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CURRENT RESEARCH ON ASTERACEAE PHYLOGENY AND CLASSIFICATION

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We take the opportunity to use the Compositae Newsletter for informing about some recent references to Asteraceae phylogeny and classification, based on morphological and chloroplast DNA data.

Phylogeny

New data on morphology and *rbc*L sequences are given in Karis et al. (1992) and Kim et al. (1992). It appears that these data are in conflict with respect to the status of the subfamily Cichorioideae. Karis et al. (1992) maintain that the Cichorioideae are paraphyletic. Kim et al. (1992) suggest that the Cichorioideae are monophyletic, in agreement with Jansen et al. (1990, 1991). These and other issues on tribal interrelationships are reviewed in detail in a joint paper from our two research groups (Bremer et al., 1992).

Classification

Since the sister group relationship between the former Mutisieae-Barnadesiinae and the rest of the family now has been firmly established, a new subfamily, the Barnadesioideae, has been described by Bremer and Jansen (1992). Bremer et al. (1992) listed the following three subfamilies and 17 tribes:

Barnadesioideae	Asteroideae
Barnadesieae	Inuleae
	Astereae
Cichorioideae	Anthemideae
	Senecioneae
Mutisieae	Calenduleae
Cardueae	Helenieae
Lactuceae	Coreopsideae
Vernonieae	Tageteae
Liabeae	Heliantheae
Arctoteae	Eupatorieae

It should be noted that tribal circumscription is uncertain in several cases, e. g. for Mutisieae, Arctoteae, Inuleae, and Helenieae. There are a number of other tribes proposed, yet with support only from one of our two data sources, either from morphological or from molecular data. These tentative tribes are the Tarchonantheae (Keeley and Jansen, 1991), Eremothamneae (Karis, 1992), Gnaphalieae (Anderberg, 1991a), and Plucheeae (Anderberg, 1991b).

Future work

Karis is currently undertaking a morphological analysis of the Asteroideae. He is sampling several genera from all tribes, attempting a cladistic analysis of Asteroideae tribal interrelationships comparable to that of Karis et al. (1992) for the Cichorioideae. Awaiting Karis's and other results, Bremer is planning a revised cladistic classification of the entire family comprising also the subtribal level. Jansen is expanding restriction site comparisons to include more enzymes and genera from throughout the family in order to further explore the status of the Cichorioideae, as well as to resolve relationships among the tribes. Sequence comparisons by Jansen and Kim are being expanded to include additional chloroplast encoded genes. We shall return to these issues at the International Botanical Congress in Tokyo 1993 and the International Compositae Conference at Kew 1994, and hope that our current studies will continue to make the Asteraceae a model case for comparison of morphological and molecular data in phylogenetic reconstruction and systematics.

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NOMENCLATURAL NOTES ON SOME COMPOSITAE OF THE MEDITERRANEAN AREA

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Going on with researches that have been begun some time ago (Soldano, 1986, 1991), I have ascertained that the names of some Compositae growing in the Mediterranean Region are illegitimate because, in most cases, there are previous valid homonyms, belonging to distinct species [Art. 64.1 of the Code of Nomenclature (Greuter et al., 1988)], or they are superfluous (Art. 63.1). Replaced synonyms are indicated or, if lacking, new names are established. In other cases I have emphasized that some combinations were published earlier than stated in standard floras or the authorship is incorrectly reported.

Abbreviations: FE = Flora Europaea (Tutin et al., 1976; FI = Flora d'Italia (Pignatti, 1982); FT = Flora of Turkey (Davis, 1975).

Name changes

Aster cinereus Korsh., Mém. Acad. Imp. Sci. St. Pétersb., ser. VIII, 7: 205 (1898).

= *A. oleifolius* (Lam.) Wagenitz, Bot. Jahrb., 83: 329 (1964), non O. E. Kuntze, Rev. Gen. Pl., 2: 315 (1891).

Reference: FE, 4: 116.

The equality *A. cinereus/oleifolius* has been verified by Wagenitz (loc.cit.). This species occurs in Hungary, Romania, Bulgaria and USSR.

Centaurea oltensis Sosn., Not. Bot. Tiflis, 21: 60 (1959).

= *C. sessilis* Willd., Sp. Pl., 3(3): 2300 (1803), non J.F. Gmelin, Syst. Nat., ed. XIII, 1267 (1792).

Ref.: FT, 5: 519.

The equality *C. sessilis/oltensis* has been verified by Wagenitz in the cited reference.

Cirsium isophyllum (Petrak) Grossh., Fl. Cauc.; 4: 181 (1934).

≡ *C. horridum* subsp. *isophyllum* Petrak, Izv. Kauk. Mus., 8: 49 (1914).

≡ *C. tomentosum* C.A. Meyer, Verz. Pfl. Cauc., 69 (1831), non Moench, Meth. Suppl., 227 (1802).

Ref.: FT, 5: 390.

In providing the synonymy I have followed Charadze's (1963) treatment, as the Flora of Turkey did. It is to be emphasized that Grossheim considered *C. isophyllum* distinct from "*C. tomentosum*". It is a species growing from the Caucasian region to North-Iran.

Cirsium penicillatum C. Koch, Linnaea, 17: 41 (1843).

= *C. lappaceum* (Bieb.) Fischer, Cat. Jard. Gorenki, ed. 2, 35 (1812), non Lam., Fl. Fr., 2: 24 (1779).

= *Carduus lappaceus* Bieb., Beschreib. Land. Casp. Meer, 193 (1800).

Ref.: FT, 5: 390-392.

The synonymy *C. penicillatum*/"*C. lappaceum*" is generally accepted (Charadze, 1963; Index kewensis; Boissier, 1875, etc.) as the author's statements (Koch, 1851, sub *Epitrachys penicillata*) that his species differs from "*C. lappaceum*" by the large, little divided and cordate leaves and by the reflexed involucral bracts, are not effective, and those characters belong in the variation range of the taxon. Unfortunately, the type, for a definitive decision, seems no longer extant. Edmondson and Lack (1977) did not find it at Berlin (B), nor did I at G, where, with LE and W, may exist Koch types.

The following new subspecific combinations are necessary:

- *C. penicillatum* subsp. *anatolicum* (Petrak) Soldano, comb. nova

≡ *C. lappaceum* subsp. *anatolicum* Petrak, Trudy Tiflissk. Bot. Sada, 12 (1): 12 (1912).

It is a taxon present from the Caucasus to North-West Iran.

- *Cirsium penicillatum* subsp. *tenuilobum* (C. Koch) Soldano, comb. nova.

≡ *C. lappaceum* subsp. *tenuilobum* (C. Koch) Davis et Parris, Notes Roy. Bot. Gard. Edinb., 33: 430 (1975).

