LITTLE-KNOWN CRASSULACEAE OF CENTRAL PERU

GUILLERMO PINO
6 de Agosto 1146, Lima 11, Peru
gpinoi@hotmail.com; gpino@amauta.rcp.net.pe

Abstract: Six little-known Crassulaceae from central Peru are discussed. (1) *Echeveria excelsa*, the largest species of this genus in Peru, is found for the first time at its type locality since Weberbauer's visit in 1906, and a new type is designated for it; (2) *Sedum andinum* is perhaps the smallest *Sedum* species in Peru; it has almost spherical leaves, and its red-and-white flowers are difficult to observe. (3) *Sedum incarum* (Ball) Pino is a new combination for *Villadia incarum*; its inflorescence is an obscure and variable cyme, which earlier may have been misinterpreted as a raceme. (4) *Sedum decipiens* has been re-collected for the first time since its discovery. It is rare in habitat and has a distinctive inflorescence forming a diffuse monochasium. (5) *Sedum renzopalmae* Pino is presented as a new species with yellow flowers. (6) *Villadia virgata* remains as the only valid species of *Villadia* in Peru, though there is evidence that other species may exist.

Key words: Crassulaceae, *Echeveria*, *Sedum*, *Villadia*

1. *Echeveria excelsa* (Diels) A. Berger

Echeveria excelsa (Diels) A. Berger In *Engl & Prantl*, *Pflanzenfam*, ed 2. 18a: 473. 1930. Poellnitz, in *Fedde Repert*, Vol 39, p 217, 1936. Macbride, *Flora of Peru*, Vol. XIII. Part. II, No. 3: 1014. 1938.

Cotyledon excelsa Diels In *Englers Botan Jahrbuch* 37: 412. 1906.

Type: *Ancash inter Samanco et Caraz infra praedius Cajabamba in rupibus 3300–3400 m flor maj. 1903* (Weberbauer 03/3149, B).

A succulent glabrous herb with usually a single (–3) rosette (Fig 1). Roots tuberous, 0.2–0.6 cm thick, light gray to white. Stem (0.7–) 1.7–3 cm diam., (5–) 18–20 cm long, rarely branched, erect or slightly decumbent. Rosette (11–) 14–22 cm diameter. Leaves 15–24, sessile, succulent, horizontally flat, obovate, (6–) 9–13 (–15) cm long, 3–4.5 cm wide 2 cm from apex, 3.5–5 (–6) cm wide at middle, (1.3–) 1.7–2.5 cm wide at base, 5–7 mm thick, acute, with a minute triangular mucro 0.5–1 mm long, 1–2 mm wide, sometimes recurved, upper side flat to slightly concave, green, lower side convex, light green, keeled with a reddish blush, margins smooth but faceted near apex when young (Fig 2).

Flowering stem a simple spike, rarely 2, erect, 40–75 (–120) cm long, 0.8–1.1 mm diam. at base, 4–6 mm diam. at apex, light green near base, reddish towards apex or becoming paler just at the tip (Fig 3). Peduncular bracts 12–19, present only in the proximal two thirds, oblong-lanceolate, 3.5–5 cm long, 1.7–2.2 (–2.5) cm wide, 5–6 mm thick, bright green. Flowers 22–26, appearing from March to May, only in the distal third, 2–2.1 cm long and 0.9–1.2 cm diam., bright red, with one lanceolate bracteole spurred or trilobed at base, 0.6–0.8 mm long and 3–3.5 mm wide, green. Pedicels absent or very short. Calyx lobes united at base, erect, sepals lanceolate, acute, 4–5 (–7) mm long, 3–3.5 mm wide, bright green. Corolla ovoid, pentagonal, 9–10 mm thick near base, petals ovate-oblong, acuminate, 1.3–2 cm long, 4–7 mm wide, outer surface red or yellowish, keeled, apex uncinate, recurving outwards, inner surface light yellow. Stamens 10, the 5 epipetalous 8–9 mm long, the antesepalous 10–12 mm long, filaments cream, 0.8 mm thick at base, gradually tapering to 0.2 mm. Anthers ovoid, yellow, 3–4 mm long and 1.5–1.6 mm wide. Gynoecium ovoid, 8–10 mm long, 6–7 mm thick. Carpels 5, greenish white. Styles 4–5 mm long, parallel, almost touching each other, reddish near the tip, stigma red (Fig 4).

PERU. Dept. Ancash, Prov. Huaylas, Dist. Mato, "Sangra Boteja," road from Cajabamba Alta to Cajabamba Baja, on rocky, south-facing, 45° slopes, 100 m below the road, on soil among grasses and low shrubs, 3540 m, 09°06′28″ S, 77°56′36″ W, Apr 14, 2006, *G. Pino 1665* (USM 210899, **neotype**). Dist. Pamparomás. Huascarán National Park, trail between Auquispuquio and Cerro Cunka, 3400 m, 08°50′ S, 77°59′ W, Apr 10, 1985, *Donald N. Smith and others 12118* (USM 102726). Prov. Huaraz, Dist. Cochabamba, 10 km by road from Cochabamba, open dwarf forest of *Escallonia resinosa* and *Myrcianthes quinqueloba*, western Andean slopes, 2870 m, 09°27′ S, 77°51′ W, June 06, 1985, *Donald N. Smith and others 10948* (USM 102775).

Diels described this species as *Cotyledon excelsa* in 1906 from a plant collected by August Weber-

