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# TAXONOMY OF THE *PYRROCOMA HIRTA* GROUP (ASTERACEAE: ASTEREAE)

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## ABSTRACT

Taxa recognized mostly as varieties of *Pyrrocoma hirta* are treated here at specific rank, as *P. hirta* (A. Gray) Greene, *P. sonchifolia* Greene, and *P. lanulosa* Greene. Morphological distinctions are subtle but consistent and each species has a discrete geographical range, allopatric with the others. A lectotype is designated for *Haplopappus hirtus*.

Mayes (1976) presented evidence justifying the recognition of *Pyrrocoma* at generic rank, and subsequent molecular studies (e.g., Brouillet et al. 2009) have confirmed that it is distinct. It is placed as the northernmost member of the Xanthocephalum group of subtribe Machaerantherinae (Nesom 2020), closely related to *Isocoma, Rayjacksonia, Stephanodoria*, and *Xanthocephalum* (x=6 species, and perhaps also to *Grindelia* and *Hazardia*). The species were identified as *Haplopappus* by Hall (1928) and kept in that genus by Ferris (1960), Hitchcock and Cronquist (1973), Cronquist (e.g., 1984), and Welsh et al. (2015), but recent floristic treatments have accepted the validity of *Pyrrocoma* as a genus.

Fifty years after Hall's *Haplopappus* monograph, Mayes made few taxonomic changes and recognized no new taxa. Thirty years after that, the FNA account of *Pyrrocoma* (Bogler 2006) "largely follows the works of Hall and Mayes," as noted by its author. In the nearly 100 years since Hall's study, and the 50 years since Mayes, many new collections have been made, warranting a reexamination of the taxonomy.

Many species of *Pyrrocoma* were early recognized by Greene (1894), Rydberg (1900), and others, but only two new taxa have been described since Hall (Keck 1958; Goodrich 2024). The dissertation by Mayes was not published and technical nomenclatural changes required to incorporate names into *Pyrrocoma* were made by Kartesz and Gandhi (1991) and Brown and Keil (1992), mostly following Mayes's concepts.

Many morphologically and geographically discrete entities were recognized and mapped by Mayes (1976), who treated 19 varieties in 13 species, using "data from field studies, cytology, flavonoid chemistry, morphology, geography, and ecology." Hall's revision of *Haplopappus* had included sect. *Pyrrocoma* with 35 subspecies in 10 species. Neither Hall nor Mayes recognized new taxa, finding earlier names (especially from E.L. Greene) for all of them. Both authors treated as conspecific those taxa sharing distinctive similarities and with small degrees (subjectively) of morphological difference — examples of taxonomic rationale from Mayes (1976) follow:

"I have been unable to find yet other consistent differences [other than vestiture] between this variety and the largely allopatric var. *lanceolata* and therefore treat it at the varietal level." p. 93

"The two varieties reportedly retain their differences when grown together in transplant gardens (Hall 1928), and while I have found no intermediate forms either among herbarium material or in nature, I deem the characters insufficient for more than varietal distinction." p. 94

"Because of the number of characters involved, I too accord the taxon specific rank." p. 98

"Were it not for the constancy of its achenial and phyllary characters and its geographical isolation, the variety would probably be considered no more than a minor variation or race." p. 103

"This variety [of *P. uniflora*] differs from var. *uniflora* in its more elongate involucre, unequal phyllaries, floccose-tomentose pubescence, and geographical isolation." p. 123

Mayes's taxonomic approach has been continued for the most part by botanists who have adopted his treatment. Taxa in such 'species complexes," however — which are morphologically discrete in at least one feature, geographically discrete, and usually allopatric with the closely similar entities — are justifiably recognized at specific rank.

Many chromosome counts were made and reported in the dissertation by Mayes, and others have been published by Solbrig et al. (1964, 1969), Taylor and Brockman (1966), Anderson et al. (1974), and Semple (1980, 1985). In some cases, these have been helpful in the interpretation of variation patterns.

