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A Revision of *Chrysactinium* (Compositae: Liabeae)

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ABSTRACT. *Chrysactinium* (Compositae: Liabeae) is composed of six species, all restricted to the Páramo-type regions of Ecuador and Peru. *Chrysactinium longiradiatum* and *C. rosulatum* are considered synonymous with *C. acaule* because of the high levels of variation exhibited in the characters previously used to distinguish them.

Chrysactinium (Kunth) Wedd. (Compositae: Liabeae) is a genus of six species of small, herbaceous perennials endemic to the Ecuadorian and Peruvian Andes. The species grow on mountain slopes at elevations higher than 2,800 m and are relatively rare today, although for two of the species, *C. acaule* and *C. hieracioides*, the number of herbarium specimens seems to indicate that they were more commonly found in the past. The highest concentration of species diversity and morphological variation is found in the northern Peruvian provinces of Cajamarca, Amazonas, Chachapoyas, and Ancash.

Chrysactinium is easily identified by its herbaceous habit, light-colored, dense, woolly tomentum on the abaxial surface of the leaves, long and slender peduncles, solitary heads with yellow ray and disk corollas (*Chrysactinium* is greek for golden rays), dark brown or black anthers, and white pappus. Kunth was the first to describe any members of this genus and he placed into *Andromachia* section *Chrysactinium* (Humboldt et al. 1818) two species, *A. acaulis* and *A. hieracioides*. *Andromachia* Humboldt and Bonpland was based on an andean concept and was subsequently submerged into the genus *Liabum* Adans., which was described from material from the Greater Antilles. Lessing (1831) transferred the two Kunth species into *Liabum*. Weddell (1855–1857) described *Chrysactinium* using *A. acuale* as the type species. Subsequently Hieronymus (1895, 1905) described three new species as *Liabum*: *L. caulescens*, *L. longiradiatum*, and *L. rosulatum*. Blake (1927) described four new species as *Liabum*: *L. arthrothrix*, *L. amphothrix*, *L. bicolor*, and *L. tenius*. In 1974 Robinson and Brettell resurrected *Chrysactinium* and transferred into it all the species listed above. Recently, two new species have been added, *C. breviscapum* (Sagastegui-Alva and Dillon 1994) and *C. wurdackii* (Zermoglio and Funk 1997). Of the eleven species named above, we place four names into synonomy with *C. acaule* and one into synonomy with *C. caulescens*, leaving six species in the genus.

Preliminary cladistic analyses at the tribal level (Bremer 1994; Funk et al. 1996), as well as traditional morphological studies (Robinson 1983), place *Chrysactinium* in a monophyletic group, the subtribe Munnoziinae, along with *Munnozia* Ruiz and Pav., *Philoglossa* DC., and *Erato* DC. The sister-group to *Chrysactinium* is *Munnozia* a genus of erect or scrambling herbs or subshrubs found primarily in the Andes.

An attempt was made to examine the species relationships via a cladistic analysis. However, the results of this analysis were not informative because of the nature of the characters used to distinguish the species, primarily leaf pubescence and shape. While these characters are distinctive for each species they did not provide any grouping characters with which to determine sister-taxa.

Pubescence on the vegetative parts of the members of *Chrysactinium* provides a number of important characters for species delimitation. The four types of vegetative indumentation, all of which are uniseriate and multi-cellular, are as follows (Fig. 1A–D):

A.) white or off-white, dense, woolly tomentum, (Fig. 1A);
B.) long, somewhat brittle, purple-walled, trichomes, (Fig. 1B);
C.) white, cob webby, often deciduous arachnoid tomentum, (Fig. 1C); and
D.) coarsely pilose indument with evenly spaced, stiff, white, slightly curved hairs, (Fig. 1D).

The abaxial surface of the leaves is covered with a dense woolly tomentum (Fig. 1A). Both the abaxial

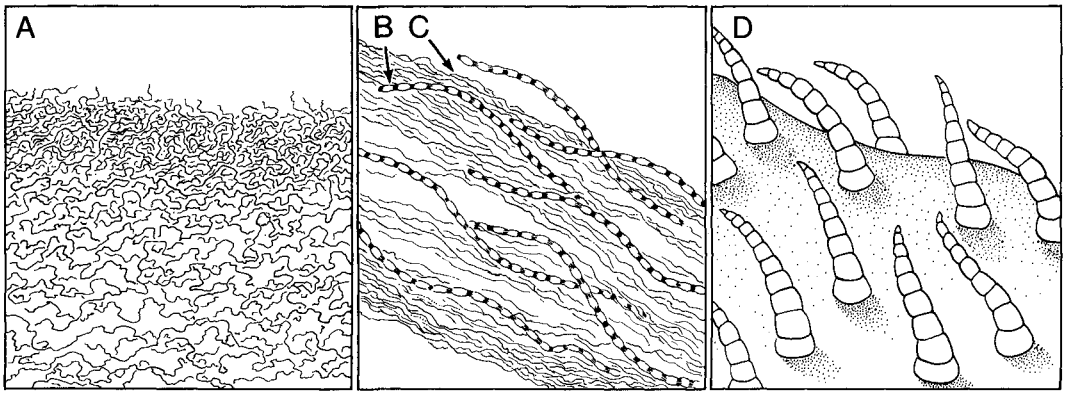


FIG. 1. Hair types found on vegetative parts of members of *Chrysactinium*. A. Dense woolly tomentum. B. Purple-walled trichomes. C. Arachnoid tomentum. D. Coarse pilose hairs. Drawing by A. Tangerini (US).

and adaxial leaf surfaces sometimes have coarsely pilose indument as well (Fig. 1D). Arachnoid tomentum is sometimes found on the adaxial surfaces of the leaves and is often deciduous, it is also found on some involucral bracts and on the peduncles (Fig. 1C). The purple-walled trichomes (Fig. 1B) are common on the peduncle and near the base of the involucre where they are intertwined with the arachnoid tomentum (Fig. 1B–C). Both the arachnoid tomentum and the purple-walled trichomes are long and intertwined, however, in addition to being purple, the trichomes are thicker, more brittle, and have undulating walls. Less frequently, the purple-walled trichomes are found near the base of the petioliate leaf and occasionally scattered in other places such as the leaf margins and along the midvein.

TAXONOMIC TREATMENT

Chrysactinium (Kunth) Wedd., Chloris Andina 1: 212. 1857.

Andromachia Kunth sect. *Chrysactinium* Kunth in A. von Humboldt, A. J. Bonpland, and C. S. Kunth, Nova Genera et Species Plantarum, ed. folio, 4: 77. 1818.—Type: *Andromachia acaulis* Kunth designated by Robinson and Brettell, Phytologia 28: 49. 1974.

Small herbaceous perennials; milky sap reported only for *Chrysactinium hieracioides*. Rhizomatous with lateral roots beginning immediately below the lowermost leaves; stem covered with a woolly tomentum that is often deciduous at maturity. *Leaves* cauline and opposite or basal and appearing whorled, sessile, petiolate; blades mostly lanceolate, some linear or rhombic, 1–10 × 0.3–1.0 cm (including base), base attenuate to decurrent, margins entire to sharply toothed (iliciform), teeth (when present) often callose-apiculate, apex acute-rounded to callose-apiculate; abaxial surface covered with dense, white or off-white tomentum, with or without coarse hairs; adaxial surface glabrous or with combinations of coarse hairs and often deciduous, arachnoid tomentum. *Infloresence* a solitary head; peduncles 15–25 (–40) cm long, slender, usually with arachnoid tomentum and purple-walled trichomes; involucre of 4–5 rows, bracts 40–60, mostly lanceolate, some linear or oblanceolate, inner bracts usually narrower than outer, free, apex acute, acuminate, or apiculate; receptacular bracts (chaff) narrowly triangular, 2–3 mm long, sometimes difficult to find. *Heads* radiate, broadly to narrowly campanulate, generally 1.0–2.5 cm in diameter (excluding rays), corollas yellow; *ray florets* 30–60, corollas 10–18 mm long, tubes puberulous on outer surface, usually 2–3 dentate, styles yellow sometimes with red near base or apex, 7–10 mm long, branches clavate and 1.75–3.00 mm long; *disk florets* usually 30–60 (100 reported in literature), corollas 4.5–8.0 mm, pilose on outer surface near tube and throat interface, styles yellow, sometimes with red near base or apex, 4–9 mm long, branches 0.4–1.0 mm long, apex acute to rounded, anthers 5, dark brown or black, base rounded, apex acute. *Cypselae* generally prismatic, dark brown at maturity, 8–10 ribbed, often pilose, carpopodium symmetrical in a distinct ring; pappus of a single row of 30–60, white or off-white bristles 3–6 mm long; pollen echinate, 30–40 μm in diameter.

Small herbs growing as solitary individuals or in small groups usually on open, grassy slopes, often

rare or uncommon. Although latex is common in the tribe it has been reported only in *Chrysactinium hieracioides*. Members of this species have been collected between 2,200 and 4,000 m in elevation but are most frequently found between 3,000–3,200 m.

Interesting features include the herbaceous habit with the basal or nearly basal leaves, solitary heads with yellow corollas and long, slender peduncles all of which combine to make members of the genus look somewhat like a member of *Hieracium* L. In addition, the light-colored, dense, woolly tomentum on the abaxial surfaces of the leaves, dark anthers, deeply lobed disk corollas (throat ca. 2 mm, lobes ca. 2–3 mm), and two distinct types of styles (ray styles ca. 8 mm with branches 2–3 mm and clavate; disk styles ca. 7–8 with branches ca. 0.75 mm and acute) make it part of the Liabeae.

