeno (East Island), off East Cape. It's pale green and the young leaves have a real twist.

Scientists at Industrial Research are carrying out interesting research on the structure and extraction of harakeke fibre. Marcus King sent us this report.

Muka stripping

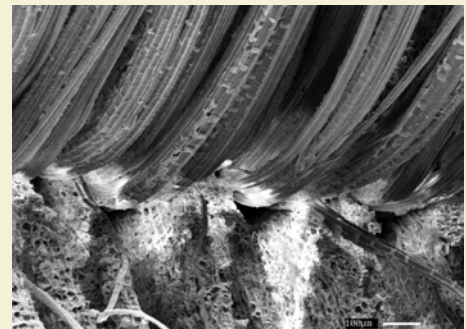
Marcus King, Industrial Research Ltd.



I have been investigating extraction of muka fibre from harakeke by both the haro method and the later European stripping machines. As a mechanical engineer that specialises in plant fibres I have been looking at the mechanics of the extraction processes that are applied to the leaves. It would be interesting to find what makes a variety suitable for muka. Other work at IRL is looking at differences in the fibre structure, but I am currently looking at just the extraction mechanisms. I have found both the traditional haro method and the European machine stripping machines give me some interesting insights into the behaviour of harakeke when it is worked on.

I have spent some interesting times with the microscope attempting to understand from an engineer's perspective what is actually happening to the fibres during the haro process. With Sue's help I collected leaves from 11 varieties grown in the Lincoln collection. Comparing the internal leaf structure of good muka varieties with ones that are not easy to extract fibre from

should show what it is that makes some varieties easier to extract fibre from than others. Electron microscopes give wonderful views of the leaf and included here is a picture of the fibres coming out of a leaf during haro extraction.



This leaf is Makaweroa and the four bundles of fibres in the picture are coming out with almost no fibres left behind and almost completely free of para. There are just a few parts of leaf cells attached to the fibres so very little further cleaning is required, except to remove the leaf cuticle from the upper surface. Fibre extracted from non-muka varieties such as Orchiston's Paretaniwha looks very different, with large amounts of para attached.

I also visited the Foxton Flax Milling Museum to observe the European stripping machine that Gordon Burr looks after there. The speed that the stripping machines operate at is enviable, although the fibre is very different from that obtained by the haro method.



Tī Time

Warwick Harris

The months from November 2001 have been full-time tī for me with the climax being Te Wānanga Tī Kōuka or the 'tī hui' in the first week of April 2002. Weekly observations on the flowering and fruiting of the more than 200 trees that flowered this year have kept me busy, and this came to an end in May with the last of the trees completing the ripening of their fruit.

Tī flowering and fruiting

The weekly observations involve recording when trees first start to flower, when they complete flowering, when the first fruit ripens, and when all the fruit on a tree are ripe. This has involved me moving

and climbing a ladder thousands of times to be able to see the flowers and to squeeze fruits within reach to determine if they are ripe. Although fruit mostly change colour when they ripen, especially late in the season, some remain green after they soften. These are mainly fruit that contain few or no seed.

Ross Beaver and Stephanie Parkes at Auckland and Bruce Smallfield at Invermay have made observations of flowering and fruiting at those sites, although

not as intensively and regularly as I have done at Lincoln. In late November 2001, I applied Ross' system of recording the stage of development of the panicles at Auckland to the trees at Lincoln and Invermay. From that we can get a measure of the difference between sites in the timing of flowering and perhaps get an indication as to whether the order of flowering of the populations also differs between sites. Certainly at Lincoln, the populations differ markedly in the times they flower and ripen fruit.



The complex branching of this tī kōuka tree on Banks Peninsula is the result of growth and flowering over many years.



Warwick up a ladder to reach panicles extending above 5m.

The considerable flowering of tī this year has provided a large number of panicles to measure. I spent three weeks doing this for panicles that I could safely reach from a 3-m ladder and another week getting up the tallest trees using a ladder that allowed me to reach up higher than 5 metres.

Although measuring the panicles is tedious, tiring and somewhat risky, it has revealed further well-defined differences between tī kōuka populations from different parts of New Zealand. This is probably a once only chance to capture this information. It is unlikely that anyone else will repeat the process of collecting and growing the tī kōuka populations in the way that has been done and in future years the panicles will be even more difficult to reach safely.



An effort is also being made to record the branching patterns of the trees and from this the number and age of the shoots or tufts they bear. With this information it should be possible to follow more precisely variation in the extent of flowering of the tī kōuka each year, i.e. the proportion of tufts of trees that bear flowers. This year a good number of trees have flowered for the second time and a few for the third time. Many of these trees bear two or more panicles, have as well non-flowering tufts, and already have fairly complex branching patterns. Nevertheless, a considerable number of the trees have yet to flower, and retain the form of a single leaf tuft on top of an unbranched trunk.

In the years to come it will be well worthwhile to continue to record which trees flower each year, how many panicles they bear, and the time they start to flower in a season. It should be possible to do this with the help of binoculars and with feet firmly on the ground. By relating these flowering observations to local climate records it will be possible to better understand what determines the large differences of tī kōuka flowering from year to year.

Mast years

Other native plant species, harakeke and beech included, also show such seasonal variation in the amount of flowering and fruiting. For beech, years of heavy flowering and fruiting are

known as mast years. The origin of the word mast is interesting. It derives from the Old English word for food or meat and now is the name given to the fruit of European trees like beech, oak and chestnut, especially where the fruit is food for pigs. Perhaps in years when there was plenty of mast there was also plenty of meat in olde England?

In New Zealand mast years are associated with marked increases of the numbers of rats and mice in indigenous forests and have an important influence on the ecology of the forests. Consequently it would be very useful to be able to define the environmental conditions that trigger mast years. Long-term observations on the flowering of the tī kōuka populations at the



The rotten base of the trunk of a fallen tī kōuka revealing how the wiry real roots arise from within the rhizome.

