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A review of the history and taxonomy of the enigmatic southern African endemic wild lettuce *Lactuca dregeana* DC. (Asteraceae: Lactuceae: Lactucinae)

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ABSTRACT

We review the herbarium material and taxonomic literature pertaining to *Lactuca dregeana* DC., a poorly understood southern African endemic species that is closely allied to and sometimes treated as conspecific with the European *L. serriola* L. Published molecular and karyological analyses on the species have all used cultivated accessions of undetermined origin. On the basis of morphology, historical occurrence, and ecology we conclude that *L. dregeana* represents a distinct genotype and should be maintained as a separate species unless analysis of appropriately documented material indicates otherwise. We lectotypify the name to fix its application and provide a complete description of the species, with illustrations, and a distribution map, as well as an identification key to the native and naturalised *Lactuca* species in South Africa. The paucity of recent collections of *L. dregeana* in herbaria suggests that the range of the species has been significantly reduced over the past century. Efforts should be made to determine its current distribution in the wild, especially given its close relationship to cultivated lettuce.

1. Introduction

The genus *Lactuca* L. (Asteraceae: Lactuceae) is an evidently paraphyletic assemblage (Bremer, 1994) variously estimated to number between ±60 (Lack, 2006) and 97 (Lebeda et al., 2004) wild species distributed throughout the temperate and warm regions of the world, with centres of diversity in Asia and Africa. The tropical and subtropical sub-Saharan Africa representatives have been well covered in the floristic accounts by Pope (1992) and Jeffrey and Beentje (2000), and most of the southern African species were dealt with by Hilliard (1977), with the significant exception of *L. dregeana* DC.

One of just three species of *Lactuca* native to the subcontinent, *L. dregeana* is scarcely better known today than it was over one and a half centuries ago when it was named (Candolle, 1838). Our examination of the herbarium collections at Kew and in South Africa revealed relatively few accessions of the species, almost all of them made in the later decades of the nineteenth and early twentieth centuries. Despite the paucity of recent collections of the species, it has a conservation status of Least Concern (Raimondo et al., 2009), presumably based on its evidently wide distribution (area of occupancy). The species is currently recorded as restricted to the Northern Cape and Free State (Herman, 2003) but early records from Western Cape and Eastern Cape indicate a wider distribution, at least historically.

Lactuca dregeana, along with prickly lettuce, *L. serriola* L., is one of several species of wild lettuce closely allied to the cultivated lettuce *L. sativa* L. (Zohary, 1991; Koopman et al., 1998). The growing interest in establishing the identity and relationships of wild crop relatives to their cultivated derivatives is no less in the case of lettuce (Dziechciarková et al., 2004), which ranks as one of the world's most important leafy salad greens. Several recent studies have focussed on species relationships in *Lactuca*, using AFLP fingerprints (Koopman et al., 2001), nuclear (Koopman et al., 1998) and plastid (Wei et al., 2015) DNA sequence comparison, and karyology (El-Esawi and Sammour, 2014). All confirm the very close relationship between *L. sativa* and *L. serriola*, to the extent that Koopman et al. (2001) considered the two taxa to be conspecific. These authors also concluded that it was probable that *L. dregeana* too should be regarded as conspecific with *L. sativa*/*L. serriola*, and went further in suggesting that it 'represented early escapes from primitive lettuce cultivars introduced to South Africa by European settlers in the 17th century' (Koopman et al., 2001). This is, however, highly unlikely given the remote locations of the type specimens of *L. dregeana* in the arid interior of the country,

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far from the earliest and more heavily settled and cultivated southern and southwestern coastal parts of the country — areas where *L. serriola* is now common and well established. The molecular findings also contrast with the morphological (Zohary, 1991; Pope, 1992) and karyological (El-Esawi and Sammour, 2014) studies that recognise differences between *L. dregeana* and *L. serriola* adequate to maintain them as distinct species. The species allied to *L. sativa*, like most of *Lactuca*, are diploid with 2n = 18 but while most accessions of *L. sativa* and all those of *L. serriola* examined by El-Esawi and Sammour (2014) have a karyotype of 10 metacentric + 8 submetacentric chromosomes, the two accessions of *L. dregeana* studied by them were found to have a karyotype of 10 metacentric + 6 submetacentric + 2 subtelocentric chromosomes.

Unfortunately it is difficult to assess the accuracy of the identification of the material of *L. dregeana* that has been used for these studies. The species is morphologically very similar to *L. serriola* and *L. sativa*, and the two accessions used by Koopman et al. (1998, 2001) in their AFLP work and by EL-Esawi and Sammour (2014) in their karyological analysis come from the same cultivated material of unspecified origin (respectively from the Giardino Botanico e Coloniale dell' Universita di Palermo and the Jardin Botanique de la Ville de Geneve). The problems in the identification of cultivated accessions of *Lactuca* species were highlighted by the attempt by Doležalová et al. (2004) to verify the identification of *Lactuca* accessions maintained by their research institute, using a combination of morphology, cytology and isozyme analysis. These accessions had been obtained from various germplasm collections around the world, and Doležalová et al. (2004) concluded that at least one quarter of them were incorrectly named. Among these were two accessions [*Sal 069* and *Sal 070*] distributed as *L. livida* Boiss. & Reuter but which Doležalová et al. (2004) determined should be reclassified as *L. dregeana* on account of their similarity to accession *CGN4790* of that species. Unfortunately, there is once again no record of the original source of this material. Their general conclusion, that a good knowledge of taxonomy combined with the comparative study of original herbarium material is crucial to the management of *Lactuca* genetic resources, is clearly relevant but should be supplemented by careful records of the wild origin of the accessions. The need to prevent hybridisation and exclude contamination from adjacent accessions is another consideration.