KEY TO THE SPECIES OF *CHRYSACTINIUM*

1. Leaves all in basal rosette, internodes not evident.
   2. Leaf blades narrowly to widely rhombic or ovate; peduncles 10–40 cm long; involucral bracts 40–70 in 5 rows. . . . . 1. *C. acaule*
   2. Leaf blades ovate; peduncles 10–18 cm long; involucral bracts 35–40 in 4 rows. . . . . 3. *C. breviscapum*
1. At least some leaves cauline, internodes evident.
   3. Leaf margins of at least some leaves regularly or irregularly deeply dentate, distinctly toothed (iliciform). . . . . 5. *C. hieracioides*
   3. Leaf margins entire to subentire, not deeply dentate or lobed.
      4. Outer involucral bracts ovate or broadly lanceolate, apex callose-apiculate, inner bracts narrowly lanceolate to linear, apex apiculate; adaxial surface of leaves coarsely pilose and with deciduous arachnoid tomentum. . . . . 2. *C. amphothrix*
      4. Outer and inner involucral bracts mostly lanceolate, differing mainly in length and apex: outer bracts lanceolate to triangular, apex acute; inner bracts lanceolate to narrowly lanceolate, apex acuminate; adaxial surface of leaves not coarsely pilose but with traces of deciduous arachnoid tomentum.
         5. Leaves 3-nervate; outer involucral bracts glabrous, especially when mature; adaxial leaf surface glabrous; scape grayish . . . . . 4. *C. caulescens*
         5. Leaves 5-nervate; outer involucral bracts with some arachnoid tomentum even when mature; adaxial leaf surface with deciduous arachnoid tomentum; scape golden orange . . . . . 6. *C. wurdackii*

1. CHRYSACTINIUM ACAULE (Kunth) Wedd., Chloris Andina 1: 212. 1857.—*Andromachia acaulis* Kunth in A. von Humboldt, A. J. Bonpland, and C. S. Kunth, Nova Genera et Species Plantarum, ed. folio, 4: 77, plate 336. 1818.—*Liabum acaule* (Kunth) Less., Linnaea 6: 696. 1831.—TYPE: ECUADOR. Pichincha: crescit in montibus Quitensibus (El Assuaye) inter Los Paredones et villam Turche, 1700 hex, Jul 1802, *Humboldt and Bonpland 3262* (holotype: B, destroyed; lectotype here selected: P-Bonpl.!; isotype P!). Figs. 2 and 3.

Chrysactinium longiradiatum (Hieron.) H. Robinson and Brettell, Phytologia 28: 50. 1974.—*Liabum longiradiatum* Hieron., Botanische Jahrbücher für Systematik 21: 352. 1895.—TYPE: ECUADOR. Imbabura: crescit in monte Imbabura, 4,000 m, Mar 1870, *Stübel 62* (holotype: B, destroyed; photograph of holotype: MO!, NY!, US!). NEOTYPE here selected: ECUADOR. Pichincha: pass west of Quito on Quito—Santo Domingo road, 3900 m, 21 Apr 1942, *Haught 3261* (neotype: US!; isoneotype: F!, P!).

Chrysactinium rosulatum (Hieron.) H. Robinson and Brettell, Phytologia 28: 50. 1974.—*Liabum rosulatum* Hieron., Botanische Jahrbücher für Systematik 36: 501. 1905.—TYPE: PERU. Cajamarca: Cutervo, Feb 1879, *Jelski 722* (holotype: B, destroyed; photograph of holotype: MO!, NY!, US!). NEOTYPE here selected: PERU. Ancash, Yungay Prov., Huascarán National Park, Quebrada Ranincuray, 3900–4100 m, 17 Apr 1985, *Smith, Valencia, and Gonzales 10377* (neotype US!; isoneotypes: F!, MO!).

Chrysactinium arthrothrix (S. F. Blake) H. Robinson and Brettell Phytologia: 49. 1974. *Liabum arthrothrix* S. F. Blake, Journal of the Washington Academy of Sciences 17: 288. 1927.—TYPE: ECUADOR. Azuay: Páramo, between Oña and Cuenca, 2,700–3,300 m, 9–10 Sep 1923, *Hitchcock 21645* (holotype: US!).

Chrysactinium tenuius (S. F. Blake) H. Robinson and Brettell, Phytologia 28: 50. 1974.—*Liabum tenuius* [as *tenuior*] S. F. Blake, Journal of the Washington Academy of Sciences. 17: 289. 1927.—TYPE: ECUADOR. Pichincha: Casitagua, May

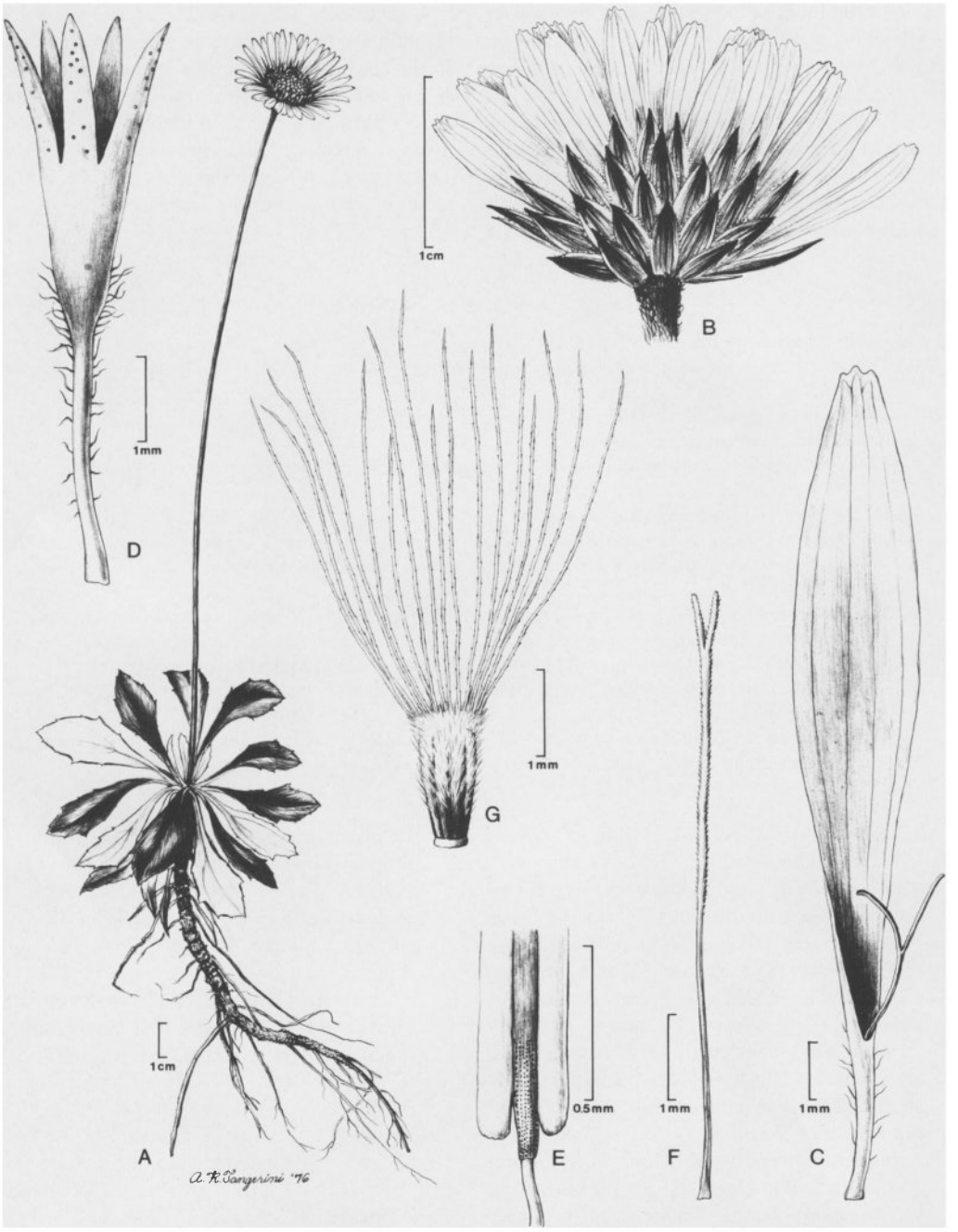


FIG. 2. *Chrysactinium acaule* (Kunth) Weddell. A. Habit. B. Head. C. Ray floret corolla and style. D. Disk floret corolla. E. Anther collar and bases of thecae. F. Disk floret style. G. Cypsela. All based on *King 6720*, (US). Drawing by A. Tangerini (US).

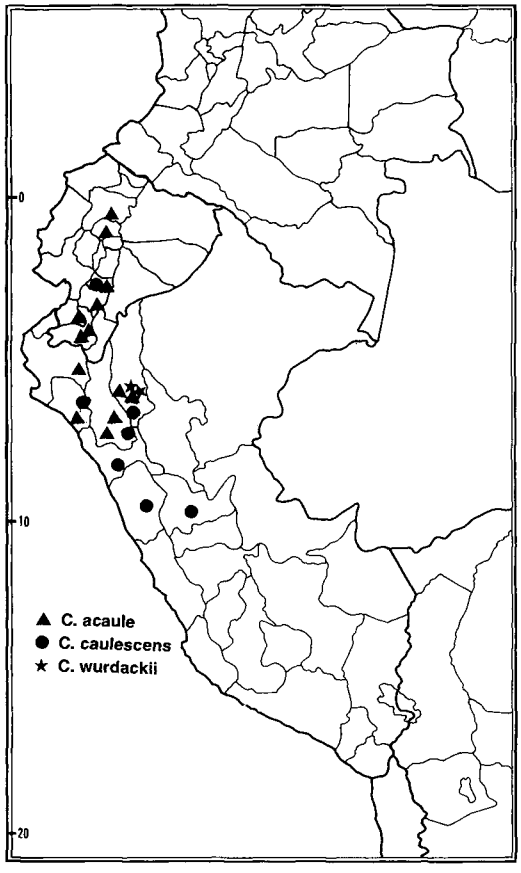


FIG. 3. Species distribution map for *Chrysactinium acaule*, C. *wurdackii*, and C. *caulescens*.

1903, *Rivet 478* (holotype: B, destroyed; lectotype here selected: P!; fragment of B: US!; photograph of B: US!; photograph of P: US!).