Auckland, Lincoln and Invermay evaluation sites and relating these observations to climate records should throw light on the nature of the trigger.

Fallen tī

During a southerly storm in January 2001, three of the tī kōuka in the Lincoln plantation fell over, broken off at the base of their trunks. Another tree fell over in late April and another completely dead leafless tree remained standing until I pushed it over. Examination of these trees showed that the tissue at the base of their trunks was rotten and this rot extended into the taproot or rhizome. There is no indication that the trees would be able to regenerate new shoots from the rhizomes. A

shared characteristic of these afflicted trees is that they all flowered this year and they were all from northern populations.

Ross Beever says that this is a condition described as collar rot. It is a common problem with ornamental cabbage trees that are propagated by tissue culture. This has been suggested to be linked to weak development of rhizomes of trees raised in this way. The fallen tī at Lincoln appear to have had well-developed rhizomes and had stood upright for more than six years in the field.

The pattern of occurrence of collar rot in the Lincoln plantation raises the question as to whether the





Leaders and participating students of the Tu Mai Rakatahi - Putaiao me Hangarau programme in the tī kōuka plantation at Lincoln. The potted plant in the foreground is tī pore.

affected trees were susceptible because they were stressed by being grown outside their natural area. There are also the questions of whether their flowering added to the stress that made them susceptible, or whether the stress of the collar rot induced them to flower.

Tī for teaching

A visit in January 2001 by leaders and participating students of the Tu Mai Rakatahi - Putaiao me Hangarau programme, designed to encourage Māori to take up careers in science and technology, provided a dress rehearsal for the visit of the weavers to the tī plantation as part of the tī hui. The programme was jointly organised by Te Tepuae o Rehua, Ngai Tahu Development Corporation, and the Foundation for Research, Science

and Technology along with the participation of several Crown Research Institutes. Judy Grindell, Manaaki Whenua Public Relations and Communications Manager, brought the participants in the programme to the tī and harakeke plantations. This was after they had been welcomed with a powhiri and waiata from the Manaaki Whenua waiata group to which the students responded admirably.

It was an enjoyable, interactive meeting, and particularly satisfying to have a group that could relate to and who were interested in the research to see the plantations. Huia McGlinchey has written an excellent report on the findings of the programme and it was pleasing to see a photo of the visiting group in the tī plantation on the cover of the report.

To introduce an element of surprise into the visit a potted plant of tī pore (*Cordyline fruticosa*, the Pacific cabbage tree) was placed amongst the tī kōuka and a pandanus plant amongst the 36 harakeke plants of the weaving variety evaluation planting. These plants were used to illustrate how the ancestors of Māori transferred their knowledge of plants they used in their Pacific Island homelands to related plants they found in Aotearoa.

The plant of tī pore came from Rangitahua (Raoul Island in the Kermadecs) and is probably a survivor of plants left there in the course of Polynesian voyages. Kilts or maro were made from the unsplit leaves of this species, and its taproot or rhizome was steamed to provide a sweet carbohydrate food. Thus there is an ancient link between the traditional Polynesian use of tī pore as a fibre and food plant and Māori use of tī kōuka for these purposes. We discussed how Ngai Tahu built large umu tī to steam stems of coppiced tī kōuka to produce the sweet food kāuru. As well I pointed out the variety of leaf forms of the tī kōuka in the plantation, indicating that knowledge of this was probably applied in Māori use of tī kōuka.

The pandanus was used in a discussion of the derivation of the name harakeke, which as discussed in *He Kōrero Kōrari 11* ('Lydia weaves from pandanus grown at Ahipara'), translates as the hard or strong pandanus. The Tepuae o Rehua students also found out about the nasty spines on the leaf margins of the *Pandanus utilis* plant displayed. Even so, they



accepted the offer of leaves from the plant so that they could take a closer look at them. They also took leaves of some of the harakeke weaving varieties from which they later extracted muka and tested its strength during their visit to Industrial Research Limited in Christchurch.

Preparing for the hui

While Sue was kept busy organising all the aspects of the involvement of Manaaki Whenua in the tī hui, I focused on preparing the plantation for the visit by the weavers and harvesting leaves for them to work with.

Until 2001 it had been possible to keep the vegetation between the rows of tī trees tidy with a mower. As trees began to shed leaves, and this differs between populations and increases after trees flower for the first time, mowing became increasingly more difficult and finally impossible as leaves tangled up the mower blades. My movement between the trees became progressively more difficult as weeds and grass grew upwards. So it seemed likely that the weavers would not be left with a good impression of the tī plantation if they also had to weave their ways through the undergrowth.

As a last resort a weed trimmer was tried and it was found that a blade attachment rather than string would cut down grass and weeds but sweep the dead tī leaves aside. I spent a backbreaking day's work trimming the entire area of the tī plantation just a week before the weavers visited. It looked good and I doubt if it will ever look as tidy again.

Selecting leaves for weaving

With the tidying up done, that allowed Sue and I to think how we could best present tī leaves to the weavers to work with. There were three parts to this. First we could offer leaves of three different species, tī kōuka (*Cordyline australis*), tī ngahere (*C. banksii*), and tōī (*C. indivisa*) from the plantations at Lincoln and Invermay. Then there was the opportunity to prepare leaves in advance of the tī hui to extract the fibre, and Sue did that. Thirdly there was opportunity to provide leaves from the different tī kōuka populations so that the weavers could investigate their suitability as a source of fibre for different weaving uses.

The tōī planted at Auckland and Lincoln have all died, but there are a good number of strongly growing trees of this species at Invermay.

