

Lastreopsis velutina
Lygodium articulatum
Microsorium pustulatum
Microsorium scandens
Paesia scaberula
Pellaea rotundifolia
Pneumatopteris pennigera
Polystichum neozelandicum
Pteridium esculentum
Pteris comans
Pteris macilenta
Pteris saxatilis
Pteris tremula
Pyrrosia eleagnifolia
Tmesipteris elongata

Gymnosperms

Agathis australis
Dacrycarpus dacrydioides
Dacrydium cupressinum
Phyllocladus trichomanoides
Podocarpus totara
Prumnopitys ferruginea
Prumnopitys taxifolia

Dicotyledons

Alectryon excelsus
Avicennia marina
Beilschmiedia tarairi
Beilschmiedia tawa
Beilschmiedia tawaroa
Brachyglottis repanda
Calystegia sepium
Calystegia soldanella
Carmichaelia australis
Centella uniflora
Clematis paniculata
Coprosma arborea
Coprosma areolata
Coprosma macrocarpa subsp.
minor
Coprosma rhamnoides

Coprosma robusta
Corynocarpus laevigatus
Dichondra repens
Dodonaea viscosa
Dysoxylum spectabile
Entelea arborescens
Geniostoma ligustrifolium
Geranium homeanum
Haloragis erecta
Hebe macrocarpa
Hedycarya arborea
Hoheria populnea
Knightia excelsa
Kunzea ericoides
Leptospermum scoparium
Leucopogon fasciculatus
Lobelia anceps
Macropiper excelsa
Melicope ternata
Melicytus ramiflorus
Metrosideros excelsa
Metrosideros perforata
Muehlenbeckia australis
Muehlenbeckia complexa
Myoporum laetum
Myrsine australis
Nestegis lanceolata
Olearia albida
Olearia furfuracea
Parsonsia heterophylla
Peperomia urvilleana
Pittosporum crassifolium
Plagianthus divaricatus
Pseudopanax arboreus
Pseudopanax crassifolius
Pseudopanax lessonii
Pseudopanax crassifolius x lessonii
Rhabdothamnus solandri
Rubus cissoides
Solanum aviculare
Sophora microphylla
Streblus heterophyllus

Vitex lucens

Monocotyledons

Apodasmia similis
Astelia banksii
Austrostipa stipoides
Bolboschoenus medianus
Bulbophyllum pygmaeum
Carex flagellifera
Carex lambertiana
Carex ochrosaccus
Carex testacea
Carex virgata
Collospermum hastatum
Cordyline australis
Cordyline pumilio
Cyperus ustulatus
Desmoschoenus spiralis
Dianella nigra
Drymoanthus adversus
Earina autumnalis
Earina mucronata
Eleocharis acuta
Ficinia nodosa
Freycinetia banksii
Gahnia lacera
Gahnia xanthocarpa
Isolepis reticularis
Juncus australis
Microlaena stipoides
Oplismenus hirtellus subsp.
imbecillis
Phormium tenax
Poa anceps
Rhopalostylis sapida
Ripogonum scandens
Spinifex sericeus
Uncinia uncinata
Winika cunninghamii

Field Trip: Bombing Range, Waionui Inlet, Kaipara South Head. 19/03/05

Ewen K. Cameron

The primary purpose of this monthly Auckland Bot Soc (ABS) field trip (19 March 2005) was to survey the oioi (*Apodasmia similis*) dominated dune slacks, west of the Waionui Inlet at Kaipara South Head (Fig. 1), for the environmental weed, royal fern (*Osmunda regalis*). Department of Conservation (DOC) staff joined the trip to help search and to spray any royal fern found. Royal fern was first found in the area in the summer of 2002-03, and since then c.80 plants have been located. The area is Crown Land within the Papakanui Conservation Area, now called the Papakanui

Conservation Area, managed by DOC and it is used as a weapons training area by the NZ Defence Department.

Present on the trip were: Enid & Paul Asquith, Jonathan Boow (leader), Ewen Cameron, Geoff Davidson, Frances Duff, Peter Hutton, Elaine Marshall, Josh Salter, Fran Hintz; and from DOC: Phil Brown, David Wilson, George Wilson and volunteer Duncan Innes.