≡ *Eriolepis tenuiloba* C. Koch, Linnaea, 24: 400 (1851).

It is a taxon limited to inner Turkey.

- *Cirsium penicillatum* subsp. *hermonis* (Boiss.) Soldano, comb. nova.

≡ *C. lappaceum* subsp. *hermonis* (Boiss.) Petrak, Trudy Tiflissk. Bot Sada, 12(1): 17 (1912).

≡ *C. hermonis* Boiss., Diagn., ser. II, 3: 40 (1853).

This subspecies is confined to the Lebanon.

Leucanthemum virgatum (Desr.) Clos, Bull. Soc. Bot. France, 17: 185 (1870).

≡ *Matricaria virgata* Desr. in Lam., Encycl. Méth. Bot., 3: 737 (1792).

= *Chrysanthemum discoideum* All., Fl. Ped., 2: 190 (1785), tab. 11, fig. 1.

= *Cotula grandis* sensu Jacq., Observ. Bot., 4: 4 (1771), tab. 81, non L., Sp. Pl., ed. 2, 1257 (1763).

Ref.: FE, 4: 177; FI, 3: 908.

The above mentioned floras use the combination *Leucanthemum discoideum* (All.) Coste, Fl. Fr., 2: 340 (1903), but the Allioni basionym is illegitimate (superfluous), because the Italian botanist cites *Cotula grandis* L., no matter if this is a distinct species [*Plagius grandis* (L.) Alavi et Heywood]. The first who recognized the specific distinction between the two taxa was Desroussoux (loc. cit.), whose epithet must be kept.

It is to emphasize that Coste's combination, in *Leucanthemum*, is later than Lacaita's, in Nyman, Consp., Suppl., 2 (2): 367 (1890). *L. virgatum* is endemic of South-West Alps.

Senecio blanchei Soldano, nom. nov.

≡ *S. exilis* Blanche ex Boiss., Fl. Or. Suppl., 302 (1888), non Hombr. et Jacquem., Voy. Pole Sud, tab. 13, fig. c (1846) [n.v.] et Remy in Gay, Fl. Chilena, 4: 143 (1849).

Ref.: Mouterde (1983).

This is an endemic species of Lebanon and Syria.

Senecio bulghardaghensis Soldano, nom. nov.

≡ *S. farfarifolius* Boiss. et Kotschy, Fl. Or., 3: 400 (1875), non Maxim., Bull. Acad. Imp. Sci. St. Pétersb., 19: 483 (1874) nec Sch. Bip. ex Koch et Fint, Wochenschr., 1: 212 (1858) [n.v.].

Ref.: FT, 5: 155.

The new epithet concerns the locus classicus, the Bulghar Dag mountain, of this endemite of Central-Southern Turkey.

Bibliographical statements

Achillea multifida (DC.) Griseb., Spicil., 2: 212 (1844) emend.

≡ *Ptarmica multifida* DC., Prodr., 7: 295 (1838).

Ref.: FT, 5: 229.

For this endemite of the Ulug Dag, the classical Olympus of Bithynia, the last literature reports Boissier, Fl. Or., 3: 277 (1875), as the author of the generic combination. The Index kewensis correctly quotes the earlier Schultz Bipontinus (1855) combination, but we must advance to the Grisebach one. Grisebach records de Candolle's basionym but includes - listing the iconography - the earlier (1829) *Ptarmica abrotanoides* Vis., a distinct species; also the inclusion of *Ptarmica scardica* Griseb. is erroneous. According to the Code of Nomenclature (Greuter et al., 1988) Grisebach's combination would be illegitimate, as he should have reported it as *Achillea abrotanoides*, but, using Art. 63.3 (ex. 10), it is possible - with emendation - to re-establish the validity of *A. multifida*, as its basionym is legitimate.

Centaurea solstitialis L. subsp. *schouwii* (DC.) Gugler, Centaur. Ung. Nationalmus., 203 (1907).

≡ *C. schouwii* DC., Prodr., 6: 593 (1838).

Ref.: FE, 4: 284; FI, 3: 209.

The above mentioned floras attribute the subspecific combination to Dostal, Bot. Journ. Linn. Soc., 71: 204 (1976). This taxon grows in Sicily and Sardinia.

Centaurea thracica (Janka) Gugler, op. cit., 201 (1907).

≡ *Serratula thracica* Janka, Österr. Bot. Zeitschr., 22: 178 (1872).

Ref.: FE, 4: 270; FT, 5: 537.

The works in reference have the later combination, Hayek in Stoj. et Stefanov, Fl. Bulg., 1194 (1925). This species occurs from Greece to Turkey.

Cirsium italicum DC., Cat. Pl. Horti Monsp., 96 (1813).

Ref.: FE, 4: 238; FI, 3: 155; FT, 5: 396.

The above mentioned floras give the authorship of the name as "(Savi) DC.", that is they attribute the basionym to Gaetano Savi; but the Italian botanist is only the author of a later combination in *Carduus*: *C. italicus*. Almost certainly, however, Savi was the first who recognized the autonomy of this species; on a label attached to a sample in the de Candolle herbarium (G!) he writes (in French): "*Cnicus* ...very common around Pisa; from much time I have tried a name for it but I have never found a description that agrees with it. I think therefore, that it is a species till now undescribed; but I am waiting for your decision. Savi, 1810". Three years later de Candolle described *Cirsium italicum*. This species is present from south-central Italy to Turkey.

Helichrysum foetidum (L.) Moench, Meth., 575 (1794).

≡ *Gnaphalium foetidum* L., Sp. Pl., 851 (1753).

Ref.: FE, 4: 131.

For this South African species, naturalized in West Europe and on Madeira (Hansen and Sunding, 1985), some modern literature gives the later combination of Cassini, Dict. Sci. Nat., 25: 489 (1822).

Jurinea mollis (L.) DC. subsp. *moschata* (Ten.) Nyman, Consp., 415 (1879).

≡ *Carduus mollis* L. var. *moschatus* Ten., Fl. Nap., XLVIII (1812).

Ref.: FE, 4: 219; FI, 3: 167.

The above mentioned floras indicate de Candolle (DC.) as the author of the basionym; this is also reported by Nyman in his combination. But the same de Candolle, establishing the combination *Jurinea moschata*, Prodr., 6: 677 (1838), refers to Tenore's epithet, even if to a later one: *Serratula simplex* var. *moschata* (Tenore, 1830).

This species grows in the north-west part of Balkan Peninsula and on the Apennines.

Jurinea mollis (L.) DC. subsp. *transsilvanica* (Sprengel) Nyman, Consp. Suppl., 183 (1889).

≡ *Serratula transsilvanica* Sprengel, Syst. Nat., ed. XVI, 3: 388 (1826).