Sue made her first visit to Invermay and harvested tōī leaves, and later Bruce Smallfield, who is based at Crop & Food Research, Invermay, brought more leaves to Lincoln for preparation by Sue in advance of the hui. I had a family visit to Te Anau at Easter, and on the way back took the chance to harvest a large bundle of fresh tōī leaves to be used by the weavers later that week. We anticipated that tōī leaves would be of more interest to the weavers than those of the other species. Tōī was the preferred species for making raincoats and it is now more difficult to get access to tōī leaves because many trees grow in protected areas.

I arrived at Invermay at the height of a southerly storm and the interception of hail and sleet by the leaves of the tōī highlighted an interesting feature of this species. The hail and the sleet, even after it



The bases of harvested leaves of tōī at Invermay with water trapped in their axils.



had melted to water, was trapped in little pools at the base of the leaves in the axil with the tree trunk.

Seeing this reinforced what I regularly see for the tī kōuka at Lincoln. While the axils of these tī do not trap reservoirs of water, they do trap wind-blown soil, large numbers of dead insects, and frequently dead birds. Where panicles are enclosed in the leaf tufts, many fruits and their seed are trapped in their leaf axils, as are the droppings of birds feeding on the fruit. For trees with panicles hanging out of the tufts these materials fall directly on to the ground around the trees. For stiff erect-leaved tī kōuka, intercepted rainwater tends to run down the trunk, whereas with lax, drooping-leaved trees water is run off the leaf tips away from the trunks. These observations lead to speculation about whether these characteristics are important in the mineral nutrition, water requirements and seed dispersal of tī.

Tī ngahere

It was also interesting to find the surviving tī ngahere growing well at Invermay, even more luxuriously than those at Lincoln. This species had been severely set back by winter frosts in the first years after planting at Invermay, but the shading and shelter now provided by the multi-trunked tī kōuka makes a better environment for them. Although lack of records suggest that Māori did not make much use of tī ngahere as a fibre plant, leaves of this species were harvested from both the Lincoln and Invermay plantations for the weavers to experiment with. Harvesting leaves



The distinctive channelled petioles of tī ngahere revealed by harvesting the leaves for weaving.

from this species highlighted the form of its well-defined, channelled petiole. Rather than being designed to trap nutrients or channel water, it is more likely that this feature is to position tī ngahere leaves in their shaded forest habitat where they can intercept more light for photosynthesis.

There is a little in the written record that indicates that Māori distinguished between tī kōuka with different leaf forms in the use of the species as a fibre plant. Philip Simpson in "Dancing Leaves" mentions the forms tī kōuka tarariki and tī kōuka wharanui and indicates the narrow-leaved tarariki was the favoured source of strong fibre.

To provide contrasting leaf forms for the weavers to work with I referred to the data presented in a paper that has been submitted to the *New Zealand Journal of Botany* titled 'Genotypic variation of leaf characteristics of wild populations of *Cordyline australis* in New Zealand'. This analyses the differences of leaf form of the 28 populations from measurements made in the Lincoln plantation. From this information four

populations were chosen to provide leaves. These were:

- Hicks Bay, East Cape: short thin leaves with yellow-green blades and well-defined yellow midribs.
- Lower Kaituna, Te Puke: broad, thin leaves that are floppy in the tufts.
- Turangi, Tongariro: long, thick, transversely curved leaves that are arranged erect in the tufts.
- Lower Awatere, Marlborough: thick, grey-green leaves of intermediate shape between the narrowest- and broadest-leaved populations.

On the morning before the group visited the tī plantation I harvested 40 or more leaves from each of three trees for each of the four populations.

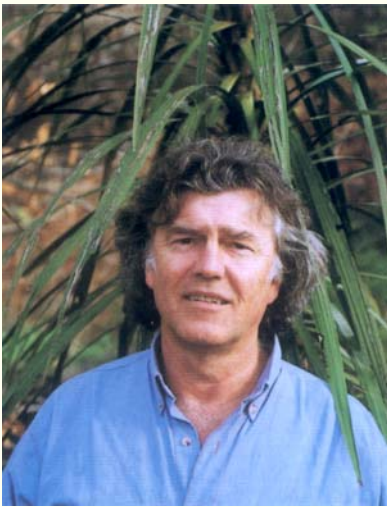
Two weeks before the hui, Sue took 15 leaves from each of the populations, boiled them for two minutes, then soaked them in separate tubs of water. This was to see whether the process would make it any easier to extract fibre. The tōī leaves were also soaked for that period (putting the bathtub out of commission), but not boiled beforehand.



Te Wānanga Tī Kōuka
2–5 April 2002
Ngāti Moki Marae, Taumutu

Sue Scheele

Weavers and Manaaki Whenua staff arrived at Taumutu on Tuesday afternoon for a powhiri, followed by afternoon tea and a good catch-up. Great to see so many familiar faces and I think we were all excited by the prospect of doing something a bit different. The idea behind the hui was to give weavers an opportunity to hear about some of the scientific research relating to tī, and to rediscover some of the ways tī kōuka has been used, through both examining old artefacts and by hands-on experience with leaves from the provenance trial.



