Supplementary Data

Table 2. Bog vegetation analysis. Homestead Ridge bog crest (near drill site, Homestead Ridge Bog X9901). E1-N5 sites along transect; s1-s10, supplementary sites to sample wetter sites. Vegetation cover visually assessed over one metre square plots. Water table measured from adjacent 15 x 15 cm hole after equilibrium reached.

Vegetation	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	E1	E2	E3	E4	E5	E6	E7	N1	N2	N3	N4	N5
Astelia	50	40	55	35	15	40	20	15	40	70	0	60	40	25	30	35	30	15	15	20	0	60
Bare ground	5	0.1	0.1	2	0	5	3	3	3	3	0	0	0	0	0	10	0	0	0	30	15	15
Bulbinella	0	0.1	0.1	0.1	0.1	0	0.1	0.1	0.1	0.1	5	1	5	5	5	5	5	2	2	2	5	1
Centrolepis	35	30	30	55	0	0.1	8	0	35	18	0	5	30	10	10	10	15	10	50	10	20	15
Chionochloa antarctica	0.1	0.1	0.1	0	0.1	0.1	0	0	0.1	0	5	5	0	5	5	15	5	10	10	5	10	5
Coprosma ciliiata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	1	0	0
Coprosma cunneata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Coprosma persusilla	3	2	1	0.1	0	0	2	0.1	0.1	1	5	5	1	5	5	0	5	10	5	5	5	5
Damnamenia	0	0	0	0	0	0	0	0	0	0	0	0	5	5	5	1	0	0	1	1	0	0
Dicranoloma	3	10	5	3	0	3	55	40	8	5	15	5	5	15	15	5	10	5	5	50	20	5
Dracophyllum longifolium	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	20	0	0	0	0
Dracophyllum scoparium	2	0.1	3	1	25	0	1	1	0	0.1	25	20	20	20	25	25	40	35	20	25	20	20
Dracophyllum seedlings	0	0	0	0.1	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Drosera	1	0.1	0.1	0.1	0	1	0.1	0.1	0.1	0.1	0	0	1	5	1	1	5	0	5	0	1	1
Gentiana	0	0	0.1	0.1	0	0	0	0.1	0.1	0.1	0	1	1	5	1	5	5	1	0	1	1	2
Phlegmariurus varius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
Isolepis antarctica	6	25	8	2	15	5	1	1	3	1	0	5	5	1	0	0	5	1	5	0	5	0
Myrsine divaricata	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0.1	0	5	5	1	0	1	0
Orchidaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Oreobolus	5	2	1	3	45	25	10	45	18	3	30	12	5	25	30	5	20	50	5	10	10	10
Phyllachne	0.1	0.1	0.1	0	0.1	0	0	0	0.1	0.1	0	5	0	5	5	5	1	5	5	0	5	5
Poa literosa	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Pleurophyllum hookeri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Schizea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Sphagnum	0.1	0.1	1	0.1	0	1	0	0	0.1	0.1	0	5	5	0	0	5	0	1	0	0	5	5
Water table (cm below litter surfac	0.16	0.14	0.15	0.12	0.37	0.3	0.31	0.31	0.17	0.18	0.3	0.16	0.08	0.26	0.29	0.28	0.14	0.46	0.1	0.2	0.17	0.6

