CHROMOSOME NUMBERS OF PERUVIAN COMPOSITAE

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ABSTRACT

Chromosome numbers are presented for 36 populations of Peruvian Compositae representing 34 species distributed among 27 genera. Of these, 22 are first reports, two new generic counts (*Garcilassa*, n = 17 pair; *Pseudonoseris*, n = 12 pair). When appropriate, systematic implications of these data are discussed.

Diels (1961) was the first to make a reasonably comprehensive survey for the chromosome numbers of Peruvian species. In this he included counts for approximately 31 species of Compositae, most of these from taxa belonging to the tribe Senecioneae (*Senecio* and *Werneria*). Turner, et al. (1967) counted an additional 59 species from a broad spectrum of tribes, most of these not reported by Diels. The present contribution presents chromosome numbers for an additional 34 taxa, bringing to about 125 the list of species which have been counted from Peruvian populations.

METHODS

Counts were obtained from bud material collected in the field and pickled in 4 parts chloroform: 3 parts absolute alcohol: 1 part glacial acetic acid. Bud material was stored in a refrigerator and subsequently counted by the junior author by the well-known "squash technique" using acetocarmine stain. A complete set of voucher specimens is deposited at the Field Museum (F) and a partial set at the University of Texas (TEX).

RESULTS AND DISCUSSION

Astereae

Aster squamatus (n = 10), closely related to the widespread, weedy, North American species, *A. subulatus,* has been variously treated as synonymous with the latter (Nash, 1976; p. 140), or else as a distinct variety. *A. subulatus*, with the exception of one count by Turner (1978), has been found repeatedly to be diploid throughout much of its range, including collections from Mexico and as far south as Costa Rica. *Aster squamatus,* from Argentina to northern Peru, has been found to be consistently tetraploid. Shinners (1953) treated *A. squamatus* as a variety (*australis*) of *A. subulatus,* but confused the issue by considering most of the Mexican and Central American collections as belonging to *A. subulatus* var. *australis* when, in fact, they are readily distinguished from the South American complex, not only by their diploid (n = 5) condition but by characters of the involucre. It would appear that the South American populations, albeit perhaps derived from populations in southernmost North America, are perhaps worthy of subspecific, if not specific rank.

Baccharis (x = 9)—Nearly all counts for the very large genus *Baccharis* have been diploid with n = 9 pairs, with the notable exception of three populations of *B. latifolia* (two from northern Peru and one from Colombia) which have been reported as tetraploid (Turner, et al., 1967; Powell & King, 1969). The present count for *B. latifolia* from central Peru (Table 1), is diploid. The closely related *B. alnifolia* is only the second tetraploid species reported for the genus, although Powell and King (1969) report an intriguing count of n = 25 pairs for *B. nitida,* presumably derived by aneuploid reduction at the hexaploid level.

Heliantheae

Enhydra oblonga (n = ca. 50 pairs) has relatively small, numerous chromosomes that proved difficult to count. The only previous count for the genus (*E. fluctuans*) has been listed as n = 11 pairs (Fedorov, 1969), thus the present count would appear to be decaploid, or thereabout.

Garcilassa rivularis (n = 17 pairs), a monotypic genus is previously unreported. It has been positioned near *Verbesina* in the Verbesininae of Hoffmann (1894), but Stuessy (1977) realigns this with *Eclipta* and related genera in the Ecliptinae. The latter, as noted by Stuessy, mostly have base numbers ranging from x = 11 to x = 16, while *Verbesina* and cohorts are mostly on a base of x = 17. This suggests that *Garcilassa* is perhaps best positioned in the latter subtribe.

Spilanthes leiocarpa (n = 16 pairs) belongs to the typical element of the genus, as discussed by Jansen and Stuessy (1980), this being consistent with their view that *Spilanthes* (sensu stricto) is on a base of x = 16, while the segregate *Acmella* is on a base of x = 12 or 13.

