Yeatts, L., B. Schneider, and A. Schneider. 2011. *Packera mancosana* (Asteraceae: Senecioneae), a new species and shale barren endemic of southwestern Colorado. Phytoneuron 2011-26: 1–8. Mailed 3 June.

PACKERA MANCOSANA (ASTERACEAE: SENECIONEAE), A NEW SPECIES AND SHALE BARREN ENDEMIC OF SOUTHWESTERN COLORADO

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ABSTRACT

Packera mancosana L. Yeatts, B. Schneider, & A. Schneider, sp. nov., is described from outcrops of grayish, argillaceous marine Mancos Shale in southwestern Colorado. The new species is currently known from several small populations in and adjacent to Lone Mesa State Park in Dolores County, Colorado, where it is represented by several hundred plants. The plants are most closely allied with the Tomentosi subgroup of the Aureoid senecios but are sufficiently different morphologically and isolated geographically from those species to be considered a distinct species.
KEY WORDS: *Packera*, Senecioneae, Mancos Shale endemic, Colorado

Biological exploration of Lone Mesa State Park in Dolores County, Colorado has brought to light a previously unknown species of *Packera*. It was first encountered in June 2008 by Betty and Al Schneider during floristic surveys of Lone Mesa State Park.

The new *Packera* exhibits salient features of the Tomentosi subgroup of the Aureoid senecios (Barkley 1988), which includes *P. cana* (Hook.) W.A. Weber & Á. Löve, *P. werneriifolia* (A. Gray) W.A. Weber & Á. Löve, *P. spellenbergii* (T.M. Barkley) C. Jeffrey (Barkley 1980; Jeffrey 1992), and *Senecio cliffordii* N.D. Atwood & S.L. Welsh (Welsh et al. 2003). This group is characterized by creeping rootstocks or stout caudices with fibrous roots, basal leaves well-developed and entire to shallowly lobed, cauline leaves progressively to abruptly reduced upward or all bracteate, leaf margins with few or no callous denticles, and some tomentum usually persistent and evident even in age.

Packera mancosana L. Yeatts, B. Schneider, & A. Schneider, sp. nov. Figs. 1–5. **TYPE**: **USA**. **Colorado**. Dolores Co.: Lone Mesa State Park, S end of the park, ca. 23 mi N of the town of Dolores, T39N, R14 W, Section 35, ca. 108˚ 28'W, 37˚ 41'N, exposure of Mancos shale, ca. 2% slope, 7575 ft; with dominants *Helianthella microcephala*, *Physaria pulvinata*, *Tetraneuris acaulis*, *Townsendia leptotes*, and *Eriogonum lonchophyllum*, abundant *Gutierrezia elegans, Petradoria pumila, Astragalus missouriensis* var. *amphibolus,* and *Heterotheca villosa*, scattered *Calochortus nuttallii, Delphinium nuttallianum*, *Orthocarpus purpureoalbus*, *Packera oödes*, *Solidago simplex*, and others; *Pinus ponderosa* with pinyon-juniper on nearby surrounding slopes; dense leafy mounds, flowers yellow; 26 May 2009, *Al Schneider 5077* with Betty Schneider (holotype: KHD; isotypes: COLO, MO, NY, RM, US).

Packerae werneriifoliae similis capitulis radiatis, laminis ellipticis foliorum, et pedunculis bracteatis sed differt cypselis majoribus pubescentibus et habitationibus argillae calcarei ad altitudines

recessas. *Packerae canae* similis capitulis radiatis et formae ac vestimenti laminarum foliorum sed differt caulinis brevioribus, phyllariis minus pubescentibus, foliis caulinibus abrupte deminutis, flosculis disci brevioribus, et cypselis pubescentibus.