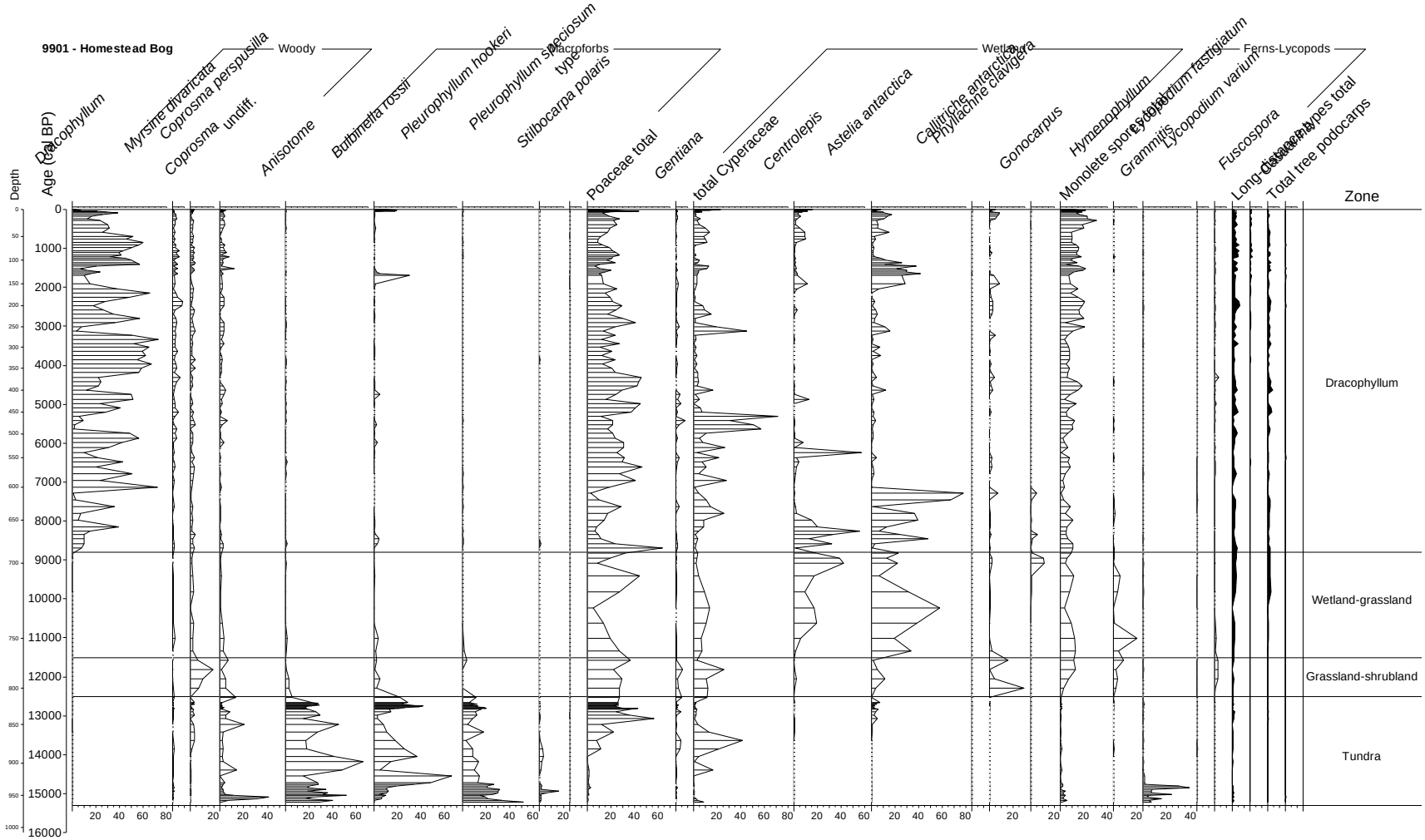

Figure 1. Homestead Ridge Bog (HRB – X9901), pollen and spore percentage diagram. Pollen sum: all island pollen types.