Tridax peruviensis (n = 20 pairs) is a tetraploid on a base of x = 10. Powell (1965), in his study of *Tridax* (x = 9, 10), noted that polyploidy was unknown in the $x = 10$ line (Sec. Imbricata). The present count establishes such ploidy and suggests, further, that the relatively few South American species were derived from their North American counterparts.

Vasquezia oppositifolia ($n = 20$ pairs) is apparently closely related to *V. anemonifolia* (HBK) Blake, which Powell and King (1969) report as $n = 19$ pairs, one population of which Olsen (1980) reported (as *V. achillioides*) to have $n = 9$ pairs. This suggests that *V. oppositifolia* is a tetraploid on a base of $x = 9$ or 10, vitiating the suggestions of Powell and King (1969) that the chromosomal base for *Vasquesia* might be "quite distinct in Bahianeae".

Liabeae

Nordenstam (1977), among others, recognizes this tribe as distinct, although Turner and Powell (1977) suggest that it might best be included as a subtribe in the Vernonieae, where its phyletic relationship appears to be (as opposed to the tribe Senecioneae where most workers have positioned the group). Regardless, the tribe has been relatively ignored until recently, when Robinson and Brettell (1973) resurrected a number of genera previously relegated to synonymy within *Liabum.* For convenience of explication the generic breakdown by these authors is followed.

Both *Chrysactinium acaule* ($n = 12$ pairs) and *C. hieracioides* ($n = 12$ pairs) have karyotypes with 11 small bivalents and 1 giant pair, as first noted by Turner, et al. (1967) for the latter species. *Liabum* itself possesses a base number of $x = 9$ (Nordenstam, 1977; Olsen, 1980). Several additional segregates from *Liabum* have now been examined (Table I): *Munnozia* ($n = 12$ pairs; previously reported as $n = 10$ pairs, Nordenstam, 1977; and $n = 9$ pairs, Olsen, 1980) and *Pseudonoseris* ($n = 12$ pairs). Thus nine of the 15 genera recognized by Nordenstam have been examined chromosomally (Nordenstam, 1977; Powell & King, 1969; present paper) with the following tally: *Chrysactinium* ($x = 12$), *Ferreyranthus* ($x =$ ca. 9), *Liabum* ($x = 9$), *Munnozia* ($x = 9$, 10, 12), *Paranephelius* ($x = 9$, 14), *Pseudonseris* ($x = 12$), *Philoglossa* ($x = 9$) and *Sinclairia* ($x = 9$?). From this assemblage it would appear that $x = 9$ is the likely base number for the Liabeae, relating the group to the Vernonieae in which base numbers of $x = 9$ and 10 predominate. This is perhaps best reflected in the morphological similarity of *Liabum* itself to the genus *Vernonia,* sections Leiboldia and Lepidonia (Turner,

Table 1. **Chromosome numbers of Peruvian Compositae**

Taxon	Voucher[1]	Chromosome no. (pairs)[2]
Tribe EUPATORIEAE		
Ascidiogyne sanchezvegae Cabr.	Cajamarca: 57 km. NE of Cajamarca. *1606.*	ca. 10
Eupatorium buddleaefolium Benth.	Cajamarca: 11–15 km. NW Celendin. *1689.*	ca. 10
Eupatorium nemorosum Klatt	Junin: 51 km NE of Tarma. *1430.*	10
Tribe ASTEREAE		
Aster squamatus (Spreng.) Hieron.	La Libertad: 4 km. NW of Coina. *1514.*	10
Baccharis alnifolia Meyen & Walp.	La Libertad: beach at Trujillo. *1531.*	18
Baccharis latifolia (R. & P.) Pers.	Junin: 19 km. NE of Tarma. *1343.*	9
Diplostephium callilepis Blake	Amazonas: 58 km. NE of Balsas. *1736.*	9
Oriotrophium hirtopilosum (Hieron.) Cuatr.	Cajamarca: 52 km NE of Cajamarca. *1590.*	18
Tribe HELIANTHEAE		
Bidens triplinervia HBK	Junin: 17 km. E of La Oroya. *1459.*	12
Coreopsis fasiculata Wedd.	La Libertad: 29 km SW of Coina. *1521.*	26
Coreopsis oblanceolata Blake	Cajamarca: 31 km. NE of Cajamarca. *1583.*	13
Coreopsis senaria Blake & Sherff	Cajamarca: 11 km. NE of Cajamarca. *1554.*	13
Coreopsis wotykowskii Sherff	Cajamarca: 23 km, SW of Celendin. *1646.*	ca. 10
Encelia canescens Lam.	Lima: ca. 150 km. N. of Lima. *1494.*	ca. 17
Enhydra oblonga DC.	La Libertad: beach at Trujillo. *1530*	ca. 50