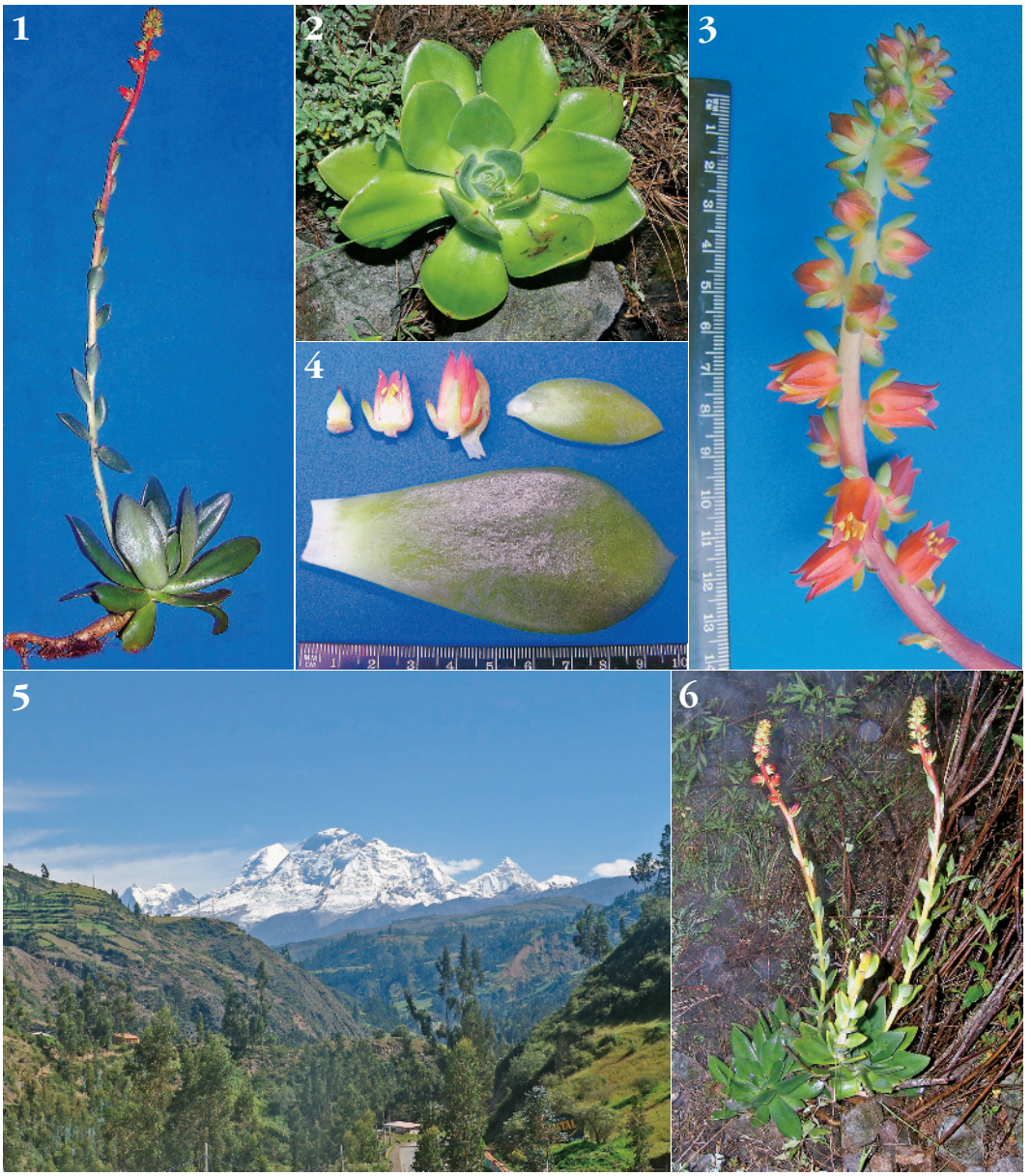


Figure 1. *E. excelsa*, ex situ. **Figure 2.** Young *E. excelsa* in habitat. **Figure 3.** Detail of the inflorescence and flowers of *E. excelsa*. **Figure 4.** Detail of (above, left to right) gynoecium, flower section, complete flower with bractlet, bract. (beneath) leaf. **Figure 5.** Huascarán summit, the highest peak in Perú, on the road to the type locality. **Figure 6.** *E. excelsa*, mature plant in habitat.

bauer (W 3149, B). Later revisions of *Cotyledon* excluded New World species, and *C. excelsa* was transferred to *Echeveria* by Berger in 1930. The type no longer exists and was probably destroyed during World War II, as mentioned by Walther (1972). Luckily, a photo was conserved at the Field Museum in Chicago (F 18250) and has been considered as the lectotype until now. The locality described by Diels is vague: "Dept. Ancash between Samanco and Caraz below estate Cajabamba in rocks between 3300 and 3100 m." Samanco is a small port along the Pacific Ocean, and Caraz is a city in the Andes by the Santa River at 2300 m. Between those two places there are several towns, including Nepeña, Jimbe, Moro, Pamparomás and Huata, at various altitudes. Caraz lies in the so-called "Callejón de Huaylas," a beautiful valley between two mountain chains, Cordillera Negra to the west and Cordillera Blanca to the east. The latter range is so-called because of its permanently snow-covered peaks, one of which, the Huascarán summit at 6768 m, is the

highest mountain in Peru (Fig 5). In our first attempt to reach this locality we traveled from the coast, trying to reach the altitude mentioned, but the road ascended slowly and soon worsened, so we decided to go in the opposite direction starting from Caraz. First we traveled north on the highway until we found a westbound road that ascended quickly to the town of Huata. After reaching the summit of the Cordillera Negra at 4350 m, we observed the rare and endangered succulent bromeliad *Puya raimondii* Harms at 4270 m. Then we were surprised to learn that a town called Cajabamba actually existed, though it is not mentioned on the usual maps. After a quick but futile search on the outskirts of the town, we decided to travel on to Pamparomás. A dense fog made it even more difficult to find plants, and we were coming back when we decided to ask the locals about it. Luckily, a man called Jobino Temple knew this plant and even had a collected specimen that he showed us. The place where it grows is not easy to reach; we had to climb down a hill by the road to discover that the plants are not common there either (Fig 6). The plant is locally called "Siempreviva," probably because the Spaniards who first saw it recalled the related European genus, *Sempervivum*. Plants are used for medicinal purposes, as are other Peruvian echeverias.

Echeveria excelsa is very similar to the recently described E. *andicola* Pino (2005), sharing with it the shape of the leaf and its apical mucro. The latter species is easily distinguished because of its smaller leaves and scapes, smaller flowers and conspicuous pedicels. According to Walther (1972), *E. excelsa* belongs to Series Elatae because of its tall, equilateral inflorescences, presence of bracteoles, evident stem and large rosulate leaves. As the type was destroyed, probably burned in the bombing of the Berlin-Dahlem herbarium, we designate a neotype for it.

2. *Sedum andinum* Ball

Sedum andinum Ball. *J Linné Society* 22: 37. 1885.

Villadia andina (Ball) Baehni & J. F. Macbride. *Candollea* 7: 285. 1937. Macbride. *Flora of Peru*. Vol. XIII Part. II. N.3: 1010. 1938.

Sedum backebergii von Poellnitz In *Fedde Repert*, Vol 44, p 95, 1939.

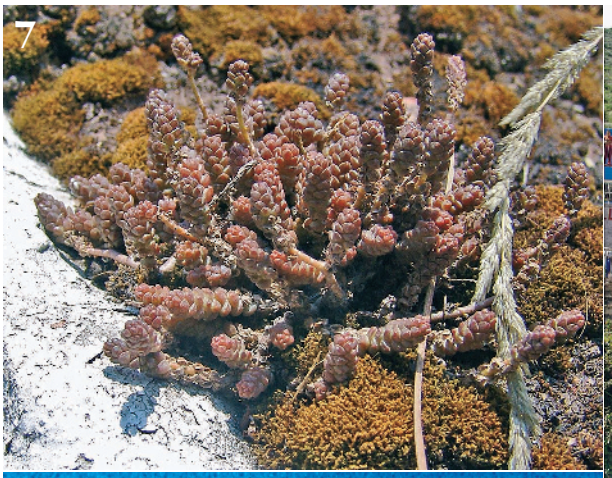
Type: *Iter Australi Americanum. Ex rupestribus Andium Peruviae juxta pagum Chicla, 3800 m.* J. Ball s.n. April 21–24 1882, (K 685).