Ref.: FE, 4: 219.

For this taxon of central Romania, the work in reference has the combination of Hayek, Prodr. Fl. Penins. Balcan., 7: 701 (1931).

Scorzonera cana (C.A. Meyer) Griseb., Spicil. Fl. Rum., Addit., 2: 546 (1844).

≡ *Podospermum canum* C.A. Meyer, Verz. Pfl. Cauc., 62 (1831).

Ref.: FE, 4: 318; FT, 5: 635.

The works in reference give the later combination of O. Hoffmann, in Engler et Prantl, Naturl. Pflanzenfam., 4(5): 365 (1897). This species is present in the central-eastern part of the European-Asiatic Mediterranean region.

Serratula erucifolia (L.) Druce, Rep. Bot. Exch. Cl. Brit. Isles, 3(4): 424 (1913).

≡ *Centaurea erucifolia* L., Sp. Pl., 909 (1753).

Ref.: FE, 4: 252; FT, 5: 460.

The above mentioned floras report the Boriss, in Bobrov et Czeep., Fl. URSS, 28: 270 (1963), later combination. This taxon grows in the south part of URSS and in the Caucasian and Transcaspian regions.

Taraxacum montanum DC., Prodr., 7: 145 (1838).

≡ *Leontodon montanum* C.A. Meyer, Verz. Pfl. Cauc., 58 (1831), non Lam., Fl. Fr., 3: 640 (1779).

Ref.: FT, 5: 797.

The last authorship for this taxon, (C.A. Meyer) DC., must be changed - according to Art. 72 (ex.2) of the Code of Nomenclature - owing to Lamarck's earlier combination in *Leontodon*. This species is present in the Caucasian region and also in Iraq, Iran and Transcaspia.

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CHROMOSOME NUMBERS IN SOME NIGERIAN COMPOSITAE

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Abstract

Chromosome numbers of 49 species distributed in 28 genera of Compositae from Nigeria are reported.

Introduction

The Compositae family is represented in the flora of Nigeria by 288 species distributed in 84 genera (Gill, 1988). The family is somewhat neglected by cytotaxonomists and many species have not been examined cytologically. With this in mind a project "Cytological survey of the Nigerian Compositae" was undertaken by the senior author and earlier contributions in this series are Gill and Omoigui (1987, 1988). The present paper lists the chromosome numbers of 49 species distributed in 28 genera.

Material and Methods

Young flower buds were collected in the field and fixed in 1:3 acetic-alcohol solution for 24 hrs, then transferred into 70 % ethyl alcohol and stored under refrigeration until they could be examined. The anthers were squashed and stained in 2 % acetocarmine solution. The haploid chromosome numbers were determined from temporary slides. At least 15-20 well spread metaphase 1 and anaphase 1 plates were examined to confirm the chromosome number of each taxon. Voucher specimens of all the collections examined are kept at the University of Benin, Department of Botany Herbarium, Benin City, Nigeria. A duplicate set of

the voucher specimens has been deposited at FHI. The results obtained during the present study are summarized in Table 1 and the arrangement of taxa in Table 1 is alphabetical.

Results

Table 1. Chromosome Numbers in some Nigerian Compositae

	Taxon	Haploid Chromo-some Number	Source and Voucher
1.	*Anisopappus africanus* (Hook.f.) Oliv.	14	Bauchi Rd., Jos, Omoigui 097
2.	*A. dalzielii* Hutch.	14	Obudu Ranch, Omoigui 098
3.	*Aspelia helianthoides* (Schum. & Thonn.) Oliv. & Hiern	14	Igbetti, Omoigui 111
4.	*Blumea aurita* var. *foliolosa* (DC.) Adams	11	Kano, Omoigui 123
5.	*Centaurea nigerica* Hutch.	10	Oyo-Ugbetti, Omoigui 133
6.	*C. perrottetii* DC.	10	Kano, Omoigui 170
7.	*Ceruana pratenis* Forssk.	16	Kaduna, Omoigui 168
8.	*Chromolaena odorata* (L.) King & Robinson	30	Jos, Omoigui 136
9.	*Coreopsis asperata.* Hutch. & Dalz.	14	Jos, Omoigui 128
10.	*C. barteri* Oliv. & Hiern	14	Vom; near Jos, Omoigui 093
11.	*C. camporum* Hutch.	14	Jos, Omoigui 119
12.	*Crassocephalum mannii* (Hook.f.) Milne-Redhead	10	Obudu Ranch, Omoigui 151
13.	*Eupatorium africanum* Oliv. & Hiern	15	Obudu Ranch, Omoigui 023
14.	*Felicia homochroma* S. Moore	9	Jos, Omoigui 166

15.	*Guizotia scabra* (Vis.) Chiov.	15	Jos. Omoigui 122
16.	*G. abyssinica* (L.f.) Cass.	15	Jos, Omoigui 169
17.	*Gutenbergia nigritana* (Bth.) Oliv. & Hiern	10	Jos, Omoigui 074
18.	*Helichrysum albiflorum* Moeser	7	Obudu Ranch, Omoigui 175
19.	*H. antunesii* var. *latifolium* C.D. Adams	7	Gembu, Omoigui 167
20.	*H. mechowianum* Klatt	7	Obudu Ranch, Omoigui 177
21.	*Inula klingii* O. Hoffm.	10	Jos, Omoigui 096
22.	*I. subscaposa* S. Moore	10	Gembu, Omoigui 172
23.	*Lactuca capensis* Thunb.	8	Jos, Omoigui 024
24.	*Laggera alata* (D.Don) Sch. Bip.	10	Obudu Ranch, Omoigui 067
25.	*Launaea nudicaulis* (L.) Hook. f.	9	Obudu Ranch, Omoigui 115
26.	*Melanthera elliptica* O. Hoffm.	16	Jos, Omoigui 116
27.	*Mollera angolensis* O. Hoffm.	9	Jos, Omoigui 124
28.	*Picris humilis* DC.	5	Vom; near Jos, Omoigui 85
29.	*Porphyrostemma chevalieri* (O. Hoffm.) Hutch. & Dalz.	11	Bauchi, Omoigui 088
30.	*Pulicaria crispa* (Forssk.) Oliv.	10	Bauchi, Omoigui 141
31.	*Senecio abyssinicus* Sch. Bip. ex A.Rich.	5	Kaura Falls, Omoigui 120
32.	*S. baberka* Hutch.	5	Jos, Omoigui 138
33.	*S. hochstetteri* Sch. Bip. ex A. Rich.	5	Jos, Omoigui 152
34.	*S. lelyi* Hutch.	5	Jos, Omoigui 117
35.	*Sonchus elliotianus* Hiern	9	Obudu Ranch, Omoigui 164
36.	*S. oleraceus* L.	16	Jos, Omoigui 112

