



<https://doi.org/10.15407/ukrbotj81.04.259>

RESEARCH ARTICLE

New combinations in *Anthoxanthum* (*Poaceae*) for Aotearoa / New Zealand taxa earlier placed in *Hierochloe*

Peter J. de LANGE * , Campbell J. JAMES 

School of Environmental & Animal Sciences, Unitec Institute of Technology,
Private Bag 92025, Victoria Street West, Auckland 1142, Aotearoa / New Zealand

* Author for correspondence: pdelange@unitec.ac.nz

Abstract. New combinations in *Anthoxanthum* (*Poaceae*) are provided for six endemic Aotearoa / New Zealand species earlier placed in *Hierochloe*: *Anthoxanthum brunonis* (Hook. f.) de Lange & C.J. James, comb. nov. (*Hierochloe brunonis* Hook. f.), *A. cupreum* (Zotov) de Lange & C.J. James, comb. nov. (*H. cuprea* Zotov), *A. equisetum* (Zotov) de Lange & C.J. James, comb. nov. (*H. equisetum* Zotov), *A. fuscum* (Zotov) de Lange & C.J. James, comb. nov. (*H. fusca* Zotov), *A. novae-zelandiae* Gand. de Lange & C.J. James, comb. nov. (*H. novae-zelandiae* Gand.) and *A. recurvatum* (Hack.) de Lange & C.J. James, comb. nov. (*H. fraseri* Hook. f. var. *recurvata* Hack.). These six combinations were omitted from Schouten and Veldkamp (1985), in which the then recognised *Hierochloe* were transferred to *Anthoxanthum* and in subsequent treatments.

Keywords: *Anthoxanthinae*, *Anthoxanthum*, Aotearoa / New Zealand, *Hierochloe*, new combinations, *Poaceae*, taxonomy

Introduction

When Schouten and Veldkamp (1985) elected to merge *Hierochloe* R. Br. into *Anthoxanthum* L. they left the Aotearoa / New Zealand species treated by Zotov (1973) in *Hierochloe* because they felt (p. 346) that (with our added words in [*]) ‘another revision of the material [species] is needed’. The noted Aotearoa / New Zealand agrostologist Henry Connor (de Lange, 2016) completed that required revision of *Hierochloe* for Volume V of the *Flora of New Zealand* series (Edgar, Connor, 2000). Although he elected to leave the species in *Hierochloe*, he stated that (*in litt.* 1 April 2008 to the senior author — PdL hereafter) ‘I am

looking at Papua N[ew] G[uinea] specimens that the Dutch now want to include in *Anthoxanthum*?... ‘There are floral differences [between both genera] and I like to keep them distinct but they [the Dutch and others] may have a point’. Connor’s last letter to PdL on the subject of generic position (29 March 2011) concerned a set of *Hierochloe* sent by PdL from the Chatham Islands for a revision of the species on that island group planned by Connor and him. Those specimens prompted him to write, tellingly, ‘it seems clear others [who is never said] want them [*Hierochloe*] in *Anthox[anthum]*, I like them where they are...they have a different reproductive system and base chromosome number ($x = 7$ c.f. $x = 5$) but when I am gone

ARTICLE HISTORY. Submitted 11 June 2024. Revised 11 July 2024. Published 29 August 2024

CITATION. de Lange P.J., James C.J. 2024. New combinations in *Anthoxanthum* (*Poaceae*) for Aotearoa / New Zealand taxa earlier placed in *Hierochloe*. *Ukrainian Botanical Journal*, 81(4): 259–262. <https://doi.org/10.15407/ukrbotj81.04.259>

© M.G. Kholodny Institute of Botany, NAS of Ukraine, 2024

© Publisher PH "Akadempriodyka" of the NAS of Ukraine, 2024

This is an open access article under the CC BY license (<https://creativecommons.org/licenses/by/4.0/>)

they could go there [i.e. into *Anthoxanthum*]. Henry Connor passed on the 26 July 2016 (de Lange, 2016) after several years of deteriorating health, the revision he and PdL planned never eventuated. What was clear though was that despite his private vacillations to PdL, Connor preferred to retain *Hierochloe* as distinct from *Anthoxanthum* citing floral, floral biology and cytological evidence to keep them apart (Connor 2008, 2012; Connor, Renvoize 2009; Edgar, Connor, 2000, 2010). Not surprisingly then, this viewpoint has been the one subscribed to mostly within Aotearoa / New Zealand.