A succulent glabrous herb, caespitose, much branched from the base, 3–7 cm tall, tufts 6–9 (–25) cm diam. Stem 1.5–2 mm diam. at base, 6–10 cm long, gray brownish, decumbent. Branches (3–) 5–20, erect or slightly decumbent, 2–5 cm long, stem 0.7–1.5 mm diam., gray-greenish. Leaves succulent, spirally attached to stem, imbricate, sessile, half-clasping the stem, spherical to slightly ovoid, 2–3.5 mm long, 1.5–2.5 mm wide, 1.5–2.5 mm thick, obscurely acute, upper and lower sides convex, dull green to reddish, margins obtusely angulate, with a reddish blush (Fig 7).

Inflorescence a terminal, very small cyme. Flowers 1–3 (–4), appearing from March to May. Apical pedicels absent, almost unnoticeable in lower flowers or very short. Flower buds 2 × 2 mm, brownish red. Bracteole replaced by a normal leaf. Sepals ovoid, 2.5–3 mm long, 1–1.2 mm wide, inner side concave, dark green. Petals lanceolate-rhombical, acute, united at base, 3.5–4 mm long, 2–2.5 mm wide, outer surface with a greenish-white keel, crimson red alongside keel, white at margins, inner surface red at margins, with a white central vertical stripe and apex. Stamens 10, the 5 epipetalous 1.5 mm long, the antesepalous 1.8 mm long, filaments white. Anthers ovoid, yellow, 0.3 × 0.4 mm. Gynoecium ovoid, 2 × 3 mm. Carpels 5, red. Styles cream-pinkish, 1–1.5 mm long, stigma white.

PERU. Dept. Lima, Prov. Huarochiri, Dist. Chicla, town of Chicla, on rocky slope beside Restaurant "Arnold," Central Peruvian Highway km 107, facing north, growing with *Peperomia verruculosa* Dahl., *Echeveria chiclensis* (Ball) Berger var. *chiclensis*, 3730 m, 11°42′18″ S, 76°16′05″ W, Apr 6, 2006, *G. Pino 1642* (USM 210895, **neotype**) (Fig 8). Dist. San Mateo, Anchi II Bridge, on west-facing banks of Anchi River 50 m south from Central Peruvian Highway km 99, growing with *Peperomia galioides* Kunth, *P.* sp aff *peruviana*, *Echeveria chiclensis* (Ball) Berger var *chiclensis*, and *Sedum incarum*, 3400 m, 11°44′ S, 76°15′ W, Apr 6, 2006, *G. Pino 1647* (USM 210897). Central Peruvian Highway km 85, to the east, above Matucana, Sept 17, 1954. *P. C. Hutchison 621* (UC 1350610). Dept. Ancash, Prov. Bolognesi, Tallenga, between Racrochaca and Pachapaque, 3600–3700 m. May 17, 1950, *E. Cerrate 665* (UC 143331).

This species was described as a Sedum based on specimens collected at Chicla by Ball in 1882. After having been transferred to *Villadia* by Baehni in 1937, it is now considered by Thiede (2003) as best returned to *Sedum*. We had already observed this plant several times along the Central Peruvian Highway but could never find it in flower. Buds are common, but they are minute, dark red, and usually only the tip is visible. Flowers appear only in exceedingly rainy periods and open on a sunny day. Despite their minute size, they are quite showy, the petals on open flowers expanding to a 45° angle (Fig 9). The combination of its red and white colors reminds one of the stripes on the Peruvian national flag (Fig 10). The inflorescences usually bear one or two flowers. The word "subquadriflora" used by Ball implies that most plants have up to four flowers, but this seems not to be the rule. More than half the observed inflorescences had only one apical flower, and the rest had mainly two (Fig 11). When the second flower is forming it is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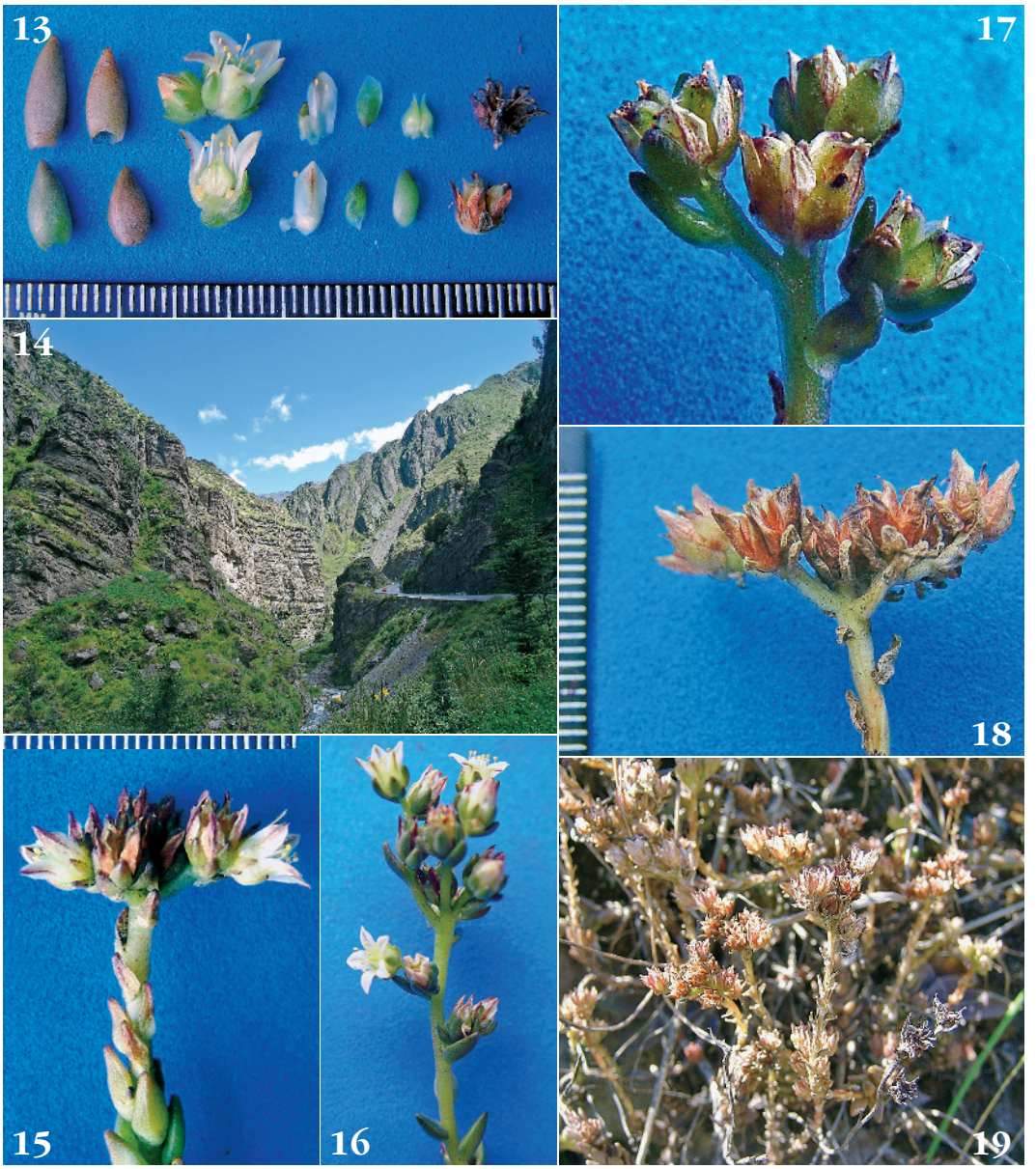


