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The identities of *Cineraria microglossa* DC. and *C. spinulosa* LAM. (Compositae-Senecioneae) from South Africa

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Abstract

Cineraria microglossa DC., a South African taxon known only from the type collection by DRÈGE, is shown to be conspecific with *Mesogramma apiifolium* DC., until recently better known as *Senecio apiifolius* (DC.) BENTH. & HOOK. f. ex O. HOFFM. *Mesogramma* DC. is a monotypic genus with a wide distribution from south Angola through Namibia and Botswana to northern Cape Province and the Orange Free State.

Cineraria spinulosa LAM. is shown to be a synonym of *Othonna parviflora* BERGIUS, a species distributed in the southwestern Western Cape Province including the Cape Peninsula.

Introduction

Recent monographic work on the African genus *Cineraria* L. (Compositae-Senecioneae) has refined the circumscription of the genus as a monophyletic and well characterized genus with 35 species (CRON 2005, CRON et al. 2006a). Fourteen species had to be removed from the genus, four to the new genera *Bolandia* CRON (CRON et al. 2006b) and *Oresbia* CRON & B. NORD. (CRON & NORDENSTAM 2006), three transferred to *Senecio* (CRON 2005, CRON et al. 2006a), whereas seven names remained unresolved as to identity and generic affiliation. Two of these will be discussed here.

One of the species with unresolved affinity was *C. microglossa* DC., described by DE CANDOLLE in 1838 and known only from the type collection by J. F. DRÈGE from the Gariiep (i.e. the lower Orange River) region in the Northern Cape Province. HARVEY

(1865) accepted the species in his section (§) *Eu-Cineraria* although with the remark, "Unknown to me". He cited DE CANDOLLE's description including the notion that the ray achenes are compressed. This observation needs qualification, however, as will be discussed below.

A second species of unknown affinity was *C. spinulosa* LAM., which was not cited by HARVEY (1865) or any subsequent authors. Its identity has remained obscure until now.

Discussion

1) *Cineraria microglossa* DC., Prodr. 6: 305 (1838). – Type: South Africa, Northern Cape, in the Gariiep region, DRÈGE 5926 (G-DC! holo., K! P! iso.). Fig. 1.

An examination of the type material of *C. microglossa* DC. suggested that it might be conspecific with *Mesogramma apiifolium* DC., a widespread annual herb from southern Africa. Until recently this taxon has been known in literature and herbaria as *Senecio apiifolius* (DC.) BENTH. & HOOK. f. ex O. HOFFM., but it has now been restored as a monotypic genus only distantly related to *Senecio* s. str. (NORDENSTAM & PELSER 2005).

Among the characteristics of *Mesogramma* are the resiniferous capitula with black-lined involucre bracts and midlined disc-floret corolla lobes, and the black cypselas with distinct lines of white hairs. NORDENSTAM & PELSER (2005) stated the number of such lines to be three, but our examination of fully ripe cypselas revealed the number to vary between three and four. The cypselar hairs are short and obtuse duplex trichomes, which become mucilaginous when wet. The cypselas are often triquetrous or nearly quadrangular, often slightly curved and a little compressed, but quite unlike the distinctly compressed cypselas of true *Cinerarias*.

The original material of *C. microglossa* agrees in all essential details with *Mesogramma apiifolium* and they are clearly the same species. Both names were published in DE CANDOLLE's *Prodromus* vol. 6, and their types were collected by J. F. DRÈGE in the same area, viz. the lower Orange River, forming the border between Namibia and Namaqualand in South Africa. Since the names were published simultaneously, *Mesogramma apiifolium* remains the correct name for this taxon, and *C. microglossa* DC. goes into synonymy. *Mesogramma apiifolium* has a rather wide and scattered distribution range from southern Angola and Botswana through Namibia to the northern parts of South Africa (Map in NORDENSTAM & PELSER 2005, Fig. 4).

The closest relative of *Mesogramma* is no doubt the recently described genus *Bolandia* CRON (CRON et al. 2006b), which shares the herbaceous habit, the

resiniferous capitula, and the black cypselas with white myxogenic duplex trichomes. This relationship is also strongly supported by molecular (ITS) data, which also place a closely linked *Mesogramma-Bolandia* subclade as sister to *Cineraria*. The *Mesogramma-Cineraria* clade in turn relates to a clade comprising *Pericallis*, *Emilia* and *Packera*, quite distant from *Senecio* s. str. in the phylogenetic tree (NORDENSTAM & PELSER 2005, PELSER et al. in press.).

- 2) *Cineraria spinulosa* LAM., Encycl. 2: 9 (1786). – Lectotype (designated here): Africa, SONNERAT, Herb. LAMARCK No. P342408(P-LA!). Fig. 2. – Note. The original material in P consists of two specimens in Herb. LAMARCK and one specimen in Herb. JUSSIEU (Cat. No. 8989), all annotated by LAMARCK. One of the former specimens is annotated “D’Afrique” and “S.” (= SONNERAT), and is selected as lectotype. LAMARCK in his description refers to SONNERAT as purveyor of material.

This is clearly a species of *Othonna*, and we regard it as conspecific with *O. parviflora* BERGIUS, a species from the southwestern region of the Western Cape Province, including the Cape Peninsula. The type specimen of *Cineraria spinulosa* has sessile and amplexicaul leaves, which are obovate to spatulate with denticulate margins. The capitula are numerous and small, with involucre bracts ca. 8 and basally connate. These characters agree well with the original material of *O. parviflora* in the BERGIUS Herbarium: “e Cap. b. spei, GRUBB, *Othonna mihi parviflora*” /BERGIUS scripsit/ (SBT! no. 4.3.9.99, holo.).

Othonna parviflora BERGIUS was published in the *Plantae capenses: Descriptiones plantarum ex Capite bonae spei* in Sept. 1767 and thus antedates *O. parviflora* L., Mant. 1: 89 (Nov. 1767). The latter illegitimate name is a synonym of *O. quinqueidentata* THUNB., a species closely related to *O. parviflora* BERGIUS, but regarded as distinct.

Confusion regarding the synonymy of *Othonna parviflora* BERGIUS and *O. rigens* (L.) LEVYNS ex ADAMSON & SALTER (1950) has been perpetuated in the literature (see BOND & GOLDBLATT 1984, ARNOLD & DE WET 1993, GOLDBLATT & MANNING 2000, HERMAN 2003). *Othonna rigens* (L.) LEVYNS was published without a basionym citation, but even if regarded as validly published (based on *Senecio rigens* L.), the name is illegitimate as a later homonym (of *O. rigens* L., syn. *Gorteria rigens* L., now *Gazania rigens* (L.) GAERTN.; cf. NORDENSTAM 1961), and *O. amplexicaulis* THUNB. is the useful name for the taxon intended. The confusion may have arisen due to LEVYNS’ (1941: 143) referral to both homonyms for *O. parviflora* in a single paragraph, despite the correct use of names/identities in NORDENSTAM (1967).

Acknowledgements

We thank the Herbarium P of the Muséum National d'Histoire Naturelle de Paris and Herbarium G-DC of the Conservatoire et Jardin botaniques de Genève for permission to view, photograph and publish the photographs of the types of *Cineraria spinulosa* and *C. microglossa* respectively, and LARS GUNNAR REINHAMMAR for kindly sending us high resolution pictures of the type of *Othonna parviflora* BERGIUS from the BERGIUS Herbarium in Stockholm. This work was in part supported by the University of the Witwatersrand Research Committee and the National Research Foundation of South Africa.

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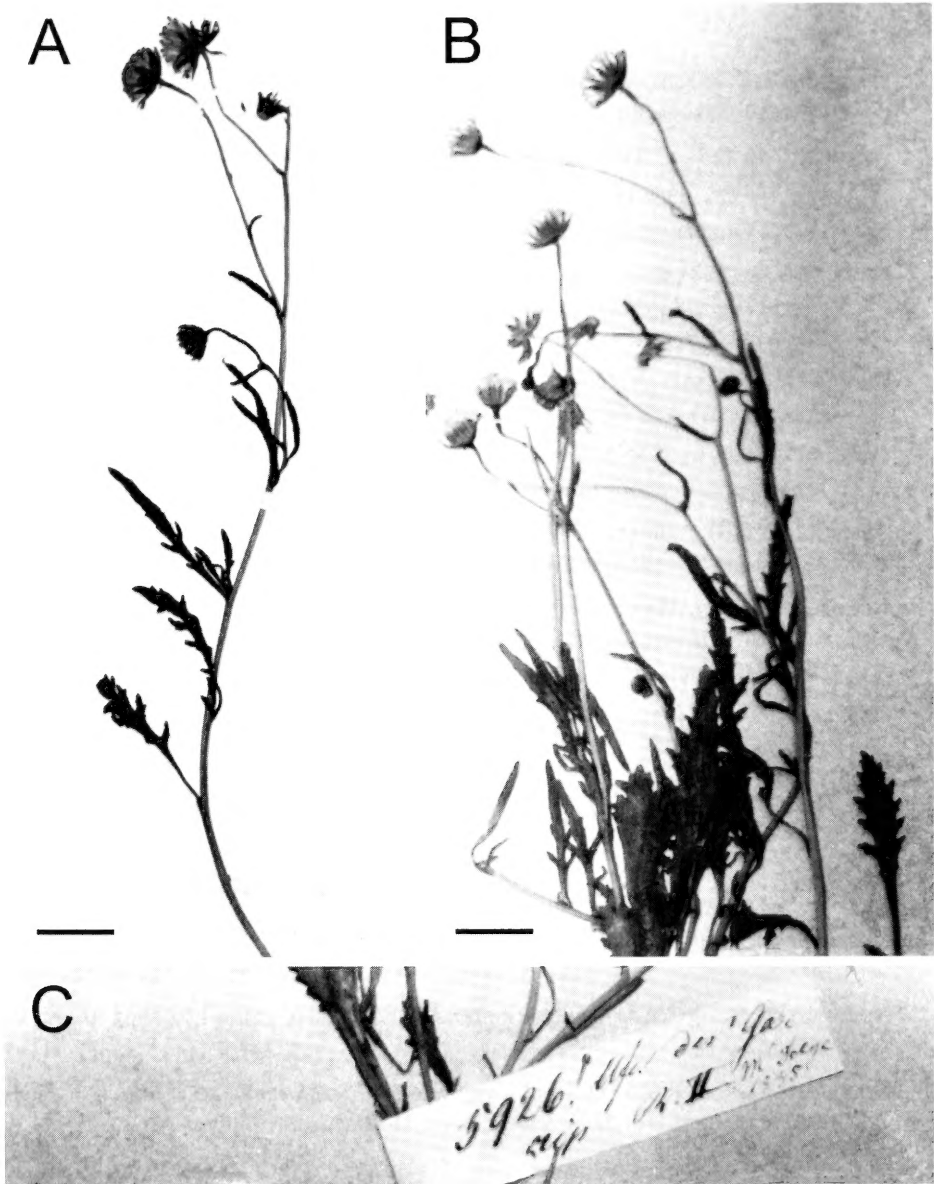


Fig. 1.

Types of *Cineraria microglossa* DC. DRÈGE 5926 (A) isotype P; (B, C) holotype G-DC, (B) portion of specimen, (C) detail of label. Scale bars: A. 7.5 mm; B. 9 mm.

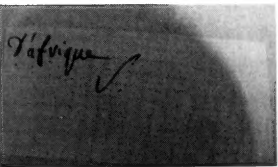


Fig. 2.

