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The Echeverias of the Chillón River Valley, Lima, Perú, including three new taxa

Abstract. The Echeverias of the Chillón River Valley, one of the three rivers that run through Lima, the Capital city of Perú, are reviewed. Three new taxa are recognized and described: two new species and a new variety. (1) *Echeveria deltoidea* is a large species with narrowly triangular, light green to glaucous-purplish leaves, and large salmon-colored widely pyramidal flowers. It differs from *E. chiclensis* in its larger and broader, flatter leaves. It has been mistaken for *E. andicola* but this latter has smaller, prismatic, evenly orange-red flowers and smaller obovate-oblong leaves instead. Its rosettes are as large as in *E. excelsa* but this species has obovate leaves with obtuse apices. (2) *Echeveria fruticosa* is a new species with conspicuous aerial stems, erect or decumbent, each crowned by a rosette of rhomboid-obovate leaves, glaucous to bright green, narrowly rhomboid to obovate and wider than the linear oblong leaves of *E. chiclensis.* It has urceolate, light yellowish-green flowers with a blush, redder when exposed. (3) *Echeveria chiclensis* var. *cantaensis* is a new variety of *Echeveria chiclensis* with lighter greener leaves and shorter flowers than the type variety, yellowish with a blush, redder than the other two varieties. It could be mistaken with *E. andicola* but this species has slightly smaller flowers and wider leaves. It thrives at the Huaura, Chancay and Chillón River Valleys at lower altitudes than var. *chiclensis* from the Rímac River and Lurín River Valleys. In the Northern range, it reaches very low altitudes. (4) *Echeveria chiclensis* var. *backebergii* is also found in the area, although it does not differ too much from the populations of the type locality in the Rímac Valley.

Keywords: Crassulaceae, *Echeveria*.

1. ***Echeveria deltoidea*** Pino & Vilcapoma sp. nova

Holotype: PERU: Dept. Lima, Prov. Canta, Dist. Lachaqui. Sotoconca Cliff, 3700 m, Jun 2, 1990, *G. Vilcapoma* & *M. Flores 0735* (MOL 00009722 Type; USM 00268555 Isotype) (Fig. 1a).

In 1990, our second author and Mercedes Flores, both Botany teachers of La Molina University discovered this plant near the town of Lachaqui in Canta Province, Lima. Graciela returned many times later finding other localities nearby, recording the local name "siempreviva" ("always alive" in Spanish), which is often applied to species of *Echeveria* in Perú. Years later, in 2002, Carlos Ostolaza, the top Peruvian cactus expert found this plant in Tantará Gorge, Huancavelica, near the border with Lima Department, and thought it was *E. chiclensis,* publishing a photo of it (Ostolaza 2002). In 2003, during a CSSA expedition led by him, James D. Mauseth, Professor of Integrative Biology at the University of Texas at Austin and researcher/anesthesiologist Leo A. Martin found an *Echeveria* in the Huaura River Valley that did not

1a. *Echeveria deltoidea* growing at the type locality near Lachaqui (G.V).

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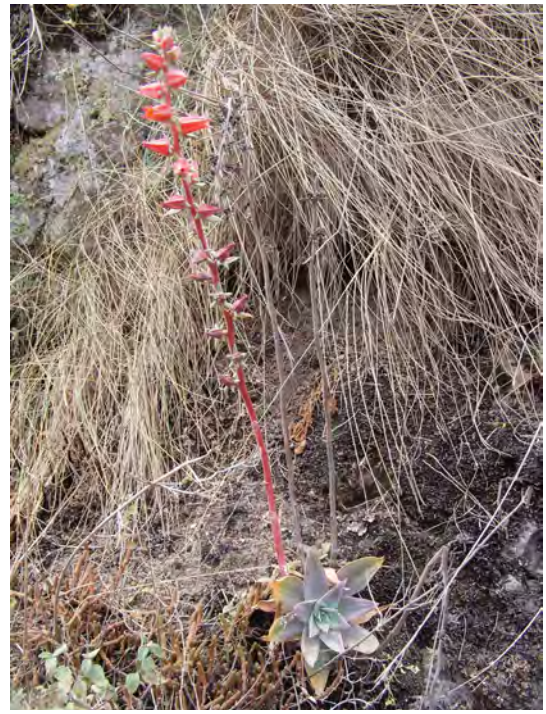
1b. Cultivated *Echeveria deltoidea* from Oyón at the end of winter with purplish flat leaves.

match anything previously described in Perú. They left this plant in cultivation with me in Lima. The closest *Echeveria* reported in this area was *E. chiclensis* var.*chiclensis* (Macbride, 1938; Walther, 1972) and it had recently been reviewed (Pino, 2002). *E. chiclensis* varieties have narrower (1.1–2.5 cm) and thicker leaves, linear oblong, somewhat shorter and darker in color compared to the wider (2.5–5 cm) and flatter, long triangular, acute-tipped leaves with a striking lighter bluish-green color of the plant they found. (Fig. 1b). Plants bloomed some months later and we observed that bracts were larger and wider (2–9 × 1.2–1.8 cm) compared to *E. chiclensis* var. *chiclensis* (2.5–5 × 0.5–1 cm). *Echeveria chiclensis* flowers are pyramidal but they have a narrower base (0.8–1.2 cm) compared to this new species (1.2–1.4 cm) and they have predominantly yellow color with a blush, compared to the redder hue so of the new species (see Table 1).

Its remarkable size and its habitat, north of Lima, made us think at first that we had found the long sought *Echeveria excelsa*, a species described from Cajabamba, Ancash, 300 km northwards. In 2005 in my description of *E. andicola* there is a leaf of *E. deltoidea* shown in a picture determined as belonging to *E. excelsa* (Pino, 2005). Later in 2006 I had the chance to find the type locality of *E. excelsa,* amending its description and publishing photos that show that *E. excelsa* has obovate leaves with obtuse apices and the only common features between both species are the remarkable size of the rosettes, (more than 20 cm across) perhaps the largest in Perú (Pino, 2006). Pilbeam also mistook *E. deltoidea* for *E. excelsa* in the cultivated plant he shows in his book (Pilbeam, 2008, p. 111).

In December 2007, I joined an expedition of Peruvian Society of Cactus and Succulents (SPECS) led by Carlos Ostolaza. We made a round trip starting



1c. *Echeveria deltoidea* in habitat in a dry summer.