Figure 7. *Sedum andinum* in habitat at the dry period. **Figure 8.** Type locality of *Sedum andinum* at Chicla. **Figure 9.** Detail of (above, left to right) apical flower bud, secondary flower bud, petals, sepals; (beneath, left to right) open flower, closing flower, flower section, leaves. **Figure 10.** Detail of flower. **Figure 11.** *Sedum andinum* in habitat at the rainy period showing flowers. **Figure 12.** *Sedum incarum* in habitat at the rainy period showing flowers. **Figure 13.** Detail of (above, left to right) leaves, flower bud, petal, sepal, gynoecium, dry fruit; (beneath, left to right) leaves, flower section, petal, sepal, bractlet, mature fruit. **Figure 14.** Type locality of *Sedum incarum* at Rio Blanco. **Figure 15.** Detail of inflorescence, common form with two main cincinni. **Figure 16.** Detail of inflorescence, less common form with main central axis. **Figure 17.** Detail of unripe fruits. **Figure 18.** Detail of mature fruits shedding seeds. **Figure 19.** *Sedum incarum* in habitat at the dry period showing dry fruits.

easy to note that there is no main axis; hence it is a very small monochasium.

Specimens collected at Anchi bridge are smaller (Low 2006), while specimens from Matucana are greener. This could be explained because plants that grow at a higher altitude receive more rainfall and sunlight. We consider *Sedum backebergii* a synonym of *S. andinum*, because the specimens growing at the lowest altitudes of its distribution near Matucana match the description made by von Poellnitz. According to Thiede (2003), it would be conspecific with *S. dyvrandae*, but the latter more closely resembles *S. incarum*, discussed below. Ball did not cite a

type for this species, so we designate *Pino 1642* as the neotype.

3. Sedum incarum (Ball) Pino, comb. nov.

Sedum incarum (Ball) Pino **comb. nov.**

Villadia incarum (Ball) Baehni & J. F. Macbride. *Candollea* 7: 286. 1937. Macbride. *Flora of Peru*. Vol. XIII, Part. II. No. 3: 1012. 1938.

Altamiranoa incarum (Ball) Berger In *Engl und Prantl, Pflanzenfam*. ed. 2, 18a: 469.1930.

Cotyledon incanum Ball. *J. Linné Society* 22: 37. 1885.

Villadia dyvrandae (Raymond-Hamet) Baehni & J. F. Macbride. *Candollea* 7: 286. 1937. Macbride, *Flora of Peru*. Vol. XIII, Part. II, No. 3: 1011. 1938.

Sedum dyvrandae Hamet in *Englers Bot Jahrbuch* 50: Beiblatt 112: 10. 1913.

Altamiranoa dyvrandae (Hamet) Berger In *Engl und Prantl, Pflanzenfam*, ed 2, 18a: 470. 1930.

Type: Iter Australi Americanum. Ex rupestribus Andium Peruviae juxta pagum Chicla, 3800 m. J. Ball s.n. April 21–24 1882, isotype at (K 867/89–684).

Stem 3–5 (–8) mm diam. at base, 7–12 cm long, light gray, decumbent. Branches 6–15, erect, 8–15 cm long, stem 1.8–2.5 (–3) mm diam., light green to reddish. Leaves succulent, spirally attached, densely imbricate at proximal half and on young shoots, more widely spaced towards tip, sessile, narrowly ovate to subtriangular, (5–) 7–10 mm long, 3.5–4 mm wide, 2.8–3.5 mm thick, blunt-subacute, upper and lower sides convex, dull green to reddish, margins entire (Fig 12).

Inflorescence terminal, initially forming a dense cyme, then with a primary axis 4–6 cm long, 1.5–2 mm diam., branching into 2 or 3 lateral alternating cincinni, 5–18 mm long, 1.2–1.5 mm diam., light green, each bearing 2 or 3 flowers, sometimes with 2 more cincinni at the base, 4–6 mm long, with 1 or 2 flowers. Flowers 7–12, appearing from March to May, apical flower sessile at the base of the last cincinnus. Flower buds 5 × 4 mm, light green, bracteoles lanceolate, 5–6 mm long, 2–2.5 mm wide. Sepals lanceolate, obtuse, 4–4.5 mm long, 1.2–1.5 mm wide. Petals oblong-rectangular, acute-deltoid at tip, united at the base, straight or slightly curved outwards, 5–6 mm long, 2–2.5 mm wide, induplicate, outer surface white with a brownish keel, inner surface white, margins entire. Stamens 10, the 5 epipetalous 2–3 mm long, the antesepalous 3–4 mm long, filaments white. Anthers ovoid, yellow, 0.4 × 0.6 mm. Gynoecium ovoid, 3 × 4 mm. Carpels 5, light green. Style 1 mm diam., greenish white. Fruit: pentalocular, dehiscent, 5 × 5 mm. Seeds: narrowly ovoid to pyriform, 0.7–0.8 mm long, 0.35–0.4 mm diam., brownish orange (Fig 13).

PERU. Dept. Lima, Prov. Huarochiri, Dist. Chicla, between Rio Blanco and Chicla, Central Peruvian Highway km 102.5, at edge of fields, growing with *Oxalis peduncularis*, *Echeveria chiclensis* (Ball) Berger var *chiclensis*, 3590 m, 11°43′44″ S, 76°15′58″ W, April 6, 2006, G. *Pino 1644* (USM 210896, **neotype**, Fig 14), Rio Blanco, between San Mateo and Casapalca, on hill slopes, among rocks, 3500 m, March 25, 1950, *Ramón Ferreyra 6995*, (US 2057878, USM 19611). Rio Blanco, on Rio Rimac, 3500 m, *P. C. Hutchison 582* (UC 52790). Rio Blanco, open hillside, 3000–3500 m, April 15, 1929, *Killip & Smith 21556*, (US 1356730). Chicla, on hill slopes, 3850 m, Apr 30, 1995, *S. Llatas 3724* (USM 112191, F 616786 as *V. andina*). Dist. San Mateo, Anchi II Bridge, on west-facing banks of Anchi River 50 m from Central Peruvian Highway km 99, growing with *Peperomia galioides* Kunth, *Peperomia sp. aff. peruviana*, *Echeveria chiclensis* (Ball) Berger var *chiclensis*, and *Sedum andinum*, 3400 m, 11°44′ S, 76°15′ W, Apr 6, 2006, *G. Pino 1648*. Central Peruvian Highway km 98, waterfall after Infiernillo Bridge and before Cacray tunnel on rocks of southern bank of river growing with *Peperomia verruculosa* and *P.* cf *peruviana*, 3300 m,, 11°44′20″ S, 76°15′45″ W, Apr 6, 2006, *G. Pino 1679*. Valley of Atacra, San Mateo, on rock walls, 3700 m, Apr 14, 1963, *J. G. E. Saunders 976* (K). Dist. Casta, road from Santa Eulalia to San Pedro de Casta, 4 km before the town, on rocky walls, growing with *Oxalis peduncularis*, *Echeveria chiclensis* var. *chiclensis*, *Austrocylindropuntia exaltata*, *Portulaca* sp, 2900 m, 11°44′48″ S, 76°35′05″ W, June 3, 2006, *G. Pino 1695* (USM 210903). Dist. Laraos, 3400 m, 12°15′ S, 76°32′ W, Feb 26, 1991, *H. Beltrán 214* (USM 133597).

