







Gustavo Heiden gustavo.heiden@embrapa.br Embrapa Clima Temperado Pelotas, RS



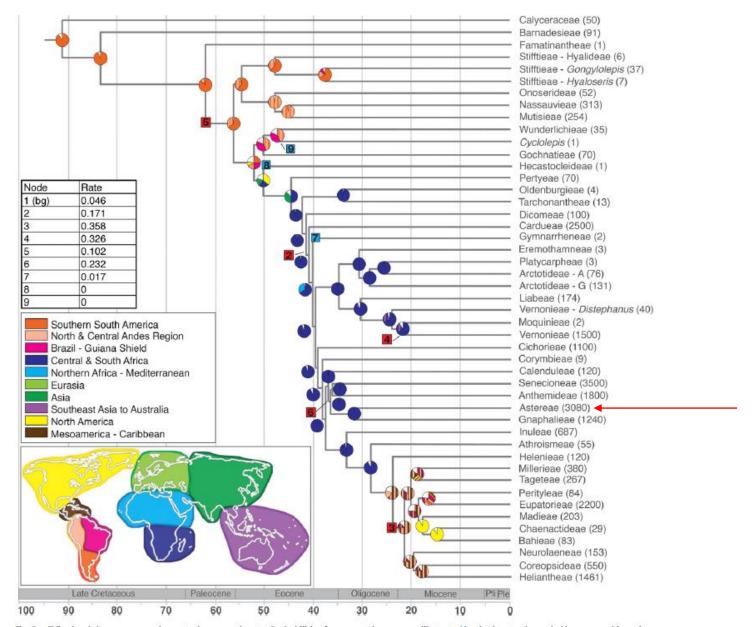


Fig. 3. Tribe-level chronogram and ancestral range estimates. Probabilities for ancestral ranges are illustrated in pie charts color coded by geographic regions on the world map. Diversification rate shifts are indicated on the phylogeny with numbered boxes corresponding to the table above the geographic legend. Rate shift increases in red and downshifts are blue boxes. Species numbers per tribe are indicated to the *Right* of tribe names.

#### Mandel et al. 2019

#### 252 genera | 3600 spp 36 subtribes

#### Worldwide

Mainly Africa, Americas and Australia

Artic to the tropics, more commonly in temperate areas

Open vegetations

Compositae second largest tribe

Aster amellus L.

Receptacle generally epaleate

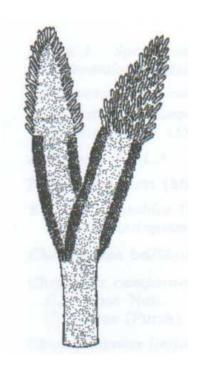
Anthers ecaudate and ecalcarate

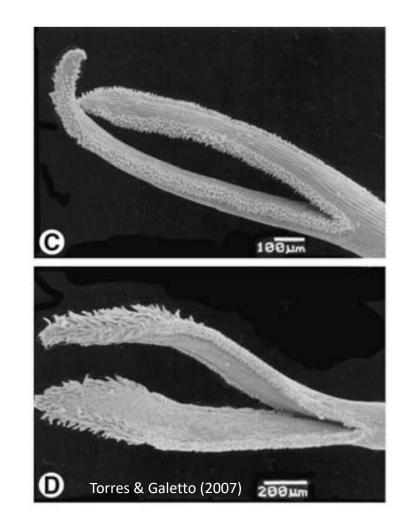
Disc floret style with two distinct marginal stigmatic lines

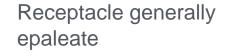
Deltate to triangular or lanceolate style appendages that are glabrous adaxially and with sweeping hairs abaxially

Apopyros warmingii (Baker) G.L.Nesom









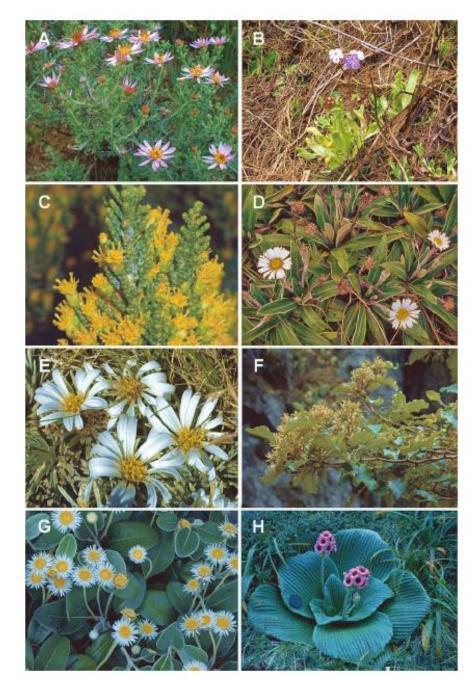
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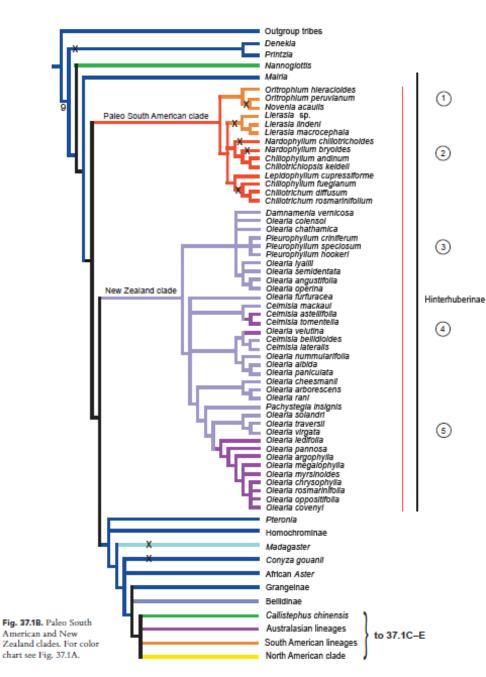
Disc floret style with two distinct marginal stigmatic lines