1d. Clustered *Echeveria deltoidea* in the dry season with glaucous leaves.

at the town of Huaral in the Chancay River Valley, climbing to the highlands of Pasco and coming back downwards through the Chillón Valley. In this expedition Mercedes Flores showed me this species near the locality she and Graciela Vilcapoma had found it seventeen years before but plants were not in blossom (Ostolaza et al., 2009), so next year I returned at the end of the rainy season to find other localities around Lachaqui enabling the description of this as a new species (Fig. 1c).

1e. Ex-situ plant of *Echeveria deltoidea* showing narrow tuberous tapering roots.

1f. Young plant of *Echeveria deltoidea* showing rhomboid leaves, deltoid at the tip

1g. Detail of the leaves of *Echeveria deltoidea.*

Description

Plant a succulent glabrous, solitary or proliferous herb eventually forming compact clusters (Fig. 1d). **Primary roots** 3–5, narrowly tuberous, slightly tapering, 4–6 (–9) cm long, 2–5 mm diam., light gray-whitish, secondary roots fascicular. **Stem** subterranean, 0.5–3.5 cm diam., napiform, tapering to the end, gray brownish, vertical or decumbent, usually short, (Fig. 1e) up to 30 cm long in very old plants. **Rosettes** usually one at the end of stem, up to 3 (–6) in very old plants, born laterally from the main stem, (10–) 15–25 cm diam. **Leaves** in young plants 12–16, triangular or mitriform to rhomboid obovate (Fig. 1f); in mature plants 17–27, narrowly triangular to narrowly oblong-lanceolate, sessile, slightly incurved when young, then conspicuously recurved at the middle and tip, (4–) 10–15 (–20) cm long, 2.5–3.5 cm wide at base, 3–5 cm wide at proximal third, 4–6 cm wide at middle, 3–5 cm wide at distal third, 3–5 mm thick (Fig. 1g), upper side concave to canaliculate when young, or convex when old, sometimes faceted 2–5 mm near margins, in the dry period light blue to light glaucous green in central leaves, tinged light purplish on outer leaves, in the rainy period light green; central nerve and paracentral parallel nerves frequently prominent like ribs

1h. Plant of *Echeveria deltoidea* at type locality showing marked parallel nerves in adaxial side of leaves (G.V.).

(Fig. 1h), lower side keeled or convex, same color, slightly redder at keel, apex narrowly acute with an acute slightly recurved reddish mucro 1–2 mm long at apex, base hyaline (Fig. 1i).

Flowering stem an erect raceme, rarely 2, dry scapes persistent up to 10, rachis 30–45 (-80) cm long, 7–10 mm diam. at base, 3–5 mm diam. at apex, light glaucous green to pink when very exposed (Fig. 1j). **Peduncular bracts** 18–26 (-40), all along the stem, larger at the proximal third or half, persistent when young, soon deciduous, spaced evenly 1–2 cm apart, oblong to lanceolate, straight to markedly recurved, 2–6 (–9) cm long, 1.2–1.8 cm wide, 5–6 mm thick, upper side flat to canaliculate or convex, lower side convex, same color as leaves, tips acute to mucronate, incurved reddish, base hyaline (Fig. 1k). **Flowers** (18-) 22–30, appearing from April to June, crowded at distal half of the scape, 1.8–2 cm long and 1.2–1.4 cm diam. (Fig. 1l). **Pedicels** horizontal and short (1–2 mm) in distal flowers, oblique in lower flowers, up to 1.2 cm long, 2.5–3 mm diam., same color as flowering stem, with a small bracteole at base. **Calyx lobes** united at base, sepals unequal, narrowly ovate acute, spreading in right angle, both sides convex, 5–8 mm long, 3–4 mm wide, light olive green. **Corolla** pyramidal, subpentagonal, 1.2–1.4 mm thick near base, 3–4 mm thick near apex, 1.7–1.9 cm long, petals narrowly oblong to triangular, acute, 1.8–2 cm long, 5–6 mm wide, outer surface obscurely keeled, salmon red with some yellowish stripes, apex slightly recurving, inner surface red 1 mm near margins and distal end, yellowish at the middle. **Stamens** 10, the 5 epipetalous 9–10 mm long, the antesepalous 12–13 mm long, filaments cream, 1 mm thick at base, gradually tapering to 0.3 mm. **Anthers** ovate, yellow, 1.2–1.4 mm long and 0.9–1 mm wide. **Gynoecium** turbinate, 12–13

1i. Detail of the back of the leaves of *Echeveria deltoidea* showing reddish keel.

1j. Ex-situ plant of *Echeveria deltoidea* showing live and dry scapes.

1k. Detail of the bracts of *Echeveria deltoidea.*

mm long, 7–8 mm thick. **Carpels** 5, greenish-yellow. **Styles** 3–4 mm long, parallel, almost touching each other, greenish, stigma reddish (Fig. 1g). **Nectaries** trapezoidal, light yellow, 1.2 × 2.5 mm. **Fruit** a dehiscent capsule 1.3–1.8 cm long, 1.2–1.5 cm diam. (spreading dry sepals), reddish-brown (Fig. 1m).

Other localities: PERU: Dept. Lima, Prov. Canta, Dist. Lachaqui, Piscunchay Gorge, 3500 m, Jun 28, 1992, *G. Vilcapoma 1792* (MOL 00010873). Lachaqui, rocky slope, 3600 m, May 08, 2004, *G. Vilcapoma s/n* (MOL). Slopes of Puclunche, 3450 m, Apr 30, 2006, *G. Vilcapoma 7646* (MOL 00016948). Road from Lachaqui to Arahuay, on clayish slopes, 2780 m, S11°29'53", W76°38'10", Dec 7, 2007, *G. Pino 1324* (USM 304296). Road from Carhua to Lachaqui, on slopes of red clayish soil, growing with *Sedum renzo-palmae* and *Peperomia cerrateae*, 3520 m, S 11°31'17", W 76°37'04", Apr 12, 2008, *G. Pino 1958* (USM 304300). Lachaqui, Cerro Champacra, 3850 m, Jun 10, 2013, *E. Jara 1224*, (USM 274768). Dist. Canta, boundary of Carhua with Lachaqui, 3400 m, May 03, 1998, *G. Vilcapoma 4768* (MOL).Dist. Arahuay, Above the town, 2650 m, Apr 2, 2008, *G. Vilcapoma 7894* (MOL). Above the town of Arahuay, Pallashcushca, 3650 m, Apr 9, 2004, *G. Vilcapoma 7077* (MOL 00014079). Arahuay boundary with Lachaqui, mountain left of Arahuay River, on soil, grassy

1l. Scape in anthesis showing bracts and crowding of flowers at the apex.