Perennials, caespitose in dense tufted mats to 30 cm in diameter and 3 cm high, from creeping or suberect rhizomes, with stout branched caudices up to 7 mm thick at junctions; roots fleshy-fibrous. **Stems** 1 per rosette, (5.2–)7–10(–13.3) cm high, simple or 1–2-branched near midstem, lanate woolly when young, becoming floccose to rarely glabrate distally at anthesis, bracteate. **Basal leaves** petiolate, petiole dilated at base and axils obscured by white lanate tomentum, blades oblanceolate or narrowly elliptic, 29–34 mm long, 3–6 mm wide, thick, leathery, ± succulent; lanate on both surfaces, sometimes becoming floccose (rarely glabrate) in age, margins usually ± revolute, especially proximally, sometimes plane, ± thickened, ± cyanic, acute, entire with a denticle at the acute apex or apically shallowly tridentate. **Cauline leaves** 3 (-5), sessile, linear-lanceolate, 2-5 mm long, 0.1-0.01 mm wide, usually cyanic distally typically with lanate, floccose dorsal surface and floccose to glabrate, mammilate ventral surface. **Heads** solitary or 2(–3) in loosely subcorymboid arrays. **Calyculi** conspicuous, scarious, glabrate, less than 1/3 lengths of phyllaries. **Phyllaries** 15 or mostly 21 on larger heads, (5–)7–9(–10) mm long, ensiform, equal, green to cyanic, usually scarious–chartaceous and ciliate–floccose margined, floccose dorsally, erose and ciliate to tufted near apex. **Ray florets** mostly 5–8(–11), averaging 7 per head, corolla laminae 5–7 mm long, tube 3.7–4.2 mm long. **Disc florets** ± 34, 5.1–7.0 mm long, tube 1.7–2.0 mm long. **Cypselae** 3.1–4.0 mm long, with 4–5 thickened, green, short-pubescent ridges, intervals glabrous; **pappus** 4.7–5.2 mm long, capillary bristles white, nearly as long as disc floret. **Chromosome number** unknown.

Measurements for achenes and florets are from rehydrated corollas. The format of the description generally matches those in Trock (2006).

Figure 1. *Packera mancosana* at the type locality.

Additional collection. **USA**. **Colorado**. Dolores Co.: 7.5' Willow Spring quad quad, NAD27 12S 0722314E 4173556N, Lone Mesa State Park along San Juan Natl. Forest Rd 514 ca. 0.3 mi W of Plateau Creek, 0.15 mi N of S entrance to Park; 7588 ft; Mancos Shale; almost flat area on barren desert pavement of broken calcareous chips, clayey soil and rock crevices; ca. 50% vegetated with *Artemisia nova, Helianthella microcephala, Orthocarpus* sp., *Townsendia leptotes,* grasses and other spp.; plants rhizomatous, forming dense mats up to 1 ft. in diam., just beginning growth; leaves gray-green, tomentose-cobwebby, heads just appearing; ray and disc flowers yellow; locally common but not seen elswhere in Lone Mesa State Park, 26 Apr 2009, *Loraine Yeatts 5733* with Al & Betty Schneider and Dick Yeatts (COLO, KHD, RM, and others to be distributed). This collection (Fig. 5) is essentially from the same population as the holotype but collected one month earlier.

Figure 2. Head of *Packera mancosana* in Lone Mesa State Park, type locality.

Etymology. The specific epithet "mancosana" alludes to the soils on which the species is found. The name "Mancos Shale" is derived from the town of Mancos in southwest Colorado where this shale formation is abundant. **Common name:** Mancos Shale Packera

Packera mancosana is known from several small populations that overlap the southern boundary of Lone Mesa State Park. The type locality is within the Park. Two other recently described species, *Physaria pulvinata* (O'Kane & Reveal 2006) and *Gutierrezia elegans* (Schneider et al. 2008), grow immediately adjacent to and in close proximity to *Packera mancosana*.

Figure 3. *Packera mancosana* at the type locality — growth habit.

Packera mancosana is distinguished from its closest relatives by the contrasts indicated in the key below. Information on related species is from the Intermountain Flora (Cronquist 1994), FNA treatment of the Tomentosi subgroup in (Trock 2006), A Utah Flora (Welsh et al. 2008), and the New Mexico Rare Plants website (NMRPTC 2010).

KEY TO SPECIES

1. Heads usually eradiate (rays sometimes 5–8 in *P. spellenbergii*); basal leaves sessile and linear to linear-oblanceolate, margins usually strongly revolute; cypselae pubescent on ribs.

2. Basal leaves (blades) 10–15+ x 1–2 mm; phyllaries usually 13; stems 1–2 per rosette; New Mexico (Harding and Union cos.) ..... **Packera spellenbergii**
2. Basal leaves (blades) 20–40 mm x (1–)2–3 mm wide; phyllaries 13 to mostly 18; stems 1(–2) per rosette; New Mexico (McKinley and Rio Arriba cos.), Arizona (Apache Co.), Utah (Kane Co.) ..... **Senecio cliffordii**

1. Heads radiate (rays rarely 0 in *P. werneriifolia*); basal leaves usually petiolate with mostly elliptic to lanceolate blades, margins plane or slightly revolute; cypselae completely glabrous or pubescent on ribs.

