

*Ptisana salicina* ^+ para, king fern

Rare, a few planted specimens in fernery at Locality J, Fig. 1. Possibly cultivated on the Auckland isthmus by Maori in pre-European times for its starchy rootstock. These plants thriving, as the species does in other rock forest where it has been planted on the isthmus, e.g. Rarotonga (Mt Smart) and Mt Eden (Withiel Thomas Reserve and Government House grounds). Consequently, these plants did not appear intrusive to me in this setting.

*Pteris macilenta* AK 128446

Rare, two small tufted plants in the same locality (G, Fig. 1) and habitat described above under *A. colensoi* from 1969–70. Trampled out by cattle.

*P. tremula* ^ turawera, shaking brake AK 126431

Common to abundant, scattered plants on rocks and soil throughout. Occurring both under trees in shade where fronds are larger, drooping, more diaphanous and lettuce-green in colour (e.g. in localities C, D and F, Fig. 1) (Fig. 18) and on rocks and rock walls in the open where fronds are smaller, erect, firmer in texture and yellowish.

*Pyrrhosia elaeagnifolia* ^ leather-leaf fern AK 129150

Abundant, on rocks and bark, most prolifically and most often fertile on stone walls (Fig. 19) where it can form large colonies.

## Historical notes on northern New Zealand's grasses

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### Introduction

Our grass Flora (Edgar & Connor 2000; hereafter "FINZ 5") excels in describing its taxa but seldom mentions how, when or where these were discovered in New Zealand. To partially remedy this I have re-examined the earliest botanical accounts for the northern part of the country, with respect to both native and adventive species.

It has not been possible to make this re-evaluation a fully specimen-based one — generally, just the published records have been relied on. However, a number of crucial specimens, including some from Cook's First Voyage, can be checked on the Web.

I show here that several species long accepted as natives (but significantly, shared with Australia) turn out to have quite unconvincing 'passports'. Any controversy, though, will probably only be settled by the future discoveries of plant-archaeologists. Perhaps some of the information here will be useful in directing their investigations.

The study area takes in the mainland north from the Manukau and Waitemata Harbours at c. lat. 37°, and includes the Three Kings Is. and the offshore islands. It does not include the Kermadec Islands, nor the Coromandel Peninsula.

### Grasses in the pre-European landscape

In prehistoric times the natural vegetation of our area, away from its coast, rivers and swamps was forest of various types, and in them bryophytes, ferns, *Astelia* spp. and sedges would have predominated on the ground. But the shade-tolerant grass *Oplismenus hirtellus* would have been widespread, as would have been *Microlaena avenacea* (streamsides and higher-altitude clearings) and *Poa anceps* (banks and rocky outcrops). Several other grasses would have been able to grow along streamsides, in 'tree-gap' clearings, and by perching on the trunks and root-plates of overthrown trees; examples would be *Deyeuxia* and *Dichelachne* spp., *Echinopogon ovatus*, *Microlaena carsei*, *Rytidosperma gracile* and *Stenostachys gracilis*. Two large tussock grasses, *Chionochloa conspicua* subsp. *cunninghamii* and *Cortaderia fulvida*, require cool conditions but might have been somewhat more common in the unfragmented landscape than they are today.

Coastal places would have had a greater diversity of grasses. Slopes nearest the sea would have had *Anthosachne* (formerly *Elymus*) sp. or spp., *Chionochloa bromoides*, *Lachnagrostis littoralis* and *Zoysia* spp. Inland these would have been joined by *Deyeuxia* spp., *Dichelachne* spp., *Echinopogon ovatus*, *Microlaena polynoda*, *Poa pusilla*, and

*Rytidosperma* spp. Some of these species (including *Microlaena stipoides* — if it is a native, see further below) would have been able to grow under what might have been a near-continuous coastal band of pohutukawa (*Metrosideros excelsa*).

On rocky, shelly or sandy ground just above high-water (but never on FINZ 5's "mud flats") *Austrostipa stipoides* would have been abundant. Sand-dunes would have had a very substantial amount of grasses. The foredunes would have been covered by *Spinifex sericeus* and the more slowly moving dunes by *Cortaderia splendens*, *Deyeuxia billardieri* and *Poa billardierei* (formerly, *Austrofestuca littoralis*). The wind-grass *Lachnagrostis filiformis*, with its tumbleweed inflorescences, would have flourished in the damp to occasionally flooded interdune "slacks" and around the edges of estuaries.