Deltate to triangular or lanceolate style appendages that are glabrous adaxially and with sweeping hairs abaxially

## An overview of Astereae: Paleo South American and New Zealand clades

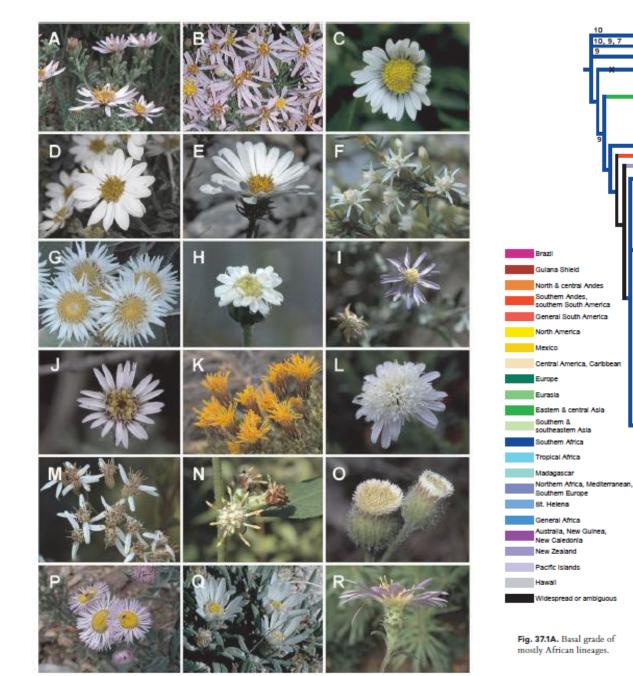


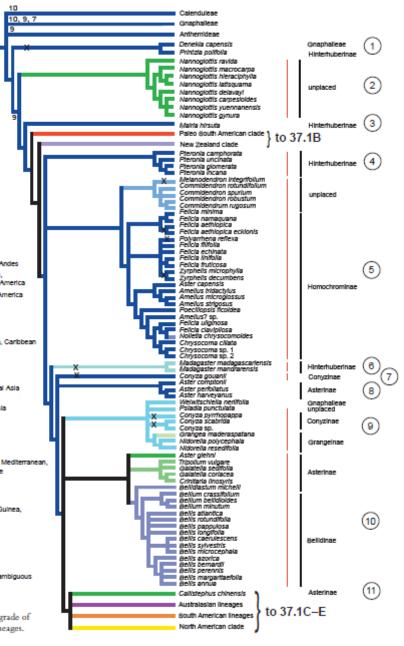




## An overview of Astereae: basal grade of mainly African lineages

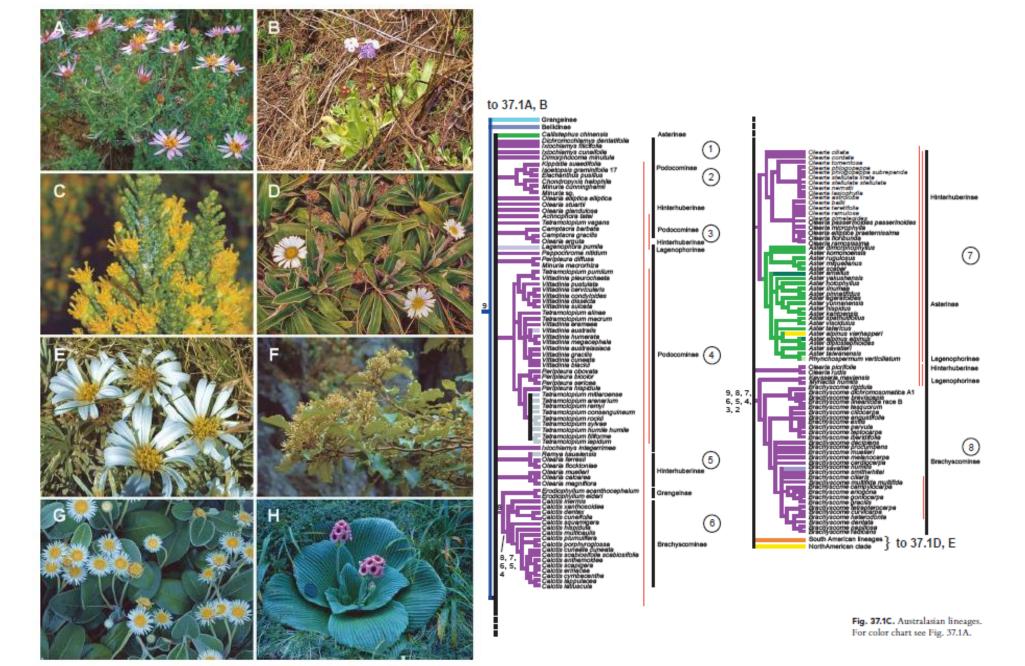