The study here is the first in a series of forthcoming studies to reevaluate *Pyrrocoma* taxonomy — many more species are recognized than in previous accounts. Some are previously undescribed but many have been previously named and subsequently unrecognized. All names and types have been studied. To cover the broad taxonomic territory, I have relied heavily on specimen images, most of which are at relatively high resolution and show diagnostic features, and personal study (so far) at MO, PH, TEX-LL, and US. Loans (to TEX and PH) have been critical. Many *Pyrrocoma* collections have been made in Canada but few images are available — critical information is lacking in my study of *P. lanceolata* and *P. uniflora* from this area.

Variation in *Pyrrocoma* is complex, and my taxonomic hypotheses are an attempt to understand the evolutionary patterns and point out instances where population systems, some with narrow distributions, have been invisible to science and surely are in need of conservation. Many taxa are in need of further taxonomic study and clarification.

#### Taxonomy of the Pyrrocoma hirta group

Plants included within *Pyrrocoma hirta* (as var. *hirta*, var. *lanulosa*, var. *sonchifolia*) by Mayes (1976), and as followed by Bogler (2006) and others, are from the northwestern USA (Map 1) and are distinct in their vestiture of glandular hairs and non-glandular hairs (as villous to hirsute), lack of fibrous remnants of the basal leaf petiole bases, clasping to subclasping cauline leaves, serrate leaf margins, loosely racemiform to subcorymboid/loosely paniculate inflorescence, and phyllaries in 2-3(-4) series usually of equal to subequal length. These plants mostly occur at 3500-8150 feet elevation in non-saline habitats, although *P. lanulosa* has been recorded from saline habitats.

Distinctions among these entities might be viewed as largely quantitative, but each of the three population systems is distinct in morphology and clearly defined in geographical distribution. Each is recognized at varietal rank in Giblin et al. (2018) and Chambers (2020), mostly following distinctions made by Mayes, but a name at specific rank is available for each and is used here.

## Key to the taxa of *Pyrrocoma hirta* sensu lato

- 1. Glands stipitate on stiffly erect hairs, non-glandular vestiture cottony-villous or hirsute; inner phyllaries without a raised/convex mid-region; basal leaves often spatulate, the blade abruptly contracted to the petiole.
  - 2. Non-glandular vestiture sparsely to moderately cottony-villous, non-glandular hairs long, loose and irregularly oriented; phyllaries in 2(–3) series, all of even width ...... **Pyrrocoma sonchifolia**

*Pyrrocoma sonchifolia* is distinct in its cottony-villous vestiture and few, linear phyllaries lacking a distinct green patch. It is similar to *P. hirta* in its vestiture of stipitate glands. *Pyrrocoma lanulosa* is distinct in its sessile glands and lanulose non-glandular vestiture, tendency for more heads per stem, tendency for keeled inner phyllaries, and a more distinctly defined green patch on the phyllaries, the phyllaries often unequal in length.



Map 1. Distribution of *Pyrrocoma hirta* sensu lato. See Map 2 for details of *P. hirta* and *P. lanulosa* allopatry in Grant Co., Oregon.

 PYRROCOMA SONCHIFOLIA Greene, Leafl. Bot. Observ. Crit. 2: 18. 1909. Haplopappus hirtus subsp. sonchifolius (Greene) Hall, Publ. Carnegie Inst. Wash. 389: 125. 1928. Haplopappus hirtus var. sonchifolius (Greene) Peck, Man. Higher Pl. Oregon, 713. 1941. Pyrrocoma hirta var. sonchifolia (Greene) Kartesz & Gandhi, Phytologia 71: 60. 1991. TYPE: Washington. [Yakima Co.]: Washington Territory, Yakima region, 1882, T.S. Brandegee "111 and 140" [on the single US label] (holotype: US 127879; isotype: UC-as cited by Mayes 1976). A collection number was not specified in the protologue.

Pyrrocoma foliosa Greene, Leafl. Bot. Observ. Crit. 2: 18. 1909 [not Pyrrocoma foliosa Torr. & Gray 1845 = Oonopsis fremontii; not Pyrrocoma foliosa Phil. 1858 = Haplopappus multifolius]. LECTOTYPE (Hall 1928): Washington. [Kittitas Co., headwaters of the Naches River]: label no locality data except "Washington," 1889, G.R. Vasey 505 (US). Vasey 506 (US) also is labeled simply as "Washington."

