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The vegetation and flora of 'Matukureia Swamp', Puhinui, South Auckland – with notes on *Ranunculus macropus*

P.J. de Lange, R.O. Gardner, T.J.P. de Lange

Fig. 1. Matukureia Swamp as viewed looking north-north-west. (Photo: P.J. de Lange, Oct 2013).

Fig. 2. Looking east across Matukureia Swamp toward the terraced, quarried remnant of McLaughlin's Mountain (Matukureia). Note the solitary cabbage tree growing in the middle of the swamp. (Photo: P.J. de Lange, Oct 2013).

Introduction

The swamp (37° 1′ 2.31″ S, 174° 50′ 30.12″ E, c.9 m a.s.l., Figs. 1, 2, 3) discussed here appears to have no official name, so being highly original thinkers we decided to refer to it using the Maori name for the nearby quarried ruin that was once Matukureia Volcano, and which is now more usually known as McLaughlin's Mountain (Fig. 2). Matukureia Swamp was first drawn to our attention when one of us (ROG) 'discovered' it during September 2000 whilst doing a survey of the scoria fields located south-west of McLaughlin's Mountain, which is the southern-most portion of the Auckland Volcanic Field (Hayward et al. 2011).

Matukureia Swamp is a eutrophic palustrine system, classified here as a 'swamp' using the New Zealand wetland types classification system of Johnson and Gerbeaux (2004). The swamp occupies a small remnant of a tuff-ring. The tuff ring was formed during the initial 'wet' (i.e., phreatomagmatic) eruptions of this volcano. Subsequently most of this tuff ring was lost when the eruption style switched from the 'wet' eruptive phase to one producing 'dry' scoria and lava, after which virtually all of the parent tuff ring (except that in which the swamp eventually developed) was obliterated (Hayward et al. 2011). At some stage (possibly even while the 'dry' eruption phase of the volcano was still active) a small permanent water body developed within the remnant portion of the tuff ring. Subsequent paludification has seen this water body gradually infilled with sediment and highly decomposed organic matter (peat grade D10 of Von Post scale – see Taylor and Pohlen (1979)), to form the swamp described here.

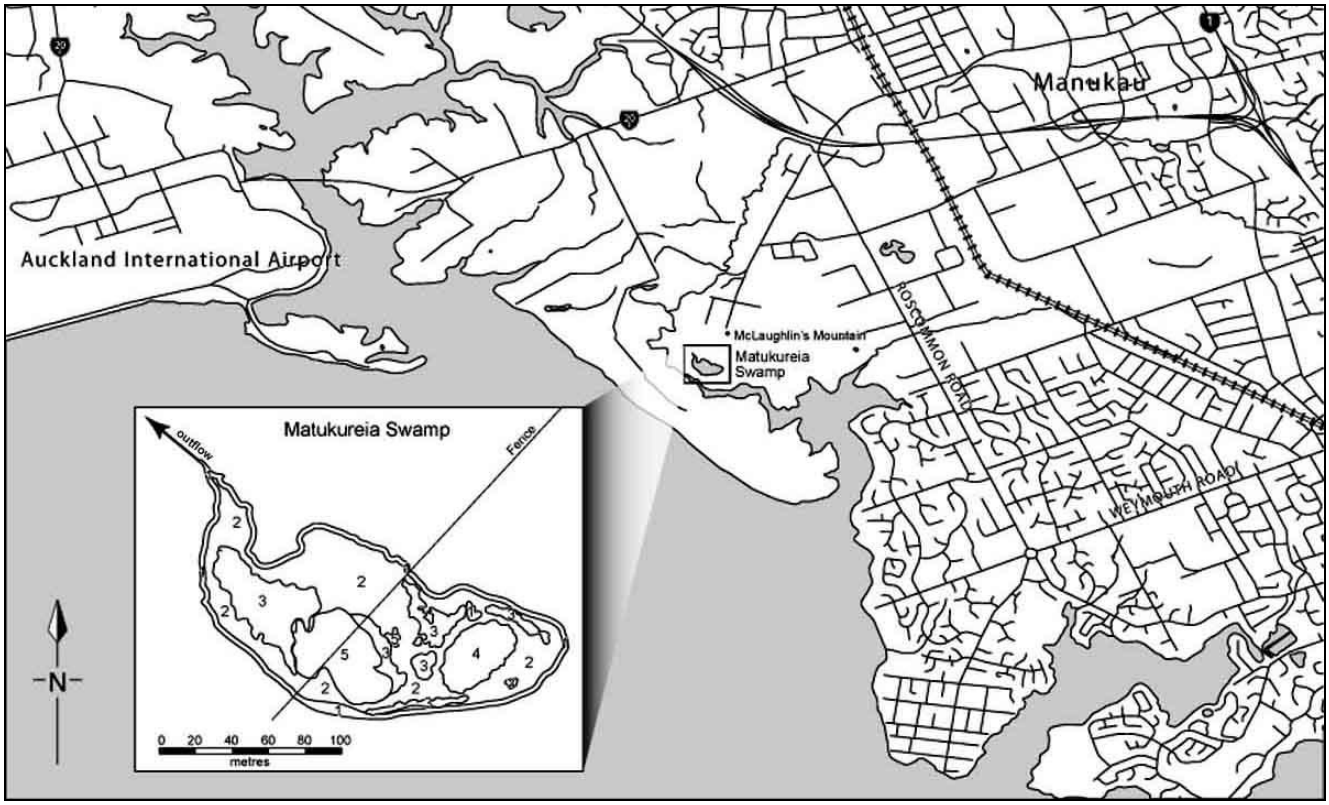

Fig. 3. Location of Matukureia Swamp, Puhinui, South Auckland. Inset: vegetation map of Matukureia Swamp, showing fenceline and direction of outflow. Plant association codes as follows: 1. Rushland; 2. *Persicaria* herbfield; 3. *Isolepis* sedgeland; 4. kutakuta reedland; 5. Raupo / *Bolboschoenus* reedland. (Map prepared by J.R. Rolfe).