## An overview of Astereae: Australasian lineages

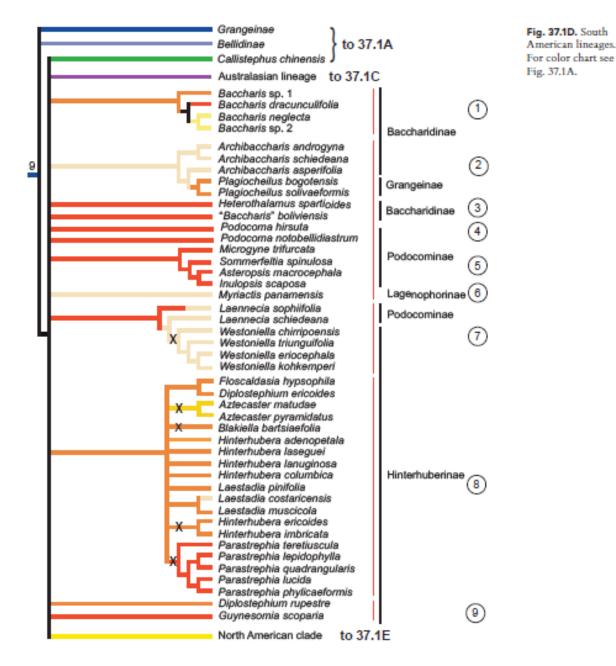




## An overview of Astereae: South American lineages

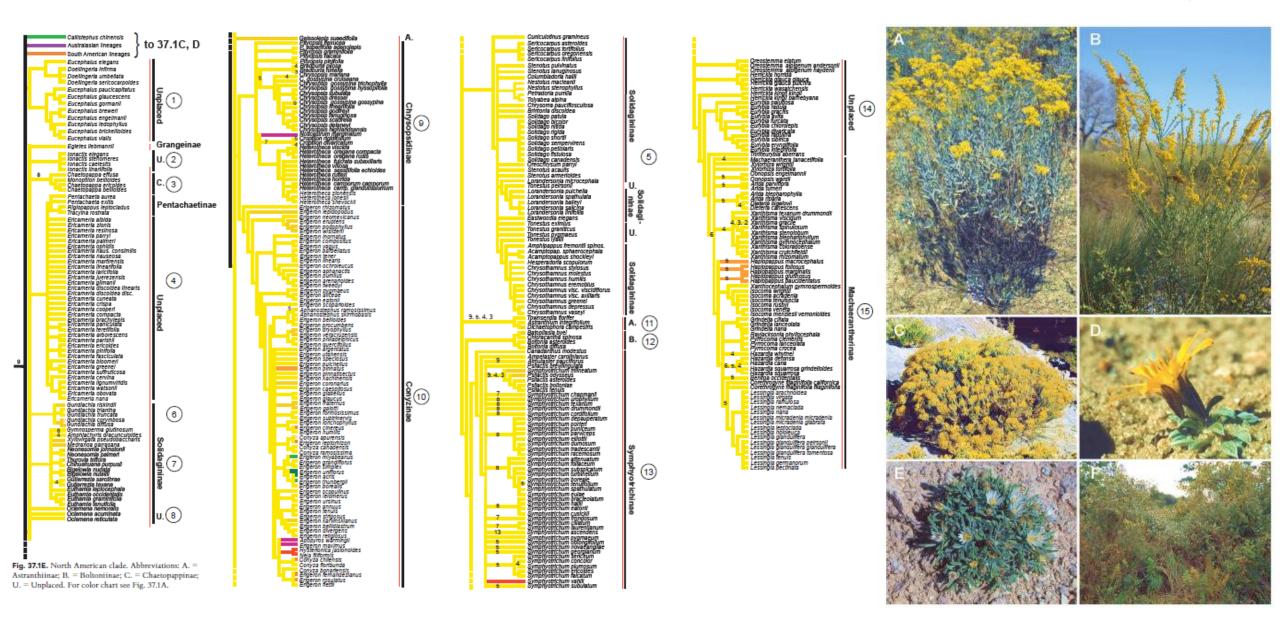






## An overview of Astereae: North American clade





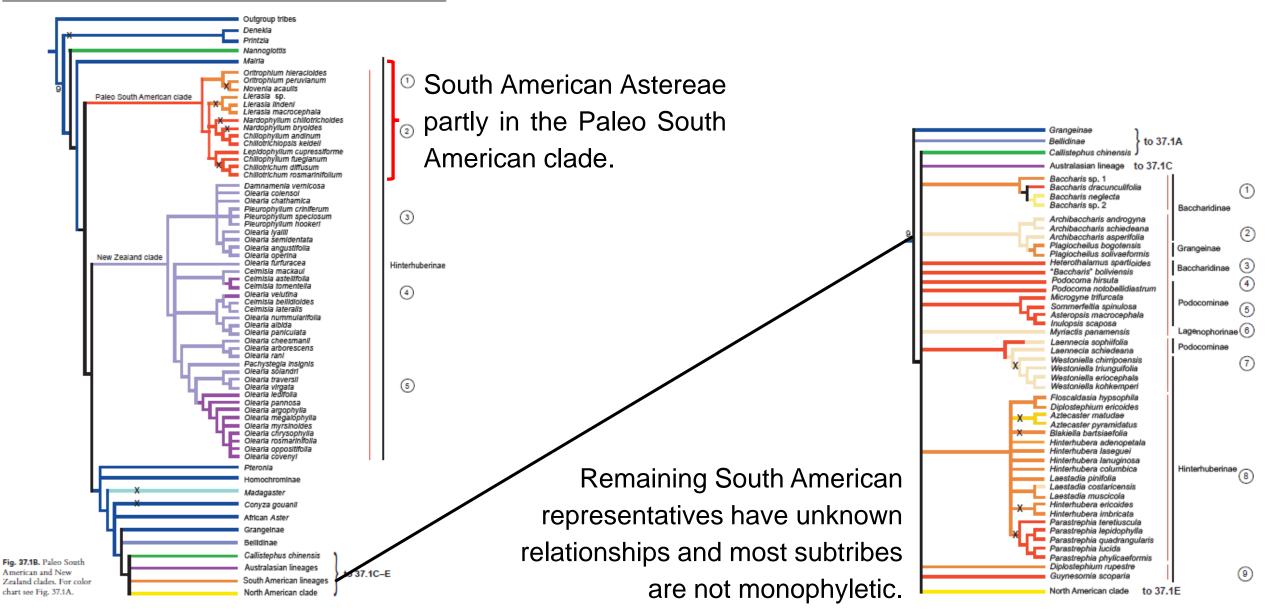
31 genera and ca. 740 species occur in South America.

