Delimiting species boundaries within the genus *Uncinia* in New Zealand[1]

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In the talk I gave to the Wellington Botanical Society meeting in February 2009 I presented the research I have been doing at Te Papa on a selected group of New Zealand *Uncinia*. These plants are commonly known as "hook grasses". However, despite their common name and grass-like appearance, they are actually sedges and belong to the family Cyperaceae. Therefore, it makes more sense to call them "hook sedges"! The most distinctive feature of the *Uncinia* sedges is the presence of a hook-like structure which arises from the base of the ovary of each female flower (Fig. 1). This structure facilitates the dispersal of the single seed (Fig. 2) to other sites by clasping to the hairs or feathers of any animal (or hairy tramper) passing by. The presence of these hooks makes *Uncinia* easily distinguishable from any other member of the Cyperaceae family, especially *Carex*.

Figure 1. Detail of a receptive female flower of *Uncinia zotovii* indicating hook and stigmas. Photo: C.A. Lehnebach © Museum of New Zealand Te Papa Tongarewa.

Figure 2. Seed (achene) of a native hook sedge. Photo: C.A. Lehnebach © Museum of New Zealand Te Papa Tongarewa.

Uncinia is primarily found in the Southern Hemisphere, where it is throughout, except South Africa. There are about 90 species of hook sedges in the world and it is in New Zealand where the greatest number of

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species occurs (Starr 2001). So far, about 34 species have been listed for the country (Edgar 1976; Heenan 1996; Heenan & de Lange 2001). Most of these species are endemic to New Zealand, with only three extending elsewhere, including Tasmania, Hawaii and the Philippines. The habitats occupied by *Uncinia* in New Zealand are diverse, ranging from coastal scrub, forests (Fig. 3), swamps, bogs, to grasslands or herbfields in subalpine and alpine habitats.

Figure 3. Plants of *Uncinia ferruginea* (A) and *Uncinia laxiflora* (B) in their habitat. Photos: Jeremy Rolfe.

Uncinia was revised by Bruce Hamlin (1959). In this study he recognised 31 species and five varieties. He also subdivided the genus into six series: *Australes*, *Compactae*, *Graciles*, *Leptostachyae*, *Macrolepidae* and *Ripariae*. *Compactae* is the most variable series within the genus and it includes numerous morphologically variable species such as *U. caespitosa* and the species complex formed by *U. angustifolia*, *U. rupestris* and *U. zotovii*. According to Hamlin there are no clear boundaries among the last three species and they form a morphological continuum.

Three hypotheses were put forward by Hamlin to explain this morphological continuum: 1) *U. zotovii* is a variety of *U. rupestris* and *U. angustifolia* is a different species, 2) *U. angustifolia* is a variety of *U. rupestris* and *U. zotovii* is a different species and 3) all three entities represent a single variable species.

To find out the reason(s) behind this morphological continuum I studied over 200 herbarium specimens. Some of these specimens are stored at Te Papa's herbarium (WELT) while others were loaned from other herbaria such as AK (Auckland War Memorial Museum) and CHR (Landcare Research, Lincoln). Specimens of *U. caespitosa* and *U. viridis* were also included in the study because they have also been considered morphologically variable and morphologically similar to the three species forming the species complex discussed above. Many of the herbarium specimens I included in this study were the same specimens Hamlin studied and used in his revision back in the 1950s.

After measuring 21 quantitative characters (e.g., lengths, widths and number of structures) and six qualitative characters (e.g., presence, shape or texture of a structure) from each of these specimens and performing a number of statistical analyses, I was able to infer the cause of this morphological continuum. It was evident after these analyses that Hamlin had misinterpreted the identity of the specimens he studied and therefore the current available descriptions for these species are based on a mixture of species.

Difficulty in identifying species within *Uncinia* is not surprising. In fact this is a rather common situation in this group because of the great similarity between species, both in reproductive and vegetative characters. Furthermore, species identification becomes even more difficult when the only material available is immature or non-fertile (i.e., leaves only). To facilitate species identification within hook sedges I am preparing an interactive identification key. This key will include all the currently accepted species, and identification will be assisted by annotated figures and images that will illustrate the characters to assess. Some useful features for species identification are the length of the female and male sections of the spike (Fig. 4).

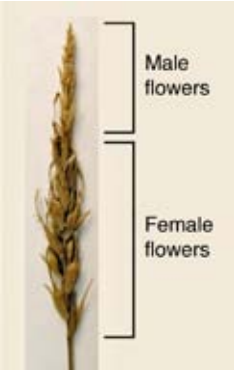

Figure 4. Mature spike of *Uncinia caespitosa* indicating female and male sections. Photo: C.A. Lehnebach ©Museum of New Zealand Te Papa Tongarewa.

Results and the taxonomic implications of my studies on *Uncinia* were discussed during the talk and a number of taxonomically useful characters indicated. These preliminary results and new findings have been compiled in an article and submitted for publication. In the mean time, if you want further information on this study or the research I am doing currently on native *Myosotis* ("forget-me-nots"), please feel free to contact me.

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