Philip Simpson – setting the scene

After one of Jill Marsh's splendid dinners, we listened to Philip Simpson, author of 'Dancing Leaves', as he set the scene for us with a presentation/slide show on tī kōuka, as a plant and a taonga of great significance and usefulness. One of the most memorable parts was when Philip talked about the whakapapa of tī, (information shared with him

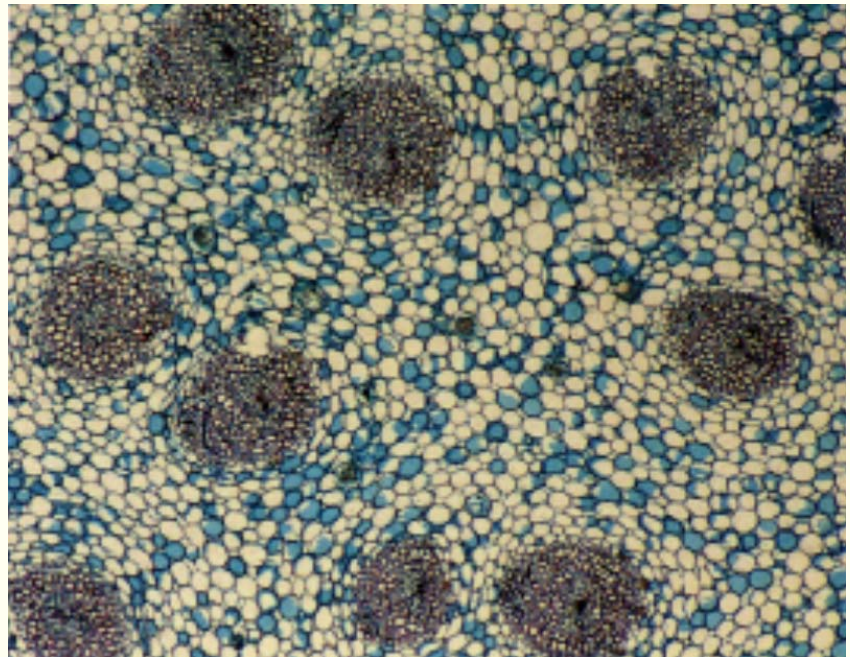
by Hohepa Delamere, Te Whānau a Apanui), and showed the links between tī genealogy and Western scientific understanding of the anatomy and ecology of tī. I think we all gasped at the microscope photo of the stem centre around which all other parts of the tree are arranged and which remains unmodified by the growth of the tree. It was as if we had a glimpse into the *io*, where the *mauri*, or life-force, resides. Seeing atua as genes makes us realise that there really is nothing new under the sun!

Canterbury Museum

On Wednesday morning, the group travelled in to Canterbury Museum, where we were greeted by Roger Fyfe, curator of ethnology. Roger talked about the various collections and then we were able to examine most of the museum's items made

from cabbage tree leaves. It was a privilege to be able to look closely at these taonga and see how they were made, and some items left even our most experienced weavers somewhat puzzled!

While some of the group went to see the excellent Māori gallery, Roger took others to see the new storage facilities. The specially designed cabinets allow the museum's collections that are not on display to be stored in an environment that is properly controlled for light, heat and humidity, while also allowing easy access for researchers and those with a special interest in particular collections. Weavers were able to see old piupiu, each beautifully laid out in its own drawer, and it was a moving experience for our kuia to reacquaint themselves with their own taonga. While in that room, we



The *io*, spiritual centre of the stem, where Haupiki-atua resides. She is the guardian of all knowledge about tī, including the *mauri*. The stem centre is devoid of vascular bundles (fibre). The palisade-like ring of vertical bundles which border the centre each becomes the most central vein in the midrib of the leaf. (From 'Dancing Leaves', p 121. Reproduced with the kind permission of Philip Simpson.)



Scenes from the Museum



also saw Inuit coats made from fish skins, and the boots that Edmund Hilary used to climb Everest!

We would have all liked to spend much longer at the museum, and it was quite a job to gather everyone together from the various rooms, so that we could travel to Lincoln for our afternoon at Manaaki Whenua. Many thanks to Roger and Anthony Wright, director of the museum, for an enlightened policy that allows folk with particular interests and passions to properly share in the museum's treasures.

We were late for the start of the visit to Manaaki Whenua, but nonetheless we were warmly greeted by staff at the pōwhiri. After lunch, we had presentations on aspects of tī by scientists Ross Beever and Tristan Armstrong, then joined Warwick Harris at the tī plantation.

Cabbage tree sudden decline

Ross 'Mr Phytoplasma' Beever

Ross gave an update on progress towards understanding the sudden decline disease of tī. He showed electron micrographs of the specialised bacterium (phytoplasma) that causes this disease and described how the same bacterium causes yellow leaf disease of harakeke and also dieback in karamū.

Phytoplasmas live inside the sugar-conducting cells of the plant and are transmitted by sap-sucking insects. While the harakeke planthopper has been identified as the insect transmitting the disease between harakeke plants, the

insect responsible for transmitting the bacterium to tī has still not been found. At present, Ross suspects that the tī disease results from insects – perhaps introduced planthoppers – picking up the bacterium by feeding on karamū before moving to tī where they inject the phytoplasma into the sap.

The disease cycle resembles that of the protozoan that causes malaria, which is transmitted by mosquito feeding in the blood stream. Ross concluded on a pessimistic note, by noting that this phytoplasma may be affecting other native species such as pūriri and mamaku. Ongoing research is needed to fully understand the complex life cycle of this phytoplasma, and this knowledge will lead to ways of managing these diseases.

(There is some more information on cabbage tree sudden decline in *He Kōrero Kōrari* No. 10:13 and No. 6: 24–25)

DNA research

Readers will recall that we carried out some preliminary DNA 'fingerprinting' work on harakeke, in an effort to establish the relationships between the weaving cultivars. Further funding is required before we can continue this research. Meanwhile, using similar molecular techniques, Tristan Armstrong is investigating the origin of tī tawhiti, a tī variety once cultivated for food. We asked Tristan to talk to us about the process of DNA fingerprinting.

Tristan 'Mr DNA' Armstrong reports:

After two days of fascinating discussion and demonstration of the skills and knowledge of the weavers present, it was my turn to say a few things about the DNA work that Landcare Research is conducting with tī kōuka and related species. Suddenly I was faced with the seemingly impossible task of trying to engage a group of professional weavers in a discussion



Tristan Armstrong shows how DNA is extracted from tī kōuka.



about methods used in DNA “fingerprinting”. In molecular biology, keeping your audience awake can be a real challenge at the best of times. It was clear that I was in trouble. Apart from relying on my silly props – a lab coat, glasses and a pair of rubber gloves – how was I going to make this molecular biology thing sound even vaguely interesting?