The trip began by meeting at the North Woodhill Forest HQ on Trig Road, having a talk from a Defence Department spokesman, about what unexploded weapons might look like, and the most important point – to leave them alone! We fitted into three 4WD vehicles, and set off with a key for the locked forestry gates. After a few 'loop-the-loops' to get our bearings we parked by an extensive oioi-filled sand dune slack, c.1km across (map NZMS 260 Q09 159267) which was nearly midway between the Waionui Inlet and the Tasman Sea, and bounded by tall active sand dunes along the western boundary. Most of the time (11am to 3pm) was spent line searching through the oioi meadows. Plants on the dry sand dunes were only seen at the margins of these meadows or from the vehicle as we drove through the dunes; a single short stop was also made by the western margin of the Waionui Inlet. Therefore the vascular plant species list (Appendix 1) will be near-complete only for the dune slacks.

The vascular flora of the fringes of the Waionui Inlet, which forms the eastern boundary of the bombing range, was studied by Cameron & Bellingham (2002) and visited by ABS in October 2002 (Kilgour & Boow 2003). In their species list Cameron & Bellingham (2002) included comment on 11 species in the bombing range observed from a vehicle by EKC in November 1998. The present field trip was a wonderful opportunity to study these botanically interesting dune slacks with difficult access.

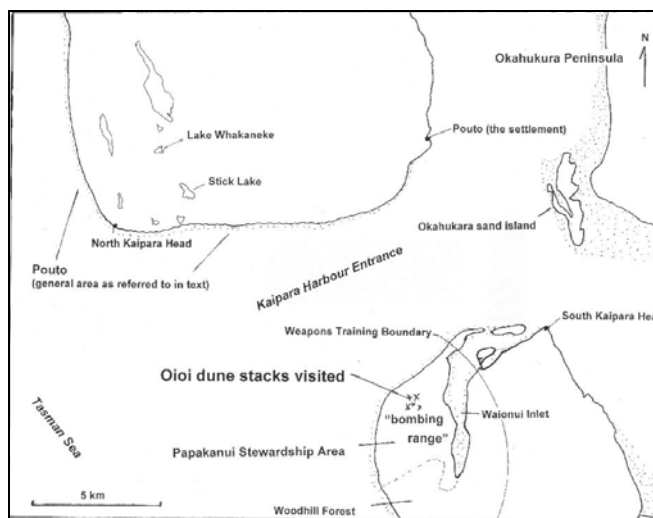


Fig. 1. Location of the dune slacks surveyed in the bombing range, and adjacent areas at Kaipara South Head.

Dune Slacks

During our visit the dune slacks were dry, apart from a single small wet hollow.

By far the dominant species was oioi, which varied from dense vegetation 1.6m tall, to more sparse cover c.0.4m tall (Fig. 2). The exotic sedge, *Cyperus polystachyos*, was common in this habitat, varying from mature brown fruiting plants (to 90cm tall) nearly

equal in height to some of the oioi, to young bright green juvenile plants.



Fig. 2. Unsuccessfully line-searching the dense oioi dune slacks for royal fern.

Locally, small native herb fields existed in the dune slacks between areas of oioi: *Myriophyllum votschii* was the most abundant species; *Isolepis cernua* was widespread; and *Triglochin striata*, *Limosella lineata* and *Lilaeopsis novae-zelandiae* more local (Fig. 3). In a few places they all occurred together, but *Lilaeopsis novae-zelandiae* was only seen at one place.



Fig. 3. Openings amongst the oioi, locally revealed native herbs like *Limosella lineata* (flowering) and *Myriophyllum votschii* (photo: 19 Mar 2005).

The one area seen with standing water was a muddy pond 5m across, c.1m deep, surrounded by oioi (map NZMS260 Q09 161265). The pond was possibly created and maintained as a wallow by the feral mammals present in the general Woodhill Forest area, i.e. pigs and fallow deer. Submerged and abundant in the pond was *Potamogeton ochreatus* with the submerged charophyte, *Chara globularis*. In the fine mud on the pond margin was a short shoot with the wide "floating" leaves of *Potamogeton cheesemanii*. Adjacent to this pond was a stand of 2m tall raupo (*Typha orientalis*) c.8m across with *Schoenoplectus tabernaemontani*, *Eleocharis acuta*, *Persicaria*

decipiens and *Myriophyllum propinquum* around its margin.