1m. From left to right: Bracts (2), sepals (3), petals (2), sectioned flower showing gynoecium, complete flower, dry fruit of *Echeveria deltoidea*.

slopes, 3200 m, Aug 4, 2010, *P. Gonzales* & *E Navarro 1151* (USM 00259450). Prov. Oyón, Dist. Oyón. Road from Churín Hotsprings to Oyón, 3965 m, growing with *Austrocylindropuntia lagopus*, (Collected by James Mauseth and Leo Martin), Aug 7, 2003, *GP 1187.* Dist. Pachangara. San Bartolomé de Curay, rocky slopes with loamy soil, on thicket. 3800 m, S 10°49'49.68", W 76°47'31.07", Jul 29, 2014, *A. Cano* & *N. Valencia 22143* (USM 295221). Prov. Huaura, Dist. Santa Leonor, Chiuchin Hotsprings to Jucul, rocky slopes at the sides of the road, 3557 m, S 10°56'31", W 76°46'31", Aug 6, 2003, *M. Arakaki, C. Ostolaza, N. Calderón, J. Mauseth* & *L. Martin 1571* (USM 186970). Dept. Huancavelica, Prov. Castrovirreyna, Dist. Tantará. Tantará Gorge, close to the border with Lima. C. Ostolaza s.n. Dept. Huánuco, Prov. Ambo, Tomayquichua, S 10°04'31, W 76°12'32, 2600 m, on rocks, growing with *Echeveria andicola*, *Peperomia naviculifolia*, *P. galioides,* and *Pilea serpyllacea*, locally called "Flor de almendra", Jun 30, 2017, Ignacio Torres s/n.

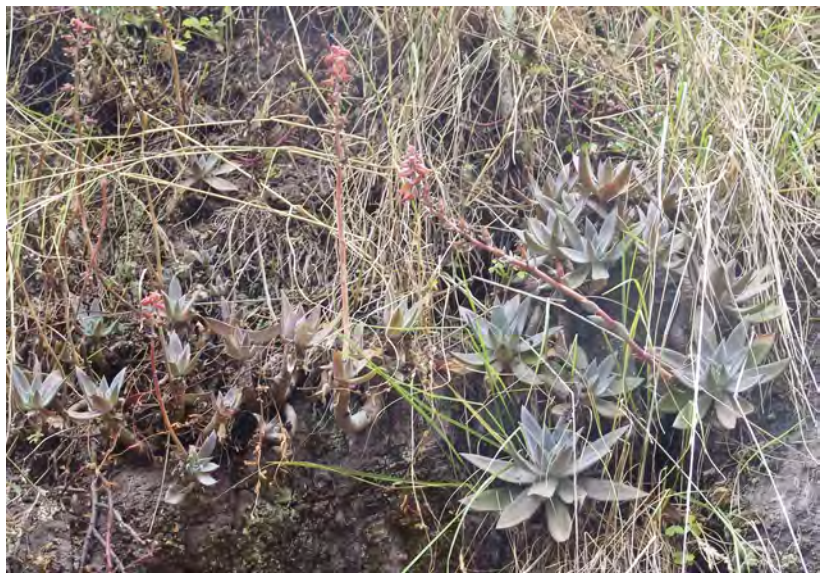
In 2017, Mexican Botanist Ignacio Torres García was exploring the northernmost distribution of *Echeveria andicola* in Tomayquichua, Huánuco, when he noticed some plants with different color and leaf shape (Fig. 1n). Checking the publication of the description of *E. andicola* with him, in Figs. 2, 3 and 11 of the article from Pino (2005) we noticed that some of the plants were *E. deltoidea* rather than *E. andicola*! Maybe the confusion is due to the fact that both species grow in the Departments of Huánuco and Junin but *E. andicola* blooms in late Summer and *E. deltoidea* in Winter, so it is quite difficult to find

1n. *Echeveria deltoidea* in habitat at Tomayquichua, Huánuco, closely resembling *E. andicola*.

both in blossom. *E. andicola* has smaller flowers (1–1.2 cm long), with an even orange red color, almost prismatic in shape and generally with short pedicels, compared to the larger flowers of *E. deltoidea* (1.8–2 cm long), that are widely pyramidal with an acute tip, red with some yellowish stripes. Leaves of *E. deltoidea* are markedly triangular compared to the obovate-oblong leaves of *E. andicola*. See Table 1.

Distribution: *E. deltoidea* is a widespread species in the Departments of Lima, Huánuco, Pasco (probably), Junin and Huancavelica but with very few, scattered localities and few individuals. It is only abundant in Canta province near the town of Lachaqui.

Etymology: The name "deltoidea" refers to the triangular shape of the apices and leaves of this new species that remind one of the shape of Greek letter "Δ" (Delta).



2a. *Echeveria fruticosa* growing at type locality near Huaros.

2. *Echeveria fruticosa* Pino, sp. nov.

Holotype: PERU: Dept. Lima, Prov. Canta, Dist. Huaros. Road from Canta to Huaros, 1 Km before the town, in shaded gorge with a small stream, hanging from the clayish walls, 3320 m, S 11°24'14", W 76°34'21", Apr 2, 2007, *G. Pino 1700* (USM 217135, Type) (Fig. 2a).

2b. Plant of *Echeveria fruticosa* in situ at the Rimac River Valley at Cacray.