Solidago chilensis Meyen

Brouillet et al. (2009): 737 Astereae ITS sequences.

Brouillet, Lowrey, Urbatsch, Karaman-Castro, Sancho, Wagstaff and Semple

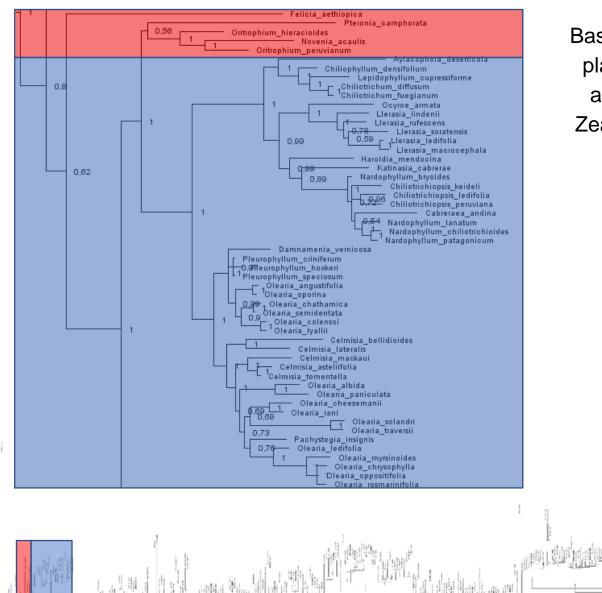
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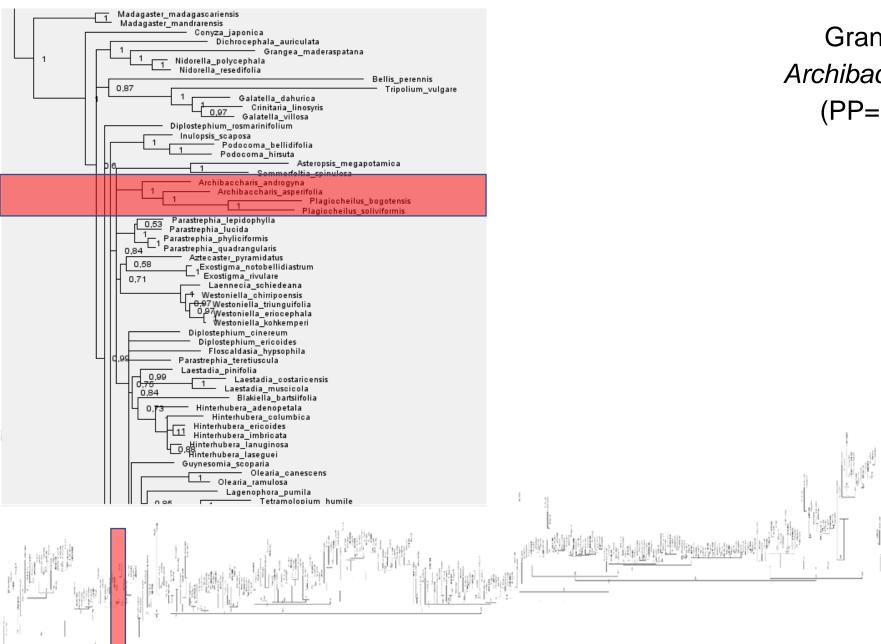
ETS and ITS sequences of 745 Astereae species (vs. 737 only ITS by Brouillet et al. 2009)

25% of the tribe diversity

Sommerfeltia spinulosa (Spreng.) Less.

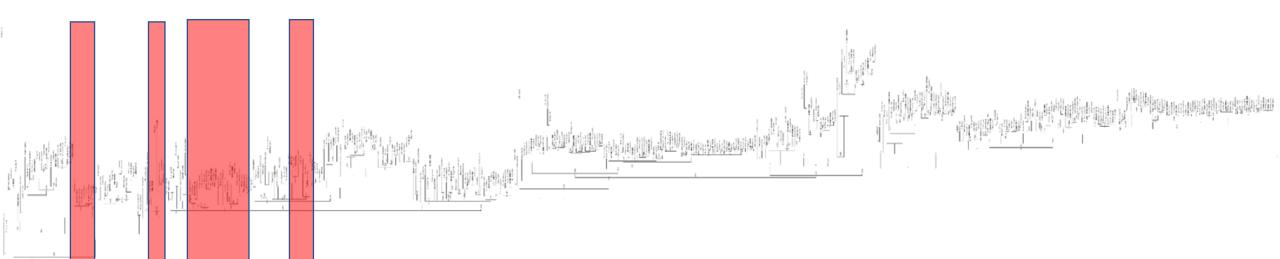


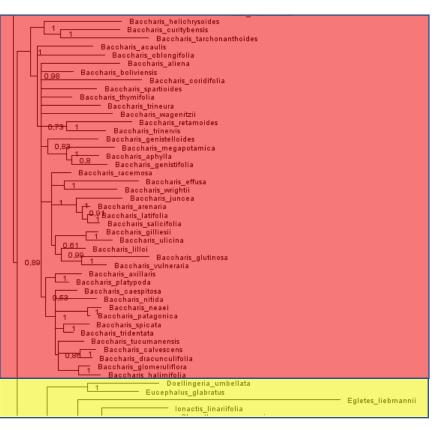
Based on these analyses, *Pteronia*, *Novenia*, and *Oritrophium*, previously placed within the Paleo South American clade, grouped together (PP=1) and emerged as the sister clade (PP=1) of a group of genera from New Zealand (PP=1) + a more restricted Paleo South American clade (PP=1).