Perennial herb with no reports of milky sap. Acaulescent. *Leaves* basal, opposite, forming a rosette, internodes not evident; blades ovate to widely elliptic, some obtrullate or rhombic, 3-nervate, (0.5–) 2–10 × (0.3–) 0.8–2.5 cm (including leaf bases), base petiolate and attenuate to decurrent, margins shallowly and irregularly toothed to iliciform with 1-mm-long, black teeth, apex apiculate to short-acute, abaxial surface with off-white, woolly tomentum, adaxial surface glabrous or with evenly spaced, coarse hairs, arachnoid tomentum mostly absent with the exception of the rare presence on very young leaves. *Heads* campanulate, 1–2.5 cm wide (excluding rays); peduncles erect, 10–40 cm long, light brown, sparsely to heavily arachnoid-tomentose and sometimes with purple-walled trichomes; receptacular bracts ca. 2–3 mm long. *Involucral bracts* 40–70 in 5 rows, mostly glabrate, some young heads with arachnoid tomentum (especially near apex) that is deciduous at maturity; those of outer series broadly elliptic to lanceolate, 4–6 × 1–2 mm, ciliate, brown or dark purple, apex acute, margins subentire; those of inner series narrowly lanceolate to linear, 8–11 × 1.0–1.5 mm, glabrous or mostly so, green at base becoming brown or purple near apex, apex apiculate, sometimes cuspidate, with one, black, 1-mm-long tooth, margins mostly entire. *Ray florets* 30–60, corollas ca. 16–18 mm long; tubes 3–6 × 0.25–0.75 mm; laminae linear to elliptic, 12–15 × 2.0–2.5 mm, 3-lobed; styles 8–10 mm long, style branches 2.5–3.0 mm long. *Disk florets* 60–100, corollas 6.25–8.00 mm long; tubes 3–4 × 0.25–0.50 mm; throats 1.75–2.25 × 1.25 mm; lobes 1.5–2.5 mm long; stamens 3–4 mm long, thecae 2.0–2.5 mm long, dark green to dark brown; styles 7.5–9.0 mm long, style branches 0.5 mm long. *Cypselae* isomorphic, cylindrical, 2 × 1 mm, light to dark brown, moderately to densely puberulous; pappus bristles 4–6 mm long.

Chrysactinium acaule grows in grasslands, on overgrazed hillsides and on rocky outcrops. Its epithet is derived from its characteristic absence of an aerial stem. Two previously recognized species, C. *longiradiatum* and C. *rosulatum*, are here placed in synonomy with C. *acaule*. The types of both C. *longiradiatum* and C. *rosulatum* were destroyed in Berlin; the neotypes were selected by comparing all available collections to the photos of the Berlin specimens and selecting the ones that most closely resembled the original material.

Robinson (1978) distinguished *Chrysactinium longiradiatum* from C. *acaule* because C. *longiradiatum* usually grows in more northern regions of Ecuador, exhibits a more robust habit, and tends more frequently to have an absence of the partially persistent, pilose indument on the adaxial surfaces of the leaves. C. *rosulatum*, from northern Peru, was described as having more dentate leaves and less pubescent involucral bracts than C. *acaule*. *Chrysactinium acaule* as traditionally recognized was distributed throughout Andean Ecuador and northern Peru, with a greater concentration of representatives in the southern Ecuador provinces of Azuay and Loja. The previously recognized habitat boundaries were not evident in the specimens analyzed for this study. Careful examination of all the characters previously used to separate these three species showed the characters to be extremely variable, almost always so within populations, and occasion-

ally even on a single plant. While it seems that plants growing in each region tend to exhibit specific morphological tendencies, one must conclude that the high levels of variability found at the boundaries of each identified region justify the lumping these previously recognized species under *C. acaule.*

Within *Chrysactinium acaule,* we have identified certain morphological trends in six geographical regions. The northern Ecuadorian Provinces around Pichincha contain a large majority of what was formerly recognized as *Chrysactinium longiradiatum,* the representatives with a general tendency towards a more robust habit. Head diameters range from 2.0 to 2.5 cm (excluding rays), leaf sizes vary between 7–10 cm in length and 2–3 cm in width, and adaxial leaf surfaces and involucral bracts are for the most part glabrous. Exceptions to these general characteristics occur, including *Humbles 6318,* which contains residual arachnoid tomentum on its adaxial leaf surfaces and has leaves that are small (1.5 × 0.5 cm) in comparison to others in the region. Representatives in this region have been collected at elevations of 3,650–3,900 m from December to August, peaking during April.

The provinces of Chimborazo, Bolivar, Morona-Santiago, and Cañar comprise the central Ecuadorian region where robustness is significantly reduced from that of plants growing farther north. Head diameters vary between 1–2 cm (excluding rays), with leaves often 1–5 × 0.3–1.1 cm, and adaxial leaf surfaces usually with long coarse pilose indument except in specimens from the Province of Bolivar where the plants that have been collected tend to be shorter and where the heads are on the average larger than those in other provinces (1.5–2.5 cm in diameter excluding rays). One variant collected at 4,300 m in Chimborazo Province, *Soejarto and Hernández 1368,* has glabrous adaxial leaf surfaces. The majority of these specimens were collected at elevations of 3,200–3,800 m during the months of January, February, May, and July.

Azuay and Loja provinces contain the most common morphological type for the species with heads 1–2 cm (excluding rays) in diameter, leaves 3–5 × 0.5–1.5 cm, and coarsely pilose adaxial surfaces. An aberration in this general morphological type can be seen in *Holm-Nielsen 4769* where the adaxial leaf surface can be glabrous, or coarsely pilose. Specimens with only glabrous leaf surfaces in this region include *Ollgaard and Balslev 9628* and *Barclay and Juajibioy 8517.* Representatives have been collected in flower at elevations of 3,000–3,500 m year round, peaking from February to April.

The Peruvian departments of Amazonas and Cajamarca comprise the fourth geographical region. It is a center for high levels of variation. Representatives from these provinces mostly have arachnoid tomentum on adaxial leaf surfaces and involucral bracts with some arachnoid tomentum. The leaves show variation in length and pubescense type and in head diameters. For instance, *Smith and Vasquez 3511* and *Sánchez Vega 3436* have long and short coarsely pilose pubescence with some arachnoid tomentum and some glabrous adaxial surfaces; *Sagástegui-Alva 12260* has short coarsely pilose indument on the adaxial leaf surfaces; *Dillon and Turner 1628,* with deciduous arachnoid tomentum on some leaves, while others are glabrous. Bracts are all covered by an arachnoid tomentum of varying density, with the exception of one specimen, *Sagástegui-Alva 8839,* showing almost no arachnoid tomentum on the bract surfaces. These specimens have been collected at elevations of 2,500–4,000 m from January to August.

Specimens from the La Libertad Province of Peru have heads of small to medium size, coarsely short-pilose adaxial leaf surfaces with some arachnoid tomentum above and involucral bracts with some arachnoid hairs. Variants from this include *Dillon 2799,* which has a combination of long and short coarse hairs on the adaxial leaf surfaces, and *Riccio and La Rose 3547,* which has purely arachnoid tomentum on adaxial leaf surfaces. The specimens in La Libertad have been collected from elevations of 3,100–3,400 m mostly in January.

Ancash, Peru, the final geographical region, also contains high levels of variation in adaxial leaf surface pubescence, as well as variation in involucral bract pubescence. These specimens had medium-sized heads and medium- to large-sized leaves. There were an equal number of plants with strong arachnoid tomentum on the outer bracts and specimens with glabrous outer bract surfaces. These also had mostly coarsely pilose and arachnoid indument on the adaxial leaf surfaces. Deviation from this is seen in the small heads of *Smith 9794,* the purely arachnoid tomentum covering adaxial leaf surfaces of *Cerrate 2498 and 3956,* and the combination of coarsely pilose, glabrous, or arachnoid adaxial leaf surfaces of *Smith 10021.* Specimens from Ancash were collected at elevations of ca. 3,400 to 4,500 m from January through June, peaking in April to May.