Indeed judging from the underlying sediments and the nature of current vegetation infilling this area, we think this is a process which has happened fairly recently, perhaps within the last 100 or so years. Certainly paludification would have been accelerated by in-washed and wind-blown sediments following the land-clearance of the adjoining McLaughlin's Mountain, subsequent farming and finally the quarrying of the mountain and its associated lava flows.

Although the swamp no longer supports any sizeable expanse of open water, at least during winter and following bouts of heavy rain it can still transform – albeit temporarily – into a small (c. 2.14 ha), shallow (up to 2 m deep) 'lake'. At times of high water, this water body drains through a small piped outlet that has been created in the tuff ring wall and flows out to Puhinui Creek 140 m away. However, aside from these seasonal and/or sporadic inundations, the swamp presents as a mostly hydrologically closed, shallow, densely vegetated system.

During our survey it became evident that Matukureia Swamp was threatened by the nearby conversion of the former Winstone's Quarry to industrial land. Indeed we had watched with growing alarm as the rural landscape of this area has been rapidly transformed in the last year or so as roads have been built, a new prison started and industrial land set aside. Amazingly, despite the paucity of wetlands in the Tamaki Ecological District (McEwen 1987), and the fact that this swamp had been described and illustrated by Hayward et al. (2011) – a book that was funded by the former Auckland Regional Council – inquiries to the Auckland Council in October 2012 revealed that the swamp had not (at least until our inquiries) been registered. Subsequently the swamp has been identified as a 'Significant Ecological Area' in the Auckland Council's Proposed Unitary Plan and will therefore be subject to rules under that Plan (J.W.D. Sawyer *pers. comm.*).

Flora

We surveyed the swamp during April, May and November 2012 and then again in October 2013 and February 2014, lodging those herbarium specimens collected either in AK or UNITEC herbarium (herbarium acronyms follow Thiers 2013). From the collation of our surveys we recorded an angiosperm flora of 75 (38 indigenous, 37 naturalised) taxa from Matukureia Swamp (see Appendix). In addition we recorded one liverwort (*Ricciocarpos natans*) and one moss (*Ptychomnion aciculare*). Of those plants recorded from Matukureia Swamp, one, the aquatic liverwort *Ricciocarpos*, is listed as 'Threatened / Nationally Endangered' (Glenny et al. 2011) while *Epilobium insulare* is nationally listed as 'Data Deficient' (de Lange et al. 2013). However, *Azolla rubra*, *Carex fascicularis*, *C. subdola*, *Gratiola sexdentata* and *Sparganium subglobosum* are all considered regionally 'Threatened', *Machaerina*

Fig. 4. *Carex fascicularis* plant growing on margin of swamp. (Photo: P.J. de Lange, Oct 2013).

Fig. 5. Close up of maturing inflorescence of *Carex fascicularis.* (Photo: P.J. de Lange, Oct 2013).

arthrophylla and *Potamogeton ochreatus* regionally 'Sparse' and *Hydrocotyle pterocarpa* is listed as regionally 'Data Deficient' (Stanley et al. 2005). *Ricciocarpos*, as judged from specimens held in the Auckland Museum Herbarium (AK!), appears to be reasonably widespread in the Auckland Region (though not necessarily common) with most records coming from the dune lakes and ponds of the Awhitu and South Kaipara Peninsula. Its scarcity within Matukureia Swamp is probably more a reflection of the lack of suitable open water habitat for it, particularly as the little that is present is often choked with a thick (up to 30 mm deep) sud of *Azolla pinnata*, *A. rubra*, and *Landoltia punctata*.

Our initial, autumnal (April, May 2012) surveys found *Azolla pinnata* to be dominant, and at that time we saw very little *A. rubra*. However, by November 2012 the situation had changed, such that *A. pinnata* whilst still the dominant *Azolla* species overall, was, especially in the more shaded area of open water (such as within the raupo / *Bolboschoenus* reedland), associated with equally dense colonies of *A. rubra*. At this time it was only in the more exposed sites where *A. pinnata* remained dominant. Later in October 2013 we were surprised to find neither *Azolla* common, and in February 2014 only *A. pinnata* seemed to be present suggesting that in this swamp a series of as yet undetermined factors seem to be regulating the abundance of both species, something that might be worth investigating further.

Within the raupo / *Bolboschoenus* reedland, on some of the pedestals of *Carex secta*, we found a few plants of *Hydrocotyle pterocarpa*. Although *Hydrocotyle pterocarpa* is currently regionally listed as 'Data Deficient' there is probably now enough data to give it a more definitive listing. Certainly it seems genuinely scarce in the Auckland Region (as defined by Stanley et al. 2005), undoubtedly due to the loss of swamps of the type described here.