Fernbirds were heard, pipits were common and we flushed out a pheasant among the oioi. From the margin of the Waionui Inlet and in the pines on the way in, Paul Asquith added: black shag, harrier, goldfinch, grey warbler, waxeye, magpie, white-faced heron, white-fronted and Caspian tern, black-backed gull, red-billed gull, godwit, variable and SI oystercatcher, ?knots, spur-winged plover, paradise ducks, starling and blackbird. Rabbit burrows and droppings were common in the dune slacks and on the adjacent dunes.

Notes on four selected species

Yellow-wort (*Blackstonia perfoliata*) – this exotic glaucous annual herb with yellow flowers is recorded here for the first time and Kaipara South Head is a small southern extension for this species in the Auckland region (AK 289602; see Cameron 2005). Even though the dune slack habitat seemed perfect for this species, only 2 plants were seen, 650m apart, suggesting that it has recently established here. We also saw this species well established in dune slacks during ABS field trips to the Okahukura Peninsula in the Kaipara Harbour in August 1995 and at Pouto in January 2001 (Cameron *et al.* 2001). This species should increase in abundance and keep spreading southwards, but is unlikely to pose a threat to the present native vegetation.

***Cyperus polystachyos* (= *Pycreus polystachyos*)** – an exotic annual to perennial species, locally common in Northland - this is the first time I've seen it in the Auckland region (AK289581-82). However, there is an earlier Auckland collection from: Silverdale, *F.W. Bartlett*, Apr 1959; turnip field: field topdressed with Seychelles fertilizer, CHR143535. This is the basis of the Silverdale record by Healy & Edgar (1980: 189); otherwise the species was then recorded as far south as Hokianga. Because it was so well established, it must have been present in the bombing range area for several years. It was the commonest species after oioi in the dune slacks and appeared to be aggressive in places invading the oioi meadows and the low native herb fields. We also saw this species in the Pouto dune slacks during the ABS trip there in January 2001 (Cameron *et al.* 2001) and Colin Ogle collected it at Stick Lake, Pouto in Feb 1994 (CHR 49875).

Isolepis cernua* ? var. *setiformis – a bright green perennial, tufted herb, with two styles, two anthers, and spikelets 6.5mm long (AK 289587; Fig. 4). Using the monograph of *Isolepis* (Muasya & Simpson 2002) because of the bifid styles it keys to *I. cernua* var. *setiformis* (Benth.) Muasya. It matches this taxon except for the longer spikelets (to 6.5mm long) which are not mentioned in the monograph and are not as long as on the only definite specimen of it held in the AK herbarium (Norfolk Island, *de Lange NF92* &

Crowcroft, Nov 1998, AK 237894). Also the habitat for this variety is cited as "seasonal seepage, along streams; 10-200m" – and the Kaipara specimens were in a salty dune slack at sea level. *Isolepis cernua* var. *setiformis* is not previously known to occur in NZ, and is native to Australia, Norfolk Island, Tristan da Cunha and South Africa (Muasya & Simpson 2002). The true identity of the Kaipara collection requires confirmation on whether it is var. *setiformis*, or just a different form within var. *cernua*.

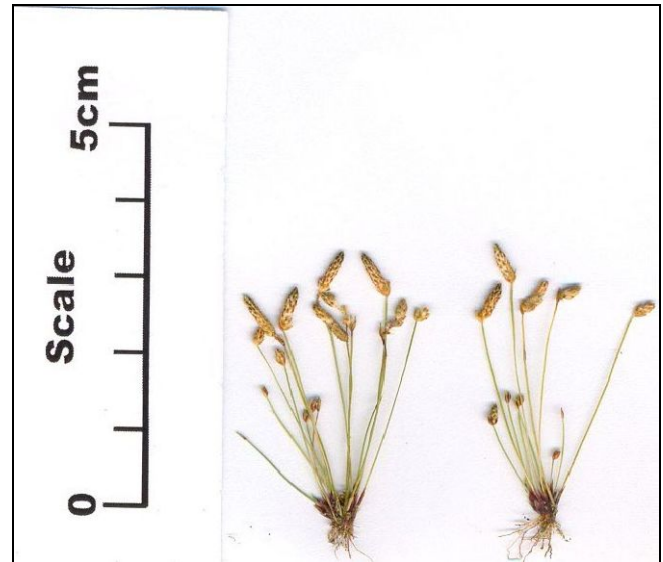


Fig. 4. *Isolepis cernua* ? var. *setiformis* from the bombing range (part of AK 289587).