Years ago, when I published the review of the varieties of *Echeveria chiclensis,* I mentioned a locality of a lonely *Echeveria* at Cacray waterfall in the Central Peruvian highway (Pino, 2002). The plant shown in the article matches the description of *E. chiclensis* var. *chiclensis* except for its very long aerial stems and its lanceolate, subrhomboid leaves, somewhat wider than leaves of normal *E. chiclensis*. I remarked these characters in the text (Fig. 2b). Despite several visits I was able to observe its flowers only once and these were only buds, that looked more globular than *E. chiclensis,* and with a greenish hue (Fig. 2c). In 2005, while exploring the Chillón valley, I found some broad-leaved *Echeverias* on the road from Canta to La Viuda Pass before the detour to Huaros, just some kilometers away from *E. chiclensis* observed at Obrajillo waterfall, but then I found the same plants, this time more abundant, with very long hanging stems and flowers in a gorge 1 km before the town of Huaros, so I returned again to this place several times to examine the plants in different seasons. In 2007 another SPECS expedition found this plant in another locality near Baños, in the Chancay River Valley, just at the other side of the mountain range above Huaros, only 10 km to the North in a straight line, and Johanna Cortez published a photo of it determining also as *E. chiclensis* (Ostolaza et al., 2009) (Fig. 2d). Lately, we have found another locality where it grows abundantly, mainly with erect stems, on the road from Canta to Pasco on the South bank of the Chillón River Valley

2c. *Echeveria fruticosa* in situ in anthesis at Cacray with urceolate, greenish flower buds.

2d. Young *Echeveria fruticosa* in situ at Baños, in the Chancay River Valley, growing at the base of *Matucana haynei*.

2e. Multi-stemmed *Echeveria fruticosa* in habitat at Cacray. Photo I.T.

2f. Ex-situ plant of *Echeveria fruticosa* from the type locality showing decumbent stem.

2g. Cluster of young *Echeveria fruticosa* with short branches and whitish stems.

2h. Rosettes of *Echeveria fruticosa* showing purple tinged, faceted leaves.

in front of the town of Huaros. Santiago Zambrano has found it on the path to the nearby ruins of Cantamarca, and Alfredo Seminario found it near the ruins of Rupac, in the Chancay River Valley. Ignacio Torres from Mexico has explored the Cacray Waterfall and Tunnel area in the Rimac River Valley after the Coastal El Niño phenomenon of 2017 and found many plants detached by the rain from the high cliffs lying on the road, and he also observed some majestic, multi-stemmed plants revealed by the landslides (Fig. 2e).

Description: A succulent glabrous, herb with conspicuous stems. **Roots** adventitious from stem, fibrous, 4–6 cm long, 1–2 mm diam., dark brown, rarely 1(-3) tapering roots in very old plants, born from the base, up to 20 cm long, 1.4–0.7 cm diam. **Stem** simple or branched, aerial, erect when young and exposed, decumbent or procumbent in shaded plants, 1.2–2.5 cm diam., gray brownish, with constrictions caused by annual growth, vertical or decumbent up to 45 cm long or more in very old plants (Fig. 2f). **Branches** 3–8 (–30) born from the base, greenish-white in young plants (Fig. 2g). **Rosettes** one at the end of stem or branch, 12–15 cm diam. (Fig. 2h). **Leaves** 12–16, narrowly rhomboid obovate, sessile, incurved when young, 5.5–12 cm long, 0.8–2.2 cm wide at base, 1–3 cm wide at proximal third, 1.5–4.2 cm wide at middle, 1.5–3.5 cm wide at distal third, 4–6 mm thick (Fig. 2i), upper side concave to canaliculate and even subplicate when dry, rarely flat, faceted 4–8 mm near margins, in the dry period light blue to light glaucous green in central leaves, tinged light purplish on outer leaves (Fig. 2j) in the rainy period bright or greenish-white near base; central nerve frequently depressed, dark reddish at tips or outer half, lower side keeled,

2i. Detail of the subrhomboid leaves of *Echeveria fruticosa.*

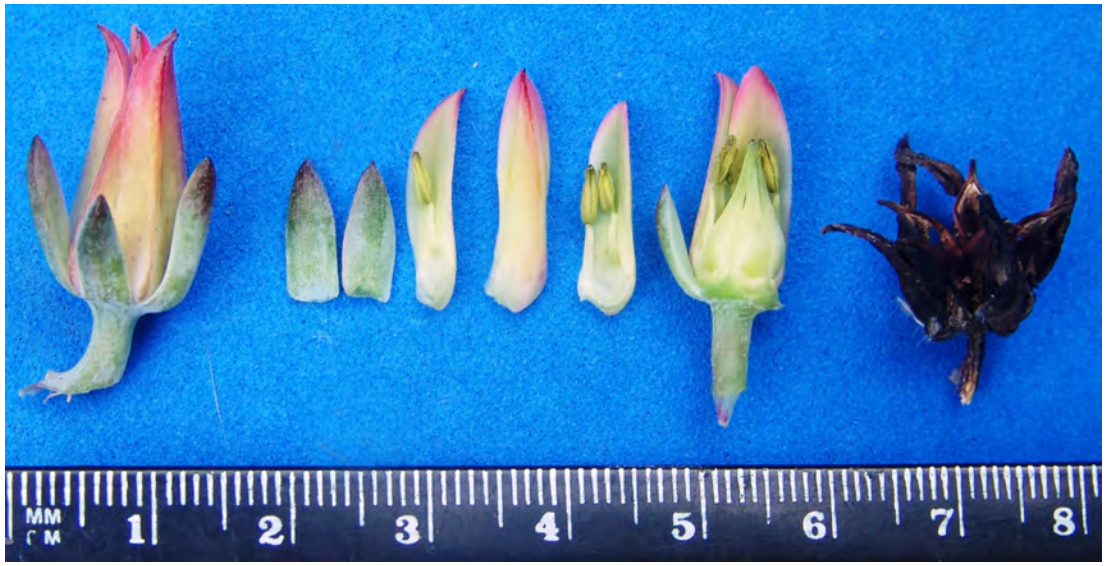
light green or reddish, redder at keel and tip, apex acute with an acute slightly recurved reddish mucro 0.5–1 mm long at apex, base hyaline.