Lectotype of *Cineraria spinulosa* LAM., D'Afrique, SONNERAT s.n. (P-LA, P342408);
Inset: details of label. Scale bar: 16.5 mm.

Senecio varicosus, a Linnaean name for the Balearic taxon known as *Senecio rodriguezii* (Compositae-Senecioneae)

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Abstract

Senecio varicosus L. fil. (Compositae-Senecioneae) is an early name for a taxon endemic to Mallorca and Menorca known as *S. rodriguezii* WILLK. ex J. J. RODR. or *S. leucanthemifolius* subsp. *rodriguezii* (WILLK. ex J. J. RODR.) O. BOLÒS & VIGO. Since *Senecio varicosus* (1762) antedates both *S. leucanthemifolius* POIR. (1789) and *S. rodriguezii* (1874), the correct name of the latter will be *S. varicosus* L. fil., and the name *S. leucanthemifolius* has been proposed for conservation against *S. varicosus*.

Introduction

The first botanical publication by the younger Linnaeus is *Decas prima plantarum rariorum horti upsaliensis* (1762, Fig. 1). In this small folio volume ten plants cultivated in the Botanical Garden at Uppsala were described and illustrated by uncoloured copper prints. Although only the first plate is signed "A. ÅKERMAN Sculpsit", they were certainly all produced by this well-known engraver. Anders Åkerman (1721–1778) held since 1758 the position as engraver for 'Kungl. Vetenskaps societeten' (The Royal Society of Sciences) in Uppsala, and he contributed to many works also by Linnaeus pater (HULTMARK & al. 1944).

One of the new species described and depicted in *Decas prima* is *Senecio varicosus* L. fil., an annual grown from seeds provided by a Dr. ROQVÈ. The origin is stated as Egypt, a statement which has caused some confusion, since later authors have been unable to identify the plant with any taxon known from Egypt. The same person, Dr. ROQVÈ, also provided in 1760 the seeds of *Zygophyllum album* L. fil. from Egypt, another species described in the same publication (LINNÉ fil. 1762).

Senecio varicosus was adopted in the second edition of *Species plantarum* (LINNAEUS 1763) and the 12th edition of the *Systema naturae* (LINNAEUS 1767), and citations continued up to WILLDENOW'S *Species plantarum* (WILLDENOW 1803).

DE CANDOLLE (1838) listed it among insufficiently known *Senecio* spp. and the name was not used thereafter.

Discussion

LINNÉ fil. (1762) provided an exhaustive description and a fair illustration of *S. varicosus* (Fig. 3), the details of which made me associate it with a well-known annual species endemic to the Balearic Islands of Mallorca and Menorca known as *S. rodriguezii* WILLK. ex J. J. RODR. (RODRIGUEZ y FEMENÍAS 1874). In the 'Lectori' preceding the descriptions of the *Decas*, LINNÉ fil. characterizes *S. varicosus* as "singularis rugis paginae superioris & colore rubro inferioris foliorum". These leaf characters are indeed characteristic of the Balearic taxon, and the rugose-bullate upper leaf surface obviously inspired LINNÉ fil. to the specific epithet, *varicosus*.

The exhaustive description of *S. varicosus* agrees perfectly with *S. rodriguezii*, except that the ovaries are described as glabrous. The cypsela pubescence was obviously overlooked by LINNÉ, no doubt because he only saw immature fruits ("semina vero non maturuerunt"). His descriptions of the florets are very accurate, however. The rayflorets are said to have "corollulis revolutis, apice trilobis, albido-purpurascensibus, subtus violaceis", and the disc florets are described as "dilute purpureis". The only *Senecio*, at least in the northern hemisphere, matching these specifications is *S. rodriguezii* (Figs. 4, 5). Pink or purplish rays occur in two montane *Senecio* species, viz. *S. hoggariensis* BATT. & TRAB. from the mountains of Hoggar, Tibesti, Gebel Elba and Sinai, and *S. rosinae* GAMISANS, a rare and local taxon endemic to Corsica. Occasional specimens of the widespread *S. leucanthemifolius* POIR. may possess pink or purplish rays, but the disc florets in these three taxa are constantly yellow.

Fortunately there is also an unequivocal type specimen of *S. varicosus*, viz. LINN 996:25 in the Linnaean Herbarium in London (lectotype, selected by NORDENSTAM 2005). The sheet is annotated "HU", which means *Hortus upsaliensis*, and "*Senecio varicosus*" in the handwriting of LINNÉ fil. (Fig. 2). The specimen represents without any doubt the same taxon as *S. rodriguezii*.

In consequence *Senecio varicosus* substitutes *S. rodriguezii* as the name of the well-known endemic species of Mallorca and Menorca, easily recognized and readily observed especially in coastal habitats. WILLKOMM provided a fine illustration in the *Illustrationes Florae Hispaniae insularumque Balearium* (1881), part of which is reproduced here (Fig. 4).

If *S. varicosus* (syn. *S. rodriguezii*) is accepted as a species distinct from *S. leucanthemifolius* POIR., as I do and some other authors (ALEXANDER 1979, BONAFÉ BARCELO 1980, BONNER 1985) there are no other complications than the simple name shift.

However, nomenclatural complications will arise if this taxon is included in the polymorphic *S. leucanthemifolius* as with many authors (CHATER & WALTERS 1976, BECKETT 1988 & 1993, BOLÒS & al. 1990, BOLÒS & VIGO 1996). In the commonly accepted rank as a subspecies the name is *S. leucanthemifolius* subsp. *rodriguezii* (WILLK. ex J. J. RODR.) O. BOLÒS & VIGO. For obvious reasons of priority *S. leucanthemifolius* would then have to go into the synonymy of *S. varicosus*. Further complications arise since *S. leucanthemifolius* also includes a large number of further infraspecific taxa on subspecific or varietal level, depending on taxonomic opinion. For these reasons I have proposed the name *S. leucanthemifolius* for conservation against *S. varicosus* (NORDENSTAM 2005). However, ongoing phylogenetic studies (PELSER et al., in progress) indicate that *S. varicosus* and *S. leucanthemifolius* are distinct species.

Conclusions

Senecio varicosus L. fil., lectotypified by Herb. Linnaeus 996: 25 (LINN), is taxonomically identical to *S. rodriguezii* WILLK. ex J. J. RODR., which goes into synonymy. This is a species endemic to the Balearic Islands of Mallorca and Menorca. Since the related *S. leucanthemifolius* POIR. is by some authors regarded as conspecific, it has been proposed for conservation against *S. varicosus* in the interest of nomenclatural stability.

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CAROLI LINNÆI FIL.
 IN HORT. ACAD. UPSAL. DEMONSTRATORIS
DECAS PRIMA
 PLANTARUM RARIORUM
 HORTI UPSALIENSIS

SISTENS
DESCRIPTIONES & FIGURAS
 PLANTARUM MINUS COGNITARUM.



STOCKHOLMIÆ,
 Sumtu & Literis DIRECT. LAURENTII SALVII,
 1762.

Fig. 1.

Title-page of *Decas prima plantarum rariorum horti upsaliensis* (LINNÉ 1762).



996.25

Senecio varicosus

Fig. 2.

Lectotype of *Senecio varicosus* L. fil., Herb. Linn. 996: 25 (LINN). "*Senecio varicosus*" written by LINNÉ fil. By permission of the Linnean Society of London.

- Fig. 3.** Illustration of *Senecio varicosus* in *Decas prima plantarum rariorum horti upsaliensis* (LINNÉ 1762). Plate 6 (1762).
- Fig. 4.** WILLKOMM'S illustration (p. p.) of *S. rodriguezii* in *Illustrationes Florae Hispaniae insularumque Balearium* 1 (1881 tab. 3).
- Fig. 5.** *Senecio varicosus* in habitat, Cabo Formentor, Mallorca.
Photo B. NORDENSTAM.
- Fig. 6.** Specimen of *S. varicosus* (syn. *S. rodriguezii*), Mallorca,
leg. B. NORDENSTAM 7968 (S).



3



4



5



6

Validity of the varieties of *Senecio patagonicus* (Asteraceae)

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Abstract

The validity of the varieties of *Senecio patagonicus* HOOK. & ARN. described by CABRERA is discussed. It is concluded that *S. patagonicus* var. *alyssoides* sensu CABRERA and *S. patagonicus* var. *lobatifolius* (HOMBR. & JACQUINOT) CABRERA are synonyms of *Senecio floccidus* HOMBR. & JACQUINOT, and *S. patagonicus* var. *andersonii* (HOOK. f.) CABRERA is synonym of *Senecio arnottii* HOOK. f.

Kew words: *Senecio patagonicus*, Asteraceae, taxonomy.

Resumen

Se discute la validez de las variedades de *Senecio patagonicus* HOOK. & ARN. descritas por CABRERA. Se concluye que *S. patagonicus* var. *alyssoides* sensu CABRERA y *S. patagonicus* var. *lobatifolius* (HOMBR. & JACQUINOT) CABRERA SON SINÓNIMOS DE *Senecio floccidus* HOMBR. & JACQUINOT, Y QUE *S. patagonicus* var. *andersonii* (HOOK. f.) CABRERA ES SINÓNIMO DE *Senecio arnottii* HOOK. f.

Palabras clave: *Senecio patagonicus*, Asteraceae, taxonomía.

Introduction

Senecio patagonicus described by W. J. HOOKER & G. A. W. ARNOTT (1841) was based upon a plant collected by Captain PARKER KING at Pot Famine (Puerto Hambre) in the Strait of Magellan (Chile).

The members of this species constitute lanuginose shrubs, 15–50 cm tall, with sessile, entire or few-toothed leaves, and discoid heads arranged in corymbs. According to these characters CABRERA & al. (1999) placed this species in the series *Xerosenecio*

(CABRERA) CABRERA & S. E. FREIRE of the genus *Senecio*.

CABRERA (1949) included *S. andersonii* HOOK. f. (the type collected by LECHLER also at Port Famine), *S. danyauii* HOMBR. & JACQUINOT var. *alyssoides* SCH. BIP. (from Sandy Point), and *S. danyauii* var. *lobatifolia* HOMBR. & JACQUINOT (from Pecket Bay, next to Sandy Point), as varieties of *S. patagonicus*.

During the revision of the series *Xerosenecio*, we conclude that *S. patagonicus* HOOK. & ARN. var. *alyssoides* sensu CABRERA and *S. patagonicus* var. *lobatifolius* (HOMBR. & JACQUINOT) CABRERA belong to a species whose valid name is *Senecio floccidus* HOMBR. & JACQUINOT, and that *S. hookeri* HOMBR. & JACQUINOT, included by CABRERA in the synonymy of the typical variety, also belongs to this species. On the other hand, the variety described by C. H. SCHULTZ (*S. danyauii* var. *alyssoides* SCH. BIP.) does not belong to *S. floccidus*, but is a synonym of *S. laseguei* HOMBR. & JACQUINOT, a species of the series *Suffruticosi* CABRERA.

As regards *S. andersonii* HOOK. f., basionym of *S. patagonicus* var. *andersonii* (HOOK. f.) CABRERA, and *S. forsteri* PHIL. (included by CABRERA in its synonymy), both are synonyms of *Senecio arnottii* HOOK. f.