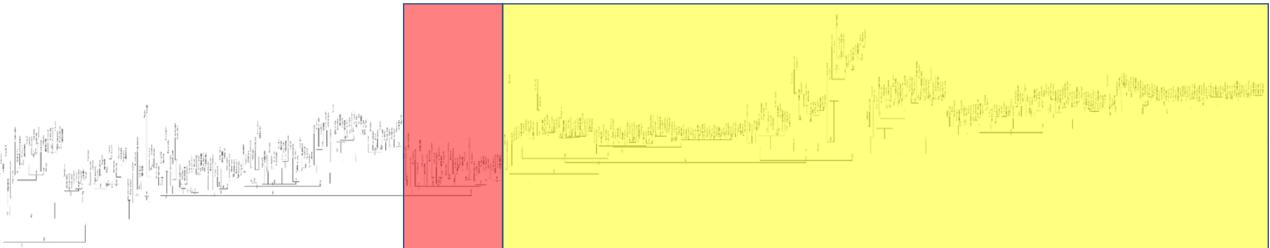
Grangeinae (PP=1) corroborate that Archibaccharis is sister to Plagiocheilus (PP=1) and should be removed from Baccharidinae respectively.

subtribe Hinterhuberinae, as many others, was polyphyletic.





Baccharidinae s.s. (PP=1) was confirmed as monophyletic.



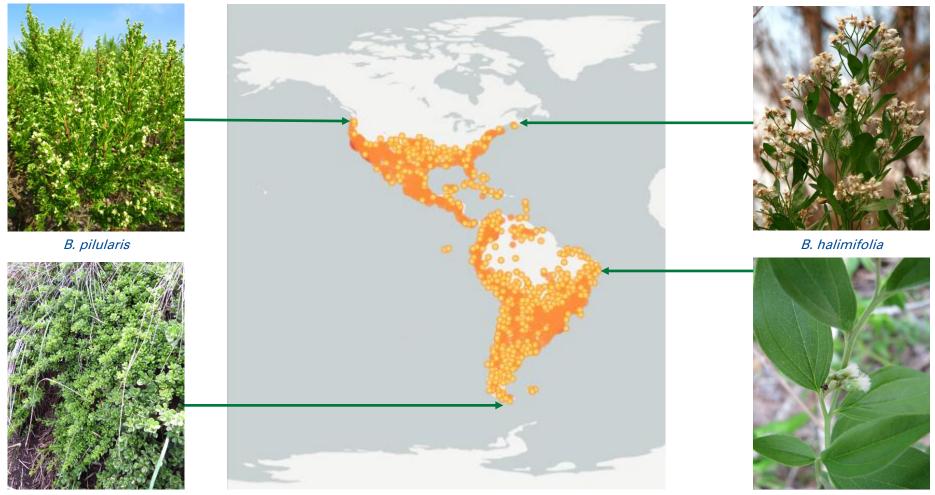


Besides the increasing in sampling and the new tools available as NGS, a great effort in sampling for the South Astereae is needed to fill the gaps (75% of the species) in the phylogeny and advance on a phylogenetic subtribul classification.





The genus is native in the Americas, from southeastern Canada and northwestern USA to Tierra del Fuego, with species native to the Falkland/Malvinas islands, across most of the Caribbean islands and the Galápagos archipelago.

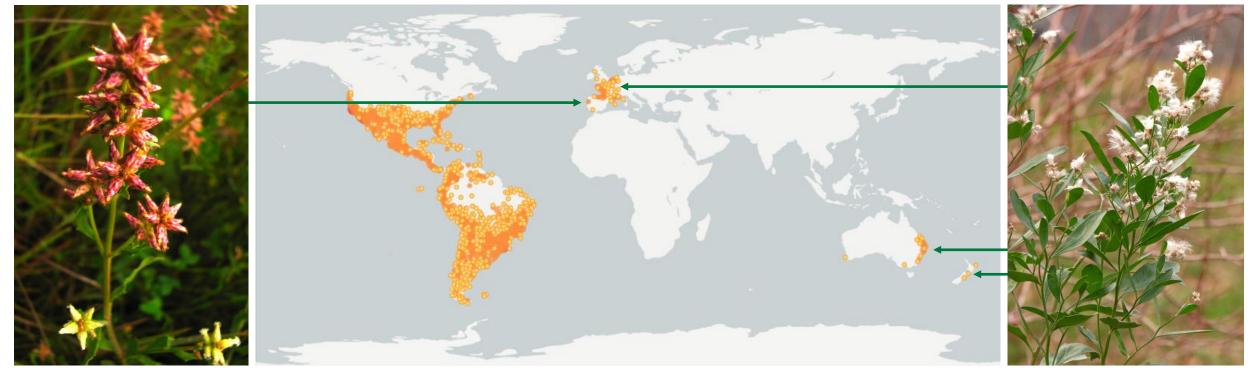


B. magellanica

B. cinerea



Some species were spread outside the American continent by anthropogenic dispersals and at least two have established naturalized alien populations: *B. halimifolia* in Europe and Oceania and *B. spicata* in Europe.