Royal fern (*Osmunda regalis*) – wild plants were first found on the sand dunes west of the Waionui Inlet in the summer of 2002/03 by Bryce Lummis, about 2km south of the oioi dune slacks searched by us during the field trip. On 14 March 2003 Bryce returned to the same area with Jonathan Boow and Bec Stanley and observed two plants (1 fertile) and collected a voucher specimen (AK 281140; dups CHR, NSW, WELT) on the "dry stunted sand dune scrub of manuka, toetoe and pampas." Subsequent searching recorded 70 royal fern plants in the surrounding area. All these plants were later sprayed with herbicide by DoC staff. In summer of 2003/04 about ten plants (to 80cm tall) were found by Jonathan scattered amongst oioi when walking only 100m in this rather dense habitat. This site was several hundred meters north of the original site. Because oioi covers several square kilometres he sought the assistance of ABS members to help search. Shane McInnes (pers comm.), the DoC fairy tern warden for last summer at Papakanui spent half a day searching the dunes for royal fern but failed to see any. This present ABS/DoC survey also found no royal fern but as a later GPS plot of our route revealed, the dune slacks we searched on this occasion were adjacent to the one where Jonathan originally located royal fern.

Discussion

Six species were recorded during this trip for the first time for all of the natural areas of Woodhill Forest and

dune areas (Cameron & P J Bellingham unpubl. data). Two were native (*Lilaeopsis novae-zelandiae*, *Triglochin striata*) and four were exotic species (yellow-wort, *Cyperus polystachyos*, *Juncus acutus*, *Paspalum urvillei*). Also a different variety of *Isolepis cernua* (var. *setiformis*) was possibly recorded for the first time in New Zealand.

The earlier collection of *Cyperus polystachyos* in the Auckland region at Silverdale is out of step with its otherwise slow movement southwards from Northland – why after 46 years hasn't it been seen again in the general area? The most reasonable explanation is that it was accidentally introduced to Silverdale from Northland as a soil contamination, and that it failed to permanently establish. However, it would be worth searching the wetlands of the wider Silverdale area to confirm this.

It would appear that yellow-wort and *Cyperus polystachyos* have spread down from the north via the Pouto area (Kaipara North Head), which has similar dune habitats and is only 6.5km distant (Fig. 1). Both species were commonly observed and also collected at Pouto during the ABS trip there in 2001. Yellow-wort at least, may have 'island-hopped' via the Okahukura Peninsula sand island 4.0km to the northeast where it was collected on wet sand flats in August 1995 (AK 223773); but *C. polystachyos* was not observed there at that time (*pers. ob.*). Possible methods of dispersal for these species are presented in Table 1. Both *C. polystachyos* and yellow-wort should both continue to disperse southwards. *Cyperus polystachyos*, being larger and appearing to be the more aggressive, will have the greater impact on these dune-slack communities.

Table 1. Propagules and method of dispersal for four suspected new arrivals at South Kaipara Head.

Species	propagule	suspected method of dispersal
Yellow-wort	seed, <0.5mm	wind, waterfowl & water
royal fern	spore	wind
<i>Cyperus polystachyos</i>	nut, c.1.0mm	water/waterfowl
<i>Isolepis cernua</i> ? var. <i>setiformis</i>	nut, c.0.8mm	water/waterfowl