The deeper swamps of northern New Zealand would have been dominated by non-grasses, particularly raupo (*Typha orientalis*) and tall sedges. But the grass *Isachne globosa* (again, if it is a native species) would have grown in the shallows (it is not able to perch on the bases of *Carex secta* and *C. virgata*). Being able to tolerate low-nutrient sites it could have occurred too in acidic coastal bogs, including those dominated by *Leptospermum scoparium*. The coldest swamps of northern New Zealand would have had some amount of *Hierochloe redolens*, a tussock much more common now south of lat. 38°.

Forests disturbed in minor ways by the Maori might have increased their cover of grasses along tracksides and where trees had been felled and camps made. But the more extensive and continued Maori-lit fires mainly produced a change to a vegetation not at all suited to grasses — a cover, wherever the remaining soil was deep enough, of what the early observers called "fern", that is, the bracken fern *Pteridium esculentum*.

However, where soils were naturally thin or where there had been repeated burning and loss of humus it seems that teatree (*Leptospermum scoparium* and *Kunzea ericoides* s.l.) would have been able to establish. Quite possibly, these small trees would have been able to regenerate under their own thinning canopies, and in such communities thrifty grasses like *Deyeuxia* and *Rytidosperma* spp. might have been numerous.

We know almost nothing about the weeds of Maori food-gardens: no grasses there seem to feature in proverb, dance or song. There would have been the opportunity for grass weeds to have been brought here from the Polynesian homelands (and from the Kermadec Is. too), including species such as *Centotheca lappacea*, *Chrysopogon acicularis*,

*Digitaria setigera* and *Urochloa paspalodes*. Evidence of their arrival, and failure to persist, may yet be found by archaeologists.

The Maori seem not to have named even the ubiquitous *Oplismenus hirtellus* and *Microlaena avenacea*. Nor does there seem to be a generic word for "grass" — the closest would be *patiti* which has variously been recorded for *Anthosachne* sp., *Dichelachne crinita* (f. Solander manuscript), *Phalaris canariensis* and *Microlaena stipoides*. It appears to be a Maori coinage, that is, it is without cognates in the Cooks and Society Islands. Two Polynesian grass names though have been transferred to New Zealand species. The one for the aromatic *Cymbopogon refractus* (called 'aretu in the Societies) appears here as *karetu*, for the unrelated but also pleasant-smelling *Hierochloe redolens*. The hillside reed *Miscanthus floridulus*, known throughout Polynesia as *kakaho* or variants thereof, gave its name to the similarly large and plumose-headed *Austroderia* spp., particularly to the culms of these tussocks, which were used, like those of *M. floridulus*, to make house walls.

### The first collections from northern New Zealand

These were made in 1769 by Cook's First Voyage botanists, Joseph Banks and Daniel Solander, at Motu Arohia island in the Bay of Islands, a short way northwest of what was to become the settlement of Russell (for maps see Robson 2000). The stay here, for six days beginning 29 November, was the sixth of the eventual eight New Zealand landfalls of this Voyage. It is the only one relevant to our study area.

The botanical manuscript Flora that came out of these collections was completed by Solander several years after getting back home. A copy of it (hereafter "Solander ms.") is in the Auckland War Memorial Museum herbarium (AK). Among the somewhat fewer than a hundred species collected at Motu Arohia were nine grasses. With identifications gleaned from various sources or from examination of the specimens themselves, the eight to which we can confidently assign modern names are (ms. names in quotes):

*Austrostipa stipoides* "*Avena angustifolia*"  
*Dichelachne crinita* "*Agrostis barbata*" [Maori name recorded as "patidi"]  
*Echinopogon ovatus* "*Dactylis barbatus*"  
*Lachnagrostis billardierei* "*Agrostis diffusa*"  
*Poa anceps* [this ms. name had been published by Georg Forster in 1786]  
*Poa billardierei* "*Festuca juncea*"  
*Spinifex sericeus* "*Ixalum inerme*"  
*Trisetum arduanum* "*Avena flavescens*"