Taxonomy

Key to the species

- A. Involucre broadly campanulate, with 18–24 phyllaries *S. arnottii*
- AA. Involucre with 8–14 phyllaries
- B. Involucre globose, 4.5–5.5 mm high. Dwarf shrubs less than 0.3 m high, with stems and leaves densely lanuginose. Leaves 0.7–1(–2) ∞ 0.1–0.2 cm
..... *S. floccidus*
- BB. Involucre campanulate, 6–8(–9) mm high. Shrubs 0.4–0.7 m high, with stems and leaves loosely lanuginose. Leaves 1.5–6 ∞ 0.15–0.45 cm. *S. patagonicus*

Description of species

***Senecio arnottii* HOOK. f.**, Fl. antarct. 2: 314. 1846. Based on *S. limbardioides* HOOK. & ARN. but J. D. HOOKER selected a new name after realizing that W. J. HOOKER & G. A. W. ARNOTT utilized the epithet *limbardioides* for another species of *Senecio* with radiate heads (J. Bot. (HOOKER) 3: 333. 1841).

S. limbardioides HOOK. & ARN., J. Bot. (HOOKER) 3: 347. 1841. Type: Chile: Port Gregory, Capt. KING (holotype K; digital image of holotype [K 9046]!).

Synonyms:

S. limbardii var. *major* HOOK. & ARN., J. Bot. (HOOKER) 3: 347. 1841. Type: Chile: Chiloe, DARWIN 388 (holotype K; digital image of holotype [K 9046]!).

S. andersonii HOOK. f. (var. α β γ). Fl. antarct. 2: 312. 1846. Type: Chile: Strait of Magallanes, Port Famine, J. ANDERSON (holotype K; digital image of holotype [K 9038]!).

S. forsteri PHIL., Anales Univ. Chile 43: 494. 1873. Type: Chile: Magallanes aestate, 1864-65, PHILIPPI s. n. (holotype SGO; digital image of holotype!; photo and fragment of isotype, ex B, in LP!).

S. pelquensis DUSÉN, Rep. Princeton Univ. Exp. Patagonia, Botany 8, suppl.: 276, plate 2. 1914. Type: not seen.

S. patagonicus var. *andersonii* (HOOK. f.) CABRERA. Lilloa 15: 270. 1949.

Icon.: P. DUSÉN, op. cit. plate 2; A. L. CABRERA, Lilloa 15: 288, fig. 102. 1949; A. L. CABRERA, in M. N. CORREA, Fl. patagonica, 7: pag. 245, fig. 249 and pag. 248, fig. 250 (sub. nom. *S. pelquensis*). 1971.

Shrubs 0.20 m, lanuginose to almost glabrous, sometimes with glandular hairs. Leaves ovate-elliptic to elliptic, 1.3–3 cm long, 1.5–4.5 mm wide, acute, entire or with 2 or more broad irregular teeth on both sides. Heads 2–6 together, sometimes solitary. Involucre broadly campanulate, 9–10 mm high, 8–9 mm wide. Phyllaries 18–24, lanuginose to subglabrous. Flowers 32–60, yellow. Achenes glabrous or papillose.

Distribution: Argentina, from Neuquén Province to Tierra del Fuego Province and S of Chile, in the Provinces of Chiloe and Magallanes.

Additional specimens examined: ARGENTINA. **Neuquén:** Dep. Aluminé: Bajada del Rahue, 20.I.1948, G. DAWSON & E. SCHWABE 2106, 2108 and 2109 (BAA). **Río Negro:** Dep. Bariloche, Verano de De Vooch, 22.I.1983, L. CUSATO 2393 (BAA). **Santa Cruz:** Dep. GüerAike: Laguna Cónдор, 15.I.1967, O. BOELCKE 12432 (BAA); Ea. Sofía, 3 km W del casco, 350 m s.m., 8.II.1978, TBPA 2995 (BAB); Valle superior del río Turbio, 5.II.1978, TBPA 3726 (BAB); Río Gallegos, 1.III.1962, C. VALLERINI 105 (BAA). Dep. Lago Argentino, Río Santa Cruz, I.1902, HAUTHAL (LP). **Tierra del Fuego:** 12.III.1902, E. L. HOLMBERG & CALCAGNINI (BAB). Dep. Ushuaia, Alrededores de Puerto Brown, 20.I.1955, E. GRONDONA 4310 (BAA); Ea. Figue, 16.II.1953, A. RUIZ LEAL 15100 (LP). CHILE. **Magallanes.** Laguna Blanca, II.1927, J. R. GUIÑAZÚ 204 and 204a (BAA).

Senecio floccidus HOMBR. & JACQUINOT, in DUM. D'URV., Voy. Pole Sud, Atlas, tab. 12. 1845. Type: Chile: Havre Pecket, 1841, HOMBRON (holotype P; digital image of holotype!).

Synonyms:

S. albicaulis var. *lobulatus* HOOK. & ARN., J. Bot. (HOOKER) 3: 344. 1841. Pro parte, syntype: Argentina: Santa Cruz, C. DARWIN 380 (holotype K; digital image of holotype [K9049]!).

S. exilis HOMBR. & JACQUINOT, in DUM. D'URV., Voy. Pole Sud, Atlas, tab. 13 C. 1846. Type: Chile, Havre Pecket, 1841, HOMBRON (holotype P; digital image of holotype!).

S. danyaussii HOMBR. & JACQUINOT, in DUM. D'URV., Voy. Pole Sud, Atlas, tab. 13 B. 1846. Type: Chile, Havre Pecket, 1841, HOMBRON (holotype P; digital image of holotype!).

S. danyaussii var. *lobatifolia* HOMBR. & JACQUINOT, in DUM. D'URV., Voy. Pole Sud, Atlas, tab. 13 B'. 1846. Type: Chile, Havre Pecket, 1841, HOMBRON (holotype P; digital image of holotype!).

S. hookeri HOMBR. & JACQUINOT, in DUM. D'URV., Voy. Pole Sud, Atlas, tab. 13 A. 1846. Type: Chile, Port Franquis, in montibus, 1841, HOMBRON (holotype P; digital image of holotype!).

S. xanthoxylon PHIL., Anales Univ. Chile 88: 7 1894. Type: Argentina: Río Santa Cruz, VIDAL. Not seen.

S. quenselii SKOTTSB., Kungl. Svenska Vetenskapsakad. Handl. 56 (5): 323. 1916. Type: Argentina: Lago Buenos Aires, 12.XII.1908, SKOTTSBERG 696 (holotype, S; digital image of holotype!). This species was included by CABRERA (1971) and CABRERA & al. (1999) as synonym of *S. filaginoides* DC. var. *filaginoides*.

S. patagonicus var. *alyssooides* sensu CABRERA, Lilloa 15: 270. 1949. Non *S. danyaussii* var. *alyssooides* SCH. BIP., Flora 38: 118. 1855 (Type: Chile: Sandy Point, Pampas, LECHLER 1056 (holotype, P, digital image of holotype!), synonym of *S. laseguei* HOMBR. & JACQUINOT).

S. patagonicus var. *lobatifolius* (HOMBR. & JACQUINOT) CABRERA, Lilloa 15: 271. 1949.

Icon.: J. S. C. DUM. D'URVILLE, op. cit. tab 13, A (sub nom. *S. hookeri*), B (sub nom. *S. danyaussii*) and C (sub nom. *S. exilis*).

Dwarf shrubs, 0.20–0.30 m, silvery-lanuginose. Leaves elliptic, entire or toothed, fleshy, margins involute, 0.7–1(–2) cm long, 1–2 mm wide. Heads numerous. Involucre globose, 4.5–5.5 mm x 4–5 mm. Phyllaries 12–14, densely lanuginose. Flowers 22–40, yellow. Achenes pubescent or glabrous.

Distribution: Argentina, from the SW of Chubut Province to Tierra del Fuego Province, and S of Chile in the Province of Magallanes.

Additional specimens examined: ARGENTINA. **Chubut**: Dep. Río Senguer, Río Mayo, Est. Zootécnica, 29.I.1954, E. GRONDONA 3527 (BAA); 3.II.1954, E. GRONDONA 3549 (BAA, BAB) and 3550 (BAA), 8.II.1954, A. SORIANO 4579 (BAB). **Santa Cruz**: Dep. Corpen Aike, Ruta 3, cruce del río Chico, 11.I.1967, O. BOELCKE 12318 (BAA, BAB). Dep. Deseado: Puerto Deseado, 10.I.1967, O. BOELCKE 12194 (BAA, BAB); Caleta Olivia, 29.XII.1928, A. DONAT 100 (SI). Dep. Güer Aike, Río Gallegos, 3.I.1962, C. VALLERINI 28 (BAA). Dep. Lago Argentino: Ruta 40, entre El Calafate y Lago Viedma, 21.I.1967, O. BOELCKE 12636 (BAA, BAB); Lago San Martín, 23.I.1967, O. BOELCKE 12729 p.p. (BAA, SI); Lago Argentino, Pnla. Magallanes, Ea. Cerro Buenos Aires, 500 m s. m., 17.II.1975, O. BOELCKE 16499 (BAA). Dep. Lago Buenos Aires, 20 km de Bajo Caracoles a Perito Moreno, 28.I.1967, O. BOELCKE 12908, 12910, 12911 (BAA, BAB). Dep. Magallanes, San Julián, 14.V.1914, C. HICKEN 225 (SI). Dep. Río Chico, Gobernador Gregores, borde Río Chico, 30.I.1965, E. ANCIBOR & A. VICINIS (BAA).

S. patagonicus HOOK. & ARN., J. Bot. (HOOKER) 3: 344. 1841. Type: Chile: Port. Famine, Capt. KING (holotype K; digital image of holotype [K 9037]!).

Synonyms:

S. neaei var. *incisus* DC., Prodr. 6: 414. 1838. Type: Argentina: Portum Deseado et Coloniam del Sacramento, NEE (holotype G; fragment of holotype in LP!; photo of holotype in SI!).

S. albicaulis var. *lobulatus* HOOK & ARN., J. Bot. (HOOKER) 3: 344. 1841, pro parte, syntype: Argentina: Santa Cruz, Port Desire, C. DARWIN 398 (holotype K; digital image of holotype [K 9041]!).

S. albicaulis var. *subglaber* HOOK. & ARN., J. Bot. (HOOKER) 3: 344. 1841. Type: Argentina: East coast of Patagonia, EIGHTS 50 (holotype K; digital image of holotype [K9049]!).

S. patagonicus var. *integrifolius* SCH. BIP., Flora 38: 117. 1855. Type: Chile: In arenosis pr. Sandy Point, Oct., LECHLER 1055 (holotype W; isotype NY; digital image of isotype [NY 259328 and 259329]!).

S. lechleri PHIL., Anales Univ. Chile 43: 494. 1873. Type: Chile: Estrecho de Magallanes, 1864-65, PHILIPPI (holotype SGO, photo and fragment of holotype in LP!).

S. palenae PHIL., Anales Univ. Chile 88: 14. 1894. Type: Chile: Río Palena, 1.II.1887, F. DELFIN (holotype SGO; photo of holotype in LP!).

S. sericeus var. *incisus* (DC.) KUNTZE, Revis. Gen. pl. 3 (2): 177. 1898. Based on *S. neaei* var. *incisus* DC.

S. danyaussii var. *pinnatifidus* MACCLOSIE, Rep. Princeton Univ. Exp. Patagonia, Botany 8 (2) 843. 1906. Type: Argentina: Río Santa Cruz, I.1897, HATCHER 152 (holotype NY, digital image of holotype [NY 259155]!). Considered by CABRERA (1949) synonym of *S. patagonicus* var. *lobatifolius*.