On the margin of the same plant association a single *Carex subdola* was also found. This is sedge that is known from four sites in the Tamaki Ecological District, though the only sizeable populations are those occurring at Kohuora Crater and 'The Grotto' (Gardner 2003; Martin 2003). In this general area we also found a small amount of *Gratiola sexdentata*, an unusual variant too, with bright green leaves and stems, entirely unblemished and without the purple spotting and markings ('stitchings') more usually seen in this species. *Gratiola sexdentata* is rather uncommon in the greater Auckland area as a whole, being rated as 'Regionally Critical' by Stanley et al. (2005). The species is perhaps most common on the Awhitu Peninsula and around the Nihotupu Dam, Waitakere Ranges. In the Tamaki Ecological District however, *G. sexdentata* is represented by only three collections in AK. One by Cheeseman is undated and has 'Auckland' as its location, while the other two, a 2005 and 2011 collection are from sites where the species is still extant. One of us (ROG) has also collected the species from Wattle Downs, where we believe it is still present.

In one site on a low mound of *Eleocharis acuta* and *Paspalum distichum* a small patch of *Epilobium insulare* was discovered. This appears to be the northern limit for the species (as judged from

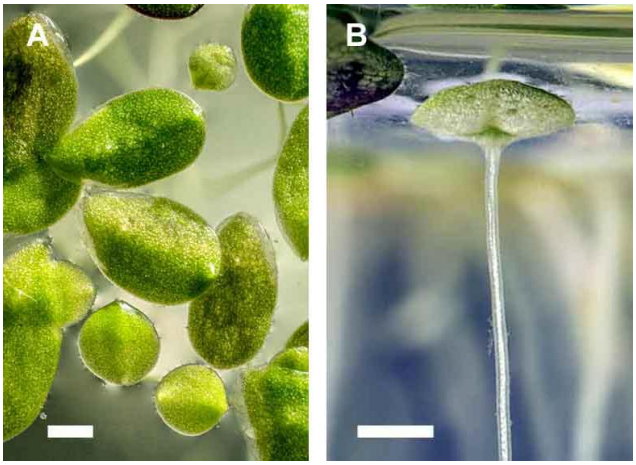

Fig. 6. A: *Lemna aequinoctialis* plants (ex cult. Matukureia Swamp). Note two prominent papillae on adaxial surface. B: *Lemna aequinoctialis* (ex cult. Matukureia Swamp) a single frond as viewed from the side at the proximal end of the frond. Note the gibbous frond, and prominent winged root sheath. Scalebars = 1 mm. (Photos: J.R. Rolfe, A: Feb 2013; B: Feb 2014).

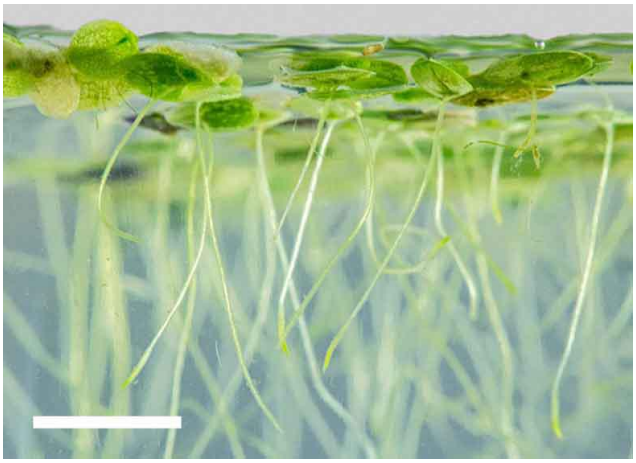

Fig. 7. *Lemna aequinoctialis* (ex cult. Matukureia Swamp) plants as viewed from the side, showing the diagnostic acute root tips. Scalebar = 5 mm. (Photo: J.R. Rolfe, Feb 2014).

the treatment given it by Raven and Raven (1976) and the distribution accorded it using the New Zealand Virtual Herbarium http://www.virtualherbarium.org.nz/map.2 accessed 31 October 2013). Although widely distributed, and apparently locally common in some parts of the country, indications are that *Epilobium insulare* seems to be on the decline, certainly from the northern part of its range. Further, because there are so few modern (i.e. last 20 years or less) records in New Zealand herbaria, and the habitats it occupies are often now under threat, it has been listed as 'Data Deficient' (de Lange et al. 2013) in the hope that botanists will make an effort to find out its true threat status.

Our survey also found only the one plant of *Carex fascicularis* (Figs. 4, 5) and ten of *Sparganium subglobosum*. *Sparganium* is scarce in the Auckland Region, perhaps reaching its greatest numbers in the wetlands of Aotea / Great Barrier Island and the greater Kaipara. In the Tamaki Ecological District *Carex fascicularis* is even scarcer; it is known from just two other sites, Western Springs and a swamp near Mangere. Nevertheless, though its presence at the swamp was anticipated, we were surprised to find it growing on the drier margin of the swamp amongst a cattle-thrashed rushland dominated by *Juncus edgariae* and *J. effusus* var. *effusus*. *Carex fascicularis* is more usually found growing in permanently saturated ground or standing water, often amongst *Carex maorica*, *C. secta*, flax (*Phormium tenax*) and raupo.