37.	*S. schweinfurthii* Oliv. &Hiern	9	Gembu, Omoigui 190
38.	*Sphaeranthus flexuosus* O. Hoffm.	10	Bauchi, Omoigui 081
39.	*S. senegalensis* DC.	10	Zaria, Omoigui 171
40.	*Synedrella nodiflora* Gaertn.	19	Benin City, Omoigui 103
41.	*Vernonia ambigua* Kotschy & Peyr.	11	Jos, Omoigui 129
42.	*V. biafrae* Oliv. & Hiern	9	Obudu Ranch, Omoigui 102
43.	*V. guineensis* var. *cameroonica* (O.Hoffm.) C.D. Adams	9	Obudu Ranch, Omoigui 108
44.	*V. macrocyanus* O. Hoffm.	11	Zaria, Omoigui 116
45.	*V. nestor* S. Moore	9	Obudi, Omoigui 131
46.	*V. saussureoides* Hutch.	9	Kaura Falls, Omoigui 092
47.	*V. stenostegia* (Stapf) Hutch.	9, 11	Jos, Omoigui 087
48.	*V. smithiana* Less.	10	Obudu Ranch, Omoigui 146
49.	*Vicoa leptoclada* (Webb) Dandy	10	Bauchi, Omoigui 086

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CHROMOLAENA ODORATA - A PROBLEMATIC WEED

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Background

Chromolaena odorata (L.) R. King & H. Robinson (Syn. *Eupatorium odoratum* L.) is a troublesome weed of open cultivated fields, roadsides and plantation crops such as oil-palm, rubber, coffee, cashew and cacao trees. Being tolerant to high soil acidity and aluminium saturation, it establishes before any other plant can do so on a cleared ground. Once established, it reduces soil loss through erosion, but this advantage is counteracted by the great difficulty of eradication particularly in low input agriculture (Eswaran, 1988). Basal clumps left after bush burning regenerate shoots quickly in the wet season (Liggit, 1983).

It also causes serious health hazards to livestock and human beings (Soerohaldoko, 1971; Sajise et al., 1972, 1974; Atterado and Talatala-Sanico, 1988), in parts of Bhutan, Nepal, China, Indonesia, Sri Lanka, Nigeria, Malaysia, India and the Mariana Islands. Its poisonous effect is due to exceptionally high level of nitrate concentration (5-6 times above the toxic level) in the leaves and young shoots; cattle feeding on these die of tissue anoxia (Sajise et al., 1974). Some plantation workers develop skin allergy from hand-weeding of *Chromolaena*, and dry stumps of the weed have caused poisonous wounds in the feet of some workers.

The large number of wind-borne cypselas of the species which are easily disseminated over a wide area carry a number of seed-borne fungi including *Fusarium culmorum, F. moniliforme, F. semisectum* and *F . solani* infecting 15-60 % of seed population; *Cladosporium herbarium* 22-79 %; many of these fungi have been reported as pathogens of food crops (Esuruoso, 1971). The weed is also reported as alternate host of the leaf spot, *Cercospora* sp., in Thailand (Puckdeedindan, 1966); and as alternate host plant for various aphid species, most of which are crop pests and vectors of plant pathogens (Napompeth et al., 1988). It also harbours some insects and mites which injure other crops in Asia (Muniappan and Marutani, 1988). In some areas it forms big bushes where wild animals that destroy agricultural crops can hide.

The *Chromolaena* plant contains, especially in leaves, a large amount of allelochemicals, thus the impoverished growth of suppressed plants in the nurseries and plantations may be partly allelopathic (Ambika and Jayachandra, 1980b, 1982).

Native of South and Central America, and now completely naturalized to humid tropical regions between latitude 30°N and S, it extends up to an altitude of about 1,000 m near the equator. It thrives in regions with acid soil and an annual precipitation of 200 cm and above, and a temperature range of 20 to 37°C. Thus it is widely distributed in West Africa from the coastal fringes of the rain forest to the Southern edge of Guinea savanna.

Description

A diffuse, rapidly growing, profusely branched, thicket-forming, perennial shrub up to 4 m high in the open, or up to 8 m high in the shade; with angular, robust, sparingly pubescent stems. Leaves opposite, often purple when young, blade triangular ovate, up to 12 cm long and 5 cm broad, pointed at the tip, conspicuously 3-nerved and with a coarsely toothed margin; stalk about 1 cm long, glabrous or sparingly pubescent, but always with glandular dots emitting a strong pungent smell. Inflorescence a many-flowered terminal corymb arising from the axil of upper leaves, composed of 10 – 20 cylindrical flower-heads about 1 cm long, 3 mm in diameter, with 5 – 6 rows of overlapping involucral bracts; florets all tubular, white or mauve pink, borne in pedunculate clusters. Cypselas slender, black ribbed, about 5 cm long, with pappus of white bristles of the same length.

The weed has an all purpose genotype, and it reproduces both sexually (by seeds) and asexually (vegetatively) from cut basal shoots and root stocks.

Control methods

Preventive, physical and cultural, chemical and biological control methods have been recommended and tried. Of these, physical and cultural methods seem to hold the greatest promise. Some workers (Gupta, 1949; Moni and George, 1959; Mohan Lal, 1960; Rajkhowa, 1966; Sheldrick, 1968; and Olaoye, 1977), recommend clearing, slashing, stumping, with subsequent use of the Cambridge roller, followed by either the establishment of a legume cover or the application of herbicides at low rate. Herbicides alone seem to be ineffective owing to phenomenal growth rate and rapid regeneration. The herbicides that have been tried (Olaoye, 1986) include 2,4-D (2,4-dichlorophenoxy acetic acid) at 7 kg/ha; 2,4,5-T (2,4,5-

trichlorophenoxy acetic acid) or a mixture of the above two at 5 – 6 kg/ha; atrazine (2-chloro-4-ethyl amino-6-isopropyl-amine-1,3,5-triazine) and diuron (3-(3,4-dichlorophenyl)-1,1-dimethylurea) at 4.5–5.6 kg/ha; commercial mixture of 2,4-D amine and picloram (4-amino-3,5,6-trichloropicolinic acid) at low rate (best results when applied following fresh sprouting after slashing).

No herbicide has been recommended for long lasting control, although a formulated mixture of picloram or 2,4-D and 2,4,5-T has been used with varying degrees of success. The most effective control measure is clearing and stumping (Ivens, 1973).

It is recommended that early infestation be checked by uprooting as a preventive control method (Mohan Lal, 1960; Salgado, 1963; Sheldrick, 1968) but this is labour-intensive and uneconomical. Growth is checked by shade to variable extent and germination is enhanced by light but not dependent on it (Ambika and Jayachandra, 1980a). Burning appears to stimulate shoot regeneration from persisting stumps left in the soil.