<u>Greene's protologue</u>: "collected somewhere in the Territory of Washington, by G.R. Vasey, in 1889; sheets 296812 [*Vasey 506*] and 296811 [*Vasey 505*] of U.S. Herb., the former, monocephalous, the latter with 3 or 4 heads and these smaller." A list of Vasey's 1889 collections (Piper 1938) does not include the two pyrrocomas, but otherwise, numbers 503-512 were collected at the "headwaters of Natches [Naches] River," which is in northwestern Kittitas County.

*Pyrrocoma sonchifolia* is distinct in its finely cottony-villous vestiture, relatively large heads, large basal and cauline leaves, and congested cauline leaves — it is endemic to central Washington. Multiple collections have been made in Kittitas County, but the type collection was made in Yakima County and another early collection was made from Chelan County — <u>Yakima Co.</u>: Yakima region, 1882, *Brandegee 111* and *140*, as on the label (US, the holotype). <u>Chelan Co.</u>: Wenatchie region, high mesas, Aug 1883, *Brandegee 840* (GH, NY, US) and *Tweedy 944*, as on the label (NY). Figures 1-4.

A remarkable habital resemblance exists between *Pyrrocoma sonchifolia* and *P. radiata* Nutt. (Fig. 5) of east-central Oregon and adjacent Idaho, but morphological details indicate that they are not closely related within the genus.

2. PYRROCOMA HIRTA (A. Gray) Greene, Erythea 2: 69. 1894. *Haplopappus hirtus* A. Gray, Synopt. Fl. N. Amer. 1(2): 127. 1884. *Aster grayanus* Kuntze [nom. nov., not *Aster hirtus* Scop 1771], Rev. Gen. 1: 316. 1891. *Hoorebekia hirta* (A. Gray) Piper, Contr. U.S. Natl. Herb. 11: 560. 1906. LECTOTYPE (designated here): Oregon. Baker Co.: Blue Mts, Upper Burnt River, Jul 1881, W.C. Cusick 951 (GH; isolectotypes: F, NY, OSC, UC, US).

<u>Protologue</u>: "Baker Co., Oregon, *Cusick*. Washington Terr., *Brandegee*." The GH sheet has Gray's annotation as "Aplopappus hirtus Gray, n. sp."

Mayes (1976) made diploid chromosome counts (n=6) from plants in three Oregon populations of *Pyrrcoma hirta* (<u>Harney Co</u>. — 16 mi N of Burns, *Mayes 92a-e* -TEX, 19 mi N of Burns, *Mayes 176a,b,c,d* -TEX; <u>Grant Co.</u> — 7 mi N of Seneca, *Mayes 96a, b, d* -TEX).

Flowering July–mid-September. Dry meadows, ridgetops, sagebrush, stony slopes, openings in ponderosa pine and pine-fir, wetland edges, roadside ditches; (3500–) 3750–6200 feet. Washington, Oregon, Idaho. Figures 6-11, 25.

A collection labeled as *Piper 2891* (GH, NY, WS, Fig. 11) from Bingham Co., Idaho ("Collins, in wet meadows," Jul 1898) seems to be mislabeled. Piper did make collections from "wet meadows" of Collins at that time, but this plant apparently is *Pyrrocoma hirta* (but the spreading-reflexing outer phyllaries are unusual). Bingham County is out of range for any of the *P. hirta* group and no other collection of that species group has been made there.

3. PYRROCOMA LANULOSA Greene, Leafl. Bot. Observ. Crit. 2: 16. 1909. Haplopappus hirtus subsp. lanulosus (Greene) Hall, Publ. Carnegie Inst. Wash. 389: 125. 1928. Haplopappus hirtus var. lanulosus (Greene) Peck, Man. Pl. Oregon, 713. 1941. Pyrrocoma hirta var. lanulosa (Greene) Mayes ex Brown & Keil, Phytologia 73: 58. 1992. TYPE: Oregon. Lake Co.: Bear Flat, 1650 m, 18 Aug 1894, J.B. Leiberg 748 (holotype: US-127836; isotypes: F, GH, MO, NY, OSC, US).

Pyrrocoma turbinella Greene, Leafl. Bot. Observ. Crit. 2: 17. 1909. TYPE: Oregon. Lake Co.: Cycan Valley, dry soil, 5500 ft, 10 Aug 1901, W.C. Cusick 2744 (holotype: US; isotypes: E, F, GH, MO, NY, RM, WS).