Ball described this species as *Cotyledon incanum* from plants collected by him at Chicla. Berger transferred it to *Altamiranoa* and changed the spelling—"incanum," ash-gray—to "incarum"—of the Incas, the rulers of pre-Hispanic Peru. Plants are reddish rather than entirely gray. Baehni later moved the species to *Villadia*, where it could remain if its inflorescence were a true spike or raceme. However, we have searched extensively for similar-appearing plants with a true raceme between Chicla and Matucana, and to date only these cymose plants have been found. For the same reason, the synonym *Villadia dyvrandae* is conspecific with *Sedum incarum*. *Villadia dyvrandae* is described with somewhat smaller leaves, which may be due to its low altitudinal range near Matucana.

The inflorescences of *S. incarum* are extremely variable; they are always apical, and most have a long axis abruptly ended by a few cincinni, generally two, that emerge very close to each other, resembling a dichasium, though they are not opposite. At the apex we generally find a sessile flower that terminates the inflorescence (Fig 15). Sometimes there are very short

cincinni or single flowers emerging alternately at the base of the central axis, which gives it the general appearance of a raceme (Fig 16). We have to consider that the description was made from dry, pressed flowers, and this may have led to confusion as to the presence of true racemes. Plants collected in the Santa Eulalia Valley have a definite monochasium. The more mature the fruits, the more the inflorescences appear to be cymes instead of racemes (Fig 17–19). In any case, due to the complex and much-branched inflorescence—very unlike the typical spike or raceme found in *Villadia*—we place this species in *Sedum*, a status that can be affirmed later through DNA analysis.

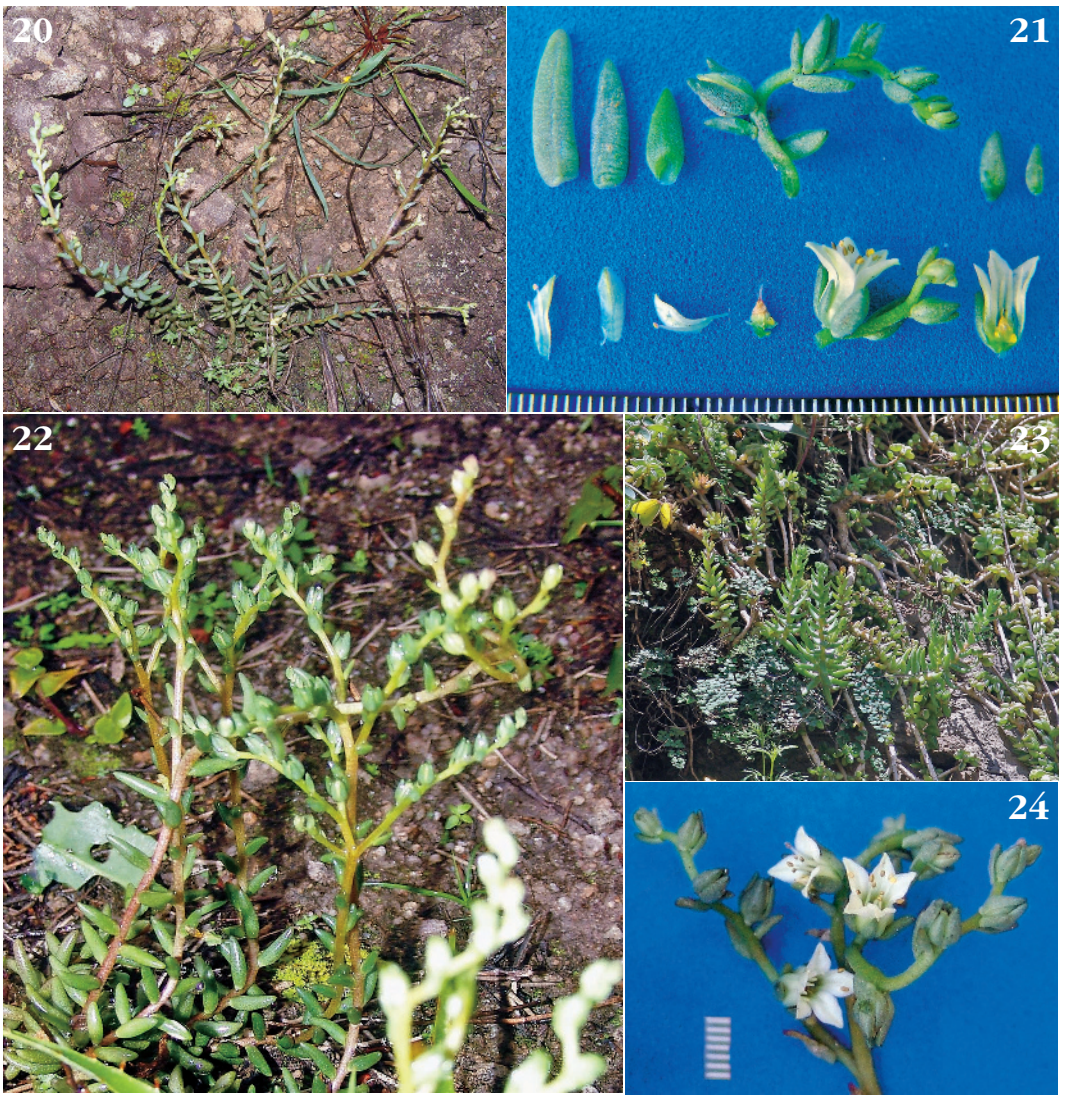
There is no type designated for this plant in the literature, but an isotype of the original collection was found at Kew. As the holotype was evidently destroyed, we designate the neotype as the specimen from Rio Blanco, where it is locally abundant. Uhl & Moran (1999) obtained a chromosome count of the plants collected by Hutchison: (n = 88–89).

4. *Sedum decipiens* (Baker) Thiede & 't Hart

Sedum decipiens (Baker) Thiede & 't Hart. *Novon* 9: 124. 1999.

Altamiranoa decipiens (Baker) Fröderstrom. *Acta Horti Gothob*. 10: 145. 1936.

