Taraxacum F.H.Wigg. (Cichorieae) in Australia: The story of systematic research on the island continent in the last four decades

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ABSTRACT

The first *Taraxacum* species to be described from Australia was the native *T. cygnorum*, published by Handel-Mazzetti in 1907. After this, there was no botanical publication on *Taraxacum* in Australia, either native or alien, until the second and so far only other known native, *T. aristum*, was described in 1964. No further *Taraxacum* work occurred until 1983, when N. H. Scarlett began his nearly 40 years of intensive work on both native and alien *Taraxacum* species. He made the first records of *T. cygnorum* since 1907 and raised progeny of both native species for the first time. This, and other detailed work, was indispensable to the description of the new *Taraxacum* sect. *Australasica* Kirschner, Scarlett & Stepanek. Regarding naturalized plants, Scarlett was eventually able to identify 29 species from five different sections, but scores more species remain to be thus recognized. This whole episode demonstrates how the progress of plant systematics research can be highly piecemeal and intermittent when it involves a large, difficult genus in a botanically under-resourced country.

Keywords: electronic floras, historical taxonomy, naturalized weeds, *Taraxcum* sect. *Australasica*.

A RECENT EPISODE OF *TARAXACUM* RESEARCH IN AUSTRALIA

Taraxacum F. H. Wigg (Dandelions; Cichorieae) is a genus of about 2,500 species and microspecies in *ca.* 58 sections (Kirschner et al., 2020) which are mostly native to Eurasia. Hundreds of these species have become naturalized in temperate and boreal areas around the world, often occurring in ruderal sites and as economically important weeds.

Australia's first flora (Bentham, 1866) records a single *Taraxacum* taxon, a Eurasian aggregate still often called *T. officinale* F. H. Wigg. It was not until Cooke (1986) that a second naturalized taxon, *T. erythrospermum* Andrz. ex Besser was recorded. The subject of naturalized *Taraxacum* microspecies is returned to below.

Turning to *Taraxacum* taxa native to Australia, the first such record is the description of *T. cygnorum* Hand.-Mazz. in 1907 (Figure 1). Not until 1964 was the second native *T. aristum* G.E.Haglund & Markl. described, which later became the first native *Taraxacum* to be included in an Australian flora (Willis, 1973). The genus remained virtually ignored taxonomically in Australia until 1983 when Neville H. Scarlett of La Trobe University, assisted by the present author (RFP), began serious systematic work on it. Significantly, Scarlett re-discovered and re-collected the native *T. cygnorum* which had not been seen since the type collection of 1907.

There were numbers of specimens of the other native, *T. aristum*, in Australia herbaria, but only one had been recognized as *T. aristum*, in this case by Willis (1973). Scarlett found, recognized, collected

Table 1. Sections, microspecies and their native range of *Taraxcum* taxa in Australia. The species records from Australia are from Scarlett (2023); the European section names and native ranges are from Kirschner et al. (2007+).

Section	Microspecies	Native range
Taraxacum sect. ***Australasica*** Kirschner, Tenney & Štěpánek	*T. cygnorum* Hand.-Mazz.	S. Australia
	T. aristum G.E.Haglund & Markl.	SE. Australia
Taraxacum sect. ***Erythrosperma*** (H.Lindb.) Dahlst.	*T. gracilens* Dahlst.	S. Europe
	T. sarcidanum Arrigoni	Sardinia
	T. gasparini Tineo ex Lojac.	S. Europe
	T. hepaticolor Soest	Iran
	T. muttidentatum Soest	S. Europe
	T. lambinonii Soest	S Europe
	T. simile Raunk	NW. & W. Europe
Taraxacum sect. ***Hamata*** H. Øllg.	*T. hamatulum* Hagend., Soest & Zevenb.	NW. & W. Europe
	T. hamiferum Dahlst.	N. & C. Europe
	T. kernianum Hagend., Soest & Zevenb.	C. Europe
	T. pruinatum M. P. Christ.	N. & C. Europe
	T. spiculatum M. P. Christ.	N. & C. Europe
	T. subericinum Hagend., Soest & Zevenb.	N. & C. Europe
Taraxacum sect. ***Celtica*** A.J.Richards.	*T. akteum* Hagend., Soest & Zevenb.	Netherlands, Great Britain
	T. bracteatum Dahlst.	NW. & W. Europe, Great Britain
	T. subbracteatum A. J. Richards	Great Britain
Taraxacum sect. ***Mexicana*** A.J.Richards.	*T. submolle* A. J. Richards	C. America & Haiti
Taraxacum sect. ***Taraxacum*** F. H. Wigg	*T. acrophorum* G. E. Haglund	N. & C. Europe
	T. aequilobium Dahlst.	N. & C. Europe
	T. ericinoides Hagend., Soest & Zevenb.	Germany
	T. khatoonae Abedin	W. Himalayas of India
	T. oblongatum Dahlst. ex Druce	N., C., S. Europe & Great Britain
	T. ohritense Sonck	Albania
	T. pachymerum G. E. Haglund	N. & C. Europe
	T. polyodon Dahlst.	N. & C. Europe
	T. prionum Hagend., Soest & Zevenb.	C. Europe, Great Britain
	T. quadrangulum Railons.	N. & C. Europe
	T. squamulosum Soest	Corsica
	T. retzii Soest	S. Europe, Great Britain
	T. skanderbegii Sonck	Albania
	T. subhuelphersianum M.P.Christ.	N. & C. Europe