The diversity of form expressed by *Ranunculus amphitrichus* within the swamp initially caused some consternation (see discussion below). In the swamp two morphodemes occur. One (the more scarce of the two) is a small plant (when flowering rarely taller than 60 mm) with delicate much-divided, deeply cut leaves, and the other (the dominant form) is a robust plant (up to 900 mm tall) with stout, almost fistular petioles and very robust, broad, sparingly (though often deeply) divided leaves. The smaller form we found in flower in May 2012. These small plants had narrow, lanceolate, acute-tipped petals, broad nectary scales (these occupying ½–⅔ of the petal length); and flowers bearing fewer than 30 carpels (with the swamp specimens having a range of 5–16). These are characters we equate with *R. amphitrichus* s.s. The other 'robust' form was, during the first two visits, only seen sterile, and so on vegetative characters (see Webb et al. 1988) it fitted *R. macropus* best. Nevertheless, following critical investigation (see discussion below) we have decided that despite the appearances, only *R. amphitrichus* is present.

The *Lemna* of Matukureia are also worthy of comment (Figs. 6, 7). Despite the New Zealand Flora series recording only *L. minor* for New Zealand (Moore & Edgar 1970), the most modern treatment of the genus we have seen affecting New Zealand *Lemna* – admittedly an Australian Flora treatment – (Landlot 2011) states that only *L. disperma* is present in New Zealand. Landlot (2011) further notes that *L. minor* is only sparingly naturalised in Australia around Melbourne. Nevertheless our own observations suggest that the species, or at least plants that match that species description, are present in New Zealand (e.g., Masterton). Interestingly, Paul Champion (*pers. comm.*) states that *L. minor* is definitely present here but then only in the aquarium trade from where he has yet to see it naturalised. Perhaps Landlot's comments reflect that at the time of his revision *Lemna* were not commonly collected in New Zealand, so under-represented in herbaria, and that many of those

specimens he saw are in poor condition. Irrespective, the relevance of this discourse is that at Matukureia Swamp we found two forms of *Lemna*: one closely matches the description of *L. disperma* (Landlot 2011) except that the adaxial surface often lacks the fine central line of papillae bisecting the frond; the other matches the description of *L. aequinoctialis* (Landlot 2011), a species first observed wild in New Zealand in 2007 at the Auckland Zoo (see http://www.nzpcn.org.nz/flora_details.aspx?ID=7585 accessed 3 February 2014) and said there to be naturalised here. *Lemna aequinoctialis* is best distinguished from *L. disperma* and *L. minor* by the lack of reddish pigmentation, acute root tips, distinctly winged root sheath and, adaxially, by the presence of two prominent papillae located at the distal and proximal ends of the frond (Figs. 6, 7). The species is usually larger than *L. disperma* (1–6 mm long vs. 0.8–4.0 mm long in *L. disperma*), and the frond is gibbous rather than flat – a feature of *L. minor*, but also seen occasionally in *L. disperma* (Landlot 2011). While *L. aequinoctialis* is easily recognised, New Zealand examples of *L. disperma* are variable and it may well be that we have further entities here. At this stage, due to this variability we prefer to call the Matukureia plants *L.* aff. *disperma*, mostly because the adaxial line of papillae is inconsistently expressed both within and between populations.

One final word regarding *Lemna aequinoctialis*. So far, beyond Matukureia Swamp this species has also been collected between 2013 and 2014 from Auckland Zoo (AK 347688) and just north-east of Putaruru at Te Waihou Springs (AK 347631). As already noted, the New Zealand Plant Conservation Network (nzpcn.org.nz) lists the species as naturalised – but without offering any basis for that decision. Considering the paucity of fresh, well pressed and carefully annotated *Lemna* collections in New Zealand herbaria, and the cryptic nature of the species, this assessment seems to us overly premature. More probable is that *L. aequinoctialis* is indigenous; either it has been overlooked by past workers (Mason 1950, Daubs 1965, Moore & Edgar 1970) or it has arrived here recently as a hitch-hiker on the feet of ducks and other wading birds that routinely travel between Australia and New Zealand (see comments by de Lange et al. 2011).

Mycobiota

During our surveys a number of lichens were collected either from the trunk of a lone cabbage tree (*Cordyline australis*) (Fig. 2) located in the middle of the swamp, or lignicolous on old totara (*Podocarpus totara* var. *totara*) fence posts and battens that are part of a fence line bisecting the swamp. At the time of writing (October 2013) most of these lichens have yet to be identified, but of the more obvious ones, *Flavoparmelia soredians* (AK 345902), *Parmotrema perlatum*, *P. reticulatum*, *Ramalina celastri* (AK 345900) and *Usnea* ?*inermis* (AK 345903) are common on the fence posts, whilst *Dirinaria applanata* (UNITEC 5437) and *Xanthoria parietina* are common on the exposed trunk of the sole cabbage tree. A few small, stunted *Sticta fuliginosa* (UNITEC 5439) were also seen on the trunk of this cabbage tree.

Plant associations

We recognised five plant associations. These were empirically distinguished using the methodology of Atkinson (1985) and then classified according to Johnson and Gerbeaux (2004).

1. Rushland

At the extremities of Matukureia Swamp, corresponding to the ecotone between pasture and swamp, is often a diffuse rushland (Fig. 8) dominated by *Juncus australis*, *J. edgariae*, and *J. effusus* var. *effusus* through which *Ranunculus repens* and Yorkshire fog (*Holcus lanatus*) is usually found intermixed. In places dense tufts of *Paspalum dilatatum* and *Carex vulpinoidea* are also common in and amongst the rushes. In this association we also found a few plants of *Carex otrubae*, seemingly the first record of this sedge for the Auckland Region (McKain 2004).

Fig. 8. Rushland – this plant association forms a somewhat discontinuous, patchy peripheral band along the ecotone between the tuff ring and the maximum extent of ground subjected to flooding from the swamp. (Photo: J.R. Rolfe, Feb 2014).