Figure 20. *Sedum decipiens* in habitat at the type locality. **Figure 21.** Detail of (above, left to right) leaves, cincinnus, bractlet (beneath, left to right) petals, gynoecium, flower, flower section. **Figure 22.** *Sedum decipiens* forming inflorescences in habitat at type locality. **Figure 23.** *Sedum decipiens* in habitat at Puente Calicanto. **Figure 24.** Detail of cincinni and flowers.



Villadia decipiens (Baker) H. Jacobsen. *National Cact. Succ. J.* 13: 76. 1958.
Echeveria decipiens (Baker) Morren. *Belgique Hort.* 24: 159. 1874.
Cotyledon decipiens Baker. *Saunders' Refugium Botanicum* 3 tab. 200. 1870.
Sedum plicatum Thiede & 't Hart. *Novon* 9: 124. 1999.
Villadia dielsii Baehni & J. F. Macbride, *Candollea* VII: 285, 1937. Macbride. *Flora of Peru*. Vol. XIII, Part. II. No. 3: 1011. 1938.
Altamiranoa stricta (Diels) A. Berger in *Engl. und Prantl, Pflanzenfam*. ed 2, 18a: 470. 1930.
Cotyledon stricta Diels in *Englers. Botan. Jahrbuch* 37: 410. 1906.
Type: *Sine loco, Farris s.n. (Ref. Bot. 3 tab. 200, Lectotype).* Sedum plicatum*: Dept. Ancash. Pr. Caraz, in rupestribus camporum herbas, gramina plerumque annua, frutices, bromeliaceas cactaceas gigantium 2200–2500 m, May 1903* (Weberbauer 3000, B).

A succulent glabrous herb, branched from the base, (9–) 12–15 (–20) cm tall. Stem 3–5.5 (–10) mm diam., 10–15 cm long, light gray, erect or slightly decumbent at the base. Branches 3–5, erect to slightly decumbent, 10–20 cm long, stem 2–2.5 (–3) mm diam., light green to reddish. Leaves succulent, spirally attached to stem, denser along distal half, sessile, narrowly ovate to subtriangular or terete, lanceolate when young, (6–) 8–17 mm long, 2–4 mm wide, 2–2.5 mm thick, subacute, upper and lower sides convex, green, margins entire (Fig 20).

Inflorescence terminal in a loose monochasium with 3–4 cincinnoid branches 1–1.2 mm diam. at base, 1–3 cm long. Flowers 4–6 per cincinnus, sessile, appearing from April to June. Flower buds 3.5–5.5 × 2.5–3.5 mm, light green. Bracteoles lanceolate, 5–6 mm long, 2.5–3 mm wide. Sepals narrowly ovoid, 3.5–5 mm long, 1.5–2 mm wide. Petals oblong-rectangular, acute-triangular at tip, united at the base, bending outward at the middle, 6–8 mm long, 2–3 mm wide, induplicate, outer surface white with greenish keel recurving outwards at apex, inner surface white, margins subundulate. Stamens 10, the 5 epipetalous 3–4 mm long, the antesepalous 4–5 mm long, filaments white. Anthers ovoid, yellow, 0.3 × 0.5 mm. Gynoecium ovoid, 1.5 × 2.5 mm. Carpels 5, greenish-olive to brownish. Style 1 mm diam., white (Fig 21).

PERU. Dept. Ancash, Prov. Huaylas, Dist. Caraz, "Pukapacha," road from Caraz to Yungay, 1 km past Caraz, on southwest-facing, 60° slopes of rock and clay, 100 m north of waterfall, growing with *Puya* sp, *Opuntia* sp, "Alalaq kasha," *Armatocereus* sp., "Pitahaya," and *Portulaca* sp., on rocks among grasses and low bushes, 2380 m, 09°03′42″ S, 77°46′37″ W, Apr 15, 2006, *G. Pino 1670* (USM 210900). Prov. Huaraz, Dist. Huaraz, San Jerónimo Bridge (formerly Calicanto) at Santa River, on west-facing rocky banks of the river 60° slope, growing with *Peperomia nivalis* Miq., *Peperomia* cf *verruculosa* Dahls., *Sedum* sp *cf reniforme*, *Portulaca* sp 3080 m, 09°31′37″ S, 77°32′09″ W, Apr 17, 2006, *G. Pino 1673*.

Diels described this plant as *Cotyledon stricta* from plants collected by Weberbauer in 1903 (W 3000, B) near the town of Caraz on rocky soil, among annual grasses and shrubs, near giant cacti and bromeliads. In 1937 Baehni changed the name to *Villadia dielsii* because of the already existing *Villadia stricta* (Rose 1906), and so it was known until Thiede and 't Hart transferred the species to *Sedum* because of its cymose inflorescence. Neither of the names *Sedum strictum* (Koch 1847) and *Sedum dielsii* (Hamet 1913) could be used, so they changed the name to *Sedum plicatum* in 1999. The name "plicatum" is well-chosen because of the plicate petals that are so distinctive in this species. However, the description of *Sedum decipiens* (as *Cotyledon decipiens*) matches perfectly *Sedum plicatum*, and the plate chosen as lectotype (Baker 1870) looks exactly like the plants we collected from Huaraz. Since this description is older, we must conserve the name *Sedum decipiens* and place *Sedum plicatum* as a synonym.

Since Weberbauer no other collections of this species have been recorded, although this name has been applied to various sedums from other localities that may or may not be *S. decipiens*. During our stay at Caraz we looked for this species in the nearby hills but could not find it. Later our friend and guide, Ever Melgarejo, showed us the fields of his family at Pukapacha, only 1 km away from the city. His land is surrounded by beautiful west-facing mountains on which many cacti and bromeliads could be seen from below. He claimed to have seen plants of our description at the top of the mountains. As we began to climb, a heavy rain commenced. We found only a few plants, which were very elongated, but the leaves and inflorescence matched the description (Fig 22). Later we found the same species growing at 3000 m in the city of Huaraz. These were in better condition, perhaps due to the higher altitude with more rain (Fig 23). The overall distribution seems to be from 2300–3000 m, with the best growth at the highest altitudes. Its medicinal properties were already mentioned by Diels, who stated that an infusion of the plant was good for eye-pain. The inflorescence is distinctive in this Peruvian species: a monochasium with loose cincinnoid branches and small buds that take very long to open; but then flowers are white and conspicuous (Fig 24).