In summary, therefore, all published molecular and cytological research citing *Lactuca dregeana* is based on the same two cultivated accessions, *CGN4790* (*PI273574*) and *CGN5805* (*PI273582*). We have cultivated plants from these two accessions ourselves and note that they are not an exact match for the wild collections of *L. dregeana* in lacking the dentate leaf margins of the typical plants. It is clear that further studies on the relationships of *L. dregeana* should be done using new accessions based on wild-collected specimens.

Concern about the taxonomic status of the southern African material is not new, and Harvey (1865) was himself not fully convinced that *Lactuca dregeana* could be separated from species like *Lactuca virosa* L., noting also that 'Cultivated specimens from Hort. Kew. and Hort. Hamburg have broadly oblong or obovate, obtuse, toothed cauline leaves! [sic.] altogether unlike those of the wild plant'. The leaf shape in these cultivated plants is certainly not consistent with typical *L. dregeana*, once again raising concerns about the identity of these early cultivated specimens, the origin of which is not specified. What is significant in the context of the status of *L. dregeana* is that all three, widely dispersed collections of annual lettuces made in southern Africa up to this date correspond perfectly in morphology to *L. dregeana*, and that not a single collection was cited or even mentioned by Harvey (1865) that was consistent in morphology with typical *L. serriola*. Our searches in South African herbaria suggest that typical *L. serriola* was only introduced into South Africa in the early twentieth century.

Although *Lactuca dregeana* was included as a synonym of *L. serriola* in the standard reference on the weeds of South Africa (Henderson and Anderson, 1966), it is currently accepted as a distinct species in checklists for the country (Herman, 2003). It is, however, very poorly understood and was overlooked in the recent floristic treatments of the Greater Cape Region (Manning and Goldblatt, 2012; Snijman, 2013) despite its recorded occurrence there. In an effort to establish more about the taxon, one of us (ZvH) travelled extensively in South Africa in search of wild populations of *L. dregeana*, and succeeded in locating it in several localities. We conclude that it represents a distinct genotype, and recommend that it is accepted as a distinct species unless the study of wild-collected and properly authenticated material shows otherwise. To facilitate this, we summarise the available knowledge about the species here and provide an updated description and distribution data. We also provide for the first time a complete key to the native and adventive species of *Lactuca* in southern Africa. This will assist in the correct identification and location of material for further study into the relationship between *L. dregeana* and *L. serriola*, and will also promote a more complete knowledge of the distribution, variation, and conservation status of the taxon.

2. Materials and methods

Specimens or digital images of the relevant types were examined, as well as all herbarium material from BOL, K, NBG, PRE and SAM (acronyms after Thiers, 2015), the primary collections of species from southern Africa. Voucher specimens from this study are deposited in NBG.

3. Taxonomy

3.1. Key to native and introduced species of Lactuca in southern Africa (modified from Hilliard, 1977; Pope, 1992)

1a. Scapose perennial with leaves mostly basal; involucre at least 20 mm long … ***Lactuca tysonii***

1b. Annuals or perennials with cauline leaves; involucre up to 15 mm long:

2a. Leaves unarmed; cypselas with one median (rarely 3) rib on each face and with well-developed marginal wings; cypsela beak shorter than body:

3a. Perennial; cauline leaves auriculate; corollas white or blue; cypsela beak ±2 mm long … ***Lactuca inermis***

3b. Annual; upper cauline leaves at least not auriculate; corollas yellow; cypsela beak ±1 mm long … ***Lactuca indica***

2b. Leaves prickly on midrib beneath; cypselas closely 4- to 8-ribbed on each face and with thickened marginal ribs; cypsela beak ± as long as or longer than body:

4a. Undivided lower and middle stem leaves oblong-oblanceolate and obtuse, lateral lobes of divided leaves truncate, oblong-falcate or rhomboid, terminal lobe triangular-ovate or sagittate; cypselas greyish brown with beak longer than body; plants from disturbed and waste places … ***L. serriola***

4b. Undivided lower and middle stem leaves linear to narrowly lanceolate-attenuate, lateral lobes of divided leaves falcate, terminal lobe linear; cypselas light brown with beak ± as long as body; plants from seasonal wetlands and streamsides … ***L. dregeana***

3.2. L. dregeana

DC., Prodr. 7: 137 (1838); Harvey in Harvey and Sonder in Fl. Cap. 3: 525 (1865). Type: South Africa, [Eastern Cape], 'ad Zneeurobergen (sic.) [Sneeubergen]', *Drège 3784* (G-DC [025504], lecto.-image!, designated here; PRE!, iso.). [Syntype: South Africa, 'Cap. Bonae-Spei in Cannaland', *Thunberg s.n.* (UPS-THUNB [18104]-image!)]. Note: We select the Drège collection as lectotype as it is the only one of the two cited specimens that was actually seen by Candolle; it includes a diagnostic basal leaf; and it is the most accurately localised of the two available syntypes. The *Thunberg* collection was not seen by Candolle and was included on the basis of its identification by Drège ['v.s. comm. à cl. Drege'].

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