An idea hit me while I watched Whero Bailey miro harakeke fibre to form coiled strings. I became transfixed by the precision and delicacy with which she bound together loose fibres on her bare leg to form a perfect double helix. Voila! I thought. There it is, DNA, and in a form that couldn't be more recognisable to an audience of weavers. So, armed with the prop I needed, I decided to weave the story of DNA around a beautiful thread of flax fibre, kindly donated by Whero.

I am not sure how the presentation was received, as at times it risked looking more like sorcery than science. The participants got involved, particularly at the stages where we precipitated tī DNA from solution, revealing fine white clouds of minute DNA fibres. It always helps when you can see the stuff! I was delighted that some of the group even asked to keep the DNA to show their friends and families back home.

Tristan certainly demystified the whole subject in a thoroughly informative and enjoyable way, that left us all buzzing! Following his presentation, we went out to the tī plantation.

Tī provenance trial

Warwick Harris

I showed the layout of the plantation and again used the tī pore plant to illustrate the linkage between the knowledge of tī we have today with the knowledge brought by the ancestors of Māori to Aotearoa.

Trees of the 30 different populations are randomly located on the site, so trees of two of the populations were labelled. This enabled the group to see the similarities within a particular population, and the differences between the populations.

A trail to follow through the plantation was provided by a series of connected hoses and notes were given on what to look for. This included looking for variation in tree height, leaf shape, leaf arrangement, the skirts of dead leaves on the trunks; the fallen trees with collar rot; and the fruit on the spikes. A ladder was in place for people to climb up to see how the fruit varied in colour and how the flower spikes were associated with branching of the trees. The fruit attracted particular attention and it was asked if they could be eaten. In fact they can be, and have a nutty flavour especially as the seeds are chewed. Several of the weavers ate some seed and found them to be OK. The linoleic acid they contain is beneficial to birds and also to people. The fruit of the tī ngahere were also spotted and their blue colour that extends into the flesh led to a request for some to be tried as a dye.

There were other diversions involved in the visit, particularly the surrounding plantings of harakeke



and wharariki. While many of these are plants of the weaving varieties some are collections from wild sites including the offshore islands. One plant attracted the attention of three younger members of the visiting party, but Sue was able to point out that while it was an attractive plant to look at it was not much good for weaving.

The harvested leaves had been left in bundles in plastic bags at the base of the trees they had been harvested from. These were gathered up and taken to Ngāti Moki Marae for the weavers to work with.

Each bundle of leaves was labelled as to the species or population they came from. Based on the assessments of the weaving qualities of the harakeke varieties it was my hope that the weavers might be able to do similar assessments of the tī samples. However, this was a too ambitious hope because there was not enough time to do this in a systematic way.





Weaving at Ngāti Moki Marae

Sue Scheele

The remaining time of the hui was spent busily weaving, and it was marvellous to see the variety of items made in just a day or so – though the ‘days’ included most of the nights as well!

Atareta Paul took up the challenge of extracting fibre from the soaked tī leaves and produced long hanks of robust fibre. She found it very hard work though. The leaves had only been retted for two weeks (although boiling first had hastened the decomposition), and obviously require a much longer soaking to make fibre extraction easier.

Rokahurihia Cameron made a pair of pāraerae (sandals). The durability of tī leaves makes them especially well suited for this purpose. (See notes on traditional uses of tī). Roka also started a rain cape from tī ngahere leaves.

The long, wide and soft tōi leaves were popular, for kete, capes and whāriki. The centre rib of tōi was found to contain beautiful white fibre.

The long, thick leaves of the tī kōuka from Turangi were preferred by some weavers for raranga. However, damage to the leaves by caterpillars of the cabbage tree moth often made it difficult to get even lengths. Warwick has noted that trees vary in their susceptibility to the caterpillars.



At Easter, southerly storms had created huge seas and a great deal of debris was flung onto the coast at Taumutu. Stones, seaweed and driftwood collected on walks to the beach became part of the weavers’ creations.

Whero Bailey took a handful of tī leaves to the beach to wash in the surf. She finds that harakeke leaves treated in this way become silkier to the touch. I was afraid that Whero was going to be grabbed by Tangaroa when she bent to swish the tī leaves about, but he kindly let her carry out her project! We compared the washed leaves with an unwashed bundle, and they were indeed smoother and more oily to the touch.



Cath Brown called the group together on the last afternoon for a kōrero on the hui. The participants were unanimous in their appreciation of all aspects of the week – the relaxed and friendly atmosphere, Philip’s talk, the visit to the museum, the science input and the opportunity to be

(re)acquainted with weaving tī. Atua, genes, DNA and phytoplasma were new buzzwords to accompany the more familiar weaving talk. The group generally would have liked more time for weaving. Many felt a fresh appreciation of harakeke after the toughness of tī on the hands.

Whero and Lovey (and earlier, Te Aue Davis) reminded us of the importance of respect for traditions and not neglecting long-established ways of relating to taonga as we move to forge new pathways of knowledge.



Te Wānanga Ti Kōuka



Traditional uses of tī leaves

Sue Scheele

Although harakeke is by far the most useful plant to a weaver, the leaves and fibre of tī have their own special virtues.

Fishers and hunters, in particular, valued tī for its robustness and its durability when wet.

Snares

(The following notes on snares are taken from Best 1942).

Men used thin strips of tī kōuka to make the loops of bird snares. Tī leaves were not only more durable, they kept their shape better. The loops remained open, even when old.

Two varieties of tī kōuka were recognised – *tarariki*, with narrow leaves, and *wharanui*, with wider leaves. Best's informants said *tarariki* leaves were best to use because they had stronger fibre, and that the narrower, softer leaves of young *kōuka tarariki* were best of all.