5. *Sedum renzopalmae* Pino

Sedum renzopalmae Pino sp. nov. *Planta succulenta caespitosa e basi ramosa 6–10 cm alta. Caulis decumbens ad basim 1.8–2.2 mm diam. Rami florigeri 6–9 suberecti 2.5–3.5 cm longi, 4–6 mm*

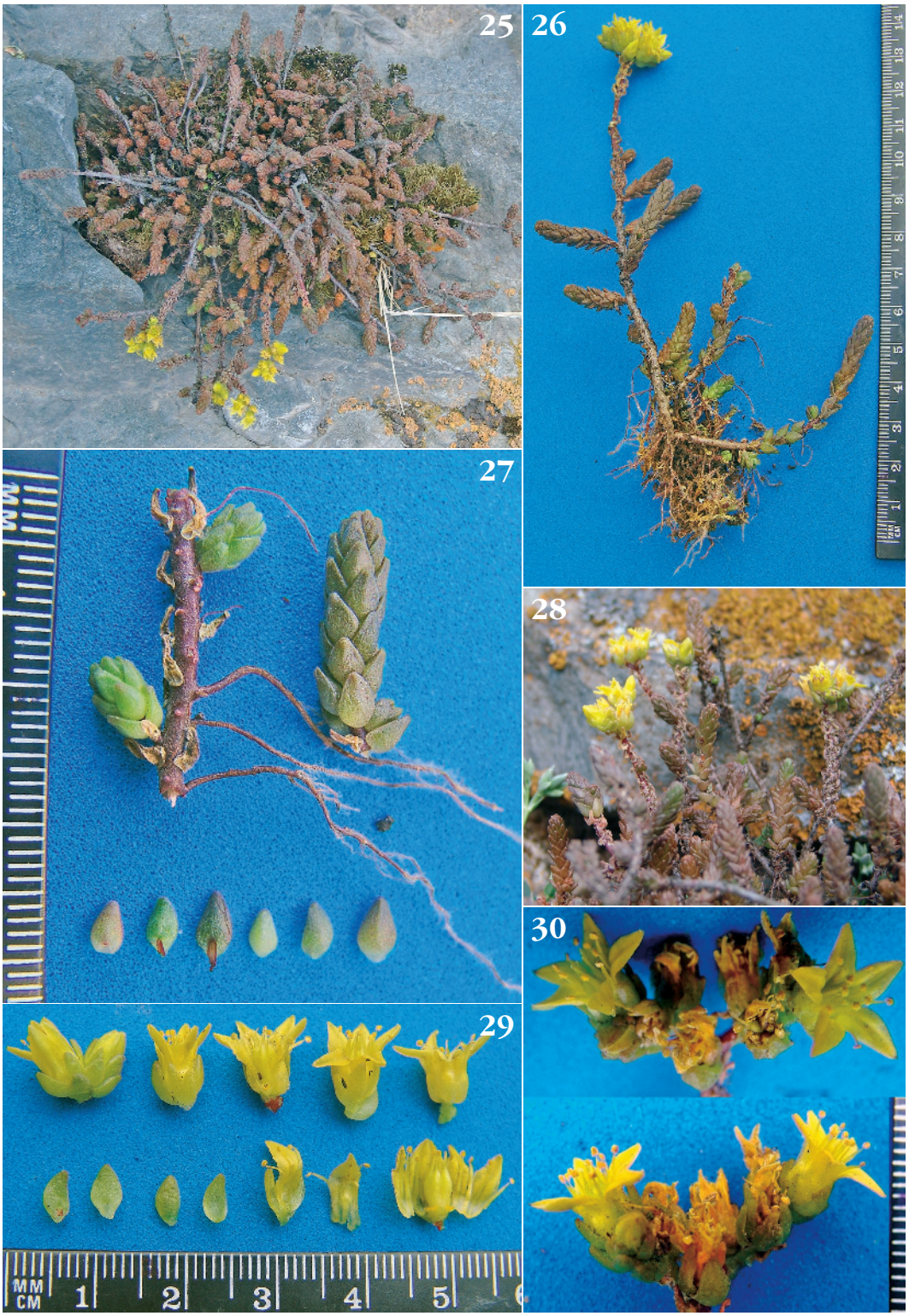


Figure 25. *Sedum renzopalmae* in habitat. **Figure 26.** *Sedum renzopalmae* ex situ. **Figure 27.** Detail of (above, left to right) flower buds, leafless branch and buds, young branch; (beneath) leaves. **Figure 28.** *Sedum renzopalmae* flowering in habitat. **Figure 29.** Detail of (above, left to right) flower buds, young flower, cross section, open flower, corolla showing bulging of the base; (beneath) bractlets, sepals, petals, carpels surrounded by open corolla. **Figure 30.** Details of the flowers.