Connor's views and the preferences of Aotearoa / New Zealand aside, it seems evident from a perusal of world literature on the subject that opinion on merging *Hierochloe* or not, remains an unresolved issue. Those favouring the merger by and large repeat the views of Schouten and Veldkamp (1985), namely, that there are morphological intermediates between *Anthoxanthum* and *Hierochloe* and that the main morphological distinction between both genera is floral. *Anthoxanthum* has hermaphrodite apical florets with no lodicules and two basal, epaleate neutral florets, whereas *Hierochloe* has bisexual or female apical florets without lodicules, with the two lower florets paleate or male (see summary by Lema-Suárez et al., 2018, 2021; Pimentel et al., 2013; Villalobos et al., 2019). Accordingly, many botanists dealing with regional flora treatments have simply made the necessary combinations for *Hierochloe* in *Anthoxanthum* without comment e.g., Allred and Barkworth (2007) for North America species and Chepinoga et al. (2023) for Asian Russia ones. Further, there seems to be increasing molecular support for merging *Hierochloe* into *Anthoxanthum*, least ways as judged by assessments given in Saarela et al. (2010), Pimentel et al. (2013), Soreng et al. (2015), Tkach et al. (2020) — to list but a few of a long list of examples. However, starting with the elegant summaries by Connor (2008, 2012), some botanists, notably from South America, have maintained that the floral distinctions and differences in base chromosome numbers (*Anthoxanthum* $x = 5$, *Hierochloe*, $x = 7$) are more than sufficient to justify keeping the genera separate (see for example Lema-Suárez et al., 2018; Lema-Suárez et al., 2021).

Recently, in Aotearoa / New Zealand, Ford (2023) elected to use *Anthoxanthum redolens* (Vahl) P. Royen for the 'taonga' (Te Reo Māori word meaning 'treasure') karetu / Holy grass — widely known in that country as *Hierochloe redolens* (Vahl) Roem. & Schult. Although Ford did not detail the

taxonomic debate on the issue, he went further and adopted the name in preference to *Hierochloe redolens* on the New Zealand Plant Conservation Network, adding further that *H. brunonis* and *H. fusca* are probably better regarded as part of *A[nthoxanthum] redolens* (Ford 2024), a view contrary to the findings of Edgar and Connor (2000, 2010).

When Ford (2023, 2024) made these decisions, this left six Aotearoa / New Zealand endemic *Hierochloe* without names in *Anthoxanthum*. On investigating these *Hierochloe* using *Plants of the World Online* (<https://powo.science.kew.org/>), we were surprised to find unpublished combinations for these six endemic *Hierochloe* in *Anthoxanthum* e.g., "*A. brunonis* (Hook. f.) ined." (<https://powo.science.kew.org/results?q=Hierochloe%20brunonis>).

On questioning *Plants of the World Online* about this apparent anomaly, we were told (R. Govaerts, pers. comm. May 2024) that '[Plants of the World Online] normally leave such names [nom. ined.] as unplaced but sometimes [they] put in some time to figure out all the synonymy and then it is more practical to put them under the correct name, so that is why there are sometimes ined./unpublished names'. The implication is that the authors of that website consider that *Hierochloe* should be reduced to synonymy in *Anthoxanthum*.