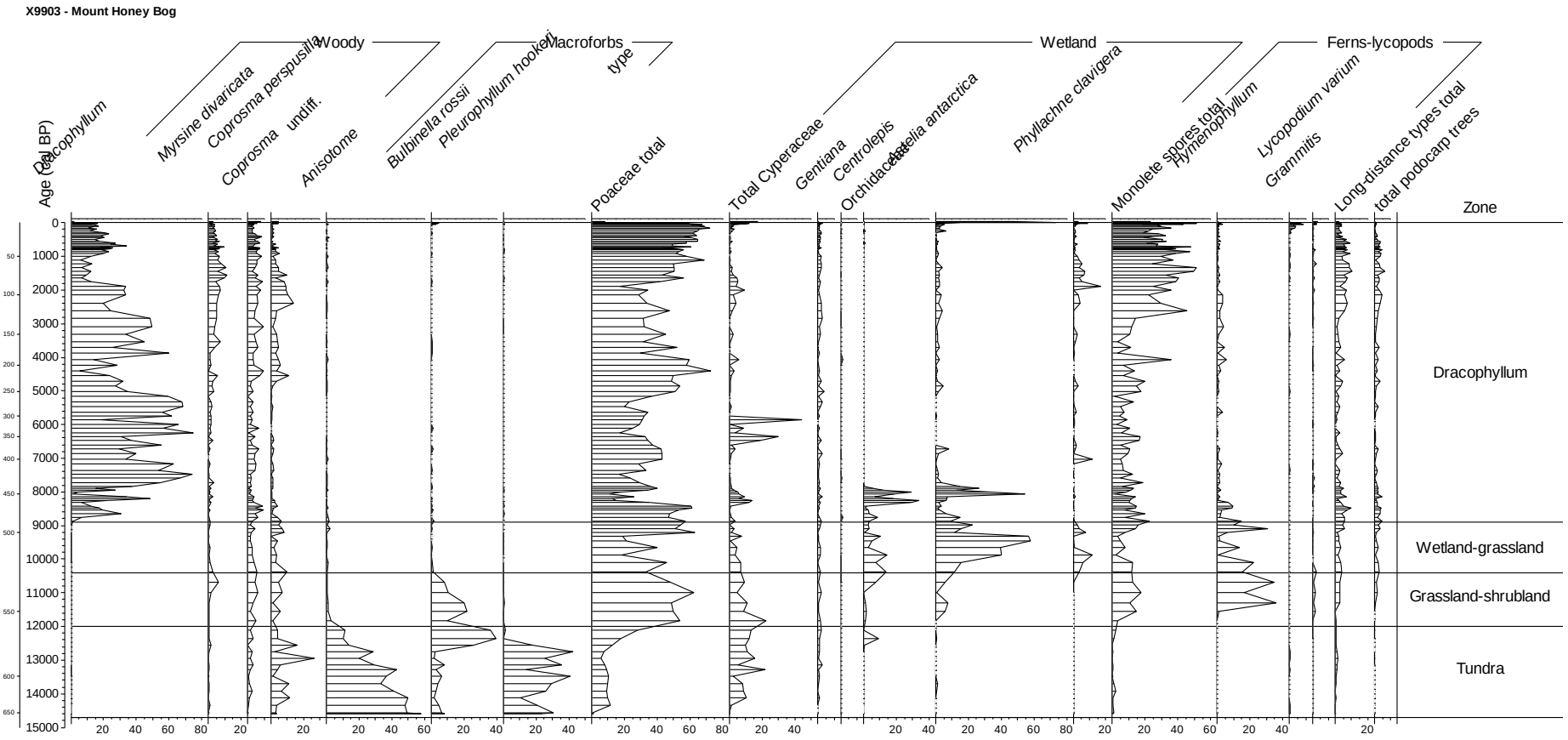

Figure 2. Mount Honey Bog (MHB -X9903): pollen and spore percentage diagram. Pollen sum: all island pollen types.