Additional specimens examined (Cuenca = Her-

barium of the University of Cuenca, Azuay). ECUADOR. **Azuay**: nudo de Cordillera Occidental y Cordillera Oriental, Páramos de Silván, 30 Jul, 3 Aug 1959, *Barclay and Juajibioy 8390* (MO, US); Cordillera Oriental, alrededores del Páramo Patococha entre Gualacéo y Limón, 6–7 Aug 1959, *Barclay and Juajibioy 8640* (US); Cuenca-Angas rd, 28 Dec 1976, *Boeke 649* (NY, US); Cuenca, Parroquia Banos, Hacienda Yanasacha, 20 Jul 1978, *Boeke 2464* (NY, US); Páramo de Tinajillas, 30–50 km S of Cuenca, 17 Mar 1945, *Camp E-2231* (MO, NY); Parroquia Jose Victor Izquierdo at "Pupazche," valley of Rio Paute between Paute and Cuenca, 13 Apr 1945, *Camp E-2570* (NY, US); 23.4 km SE Gualacéo near summit of pass, 28 Oct 1988, *Dorr and Barnett 5938* (NY); Páramo Corredores, N. of Zaruma, 10 Sep 1947, *Espinosa E-2226* (F-2 sheets); 21 km W of Sayausid on rd to Parque de las Cajas, 23 Oct 1995, *Funk and Montezuma 11424* (Cuenca, QCA, QCNE, US); 21 km W of Sayausid on rd to Parque de las Cajas, 23 Oct 1995, *Funk and Montezuma 11425, 11425a* (Cuenca, F, QCA, QCNE, US; *11425a* at US only); 5 km W of Soldados on Cuenca-San Joaquin-Angus rd., ca. 100 m up slopes N of rd. toward large laguna, 24 Oct 1995, *Funk and Montezuma 11445* (Cuenca, QCA, QCNE, US); rd from Cuenca to Loja, ca. 18 km S of Cumbe, 27 Oct 1995, *Funk 11457* (Cuenca, QCA, QCNE, US); Sayausid, 16 Apr 1968, *Harling 8328* (F, US); Gualacéo-Limón rd, km 13, 4 Mar 1985, *Harling and Andersson 22703* (MO); ca. 7 km SE Jima on rd towards San Miguel de Cuyes, 27 Apr 1985, *Harling and Andersson 24664* (US); km 85 on Pan American highway N of Loja, 3 May 1973, *Holm-Nielsen 4769* (F, MO, NY, US); along rd to Naranjal, ca. 19 km generally W of Cuenca, 2 Feb 1974, *King 6666* (F, MO, US); along rd to Loja, ca. 7 km generally SE of Cumbe, 4 Feb 1974, *King 6705* (US); along rd to Loja, ca. 6 km generally SE of Cumbe, 4 Feb 1974, *King 6705a* (F, MO); along rd to Loja, ca. 16 km generally S of Cumbe, 5 Feb 1974, *King 6720* (F, MO, US); 15 km S of Cumbe on rd to Loja, 22 Jan 1979, *King and Almeda 7777* (MO, US); Cuenca, "Cunno-Yanghuan", Nov–Dec 1890, *Lehmann 5690* (K); between Huabidula and Cruz Pampa, near La Chorrera, in route Cuenca-Quinua, 21 May 1979, *Ochoa 13360* (US); Las Cajas, 1981, *Oxford Expedition 168* (K); 15.1 km S of intersection of roads to Loja and Girón on rd to Loja, 6 Jul 1992, *Panero and Clark 2938* (US); Las Cajas, Totorococha, 8–11 Sep 1987, *Ramsay et al. 145* (K); Las Cajas, Totorococha—Mazan Valley, 12 Sep 1987, *Ramsay and Merrow-Smith 452* (K); Cumbe-Oña, Paramo, 21 Sep 1987, *Ramsay and Merrow-Smith 609* (K); páramos, in vicinity of Toreadór, between Molleturo and Quinoas, 15 June 1943, *Steyermark 53244* (NY); km 67, S towards Oña, 3 Aug 1943, *Steyermark 53681* (NY). **Bolivar**: Simiatug, Hacienda Talahua, 29 Apr 1939, *Penland and Summers 565* (F). **Cañar**: Nudo de Cordillera Occidental y Cordillera Oriental, entre Chunchí y Cañar, 28 Jul 1959, *Barclay and Juajibioy 8327* (MO, US); vicinity of Cañar, 16 Sep 1918, *Rose and Rose 22751* (NY, US). **Chimborazo**: Alao, cordillera Oriental, 8 Feb 1944, *Acosta Solis 7187* (F); "in decliv. occ. Chimborazo," 7 Jul 1876, *Andre 3940* (K, NY); Hacienda Magna al este de Chunchí, Páramo de Cacheaco, 27 Jul 1959, *Barclay and Juajibioy 8248* (US); Atilio, 29 Jan 1968, *Harling 6692* (US); rd/trail from campsite above Rio Algo (8.5 km from Guardiana Alais by rd from Alao), 20 May 1990, *King and Judziewicz 10172* (MO, US); in paucis andinis, prop. "Pifo", "Dec 96", *Mille 596* (US, NY); ca. 10 km NE of Alao, rd at Cuspipaccha, 6 May 1982, *Ollgaard 38084A* (AAU, US); 40 km SE of Riobamba, Alao Valley, 8 Sep 89, *Ramsay, Evans, and Buckland s.n.* (K); Nevado del Chimborazo, above San Juan, 3 Sep 1964, *Soejarto and Hernández 1368* (US); in andibus Ecuadorensibus, 1857–1859, *Spruce 5478* (NY). **Loja**: Rancho Ovejero, entre Cumbe y Saraguro, 2 Aug 1959, *Barclay and Juajibioy 8517* (US); Páramo de Saraguro, Sep 1864, *Jameson s.n.* (NY-2 sheets, US); Pichig-Fierro Urco rd, km 11 (app. 15 km SW of Saraguro), 22 Jan 1989, *Madsen 85615* (MO); muletrack from Amaluza to Palanda, near pass W of Laguna Chuquiragua, 22 Sep 1976, *Ollgaard and Balslev 9628* (MO, NY); Amaluza, 10–12 km ENE of village near Laguna Negra, 23 Sep 1976, *Ollgaard and Balslev 9773* (MO, NY, US); Paramo de Oña, 16 Oct 1987, *Ramsay and Merrow-Smith 452* (K). **Morona-Santiago**: Gualacéo-Limón rd (General Plaza), 2 Apr 1974, *Harling and Andersson 13100* (US). **Napo**: Antisana, Hacienda del ISCO, Hartweg 1144 (K, P). **Pichincha**: Pichincha, 9 July 1976, *3875 Andre* (K); E of Pichincha, 18 Mar 1930, *Benoist 2183* (P); Rucu Pichincha, 23 Mar 1930, *Benoist 2212* (P); 20 Apr 1930, *Benoist 2424* (P); Andina mont., 27 Apr 1920, *Holmgren 560* (US); páramo between Quito and Baeza near Paso de Guamani, 17 Apr 1973, *Humbles 6318* (MO); Quito, *Jameson 117* (K); Andes of Quito, 21 Jan 1856, *Jameson 276* (K, P); Quito, 1846–69, *Jameson 807* (US); Andes of Quito, *Jameson s. n.* (K); Pichincha, "7-72", *Sodiro s.n.* (W); Paramo del "Puyal", Sep 1838, *Spruce, R. s. n.* (K). **Department Unknown**: 1856, *Jameson s. n.* (P); Pascuis andinis, prope Pifo, Dec 1906, *Mille 596* (K); April 1904, *Rivet 602* (P); April 1904, *Rivet 604* (P).

PERU. **Amazonas**: Chachapoyas Prov., Balsas-Leimebamba road, km 394, 3 Jun 1977, *Boeke 1894* (US); Chachapoyas Prov., camino de Herradura Leimebamba-Balsas, arriba de Pamacocha, 16 Jun 1982, *Fernandez and Clemants 67* (NY); 31 km along rd from Leimebamba SW towards Celendín, 19 Jan 1983, *King and Bishop 9255* (MO, US). **Ancash**: Bolognesi Prov., entre Tallenga y Pachapaque, 17 May 1950, *Cerrate 675a* (US); Bolognesi Prov., entre Llamac y Jahuacocha, 29 May 1954, *Cerrate 2332* (US); Bolognesi Prov., Cerro Manta, arriba de Quero, 19 Apr 1956, *Cerrate 2498* (US); Bolognesi Prov., Parapara, 24 May 1962, *Cerrate 3956* (US); ca. 25 km NE of Yungay, below Laguna de Llanganuco, 28 Jan 1983, *Dillon 3120* (F, US); Santa Prov., Jalca de Ultu-Cruz (Jimbe), 3 May 1987, *Mostacero 1889* (F); Huascaran National Park, Llanganuco Sector, Orconcocha, 28 Jan 1985, *Smith 9429* (MO); Huara Prov., Huascaran National Park, Quebrada Shallap, 20 Feb 1985, *Smith 9699* (F, MO); Huaylas Prov., Huascaran National Park, Quebrada Alpamayo, peak above Lago Jancarurish, 9 Mar 1985, *Smith 9794* (F, MO); Huaylas Prov., Huascaran National Park, Alpamayo-Cashapampa trail, 13 Mar 1985, *Smith 10021* (F, MO, US); Yungay Prov., Huascaran National Park, Llanganuco sector, Quebrada Demanda, 12 Apr 1985, *Smith 10243* (F, MO); environs of Auquispuquio, 9 Apr 1986, *Smith 10283* (F, MO); Huari Prov., Huascaran National Park, Quebrada Rima Rima, a lateral valley of Quebrada Carhuazcancha, 6 May 1986, *Smith 12217* (MO, US); Huari Prov., Huascaran National Park, Quebrada de Yuraccocha, a lateral valley of Quebrada Rurichinchay, 16 Jun 1986, *Smith 12730* (MO); Yungay prov, Huascaran National Park, Lake Llaganuco, 28 Jan 1985, *Stein 2030* (F). **Cajamarca**: Chamis alto, cerro de la Vizcacha, 12 Mar 1986, *Becker and Terrones 687* (US); Sexemayo, antena, 31 Mar 1986, *Becker and Terrones 822* (US); ca. 60 km NE Cajamarca, along rd to Celendín, 4 Jan 1979, *Dillon and Turner 1628* (F, MO); abra "El Gavilan," ca. 15.5 km SSE of Cajamarca on rd to Pacasmayo, 13 Jan 1983, *Dillon 2962* (F); puna, 70 km S of Chota, rd to Cajamarca, 13 Feb 1988, *Gentry 61596* (F); 55 kms NE of Cajamarca along the rd to Celendín, 9 Jan 1983, *King and Bishop 9139* (MO, US); Celendín Prov., Pumarrume, 30 Jul 1985, *Mostacero 1097* (F); San Miguel Prov., Jalca de las Estacas (El Tingo-Calquis), 12 May 1977, *Sagástegui-Alva 8839* (MO); Jalca del Pozo Kuan, 27 Jun 1983, *Sagástegui-Alva 10780* (F); Jalca de Kumulca (Ruta á Celendín), 19 Aug 1984, *Sagástegui-Alva 12260* (F); Pozo Chuno, 30 May 1988, *Sagástegui-Alva 14001* (F); Cumbe Mayo, 28 Apr 1984, *Sánchez Vega 3436* (F); Hualgayoc Prov., Cajamarca-Bambamarca road, pass above Hualgayoc, 17 Feb 1983, *Smith and Vasquez 3511* (MO, NY). **La Libertad**: Otuzco Prov., ca. 14 km E of Agallpampa, ca. 3.5 km E of Motil, 6 Jan 1983, *Dillon 2782, 2783* (F, US); Otuzco Prov., ca. 28 km E of Agallpampa on rd to Huamachuco, 6 Jan 1983, *Dillon 2799* (F); Huamachuco Prov., ca. 20 km W of Huamachuco, 7 Jan 1983, *Dillon 2808* (F); Sanchez Carrion Prov., ca. 10 km N of Laguna Sausacocha, ca. 20 km NE of Huamachuco, 10 Jan 1983, *Dillon 2844* (F, US); Huamachuco Prov., Cacanan, 23 Feb 1967, *Riccio and La Rose 3547* (US); Otuzco Prov., Cerro Sango (Motil-Shorey), 28 Mar 1991, *Sagástegui-Alva 14425* (F). **Pasco**: en la subida hacia las Chulpas de Yarush, 21 Mar 1951, *Ochoa 1125* (US).