The ninth Solander ms. record, "*Agrostis variabilis* var. *tenella*", is problematic. The habitat of this plant was said to be "sandy expanses", and it was noted as having been collected at five of the eight landings in New Zealand. In comparison with the manuscript's preceding taxon, "*Agrostis variabilis* var. *procera*", which was a grass found just at Totaranui, "var. *tenella*" was said to have a narrow panicle and subconvolute leaves. Connor and Edgar (2002: 94) cite "var. *procera*" as representing *Lachnagrostis filiformis*, but give no information about "var. *tenella*". However, at least one specimen of the latter (WELT collection 63932b, with its original red-ink label), belongs to *L. filiformis*.

These grasses, together with the other native plants gathered from Motu Arohia, come only from coastal habitats. But the failure to get several grass taxa there or at any other anchorage is prima facie evidence that these plants might not be native ones. The most striking omissions are *Bromus arenarius*, *Microlaena stipoides*, *Paspalum vaginatum* and *Rytidosperma biannulare*. The omission from the Motu Arohia gatherings of two undoubted natives, *Anthosachne kingiana* subsp. *multiflora* and *Chionochloa bromoides*, would seem to require a different class of explanation: all I can do here is to note that *C. bromoides* is common on the island today (specimens in AK) and has perhaps increased substantially following 19<sup>th</sup> century fires.

### The next collectors

There is now a considerable gap in the botanical record until the arrival of the Duperrey (*Coquille*) Expedition at the Bay of Islands on April 3 1824, with Dumont d'Urville its second in command, and naturalist, R. P. Lesson, assisting. A fortnight's stay was made but it seems that ethnology and word-collecting were concentrated on, with Lesson saying that he obtained "perhaps only five or six plants in flower" (Lesson 1839: 704).

The *Coquille* records would have been incorporated into the next work on New Zealand botany, Achille Richard's (1832) "Essai d'une Flore de la Nouvelle-Zelande". This was largely based on Cook's Second Voyage (G. Forster) collections and on those made by the next French expedition to New Zealand, that is, the First Voyage of the *Astrolabe*, with d'Urville now in command, and P. A. Lesson as botanist. This expedition spent six days in the Bay of Islands in March 1827, the last of the several coastal sites they investigated (again, the only one in our study area).

Among the grasses of Richard (1832) are two naturalizations, of Canary grass (*Phalaris canariensis*) and oat (*Avena sativa*). (A third record, of "*Agropyron repens*", is a misidentification of

*Anthosachne kingiana*). A notable New Zealand first in the *Astrolabe's* Bay of Islands collections was that of *Paspalum orbiculare*. Its Maori name was recorded as *tuhui* (not a plant-name of the Cooks or the Societies), and it was said to be very common along the sea-shore (Richard 1832: 141).

During the previous fifty years the Bay of Islands had become irresistible to whalers, traders, sawyers, missionaries, travellers and assorted ne'er-do-wells. Very likely this resulted in the assisted introduction of weedy species, perhaps particularly from Australia, and in material brought on shore and discarded, such as animal fodder and bedding.

However, except for *Phalaris canariensis* (see further below) no introduced grass seems to have been virile enough to have attracted notice. All descriptions of the early 19<sup>th</sup> century Bay of Islands landscape comment adversely on the dominance of bracken fern. It seems that grasses could only spring up along tracks or where the bracken had been trampled by cattle. For example, Richard Cruise said about his 1820 visit: "The ground, where there was no timber, appeared green and rich at a distance; but ... it was covered with a sheet of fern, so strong and tall, that if there had not been a path we should have made very slow progress through it. No natural grass was observed ..." Cruise (1824: 30).

The next account of New Zealand grasses appeared in 1837, in the fourth part of Allan Cunningham's "Precursor" series. It is based on his own collections from the Bay of Islands-Whangaroa-Hokianga region, with additions from his brother Richard made during a stay in the same locality in 1833-4. Records from Cook's Second Voyage and from Richard (1832) are cited too, but for only two species ("*Poa caespitosa*", now called *Poa cita*, and *Spinifex sericeus*) is any reference made to the grasses of the Solander ms.

