

then battered into the rocks before being sucked down again. As with a car accident, time really has no meaning when you are subject to such turmoil. Everything just slows into a weird dream. After the third dunking and bashing I managed to reach the boat, where upon I was dragged in by its occupants (the life guard mentioning that what I had just experienced "was really cool"), pack and all still intact (remarkably), and we began a laboured "sprint" to the shore. The way back was, if anything even less pleasant than the trip out, and as a person who has never professed any desire to learn surfing, I can now add to my credentials my involuntary participation in the exercise.

Once on the beach we all laughed, groggy with saltwater inhalation and probably too high on adrenaline to appreciate the danger we had just subjected ourselves to, while the life guard grinned and suggested we go out again to catch that surf! Needless to say "X" and I declined. Back at home I was reminded of just how close it had all been when I surveyed my ruined wet, poly-prop, the numerous cuts, abrasions and bruises (to name a few injuries). "X" fared similarly.

Still every cloud has a silver lining. While cleaning my gear I was surprised to see, mixed up with a specimen of taupata, a small sprig of Cook's scurvy grass! The first time I have ever collected a plant without seeing it first. Obviously the species still survives on Oaia but where and in what quantity exactly, I for one have no burning desire to find out. I wonder if there are any volunteers out there for a future Botanical Society trip to Oaia?

References

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***Gunnera dentata* - Karioitahi Beach**

Steve Benham

Introduction

Whilst searching for flowering specimens of *Zoysia minima* (a drought tolerant grass) on the unstable and severely slumping cliffs of Karioitahi Beach during late November 1996, I discovered four extant populations of *Gunnera dentata* sensu lato (AK 230766). This taxon is listed on the draft Auckland Regional Threatened Plant List (P.J. de Lange & E.K.Cameron 1997). A co-associate with the gunnera populations was the diminutive *Leptinella dispersa* subsp. *rupestris*. Both species were presumed extinct from this location. Small patches of *Leptinella* were also seen growing on the wet sandstone cliffs with *Limosella lineata* directly below the area where the gunneras occurred.

Previous collections from Karioitahi

The last herbarium specimen of *G. dentata* to be lodged in the AK herbarium was in March 1937 by E. Phillips Turner (AK 101244). The voucher label only states Waiuku dunes (Karioitahi ?). The earliest collection (AK 101245 - 46) was made by H. Carse in 1899 at "Karioitahi" (sic).

Physiography and Edaphic factors

The extant populations occur 200 m south of the beach carpark on a reasonably flat area c. 5 m a.s.l. with higher ground either side. The mats of gunneras grow over a 25 cm thickness of a moist silt/sand matrix overlying sand/ironstone substrate. The sand has up to a 10% titanomagnetite content and dates from the late Pleistocene (Waterhouse 1978). This area is kept moist by seepage's from the surrounding higher ground and an ephemeral stream. Three populations occur on the south facing side of this seasonal stream and the fourth occurs at c. 10 m a.s.l. running north - south across the top of another nearby terrace to the east of original populations.

A random study of one of the populations indicated that c. 18 rosettes covered an area of 12.5 sq. cm (c.1525 plants per sq. m). The four populations were measured and the number of fruiting spikes counted :-

1.	2.25 m long x 65 cm wide	19 fruiting spikes
2.	1 m x 65 cm	18 fruiting spikes
3.	2.20 m x 1 m	17 fruiting spikes
4.	3 m x 50 cm	8 fruiting spikes

On a return visit to Karioitahi Beach in February 1997, two further disjunct populations were found further south at 90 cm a.s.l. on moist cliff faces.

Vegetation type

Dense mats of *G. dentata* occur with *Selliera radicans*, *Leptinella dispersa* subsp. *rupestris*, *Lotus suaveolens* and *Leontodon taraxacoides*.