Flowering mid June-August. Dry and wet meadows, saline depressions, sagebrush, sandy flats, volcanic flats, rocky slopes and ridges, roadsides; (4000–) 5000–8150 feet. Oregon, California, Nevada. Maps 2, 3, and 4. Figures 12-24.

The voucher for a tetraploid chromosome count (n=12, *Anderson 2962-NY*) reported for "*Haplopappus hirtus*" from Elko Co., Nevada (Anderson et al. 1974), is *Pyrrocoma subviscosa*.

Plants of a collection from Modoc Co., California, within the range of *Pyrrocoma lanulosa*, have glandular stems, leaves, and involucres — non-glandular hairs are produced only near the base of the involucre. The glands are sessile in the US sheet but stipitate in the LL sheet, and the morphology is otherwise that of the species — this collection is interpreted here are as mutant variant and identified as *P. lanulosa*. <u>Modoc Co.</u>: 17 mi S of Altura, N edge of Likely, W side of road in wet meadows at RR crossing, 30 Aug 1925, *Hall 12212* (LL, US). Plants of *Pyrrocoma hirta* also sometimes lack non-glandular hairs, mostly having stipitate-glandular hairs but sometimes also with short non-glandular hairs proximally (e.g., *Jones 6398*-US, in Idaho; *Heller 3434*-US in Idaho).

As identified by Mayes, *Pyrrocoma hirta* and *P. lanulosa* overlap in geography and differ in altitude and ecology where they are sympatric — in contrast, in the study here, they are allopatric, closely approaching each other in Grant Co., Oregon (Map 2), and consistent ecological differences are not apparent from label data. *Pyrrocoma lanulosa* in Grant County is mostly south of the Blue Mountains.



Map 2. Distribution of *Pyrrocoma hirta* (blue) and *P. lanulosa* (gold) in Grant Co., Oregon. The county boundary is outlined in red. Vouchers for locality records are cited in the text.

**PYRROCOMA HIRTA** in <u>Grant Co.</u>: Wallowa-Whitman Natl Forest, base of slope on N side of Hoodoo Creek ca. 1.3 air km SW of Chicken Hill, 44.977886° N, 118.37001° W, mesic meadow at base of dry slope, bordered by *Pinus contorta* woods, 5840 ft, 14 Jul 2018-14, *Bassett 2018-14* (WTU); Austin Ranch, E Grant Co., 44.6139° N, 118.5446° W, dry, sunny pastures, wet in the middle, 4100 ft, 21 Jul 1925, *Henderson 5545* (MO, OSC); Umatilla Natl Forest, 26 mi WSW of North Powder, Trout Meadows, 100 ft W of FS Rd 52, 300 ft from its junction with Rd 724, 44.9443° N, 118.43959° W, edge of meadow and *Pinus contorta* forest, 5430 ft, 7 Aug 2019, *Jump HEJ-332.5* (OSC); Umatilla Natl Forest, 44.97341 N, 119.66236 W, meadow, 3750 ft, 29 Sep 1940, *Mottet 6* (ID); Umatilla Natl Forest, North Fork John Day Campground, 44.91403° N, 118.40157° W, lodgepole pine woodland with open meadows and riparian habitat, 6040 ft, 15 Jul 2018, *Olmstead 2018-52* (SRP); Malheur Natl Forest, Keeney Meadows, 44.6139° N, 118.9918° W, drier sites on reseeded area of depleted meadow, 5477 ft, 2 Aug 1945, *Weber 3107* (NY, WS).