3. Cauline leaves gradually reduced distally; stems 1 per rosette; heads 8–15+ in corymbiform arrays; cypselae 2.5–3.5 mm long ..... **Packera cana**
3. Cauline leaves abruptly reduced distally, bractlike and inconspicuous; stems 1–5 or 1 per rosette; heads 1–5(–8) per stem; cypselae 1.5–2 mm or 3.1–4 mm long.

4. Leaves glabrous to glabrate at maturity, dark green, glossy; blade margins usually shallowly serrate-dentate; stems 1–5 per rosette; heads 1–5(–8) per stem; cypselae 1.5–2 mm long, completely glabrous ..... **Packera werneriifolia**
4. Leaves persistently tomentose, gray-green, dull, blade margins entire or apically shallowly tridentate; stems 1 per rosette; heads 1–2(–3) per stem; cypselae 3.1–4 mm long, pubescent on ribs ..... **Packera mancosana**

Packera werneriifolia as described by Trock (2006) is morphologically variable over its range. Leaves vary from spatulate with ovate, elliptic, or narrowly elliptic blades and flat, dentate margins in the Rockies to narrowly oblanceolate to oblong-oblanceolate and essentially epetiolate with revolute, mostly entire margins in California and Arizona (see photos on Calflora 2011). Far-western populations also tend to be more persistently tomentose than the Rocky Mountain ones. The key contrasts above are for Rocky Mountain plants.

The distinction between *Packera mancosana* and *P. werneriifolia* appears to be discontinous both in morphology and ecology and recognition of *P. mancosana* at specific rank is appropriate. *Packera mancosana* is more similar in leaf morphology to far-western expressions of *P. werneriifolia* than to Colorado ones but this similarity apparently is convergent.

Habitat. The new species is represented by a total of over 400 plants at the type locality. The plants occur as well-separated individuals on very sparsely vegetated flats (slopes ca. 2%) and sides of shallow washes. They grow along cracks in the bare shale and in thin gravelly soil over the shale. *Packera mancosana* is among the more abundant species in this habitat. Depending on the arrival of spring, it begins flowering in mid-May, fruiting into July.

Figure 4. Habitat of *Packera mancosana* in Lone Mesa State Park, type locality.

Further exploration will be needed to determine if there are additional populations of *Packera mancosana* and to determine if this species is restricted to Mancos Shale. Herbarium records studied indicate that none of the other closely related *Packera* species in the Tomentosi subgroup have been documented on Mancos Shale. Several yet unaccessioned collections of *Packera cana* at RM (Rocky Mountain Herbarium 2011) were collected on Cretaceous Pierre Shale, which probably is not calcareous but which correlates in time with Mancos Shale.

In growth habit and substrate preference *Packera mancosana* is most similar to *P. spellenbergii* and *Senecio cliffordii*, which form tufted mats on limey substrates. *Senecio cliffordii* was treated as a synonym of *P. spellenbergii* by Trock (2006), but Trock has now agreed with regional botanists who conclude that the two are distinct (NMRPTC 2010).

Packera cana is the most cosmopolitan of the group in its ecological requirements, flowering by the middle of May at low elevations (to 200 m) and much later in August at alpine altitudes (to 3700 m) on a variety of substrates. *Packera werneriifolia* is primarily found near and above treeline, occasionally lower. Of the 121 Colorado specimens of *P. werneriifolia* housed at University of Colorado Museum (CU Museum-COLO 2011), only 13 were located below 9000 feet in elevation.

Figure 5. Large mat of *Packera mancosana*, engulfing a plant of *Townsendia leptotes*. On the Mancos Shale it is common for plants to grow in close association — the first-established providing a microhabitat similar to a nurse-log.

ACKNOWLEDGEMENTS

We are grateful to Scott Elder (Superintendent of Lone Mesa State Park) for his cooperation, Stanley Welsh (BRY) for studying our specimens and suggesting that we describe this *Packera* as a new species, Tim Hogan (COLO) for access to *Packera* specimens for study and measurements, Arnold Clifford for his inspiring understanding of the Four Corners geology and floristics and the opportunity to view his personal *Senecio cliffordii* type specimen for comparison study, and to Chick Keller and Craig Freeman for helpful review comments. We are especially grateful to Guy Nesom for expeditiously providing suggestions, editorial assistance, and the Latin translation. Photographs are by the authors; also see Schneider (2011) for others.

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