B. spicata

B. halimifolia



1. Brazil: 185 species, 114 endemics 2. Argentina: 110 species, 25 endemics 3. Bolivia: 76 species, 22 endemic 4. Peru: 61 species, 21 endemics 5. Uruguay: 54 species, 5 endemic 6. Chile: 48 species, 15 endemics 7. Paraguay: 47 species, 2 endemics 8. Mexico: 46 species, 22 endemic 9. Colombia: 39 species, 15 endemics 10. Ecuador: 38 species, 10 endemic 11. USA: 23 species, 4 endemics

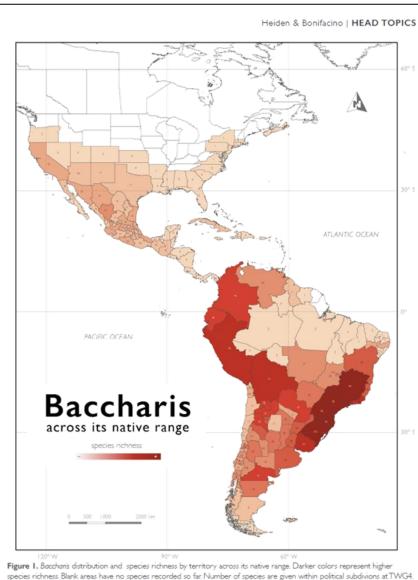
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#### Baccharis L. (Astereae): from Nova Scotia to Cape Horn

#### Gustavo Heiden<sup>1</sup> & J.Mauricio Bonifacino<sup>2</sup>

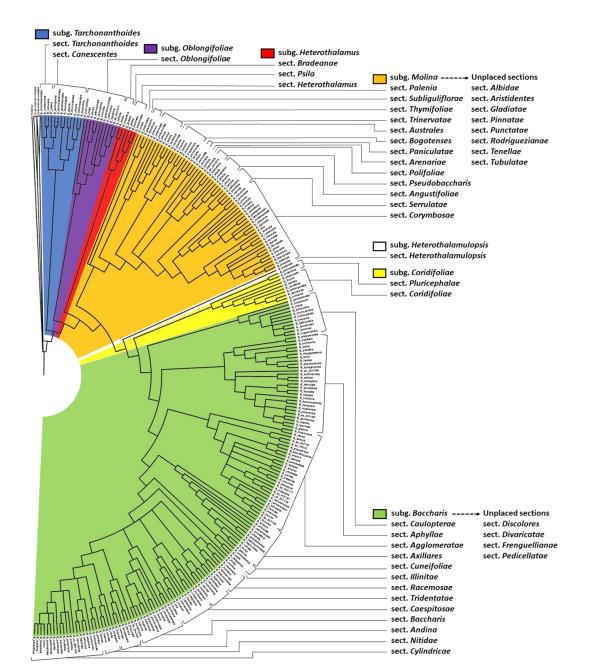
<sup>1</sup> Embrapa Clima Temperado, BR 392, Im 78, Pelotas, RS 96010-971, Brazil; gustove/heiden@embrapa.br
<sup>2</sup> Laboratorio de Botánica; Facultad de Agronomía, Universidad de la República, Av, Garzón 780, Montevideo CP 12900, Uruguay, mbonifo@gmal.com

Keywords: Asteraceae, Asteroideae, Baccharidinae, Compositae



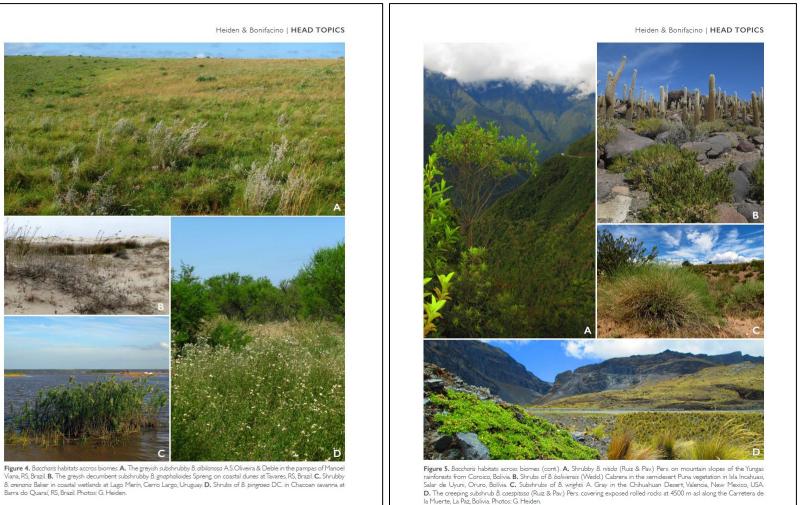
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# *Baccharis* comprises 442 species classified into 47 sections and seven subgenera.





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Figure 2. Habit diversity in Boccharis: A. Shrubby B. uncinella DC. from the subtropical highland grasslands, Lages, Santa Catarina, Brazil B. Herbaceous B. nivolis (Weld) Sch.Bip. ex Phil, from the Patagonian Andes at Locs Glaciares NP, Santa Cruz, Argentina: C. Subshrubby B. cliniza Gardher from the rock outcrops of Organ Mountains, Teresópolis, Ro de Janeiro, Brazil. D. Tree of B. longiattenuata A.S.Oliveira from seasonally semideciduous forests of Arroio do Padre, Rio Grande do Sul, Brazil. E. Scandent shrubby B. anomala DC. from the coastal scrubs of São Lourenço do Sul, Rio Grande do Sul, Brazil. Photos: A.C.E.G. Heiders, M. Bonfacino.