Whilst the literature suggests that the merger of *Hierochloe* proposed by Schouten and Veldkamp (1985) is still not universally accepted (Lema-Suárez et al. 2021), we think it preferable to provide combinations in *Anthoxanthum* for those Aotearoa / New Zealand *Hierochloe* lacking formal combinations. This is preferable to having names listed as 'ined.' so not effectively published on a world database of plant names. As stated earlier, Schouten and Veldkamp (1985) refrained from making the necessary combinations because they said a revision of the Aotearoa / New Zealand species of *Hierochloe* was needed. This has now been done (Edgar, Connor, 2000, 2010), and whilst some questions remain about the species on the Chatham Islands, there is now no reason not to make the necessary combinations in *Anthoxanthum* here. This situation is similar to that undertaken for members of the *Blechnum vulcanicum* (Blume) Kuhn complex, for which new combinations in that genus were proposed by Chambers and Wilson (2019) and then de Lange and Parris (2019) made the necessary combinations of those taxa in *Cranfillia* Gasper & V.A.O. Dittrich to provide legitimate name options for those preferring the generic segregation of the

Blechnaceae advocated by the Pteridophyte Phylogeny Group (PPG, 2016) and followed by many botanists worldwide.

Therefore, we make the necessary combinations under *Anthoxanthum* which we accept in the broad sense.

New Combinations

Anthoxanthum brunonis (Hook. f.) de Lange & C.J. James, comb. nov.

Basionym: *Hierochloa brunonis* Hook. f., Bot. Antarct. Voy. 1 (Fl. Antarct.): 93 (1845) ≡ *H. antarctica* (Labill.) R. Br. var. *brunonis* (Hook. f.) Zotov, Trans. Roy. Soc. New Zealand 73: 234 (1943)

Life Science Identified (LSID): urn:lsid:ipni.org:names:77343403-1

Anthoxanthum cupreum (Zotov) de Lange & C.J. James, comb. nov.

Basionym: *Hierochloa cuprea* Zotov, New Zealand J. Bot. 11: 571 (1973)

Life Science Identified (LSID): urn:lsid:ipni.org:names:773404-1

Anthoxanthum equisetum (Zotov) de Lange & C.J. James, comb. nov.

Basionym: *Hierochloa equiseta* Zotov, New Zealand J. Bot. 11: 568 (1973)

Life Science Identified (LSID): urn:lsid:ipni.org:names:77343405-1

Anthoxanthum fuscum (Zotov) de Lange & C.J. James, comb. nov.

Basionym: *Hierochloa fusca* Zotov, New Zealand J. Bot. 11: 576 (1973)

Life Science Identified (LSID): urn:lsid:ipni.org:names:77343406-1

Anthoxanthum novae-zelandiae (Gand.) de Lange & C.J. James, comb. nov.

Basionym: *Hierochloa novae-zelandiae* Gand., Bull. Soc. Bot. France 66: 300 (1920)

Life Science Identified (LSID): urn:lsid:ipni.org:names:77343407-1

Anthoxanthum recurvatum (Hack.) de Lange & C.J. James, comb. nov.

Basionym: *Hierochloa fraseri* Hook. f. var. *recurvata* Hack., in Cheeseman, Manual New Zealand Fl: 856 (1906) ≡ *H. alpina* (Sw. ex Willd.) Roem. & Schult. var. *recurvata* (Hack.) Zotov, Trans. Roy. Soc. New Zealand 73: 235 (1943) ≡ *H. recurvata* (Hack.) Zotov, New Zealand J. Bot. 11: 566 (1973)

Life Science Identified (LSID): urn:lsid:ipni.org:names:77343408-1


Acknowledgements

We would like to thank Dr Rafaël Govaerts for discussion on the transfer of Aotearoa / New Zealand *Hierochloa* to *Anthoxanthum*. For a past assessment of the generic position of *Hierochloa* in relation to *Anthoxanthum*, PdL would like to acknowledge the fruitful correspondence of the late Dr Henry Connor who was working with him on a revision of the Chatham Island species (2008–2014) when his advanced age and unfortunate illness prevented further developments. We would also like to recognise here the efforts of the editorial team of the *Ukrainian Botanical Journal* who continue to work and publish under extremely trying circumstances, and by extension our respect and admiration for the Armed Forces of Ukraine. *Manawareka tch'mouri ora! Me rongo* (Ta Re Mori meaning 'nature is alive, be at peace').

ETHICS DECLARATION

The authors declare no conflict of interest.