2. CHRYSACTINIUM AMPHOTHRIX (S. F. Blake) H. Robinson and Brettell, Phytologia 28: 49. 1974.—*Liabum amphothrix* S. F. Blake, Journal of the Washington Academy of Sciences 17: 290. 1927.—TYPE: PERU. Huanuco: Mito, in deep grass of slopes, 2,745 m, 8–22 Jul 1922, *Macbride and Featherstone 1665* (holotype: F!; isotype: US!; photograph of holotype: F!). Fig. 3.

Small perennial herbs with no reports of milky sap. Stems leafy portions 2–20 cm long, internodes 0.5–2.5 cm long with dense, surpressed arachnoid tomentum. *Leaves* opposite, cauline and basal; blades nearly linear to lanceolate, 3-nervate, 1–6 × 0.3–1.0 cm (including leaf base), base petioliate and attenuate, margins mostly entire, some irregularly dentate, apex callose-apiculate, abaxial surface with dense white to grayish woolly tomentum, adaxial surface with sparse, arachnoid indument that is nearly always deciduous at maturity and sparsely to densely coarsely pilose. *Heads* campanulate, 1–2 cm wide (excluding rays); peduncles erect, 10–30 cm long, gray, covered with sparse to dense arachnoid tomentum, purple-walled trichomes absent; receptacular bracts 1–2 mm long. *Involucral bracts* 40–50 in 5 rows, mostly glabrous, rarely with sparse, arachnoid tomentum; those of outer series ovate to broadly lanceolate, 4–5 × 1.5–2.8 mm, dark brown with brown-purple apex, apex callose-apiculate, margins entire to subentire; those of the inner series narrowly lanceolate to linear, 8 × 1 mm long, yellow with brown tips, apex apiculate, margins entire. *Ray florets* 30–35, corollas 13–19 mm long; tubes 3–4 × 0.33 mm, laminae narrowly elliptic, 9–16 × 1.7–2.5 mm, abaxially pilose, 2–3 lobed; styles 7–8 mm long, style branches 2.0–2.5 mm long. *Disk florets* 30–40, corollas 6.5–7.0 mm long, tubes 3.0–3.5

× 0.25 mm, throats 1.5–2.0 × 0.5–1.0 mm, lobes 2–3 mm long; stamens 3 mm long, thecae 2 mm long, dark gray-black; styles 7–8 mm long, style branches 1 mm long. *Cypselae* (immature), isomorphic, obovoid and somewhat compressed, 2–3 × 1 mm, light to dark brown, pilose; pappus bristles 6 mm long.

Chrysactinium amphothrix is named for the characteristic of having different types of hairs on both surfaces of the leaves (amphi-: on both sides, -thrix: hair). *Chrysactinium amphothrix* is similar to *C. caulescens* in having long leaves and woolly tomentum on the abaxial leaf surfaces, and differs in the intensity of these characteristics, both being much stronger in *C. caulescens*. This species is unique in *Chrysactinium* in that the leaves are more linear in shape, the leaf margins are more subentire, and the abaxial surface of the leaves has a dense, off-white to grayish pubescence. *Chrysactinium amphothrix* grows among rocks and in subtropical grasslands in Peru and Ecuador as well as on sunny, grassy slopes and in open fields. It is found at elevations of 2,700–3,000 m and it has been collected in flower primarily between May and July.

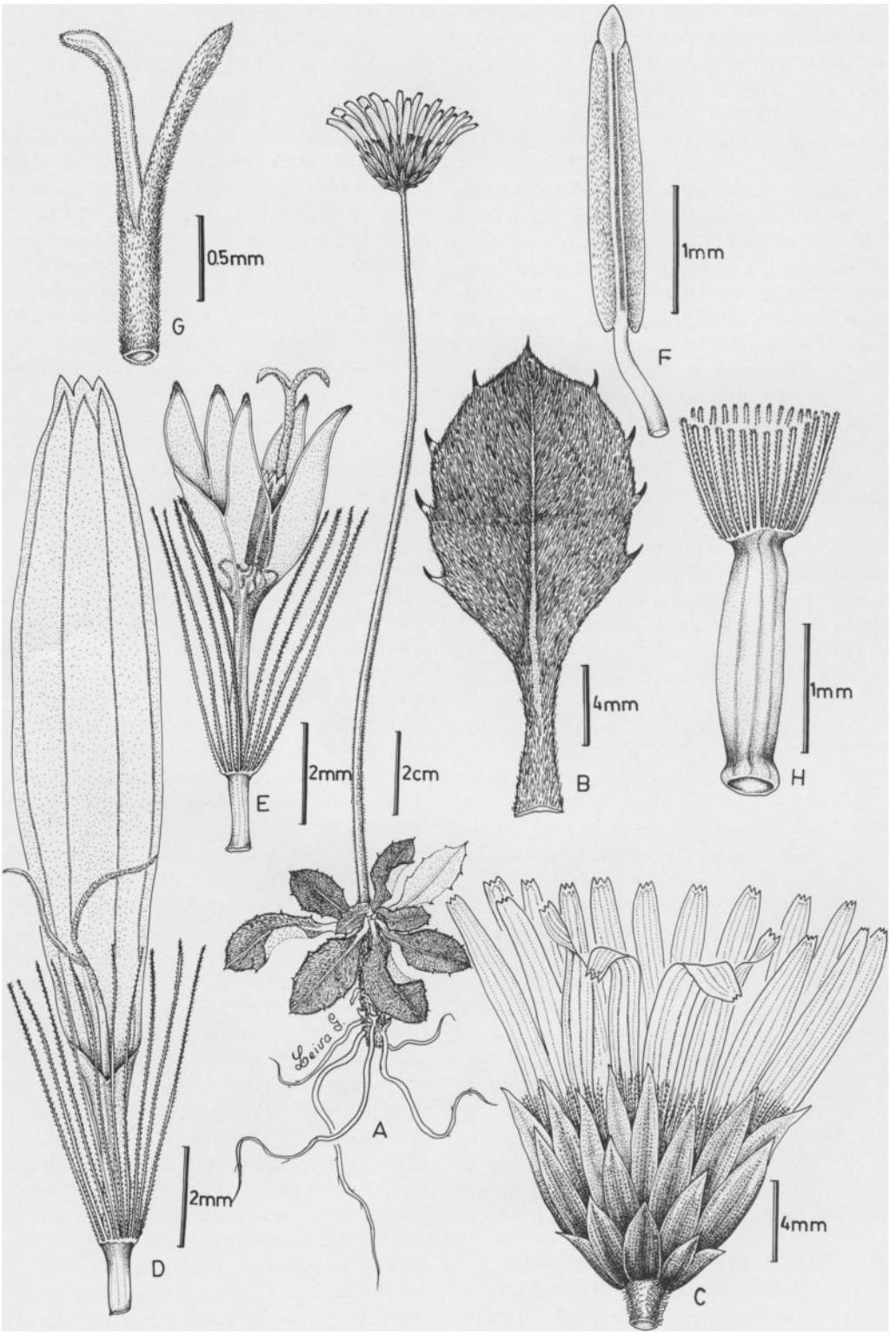
Additional Specimens Examined. ECUADOR. **Azuay**: between Paute and Cuenca, Valley of the Rio Paute, 13 Apr 1945; *Camp E-2570 [coll. by F. Prieto]* (P). **Cãnar:** between Tambo and Suscal, N rim of valley of Rio de Cãnar, 23 Apr 1945, *Camp E-2771* (NY, US).

PERU. **Amazonas**: Chachapoyas Prov., Balsas-Leimebamba rd km 394, 3 Jun 1977, *Boeke 1902* (NY, US). **Ancash**: Huasta Dist., Huampu-cuta, 21 May 1962, *Cerrate 3873* (US). **Cajamarca**: Celendín prov; on rd to Celendín, 31 km E of Cajamarca, 16 May 1964, *Hutchison and Wright 5108* (F, MO, NY, US); Chinchapalca: pueblo 5 miles above Mito, 16–27 Jul 1922, *Macbride and Featherstone 1591* (F, US); "Kumbemayo", *Reichlen 188* (P). **Huanuco**: Mitotambo, arriba de Mito, 24 Jun 1953, *Ferreyra 9481* (US); 15 miles NE of Huanuco, 12–22 Jun 1922, *Macbride and Featherstone 2157* (F, US); Huanuco, April 1863, *Pearce s. n.* (K); Huanuco, Pillao, 14 Feb 1946, *Woytkowski 34051* (F). **La Libertad**: Bolivar Prov.; arriba de Longotea, 27 May 1960, *Lopez and Sagástegui-Alva 3173* (NY); Santiago de Chuco, above Cachicadan, 11 Nov 1938, *Stork and Horton 26330* (F). **Department Unknown**: *Hartweg 766* (K, P).

3. CHRYSACTINIUM BREVISCAPUM Sagást. and M. O. Dillon, Arnaldoa 2: 31. 1994.—TYPE: PERU. Lambayaque: Province of Ferreñafe, District of Incahuasi, Laguna Tembadera-Cerro Negro, jalca, 3,300 m, 12 Sep 1985, *Sagástegui-Alva, Skillman, Mostacero and Ramirez 12820* (holotype: HUT, isotype: F!). Figs. 4, 5.