Morphology

The maritime form of *G. dentata* sensu lato (Fig. 1) is a stoloniferous branching herb forming dense mats of evergreen rosettes. Leaf blades are glabrous and coriaceous, almost succulent in texture, mid-green and approximately 1.5 cm long forming symmetrical rosettes. The costa (a prominent midrib on the abaxial leaf surface) is diagnostic of this species. Domatia (small pits) on the abaxial leaf surfaces are also present. The 2.5 cm long petioles are reddish-brown and sparsely covered along the margins of the lower surface with curved-flexed translucent soft and simple trichomes. Otherwise the petioles are glabrous. The leaf margins are best described as being crenate rather than dentate. Basal leaf scales are yellowish/green and appear to be slightly hairy towards the base. The reddish/brown stolons are sparsely covered in translucent trichomes which are rather variable, ranging from reclinate, declinate, decurved, recurved and vertical. Adventitious rooting occurs at the nodes where young plants form which in turn produce their own stolon.

G. dentata is a dioecious species flowering in October-November and fruiting in January-March. The drupes are fleshy, three-angled, yellow with a hint of orange and very conspicuous extending above the foliage on 4.5 cm peduncles. Occasionally the female fruiting spikes are very short and hidden at the base of the leaves. A single seed is embedded in copious oily endosperm.

Early botanists originally placed this relict Gondwanan genus viz. *Gunnera* in the Haloragaceae. It has now been placed in its own family, the Gunneraceae, which is based on gunneras having single celled ovaries whereas genera belonging to Haloragaceae have 2-4 celled ovaries.

Phytogeographical distribution :- The majority of *Gunnera* species (ranging from large megaherbs to mat-forming stoloniferous herbs) occur in S. America (a few species extend north into southern Mexico) and New Zealand. Indonesia, Tanzania and Tasmania each has a single species and Hawai'i has two species, viz *G. kauaiensis* and *G. petaloidea*. Each species appears to be endemic.

Symbiotic relationship :- The majority of gunneras grow on moist / wet soils where the utilisation of nitrogen is extremely difficult. To overcome this difficulty gunnera has developed an association with a cyanobacteria belonging to the genus *Nostoc*.