No satisfactory biological control measure has been found although arctiid moth has been introduced to control the weed in Sabah province of Malaysia (Ooi et al., 1988).

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POLLEN MORPHOLOGICAL STUDIES IN *SENECIO* (COMPOSITAE-SENECIONEAE) FROM ETHIOPIA

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Abstract

The external morphology of pollen grains in eight species of *Senecio* from Ethiopia was investigated using LM and SEM. They are radially symmetrical, isopolar, subprolate or spheroidal. The shrubby species have relatively larger grains than the herbaceous ones.

Key words: External morphology, Pollen, *Senecio*, Ethiopia.

Introduction

The first detailed studies of the external morphology of pollen walls in Compositae were conducted by Wodehouse in 1926-35 (several works, cited in Skvarla and Turner 1966a). By employing ultraviolet microscopy on sectioned pollen, Stix in 1960 (cited in Skvarla and Turner 1966a) subsequently described for the first time the internal morphology of pollen wall in Compositae. From her investigations, she "...recognized 42 pollen types in Compositae." Skvarla and Turner (1966a) in their studies of Compositae pollen wall morphology using electron microscopy, recognized three ultrastructural pollen wall patterns in the tribe Senecioneae, viz., i) the Helianthoid pattern; ii) the Senecioid pattern, which they noted was similar to the Helianthoid but differed in lacking internal foramina; and iii) a pattern similar to that found in Anthemideae and which they tentatively considered as the "Anthemoid-like" pattern.

Out of the six *Senecio* species that they observed, five had the Senecioid pattern and *Senecio glabellus* had the Helianthoid pattern. In a later study, Skvarla and Turner (1966b) made a comparison of pollen wall ultrastructure in *Blennosperma* (Heleniea) and *Crocidium* (Senecioneae). They described the pollen in the

two genera as being "...triangular in polar view, tricolporate with numerous spines...", concluded that the two genera are closely related, and again noted the occurrence of both the Helianthoid and Senecioid pollen types in *Senecio*. Skvarla et al. (1977) once more observed that most species in *Senecio* had the Senecioid pollen pattern. *Senecio heritieri* was, however, found to be "...decidedly Helianthoid", but this species is now accomodated in a different genus, as *Pericallis lanata* (Nordenstam 1978).

Material and Methods

Light microscopic studies were undertaken using pollen prepared at the Palynological Laboratory at the Swedish Museum of Natural History in Stockholm, Sweden. Duplicates are kept at the National Herbarium, Ethiopia. A BHB Olympus microscope with a magnification of up to x 1000 was used to study the pollen external morphology. Photographs were taken using a Carl Zeiss D-7082 Oberkochen Axio-photomicroscope with a microscope illuminator (100 Hal) and a lamp exchange (100 Hal and HB050) and a magnification of up to x 100. Measurements of the equatorial diameter, polar axis and spine length were made on 25 grains per specimen.

Scanning electron microscopic studies were done using pollen grains obtained from herbarium specimens, which were then acetolyzed following the methods outlined in Erdtman (1969). The acetolyzed pollen grains were then mounted on brass stubs to which a double sided adhesive tape was attached. A JEOL fine coat ion sputter (JFC-100) operated at 1 Kv was employed to coat the pollen grains with gold. The grains were subsequently examined and photographed using a JEOL (JSM-T100) scanning electron microscope operated at 15 Kv at the National Museums of Kenya-East African Herbarium.

The equatorial diameter and polar axis measurements for *S. mesogrammoides, S. steudelii,* and *S. fresenii* were made from scanning micrographs using the scale WD = 10 mm where WD is the working distance at a displayed magnification of 3500 and measured D values (where D is the distance from one end of the scale to the beginning of the next on the micrograph) of 44 mm for *S. mesogrammoides*, 46 mm for *S. steudelii* and 43 mm for *S. fresenii*.

Example: WD at x 3500 for *S. mesogrammoides* = 10 mm
D at x 3500 for *S. mesogrammoides* = 44 mm
Magnification of pollen of *S. mesogrammoides* =

$$\frac{44 \text{ mm} \times 10^3}{10 \text{ mm}} = 4400$$

$$E = \frac{104 \text{ mm} \times 10^3}{4400} \ \mu\text{m/mm} = 23{,}1 \ \mu\text{m}$$

Results and Discussion

Size

The size of the pollen grains ranges from 22 x 23 µm, as in *Senecio inornatus*, to 27 x 28 µm, as in *Senecio farinaceus*. In species examined under LM, the pollen size was found to be more or less constant within each species. The shrubby *Senecio* species tend to have relatively larger grains than the herbaceous ones (see Table 1). However, *Senecio schultzii*, a herbaceous species, has pollen that is about equal to those of the shrubby forms.

Table 1. Summary of some pollen morphological features in *Senecio*. The values, except those shown with asterisks, are means followed by variation ranges in parenthesis. Values shown with asterisks have been calculated from scanning micrographs. VS: Voucher specimen, E: Equatorial diameter (µm), PA: Polar axis (µm), SL: Spine length (µm), H: Herb, S: Shrub.

Taxon	VS	E	PA	SL
S. unionis (H)	4	22,5(19-24)	23(21-25)	3.2(3-4)
S. inornatus (H)	5	22(19-23)	23(19-26)	2.2(1-3)
S. schultzii (H)	6	26(24-28)	26(26-28)	3.0(2-4)
S. schultzii var. A (H)	7	26(24-28)	27(25-29)	2.6(2-4)
S. farinaceus (S)	8	27(25-30)	28(26-30)	3.8(3-4)
S. mesogrammoides (H)	1	c. 23.1*	c.24.0*	-
S. steudelii (H)	2	c. 21.5*	c.24.3*	-
S. fresenii (S)	3	c.26.7*	c.27.4*	-

Source: Otieno (1990).

Voucher specimens. 1: Mooney 7941, Shewa (ETH). 2: Mesfin & Kagnew 2056, Shewa (ETH). 3: Anderberg 1705, Bale (ETH). 4: Ash 3535, Bale (ETH). 5: Mesfin & Kagnew 2442, Illubabor (ETH). 6: Hedberg 4214, Galamma mts. (UPS). 7: Mooney 8332, Bale (ETH). 8: Evans & Hiller 324, Gojjam (K).

Shape
The pollen grains in the eight *Senecio* species investigated were found to be radially symmetrical, isopolar, subprolate or spheroidal (Figs. 1, 2 and 3). The ratio of P (length of polar axis) to E (equatorial diameter) is 1-1.5.