Small perennial herbs with no reports of milky sap. Acaulescent. *Leaves* of most plants all basal, forming a rosette, internodes not evident except on a few which have very small internodes on side branches; blades ovate, 3-nervate, 1–3 × 0.6–1.2 cm (including leaf base), base petiolate and attenuate, margins remotely denticulate with 3–5 pairs of callous teeth (iliciform), apex acute and callose-apiculate, abaxial surface with dense, white, woolly tomentum, adaxial surface densely coarsely pilose. *Heads* broadly campanulate, ca. 1.5 cm wide (excluding rays); peduncles erect, 10–18 cm long, dark gray/black, arachnoid-tomentum interspersed with purple-walled trichomes; receptacular bracts ca. 3 mm long. *Involucral bracts* 35–40 in 4 rows, glabrous; those of outer series ovate, 3–4 × 1.5 mm, surface with sparse arachnoid tomentum, darker in color and purple tipped, apex acute, margins entire; those of the inner series linear, 10–12 × 1 mm, lightly arachnoid tomentose, lighter in color and purple tipped, apex apiculate, margins entire. *Ray florets* 30–35, corollas 13–14 mm long; tubes 2 × 0.25; laminae linear-elliptic, 10–12 × 2.5–3.0 mm, 3–4-lobed; styles 7–8 mm long, style branches 2.0–2.5 mm long. *Disk florets* 40–45, corollas 4.5–5.5 mm long, tubes 1.5–2.0 × 0.25 mm, throats 1.5–2.0 × 1 mm, lobes 1.25–1.50 mm long; stamens 3 mm long, thecae 2 mm long, black; styles 4–5 mm long, style branches 0.5 mm long, branches usually 2 but sometimes 3 or 4, ca. 1.6 mm long. *Cypselae* (immature) isomorphic, cylindrical, 5–6 mm long, dark brown, densely white setulose; pappus bristles 5–6 mm long.

According to the original species description (Sagástegui-Alva and Dillon 1994) *Chrysactinium breviscapum* "...grows at high elevations near small lakes in the jalca and páramo regions of the Peruvian Andes." The epithet *breviscapum* refers to the brief length of its scape (peduncle), which is somewhat shorter than that in *C. acaule*, its closest relative. *Chrysactinium breviscapum* resembles *C. acaule* in having leaves forming basal rosettes; it differs from *C. acaule* in having a more broadly ovate leaf shape and the shorter scapes. *Chrysactinium caulescens* has also been collected in the Incahuasi region of Peru, but it is easily distinguished from *C. breviscapum* because *C. caulescens* has distinct internodes, longer scapes, and the adaxial surface of the leaves is glabrous at maturity. *Chrysactinium brev-*


0.5mm
G
1mm
F
4mm
B
1mm
H
2mm
E
2cm
2mm
D
A
4mm
C

iscapum is known only from the type collection and it is possible that once this species is collected again and its morphology better understood it may be placed in synonomy with *C. acaule.*

4. CHRYSACTINIUM CAULESCENS (Hieron.) H. Robinson and Brettell, Phytologia 28: 50. 1974.—*Liabum caulescens* Hieron., Botanische Jahrbücher für Systematik 36: 500. 1905.—TYPE: PERU. Cajamarca: between Chota and Cutervo, Jun 1879, *Jelski 727* (holotype: B, destroyed; lectotype here selected: KRA!; photograph of B: NY!, US!). Fig. 3.

Chrysactinium bicolor (S. F. Blake) H. Robinson and Brettell, Phytologia 28: 49. 1974.—*Liabum bicolor* S. F. Blake, Journal of the Washington Academy of Sciences 17: 290. 1927.—TYPE: ECUADOR. Loja: mountains, Sep 1864, *Jameson s.n.* (holotype: US!).

Small herbaceous plants with no reports of milky sap. Stems sometimes branching, leafy portions 10–20 (–30) cm long, internodes 0.5–4.0 cm long with dense, surpressed arachnoid tomentum. *Leaves* forming a rosette, mostly basal; blades narrowly obovate, narrowly rhombic, or lanceolate, 3-nervate, 2–7 × 1.0–1.5 cm (including leaf base), base petiolate and attenuate to slightly expanded, margins subentire to entire, very rarely dentate, apex callose-apiculate, abaxial surface with dense, off-white woolly tomentum, adaxial surface sometimes with arachnoid tomentum when young, glabrate when mature, both surfaces lacking coarse pilose indument. *Heads* narrowly campanulate, 1.5 cm wide; peduncles erect to slightly decumbent, 15–30 cm long, grayish brown, covered with arachnoid tomentum interspersed with purple-walled trichomes; receptacular bracts 1–2 mm long. *Involucral bracts* 40–60 in 5 rows, inner and outer rows similar, brownish-orange lighter at the base grading to darker at the apex, glabrous; outer bracts narrowly triangular, 3–4 × 0.75–1.25, apex acute; inner bracts linear to narrowly lanceolate, 8–10 × 0.75–1.25 mm, apex acuminate. *Ray florets* 30–35, corollas 14–20 mm long; tubes 3–5 × 0.25 mm, laminae narrowly elliptic, 10–12 × 1.0–1.3 mm, 3-lobed; styles 6–8 mm long, style branches 2.0–2.5 mm long. *Disk florets* 50–60, corollas 6.5–8.0 mm long, tubes 3–4 × 0.25 mm, throats 2 × 1 mm, lobes 2–3 mm long; stamens 3 mm long, thecae 2–3 mm long, dark gray; styles 6.0–8.5 mm long, style branches 0.75 mm long. *Cypselae* isomorphic, cylindrical, 2 × 0.75 mm, dark brown, pilose; pappus bristles 4–6 mm long.

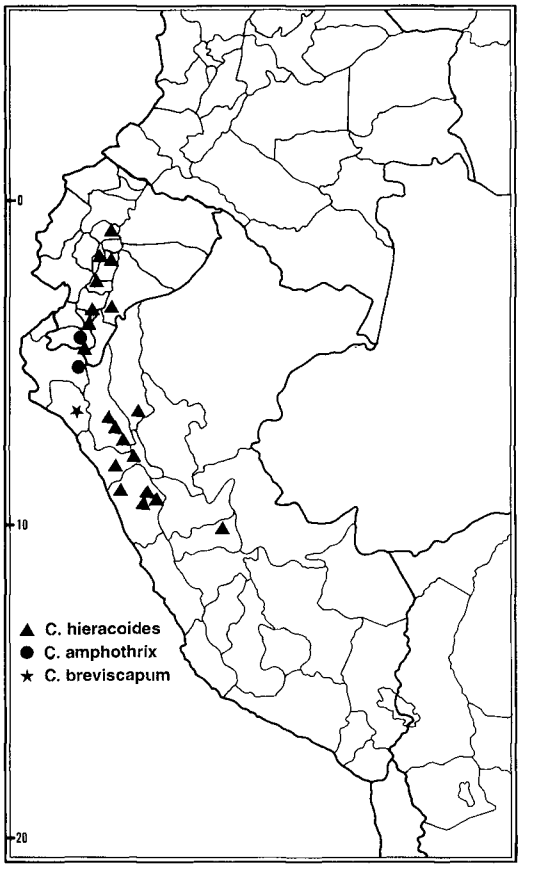


FIG. 5. Species distribution map for *Chrysactinium acaule, C. wurdackii,* and *C. caulescens.*

Chrysactinium caulescens grows on dry shrubby hillsides in clay soils in páramos. The epithet *caulescens* is derived from the characteristic presence of a stem. *Chrysactinium caulescens* has been collected in Ecuador and Peru at elevations between 2,400–3,200 m and flower most often during September.

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FIG. 4. *Chrysactinium breviscapum* Sagast. & M. O. Dillon. A. Habit. B. Leaf. C. Capitulum. D. Ray floret corolla and style. E. Disk floret corolla and style. F. Stamen. G. Style branches of disk floret. H. Cypsela (not showing setulae). All based on *Sagástegui-Alva, Skillman, Mostacero & Ramirez 12820,* (HUT). Drawing by S. Levia Gonzáles.

Chrysactinium caulescens is similar to *C. amphothrix* in having decurrent leaf bases, and is distinguised from *C. amphothrix* by the lack of coarse pilose indument on the adaxial surfaces of the leaves and the larger number of disk florets (*C. amphothrix* = 30–40, *C. caulescens* = 50–60).

Additional Specimens Examined. ECUADOR. **Loja**: Bosque "La Mira," Hcda. La Hamaca, Catacocha, 17 Apr 1944, *Acosta Solis 7928* (F); Cajaimina, S of Loja, 7 May 1946, *Espinosa E-322* (F, NY); Chepel, NE Zaruma between Pamaya and Tioloma, 30 Aug 1947, *Espinosa E-2018* (F-2 sheets); rd to and within 1 km from top of Cerro Villanaco, 17 Jan 1981, *Luteyn and Clemants 7991* (F, NY, US). **Department Unknown**: 25 May 1905, *Rivet 775* (P).

PERU. **Amazonas**: Chachapoyas, 1835, *Mathews 1393* (K); Chachapoyas, 1835, *Mathews s. n.* (K); Chachapoyas, 1936, *Mathews s. n.* (K). **Piura**: Cuello del Indio, ruta Huancabamba, 13 Sep 1981, *Lopez et al. 8886* (US); top of western cordillera opposite Huancabamba, 26 Sep 1911, *Townsend A212* (F). **Department Unknown.** *Hartweg s.n.* (NY).

Country Unknown. Ecuador and Peru, paramos, 30 Jan 1977, *Vidal-Sénège 4800* (P).

5. CHRYSACTINIUM HIERACIOIDES (Kunth) H. Robinson and Brettell, Phytologia 28: 50. 1974.—*Andromachia hieracioides* Kunth in A. von Humboldt, A. J. Bonpland, and C. S. Kunth, Nova Genera et Species Plantarum, ed. folio, 4: 77. 1818.—*Liabum hieracioides* (Kunth) Less., Linnaea 6: 699. 1831.—TYPE: ECUADOR. Loja: crescit locis siccis temperatis prope Loja Quitensium, 1060 hex, Jul 1816, *Bonpland 3329* (holotype: B, destroyed; lectotype here selected: P-Bonpl.!; photograph of holotype: MO! US-2 sheets!). Fig. 5.