S. choiquelahuensis SPEG., Anales Soc. Ci. Argent. 53: 16. 1902. Type: Argentina: Choique-lahuen, VIII. 1899, C. SPEGAZZINI (holotype LP!).

Icon.: A. L. CABRERA, Lilloa 15: 268, fig. 96. 1949; A. L. CABRERA, in M. N. CORREA Fl. Patagónica 7: 240, fig. 243 and fig. 245 (sub nom. *S. neaei*). 1971.

Shrubs 0.40–0.70 m, lanuginose or sublanuginose. Leaves elliptic, acute, entire or toothed, 1.5–6 cm long, 1.5–4.5 mm wide. Heads numerous. Involucre campanulate, 6–8(–9) mm x 4–6 mm. Phyllaries 10–14, sublanuginose to glabrous. Flowers 25–50, yellow. Achenes pubescent or glabrous.

Distribution: Argentina from Neuquén Province to Santa Cruz Province, and Chile in the Provinces of Aysen and Magallanes.

Additional specimens examined: ARGENTINA: Chubut: Dep. Futaleufú: Esquel, La Hoya, 26.II.1975, A. L. CABRERA 25963 (SI); Esquel, 26.II.1926, C. HICKEN 19 (SI). Dep. Languineo: Tecka, 12.XII.1985, A. L. CABRERA 33102 (SI). Dep. Tehuelches: Gobernador Costa, 13.XII.1981, A. L. CABRERA 33137 (SI); Lago Vintter, 9.II.1988, E. NICORA 9424 (SI). Dep. Sarmiento, ruta 20, a 33 km de W de Sarmiento, 4.XII.1976, S. ARROYO 287 (SI). **Neuquén**: Dep. Aluminé, PN Lanín, Ea Los Helechos, 17.II.1983, L. CUSATO 2833 (BAA); P. N. Lanín, Cerro Bandurria, 4.III.1985, L. CUSATO 3818 (BAA); P. N. Lanín, Malalco-Quillén, 26.II.1985, L. CUSATO 3893 (BAA). Dep. Chos-Malal, Chos Malal, 15.XI.1969, E. ANCIBOR & al. (BAA); Cerro de la Virgen, 16.XI.1969, E. ANCIBOR & al. (BAA, BAB 90189, LP). Dep. Huiliches: Entre lagos Paimún y Huechulafquen, 5.II.1948, G. DAWSON & E. SCHWABE 2495 (BAA); Ea Mamuil Malal, 20.III.1952, J. DIEM 2064 and 2066 (BAA). Dep. Lacar: Pampa de Alicura, 9.IV.1955, O. BOELCKE 7603 (BAA). Dep. Zapala; Bajada del Manzano, 20 km S de Zapala, ruta 40, 19.XI.1969, E. ANCIBOR & AL. (BAA, BAB 90247). **Río Negro**: Dep. Bariloche: Faldeos Cerro Santa Elena, 31.I.1952, O. BOELCKE 6175 (BAA); Parque Nacional Nahuel Huapi, I.1952, O. BOELCKE 6827 (BAA); San Carlos de Bariloche, 1.IV.1961, M. HAVRYLENKO 5 (BAA); Río Limay, 1.IV.1961, M. HAVRYLENKO 8 (BAA). Dep. Ñorquinco: Ñorquinco, 3.II.1944, E. NICORA 3801 (SI). **Santa Cruz**: Dep. Corpen Aike, 10 km W de Cañadón de Piedra Buena, 13.II.1975, CABRERA 25848 (LP). Dep. Deseado, Caleta Olivia, 8.XII.1970, S. CRESPO & N. TRONCOSO 1673 (SI). Dep. Lago Argentino: Lago San Martín, Ea. La Federica, 23.I.1967, O. BOELCKE 12710 (BAA); Pla. Magallanes, laderas SW Sa. Buenos Aires, 14.II.1975, O. BOELCKE 16388 (BAA, LP). Dep. Lago Buenos Aires, Los Antiguos, camino a Perito Moreno, 24.XI.1965, E. NICORA & M. N. CORREA 3637 (BAA). Dep. Río Chico, Lago Posadas, 30.XII.1964, M. CLEMENS (BA). Dep. Río

Gallegos, Río Gallegos, 6.I.1960, M. N. CORREA 1805 (BAA). CHILE. Aysen: Región del Lago Buenos Aires, Valle Ibañez, 29.I.1939, I. RENTZELL (SI 6169). Magallanes: Última Esperanza, Lago Sofía, 14.I.1977, P. SEIBERT, TBPA 2288 (BAA).

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The enigmatic genus *Dipterocome*

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Abstract

The systematic position of the enigmatic genus *Dipterocome*, which has either been placed in the Calenduleae, or treated as Asteraceae incertae sedis is investigated by jackknife analysis of DNA sequence data from the plastid gene *ndhF*, and from the internal transcribed spacers (ITS) of the nuclear genome. It is concluded that the genus is a member of the tribe Cardueae, but that its exact relationships within that tribe remain to be found.

Introduction

The genus *Dipterocome* was described 1835 by F. E. L. VON FISCHER and C. A. VON MEYER (FISCHER & MEYER 1835) on material from Azerbaidjan, but they could not place their new genus. They concluded:

“Genus sane distinctissimum in nulla ex tribubus a cl. CASSINI conditis, apte collocandum; quoad fructus structuram ad *Koelpinia* accedit, sed ab omnibus Lactuceis tota flosculorum et stylorum conformatione abhorret, neque melius inter Calenduleas vel inter Adenostyleas collocari potest.”

[A genus that clearly does not fit into any of the tribes which the celebrated CASSINI surrected; with respect to the structure of the fruit it approaches *Koelpinia*, but it differs entirely from all the Lactuceae in the shape of florets and styles, neither is it possible to place it better among the Calenduleae or the Adenostyleae.]

Also CANDOLLE (1838) looked with disbelief on the strange morphological features in *Dipterocome* hence leaving it unplaced among "Genera compositarum incertae sedis". BENTHAM (1873) included *Dipterocome* in his tribe Calenduleae but referred to it as a "genus anomalum". HOFFMANN (1892) followed BENTHAM and included *Dipterocome* in the Calenduleae where its male central florets and curved spiny cypselas seemed to be in agreement with the situation in the majority of taxa of the Calenduleae. However, members of the Calenduleae do not have a pappus, and *Dipterocome* with its florets provided with up to 5 or 10 flattened bristles differs. The fact that the bristles readily fall off could have been interpreted as a stage in a reduction trend, from ancestors of the Calenduleae with a persistent pappus, via *Dipterocome* with caducous bristles, to a total lack of pappus elements in the other members of the tribe. In most flora treatments, *Dipterocome* is mentioned together with the genera of the Calenduleae (e. g. RECHINGER 1989, TAKHTAJAN 1995).

In his treatment of the Calenduleae, NORLINDH (1977) included *Dipterocome* in his taxonomic review, although also he described the genus as deviating in morphology and as a "satellite" genus only remotely related to the Calenduleae proper. NORLINDH described the differences in *Dipterocome* as: 1) ray-florets sub-bilabiate; 2) anther filaments connate; 3) different pollen morphology (based on then unpublished data provided by PRAGLOWSKI), and in summary, he considered the tribal placement of *Dipterocome* was uncertain and in need of further study. Later, PRAGLOWSKI & GRAFSTRÖM (1980) published their palynological investigations in the Calenduleae, where they had found that pollen of *Dipterocome* differed from that of other Calenduleae by having supratectal spines being reduced to minute solid spinules, by presence of well-developed infratectal baculae, lack of caveae, and a comparatively thick nexine (Fig. 2). The authors proposed a position of *Dipterocome* in the Cardueae or the Anthemideae, but NORDENSTAM (1994) presented several arguments against the Anthemideae alternative. He included *Dipterocome* in his cladistic analysis of the Calenduleae but stated that it with certainty did not belong to that tribe. The 4- or 5-veined cypselas of the central male florets were found to be plesiomorphic in contrast to the 2-veined cypselas of other Calenduleae. Other plesiomorphic features were presence of pappus bristles and elongated prismatic cypselas crystals (pappus absent and crystals druse-shaped in Calenduleae s. str.). NORDENSTAM concluded that the genus should be excluded entirely from the Calenduleae. As noted already in the protologue (FISCHER & MEYER 1835), the minute rays in *Dipterocome* are somewhat bilabiate, a feature that is otherwise characteristic of taxa in the Mutisieae. This had earlier led BREMER (1987) to suggest that it belonged there. Later, BREMER (1994) moved the genus back to the Asteroideae including it among genera of the subfamily with uncertain systematic position. In a preliminary molecular study of the phylogeny of the Calenduleae, NORDENSTAM et al. (2006), omitted *Dipterocome*, in consequence with his earlier work. It seems clear that morphological characters argue against a position

of *Dipterocome* in Calenduleae, but there is no prevailing modern view of where it belongs, although JEFFREY (2007) had it as an isolated carduoid genus of the Cichorioideae.

In connection with ongoing research in the Asteraceae based on sequence data it became interesting to test the systematic position of the enigmatic *Dipterocome* also in a molecular framework.

Material and methods

DNA was extracted from leaves taken from a herbarium specimen of *Dipterocome pusilla* [Voucher: Iran, JOHARCCHI & ZANGOORI 19925 (S)]. To test the systematic position of *Dipterocome* in the Calenduleae, a *ndhF* sequence was analysed together with the data set (184 taxa) from ANDERBERG et al. (2005) and with an additional number of unpublished sequences, mainly from the Inuleae, and included 253 taxa representing all Asteraceae tribes. Based on the results of that analysis, an ITS sequence was subsequently included in a smaller data set together with 128 ITS sequences retrieved from GenBank (AY826222-AY826349).

Molecular methods. DNA extraction was carried out with QIAGEN's DNeasy Plant Mini Kit using the manufacturer's protocol. For *ndhF*, PCR reactions were performed with PuReTaq Ready-To-Go PCR Beads, 95°C 5 min, followed by 40 cycles of 95°C 30 sec, 50°C 30 sec, 72°C 1 min 30 sec, and finally 72° 8 min. For ITS the same protocol was followed with the exception that the annealing temperature was raised to 55°C. Purification of PCR products was done with Omega Bio-Tek, Inc. E. Z. N. A. Cycle-pure Kit following the manufacturer's protocol. Sequencing reactions were made using the BigDye Terminator v3.1 Cycle Sequencing Kit and unincorporated dye terminators were removed using QIAGEN's DyeEx 96 Kit. Fragments were separated and analysed on an ABI PRISM 3100 Genetic Analyser. Primers used for PCR and sequencing of *ndhF* are presented in Table 1. Primers used for PCR and sequencing of ITS are presented in Table 2. The ITS sequence, as well as a sequence of *trnL-F* which we did use in any analysis were compared to other deposited sequences in GenBank using BLAST.

Alignment. Alignment of *ndhF* was unproblematic and performed with the BioEdit software (HALL 1999) ver. 6.0.5. The aligned *ndhF* data set included 253 taxa with several representatives of each tribe of the Asteraceae. Alignment of ITS was partly difficult and therefore performed with the ClustalW function included in the BioEdit package. Two different alignments were analysed. The first alignment was performed with default gap opening or gap extension penalties. The second alignment used gap opening penalty 2, and gap extension penalty 5 and was also somewhat adjusted manually. The first alignment of the ITS data set included 683 characters. The second

alignment included 717 characters.