Apertures
The pollen grains in Compositae are usually described as tricolporate with lalongate ora (Mesfin 1984:28). In the investigated species of *Senecio*, the pollen grains were also found to be tricolporate with colpi having lalongate ora (Figs. 1, 2 and 3).

Spines
The spines are conical, broadened at the base and usually sharp at apex (Figs. 1, 2 and 3). In *S. inornatus* and *S. schultzii* the grains are spinulose. The length varies between 2.2 and 3.8 µm; the smallest being recorded in *S. inornatus*. The spine bases are either perforate (Figs. 2 and 3) or nonperforate (Fig. 1). In those that are perforate, the largest perforations tend to be located away from the extreme base of the spines.

Acknowledgements

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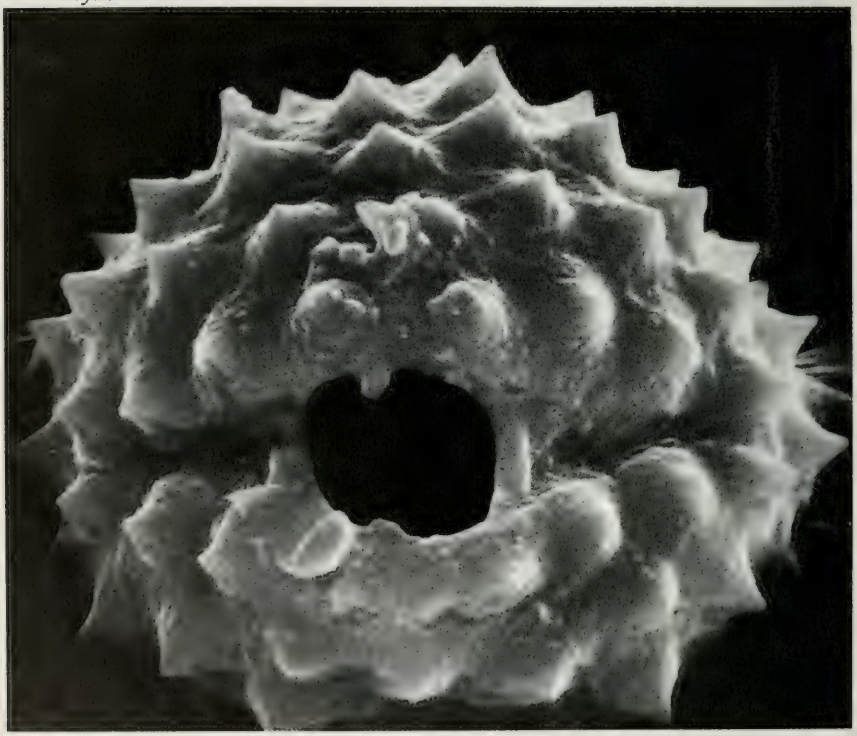

Fig. 1. Scanning electron micrograph of a pollen grain of *S. steudelii* showing colpus with lalongate ora, short spines without perforations at the base, and subprolate pollen. Magnification x 3500.

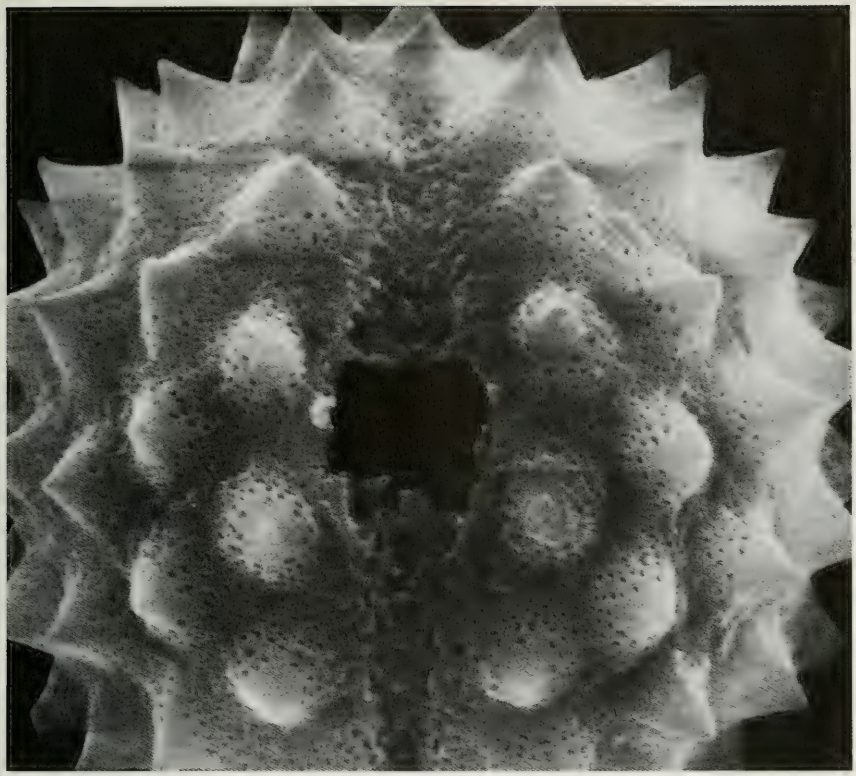

Fig 2. Scanning electron micrograph of a pollen grain of *S. fresenii* showing equatorial view, colpus with lalongate ora, perforations at spine bases, and spheroidal pollen. Magnification x 3500.