Figure 1. The Australian native species *Taraxacum cygnorum* near Cape Nelson, Victoria. *Photo by John Eichler.*

and raised progeny of a series of plants in the 1980s. These new collections and progeny of both species were indispensable to the description of a new section, *Taraxacum* sect. *Australasica* Kirschner, Tenney & Štěpánek which thereby was separated from the South American *T.* sect. *Antarctica* Hand.-Mazz. and is made up of the Australian species and *T. zealandicum* Dahlst., the only New Zealand native *Taraxacum* (Uhlemann et al., 2004). *Taraxacum* sect. *Australasica* is distinguished from most other sections by having outer involucral bracts appressed against the capitulum instead of spreading. It can be distinguished from *T.* sect. *Celtica* by having a white margin on the outer involucral bracts, and by the ligules not or barely exceeding the length of the involucre (Figure 2).

The genus *Taraxacum* is known for its variation in breeding systems and for the large number of 'microspecies'. Only about 10% of the species are self-compatible or self-incompatible-allogamous sexual diploids, including the three species in *T.* sect. *Australasica* (Scarlett, 2015). Most species, however, are polyploid (usually triploid) and apomictic. Their apomixis is autonomous, meaning that they do not require pollination even to develop the endosperm (van Dijk et al., 2003). Conversely, apomictic, polyploid plants produce some diploid,

Figure 2. A. Capitulum of *Taraxacum aristum* (L.G. Adams 2636, CANB 252303) showing key characters of *Taraxacum* sect. *Australasica*; red arrow indicates the appressed outer phyllaries with scarious white margin; dotted lines indicate ligules barely exceeding the phyllaries. **B.** *Taraxacum hamatulum* (N.H. Scarlett s.n., CANB 883565); red arrow indicates the reflexed outer phyllaries; dotted lines indicate longer ligules typical of most species of the genus. *Photos by Alexander Schmidt-Lebuhn.*

Unveiling the Dandelion

Dandelions are one of the most familiar genera of Compositae, but other Cichorieae are often confused for them. Dandelions are characterized by solitary capitula on leafless stems, a differentiation of the involucre into inner and outer bracts, cypselae with a long beak, and a multiseriate, finely barbellate pappus. The apical portion of the seed-bearing part of the cypsela, just under the beak, is often called the 'cone' and its shape is a character useful for species identification, as is the ornamentation of the cypsela surface.

A member of T. sect. Taraxacum, Canberra, Australia.
Photo by Alexander Schmidt-Lebuhn

functional pollen that can cross with sexual, diploid species to produce new triploids, who inherit apomixis as a dominant trait (Mártonfiová, 2015). In this way, numerous apomictic 'microspecies' have been created through repeated crosses between apomictic and sexual plants, including all species that are introduced to Australia.

Simultaneously to this work, Scarlett began to identify *Taraxacum* microspecies introduced to Australia; these were hitherto treated in Australia simply as two aggregate taxa, *T. officinale* and *T. erythrospermum* (see above). By 2015, he had identified 13 alien taxa to already-described species in four different sections, and his account was published in the Flora of Australia (Scarlett, 2015).

Scarlett's following flora account was for the state of Victoria (Scarlett, 2019), adding the names of further alien species. Following his death in 2022, that account has been combined with his earlier work on the other Australian states in the periodically updated eflora version of the Flora of Australia (Scarlett, 2023) which includes only minor changes since his death.

The final tally of his additions to the naturalized flora stands at 29 taxa from 5 sections (Table 1), but scores more microspecies remain to be recognized.

The source areas of the identified alien taxa (Table 1) clearly show the huge predominance of apomictic microspecies of European origin. Also, the data for the three most common European sections show the well-known climate correlation between the predominantly northern European *T.* sect. *Hamata* H. Øllg. and the temperate European to Central Asian *T.* sect. *Erythrosperma* (H.Lindb.) Dahlst.. There are a few taxa in Australia of restricted native range in Europe (Albania, Corsica and Sardinia) and, more strikingly, a single taxon from areas remote from Europe (Central America, Iran and the Himalayas). Further interpretation must await future data (Lenzner et al., 2022).

The background to Scarlett's work was that he was working on the second-largest genus in the tribe Cichorieae, of about 2,500 species and microspecies, many of them apomictic and taxonomically difficult; accordingly, it was essential for him to correspond with European experts, in his case, Antonio Galán de Mera in Madrid, Jan Kirschner and his group in Pruhonice, Czech Republic and Ingo Uhlemann in Dresden. Scarlett himself had completed an excellent plant systematics course for his B.Sc. degree. He worked mostly alone; his great ability to work successfully on one of the most taxonomically difficult angiosperm genera was largely due to an exceptional innate ability to recognize significant differences between plants both in the herbarium and in the field.

Unusually, Scarlett faced a task where a large, weedy genus had become prominent in the Australian flora, yet more than 150 years since the publication of the first flora there (Bentham, 1866), the alien *Taraxacum* flora was known by just two aggregate taxa. After his 40 years of single-handed research, 29 taxa are now known to microspecies level but scores more species remain to be recognized. It is to be hoped that his project exploring which *Taraxacum* species are naturalized in Australia will be continued by others.

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