**PYRROCOMA LANULOSA** in <u>Grant Co.</u>: Silvies, Aug 1901, *Griffiths & Morris* 780 (US); Malheur Natl Forest, 3.4 mi up gravel Road 1647 at jct 471, close to road sides along beginning of 471, 44.1334° N, 118.58498° W, open, flat grassland/sagebrush close to edge of ponderosa pine forest at foot of hills, 5100 ft, occasional along roadside in dry open slope, 17 Jul 2010, *Lorberau 10-5* (OSC, WTU); South Fork Antelope Creek drainage, between Antelope Valley and Forest Road 1601, 4.0 air mi SE of Seneca, 44.11016° N, 118.89236° W, edge of small wetland in scabland, 4950 ft, 11 Jul 2010, *Otting 2891* (OSC); unnamed tributary of South Fork Antelope Creek along Forest Road 503, 7.7 air mi E of Seneca, 44.08311° N, 118.8242° W, moist floodplain of ephemeral stream in mixed conifer forest, 5725 ft, 11 Aug 2010, *Otting 3022* (WTU); 10 mi N of Seneca, 44.279433° N, 118.97161° W, yellow pine and sagebrush slopes, 4000 ft, 7 Jul 1935, *Thompson 11926* (MO, NY, WILLU, WS); Silvies Timber Sale about 3 mi due S of Seneca, 1 mi W of Hwy 395, 44.0975° N, 118.98663° W, ponderosa pine, grasses, forbs, 10 Jul 1980, *Wright 1370* (OSC).

The populations of *Pyrrocoma lanulosa* in Elko County, mostly in the Jarbidge Mountains, are about 130 miles eastward disjunct from the nearest conspecific populations in Humboldt County (Map 1). No records have been found from Malheur and Owyhee counties. Although it is probable that the Jarbidge plants are at least physiologically differentiated, potential morphological distinctions from typical *P. lanulosa* (which has a relatively continuous range) are slight and their taxonomic recognition seems unjustified. Similar sister-disjunctions are encountered in other *Pyrrocoma* species, e.g., *P. apargioides*, *P. clementis*, *P. crocea*, and will be interesting to study in more detail.

PYRROCOMA LANULOSA in Nevada. Elko Co.: S end of Wildhorse Reservoir, old water line of reservoir, 21 Jun 1993, Atwood 18141 (BRY, ID, NSMC); [Hwy 93,] just S of HD Summit, 41.339145 N, 114.810093 W, sloping moist meadow, ca 6190 ft, 20 Jun 2009, Clifton 48776 (RENO); Humboldt Reserve, Gold Creek, 41.753278 N, 115.727283 W, 7150 ft, 7 Aug 1913, Kennedy 4334 (PH, RENO); Charleston-North Fork road, 2 mi W of summit, dry places in gully, Artemisia nova, 10 Aug 1943, Maguire & Holmgren 22420 (MO, NY, PH); ca. 20 air km SSW of Jarbidge, ca. 19 air km NNE of Wild Horse Airport, 1 mi from F Rd 930, 41° 46.94' N, 115° 46.604' W, cattle pond, dry low sage goes by road to aspen grove, 6511 ft, 28 Jun 2014, Smith 11984 (CIC, SRP); Copper Mts, 4.7 road mi S of Coon Creek Summit on main road to Charleston, then 0.6 road mi S on a side road, 41.74038 N, 115.46715 W, dry meadow, with Wyethia amplexicaulis, Muhlenbergia richardsonis, 7200 ft, 21 Aug 2017, A. Tiehm 18032 (ASU, BRIT, BRY, ID-2, NY, OBI, RENO, RSA, TEX, UCR, UTC); Jarbidge Mountains, divide between Coon Creek and Bear Creek, 4 mi N of Coon Creek Ranger Station. 41.826983 N, 115.469101 W, dry rocky ridge, 8000-8500 ft, 10 Aug 1937, Train 712 (RENO); Belcher's Meadow, ca. 14 mi from Mountain City toward Wildhorse Reservoir, 41.740525 N, 115.767824 W, sandy flat near the meadows, 6400 ft, 15 Aug 1978, Williams 78-307-5 (RENO); N of Sunflower Flats on road to Bieroth Spring, 41.7965 N, 115.7415 W, clay soil, with perennial grasses, Juncus, Artemisia cana, 6700 ft, 18 Jul 1980, Williams 80-210-8 (RENO-3 sheets and 80-210-7). Humboldt Co.: Pine Forest Range, Outlaw Meadow, 41.6665° N, 118.7346° W, in dry pumice of hillsides, 17 Jul 1986, Mastrogiuseppe 4239 (ID); Trout Creek Mtns, ridge NE of the springs at head of Kings River, at the state line, 8150 ft, 4 Aug 2006, Tiehm 15310 (ASC, CIC, COLO, ID, IDS, KANU, NY, RENO, UNLV); Pine Forest Range, Onion Creek Reservoir NW of Blue Lake and Duffer Peak at the N end of the range, meadow areas near the reservoir, 7060 ft, 3 Aug 1987, *Tiehm 11488* (CIC, COLO, ID, IDS, MO, TEX, UNLV).