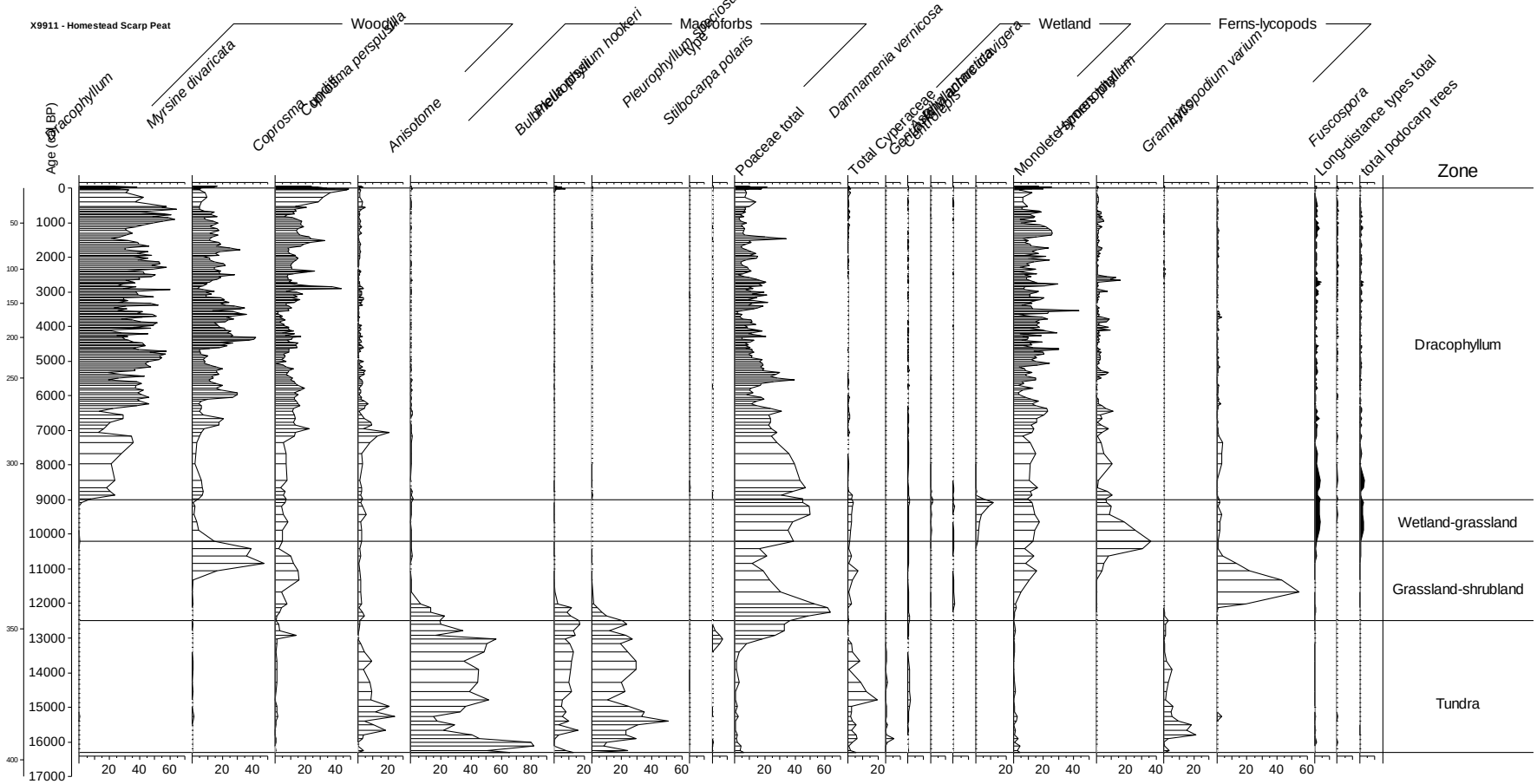

Figure 3. Homestead Scarp Peat (HSP -X9911): pollen and spore percentage diagram. Pollen sum: all island pollen types.

Derivation of a surface wetness index

We used an ordination to arrange both modern surface sample pollen data and peat core pollen data according to composition to interpret major past environmental gradients. Modern surface sample data have been obtained across the island from coastal communities through to high elevation communities, spanning significant gradients of temperature and moisture [1]. We used non-metric multidimensional scaling (NMS) to optimally arrange the pollen compositional data in multidimensional space. Ordination analyses used raw counts of pollen grains and data were log-transformed while preserving zero values following [2]. We used metaMDS in the vegan library of R v.3.5.1 [3] with Bray's distance measure, 999 permutations and default settings. This approach finds a stable solution (i.e., minimises stress) from many random starts and is considered the most robust form of ordination available. The optimal solution had two axes, stress of 0.16 and a good non-metric fit between sample and ordination distances (R2 = 0.974).