The leaves were further treated before being made into snares. In some areas, the green leaves of *kōkōmuka* or *koromiko*, *poroporo* and *kawakawa* were put on a fire to make a thick smoke. In other places the resinous heartwood of *kahikatea* was used. The tī leaves were split into very narrow strips (discarding the midrib and outer part) and hung up in the smoke, which blackened them and made them more durable. After that process, they were hung up in a

hut for a few days, then soaked in water for a time before being made into snares. Sometimes the snares were placed in *paru* to darken them further and make them even less obvious when put into position.

Percy Smith wrote that fowlers made snares 'from the delicate epidermis of the stem of the *mouku*' (*Asplenium bulbiferum*). The stem of this fern is soft and fragile, contains no fibre, and could not possibly have been used. The informant had used the word *mauku*. Although this word is a variant for *mouku*, in this instance the informant probably meant the dwarf cabbage tree, tī rauriki or mauku.

Ropes, nets and sails

Tī kōuka was used for ropes when toughness was required. Because tī fibre doesn't shrink in water, the leaves were used for anchor ropes. Sometimes whole leaves were plaited together, or the leaves were soaked, the para scraped off, and

the fibre twisted into a rope. Colenso (1892) describes a remarkably strong one that was four-sided. It was made of the unscraped leaves of tī kōuka that had been gathered and carefully wilted in the shade, then soaked in water to make them pliant.

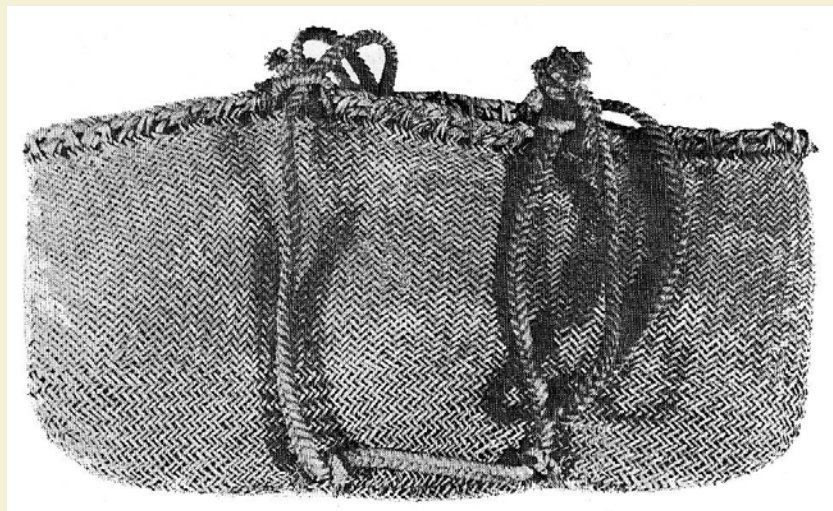
Fishing nets were largely made from harakeke, but the top and bottom runners were strengthened with tough tī leaves. Tī leaves were used in making strong kawē, the whiri straps used for carrying heavy loads on the back.

Sails were made from *houhere* or *houi* (lacebark) sewn together with fibre from tī. Sometimes tī and *houhere* were plaited together and the strips sewed into a sail.

Kete

Sometimes tī was the preferred material for making containers.

Hīnau berries were an important food supply, especially in cooler,



Kete Cordyline sp. Fig. 61 Goulding 1971



inland districts. The floury flesh of the hīnau had to be separated from the stone. After long soaking, the berries were poured into open-plaited kete, sometimes made from the tuaka (midribs) of tī rauriki, and sifted to separate the meal. The meal was mixed with water, kneaded into a paste and cooked to form a cake. Before steaming in the umu, the hīnau paste was put in a basket made from tī or kiekie leaves. Harakeke leaves were not used because they imparted a bitter taste to the meal.

Ripe tutu berries were crushed to make a refreshing beverage. It was crucial that the poisonous seeds did not go into the juice. The crushed berries were sieved through a funnel-shaped container (pū tutu) made of narrow strips of tī and lined with the flower heads of toetoe to catch the seeds.

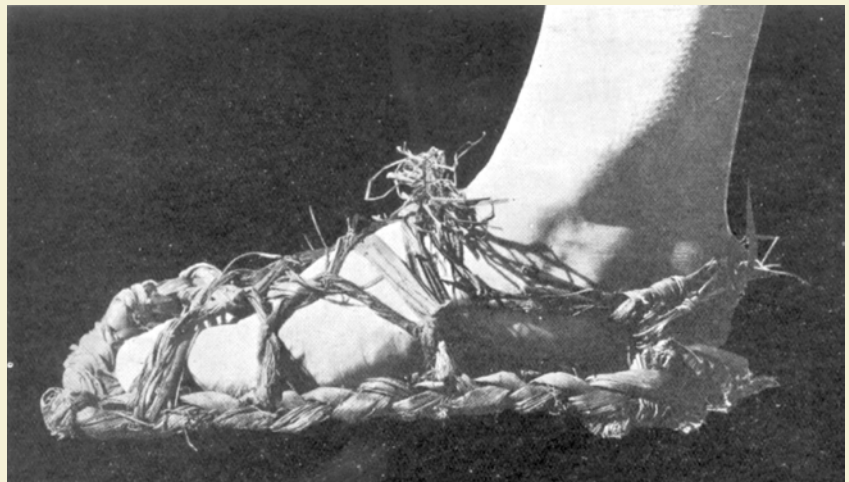
During the harvesting season, hundreds of large kete, kāuru-tī, were made to hold tī kōuka stems for steaming. Tapora (mats) of tī were made to cover the kāuru in the umu.

Tī kete with an open weave for drainage were plaited to hold the

stones used as sinkers, or for collecting shellfish.