Small herbaceous plants with milky sap present. Stems varying in length, leafy portions 0–10 cm, internodes 0–4 cm long with dense, surpressed, arachnoid tomentum. *Leaves* opposite, rarely some forming appearance of basal rosette; blades mostly lanceolate to narrowly ovate, 3-nervate, 2–9 × 0.8–3.1 cm (including base), base petiolate and attenuate to decurrent, margins irregularly subentire to deeply dentate (iliciform), apex callose-apiculate, abaxial surface with dense, off-white, woolly tomentum, adaxial surface covered with scattered to dense coarse pilose indument and little if any arachnoid tomentum. *Heads* campanulate, 1.5–2.5 cm wide (excluding rays); peduncles erect, 15–25 (–40) cm long, golden orange, covered by dense, arachnoid tomentum with or without purple-walled trichomes; receptacular bracts 2–3 mm long. *Involucral bracts* 50–70, in 4 or 5 series, scabrous, mostly glabrous but some with scattered light arachnoid tomentum especially on outer bracts or near apex; those of outer series elliptic to widely elliptic, 3–5 × 1–2 mm long, green with purple tips, entirely dark purple, or brown with orange tips and borders, apex acute with interpersed arachnoid tomentum, margins subentire; those of the inner series narrowly lanceolate to narrowly triangular, 8–12 × 1 mm, yellow with brown tips, green with dark purple tips on the distil half, or pale yellow with brown-orange tips, apex apiculate, margins subentire, sometimes purple-brown. *Ray florets* 40–50, corollas 12–15 mm long, tubes 3–4 × 0.25 mm, laminae linear to lanceolate, 10–12 × 1.5–1.75 mm, 3-lobed; styles 6–8 mm long, style branches 1.75–2.00 mm. *Disk florets* 50–60, corollas 6–8 mm long, tubes 2.5–3.5 × 0.25 mm, throats 1.75–2.25 × 1.25 mm, lobes 2 mm long; stamens 3 mm long, thecae 2–3 mm long, dark gray/brown; styles 7–8 mm long, style branches 0.75 mm long. *Cypselae* isomorphic, cylindrical, 2–5 × 1 mm, dark brown, hispid; pappus bristles 4–5 mm long.

Chrysactinium hieracioides grows in moist soils, along ravines, and on dry north-facing slopes. It is named for its resemblance to the genus *Hieracium* (Compositae: Lactuceae). It has been collected in the Andes at elevations of 2,800–3,200 m and is distributed from the Province of Cañar in southern Ecuador to Ancash in central Peru. It has been most frequently collected along the road from Cajamarca to Celendín. It appears to flower throughout the year but more often between January to May, peaking in January.

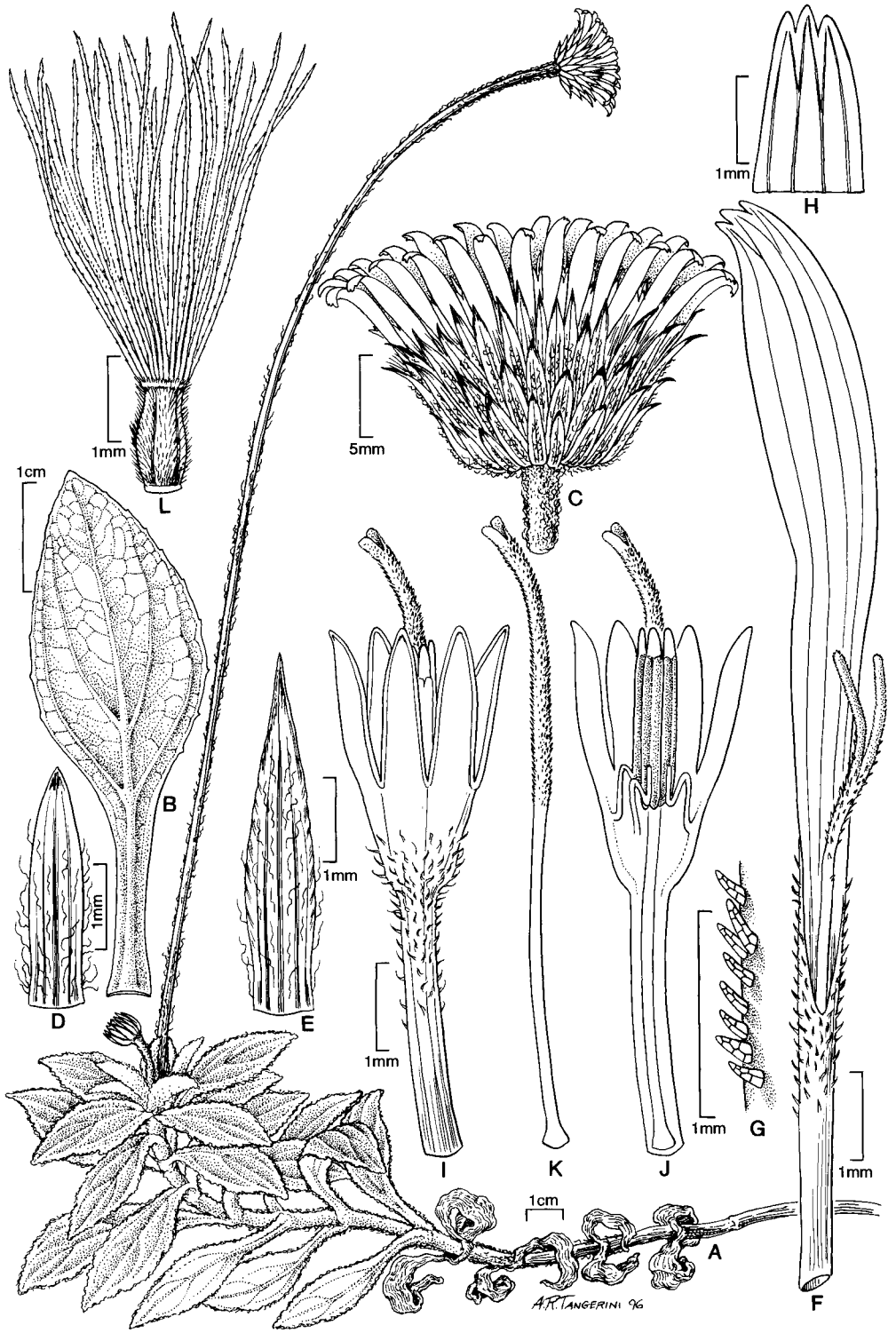
Examples of nearly all of the variability found in *Chrysactinium hieracioides* can be found in the northern Peruvian Province of Cajamarca. Head sizes in Cajamarca populations vary in diameter from 1–3 cm (excluding rays), the internodes vary from near zero up to 4 cm in length, the peduncles may lack the purple-walled trichomes, the leaf sizes vary from 4 to 9 cm in length and 0.8 to 1.2 cm in width, the leaf margins range from subentire to sharply toothed, and involucral bract coloration is extremely variable (the inner bracts can be green with a dark purple distil half, or pale yellow with brownish-orange tips, or brown with orange borders).

Chrysactinium hieracioides resembles *C. amphothrix* and can be distinguished from it because *C. hieracioides* usually has sharply toothed (iliciform)

leaves, whereas C. *amphothrix* has entire or subentire leaves.

Additional Specimens Examined. ECUADOR. **Azuay**: Pan-American Highway 65–70 km S of Cuenca, 3 Jan 1981, *Balslev 1424* (F, NY); along Río Matadero, W of Cuenca, 3 Mar 1945, *Camp E-1967* (F, NY, US); Cuenca-Girón rd, 10 km N of Girón, 2 Apr 1968, *Harling et al 7985* (MO, US); Cumbe, 22–24 Apr 1968, *Harling et al. 8696* (US); Cuenca-Cumbe rd, 4 Jun 1942, *Haught 3349* (F, US); along rd to Loja, ca. 6 km generally SE of Cumbe, 4 Feb 1974, *King 6701* (MO, US); 42.3 km S of the intersection of the roads to Loja and Girón on rd to Loja, 6 Jul 1992, *Panero and Clark 2942* (US); near Lago Zurru Cuchu, 13 Mar 1953, *Prescott 831* (NY); 70 km S Cuenca on rd to Oña, 31 Dec 1976, *Simpson 8522* (US). **Cañar**: near San Marcos, 5–8 km NE Azogues, 1 Apr 1945, *Camp E-2476* (NY, US). **Chimborazo**: Daldal Valley, 10 km E of Licto, 17 July 1987, *Ramsay and Merrow-Smith 52* (K). **Cotopaxi**: Cordillera Occidental, Páramo de Apagua between Zumbaqua and Pilalo, 18–19 Jul 1959, *Barclay and Juajibioy 8079* (MO-2 sheets, US). **Loja**: N of Loja, 4 Jun 1946, *Espinosa E-65* (F); Jipiro, 5 km NE of Loja, 3 Jun 1947, *Espinosa E-1353* (F, NY); Haico-Pamba, 55 km S of Loja, 2 Aug 1948, *Espinosa E-2335* (F); Loja-Zaruma rd, between Chinches and Sambi, 3 May 1974, *Harling and Andersson 14254* (US); Celica-Guachamana rd, km 8 at the Roldos memorial monument, 19 Feb 1985, *Harling and Andersson 22248* (US); Hills near Loja, 8 Sep 1865, *Jameson 30* (K); Cerro de Celica, Celica-Guachauamá, km 14, 15 Apr 1994, *Jorgenson 258* (US); 2 km N of Chinchas on rd to Piñas, 4 Feb 1979, *King and Almeda 7962* (US); vicinity of Las Juntas, 29 Sep 1918, *Rose et al 23222* (US). **Pichincha**: camino Yanacocha en faldas norte de Cerro Pichincha, 3 Jun 1982, *Balslev 2680* (F). **Department Unknown**: 30 Oct 1876, *André 4328* (K); *Jameson s.n.* (US); Andes, 1857–9 (1861) *Spruce s. n.* (P).