Galinsoga quadriradiata R. & P.	Junin: 35 km. NE of Tarma. *1402.*	16
Garcilassa rivularis Poepp. & Endl.	Junin: 51 km NE of Tarma. *1422.*	17
Helianthus viridor Blake	Junin: 19 km NE of Tarma. *1329.*	ca. 17
Spilanthes leiocarpa DC.	La Libertad: beach at Trujillo. *1532.*	16
Tridax peruviensis Powell	Cajamarca: 3 km. NW of Celendin. *1680, 1680A.*	20
Tridax peruviensis Powell	La Libertad: 65 km. E of Trujillo. *1496.*	20
Tridax cf. *peruviensis* Powell	Cajamarca: 31 km. NE of Cajamarca. *1582.*	20
Vasquezia oppositifolia (Lag.) Blake	Junin: 19 km. NE of Tarma. *1327.*	20
Vasquezia oppositifolia (Lag.) Blake	Junin: 28–32 km. NE of Tarma. *1349.*	20
Verbesina sp.	La Libertad: 4 km. E of Otuzco. *1526.*	ca. 34
Tribe TAGETEAE		
Porophyllum ruderale (Jacq.) Cass.	Junin: 51 km. NE of Tarma. *1435.*	ca. 12
Tribe ANTHEMIDEAE		
Cotula australis (Sieb. & Spreng.) Hook f.	Cajamarca: 23 km SW of Celendin. *1645.*	ca. 9
Tribe SENECIONEAE		
Senecio nubigenus var. *laciniatus* (HBK) Cuatr.	Cajamarca: 13 km SW of. Celendin. *1663.*	ca. 50
Tribe LIABEAE		
Chrysactinium acaule (HBK) Wedd.	Cajamarca: 60 km. NE of Cajamarca. *1628.*	12
Chrysactinium hieracioides (HBK) Rob. & Brett.	Cajamarca: 31 km. NE of Cajamarca. *1581.*	12
Liabum floribundum Less.	Cajamarca: 33 km. SW Cajamarca. *1546.*	18

Munnozia lyrata (Gray) Rob. & Brett.	Amazonas: 30 km. SW Leimebamba. *1746.*	ca. 24
Munnozia ferreyrii Robinson	Amazonas: 43 km. NE of Balsas. *1724.*	12
Pseudonoseris szyszylowiczii Hieron.	Cajamarca: 26 km. NW of Celendin. *1699.*	12
Tribe MUTISIEAE		
Onoseris albicans (D. Don) Ferreyra	La Libertad: 65 km E of Trujillo. *1495.*	18
Perezia multiflora (H. & B.) Less.	Junin: ca 140 km. E of Lima. *1481.*	8
Tribe CICHORIEAE		
Hieracium lagopus D. Don	Cajamarca: 11 km. NE of Cajamarca. *1557.*	9

[1] Collection numbers are those of *Dillon & Turner.*
[2] Numbers are gametic, i.e., chromosome *pairs* observed at meiosis I.

1981). For example, *Liabum* (Sinclairia) *pringlei* Rob. & Greenm. has floral and fruit features which clearly relate the genus to the Vernonieae, the corolla, pappus, style branches, achene, and involucre being essentially like elements within *Vernonia.* Ultrastructural studies of the pollen also suggest such a disposition since members of the Vernonieae and Liabeae both possess "anthemoid" internal structural patterns in their pollen walls, as noted by Skvarla et al. (1977) and Bolick (1978).

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