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*Baccharis* is a monophyletic genus characterized by functionally unisexual florets, generally distributed in distinct individuals (dioecy), but also including monoecious, gynodioecious and polygamous species.



Dioecious *B. tarchonanthoides*.

Gynodioecious *B. aliena*.

Monoecious *B. breviseta* (a, b) & *B. vulneraria* (c, d).

Polygamous *B. punctulata*.

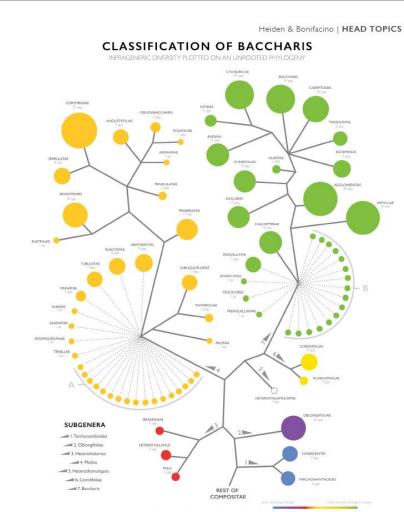
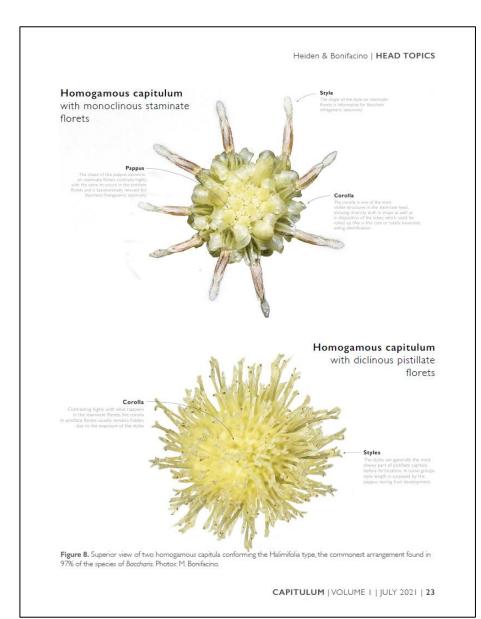


Figure 12. Unrooted phylogeny of Baccharis (adapted from Heiden et al. 2019). Circle size is indicative of species number. Datted lines indicate sections or species with uncertain or undetermined relationships (placed within subgenera based on morphology but with pending subgeneric relationships corroborated by molecular data.). **A.** Species belonging to Baccharis subgen. *Malina* but not formally assigned to sections. **B.** Species belonging to Baccharis subgen. Baccharis but not formally assigned to sections.

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Figure 6. Indument in *Baccharis*. A. Detail of young leaf of *Baccharis dracunculilfolia*, notice that there is a conspicuous indument of uniseriate trichomes (with branched terminal cell) easily visible at naked eye shadowing an almost inconspicuous microindument of uniseriate and biseriate glandular trichomes, some of them free, while the majority are packed in clusters with a single adjoining basal cell and placed in minute cavities conforming the so-called tufted indument characteristic of the vast majority of the genus. **B.** Close up of the "punctate-glandular" tufted microindument. Photos: M. Bonifacino.



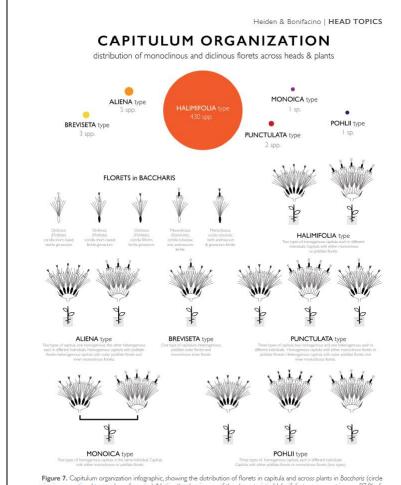


Figure 7. Capitulum organization imographic, snowing the distribution of horets in capitula and across plants in bocchars (circle size is proportional to number of species). Notice the dominance of the characteristic Halimifolia type, present in over 97 % of the species.

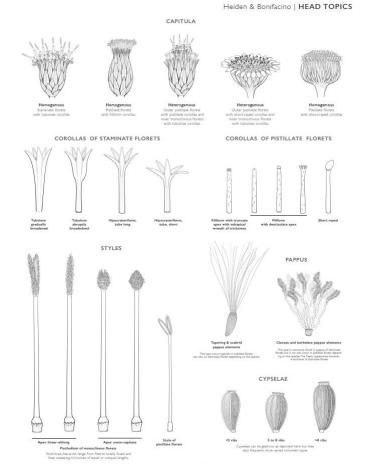


Figure 11. Some important morphological reproductive characters for the infrageneric taxonomy and useful in the identification of Baccharis.

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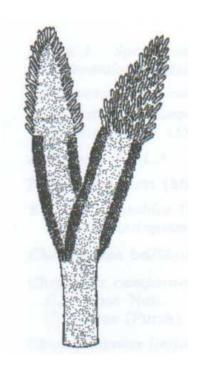


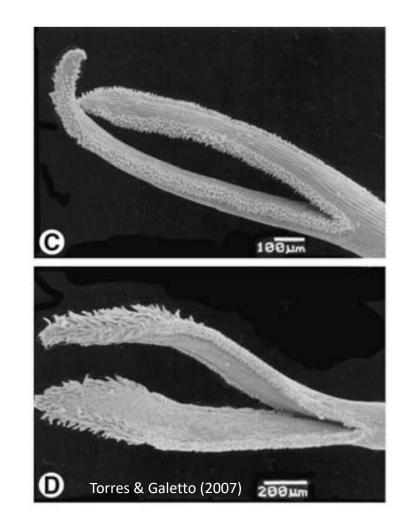
Figure 9. Examples of main types of capitula in Boccharis A. Homogamous capitulum with pistillate florets with fillform corollas (B.megopotamicoSpreng). B.Homogamous capitulum with taminateflorets with tubulose corollas (B.gingreed DC). C. Heterogamous capitulum with outer pistillate florets with fillform corollas and inner monoclinous florets with tubulose corollas (B. vulneraria Baker). D. Homogamous capitulum with pistillate florets with short-rayed corollas (B. diena (Spreng) Joch. Müll). E. Heterogamous capitulum with outer pistillate florets with short-rayed corollas and inner monoclinous florets with tubulose corollas (B. diena). Photos: M. Bonifarian.