Flowering stem 1–2 oblique lateral subterminal racemes, **dry scapes** persistent up to 3, rachis 30–45 (-60) cm long, 8–10 mm diam. at base, 2–3 mm diam. at apex, light green to pink when very exposed (Fig. 2k). **Peduncular bracts** 18–24, all along the stem, larger at the proximal third or half, soon deciduous, spaced evenly 1–3 cm apart, oblong to lanceolate, straight or slightly recurved, 2–6 cm long, 0.8–2 cm wide, 6–8 mm thick, upper side flat to canaliculate or convex, lower side keeled, same color as leaves, base hyaline, tips reddish, acute to mucronate, incurved (Fig. 2l). **Flowers** (12–) 16–20, appearing from April to June, present at distal half of the scape, 1.8–2.5 cm long and 0.7–1.1 cm diam. **Pedicels** short (1–7 mm) or in lower flowers, oblique, 2.5–3.5 mm diam., same color as flowering stem, with a small bracteole at base. **Calyx lobes** united at base, sepals unequal, narrowly ovate acute, spreading in right angle or erect, both sides concave, 7–10 mm long, 4–4.5 mm wide, olive green, distal half and tip reddish. **Flower buds** ovoid, 1 × 1.2 cm, light or bright green when shaded, reddish at the tips and keels (Fig. 2m). **Corolla** urceolate, subprismatic, 0.8–1.1 cm thick near base, 0.7–0.8 mm thick near apex, 1.8–2.5 cm long, **petals** narrowly oblong, acute, 1.7–2.4 cm long, 3–4 mm wide, outer surface keeled, light green when shaded, reddish at the tips and keel, becoming entire reddish when exposed (Fig. 2n), apex slightly recurving, inner surface light green to yellowish. **Stamens** 10, the 5 epipetalous 4–6 mm long, the antesepalous 6–8 mm long, **filaments** cream, 1 mm thick at base, gradually tapering to 0.6 mm. **Anthers** ovate, yellow, 2–4 mm long and 0.6–1 mm wide. **Gynoecium** turbinate, 10–12 mm long, 5–6 mm thick. **Carpels** 5, greenish-yellow. Styles 3–4 mm

2j. Young plant of *Echeveria fruticosa* with developing inflorescence in winter of a very dry year.

2k. Shaded *Echeveria fruticosa* with developing inflorescence along the road to La Viuda Pass.

2l. Bracts of *Echeveria fruticosa*.



2m. From left to right: *Echeveria fruticosa* complete flower, sepals (2), petals (3), sectioned flower showing gynoecium, dry fruit.

long, parallel, almost touching each other, greenish (Fig. 1g). **Nectaries** reniform, whitish 0.6 × 1.5 mm. **Fruit** a dehiscent capsule 1.5–1.6 cm long, 1.6–1.8 cm diam. (spreading dry sepals), dark brown (Fig. 2o).

Other localities: PERU: Dept. Lima, Prov. Canta, Dist. Huaros. Road from Canta to Huaros, before the town, in gorge, 3320 m, S 11°24'09", W 76°34'22", Feb 19, 2005, *G. Pino 1594* (USM 304295). Road from Canta to La Viuda Pass, Km 115, before the town, on shaded wall, 3330 m, S 11°25'30", W 76°35'22", Feb 19, 2005, *G. Pino 1592* (USM 304298). Huaros. Road from Canta to La Viuda Pass, before the detour to Huaros, rocky vertical walls, 3376 m, S 11°24'47", W 76°34'15", May 7, 2017, *G. Pino 2801.* Dist. Canta. Road from Canta to Cantamarca ruins, on a detour, 3169 m S 11°27'13", W 76°36'19",May 10, 2016, *S. Zambrano G S/N*. Prov. Huaral, Dist. Andamarca. Road from Santa Cruz de Andamarca to Baños, growing at the base of *Matucana haynei*, 3890 m, S 11°13'02", W 76°36'15", Dec 12, 2007, *G. Pino 1817*. Dist. Atavillos Bajo, Near the Ruins of Rupac. 3400m. S 11°19'29", W 76°48'08" *Alfredo Seminario s/n*. Prov. Huarochiri, Dist. San Mateo: Km 97 of Carretera Central, Cacray waterfall at Rimac River past Puente Infiernillo, on rocks together with *Oxalis megalorrhiza, Sedum incarum*, *Nasa* sp., *Peperomia pugnicaudex, P. parvisagittata* and *P. cerrateae,* 3300 m, S 11°44'20", W 76°16'45", Jan. 14, 2001, *G. Pino 620.* Cacray waterfall, Jul. 17, 2017*, Ignacio Torres s/n*.

Echeveria fruticosa differs from all other species of *Echeveria* of Lima in the presence of conspicuous, erect or sometimes hanging aerial stems branching

2n. Detail of the reddish flowers of *Echeveria fruticosa* in sunny summers.

generally from the base. Its leaves are narrowly rhomboid to obovate and wider (2–4 cm) than *E. chiclensis,* that has linear oblong leaves in all its varieties, 1–2 cm wide. Its subrhomboid leaves could be confused with those of *E. deltoidea* that has narrowly triangular but sometimes subrhomboid leaves and with *E. andicola* that has obovate leaves, but the flowers of *E. fruticosa* are urceolate and subprismatic, not pyramidal like those of *E. deltoidea*, light green with a flush or partially reddish compared to the smaller, even orange red flowers of *E. andicola* (Table 1).

Distribution: To this date, *Echeveria fruticosa* is only found in the Chillón River valley and scattered in its adjacent river basins (Rimac River valley and Chancay River valley), being abundant only near the type locality in Huaros.

3a. *Echeveria chiclensis* var. *cantaensis* at the type locality.

Etymology: The name "fruticosa" refers to its appearance like a small shrub "frutex" in latin, due to its tendency to form conspicuous stems, a character evident even in small plants.

3. ***Echeveria chiclensis*** (Ball) Berger var. ***cantaensis*** Pino & Vilcapoma, var. nov.

Holotype: PERU: Dept. Lima, Prov. Canta, Dist. San Buenaventura, road to San Miguel de Pumacoto, slopes of La Viuda mountain range. 2650 m, Apr. 9, 1998, *G. Vilcapoma 4722* (MOL 00009721) (Fig. 3a)

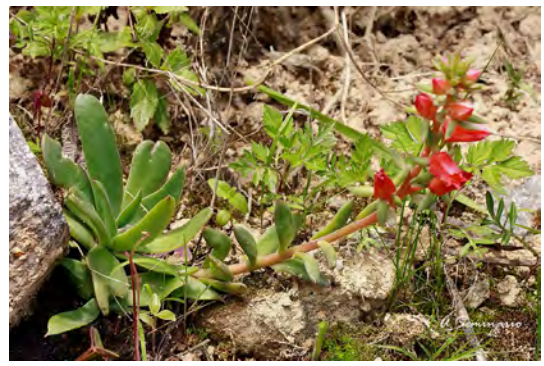
This taxon was collected for the first time by the second author in 1998 near Pumacoto in Canta and she correctly determined it as *Echeveria chiclensis* in the MOL herbarium. She is an expert of the Flora of Canta and the Chillón Valley, but she was not aware of the distinctive features of the type variety of the Rimac Valley by that time. I found this plant later at Obrajillo Waterfall near Canta Town and mentioned it in the publication of the varieties of *E. chiclensis* (Pino, 2002), determining it as var. *chiclensis*. I noticed some differences in flower size and shape with the

3b. Plant in-situ of *Echeveria chiclensis* var. *cantaensis* from the road to Churín with yellowish flowers.