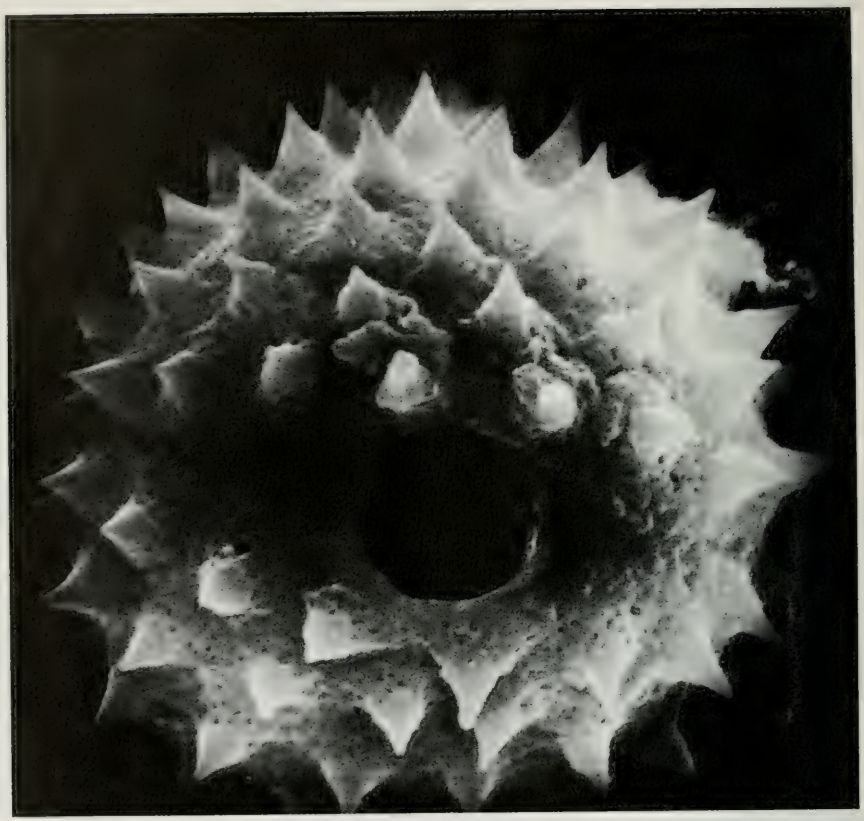

Fig 3. Scanning electron micrograph of a pollen grain of *S. mesogrammoides* showing colpi with lalongate ora, perforate spine base, and spheroidal pollen. Magnification x 3500.

ARE *URSINIA* SPECIES WITH MISSING RAY FLORETS AND EXAGGERATED INVOLUCRAL BRACTS MIMICKING BEETLES?

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Hutchinson (1946) suggested that the dark marks on *Gorteria diffusa* ray florets mimicked beetles. Because of these marks this species is known as a "beetle-daisy". The beetles involved are known as "monkey-beetles" (*Hopliinae*), a largely South African subfamily. These beetles are often found head-first in the inflorescences of Cape Asteraceae, especially the annuals. Some other Asteraceae species (e.g. *Gazania* and *Ursinia* spp.) also have dark markings on their ray florets or even dark disc florets which also may be mimicking these beetles.

However, some species of *Ursinia* appear to be approaching beetle mimicry from a different angle. In these species some of the ray florets have been lost and large, dark involucral bracts protrude through the gaps they have left. These bracts are iridescent and in the field look very much like insects on the edge of the disc (see Fig. 1).

In *Ursinia* the ray florets are sterile so the loss of these florets is not accompanied by a direct loss of reproductive output. The typical bract in *Ursinia* is a white smallish papery bract whereas the beetle *Ursinias* have large, black and stiff involucral bracts. Interestingly, the "beetle *Ursinias*" also seem to close their inflorescences at mid-day whereas other *Ursinias* mostly close in the evening or under dull condition (e.g. Stirton 1983). Research needs to be done into the reasons for midday closure and for the floral modifications of these particular *Ursinia* species.

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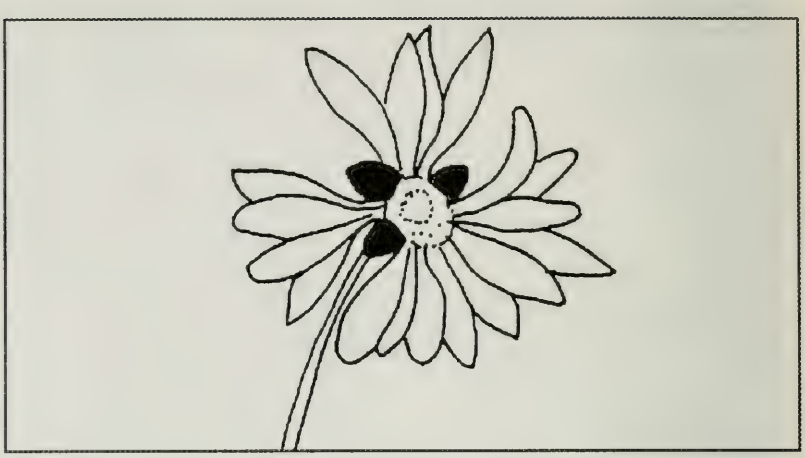

Fig 1. An *Ursinia* species (close to *U. paleacea*) showing loss of peripheral florets and expanded dark involucral bracts. Numbers of florets and bracts vary tremendously within and between individuals. The bracts are shiny and when fully erect they appear to mimic "monkey-beetles".

FERDINAND BOHLMANN (1921-1991) IN MEMORIAM

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Ferdinand Bohlmann was born on August 28, 1921, in Oldenburg near Bremen. He began his university studies in 1939 in Göttingen, but had to interrupt them because of military service, where he was severely wounded. In spite of this he managed to finish his doctorate under the guidance of his academical teacher K. Dimroth in 1946 with a dissertation on solvatochromy of the pyridin series. Also in 1946 he joined H.H. Inhoffen in Marburg; in 1947 both moved to the Technische Hochschule in Braunschweig. Bohlmann's work on the relationship between structure and light absorption led to the *venia legendi*: he became a lecturer in 1952.

While he was in Braunschweig, Bohlmann also started his research into naturally occurring acetylene compounds as well as pioneering work on the total synthesis of lupine alkaloids. Both fields of research proved to be important and yielded a rich and stimulating harvest for the chemistry of natural compounds and for organic chemistry in general. In his work on polyacetylene compounds Bohlmann demonstrated in a masterly manner how to detect, isolate, reliably characterize, and finally how to synthesize substances, that are unstable and extremely reactive. The mild but efficient techniques of separation combined with highly sensitive analytical and spectroscopic methods led to the discovery of several most remarkable types of structure.

During his work on the synthesis of lupine alkaloids Bohlmann's main interest was focussed on stereochemistry, with particular attention to the relative configuration of intermediates. He was a pioneer in the consistent application of spectroscopic techniques for the rapid and reliable assignment of configurations. Indeed he made himself a name (in the true sense of the word) with the "Bohlmann absorption bands" indicating the trans-quinolizidin configuration. National and international recognition followed with prizes and grants, and in 1958 Bohlmann was appointed to the chair of organic chemistry in the Technical University of Berlin as the successor to F. Weygand.

In Berlin Bohlmann enlarged his fields of research and paid much attention to the acquisition of modern and efficient equipment. This resulted in state-of-the-art instrumentation concerning nuclear resonance and mass spectroscopy. Continuous

renewal and improvement in the following years and decades made Bohlmann's institute an attractive place for many foreign visiting researchers because of optimal working conditions.

With the same energy and dedication Bohlmann addressed the questions of improvement and modernization of the practical courses for students. Always questioning and reexamining current practice he emphasized the discussion of all parties involved. In the beginning of the seventies, a wave of ideologically tinged reforms and endless tiring, anaemic, and futile discussions of irrelevant organisational detail prevailed. At that time it was most impressive to observe the Institute of Organic Chemistry steering an independent course of competent, objective, and efficient innovation of teaching methods. In the field of postgraduate teaching the advanced courses on modern methods of isolation/preparation were organized by Bohlmann with a strong personal engagement.