ORCID

Peter J. de Lange:  <https://orcid.org/0000-0001-6699-7083>
Campbell J. James:  <https://orcid.org/0009-0008-0637-7139>

REFERENCES

- Allred K.W., Barkworth M.E. 2007. *Anthoxanthum*. In: M.E. Barkworth, K. Capels, S. Long, L.K. Anderton (eds.). *Flora of North America north of Mexico*. Vol. 24. New York; Oxford: Oxford University Press, pp. 758–764.
- Chambers T.C., Wilson P.G. 2019. A revision of *Blechnum vulcanicum* (Blume) Kuhn and related taxa (*Blechnaceae*) in Maleisia and Oceania. *Telopea*, 22: 41–59. <https://doi.org/10.7751/lopea13185>
- Chepinoga V.V., Seregin A.P., Barkalov V.Y., Ebel A.L., Efimov P.G., Friesen N.V., Gontcharov A.A., Kechaykin A.A., Knyazev M.S., Korobkov A.A., Korolyuk E.A., Kosachev P.A., Luferov A.N., Melnikov D.G., Nikiforova O.D., Ovzinnikova S.V., Schekhovtsova I.N., Troshkina V.I. 2023. New combinations and new names in vascular plants of Asian Russia. *Botanica Pacifica*, 12: 120–133. <https://doi.org/10.17581/bp.2023.12s06>

- Connor H.E. 2008. Floral biology of Australian species of *Hierochloe* (Gramineae). *Australian Journal of Botany*, 50: 166–176. <https://doi.org/10.1071/BT07035>
- Connor H.E. 2012. Flowers and floral biology of the holy grasses (*Hierochloe* and *Anthoxanthum*: Aveneae, Gramineae). *Flora*, 207: 323–333. <https://doi.org/10.1016/j.flora.2012.01.010>
- Connor H.E., Renvoize S.A. 2009. *Hierochloe quebrada* (Poaceae), a new species from Peru and notes on floral biology in South American species. *Kew Bulletin*, 64: 727–734. <https://doi.org/10.1007/s12225-009-9167-6>
- de Lange P.J. 2016. *Aequi iniqui* Henry E. Connor CNZM, M. Sc. (Hons), D. Sc., FRSNZ — Man of Science (4 August 1922 — 26 July 2016). *Trilepidea*, 153: 1–7. Available at: <https://www.nzpcn.org.nz/site/assets/files/0/51/277/trilepidea-153-160828.pdf>
- de Lange P.J., Parris B.S. 2019. New combinations in *Cranfillia* (Blechnaceae: Polypodiopsida) for recent segregates of the *Blechnum vulcanicum* complex. *Telopea*, 22: 153–156. <https://doi.org/10.7751/telepea14000>
- Edgar E., Connor H.E. 2000. *Flora of New Zealand*. Vol. 5. Grasses. Lincoln: Manaaki Whenua Press, 650 pp.
- Edgar E., Connor H.E. 2010. *Flora of New Zealand*. Vol. 5. Grasses. 2nd ed. Lincoln: Manaaki Whenua Press, 650 pp.
- Ford M. 2023. The return of Holy Grass, a century unrecorded in the North. *Trilepidea*, 228: 10–12. Available at: https://www.nzpcn.org.nz/site/assets/files/0/73/202/trilepidea_april_2023_final.pdf
- Ford M. 2024. *Anthoxanthum redolens* Fact Sheet (content continuously updated). New Zealand Plant Conservation Network. Available at: <https://www.nzpcn.org.nz/flora/species/anthoxanthum-redolens/> (Accessed 31 May 2024).
- Lema-Suárez I., Balbuena E.S., Estévez-Pérez G., Loureiro J., Castro S., Pereira M.P. 2018. A taxonomic and evolutionary review of the South American *Hierochloë* section *Monoecia* (Poaceae: Anthoxanthinae). *Botanical Journal of the Linnean Society*, 186(3): 389. <https://doi.org/10.1093/botlinnean/box102>
- Lema-Suárez I., Sahuquillo E., Pimentel M. 2021. A revision of *Hierochloe* sect. *Monoecia* (Anthoxanthinae, Pooideae, Poaceae). *Phytotaxa*, 478(1): 92–104. <https://doi.org/10.11646/phytotaxa.478.1.6>
- Pimentel M., Sahuquillo E., Torrecilla Z., Popp M., Catalán P., Borchmann C. 2013. Hybridization and long-distance colonization at different time scales: towards resolution of long-term controversies in the sweet vernal grasses (*Anthoxanthum*). *Annals of Botany*, 112: 1015–1030. <https://doi.org/10.1093/aob/mct170>
- Pteridophyte Phylogeny Group [PPG]. 2016. A community-derived classification for extant lycophytes and ferns. *Journal of Systematics and Evolution*, 54: 563–603. <https://doi.org/10.1111/jse.12229>
- Saarela J.M., Liu Q., Peterson P.M., Soreng R.J., Paszko B. 2010. Phylogenetics of the grass 'Aveneae-type plastid DNA clade' (Poaceae: Pooideae, Poaeae) based on plastid and nuclear ribosomal DNA sequence data. In: O. Seberg, G. Peterson, A. Barfod, J.I. Davis (eds.). *Diversity, phylogeny and evolution in the Monocotyledons*. Aarhus, Denmark: Aarhus University Press, pp. 557–586.
- Schouten Y., Veldkamp J.F. 1985. A revision of *Anthoxanthum* including *Hierochloë* (Gramineae) in Malesia and Thailand. *Blumea*, 30: 319–351. Available at: <https://repository.naturalis.nl/pub/526058>
- Soreng R.J., Peterson P.M., Romaschenko K., Davidse G., Zuloaga F.O., Judziewicz E.J., Filgueiras T.S., Davis J.I., Morrone O. 2015. A worldwide phylogenetic classification of the Poaceae (Gramineae). *Journal of Systematics and Evolution*, 53: 117–137. <https://doi.org/10.1111/jse.12150>
- Tkach N., Schneider J., Döring E., Wölk A., Hochbach A., Nissen J., Winterfeld G., Meyer S., Gabriel J., Hoffman M.H., Röser M. 2020. Phylogenetic lineages and the role of hybridization as driving force of evolution in grass supertribe Pooideae. *Taxon*, 62: 234–277. <https://doi.org/10.1002/tax.12204>
- Villalobos N.I., Finot V.L., Ruiz E., Peñailillo P., Collado G. 2019. Morphometric and taxonomic study of the native Chilean species of genus *Anthoxanthum* (Poaceae, Pooideae, Poaeae, Anthoxanthinae). *Darwiniana*, nueva serie, 7(1): 93–136. <https://doi.org/10.14522/darwiniana.2019.71.822>