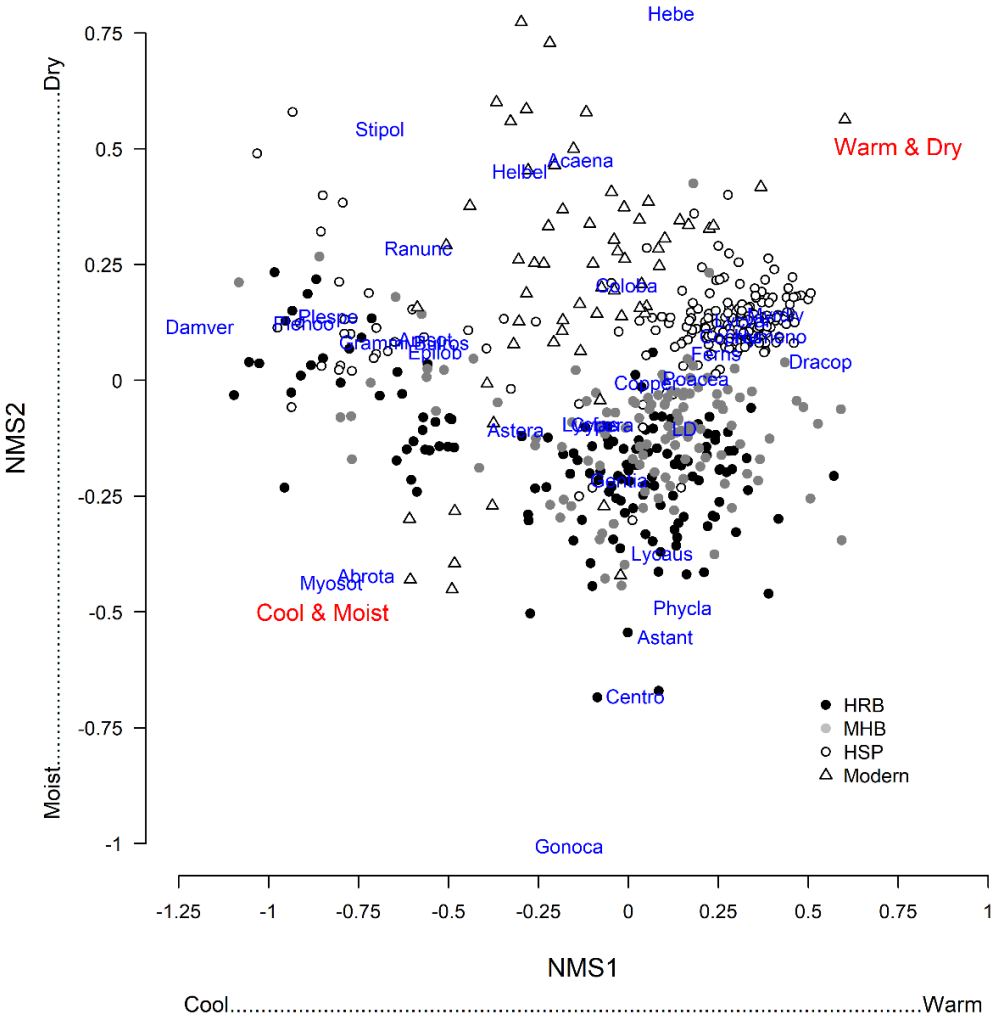

Figure 4. NMS ordination of modern pollen samples and peat core pollen samples collected from Campbell Island, New Zealand.