Phylogenetic analyses. The aligned sequences were analysed with parsimony jackknifing using the software XAC (FARRIS 1997) with the following settings: 1000 replications, each with branch-swapping and 10 random-additions of sequences. For the analysis of *ndhF*, *Boopis* of the Calyceraceae was used as outgroup (FARRIS 1972). The analysis of ITS included sequences from 129 taxa and used *Tarchonanthus* as outgroup.

Results

The aligned *ndhF* data set contained 2286 characters of which 693 were informative. The results of the XAC analysis placed *Dipterocome* with taxa of one of the three Cardueae clades (70 % jackknife support), together with genera such as *Saussurea*, *Synurus*, *Carthamus*, *Centaurea*, two species of *Cirsium*. In that analysis, the taxa from the Cardueae form three clades with unresolved relationships. The two other clades comprise *Echinops* in one clade and *Atractylodes* together with *Carlina* (98 % jackknife support) respectively (Fig. 3).

In the subsequent analysis of ITS, the first alignment had 365 informative characters, and gave a tree with *Dipterocome* in an unresolved position in a well supported clade (94 %) comprising most of the genera of Cardueae, a clade which has *Atractylodes*, *Atractylis*, and *Carlina* as its sister group. Sister to both these is a clade comprising the two genera *Cardopatum* and *Cousiniopsis* (Fig. 4). The second alignment with 357 informative characters of ITS (using the gap penalties mentioned above) also gave a tree with included *Dipterocome* in the large Cardueae clade that excluded the *Atractylodes*, *Atractylis* and *Carlina* clade as well as the *Cardopatum*, *Cousiniopsis* clade. Although *Dipterocome* was again found to be within the Carduinae/ Centaureinae its position this time was not unresolved but instead with very low support at the base of the *Xeranthemum*, *Siebera*, *Amphoricarpos* clade that also included *Echinops* and *Acantholepis* (Fig. 5).

The BLAST search in GenBank gave one single ITS sequence with the highest similarity score, viz. a species of *Atractylodes* (Cardueae). The BLAST of the *trnL-F* sequence gave six sequences with the highest score, 2 spp. of *Centaurea*, and four species of *Saussurea*, all Cardueae.

Discussion

We conclude that *Dipterocome* has been misplaced in Calenduleae, as previously noted by several authors. Its true systematic position is apparently in the Cardueae. This may seem surprising, as *Dipterocome* does not share any obvious

synapomorphies with taxa of that tribe. On the other hand, *Dipterocome* is strongly derived in morphology and does not share any obvious diagnostic characters with taxa of any tribe. Only the pollen wall morphology described by PRAGLOWSKI & GRAFSTRÖM (1980) indicated a position in the Cardueae.

Our molecular data obtained from *ndhF* and ITS DNA sequences unequivocally place *Dipterocome* within the Cardueae, probably somewhere at the base of the Carduinae/Centaureinae complex as defined by SUSANNA et al. (2006). In the tree from a combined analysis of ITS, *trnL-F* and *matK*, as well as in the tree from a Bayesian analysis of ITS alone, SUSANNA et al. (2006) found that there are a few major groups of the Cardueae, but with poorly supported basal relationships. They identified a Cardopatiinae, Carlininae, and Echinopinae in an unresolved basal complex together with the Carduinae/Centaureinae that comprise the majority of Cardueae genera. At the lowermost node of the Carduinae/Centaureinae in their ITS tree, there is a group called the *Xeranthemum* group with *Xeranthemum*, *Siebera*, *Chardinia*, and *Amphoricarpus*. The first two have a somewhat bilabiate corolla, like *Dipterocome*, whereas the florets in latter two are actinomorphic. Members of the Carlininae and Echinopinae have a basal attachment point for the cypselas in contrast to many genera of Carduinae/Centaureinae, which have an oblique scar.

The anthers in *Dipterocome* are very small but the base seems to be somewhat calcarate, i.e. the attachment point of the filament is above the lowest fertile point of the thecae. This is not a feature characteristic of the Cardueae but rather a plesiomorphic character state that is not present in the vast majority of species of the Asteroideae tribes.

As noted already by FISCHER & MEYER (1835), *Dipterocome* has mature cypselas that much resemble the ones in *Koelpinia linearis*, a plant that belongs in the Lactuceae and therefore differs in many other respects. However, the two inhabit the same kind of environment and are partly sympatric. Apart from their obvious differences they display some interesting similarities. Also in *Koelpinia linearis* the stems are sometimes prostrate, the leaves linear-lanceolate and the flowering capitulum small, becoming much enlarged when the fruits mature. Both species have dorsally spiny fruits that enlarge very much during maturity. The fruits seem to be adapted to zoochory and the two plants are good examples of convergent evolution in plants inhabiting similar climatological and geographical conditions.

Dipterocome pusilla FISCH. & C. A. MEY.

Index Sem. Hort. Petrop. i. 26 (1835).

Type: In collibus salsis ad Ulabanlı rarissimus. Distr. Khoi, Provinz Aderbeidschan 3.V.1828. Leg. SZOVITS 174 (LE, lecto-, selected by G. MENITSKY 1999). Digital images of

lectotype and isolectotypes seen.

Syn.: *Jaubertia koelpinioides* SPACH, Ill. Pl. Orient. 3: 131, (1850) (n. v.); *Koelpinia sessilis* BOISS., Diagn. Pl. Orient. Ser. 1, 11: 34 (1853) (n. v.).

Illustr.: Fig. 1.

Small, glabrous, annual herb, often more or less prostrate. Leaves alternate, linear-lanceolate, entire, glabrous. Capitula axillary, heterogamous, disciform, few-flowered, very small, 3–4 mm long and 1–2 mm wide, later larger due to the growth of the cypselas. Receptacle epaleate. Involucral bracts arranged in two–three rows, herbaceous with whitish margins. Outer florets 4–7, c. 2 mm long, female, radiate, two-lipped; upper lip 2–3-dentate, longer than the very small lower lip. Fruits much larger than corolla, curved outwards, dorsally spiny, with two protruding horn-shaped spiny appendages apically; pappus of a few, soon caducous, flattened bristles. Central florets, 2–3, functionally male, c. 2 mm long, 5-lobed; corolla-lobes shortly triangular. Anther filaments connate. Anthers ecaudate but probably somewhat calcarate; anther appendage well developed, acute; endothelial tissue polarized. Style undivided or shortly divided but with branches not separating, with elongated, apically rounded sweeping hairs distally. Pappus of a few caducous, flattened bristles. Fruit not developing.

Geographic range: *Dipterocome pusilla* grows in desert and semi-deserts, in the Middle East from Jordan, Syria, to Armenia, Azerbaidjan, Iran and Afghanistan.

Acknowledgements

The authors are grateful to BODIL CRONHOLM for laboratory assistance, and to Dr. IVAN TATANOV, St. Petersburg (LE) for sending digital images of the type material of *Dipterocome pusilla* and of the protologue. Financial support was received as a Swedish Research Council grant (to A.A.) for Angiosperm phylogeny.

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Table 1.

Primer sequences (5'-3') for *ndhF*. F = forward, R = reverse.

<u>Name</u>	<u>Direction</u>	<u>Primer sequence</u>
RJ1	F	AGG TAA GAT CCG GTG AAT CGG AAA C
1b	F	TGG GAC TTC TTC TTT TTCC
431	F	GAT ACA AAT TTA TAT TTT TTG GG
520	R	CAA ATG CTT TTT GAC AAG CAT TTG CCG C
5	F	GTC TCA ATT GGG TTA TAT GAT G
5B	F	GGAGCTACTTTAGCTCTTG
16	R	GTT AAA CCT CCC ATA AGC ACC ATA TTC TGA C
1260	F	TCT TAA TGA TAG TTG GTT GTA TTC ACC
1700	R	CAT AGT ATT ATC TGA TTC ATA AGG ATA
1750	R	ACT GAA AAA ATT GCA TCT TTT
10	R	CCC CCT AYA TAT TTG ATA CCT TCT CC
10B	R	CCT ACT CCA TTT GGA ATT CCA TC
RJ14	R	ACCAAG TTC AAT GTT AGC GAG ATT AGT C

All primers were published in KÄLLERSJÖ et al. (2000), except for primers 520 and 1750 that were published by ANDERBERG & SWENSON (2003). Primers RJ1 and RJ14 were designed by KI-JOONG KIM and ROBERT JANSEN.

Table 2.

Primer sequences (5'-3') for ITS. F = forward, R = reverse.

<u>Name</u>	<u>Direction</u>	<u>Primer sequence</u>
18SF	F	GAA CCTTATCGT TTA GAG GAA GG
26SR	R	CCG CCA GAT TTT CAC GCT GGG C
N18L	F	AAG TCG TAA CAA GGT TTC CGT AGG TG
C26A	R	TTT CTT TTC CTC CGCT
5.8SN	F	ATC GAG TCT TTG AAC GCA
5.8SC	R	TGC GTT CAA AGA CTC GAT
ITS5	F	GGA AGT AAA AGT CGT AAC AAG G
ITS4	R	TCC TCC GCT TAT TGA TAT GC
ITS3	R	GCATCGATGAAGAACGCAGC
ITS2	F	GCTGCGTTCTTCATCGATGC

18SF and 26SR were designed by CATARINA RYDIN. N18L, C26A, 5.8SN, and 5.8SC were designed by YOUNGBAE SUH. ITS2-ITS5 are designed by WHITE et al.



Fig. 1.

Dipterocone pusilla. Scanned herbarium specimen. -
JOHARCCHI & ZANGOORI 19925 (S).

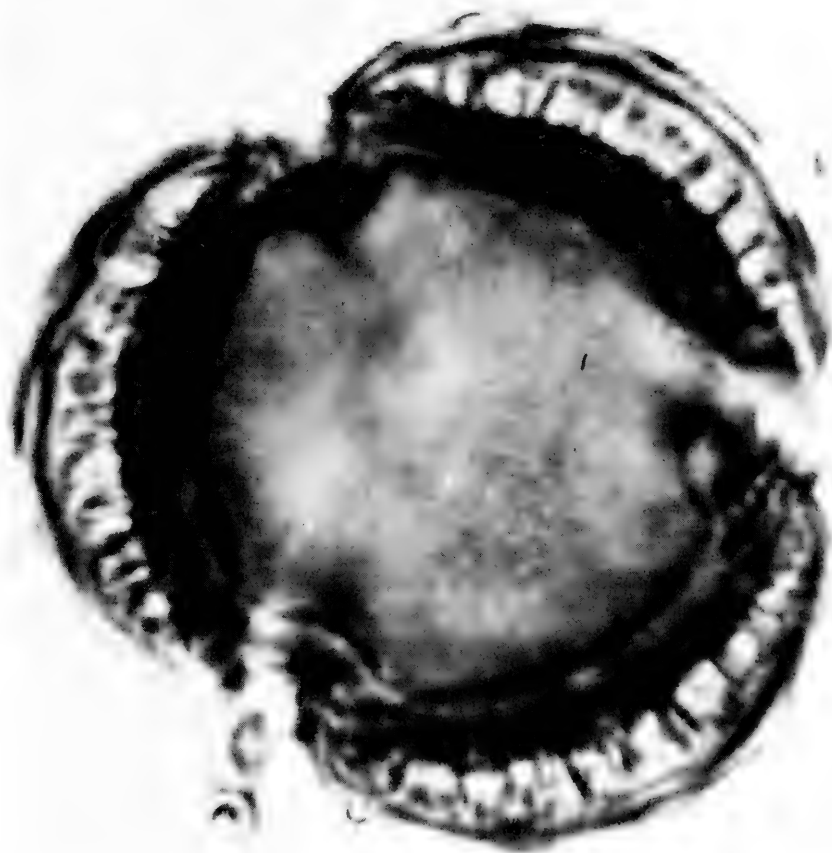


Fig. 2.