2. *Persicaria* herbfield

The race of *Persicaria decipiens* present at Matukureia is particularly robust, sometimes exceeding 1 metre in height, often with branched inflorescences, and usually very dark pink flowers. Collectively these plants mostly form a dense, much intertwined, rafted and/or floating herbfield, which is the dominant vegetation of Matukureia Swamp (Fig. 9). However, this dominance may be somewhat seasonal, as, in places, we have seen the dried off stems of beggar's ticks (*Bidens frondosa*), and during our October visit numerous seedlings, suggesting that the herbfield could be secondarily – though patchily – co-dominated by a canopy of that species.

Other associated species vary in frequency. In places the most common are *Azolla pinnata*, *Landlotia punctata, Ludwigia palustris*, *L. peploides*, *Myriophyllum propinquum, M.* ?*variifolium* and *Paspalum distichum*. Where there is standing water *Glyceria declinata*, *Ranunculus amphitrichus* and *Galium palustre* may also be locally common, whilst the drier margins of this herbfield often have a fringing of *Mentha pulegium* and *Persicaria maculosa*. Again, seasonally, *Lachnagrostis filiformis* is locally common throughout this herbfield.

Fig. 9. *Persicaria* herbfield. (Photo: P.J. de Lange, Oct 2013).

3. *Isolepis* sedgeland

A distinctive plant association easily recognised in the field by the yellow-green colour of the dominant sedge forming it – *Isolepis prolifera* (Fig. 10). Aside from the *Isolepis* the sedgeland often includes scattered plants of *Cotula coronopifolia*, *Azolla rubra*, occasional *Eleocharis acuta* and *E. gracilis*, *Glyceria declinata*, both *Ludwigia* species, *Persicaria decipiens*, and especially in the more open areas of standing water, *Ranunculus amphitrichus*, *Myriophyllum propinquum*, *M.* ?*variifolium, Landoltia punctata* and *Azolla pinnata* are locally common.

Fig. 10. *Isolepis* sedgeland forms a distinct yellow-green floating sud along the margins of the peripheral rushland, and centrally, especially at the northern end of the swamp in an area surrounded by *Persicaria* herbfield. (Photo: P.J. de Lange, Oct 2013).

4. *Eleocharis* reedland

The central south-eastern portion of the swamp is entirely dominated by a dense reedland of kutakuta (*Eleocharis sphacelata*) (Fig. 11). Interestingly, this plant association has developed in an area of damp ground. During our visits we have never seen this portion of the swamp flooded. This is a little unusual as kutakuta is usually a species colonising the margins of permanent water bodies. Other plants found in this association are typically sparse, and then mostly confined to festooning the culm bases and colonising the few spaces in between the kutakuta plants. The most commonly seen associates were *Calystegia sepium* subsp. *roseata*, *Cotula coronopifolia*, *Holcus lanatus*, *Isolepis prolifera*, *Galium palustre*, *Ludwigia palustris*, *L. peploides*, *Myriophyllum propinquum*, *Persicaria decipiens*, *Ranunculus amphitrichus* and *R. flammula*. In this area beggar's ticks can be seasonally prominent.

Fig. 11. Kutakuta (*Eleocharis sphacelata*) reedland – seen here looking along the ecotone between *Persicaria* herbfield and reedland. (Photo: P.J. de Lange, Oct 2013).

5. Raupo / *Bolboschoenus* reedland

Confined to the only area of permanent standing water (Fig. 12) this association is readily distinguished by the dominance of raupo, throughout which stands of the secondarily dominant *Bolboschoenus* are common. Along the northern portion of this association *Machaerina articulata* and *Carex maorica* are locally common. Within the raupo grow a few *Carex secta*, a little *Machaerina arthrophylla*, typically stunted *Calystegia sepium* subsp. *roseata* vines, occasional swards of swamp millet grass (*Isachne globosa*) and one flax plant (*Phormium tenax*). Aside from the aforementioned *Hydrocotyle pterocarpa*, the 'trunks' of *Carex secta* often support clumps of creeping bent (*Agrostis stolonifera*), and less frequently, wind grass (*Lachnagrostis filiformis*). Around the raupo culms and in the few areas of 'open' standing water, both *Azolla* and *Landoltia* are common, and in these places is often seen *Wolffia australiana* and *Lemna*

aff. *disperma*. *Ranunculus amphitrichus* is also common, though it is more usually found festooning the raupo culm bases rather than as an emergent. Here too we found the pondweeds *Potamogeton cheesemanii* and *P. ochreatus*, though neither were common, because the habitat for them is extremely limited. Throughout the raupo / *Bolboschoenus* reedland, swamp willowherb, *Epilobium pallidiflorum*, a species well suited to raupo swamps (Raven & Raven 1976), is locally common. The plants in this swamp not only have the usual white flowers typical of New Zealand plants but also sometimes pink flowers, which is the more usual colour of this species' flowers in Australia (Raven & Raven 1976). Other common associates of this vegetation type included *Galium palustre*, *Myriophyllum propinquum*, *Persicaria decipiens* and *Ranunculus flammula,* and, seasonally, beggar's ticks.

Fig. 12. Raupo / *Bolboschoenus* reedland, from the south-western side of Matukureia swamp looking due north. At left, the fence line that bisects the swamp can just be seen, along with a dark band of *Machaerina articulata* that delineates the northern margin of this plant association. (Photo: P.J. de Lange, Oct 2013).