The stronghold for royal fern in New Zealand is in the Waikato (Webb *et al.* 1988, Brownsey & Smith-Dodsworth 2000). Until royal fern was located at the

bombing range it was known to be wild in the Auckland region on Great Barrier Island (see Martin 2002); and based on AK herbarium records: one plant in Waharau Regional Park in the eastern Hunua Ranges (*Wright 8015*, Mar 1988, AK 179309); one plant at Lake Pokorua at Awhitu (*Myers*, Feb 2000, AK 245620); and one at Ahuroa in Rodney (*Dunn*, Dec 2002, AK 280970). Twelve kilometres to the northwest of Kaipara South Head it has been collected (1 or 2 plants) on the shores of Lake Whakaneke at Pouto (*Forester*, Nov 2000, AK 252345-46). At Pouto royal fern is now widespread but uncommon (*Lisa Forester pers. comm.*). Royal fern is also cultivated as a garden ornamental in urban Auckland (*pers. ob.*). Therefore it is difficult to ascertain where the wind-blown spores may have come from, but it could have been from the closest known population at Pouto. Note - that royal fern is nationally banned from sale, propagation and distribution.

It was good not to find any royal fern during this present survey which indicates that it is not widely established in the dune slacks at Papakanui. But a survey of the other dune slacks in the area should still be done. The dry sand dunes and the salty oioi dune slacks both appear to be unlikely habitats for this species that usually frequents fresh water habitats. "It likes to have its feet in damp to wet ground and its head in the sun, wherever I've seen it in the wild. In cultivation it will stand drier and shadier conditions. This Woodhill site does seem pretty odd. Perhaps the colony established in a very wet summer?" B.S. Parris (*pers. comm.*). Monitoring and time will tell how well suited royal fern is to this mainly dry or salty sand habitat. However, the string of Woodhill dune lakes, starting c.5km to the SE and strung out over 43km, would be a most suitable habitat and should be monitored for the establishment of this environmental weed.

Apart from the three exotic species commented on above, hopefully some native species may also disperse south from Pouto. For example, an eye should be kept open for the establishment of the native herb, *Gunnera dentata*, in the Papakanui dune slacks which should suite it as it is locally abundant in this type of habitat at Pouto (*pers. ob.*). It is possible that plants may also disperse in the opposite direction. For example, will the 3-sided sedge, *Schoenoplectus pungens*, which is currently at its northern New Zealand geographical limit at Waionui Inlet (Cameron & Bellingham 2002) reach Pouto in the near future?

Acknowledgements

I thank Jonathan Boow for organising the trip and for commenting on a draft of this article; Peter Bellingham, Lisa Forester, Rhys Gardner, Shane McInnes, Barbara Parris and Bec Stanley for comments to my various queries; and staff from the following herbaria for label information of their holdings of *Cyperus polystachyos*: CHR, NZFRI, WAIK and WELT.

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Appendix 1. Vascular plants seen during the field trip

Key

a = abundant

c = common

o = occasional

l = local

s = scarce (<5 plants seen)

***** = naturalised exotic species

^a = additional wild records to the lists of Cameron & Bellingham (2002), & Kilgour & Boow (2003)

AK = herbarium voucher number of specimens collected during the field trip.

DS = sand dune slacks mainly dominated by oioi

SD = adjacent sand dunes to oioi dune slacks

WWI = W margin of Wainui Inlet (single spot <100m long: map 260 Q09 171268)

Ferns

Osmunda regalis^{*a} lc DS; o SD (although not seen during our visit, it has been observed here in both these habitats since 2002)

Confers

Pinus radiata^{*a} o SD (wildlings from the adjacent pine plantation)

Dicots

Anagallis arvensis s.str.* o DS

*Aster subulatus** o DS

Avicennia marina c WWI

Blackstonia perfoliata^{*a} s DS (AK 289602)

Calystegia sepium l WWI

Centaureum erythraea^{*a} o DS

*Conyza albida** o SD

Kunzea ericoides c SD (AK 289596)

Leontodon taraxacoides^{*a} lc DS; o SD (AK 289515)

Leptospermum scoparium o SD

Leucopogon fasciculatus o SD

Lilaeopsis novae-zelandiae^a l DS (open damp herbfield between the oioi)

Limosella lineata l DS (AK 289590)

Lobelia anceps o DS

Lotus suaveolens^{*a} o DS (dryer areas with low oioi)

Lythrum hyssopifolia^{*a} s DS

*Lupinus arboreus** o SD

Muehlenbeckia complexa^a lc SD

Myriophyllum propinquum^a l DS (small wet area by raupo) (AK 289593)