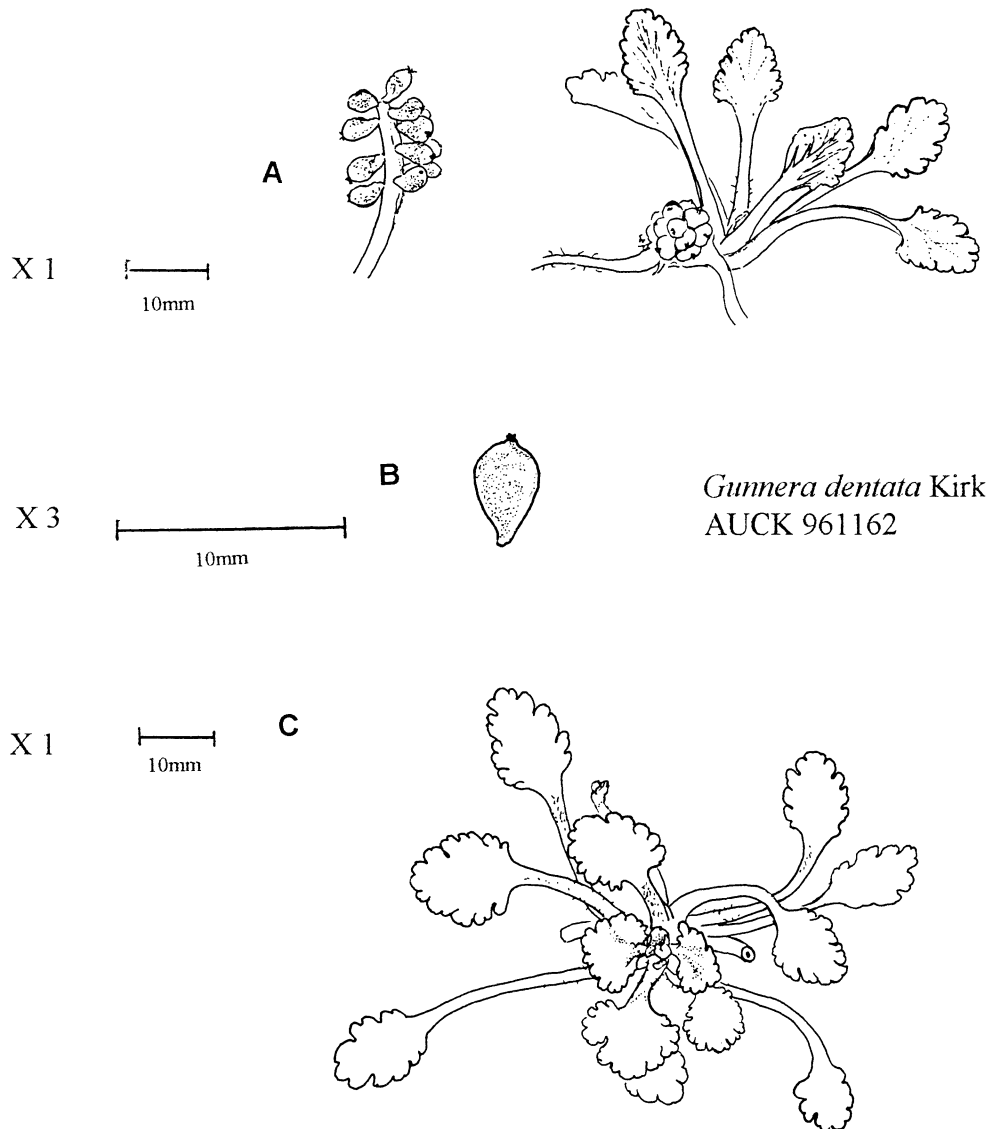


Figure 1. Diagram of *Gunnera dentata* showing: (A) fruiting rosette; (B) single fruit; & (C) non-fruiting rosette.

The cyanobacteria infect the gland organs situated at the nodes entering the plant through the mucus excreted from these glands. The cyanobacteria then enters the cells and begins to absorb the nitrogen from the air and fix it for the plants use. This process makes it one of the few real endocellular symbioses between an angiosperm and some bacteria.

Taxonomy

Allan (1961) accepted *G. arenaria* and *G. dentata* as distinct entities. Webb et al. (1988) suggest that *Gunnera arenaria* should be sunk into *G. dentata* as "*Gunnera arenaria* Cheeseman, accepted by Allan (1961) as a distinct coastal species, cannot be distinguished

by leaf or fruit characters from forms found within inland populations of *G. dentata*, and is therefore placed in synonymy here".

Cheeseman (1906), recognised the two species as being distinct but closely allied. *G. arenaria* is said to be stouter more glabrous, broader rounder and more fleshy leaves with stouter peduncles and larger fruit. Whereas *G. dentata* has narrow - ovate, thinner and coarsely dentate lamina.

The Auckland Regional Botanic Gardens has collections of *G. dentata* from Tongariro (AUCK 961166 - 67) and Taranaki National Parks (AUCK 961165) and simply by comparing leaf morphology, these two montane forms appear to be clearly distinct from the coastal plants.

Research

Livia Holmgren from the University of Stockholm is presently working on the systematics and biogeography of gunneras using both molecular and morphological data. *G. dentata* of both coastal and montane provenance are being studied by Livia together with the remaining NZ species.

Michael Doyle, Curator of the South Pacific Herbarium in Fiji, is also working on the genus and is aiming at a new treatment of NZ taxa by the end of 1997 (M. Doyle pers. comm., 1996).

Acknowledgements

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Ihumatao Fossil Forests, Manukau Harbour

Mike Wilcox

Our group for this outing on 15 February 1997 numbered 35, and Bruce Hayward was our leader. For ease of access, comfort, a pleasant sunny morning, and a most informative guide, this field trip would be hard to beat. The objective was to see and learn about unusual fossil forests, found on the Manukau Harbour foreshore at the end of Renton Road.

Two fossil forests can be discerned at this site. The first comprises well-preserved large stumps and logs of kauris that grew here 30,000 -50,000 years ago. These can best be seen scattered about for about 100 m out on the mudflats. It is thought that the trees died from water-logging, forming a swamp, and subsequently fell over. Under the anaerobic conditions of this ancient peat swamp, the wood has remained remarkably well preserved. Pieces of kauri gum can be readily found. The black peat deposits, often compressed and up to 1m deep, are readily seen at the base of the cliffs, underlying volcanic ash, and overlying a creamy-coloured rhyolitic mudstone.

The second fossil forest was buried and preserved beneath volcanic ash (tuff) from an eruption of nearby Ellett's Mountain (Maungataketake) 29,000 years ago. Remains of the