Pollen of *Diptero come pusilla* - GROSSHEIM & GURVITSH s. n. (S).

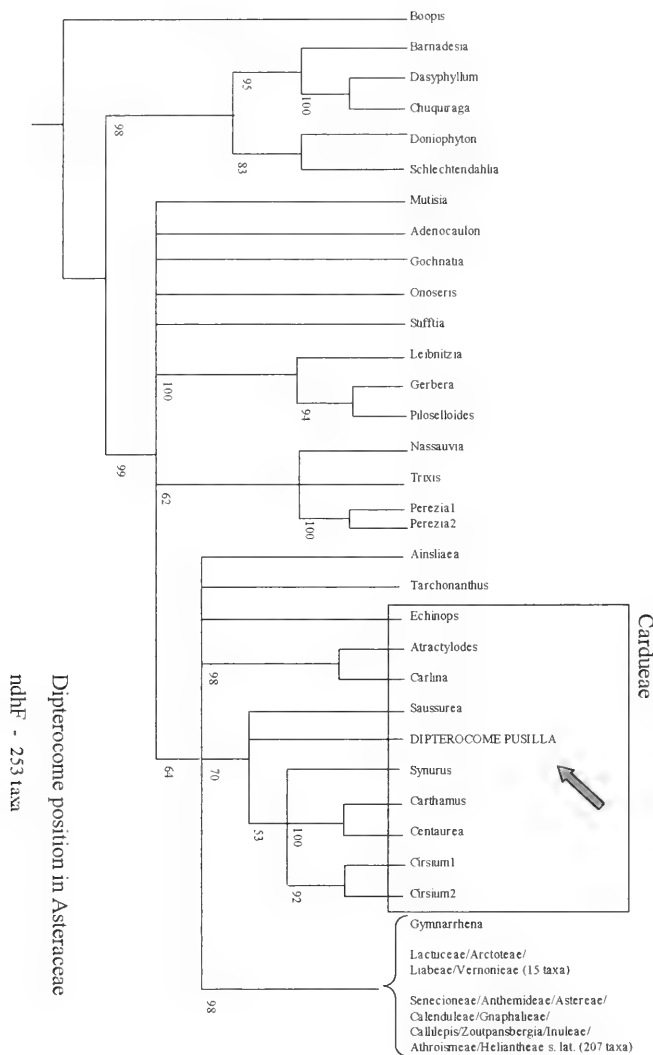


Fig. 3.

Parsimony jackknife tree based on *ndhF* sequence data showing the position of *Dipterocome* among the Asteraceae tribes. Support values > 50 % are shown for each clade.

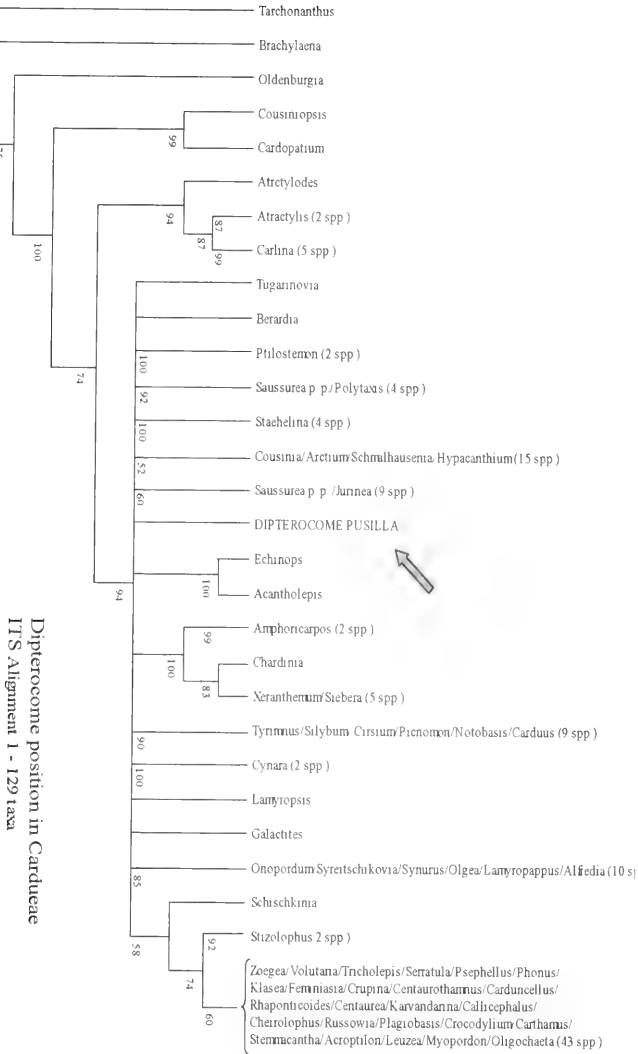


Fig. 4.

Pasimony jackknife tree based on analysis of ITS sequence data.
Alignment using default gap penalties.
Support values > 50 % are shown for each clade.

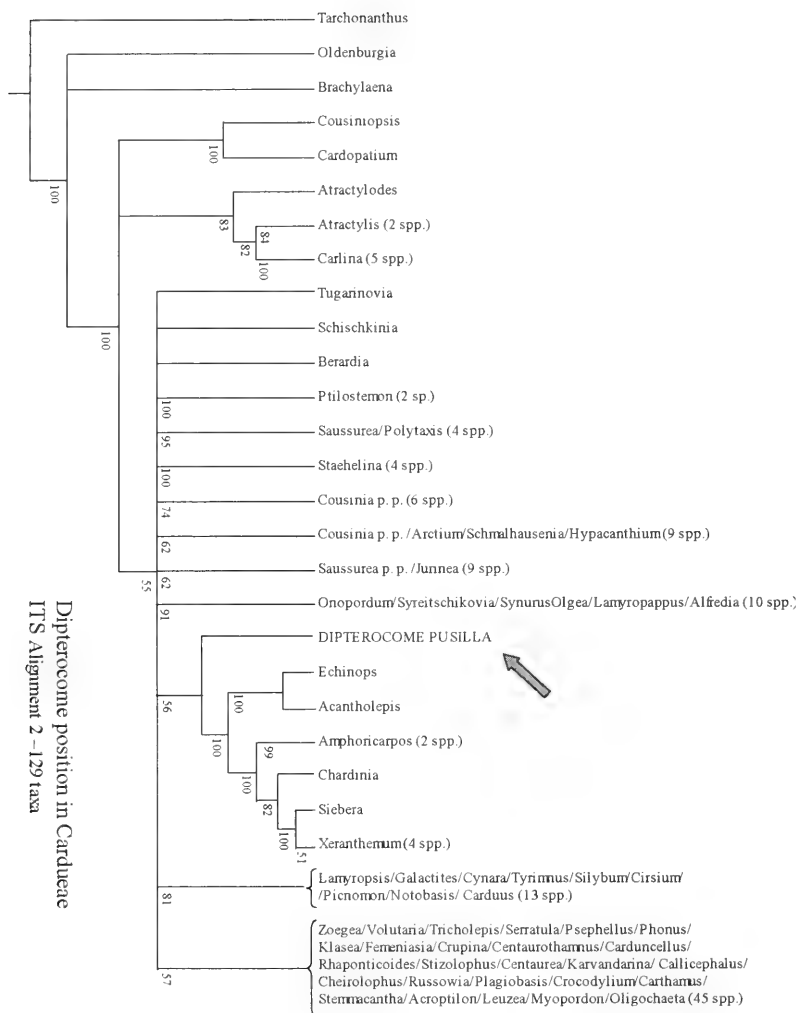


Fig. 5.

Pasimony jackknife tree based on analysis of ITS sequence data.

Alignment using non-default gap penalties.

Support values > 50 % are shown for each clade.

Validation of *Nesampelos* B. NORD. (Compositae-Senecioneae)

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Abstract

The genus *Nesampelos* B. NORD. (Compositae-Senecioneae) is validly published by citation of the type, which was omitted in the original publication by NORDENSTAM (2006). New combinations are published for the three species referred to the genus.

Nomenclature of *Nesampelos*

The new genus *Nesampelos* B. NORD. was described among other novel genera from the Greater Antilles by NORDENSTAM (2006). By a technical mistake the line stating the type of the genus disappeared in the printing, and accordingly the new genus and its constituent taxa were not validly published (ICBN Art. 37.1, 43.1). This mistake will be rectified here.

Nesampelos B. NORD., gen. nov.

Nesampelos B. NORD., Compositae Newsletter 44: 58 (2006), nom. inval. (typus non designatus).

Typus: *N. lucens* (POIR.) B. NORD.

Species 3, Hispaniola:

1. *Nesampelos lucens* (POIR.) B. NORD., comb. nov.

Basionym: *Conyza lucens* POIR., Encycl. (LAMARCK) Suppl. 2: 341 (1811).

Syn.: *Senecio lucens* (POIR.) URBAN, Symb. Antill. 3: 413 (1903).

Typus: NECTOUX s.n., Haiti (P).

2. *Nesampelos hotteana* (URB. & EKMAN) B. NORD., comb. nov.

Basionym: *Senecio hotteanus* URB. & EKMAN, Arkiv f. Bot. 23A(11): 93 (1931).

Typus: E. L. EKMAN H7430, Hispaniola, Haiti, Massif de la Hotte, western group, Torbec, Morne Formon, 1400-1500 m, 27.XII.1926 (S holotype, iso., EHH iso., NY iso.).

When collecting the type material EKMAN was accompanied by HENRY D. BARKER (label information from isotype in herb. EHH, Damien, Haiti).

3. *Nesampelos alainii* (J. JIMÉNEZ ALM.) B. NORD., comb. nov.

Basionym: *Herodotia alainii* J. JIMÉNEZ ALM., Colección Conferencias Acad. Sci. Rep. Domin. 2(11): 15 (1977).

Syn.: *Ekmaniopappus alainii* (J. JIMÉNEZ ALM.) BORHIDI, Acta Bot. Hung. 37: 111 ("1992", prob. publ. 1994).

Typus: LIOGIER 22276, Rep. Domin., Prov. De La Vega, Constanza, El Convento, 10.I.1975 (Herb. JIMÉNEZ holo., JBSD iso.!).

Acknowledgements

I wish to thank KANCHI GANDHI, WERNER GREUTER and GEA ZIJLSTRA for correspondence on matters of nomenclature.

Reference

NORDENSTAM, B. 2006. New genera and combinations in the Senecioneae of the Greater Antilles. *Comp. Newsl.* 44: 50-73.

Studies on the reproductive biology of *Emilia* (Asteraceae - Senecioneae)

2. Floret number, reproductive propagules and seed germination

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Abstract

Floret number displayed low variability within each species and is statistically species-specific, and thus considered of great diagnostic value in taxonomic evaluation within the genus *Emilia* CASS. (Asteraceae-Senecioneae).

Two reproductive propagules were identified in the genus *Emilia*, viz. the seeds and the adventitious roots. The incidence of production of adventitious roots was highest in *E. coccinea*.

E. praetermissa MILNE-REDH., the allotetraploid hybrid of *E. coccinea* (SIMS) G. DON and *E. sonchifolia* (L.) DC., had the shortest number of days to germination and the highest percentage germination performance. The compensatory balance between the two reproductive propagules in the genus is highlighted.