3c. Plant in situ of *Echeveria chiclensis* var. *cantaensis* from Caujul. Note the redder flowers.

Rímac River variety but not enough data was available then to enable describing a new variety. In year 2003 Graciela found it again growing at a higher altitude above the town of Santa Rosa de Acochaca, some km walking eastward from Obrajillo waterfall, at the same Chillón River bank. In year 2004, an expedition of the Peruvian Society of Cactus and Succulents (SPECS) found this variety in the Huaura River basin, the next river North of Chillón River, in a detour from the road from Sayán to Churín towards Paccho, growing with *Espostoa melanostele*, very low, at 1720 m. They thought it was *E. chiclensis* var. *backebergii* but the photo is not very clear and the color of the flowers did not match the yellow color of this variety of *E. chiclensis* (Ostolaza et al. 2005).

In 2008 I visited the Huaura River basin heading to Churin Hotsprings. I found *Echeveria chiclensis* already at 2000 m on the road from Sayán to Churín, growing in very dry places (Fig. 3b) and later on the road to Caujul and to Oyón in different altitudes from 1900 to 3100 m (Fig. 3c). Plants have some variation, but their flowers resemble the Chillón River Valley plants very much in color and in the right angle insertion of sepals, although they may have longer pedicels in basal flowers. Recently, Alfredo Seminario has also found this variety growing in the Chancay River



3d. *Echeveria chiclensis* var. *cantaensis* in habitat, the Chancay River Valley with very red flowers. Photo A.S.

3e. Plant ex-situ of *Echeveria chiclensis* var. *cantaensis*.

Valley with very red flowers at 2100 m (Fig. 3d).

Description: A succulent glabrous, solitary or rarely proliferous herb (Fig. 3e). **Roots** 2–6, tuberous, tapering, 0.3–1.2 cm diam., 4–9 cm long, light gray-whitish. **Stem** subterranean, only in very old plants, 1–2 cm diam., 2–8 cm long, rarely branched from base, erect, with constrictions caused by annual growth, dark brown. **Rosettes** one at the end of stem, 12–20 cm diam. **Leaves** 10–14, lanceolate and spreading when young (Fig. 3f), later narrowly oblong, slightly incurving at tips, sessile, 6–13 cm long, 0.6–1.4 cm wide at base, 1–1.6 cm wide at proximal third, 1.0–2 cm wide at middle, 0.8–2 cm wide at distal third, 3–6 mm thick, upper side concave to flat or canaliculate,

3f. Young plant of *Echeveria chiclensis* var. *cantaensis*. at the Obrajillo waterfall.

3g. Leaves of *Echeveria chiclensis* var. *cantaensis.*

sometimes keeled, light glossy green, lower side convex, light green or reddish, obscurely keeled, margins smooth with an narrow acute mucro 1 mm long at apex, base hyaline (Fig. 3g).

Flowering stem an erect raceme, rarely up to 3, rachis 25–60 cm long, 7–10 mm diam. at base, 2–3 mm diam. at apex, whitish-green near base, reddish towards apex (Fig. 3h). **Peduncular bracts** 18–22, ascending or at 45°, spaced evenly 1–1.5 cm apart, narrowly oblong to lanceolate, tips acute to acuminate, recurved, 2–5 cm long, 8–13 mm wide, 2–4 mm thick, upper side flat or convex, bright green, lower side convex, light green, base hyaline (Fig. 3i). **Flowers** (4-) 6–12, appearing from October to May, present at the distal fourth or fifth of the scape, 1.2–1.3 cm long and 8–12 mm diam. **Pedicels** 1.5–2 mm long, 1.8–2 mm wide, orange, with 1 or 2 minute linear bracteoles 2.5–3.5 mm long and 1 mm wide (Fig. 3j). **Calyx lobes** united at base, spreading at right angle or up to 45°, ovoid, subacute, 5–10 mm long, 2.5–4 mm wide, green. **Corolla** pyramidal to prismatic, subpentagonal, 8–12 mm thick near base, 3–4 mm thick near apex, 1.2–1.3 cm long, petals oblong, acute, 1.2–1.4 cm

3h. Detail of scape and flowers of *Echeveria chiclensis*.

3i. Bracts of *Echeveria chiclensis* var. *cantaensis.*

3j. Detail of the flowers of *Echeveria chiclensis* var. *cantaensis.*

3k. From left to right: *Echeveria chiclensis* var. *cantaensis* sepals (4), petals (2), sectioned flower showing gynoecium, mature fruit and dry fruit.

long, 2–4 mm wide, outer surface subcarinate, evenly reddish-orange to yellowish, apex slightly recurving and more yellowish, inner surface yellow. **Stamens** 10, the 5 epipetalous 5–6 mm long, the antesepalous 10–12 mm long, **filaments** cream, 1 mm thick at base, gradually tapering to 0.2 mm. **Anthers** ovate, yellow, 1.2–1.4 mm long and 1 mm wide. **Gynoecium** turbinate, 8–9 mm long, 4–5 mm thick. **Carpels** 5, greenish-white. **Styles** 2–3 mm long, parallel, almost touching each other, stigma reddish. **Nectaries** lunate, light greenish-yellow 1.5 × 0.5 mm. **Fruit** a dehiscent capsule 0.7–0.9 cm long, 1.3–1.7 cm diam. (spreading dry sepals), brown (Fig. 3k).