Discussion

Matukureia Swamp is an example of an ecosystem that is all but extinct in urban Auckland. Whilst the vascular flora of the Matukureia Swamp is 49% naturalised the swamp preserves a range of indigenous plants that are either regionally uncommon or nationally threatened (see above). Furthermore during our visits, the calls of both bittern (*Botaurus poiciloptilus*) and spotless crake (*Porzana tabuensis tabuensis*) were heard. This suggests that the swamp, despite its small size has some value to threatened wild life as well.

Other birds observed within the swamp during our visits include mallard ducks (*Anas platyrhynchos*), harrier hawk (*Circus approximans*), kingfisher (*Todiramphus sanctus vagans*), white-faced heron (*Egretta novaehollandiae*), pukeko (*Porphyrio melanotus melanotus*), welcome swallow (*Hirundo neoxena neoxena*) and pied shag (*Phalacrocorax varius varius*). While our October 2013 visit observed a single Canada goose (*Branta canadensis*). Frogs, probably both *Litoria aurea* and *L. raniformis*, are also present in the swamp, though they are hardly common; the general lack of open water may explain why their tadpoles are only rarely seen.

With respect to other documented wetlands in the Tamaki Ecological District, as far as we know only 'The Grotto', Onehunga Springs (a collective for Bycroft's and Captain Springs), and Kohuora Crater preserve a similar association of plants (Gardner 1994; Martin 2003; P.J. de Lange unpubl. data). However, any similarity between the vegetation of the swamp remnant at Kohuora and Matukureia Swamp is probably more artificial than real, as Kohuora is highly modified, with the present vegetation overlying c.8 m of peat, whose surface has been severely damaged during the crater's long use (abuse) as a site for industrial landfill.

The vegetation of Onehunga springs and 'The Grotto' however, accords more with the highly fertile, eutrophic swamp system present at Matukureia. Of the two Onehunga springs, the vegetation and plant assemblage of Matukureia is most similar to that described by Gardner (1994) for Captain Springs, where despite the abundance of willow (*Salix fragilis*), a swamp dominated by *Carex secta* is described, though raupo and kutakuta are not present. However, a full comparison between Captain Springs and Matukureia swamps is not possible because Gardner (1994) did not provide a full listing of the plants he saw at Captain Springs. A thorough listing for 'The Grotto' is, however, provided by Martin (2003) who also described the floor of that swamp as being two thirds occupied by a *Carex* sedgeland dominated by *Carex subdola*, *C. secta*, *Paspalum dilatatum* and tangles of *Calystegia sepium* subsp. *roseata*. Martin (2004) also noted a small area of *Bolboschoenus fluviatilis*, and areas of swamp dominated by *Isolepis prolifera*, *Lemna minor*[1] and *Persicaria decipiens*. These plants and their associations are very similar to those observed at Matukureia. The major difference between these two swamps is the dominance of raupo, kutakuta, *Machaerina articulata* (all species typical of lake, pond and stream margins), and *Ranunculus amphitrichus* at Matukureia. Further, whilst the dominant *Carex* at 'The Grotto' was *C. subdola*, at Matukureia it is *C. maorica* and *C. secta*. Also, as one would expect considering its setting within residential Onehunga, Auckland, the vegetation of 'The Grotto' is dominated by naturalised plants (102 (76%) taxa).

That 'curious species' *Ranunculus macropus*

As noted under the 'Flora' section of this article above, using vegetative characters it appeared that both *Ranunculus amphitrichus* and *R. macropus* were

[1] As Martin (2003) did not collect specimens of *Lemna* from 'The Grotto' we cannot determine what species he actually saw so we have retained his usage of *L. minor* here.

present in the swamp. Because accurate identification of *Ranunculus macropus* is difficult, and because it and *R. amphitrichus* are so often confused, we therefore offer here this digression.

Ranunculus macropus was first described by Joseph Dalton Hooker in his father's *Icones Plantarum* using specimens collected by William Colenso from the East Coast (East Cape) of the North Island (Hooker 1844). Traditionally it has been distinguished from *R. amphitrichus* by its much larger overall dimensions, less-divided, typically ternate leaves, and by the greater numbers of carpels (Hooker 1844; Cheeseman 1906, 1925; Allan 1961; Webb et al. 1988). Of *R. macropus* Cheeseman (1906) stated: "the usual form of this species, with very long petioles and broad-leaf segments, has a very distinct appearance; but small varieties are difficult to distinguish from *R. rivularis* var. *major* [sic]". Later, in his 1925 Flora, Cheeseman seemingly recanted this uncertainty though he stated, somewhat cynically perhaps, that it was a 'curious species'.

Allan (1961) also seems to have had some issues, for while he accepted *R. macropus*, he then somewhat ambiguously observed that "no detailed study of the whole group has been made". The most recent published word on the species, that offered in Webb et al. (1988), noted the species' similarity to *R. amphitrichus*, again mostly repeating previous flora writers' views that the species is recognised by its overall greater stature, long and stout petioles, larger flowers, and more numerous achenes. Webb et al. (1988) also noted that sterile specimens were distinguished from *R. amphitrichus* and *R. glabrifolius* by the lateral leaflets being longer than the terminal one, and this is generally correct.