Beside these important activities for the institute and the students Bohlmann managed to devote much time to his own scientific work and to his numerous postgraduate co-workers: 224 chemists with doctor's degrees originated from his school. The results of his research are laid down in more than 1200 publications, a most impressive figure. Even in the terminal phase of his disease he continued his work, leading to 34 papers submitted in the first eight months of 1991.

In recent years Bohlmann elucidated a multitude of complex unusual terpene structures (some of them of biogenetic interest) and synthesized several of them. In recognition of his scientific achievements of applying spectroscopic techniques for the determination of the structure and configuration of highly reactive terpenes with unusual structure, the GDCh (Gesellschaft Deutscher Chemiker) awarded him the "Otto-Wallach-medal" in 1974.

In addition to his success in teaching and research Bohlmann took a deep interest in the general situation of the chemistry of natural compounds. Promising young scientists and lecturers were quickly recognized, encouraged and supported. Also, his initiative led to the establishment of a special program for the isolation and elucidation of structure of biologically active natural compounds, funded by the Deutsche Forschungsgemeinschaft, thus bringing together all West German groups engaged in this field.

When Professor Bohlmann retired from his chair at the age of 68, he went on working and he had the pleasure of introducing his oldest granddaughter to the world of chemical research. Even a couple of weeks before his death he was working in the laboratory. A bed was put in his office, so that he could take short periods of rest. He died from cancer on Sept. 23, 1991, a few weeks after his 70th birthday.

A MOLECULAR ANALYSIS OF COMPOSITAE TRIBE SENECIONEAE

Charles Jeffrey of Kew (England), Bertil Nordenstam of Stockholm (Sweden) and Joachim W Kadereit of Mainz (Germany) are about to start a molecular analysis of Compositae tribe Senecioneae.

Our intention is to cover all genera of the tribe adequately on the basis of Charles Jeffrey's forthcoming "The tribe Senecioneae (Compositae) in the Mascarene Islands with an annotated world check-list of the genera of the tribe. Notes on Compositae: VI. Kew Bull. 47 (1): 49 - 109." This will require the examination of at least some 150 species. In a first go we may wish to analyse the nucleotide sequence of the *rbc*L gene of the chloroplast genome, but other suitable genes will be considered.

We will be happy to establish contact and cooperate with anybody conducting studies in this group both in order to enhance the progress of the project and to avoid unnecessary duplication of results. Contact in such matters should be made with Bertil Nordenstam.

We also welcome viable achenes, air-dried or fresh material of any member of the tribe. A more specific request for plant material with a list of taxa and instructions for collecting will be sent out separately to the recipients of this Newsletter and other people soon. All material should be sent to Joachim W. Kadereit. Our addresses are as follows:

Charles Jeffrey, Royal Botanic Gardens,
Kew, Richmond, Surrey TW9 3EA, England

Bertil Nordenstam, Swedish Museum of Natural History,
Department of Phanerogamic Botany,
P.O. Box 50007, S-104 05 Stockholm, Sweden

Joachim W. Kadereit, Institut f. Specielle Botanik u.
Botanischer Garten, Johannes Gutenberg-Universität Mainz,
Bentzelweg 7-9, D-6500 Mainz, Germany

REQUEST FOR MATERIAL

Dr. Linda E. Watson, Oklahoma Biological Survey, University of Oklahoma, 2001 Priestly Ave., Bldg. 605, Norman, Oklahoma 73019, U.S.A. is conducting a molecular systematic study of the tribe Anthemideae. She would like to request information on obtaining fresh leaf material and/or seeds of this tribe.

CLADISTICS OF THE GNAPHALIEAE, ADDITIONAL DATA

Arne A. Anderberg
Swedish Museum of Natural History
Dept of Phanerogamic Botany
P. O. Box 50007, S-104 05 Stockholm, Sweden

My recent paper, "Taxonomy and phylogeny of the tribe Gnaphalieae (Asteraceae)", published as volume 104 of Opera Botanica (1991), contains a very unfortunate printing error.

During the process of publication, the data matrix in Table 4 (page 11) became erroneous and incomplete with FIVE GENERA OMITTED. In order to make the results of the "third analysis" (page 30), and the consensus tree (fig. 12, page 32) comprehensible it is necessary that the data matrix from which the results were obtained is published.

The present matrix should be cut out and glued onto page 11 to replace table 4.

Tab. 4. Data matrix used in the analysis of the subtribe Cassiniinae. Hyphens indicate unknown or inapplicable characters. The codings are further discussed in the text.

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                    000000000111111111122222222223333333333444444444455555555556666666666677777777778888
                    123456789012345678901234567890123456789012345678901234567890123456789012345678901234
Outgroup            010010010000101000000011111000000000--02-000000020201101200000100010010000000001000
Argyroglottis       100010010000100000000001100000000001--02-000000020201001000000100000000000001020--00
Acanthocladium      100010000000100000000010000000000000000000000000211010010000001020100000000001020-000
Raoulia             000010000000100000000011110000000000001000001000211010010000001000000000000001-21-000
Ammobium            010000000000100000000010110000000201--02-000100021101101000000010-1-000-0--00---3-00
Basedowia           0100-000000010000000101011000000000-00000000-00121101--100000010-1-000-00-00-----00
Apalochlamys        000010010000100000020010000000000101--02-000100021101001000000010-0-100000000010--00
Haeckeria           100000012000100000010010000000000000--02-000100021101001000000010-000-0--00-----00
Ixodia              100000012000100000010011110000000201--02-000100021101001000000010100000-0--00-----00
Odixia              100000012000100000010011110000000201--02-000100021101001000000010100000-0--00-----00
Ozothamnus          100000012000100000010011110000000000000000000100021100001000000101010000000000022-00
Cassinia            100000012000100000010011110000000200000000001000211010010000001000010000000011-000
Chionolaena         100000002000110000010011110000000000011000011001201010010000001000000000000-112000
Gnaphaliothamnus    100000002000110000010011110000000000011000011000201010011000001010100000000100-000
Anaxeton            100010002000100000010011110010000000010000010001211010010000001000010000000-10-000
Petalacte           100000000000100000010011110000000010010000010001211010010000001000000000000000-000
Langebergia         100010000000100000010011110010000000010000010001211010010000001010000000000102-000
Ewartiothamnus      000010000000100000010011110000000000--02-001000021101001100000010-1-00000-000102-000
Ewartia             000010000000100001000011110010000000010000010001201010011000001010000000001000102-000
Antennaria          000100000000100010010011110000000000001-000010001201010011000001010100000010001012000
Anaphalis           000010000000100001010010110010000000001000000001201000011000001010100000010001012000
Anaphaloides        0000-000000010000000001011000000000000010000000012010100110000010101000001000102200
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