Other localities: PERU: Dept. Lima, Prov. Canta, Dist. Huaros, Santa Rosa de Acochaca, above the town, on rocky slope, 3000 m, Apr. 12, 2003, *G. Vilcapoma 5993* (MOL 00010872) Dist. Canta, Obrajillo, on walls of the path to the waterfall with moss and grass, together with *Peperomia galioides* and *Oxalis peduncularis*, 2750 m, S 11°26'51", W 76°36'57", Aug. 16, 2001, *G. Pino 749* (USM 162963) Dist. San Buenaventura, road from Canta to Obrajillo, north margin of Río Chillón, on rocks with moss and grass, together with *Peperomia galioides*, *P. nivalis var. lepadiphylla*, *Cleistocactus acanthurus* ssp. *acanthurus*, *Trichocereus peruvianus* and *Tecoma sambucifolia*, 2570 m, S 11°27'34", W 76°37'45", Feb. 16, 2002, *G. Pino 781, G. Pino 1598* (USM 162967). Prov. Huaral, Dist. Pacaraos, at the entrance of the town. 3,360 m. S 11°11'07", W 76°38'46" Dec. 5, 2007, *G. Pino 1816.* Dist. Atavillos Bajo, Road to the town of La Florida and the Ruins of Rupac. 2100m. *Alfredo Seminario s/n*. Prov. Huaura, Dist. Paccho. Detour from the road from Sayán to Churín towards Paccho, growing with *Espostoa melanostele*, 1720 m. *Ostolaza s.n.*, 2004. Dist. Checras, Road from Sayán to Churín, together with *Peperomia galioides*, *P. nivalis var. lepadiphylla*, *Mila nealeana*, *Trichocereus peruvianus* and *Opuntia pubescens*, 2060 m, S 10°51'20", W 76°55'18" Mar. 20, 2008, *G. Pino 1922.* Prov. Oyón, Dist. Caujul, Just before the town of Caujul, with *Trichocereus peruvianus, Weberbauerocereus churinensis* and *Matucana haynei,* 3128 m, S 10°48'40", W 76°58'56" Mar. 21, 2008, *G. Pino 1932* (USM 304297). Road from Caujul to Aguar, Caujul River banks, 1900 m, S 10°52'03", W 76°58'37" Mar. 21, 2008, *G. Pino 1939.* Dist. Oyón, 2 km before town of Viroc, with *Trichocereus peruvianus, Peperomia galioides, Sedum incarum* and *Pilea serpyllacea,* 3050 m, S 10°41'32", W 76°48'56" Mar. 21, 2008, *G. Pino 1943* (USM 304299).

The three varieties of *Echeveria chiclensis* have very similar leaves in shape: linear to narrow oblong. Variety *chiclensis* and *cantaensis* have smooth, glossy leaves but the first has redder or more purplish leaves and bracts when exposed, mainly in the lower surface (Fig. 3l). On the other hand, leaves of var. *backebergii* are slightly smaller and the whole plant is constantly covered by minute transparent papillae that gives it the palest color of all three varieties (Fig. 3m).

The most striking differences between the three varieties are the flowers. They are much shorter in var. *cantaensis* than in the other two varieties, not so narrowly pyramidal in shape. Its pedicels are short, sepals are wide, spreading at a right angle and light green, very convex at both sides. Petals are redder than in the other two varieties, and redder in the northern range of this variety. A comparison of the flowers of the three varieties of *E. chiclensis* is made (Fig. 3n). Variety *cantaensis* could easily be mistaken for *E. andicola,* a species occurring in the Departments of the

3l. Plant ex-situ of *Echeveria chiclensis* var. *chiclensis* from the type locality.

3m. Echeveria chiclensis var. *backebergii* at the Chillón River Valley, near Puente Chaperito.

3n. Comparison of the flowers of all three varieties of *Echeveria chiclensis*. Above: var. *cantaensis;* Center: var. *backebergii;* Below: var. *chiclensis.* From left to right: Complete flower, sepals (4), petals (4), sectioned flower showing gynoecium, mature fruit and dry fruit.

3o. Detail of the flowers of *Echeveria andicola*.

eastern boundaries of Lima, (Huánuco, Junin, Pasco, Pino, 2005) but this species has slightly smaller flowers, evenly orange red in color and prismatic in shape, not pyramidal (Fig. 3o), also its leaves are wide oblong to obovate and not linear oblong. However, plants from the northeastern range of this new variety (Caujul and Oyon) show some characters like redder and more prismatic flowers, oblong or subobovate leaves, that approach *E. andicola* suggesting there could be intermediate forms between these two or even established hybrids between them but this needs to be confirmed in the future by molecular analysis.

Distribution: This variety occurs in the three valleys North of the city of Lima, always at lower places (1,700–3,100 m) than the variety for which it has always been determined: *E. chiclensis* var. *chiclensis* (3300–3800 m). In the case of the Huaura and Chancay Valleys, it grows at even lower altitudes than variety *backebergii* (2000–2600 m).

Etymology: The name of the variety recalls the province of Canta, in the Chillón River Valley, where it was first discovered.

4. *Echeveria chiclensis* var. *backebergii* (Poellnitz) Pino. *Haseltonia* 9: 51–61.

Synonyms: *Echeveria chiclensis* forma *backebergii* (Poellnitz) Kimn., *Haseltonia* 5: 51, 1997. *Echeveria backebergii* Poellnitz, *Repertorium specierum novarum* 38: 185.

This other variety of *Echeveria chiclensis* has also been found in the Chillón Valley. Features of the plants collected match the original description (Pino, 2002).

Localities in the Chillón Valley: PERU: Dept. Lima, Prov. Canta, Dist. San Buenaventura. Below Canta, rocky banks of Chillón River. 2500 m, Apr. 2, 1953, *R. Ferreyra 9013* (USM 19893). Road from Lima to Canta km 95, north margin of Chillón River, on rocks with moss and grass, together with *Peperomia parvisagittata*, *Cleistocactus acanthurus* ssp. *acanthurus*, 2390 m, S 11°29'11", W 76°38'39", Feb. 20, 2005, *G. Pino 1599* (USM). Km 94, Puente Chaperito, together with *Peperomia nivalis* var. *lepadiphylla*, *Peperomia rupiseda, Peperomia galioides*, 2320 m, S 11°29'30", W 76°39'01", Feb. 20, 2005, *G. Pino 1606* (USM) Dist. Arahuay, Collo, road to Arahuay, on rocky slopes, 2100 m, Mar. 7, 2004, *G. Vilcapoma 7064* (MOL, USM 268556). Collo, on rocky communities, 2090 m, Apr. 15, 1988, *S. Rivas, O. Tovar, J. Campos & A. Galán de Mera S/N* (USM 125468). Around town of Arahuay, on soil, grassy slopes, 2650 m, Aug 4, 2010, *P. Gonzales & E Navarro 1075* (USM 00259449).