In the late 1980s one of us (PdL, unpublished) took a keen interest in *R. macropus*, characterising it ecologically by its preference for growing in standing water, often amongst raupo, and morphologically by the flowers whose petals are much broader, with blunt to obtuse-tipped (never acute) apices; and by the nectary scale being ⅓–½ the petal length. Notably, in *R. macropus* the carpels are more numerous (up to 65) and thus often obscure the nectary scales altogether, such that on casual inspection the petals appear shorter than they really are. While this system works well for flowering material, most herbarium specimens that we have seen attributed to this species are sterile, and many of these appear to vegetatively intergrade between *R. amphitrichus* and *R. macropus*. Because *R. amphitrichus* and *R. macropus* often grow sympatrically, with ranges that are often syntopic in disturbed habitats, and, as most of the sterile intergrading collections came from disturbed wetland systems, PdL concluded that the intergrades represented putative introgressed hybrid swarms between both species. At the time, this observation was supported by the fact that *bona fide R. macropus* seemed more common in less disturbed swamps. However, this hybridisation idea remains untested by experimentation. The fact that many of the intergrading collections were sterile was not, however, taken to mean that the putative hybrids were sterile, for seemingly 'pure' *R. macropus* itself is at best a 'shy flowerer'.

Irrespective of this postulated hybridisation issue (real or imagined), it was concluded that definitive determinations of *R. macropus* can only be made using flowering and/or fruiting material, without which vegetative features alone cannot be reliably used to separate *R. macropus* from *R. amphitrichus* (or for that matter from *R. glabrifolius*).

It is unfortunate that none of these observations were ever published. By way of excuse it is here offered that at the time PdL concluded his musings (December 1988) others (e.g., Rendle 1987; Rendle & Murray 1989; P.J. Lockhart *pers. comm.*) either had taken or were just starting to take a more serious interest in New Zealand *Ranunculus*, and in the process making hybrids between the various taxa, and/or using cytological and DNA sequence data that PdL thought might better resolve the status of *R. macropus*. Sadly, despite the wealth of such studies, none have offered any further taxonomic resolution on the status of *R. macropus*, and it remains to this day a problematic species, indeed worthy, as Cheeseman (1925) inferred, of 'critical' study.

Now, returning to the Matukureia *Ranunculus* specimens, based on vegetative characters alone, then following Webb et al. (1988) the 'robust' buttercup forms dominant there can be placed in *R. macropus*, while the gracile, flowering ones fit *R. amphitrichus*. So this is what we had reluctantly done (i.e. accepted two species from Matukureia, *R. amphitrichus* and *R. macropus*) until, that is, November 2012 when we finally found these 'robust' plants in full flower, and it was seen that they all had the floral characters of *R. amphitrichus*, not *R. macropus*. Although we have not germinated seed from these plants, the seed they produced appears viable. While sterility, in the New Zealand flora, is not necessarily a reliable test of putative hybridity, many hybrid *Ranunculus* here are sterile or have reduced seed viability (Rendle 1987; Rendle & Murray 1989; B.G. Murray *pers. comm.*). Nevertheless both *R. amphitrichus* and *R. macropus* which have the same chromosome number were easily hybridised (Rendle & Murray 1989), so hybrid sterility in this species pair seems not to be an issue. So while it is possible that the robust-leaved *Ranunculus* of Matukureia are *R. amphitrichus* × *R. macropus*, we prefer for now to treat them as *R. amphitrichus*, because florally they match that species in all respects.

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Appendix 1. Flora of Matukureia Swamp, Puhinui, South Auckland. Vascular plant taxa are arranged in phylogenetic groups, then alphabetically by family, as in de Lange & Rolfe (2010). An '*' indicates naturalised status within the New Zealand Botanical Region.

Family	Taxa	Abundance	Voucher
Ferns (2)			
Salvinaceae	*Azolla pinnata* *	dominant	AK 330802
Salvinaceae	*Azolla rubra*	locally common	AK 331007
Monocots I (8)			
Araceae	*Landoltia punctata* *	dominant	AK 330675
Araceae	*Lemna aequinoctialis*	uncommon	AK 347695
Araceae	*Lemna* aff. *disperma*	uncommon	AK 330675
Araceae	*Wolffia australiana*	uncommon	AK 331008
Asparagaceae	*Cordyline australis*	one tree	AK 335120
Potamogetonaceae	*Potamogeton cheesemanii*	uncommon	AK 330840
Potamogetonaceae	*Potamogeton ochreatus*	uncommon	AK 346014
Xanthorrhoeaceae	*Phormium tenax*	one plant	AK 335114
Monocots II— Commelinids (33)			
Cyperaceae	*Bolboschoenus fluviatilis*	common	AK 331193
Cyperaceae	*Carex divulsa* *	uncommon	AK 346008
Cyperaceae	*Carex fascicularis*	one plant	AK 335121
Cyperaceae	*Carex maorica*	locally common	AK 335107
Cyperaceae	*Carex otrubae* *	uncommon	AK 345894
Cyperaceae	*Carex secta*	uncommon	AK 335109
Cyperaceae	*Carex subdola*	one plant	AK 344154
Cyperaceae	*Carex virgata*	locally common	AK 346009
Cyperaceae	*Carex vulpinoidea* *	locally common	AK 345884
Cyperaceae	*Cyperus eragrostis* *	uncommon	
Cyperaceae	*Cyperus ustulatus*	uncommon	
Cyperaceae	*Eleocharis acuta*	uncommon	AK 345885
Cyperaceae	*Eleocharis gracilis*	uncommon	AK 345893
Cyperaceae	*Eleocharis sphacelata*	dominant	AK 330825
Cyperaceae	*Isolepis prolifera*	dominant	AK 335117
Cyperaceae	*Machaerina arthrophylla*	one plant	AK 331009
Cyperaceae	*Machaerina articulata*	locally common	AK 330863
Juncaceae	*Juncus* ?*amabilis* *	locally common	
Juncaceae	*Juncus australis*	common	
Juncaceae	*Juncus edgariae*	common	AK 344155
Juncaceae	*Juncus effusus* var. *effusus* *	common	
Juncaceae	*Juncus microcephalus* *	locally common	
Juncaceae	*Juncus prismatocarpus*	uncommon	AK 345892
Juncaceae	*Juncus usitatus*	uncommon	AK 346010
Poaceae	*Agrostis stolonifera* *	uncommon	
Poaceae	*Glyceria declinata* *	uncommon	AK 346013
Poaceae	*Holcus lanatus* *	common	AK 346012
Poaceae	*Isachne globosa*	uncommon	AK 348735
Poaceae	*Lachnagrostis filiformis*	uncommon	AK 348733
Poaceae	*Paspalum dilatatum* *	locally common	
Poaceae	*Paspalum distichum* *	common	
Typhaceae	*Sparganium subglobosum*	uncommon	AK 345896
Typhaceae	*Typha orientalis*	dominant	AK 345888
Eudicots (6)			
Ranunculaceae	*Ranunculus acris* *	uncommon	AK 330866
Ranunculaceae	*Ranunculus amphitrichus*	common	AK 330864, AK 335108
Ranunculaceae	*Ranunculus flammula* *	common	AK 330865
Ranunculaceae	*Ranunculus repens* *	common	
Ranunculaceae	*Ranunculus sardous* *	uncommon	
Ranunculaceae	*Ranunculus sceleratus* *	uncommon	AK 348736