Map 3. *Pyrrocoma lanulosa* in the southwestern portion of its range. Modoc, Lassen, Plumas, and Sierra cos., California. The Lassen County boundary is outlined in red. The record for Sierra County is *Ornduff* 4352 (JEPS). Nevada County: *Howell* 53194 (CAS, MO). Inset shows the total range of *P. lanulosa* (arrow points to Elko County, see Map 4).



Map 4. Distribution of *Pyrrocoma lanulosa* in the Jarbidge Mountains, Elko Co., Nevada. Vouchers for locality records are cited in the text. The locality of *Clifton 48776* (Fig. 19) is off the map, to the southwest.

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Figure 1. Pyrrocoma sonchifolia. Yakima Co., Washington, Brandegee "111 & 140," holotype (US).



Figure 2. Pyrrocoma sonchifolia. [Kittitas?] Co., Washington, Vasey 506 (US). Holotype of P. foliosa.



Figure 3. Pyrrocoma sonchifolia. Kittitas Co., Washington, Knoke 1442 (RENO).



Figure 4. Pyrrocoma sonchifolia. Chelan Co., Washington, "Brandegee 840 and Tweedy 944" (NY).



Figure 5. Pyrrocoma radiata. Wallowa Co., Oregon, Jump & Carlson 358 (WTU).



Figure 6. Pyrrocoma hirta. Grant Co., Oregon, Olmstead 2018-52 (WTU).



Figure 7. Pyrrocoma hirta. Grant Co., Oregon, Henderson 5545 (OSC).



Figure 8. Pyrrocoma hirta. Union Co., Oregon, Naas 3163 (SEFR).



Figure 9. Pyrrocoma hirta. Garfield Co., Washington, Darlington 160 (WS).





Figure 10. Pyrrocoma hirta. Morrow Co., Oregon, Bradtke 8309 (ID).





Figure 11. *Pyrrocoma hirta*. Labeled as from Bingham Co., Idaho, but probably mislabeled, see text (p. 4). *Piper 2891* (WS). The spreading-reflexing phyllaries are unusual.



Figure 12. Pyrrocoma lanulosa. Grant Co., Oregon, Griffiths & Morris 780 (US).



Figure 13. Pyrrocoma lanulosa. Harney Co., Oregon, Maguire & Holmgren 26736 (IDS).





Figure 14. Pyrrocoma lanulosa. Lake Co. Oregon, Leiberg 748, isotype (GH).



Figure 15. *Pyrrocoma lanulosa*. Lake Co. Oregon, detail from isotype (GH), Fig. 14. Also see Figs. 23 and 24 for close views of involucres.



Figure 16. Pyrrocoma lanulosa. Klamath Co. Oregon, Lang 1578 (SOC).



Figure 17. Pyrrocoma lanulosa. Plumas Co. California, Clifton 38157 (RENO).





Figure 18. Pyrrocoma lanulosa. Modoc Co. California, Wheeler 3745 (NY).



Figure 19. *Pyrrocoma lanulosa*. Elko Co. Nevada, *Clifton 48776* (RENO). The long, woody, abruptly defined taproot is unusual, perhaps suggesting an annual duration.





Figure 20. Pyrrocoma lanulosa. Elko Co., Nevada, Tiehm 18032 (RENO).





Figure 21. Pyrrocoma lanulosa. Elko Co., Nevada, Williams 80-210-8 (GH).



Figure 22. Pyrrocoma lanulosa. Elko Co., Nevada, Smith 11984 (SRP).



Figure 23. *Pyrrocoma lanulosa*. Variation in involucral morphology. Plants from the Jarbidge Mountains, Elko Co., Nevada.



Figure 24. *Pyrrocoma lanulosa*. Variation in involucral morphology. From the type collection of *Pyrrocoma turbinella*, each from a different plant. Lake Co., Oregon.





Figure 25. Pyrrocoma hirta. Heads from the type collection (Cusick 951).