Of particular interest among Cunningham's new records are: *Bromus arenarius* "open situations on the sea-coast, Bay of Islands"; *Cortaderia* [presumably] *splendens* "sand heads of the Hokianga River" (specimen not cited by Connor, 1971); *Rytidosperma pilosum* "open clay lands, near the Bay of Islands". For *Paspalum orbiculare* there is mention of the 1827 d'Urville collection and a note from Richard Cunningham: "So scanty is the pasturage on the Northern Island, that the British Resident, living near the Bay of Islands, collected a bushel of the seed of this grass, to sow near his dwelling, from which he hoped to derive food for his horse, and thus prevent the animal from straying far and wide in search of provender" (Cunningham 1837: 371).

Notable absences from the Cunningham collections are *Isachne globosa*, *Microlaena stipoides*, and species of *Rytidosperma* other than *R. pilosum*. Two grasses now uncommon in northern New Zealand were found: *Chionochloa conspicua* subsp. *cunninghamii* (as *Agrostis pilosa*), in "shady woods on the Keri-Keri River"; and *Hierochloa redolens* in "marshy grounds in the neighbourhood of the Bay of Islands ... A Grass of strong growth, having the fragrance of *Anthoxanthum*, by which it may be readily detected in swampy hollows between the Bay of Islands and the Keri-Keri River" (Cunningham 1837: 370, 372).

As mentioned above, oat (*Avena sativa*) had been recorded by Richard (1832) for the Bay of Islands, apparently as a wild plant (since he felt the need to say that it had most likely been introduced by Europeans). Cunningham did not record *A. sativa*, but said (1837: 370) that wheat (*Triticum aestivum*) was "perfectly wild", and also felt it necessary to warn against thinking it was a native species!

Remarkably, neither writer made a similar comment with respect to Canary grass, *Phalaris canariensis*. Richard gave no habitat information and Cunningham (1837: 370) just said that it grew on "summits of hills cleared by the natives; Bay of Islands and its vicinity". The missionary William Yate seems to have observed it there too, saying: "The native grasses flourish throughout the year, and, where the fern has been destroyed, afford an abundant supply .... All English grasses flourish well ... and, where the fern has been destroyed, a strong native grass, something of the nature of the Canary-grass, grows in its place ..." (Yate 1835: 73).

The interest of these occurrences has not been realized: Canary grass is the first-recorded New Zealand adventive, with a presence here that dates back to Cook's Second Voyage (Forster 1786: 7). Forster's record is presumably based on plants at Queen Charlotte Sound that had sprung up in the gardens made there by the Second Voyage ship *Adventure* (Edwards 2003: 271, 316). Nicolson and Fosberg (2004: 240) say about this record that although no specimen has yet been located, "*Phalaris canariensis* on Banks' January 1778 supplementary list of plants presented by the Forsters ... and should be at BM ...". We are left then to wonder if it might have been sown with the other European food-plants, or whether it might have come up from discarded pig or poultry feed.

In the next decade, at the end of March 1840, the U.S. Exploring (Wilkes) Expedition called in at Bay of Islands for a week's stay. Only some of their plant-records were published as a body, but a wider knowledge of them is now available from

the US herbarium database, and, for our grasses, from manuscript notes (copy in AK) made c. 1950 by former US agrostologist Agnes Chase, in response to queries by New Zealand botanists V. D. Zotov and R. C. Cooper.

Most notable are the finds of *Paspalum vaginatum* (US 929510), *Vulpia* cf. *bromoides* (1006523, as *Festuca dertonensis*), and the first New Zealand collections of *Isachne globosa* (US 97511), and *Rytidosperma penicillatum* together with *R. racemosum* (mixed sheets of US 878259, -60; see Zotov 1963: 121–122). There is also a species of *Anthosachne*, perhaps *A. kingiana* (US 1015210, databased as *Brachypodium* sp.).

There are two dubiously localized specimens. That of *Cortaderia selloana* (US 899917) is probably one of the Expedition's South American finds; it seems unlikely that the plant was in cultivation in New Zealand so early. That of *Digitaria setigera*, if it had come from the Bay of Islands, would be the only such collection for New Zealand (FINZ #5: 544). It seems more likely that it came from one of the Pacific Islands the Expedition visited.