**Нові комбінації в роді *Anthoxanthum* (Poaceae)
для новозеландських видів, які раніше включалися до роду *Hierochloe***

П.Дж. де ЛАНГЕ, К.Дж. ДЖЕЙМС
Технічний університет УніТек, Окленд, Нова Зеландія

Реферат. Запропоновано нові комбінації в роді *Anthoxanthum* (Poaceae) для шести ендемічних для Нової Зеландії видів, які раніше включалися до складу роду *Hierochloe*: *Anthoxanthum brunonis* (Hook. f.) de Lange & C.J. James, comb. nov. (*Hierochloe brunonis* Hook. f.), *A. cupreum* (Zotov) de Lange & C.J. James, comb. nov. (*H. cuprea* Zotov), *A. equisetum* (Zotov), de Lange & C.J. James, comb. nov. (*H. equisetum* Zotov), *A. fuscum* (Zotov) de Lange & C.J. James, comb. nov. (*H. fuscum* Zotov), *A. novae-zelandiae* (Gand.) de Lange & C.J. James, comb. nov. (*H. novae-zelandiae* Gand.) і *A. recurvatum* (Hack.) de Lange & C.J. James, comb. nov. (*H. fraseri* Hook. f. var. *recurvata* Hack.). Ці шість комбінацій були пропущені при перенесенні раніше визнаних видів *Hierochloe* до роду *Anthoxanthum* (Schouten, Veldkamp, 1985) і в подальших опрацюваннях.

Ключові слова: *Anthoxanthinae*, *Anthoxanthum*, *Hierochloe*, *Poaceae*, Нова Зеландія, нові комбінації, таксономія