Pāraerae (Sandals)

Pāraerae made from harakeke or the more durable tī leaves were a valued item for long journeys – particularly in the south, for treks across cold, rocky mountain



One of the double-soled pāraerae found in an Upper Taieri cave. The heel-band, three side loops, lacing across loops, and the tie show clearly; the lacing-strands are frayed through age. Plate 29, Te Rangī Hiroa 1924

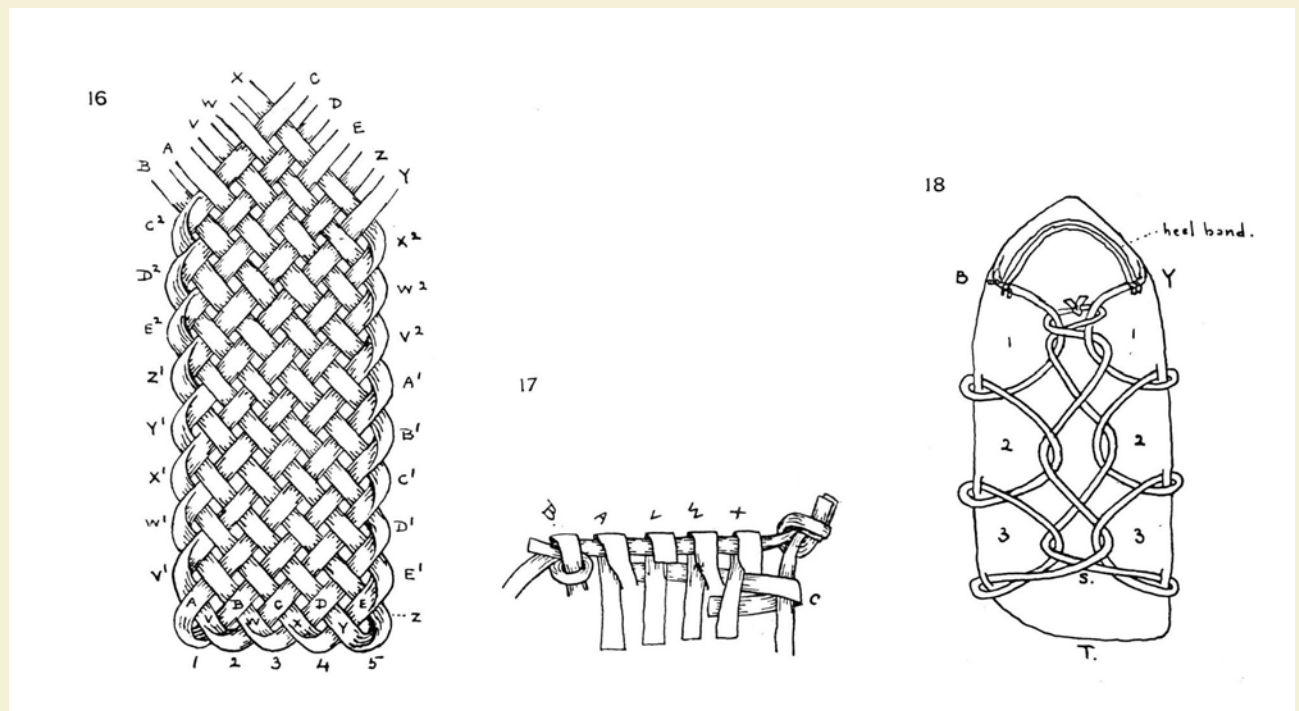


Fig. 16 the sole; 17, half the heel; 18, the lacing

Te Rangī Hiroa 1924



passes to Te Tai Poutini for pounamu. They were not so widely used in the North Island.

‘The time they lasted depended on the materials used, the care taken in manufacture, and the nature of the country traversed. The number of pairs of sandals they carried varied – some took five, some twelve, some twenty. Wherever they stopped they made more, using whatever material was handiest. The best ones were made of dried tī leaves, and if double, would last for five or six days on fair ground. In swampy country they would last for three or four days.’ (Skinner 1912)

Simple types were a plaited flat sole (papanui). More elaborate pāraerae were woven from harakeke or tī fibre, with a raised edge around the sides and heel (whakareke). Soles were sometimes a single thickness (takitahi), or a more comfortable and protective double sole (tōrua).

‘Mine were a pair with double soles, called “torua”, calculated to endure several days’ walk along a beach, which is so destructive to shoes. They no doubt owed their invention to the necessity of protecting the feet from the snow, and the sharp prickles of the small shrub “tūmatakuru” ..., which is very common on the plains, and often lies so much hidden in the grass, that you first become aware of its presence by your feet being wounded by it.’ (Shortland 1851)

Tī leaves were also used to make leggings (whakapuru or taupa) to

offer protection from spiny plants like matagouri and speargrass. They were rather uncomfortable and not commonly used.

Clothing

The lasting qualities of tī made it useful for certain garments.

Rough shoulder capes were made of the fibre of the leaves of tī or tī tōī, the mountain cabbage tree. The leaves were soaked for perhaps 12 months and beaten to release the fibre.

Sometimes rough capes were made from the whole dried leaves (kuka) of tī kōuka or tōī, but usually the leaves (or parts of) were attached to a woven backing, most often of harakeke.

Beattie (1994) said that a waist mat called a pakipaki was sometimes made of tī leaves. It was usually worn by women.

The most elaborate garments made of tī were rain capes manufactured from tī or tōī. This was especially so in the Urewera. Harakeke does not grow naturally there. The best fibre available was from the leaves of tōī.

Best (1899) had this to say about the manufacture of strong, durable rain capes.