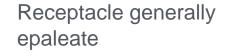
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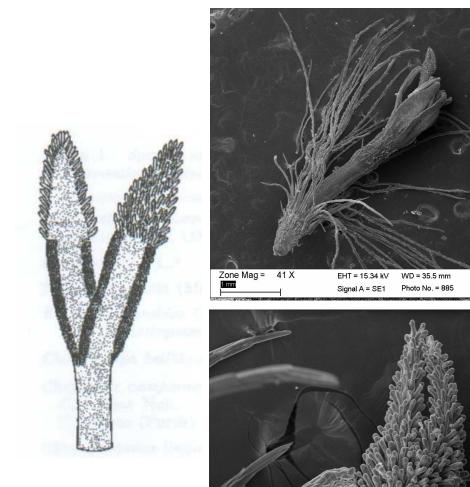


Anthers ecaudate and ecalcarate

Disc floret style with two distinct marginal stigmatic lines

Deltate to triangular or lanceolate style appendages that are glabrous adaxially and with sweeping hairs abaxially





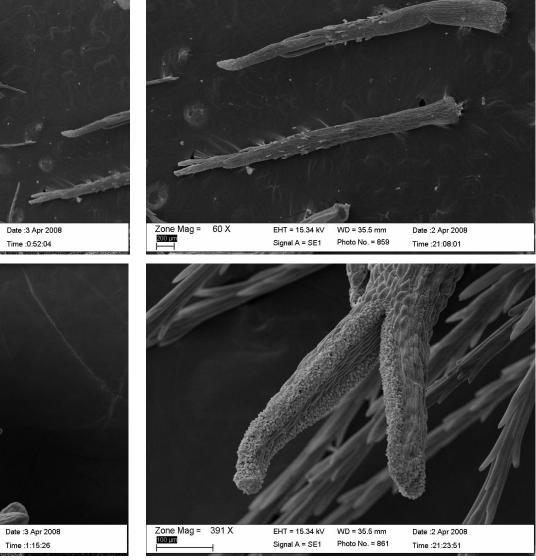
Zone Mag = 292 X

EHT = 15.34 kV

Signal A = SE1

WD = 36.0 mm

Photo No. = 890



Receptacle generally epaleate

Anthers ecaudate and ecalcarate

Disc floret style with two distinct marginal stigmatic lines

Deltate to triangular or lanceolate style appendages that are glabrous adaxially and with sweeping hairs abaxially

## An overview of Astereae: Nesom (2020) new subtribal classification



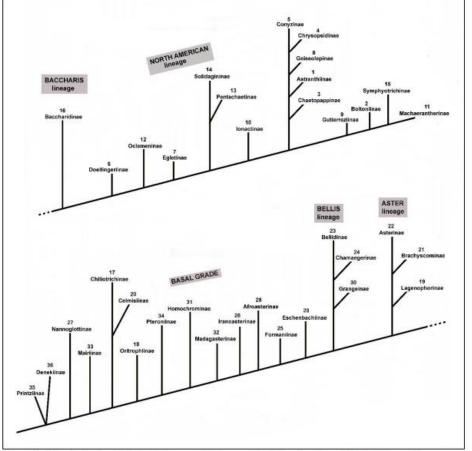


Figure 1. Hypothetical subtribal phylogeny of Astereae. See "Construction of the phylogenetic diagrams" in the introduction. Most, if not all, published trees have been studied as the basis for this intuitively constructed diagram. It is an approximation and hopefully will serve at least as a guide for further analyses.

36 subtribes based on a hypothtetical subtribal phylogeny collated from several published phylogenies

#### Heiden & Bonifacino | HEAD TOPICS

Heiden & Bonifacino | HEAD TOPICS

## Along the extensive coastal mountain range from Eastern Brazil...

Baccharis species usually constitute a characteristic and at times dominant element of the open and climax scrub vegetation. The rare Baccharis magnifica G.Heiden, Leoni & J.Nakaj. stands out on the summit of Pico da Bandeira (2890 m a.s.l), the highest peak in the Eastern side of South America. Brazil also stands out accounting 185 species of Baccharis, 114 of them endemic, the highest number recorded for a single country.

# An overview of Astereae

Gustavo Heiden, gustavo.heiden@embrapa.br – Embrapa Clima Temperado, Pelotas, RS, Brazil.

### ...all the way south to Southeastern Uruguay.

In this image Baccharis aliena dominates the rocky outcrops landscape in Uruguay, where the genus, with 54 species (five endemic) is the country's most speciose.

Baccharis mognifica G.Heiden/Leoni & J.N.Nakaj in Parque Nacional do Caparaó, border of Espírito Santo and Minas Gerais, Brazil Photo: G. Heiden

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Baccharis aliena (Spreng.) Joch Müll. in Cerro Verdún, Lavalleja, Uruguay. Photo: M. Banifacino

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