PERU. **Amazonas**: along rd ascending mountain SE of Chachapoyas, 14 Jan 1983, *King and Bishop 9200* (MO, US); 40 km along rd from Leimebamba SW towards Celendín, 19 Jan 1983, *King and Bishop 9245* (MO, US); Río Utcubamba valley, 23 km along rd S of Tingo, 21 Jan 1983, *King and Bishop 9273* (MO, US); Chachapoyas, 1840, *Mathews 305b* (K); Chachapoyas, 1836, *Mathews s. n.* (K); Balsas-Leimebamba road, 21 Feb 1984, *Smith 6078* (F, MO); Marañon river valley, Chachapoyas-Celendín rd, cerro Calla-Calla, 27 May 1984, *Smith 7228* (US); Leimebamba, 8 Dec 1962, *Woytkowski 7710* (MO); Puma-urcu, SE of Chachapoyas, 7 Jun 1962, *Wurdack 793* (P, US); Prov. de Bongará, along Shipasbamba-Pomacocha trail, 29 Jun 1962, *Wurdack 1113* (F, K, P, US); Chachapoyas Prov., upper slopes and summit of Cerro Yama-uma above Taulia, 12–15 km S-SE of Molinopampa, 11 Aug 1962, *Wurdack 1677* (US). **Ancash**: Bolognesi Prov., Matarragra, Cerro al NE de Chiquián, 8 Apr 1949, *Cerrate 008* (US); Bolognesi Prov., Capillapunta, arriba de Chiquián, 14 Apr 1949, *Cerrate 157* (US); Bolognesi Prov., Cashapata, 16 Apr 1949, *Cerrate 252* (US); Bolognesi Prov., Casca, abajo de Chiquián, 9 May 1950, *Cerrate 508* (US); Bolognesi Prov., camino Pampan San Isidro, Distrito Huasta, 12 Apr 1961, *Cerrate 3723* (US); Bolognesi Prov., Matarragra, Cerro al NE de Chiquián, 8 Apr 1949, *Ferreyra 5586* (US); arriba de Chiquián, 14 Apr 1949, *Ferreyra 5713* (US); Casca, abajo de Chiquián, 9 May 1950, *Ferreyra 7312* (MO, US); Huaylas Prov., Huascaran National Park, Paron valley, at lake, 1 Jan 1985, *Smith and Goodwin 8917* (MO). **Cajamarca**: Corisorgona, 8 Apr 1986, *Becker and Terrones 950* (US); Chetilla, Camino Llullapuquio, 21 May 1986, *Becker and Terrones 1202* (US); Maymay, canal de la laguna, 4 Feb 1987, *Becker and Terrones 1674* (US); ca. 31 km NE of Cajamarca, along rd to Celendín, 4 Jan 1979, *Dillon and Turner 1581* (F); ca. 6.5 km SW Cajamarca, 12 Jan 1983, *Dillon, et al. 2903* (F, K, MO, NY, US); Abra "El Gavilan," ca. 15.5 km SSE Cajamarca on rd to Pacasmayo, 13 Jan 1983, *Dillon 2961* (F, NY, US); ca. 32 km NE of Cajamarca, ca. 13 km W La Escañada, 15 Jan 1983, *Dillon 2968* (F, NY); ca. 22.5 km S Cajamarca on rd to Chilete, 19 Jan 1983, *Dillon 3031* (F, NY); Contumazá Prov., Bosque Cachil, 17 May 1993, *Dillon 6496* (F); Cumbre El Gavilan, carretera Cajamarca-Chilete, 31 Mar 1948, *Ferreyra 3274* (MO); 31 km E Cajamarca, rd to Celendín, 16 May 1964, *Hutchison and Wright 5107* (F, MO, NY, US); gorge of Rio Marañon, 3–4 km below summit on rd between Celendín and Balsas, 21 May 1964, *Hutchison and Wright 5227* (F, K, MO, NY, P, US); 9 km N along rd from Cajamarca to Bambamarca, 8 Jan 1983, *King and Bishop 9113* (F, MO, US); 30 km NE Cajamarca along rd to Celendín, 9 Janary 1983, *King and Bishop 9128* (MO, US); 4 km N of Banos del Inca along Cajamarca-Celendín rd, 7 Mar 1988, *Panero 1130* (US); Las Campanillas (Guzmango), 23 May 1978, *Sagástegui-Alva 9157* (F, US); Contumazá Prov., alrededores de Guzmango, 2 Apr 1981, *Sagástegui-Alva 9673* (F); alrededores del Pozo Kuán, 13 Jun 1981, *Sagástegui-Alva 10064* (F, MO, NY, US); arriba de Lleden, 28 Jun 1983, *Sagástegui-Alva 10815* (F-2 sheets, MO); Cajamarca, 1 Apr 1967, *Sánchez Vega 290* (F); Hacienda Polloquito, Namora, 9 Apr 1967, *Sánchez Vega 304* (F); Quebrada de la Esper-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anza, sobre carretera a Cumbe Mayo, 3 Apr 1984, *Sánchez Vega 3268* (F); Chetilla dist., ruta a Llullapuquio, 21 May 1986, *Sánchez Vega 4112* (F). **La Libertad**: Ca. 14 km E of Agallpampa, ca. 3.5 km E of Motil, 6 Jan 1983, *Dillon 2788* (F); 5–8 km WNW Huamachuco, trail to Marcahuamachuco ruins, 8 Jan 1983, *Dillon 2815* (F, US); Otuzco Prov., Camino "Piedra la chunga" milluachaqui, 3 Jun 1990, *Leiva 71* (F); abajo de Shitahuara (camino San Andres de Carcel), 16 May 1991, *Leiva 303* (F); Otuzco Prov., Chanchacap-Agallpampa, 24 May 1984, *Sagástegui-Alva 11672* (F, MO, NY, US); Cerro La Batica (Cachicadan), 14 Jun 1984, *Sagástegui-Alva 11864* (F). **Lambayeque**: Ferreñafe, ca. 7 km NW of Incahuasi, near Cerro Punamachay on trail to Laguna Hualtaco, 16 Nov 1984, *Dillon and Skillman 4113* (F); Incahuasi, 22 Jun 1986, *Llatas Quiroz 1957* (F); Incahuasi, 13 Sep 1985, *Sagástegui-Alva 12878* (F). **Piura**: Huancabamba Prov., La Cruz, 4 June 1961, *Acleto 336* (US); 162 km along rd from Jaen W to Chiclayo, 24 Jan 1983, *King and Bishop 9307* (US).

Country Unknown. Ecuador and Peru, 1876–1877, *Vidal-Sénège s. n.* (P-2 Sheets).

6. CHRYSACTINIUM WURDACKII M. F. Zermoglio and V. A. Funk, BioLlania, Edición Especial No. 6: 568–569. 1997.—TYPE: PERU. Amazonas: Province of Chachapoyas, Quebrada Molino, 5 km below Chachapoyas, 2,200–2,400 m, open grassy knoll, flowers orange-yellow, 5 Jun 1962, *Wurdack 746* (holotype: US!). Unicate. Figs. 5, 6.

Small herbaceous perennials with no reports of milky sap. Stems leafy portions 10–20 cm long, internodes 4–12 mm long with dense, surpressed arachnoid tomentum. *Leaves* opposite; blades mostly rhombic, some narrowly elliptic, 5-nervate with 2 pairs of secondary veins, 3.5–4.0 (including leaf base) × 1 cm, base petiolate and attenuate to slightly expanded, margins subentire, rarely shallowly lobed, apex rounded-acute, abaxial surface covered with creamy white, dense tomentum, adaxial surface with some arachnoid tomentum when young, glabrate when mature, no coarse pilose indument. *Heads* broadly campanulate, 1.0–1.5 cm wide (excluding rays); peduncles somewhat decumbent, 18–40 cm long, golden orange, with sparse arachnoid tomentum and scattered purple-walled trichomes; receptacular bracts ca. 3 mm long. *Involucral bracts* 40–50 in 5 rows, inner and outer rows similar with sparse, arachnoid tomentum or glabrous, margins entire to sub-entire; those of outer series lanceolate, 3.5–6.0 × 0.75 mm, green with dark purple borders at and near the apex, apex acute; those of the inner series linear-lanceolate, 6–10 × 1 mm, green, rarely purple at distal portions, apex acuminate. *Ray florets* 30–40, corollas 14 mm long, tubes 3 × 0.25 mm, laminae linear-lanceolate, 11 × 1.25 mm, 3-lobed; styles 7.5 mm long, style branches 1.75–2 mm long. *Disk florets* 30–40, corollas 6–7 mm long, tubes 3 × 0.3 mm, throats 1.5 × 1 mm, lobes 3 mm long; stamens 2.5–3.0 mm long, thecae 1.5–2.0 mm long, light gray to light olive green; styles 8 mm long, style branches 0.4 mm long. *Cypselae* (immature) isomorphic, cylindrical, 1.0–1.5 mm long, orange near pappus becoming dark brown near base, ribs 8, pilose; pappus bristles 3–5 mm long.

Chrysactinium wurdackii was named in honor of John J. Wurdack (US) (1921–1998), an expert in the Melastomataceae who has worked in the Compositae family in the past, and who collected the holotype. The species is known only from two collections in the Peruvian department of Amazonas. Information on the ecology is available only from the holotype label.

The specimens of *Chrysactinium wurdackii* were previously identified as *C. caulescens* because they have the same type of heavy tomentum covering the abaxial leaf surfaces. However, the new species can be distinguished by its distinct 5-nervate leaves, a characteristic not present in any other species of the genus.

Additional Specimen Examined. PERU. **Amazonas**: entre donila y Cohechan, Jun 1952, *Soukup 4125* (F).

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FIG. 6. *Chrysactinium wurdackii* M. F. Zermoglio and V. A. Funk. A. Habit. B. Leaf. C. Head. D. Outer involucral bract. E. Inner involucral bract. F. Ray floret corolla and style. G. Hairs on tube of ray floret. H. Apex of ray corolla. I–J. Disk corolla. K. Style of disk floret. L. Cypsela and pappus. All based on *J. J. Wurkdack 746* (US). Drawing by A. Tangerini (US).

le and *C. wurdackii*. John Strother, Fred Barrie, and an anonymous reviewer provided helpful comments and recommendations. Michael Dillon (F) kindly allowed us to use the original of the illustration of *C. breviscapum*. We also thank the National Museum of Natural History Research Training Program, the Smithsonian Scholarly Studies Program, and The National Geographic Society, for funding and support. The staff and students in the Herbarium at the University of Cuenca, in the Ecuadorian Province of Azuay, provided invaluable assistance to Funk when she collected specimens of *Chrysactinium*. The following herbaria assisted by loaning material: F, KRA, MO, and NY. The herbaria of QCA and QCNE provided assistance in Quito, and of course, as usual, the staff at Kew (K) and Paris (P) were most generous with their time and allowed Funk to work late and on the weekends. Without the help of our fellow institutions, in the Americas, Europe, and the United Kingdom, this type of work would not be possible.

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