M. votschii^a lc DS (open damp herbfield between the oioi) (AK 289585)

Ornithopus pinnatus^{*a} o SD

Ozothamnus leptophylla c SD

Parentucella viscosa^{*a} o DS (all plants dried up)

Persicaria decipiens l DS (small wet area by raupo) (AK 289594)

*Phytolacca octandra** l WWI

*Polycarpon tetraphyllum** s DS

Pseudognaphalium luteoalbum^a lc DS (AK 289601)

*Ulex eropaeus** o SD

*Vellerophyton dealbatum** c DS

Monocots

Aira caryophylllea s.str.*
Ammophila arenaria * c SD
Apodasmia similis a DS
*Aristea ecklonii** o SD
Baumea juncea lc DS
Carex pumila la margin of DS & SD
C. "rarotest" l SD (AK 289597-98)
*Cortaderia selloana** c DS (as small plants); c SD (as adults) (AK 289587)
Cortaderia splendens o DS (as small plants); lc SD (as adults)
*Cyperus congestus** o DS
*Cyperus polystachyos**^a a DS (AK 289581-82)
Desmoschoenus spiralis c SD (many plants were dead)
Eleocharis acuta l DS (damper hollows)
Ficinia nodosa o DS & SD
Isolepis cernua ? var. *setiformis*^a o DS (open damp herbfields between the oioi) (AK 289587)
*Juncus acutus**^a l WWI
*J. articulatus** lc (damper hollows)
J. kraussii lc WWI
Lachnagrostis ? *billardierei*^a o SD (loose heads were present among the oioi)
*Lagurus ovatus**^a o SD
*Paspalum vaginatum** lc DS (sward-forming) (AK 289586)
*P. urvillei**^a s DS (AK 289592)
Phormium tenax o WWI
*Polypogon monspeliensis**^a o DS (AK 289589)
Potamogeton cheesemani^a s (margin of small pool by raupo)
P. ochreatus^a l DS (submerged in small pool by raupo) (AK 289603)
Schoenoplectus tabernaemontani lc DS (damper hollows)
Spinifex sericeus c SD
*Sporobolus africanus** l DS (dryer areas with low oioi)
*Stenotaphrum secundatum** lc SD by WWI
Triglochin striata^a l DS (open damp herbfields between the oioi) (AK 289584)
Typha orientalis l DS (small wet area)
Zoysia pauciflora lc SD

Field Trip: Mt Taranaki Easter Camp 26-28/03/05

Jan Butcher

Field trip members: Enid Asquith, Paul Asquith, Jan Butcher, Gwenda Cruickshank, Murray Cruickshank, Brian Cumber, Barbara Hammonds, Bernice Hintz, Fran Hintz, Tony Keen. Taranaki group: Ian Dudding, Barry Hartley, Jane Hart, Wayne Peters.

It rained and it rained and rained and rained
The average fall was well maintained
And when the tracks were simply bogs
It started raining cats and dogs

After a drought of half an hour
We had a most refreshing shower
And then the most curious thing of all
A gentle rain began to fall

Next day was also fairly dry
Save for the deluge from the sky
Which wetted the party to the skin
And after that the rain set in

It is always great to see the *Cordyline indivisa* that greets you as you drive up to the Konini Lodge where we were staying. Unfortunately Kerry Bodmin, the original leader for the trip was unable to go due to a new job taken up at Wellington. So with some local knowledge, (the Taranaki group) we carried on. With the rain forecast for the Friday, we arrived like brown cows. In the afternoon, Tony, Brian, Paul and myself braved the track down to the Dawson Falls, which the rain had turned into fast flowing streams with water over our ankles. Tony was the first "cry" as he spotted *Leptinella squalida* with all the water rushing over the top of it. The brightly coloured leaves of *Pseudowintera colorata* and the red berries of the *Alseuosmia pusilla* cheered us on. Most of the *Ourisia macrophylla* had finished flowering, but found a late one just to show us what it can do. The volume of water coming over the falls was certainly spectacular.

Anonymous On the Monday, after everyone else had headed home in the morning, Brian and myself braved the rain