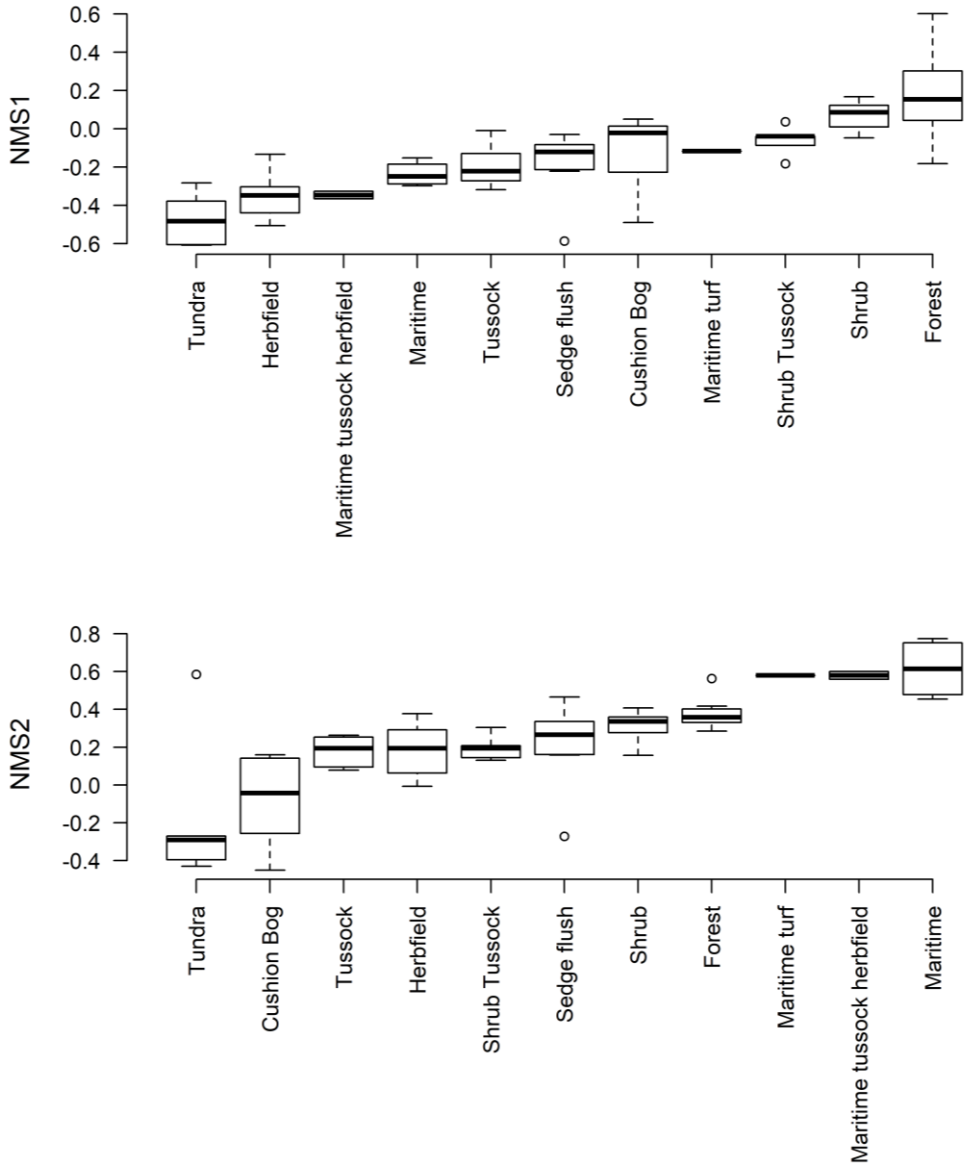

Figure 5. NMS scores for modern pollen samples from 11 distinct plant communities from Campbell Island, New Zealand.

The first axis arranged samples according to temperature (Figure S4). Low axis one scores were associated with modern sites in tundra and alpine herbfield (Figure S5), and peat core samples from the early Holocene (12-16,000 years). Species with low axis one scores were macrophyllous herbs (e.g. *Pleurophyllum hookeri*) and subshrubs (e.g. *Damnamenia vernicosa*). High axis one scores were associated with modern sites in woody vegetation (shrublands and forest; Figure S5), and peat core samples from the last 6,000 years. Species with high axis one scores were *Dracophyllum* and *Myrsine divaricata*.

The second axis arranged samples according to moisture availability (Figure S4). Low axis two scores were associated with modern sites in cushion bogs, tundra and tussocklands (Figure S5) and species with low axis two scores were the restionad herb *Centrolepis*, the graminoid herb *Astelia antarctica* and the shrub *Phyllachne clavigera*. High axis two scores were associated with modern sites in woody vegetation (shrublands and forest) and maritime turfs and herbfields (Figure SXb), and species with high axis two scores were Hebe shrubs, the macrophyllous herb *Stilbocarpa polaris*,

Acaena herbs, and subshrubs including *Anaphylloides bellidioides*. Based on the organisation of communities and species along this second axis, we used Axis 2 scores as a Wetness Index.

1. McGlone, M.S.; Meurk, C.D. Modern pollen rain, subantarctic campbell island, new zealand. *N. Z. J. Ecol.* **2000**, *24*, 181-194.
2. B, M.; Grace, J.; Urban, D. Analysis of ecological communities. MJM Software Design Oregon, USA, 2002.
3. Oksanen, J.; Blanchet, F.; Friendly, M.; Kindt, R.; Legendre, P.; McGlinn, D.; Minchin, P.; O'Hara, R.; Simpson, G.; Solymos, P. Vegan: Community ecology package.[internet].[cited march 24, 2019].