A comparison of all taxa from Lima mentioned is shown in Table 1.

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All photos taken by Guillermo Pino except for (G.V.) = Graciela Vilcapoma Segovia, (I.T.) = Ignacio Torres García and (A.S.) Alfredo Seminario Fernández.

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Table 1. Comparison of the main features of the species of *Echeveria* growing in the Department of Lima.

	Echeveria chiclensis var. *chiclensis*	*E. chiclensis* var. *cantaensis*	*E. chiclensis* var. *backebergii*	*E. deltoidea*	*E. fruticosa*	*E. andicola*
Roots/ number	Tuberous, 3–8 tapering	Tuberous, 2–6 tapering	Tuberous, 3–18 tapering	Narrowly tuberous, 3–5 tapering	Adventitious, fibrous, rarely tapering.	Narrowly tuberous, 3–8 tapering
Stem	Subterranean, 2–10 × 1.5–5.5 cm	Subterranean, 2–8 × 1–2 cm	Subterranean,very short.	Subterranean, tapering, –30 × 0.5–3.5 cm	Aerial, erect or trailing, (–30) branched, 20–30 (–45) × 1.2–2.5 cm	Subterranean, 4–10 × 1–3 cm
Rosettes (diam.)	9–20 cm	12–20 cm	10–18 cm	15–25 cm	12–15 cm	7–18 cm
Leaves	10–32, linear – oblong. Glossy green to purple	10–14, linear oblong. Glossy green, lower side somewhat reddish	12–23, linear – oblong, light green to glaucous-whitish, with minute papillae	12–27, narrowly –triangular-ovate Glaucous - sky blue, reddish distally	12–16, narrowly rhomboid obovate Glaucous green – purplish abaxially	18–40, lanceolate obovate to wide oblong, wide at the base. Light green to glaucous
Length × width of leaves	5–13 × 1.1–2.5(-3) cm 2.5–8 mm thick	6–13 × 0.6–2 cm 3–6 mm thick	4–11 × 1–1.8 cm 2.5–4 mm thick	10–15 × 2.5–5 cm 3–5 mm thick	5.5–12 × 1–4.2 cm 4–6 mm thick	5.5–10 × 2–4 cm 2–3 mm thick
Scape	30–50 cm 3–4.5 mm diam. at base, 1.5–2 mm diam. at apex	25–60 cm 7–10 mm diam. at base, 2–3 mm diam. at apex	20–40 cm 3.5–4.5 mm diam.at base, 2–3 mm diam. at apex	30–80 cm 7–10 mm diam at base, 3–5 mm diam at apex	30–60 cm 8–10 mm diam. at base 2–3 mm diam at apex	20–35 cm 4–6 mm diam. at base 1.5–2 mm diam at apex
Bracts	23–42, 2.5–5.5 × 0.5–1 cm	18–22, 2–5 × 0.8–1.3 cm	15–20, 1.5–4 × 0.6–0.9 cm	18–26, 2–9 × 1.2–1.8 cm	18–24, 2–6 × 0.8–2 cm	7–15, 3–3–5 × 0.9–1.3 cm
Flowers	10–16, narrowly pyramidal, 1.8–2.7 cm long × 8–12 mm diam.	6–12, pyramidal to prismatic, 1.2–1.3 cm long × 8–12 mm diam.	8–13, narrowly pyramidal, 1.4–1.6 long × 8–9 mm diam.	16–24 pyramidal with wide base and narrow tip, 1.8–2 cm long × 1.2–1.4 cm diam.	12–20, urceolate, subprismatic 1.8–2.5 cm long and 0.7–1.1 cm diam.	11–22, subprismatic, 1.0–1.4 cm long and 0.8–0.9 cm diam.
Pedicels	1–2.5 (-5) cm × 1–2 mm, curved	1.5–2 × 1.8–2 mm, erect	0.2–1.5 cm × 1–2 mm, straight oblique	2–12 mm, slightly curved	1–7 mm × 2.5–3.5 cm, straight oblique	1.2–1.5 mm × 0.2–1 cm, straight
Sepals	erect, linear-oblong, acute, 5–9 mm long, 2.5–3 mm wide, dull green, reddish at base	spreading in 45–90°, ovoid, subacute, 5–10 mm long, 2.5–4 mm wide, bright green	erect, lanceolate, acute, 5–7 mm long, 2–3 mm wide, grayish green	narrowly ovate acute, spreading in right angle, 5–8 mm long, 3–4 mm wide, light olive green	spreading in right angle or erect, 7–10 mm long, 4–4.5 mm wide, olive green, distal half and tip reddish	erect, linear lanceolate, 6–9 mm long, 2–2.5 mm wide, dark green, reddish at the base.
Petals	elliptic-oblong, acuminate, 1.4–2.4 cm long, 3–5 mm wide, exterior red at base, orange to yellow near apex, inside pinkish at base, apex greenish, recurvate.	oblong, acute, 1.2–1.4 cm long, 2–4 mm wide, exterior evenly reddish, orange to yellowish, inside yellow, apex slightly recurvate	oblong, acuminate, 1.2–1.4 cm long, 3–4 mm wide, exterior red at base, yellow at apex, sometimes entirely yellow, inside yellowish	narrowly oblong to triangular, acute, 1.8–2 cm long, 5–6 mm wide, outer surface obscurely keeled, bright red with some yellowish stripes, apex slightly recurving, inner surface red 1 mm near margins and distal end, yellowish at the middle.	narrowly oblong, acute, 1.7–2.4 cm long, 3–4 mm wide, outer surface keeled, light green when shaded, reddish at the tips and keel	elliptic oblong, acuminate, 1.0–1.4 cm long, 3–3.5 mm wide, outer surface keeled, bright orangish red, inside pink.
Gynoecium	9–12 mm long, 5–7 mm thick	8–9 mm long, 4–5 mm thick	7–9 mm long, 4–5 mm thick	12–13 mm long, 7–8 mm thick.	10–12 mm long, 5–6 mm thick	8–9 mm long, 4–5 mm thick
Fruit (dry), length × width	8–15 × 15–24 mm	7–9 × 13–17 mm	9–12 × 8–12 mm	12–15 × 13–18 mm	15–16 × 16–18 mm	10–14 × 7–9 mm