Introduction

The attributes of the florets are emphasized by plant taxonomists in classification and identification of the Asteraceae (BURTT 1977). The constancy of the characteristics of florets, in spite of variation occurring in capitulum character, was one reason for the outstanding success of the Asteraceae (BURTT 1977). AYODELE (1995) used floret number to differentiate and separate some species in the genus *Vernonia* SCHREB.

The features of sexual reproduction dominate flowering plant life cycles. But many species can also reproduce asexually by various modes of vegetative growth (STARR & TAGGART 1998). OOLORODE (1984) reported exceptional cases of reproduction by vegetative (asexual) means in the genus *Vernonia*.

SALISBURY (1961) had earlier identified the variability in the mode of seed germination even if conditions are favourable. *E. praetermissa* MILNE-REDH. is an allotetraploid

hybrid (a hybrid and a polyploid) of *E. coccinea* (SIMS) G. DON and *E. sonchifolia* (L.) DC. (OLORODE & OLORUNFEMI 1973). The absence of highly widespread populations in the two diploid relatives of *E. praetermissa*, calls for an investigation on the efficiency or otherwise, of the seed germination performance among the species of the genus.

The objectives of this paper are, to document the reproductive propagules observed in the species of the genus *Emilia*, to determine the importance or otherwise of floret number in the taxonomy of the genus, and also to document the seed germination performance of the genus in Nigeria. These data will enhance useful deductions on certain aspects of reproductive efficiency in the genus *Emilia*.

Materials and Methods

Capitula at anthesis were harvested randomly from *Emilia* plants among field populations, garden and screen-house plants. At least twenty-five capitula from twenty plants of each species were used during each investigation for assessment of number of florets per capitulum. Each capitulum was dissected by means of a pair of forceps and a mounted needle to detach the florets from the receptacle. Floret counts were taken, using a tally-counter. Floret numbers were subjected to Analysis of Variance (ANOVA) and DUNCAN'S Multiple Range Test (DMRT) for significant differences among the species.

Observations were made regularly on the field, garden and screen-house plants to establish the propagules for reproduction. One hundred plants of each species in the garden and screen-house carried labels on which regular entries were recorded. A bar diagram illustrating the percentage incidence of adventitious roots production in the species of *Emilia* was prepared.

For the germination studies, ripe capitula were harvested from field plant populations and bagged in sachets labelled according to their species numbers. The fruits (achenes) were separated from each capitulum by manual threshing. This also detached the pappus from the achenes. The threshed material was then winnowed to separate the seeds from the chaffs of involucre bracts and detached pappus. Three disposable plastic petri dishes were cleaned and the inside lined with moist filter paper. Fifty seeds were put on the moist filter paper in each petri dish. This was done for each of the species investigated. The dishes were kept on laboratory benches at room temperature for germination. The filter paper was kept moist (but not wet) regularly by adding more distilled water using a wash bottle. Germination observations were recorded for up to thirty days. The experiment was repeated five times at different intervals of the study. A bar diagram illustrating the mean percentage germination performance in the species of *Emilia* was prepared.

Observations/Results

There were significant differences among the species in the number of florets contained in each capitulum (Tables 1 & 2). *E. coccinea* and *E. praetermissa* are species with large-size capitula compared with *E. sonchifolia* and they were found to have higher number of florets; however, the variability in floret counts within each species was observed to be low (Table 1).

The study of the reproductive propagules in the species of the genus *Emilia* revealed two reproductive propagules, the seed (Fig. 1B & C) and the adventitious roots (Fig. 2A & B). It was observed that adventitious roots protruded out of the leaf nodes of lodged stems in the three species but the incidence of adventitious roots varied from one species to the other (Fig. 3). It was observed to be highest in *E. coccinea* and lowest in *E. sonchifolia*, with *E. praetermissa*, the tetraploid hybrid of the other two species, being intermediate.

A ripe capitulum is usually dry and crowned with pappus (Fig. 1A). This gives the capitulum the appearance of a full bloom flower. The colour of the pappus in the three species is usually white to dirty white (Fig. 1A–C). All the species have small-sized seeds. Germination performance studies reveal that *E. praetermissa* seeds were quick in germination (2–3 days after sowing) and had the highest mean germination performance of 94 %. *E. sonchifolia* and *E. coccinea* follow closely with 3–5 days to germination and mean percentage germination performance values of 91 % and 80 %, respectively (Fig. 4). Seed germination period for the germinated seeds in the three species ranges from 7 to 10 days.

Discussion

The low variability trend in the number of florets per capitulum within each species is noteworthy. Statistical analysis reveals that floret numbers in the genus are significantly different and species-specific and thus can be used to identify, separate and classify each species of the genus (Tables 1 & 2).

Two reproductive propagules, the seed and the adventitious roots were observed in the genus *Emilia*. The seed (Fig. 1) is the propagule of sexual reproduction while adventitious root (Fig. 2) is the propagule for vegetative or asexual reproduction. According to STARR & TAGGART (1998), asexual reproduction proceeds by way of mitosis, so offspring are genetically identical to the parent, they are a clone.

E. praetermissa had the shortest number of days to germination and the highest percentage germination performance. According to SWANSON (1968), the increased size of seeds which accompanies polyploidy increases seed and seedling vigour and hence helps in the process of stabilization and establishment in new habitats.

Generally in the genus, the seeds germinated within 2–5 days and completed the process of germination for germinated seeds within 7 to 10 days. This is an advantage for species that produce small fruits, which have very limited food stored in them (SALISBURY 1942). This stored food must be utilized as soon as the seeds find a favourable environment. Finding a favourable environment is an important determinant of the germination performance of these small-seeded species of *Emilia*. It was observed that despite the fact that *E. sonchifolia* and *E. coccinea* had considerably high seed germination performance, they still lack relatively large and widespread populations in the natural habitats. This could be due to two reasons, firstly, the seeds of these species may not readily find suitable favourable sites for germination in the wild and hence lose the viability. Secondly, even where the seeds germinate, not many of the seedlings reach adult stage because of the slow rate of growth of the seedlings, and other plants in the community soon overtake them and they get smothered.

We can see the compensatory balance between the reproductive propagules in the genus. *E. coccinea* with the highest incidence of adventitious roots (Fig. 3) has the lowest percentage germination performance of seeds (Fig. 4), while *E. praetermissa* and *E. sonchifolia* with the highest percentage germination performance have the lowest incidence of adventitious roots.

In the genus, dispersal of achenes is largely with the aid of wind because of the pappus (Fig. 1A & B). The combined strategies of seed dispersal and germination in *Emilia* species serve more of a colonization function than escape from pests. No significant or noticeable insect pests or any plant diseases of the seeds (fruits) were observed during this study.

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Table 1. Number of florets per capitulum in the species of *Emilia*

Species grouping* from DUNCAN'S multiple range test	Species name	Mean	Range	CV%**
A	<i>E. praetermissa</i>	97.25	88ñ110	6.56
B	<i>E. coccinea</i>	92.70	86ñ101	6.90
C.	<i>E. sonchifolia</i>	41.70	40ñ43	2.59

Note: * Means with the same letter are not significantly different (conversely, means with different letters are significantly different).

** Coefficient of variation of attribute.

Table 2. Analysis of Variance (ANOVA) in number of florets per capitulum of *Emilia*

Character	Source of variation	Sums of Squares (SS)	Degree of freedom (DF)	Mean Square (MS)	F-value
Number of florets per capitulum in <i>Emilia</i>	Model	38050.03	2	19025.02	658.76*
	Error	1646.15	57	28.88	
	Corrected total	39696.18	59		

* Significant at 0.05% level.

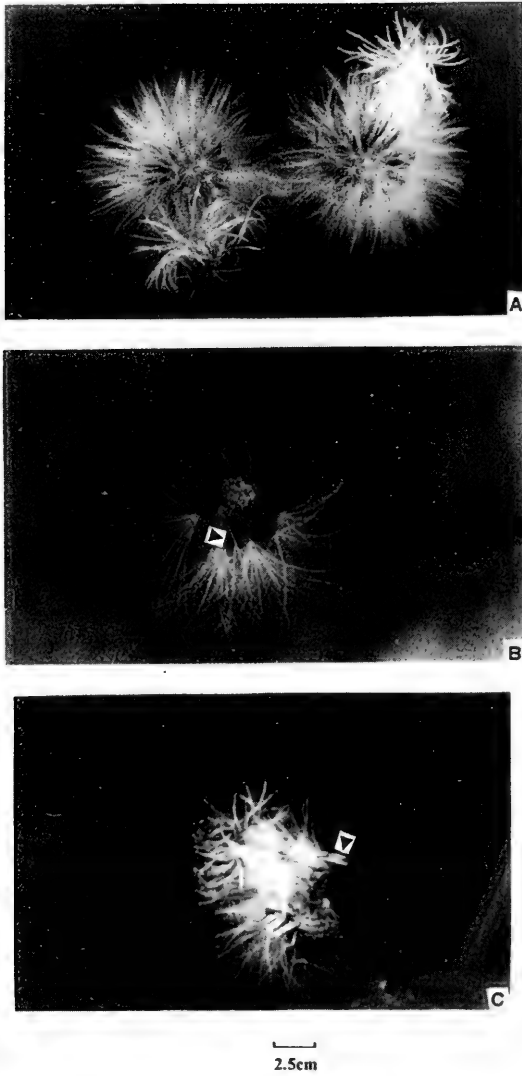


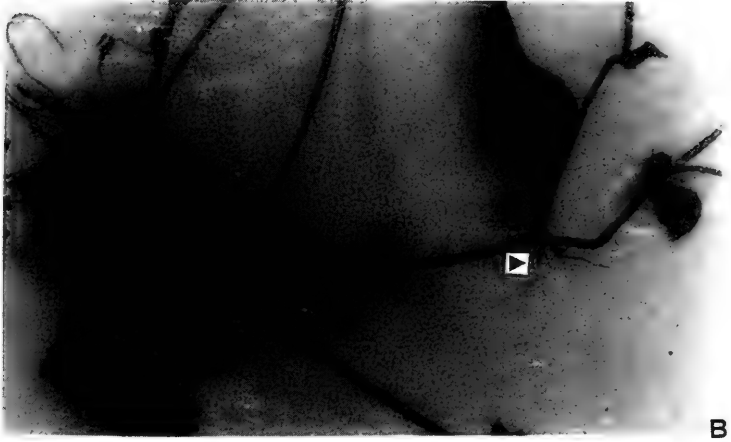
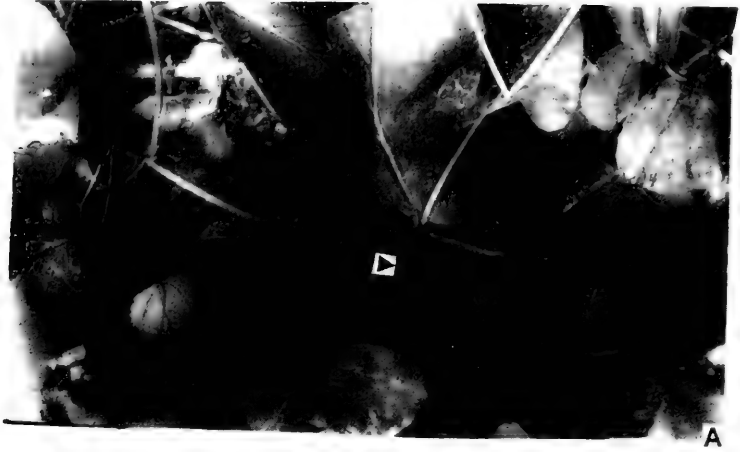
Fig. 1.