Core Eudicots (26)			
Apiaceae	*Hydrocotyle pterocarpa*	uncommon	AK 330826
Asteraceae	*Bidens frondosa* *	common	
Asteraceae	*Cotula coronopifolia*	locally common	AK 345886
Asteraceae	*Hypochaeris radicata* *	uncommon	
Asteraceae	*Leontodon taraxacoides* *	uncommon	
Caryophyllaceae	*Stellaria alsine* *	locally common	AK 345895
Caryophyllaceae	*Stellaria graminea* *	uncommon	AK 345887
Convolvulaceae	*Calystegia sepium* subsp. *roseata*	uncommon	
Fabaceae	*Trifolium repens* *	uncommon	
Fabaceae	*Lotus pedunculatus* *	locally common	
Fabaceae	*Ulex europaeus* *	one plant	AK 335119
Haloragaceae	*Myriophyllum propinquum*	common	AK 251622
Haloragaceae	*Myriophyllum ?variifolium* *	locally common	AK 335105
Lamiaceae	*Mentha pulegium* *	locally common	
Onagraceae	*Epilobium insulare*	uncommon	AK 345897
Onagraceae	*Epilobium pallidiflorum*	locally common	AK 330803
Onagraceae	*Ludwigia peploides* subsp. *montevidensis* *	common	
Onagraceae	*Ludwigia palustris* *	common	AK 345890
Plantaginaceae	*Callitriche stagnalis* *	uncommon	
Plantaginaceae	*Gratiola sexdentata*	uncommon	AK 348734
Plantaginaceae	*Veronica anagallis-aquatica* *	uncommon	AK 335103
Polygonaceae	*Persicaria decipiens*	dominant	AK 330801
Polygonaceae	*Persicaria maculosa* *	common	
Polygonaceae	*Rumex conglomeratus* *	locally common	
Polygonaceae	*Rumex obtusifolius* *	locally common	
Rubiaceae	*Galium palustre* *	locally common	
Mosses (1)			
Ptychomniaceae	*Ptychomnion aciculare*	uncommon	AK 335150
Liverworts (1)			
Ricciaceae	*Ricciocarpos natans*	uncommon	AK 345889
Total Taxa 77			

Plants of Lake Tāngonge, Kaitaia, Northland

Mike Wilcox, Maureen Young and Lisa Forester

Introduction

Lake Tāngonge west of Kaitaia (Figs. 1, 2) attracted the attention of early resident botanists, particularly R.H. Matthews, H.B. Matthews and H. Carse (Carse 1911) and also T.F. Cheeseman (Cheeseman 1896). It was once an expanse of 1000 ha comprising a large shallow lake fringed by wetlands and bogs and was renowned for its rich assemblage of plants. There are historical records, most with supporting herbarium specimens, of (a) Pteridophytes: *Lycopodiella serpentina*, *Cyclosorus interruptus*, *Hypolepis ambigua*, *Thelypteris confluens*; (b) Orchids: *Anzybas carsei*, *Pterostylis micromega*, *Spiranthes novae-zelandiae*, *Thelymitra mathewsii*; (c) Other monocots: *Carex brownii*, *Carex maorica*, *Empodisma robustum*, *Isolepis fluitans* var. *lenticularis*, *Sporadanthus ferrugineus*; and (d) Dicots: *Centella uniflora*, *Centipeda minima*, *Elatine gratioloides*, *Epilobium billardiereanum* subsp. *billardiereanum*, *Epilobium pallidiflorum*, *Euchiton involucratus*, *Glossostigma elatinoides*, *Hydrocotyle novae-zelandiae*, *H. pterocarpa*, *Limosella lineata*, *Pittosporum obcordatum* and *Utricularia australis*.

A drainage scheme supported by settlers and the government from the 1920s resulted in the lakebed being exposed, and the waters being drained away into the Awanui River (Fig. 3). A large boggy flood