The next year, in August 1841, the Antarctic (*Erebus* and *Terror*) Expedition arrived at the Bay of Islands. Its assistant surgeon and naturalist was Joseph Hooker, here at the start of his long association with New Zealand. During a visit of several months he collected in the Bay of Islands region, sometimes accompanied by William Colenso and Andrew Sinclair.

Their collections feature conspicuously in Hooker's "Florae Novae Zelandiae" (dated, for Gramineae, 1853). But with respect to the northern grasses, this work does not have much that is new. Perhaps most interestingly, *Microlaena stipoides* appears, but without any reference to there being collections from north of Auckland. Also noted is a Cunningham collection of "*Danthonia semi-annularis*", a reference apparently to the species we now call *Rytidosperma pilosum*; Zotov (1963: 118) has "A. Cunningham 256" as representing this species, and also mentions a collection by Hooker himself.

Several of Hooker's entries have to be queried. He says that *Paspalum orbiculare* (as *P. scrobiculatum*) was collected in New Zealand by Banks and Solander and was referred to in various of their manuscript Floras (as "*P. venustum*"). This is not true for the particular Solander ms. that concerns New Zealand, although "*P. venustum*" is noted in the corresponding manuscript for the Society Islands (Gardner 2007) and presumably too, in the one for Australia. Also, Hooker credits Richard Cunningham with *Paspalum vaginatum* ("*P. distichum*"), and [Allan] Cunningham with *Isachne globosa*

("I. australis"), even though neither is recorded in the "Precursor" (Cunningham 1837). Hooker's citations here might be based on wrongly localized specimens (both spp. occur in Australia), or they might be genuine, having been mixed in with other of the Cunninghams' New Zealand collections.

A number of grasses, including *Phalaris canariensis* (oddly, wheat is omitted but not oat) were briefly mentioned in the second part of "Flora Novae-Zelandiae" (Hooker 1855) as being naturalized exotics in this country. But *Vulpia bromoides* (as *Festuca bromoides*) gets a full entry in the main part of the work (Hooker 1853: 309). It was said to have been found at the Bay of Islands, Great Barrier Island and Auckland, with Sinclair as the only collector credited. It was described as: "A very common grass ... it has possibly been introduced ... I do not find it in any of the older collections". A full entry is also given for *Sporobolus africanus* ("*S. elongatus*") on the basis of a Sinclair specimen from Auckland, and it too appears to be considered as native, being said to be "abundant in all tropical countries, also found at the Cape of Good Hope and at Port Jackson" (Hooker 1853: 295).

Hooker's subsequent "Handbook of the New Zealand Flora" (1864–7) is a simplification of his earlier account. It too contains an Appendix of a

number of naturalized species, these nearly all listed without geographical information relevant to northern New Zealand.

The last work to be mentioned is by Thomas Kirk (1870). His annotated list of the exotic species he had seen growing more or less wild in the northern part of the North Island comes a hundred years after Banks and Solander. It can be taken as marking the end of the historical era and the start of a modern, ecologically orientated approach to our flora, in which, at least for the northern grasses, native species seem hardly able to resist the encroachment of foreign ones. Kirk's list (probable modern names in brackets) is : *Alopecurus pratensis*, *Phalaris canariensis*, *Holcus lanatus*, *H. mollis* [an error ?], *Setaria viridis*, *S. italica*, *Agrostis vulgaris* (*A. capillaris*), *Gastridium lendigerum* (*G. ventricosum*), *Cynodon dactylon*, *Digitaria sanguinalis*, *Anthoxanthum odoratum*, *Avena sativa*, *Poa annua*, *Poa pratensis*, *Eragrostis brownii*, *Briza minor*, *Dactylis glomerata*, *Cynosurus cristatus*, *Festuca bromoides* (*Vulpia bromoides*), *Bromus mollis* (*B. hordaceus*) and *B. sterilis*, *Ceratochloa unioloides* (*Bromus catharticus*), *Lolium italicum* (*L. multiflorum*), *L. perenne*, *L. temulentum*, *Triticum sativum* (*T. aestivum*), *Hordeum* (*Critesion murinum*). All are still with us today.

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