‘The fibre is much coarser than that of flax, and much resembles in colour and appearance the cocoanut-fibre [sic] seen in floor-matting. In making these capes only enough leaves are cut for one day’s weaving, for if left longer they cannot be prepared; they become

dry and the vegetable matter cannot be disengaged from the fibre.... The midrib (tuaka) is taken out of the toi leaves, it being too hard to work, after which the leaves are beaten to soften them and disengage the para or vegetable matter. These fine leaves are often seen 8" [20 cm] wide. The hukahuka of this cape are strips of the toi leaf, not bruised or beaten, or they would not lie close and flat, but curl up. ... The toi capes are dyed black when finished, and will remain waterproof for many years. The old dried leaves of the toi are termed “kuka”; they are used for the hukahuka of the capes (strips same as for timu) and for the aho. ‘

References and further reading

Beattie, J.H. 1994: Edited by Atholl Anderson. *Traditional Lifeways of the Southern Maori*. University of Otago Press, Dunedin.

Best, Elsdon 1899: *The art of the Whare Pora. Transactions of the New Zealand Institute 31: 625–658.*

Best, Elsdon 1942: *Forest lore of the Māori*. Government Printer, Wellington.

Colenso, W. 1892: *Vestiges: reminiscences: memorabilia of works, deeds, and sayings of the ancient Maoris. Transactions of the New Zealand Institute 24: 445–467.*

Goulding J.H. 1971: *Identification of archaeological and ethnological*



specimens of fibre-plant material used by the Maori. *Records of the Auckland Institute and Museum 8: 57–101.*

Shortland, E. 1851: The southern districts of New Zealand. Reprinted 1974, Capper Press, Christchurch.

Simpson, Philip 2000: Dancing leaves. The story of New Zealand's cabbage tree, tī kōuka. Canterbury University Press, Christchurch. [The very best reference on tī, including cultural uses. It is a stunning book with information on all aspects of tī and over 600 illustrations.]

Skinner, H. D. 1912: Maori life on the Poutini Coast, together with some traditions of the natives. *Journal of the Polynesian Society 21: 141–151.*

Te Rangi Hiroa 1923: Maori plaited basketry and plaitwork: I, Mats, baskets, and burden-carriers. *Transactions of the New Zealand Institute 54: 705–742.*

Te Rangi Hiroa 1924: Maori plaited basketry and plaitwork: 2, Belts and bands, fire-fans and fly-flaps, sandals and sails. *Transactions of the New Zealand Institute 55: 344–362.*

Te Rangi Hiroa 1926: The evolution of Maori clothing. Thomas Avery, New Plymouth.

TĪ TV

Warwick Harris

Working with Manaaki Whenua journalist Diana Leufkens, Sue had set up a news media release about the tī hui. This was picked up by TV3 and brought interviewer Tama Moiser and cameraman Daniel out to Taumutu and then to the tī plantation at Lincoln on Friday 5 April. The resulting news item was shown on the 6 o'clock 3 News that evening. Tama told me that she had been given a lot of cheek about her name by the weavers and explained that her parents had liked the name and given it to her without realising that it meant 'boy'.

More than an hour was spent at the plantation filming and interviewing during which time I said many profound things about tī. I was asked to climb up and down the ladder to look at the trees and their fruit several times, and my action of folding up dead leaves and tying them in bundles was filmed from all angles. This arose from the emphasis Tama put on the nuisance value of dead leaves that leads some people to hate cabbage trees. I said my preferred way of disposing of fallen tī leaves was to compost them, as they do break down quickly if kept continually moist and mixed with soil and other softer plant material. But I also said that the bundles of dry leaves burn quickly and make good kindling to start a fire.

Naturally I was curious as to how all the film footage and interview time would be edited down for the short time given to most TV news items.

As it turned out there was clever juxtaposition in the item between the weaver's appreciation of the durability of tī leaves and my comments on how to dispose of them.

Tama Moiser: "*Relearning a lost art. These Māori weavers are working with the leaves of a cabbage tree or tī kōuka rather than the flax they normally use. They say the beauty of tī kōuka is the strength and durability of its rot resistant leaves.*"

And later in the item after I had said people hate them and cut down cabbage trees because their leaves tangle up mower blades:

Tama Mosier: "*But Harris says that's not the answer. He suggests tying the leaves into bundles and using them as kindling.*"

With the emphasis that Manaaki Whenua is putting into research into carbon sequestration as a means of offsetting global warming resulting from greenhouse gases that was not a good way for that item of information to come out! I have since made amends to the carbon sequestration programme by giving the five fallen tī kōuka to Fiona Carswell so that their biomass can be determined. This will allow estimation of the efficiency of tī kōuka as a banker of carbon. There are large areas of non-productive land in New Zealand, roadsides being an obvious example, where tī kōuka could be grown to sequester carbon and at the same time play its role as a distinctive and characteristic tree of New Zealand.



The next week I had a live early morning interview with Donna Gibson on the CTV programme 'Billboard' which was retransmitted twice again that day. That interview mostly dealt

with the genetic variation of tī kōuka, the conservation issues that relate to this variation, and Māori traditional use of the species. The subject of dead leaves was avoided.

The news release has also been used by the print media, so information about the tī hui has been spread far and wide.

Te Wānanga Tī Kōuka participants



Standing: (left to right)

Whero-o-te-rangi Bailey, Rose Brown, Te Aue Davis, Sue Scheele, Erenora Puketapu-Hetet, Dawn Schuster-Smith, Cath Brown, Rawinia (Lovey) Hodgkinson, Warwick Harris

Front row:

Tania Todd, Edward Maxwell, Ross Beever, Edna Pahewa, Rokahurihia Cameron, Mata Murray, Connie Pewhairangi

Headshots in foreground:

Tristan Armstrong, Ranui Ngarimu, Philip Simpson, Morehu Henare, Atareta Paul, Debs Gillanders, Te Amokura Griggs





Roka Cameron weaves a basket using whole harakeke leaves.

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