Ripe capitula in *Emilia*.

A: Capitulum with pappus and seeds.

B: Capitulum with few seeds and their attached pappus (arrow head indicates seed).

C: Capitulum with seeds and pappus (arrow head indicates seed).




0.3cm

Fig.2.

Asexual reproduction in *Emilia*.

A & B: Adventitious roots (arrow head) on the stem.

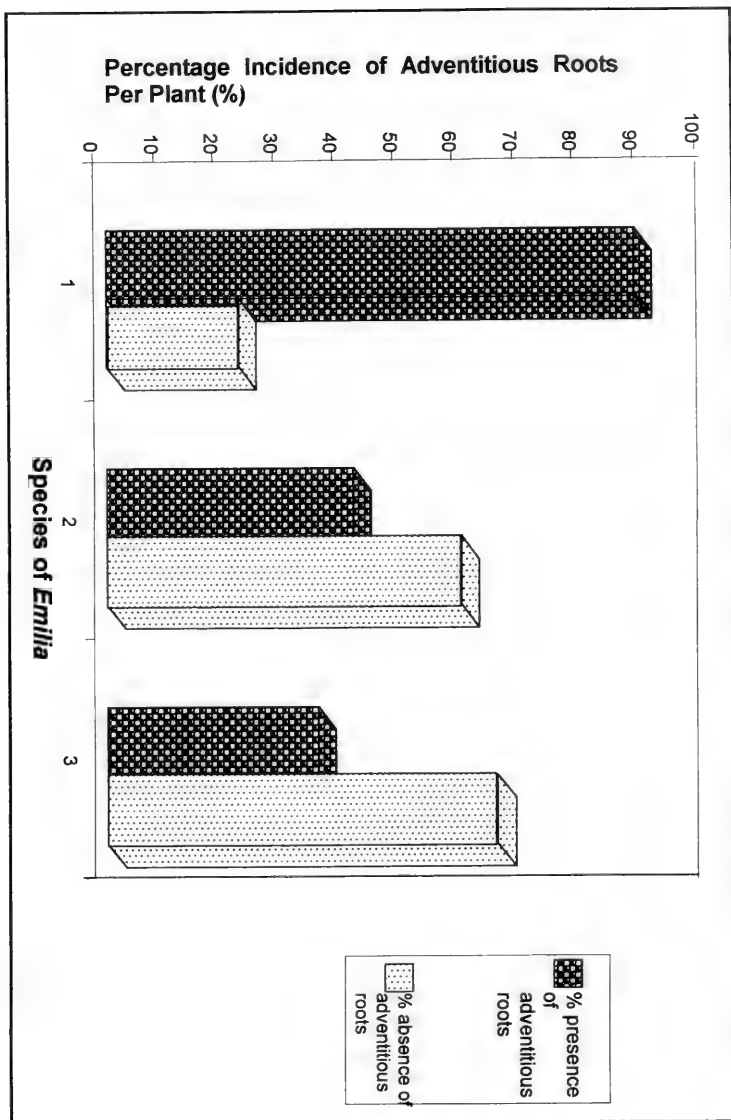


Fig. 3.

Incidence of adventitious roots per plant in the species of *Emilia*.

Key to species numerals:

1. *E. coccinea* 2. *E. praetermissa* 3. *E. sonchifolia*

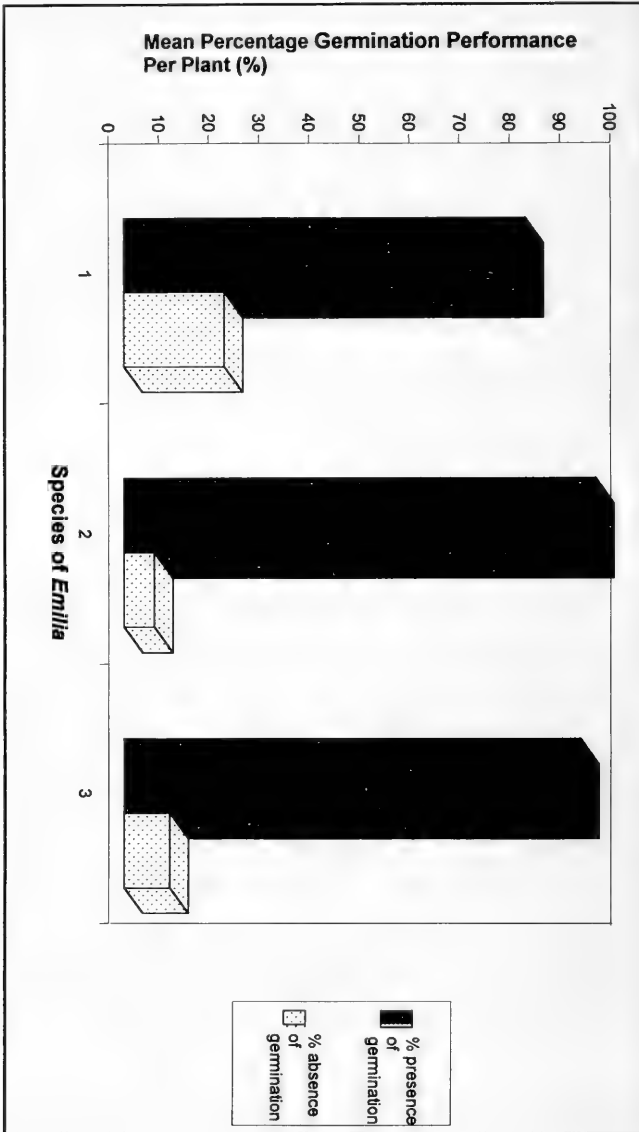


Fig. 4.

Mean percentage germination performance in the species of *Emilia*.

Key to species numerals:

1. *E. coccinea* 2. *E. praetermissa* 3. *E. sonchifolia*

The International Cichorieae Network

This letter is to inform you about a new project that will provide a web-distributed revision of the Compositae tribe Cichorieae (= Lactuceae). We would like to invite you, as an expert in this field, to participate in building a global network of Cichorieae specialists (tentatively called *The International Cichorieae Network*). This project is part of Work Package 6 (WP6), an important component of EDIT (European Distributed Institute of Taxonomy), a network of excellence funded by the European Union over the next four years (see background information attached).

Within WP6, we are planning to build a web revision of a core of the Cichorieae, and to set the ground for the remainder by providing the basic data as well as providing the structure for continuous expansion and updating. At the BGBM Berlin-Dahlem we have been starting with the subtribes Crepidinae (c. 440 species, microspecies excluded) and Lactucinae (c. 230 species), while *Scorzonera* s.l. of the Scorzonerinae (c. 175 species) is co-centred in Bratislava (Slovakia) with the working group of KAROL MARHOLD. The first results of this project will be available shortly, once the extant taxonomic data sets have been fully integrated (e.g. the taxonomic backbone and distribution data for Europe and the Mediterranean from the Euro+Med Plantbase) and expanded.

We invite you to participate in building *The International Cichorieae Network*:

- By treating taxa of whatever rank in the web based taxonomic revision of the Cichorieae, worldwide or on a national or regional scale.
- By providing data (e.g., phylogenetic, distributional, matters regarding typification) and documentation (e.g., illustrations, photos) that will be included in the above mentioned treatments.
- By building co-operative structures for the treatment of further subtribes or entities (e.g., *Hieracium* and *Taraxacum*).
- By giving bibliographical, nomenclatural and taxonomic advice, or acting as a referee for contributions to the web revision.
- By testing tools for the working platform on the web.

This project is meant to initiate the building of a large network of researchers working on Cichorieae. The project also aims to collect distributed data and to display them on the web. Beyond that, it is intended to contribute to a fundamental change and improvement of the way taxonomic research is done worldwide. *The International Cichorieae Network* will make full use of the advantages that the web provides for taxonomists as well as for the public. The revisionary web platform will make the taxonomic work process more efficient by enabling the taxonomist to access scattered data from protologues and type images to phylogenetic, cytological, palynological

and molecular data (to name only a few). The web platform will also benefit those without easy access to libraries and herbaria within larger institutions. As part of the working platform, a community tool (currently under construction) will facilitate communication and data exchange within the network.

We would be delighted to welcome your participation at any stage of the project. If you are interested in any kind of co-operation, please do not hesitate to contact us and specify your interest. If you, for the time being, would appreciate just to be kept informed about the progress of the Cichorieae Group's work, please inform us correspondingly.

Please find the preliminary concept of the web revision below, as well as a reference to the background of the EDIT project for further detailed information. We will be happy to answer any further questions you might have concerning the project.

Please feel free to forward this information to any of your colleagues who might be interested in this project.

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Preliminary concept for the web revision of the Compositae tribe Cichorieae

By initiating *The International Cichorieae Network* and providing a web revision platform for its participants, we want to encourage taxonomic specialists to present their different groups on ONE cyber platform. This will also allow for a combination of different types of data and characters, compiled by different methodological specialists, i.e. micromorphology, anatomy, cytology, phytochemistry, phylogeny, chorology, typification, nomenclature, etc. Setting links to already existing databases are as welcome as the contribution of new data. It is also envisaged to produce an anthology of descriptive terms to optimize communication.

We consider the following elements to be most important for the user interface, which is the Open Access web site presenting the results to the taxonomic community as well as to the general public.

(1) *Taxa list and synonymies*. – This will comprise:

- names of accepted taxa, full bibliographical citations, type information;
- a full list of synonyms;
- links to images of protologues and type illustrations;
- data on infrageneric classifications;
- data on hybrids and cultivars.

(2) *Descriptions.* – This involves:

- choosing a detailed (macro)morphological taxon description as basis, developing a standard description scheme for characters (applicable to the Cichorieae) and the grammatical structure of the character descriptions;
- information on the variability of taxa;
- harmonization of terminology;
- developing an antology of descriptive terms by building a defined and illustrated glossary integrating alternative terms.

(3) *References.*

- all data will be comprehensive and referenced; allowing for the generation of full bibliographies for individual taxa.

(4) *Identification keys.*

- Implementation of illustrated multi-access keys.

(5) *Additional data.*

- micromorphology, anatomy;
- palynology (links to databases);
- cytology (links to databases);
- phytochemistry;
- phylogeny (links to, e.g., Tree Base);
- links to DNA sequence data (EMBL/GenBank accessions);
- specimen specific DNA data;
- chorology with occurrence and status information (preferably by maps),
- ecology;
- use and conservation (at least IUCN status);
- etymology and indigenous names (Unicode);
- illustrations (habit, details of flower heads, flowers, achenes [REM], photograph of one characteristic herbarium specimen as minimum standard).

Background

On 1 March 2006 the **E**uropean **D**istributed **I**nstitute of **T**axonomy (EDIT) has been launched. EDIT is a European Union funded so-called "Network of Excellence".

Further basic information on EDIT and on its Work Package 6 is available on the homepage at <http://www.e-taxonomy.eu/index.php>.

New taxa and combinations published in this issue

Nesampelos B. NORD., gen. nov.: p. 38

Nesampelos alainii (J. JIMÉNEZ ALM.) B. NORD., comb. nov.: p. 39

Nesampelos hotteana (URB. & EKM.) B. NORD., comb. nov.: p. 38

Nesampelos lucens (POIR.) B. NORD., comb. nov.: p. 38

New York Botanical Garden Library



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