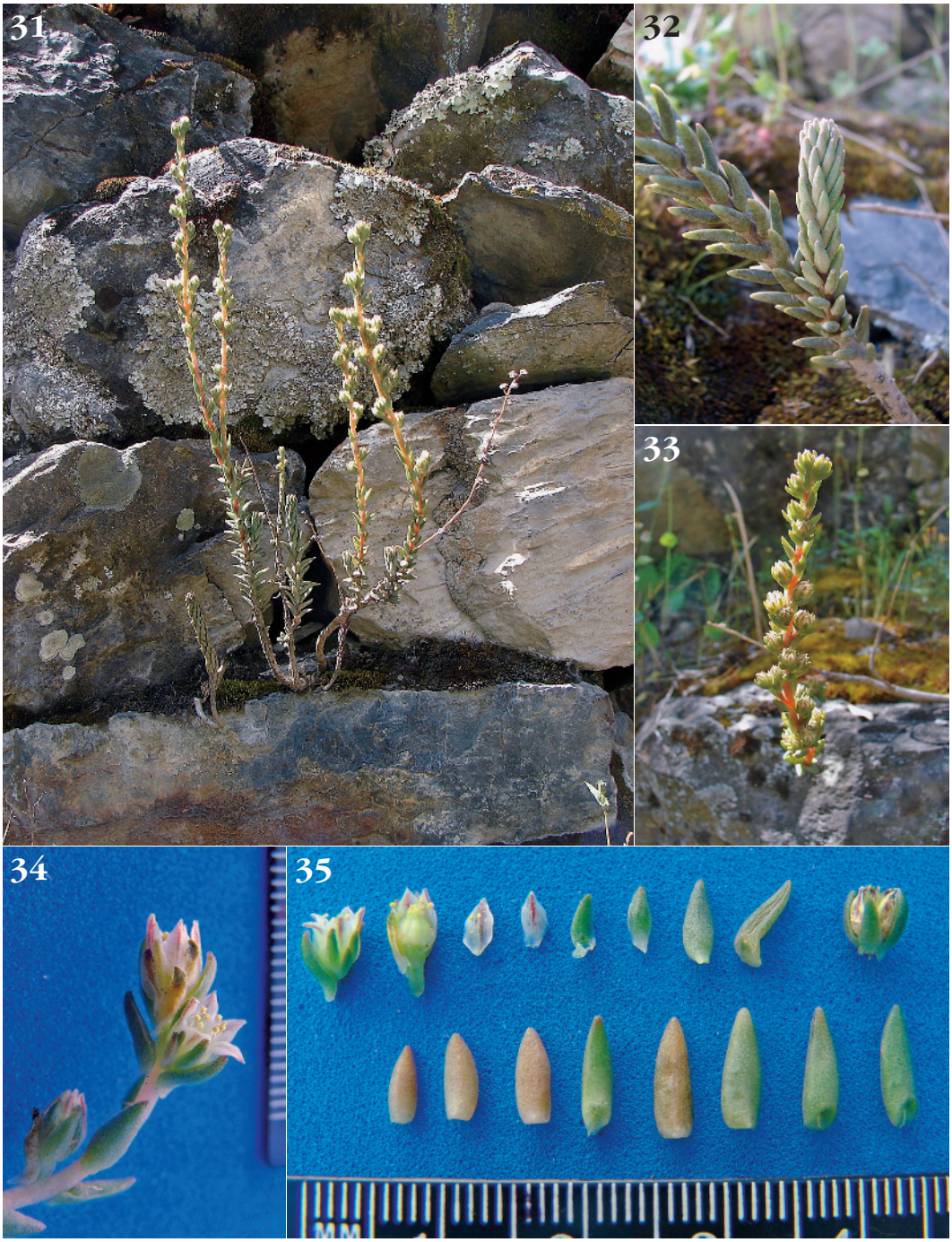


Figure 31. *Villadia virgata* plant in habitat on rock wall. **Figure 32.** *Villadia virgata,* detail of leaves. **Figure 33.** *Villadia virgata*, huge inflorescence in habitat. **Figure 34.** *Villadia virgata*, detail of flowers. **Figure 35.** Detail of (above, left to right) open flower, flower section, petals, sepals, bractlet, immature fruit; (beneath, left to right) leaves.

diam., caule 1–1.6 mm diam. rubro purpureo. Folia succulenta confertim imbricata spiraliter disposita sessilia ovoidea vel subtriangularia 3–4 mm longa, 2.5 mm lata, subacuta, e viridi rubentia in apricis, infra insertionem in calcar hyalinum instructa, insertione ad caulem in centro conspicue rubra. Inflorescentia terminalis dichasium 6–8 floribus, apicalibus sessilibus, lateralibus breviter pedicellatis, bracteolis late ovatis acutibus 4–6 mm longibus 3–4 mm latis.

Sepala lanceolato-ovoidea 4.5–5 mm longa 2.5–3 mm lata. Petala oblonga acuta flavo-sulphurea 8–9 mm longa, 2.5–3 mm lata, extus subcarinata, a basi usque ad dimidiam partem coalita. Stamina filamentis flavis. Carpela 5 fusiformia flavovirentia. Squamae flavae, 1 × 0.4 mm. Floret a Majo ad Junium.

Type: Dept. Lima, Prov. Huarochiri, Dist. Casta, "Casha," Road from Santa Eulalia to San Pedro de Casta, 0.5 km before the town, on pathway to the right before road turns left, on rocky walls, 3170 m, 11°45′19″ S, 76°35′51″ W, June 11, 2006, G. Pino 1697 (USM 210905).

A succulent glabrous herb, caespitose, much-branched from the base, 6–10 cm tall, tufts 15–20 (–35) cm diam. Roots filiform, forming dense mats, 0.2–0.3 mm diam., 1.5–3 cm long, pink. Stem 1.8–2.2 mm diam. at base, 9–14 cm long, gray reddish, decumbent. Branches 6–9 (–14), subdecumbent to erect, (0.7–) 2.5–3.5 cm long, 4–6 mm diam., stem 1–1.6 mm diam., dark red. Leaves succulent, spirally attached to stem, densely imbricate, sessile, ovoidal to subtriangular, 3–4 mm long, 2.2–2.5 mm wide, 1.3–1.5 mm thick, subacute, both sides convex, outer side obscurely carinate, margins obtusely angulate, reddish on all exposed surfaces, base obtuse, spur hyaline, the place of attachment of leaf to stem reddened (Figs 25, 26).

Inflorescence terminal, a small dichasium. Flowers 6–8, appearing from May to June. Pedicels almost absent in upper flowers, 2–3 mm long in lower flowers, 0.8–1 mm diam., dark red. Flower buds 6–7 mm long × 4–5 mm diam., light green. Bracteole broadly ovate, acute, 4–6 mm long, 3–4 mm wide, outer side convex, inner side concave, light green-yellow. Sepals lanceolate-ovate, outer side convex, inner side concave, light green-yellow, 4.5–5 mm long, 2.5–3 mm wide. Petals oblong, acute, united from the base to the middle, 8–9 mm long, 2.5–3 mm wide, bright yellow, outer surface subcarinate, the apical half expanded, the basal third bullate. Stamens 10, the 5 epipetalous 4.5 mm long, the antesepalous 5.5 mm long, filaments yellow, anthers ovoid, dark yellow, 0.6 × 0.3 mm. Gynoecium ovoid, 6 × 3 mm. Carpels 5, fusiform, yellowish green, 4 ×1.3 mm. Styles cream, filiform 1.5–2 mm long, 0.25 mm diam, stigma white. Nectary scales yellow, 1 × 0.4 mm (Fig 27, 28).

PERU. Dept. Lima, Prov. Huarochiri, Dist. Casta, "Casha," road from Santa Eulalia to San Pedro de Casta, 0.5 km before the town, on pathway to the right before road turns left, on rocky walls, 3170 m, 11°45′19″ S, 76°35′51″ W, June 11, 2006, *G. Pino 1697* (USM 210905, **holotype**). Dist. Langa, road from Langa to Matarachi, bridge over river Matahuara, on rocks ca. 300 m below the cliff, growing with *Peperomia* sp, *Echeveria chiclensis* (Ball) Berger var *chiclensis*, *Austrocylindropuntia exaltata* and *Matucana haynei*, 3320 m, 12°09′17″ S, 76°23′40″ W, May 28, 2006, *G. Pino 1681.*

Sedum renzopalmae is the latest sedum to be discovered in central Peru. Plants seen or collected previously were proba bly believed to be *S. andinum*, which it resembles in its growth and leaf-color. However, the latter species is smaller and has a totally different inflorescence, with a few, small red flowers instead of the bright yellow ones of *S. renzopalmae* (Fig 29, 30). The name honors Renzo Palma, who passed away only two days before the plant's discovery. He was a superb horticulturist and amateur botanist, as well as the owner of perhaps the finest succulent collection in Peru. His curiosity led him to travel all around the world to observe and collect plants. His death is a great loss to the Peruvian Cactus Society (SPECS) and the other international societies to which he belonged. Renzo was also the great grandson of the best-known Peruvian writer, Ricardo Palma.

People from the town of San Pedro de Casta know this plant as "kushka." Its branches are boiled and used for stomach aches. Casta is the nearest point (after a breathtaking two hour walk) to Markawasi, an out-of-this-world mesa—its giant rock sculptures shaped by erosion are well known to tourists. It is interesting that this new species grows only in valleys at right angles to the Equator, but never in those parallel to it, such as the Rimac valley. The vegetation in these east-west valleys is different from that of the north-south valleys, not only in succulents but also in cacti, which may be due to solar exposure and different patterns of rainfall.

6. *Villadia virgata* (Diels) Baehni & J. F. Macbride

Villadia virgata (Diels) Baehni & J. F. Macbride. *Candollea* 7: 286. 1937. Macbride. *Flora of Peru*. Vol. XIII, Part. II, No. 3: 1012. 1938.

Cotyledon virgata Diels in *Englers Botan Jahrbuch* 37: 410. 1906

Altamiranoa virgata (Diels) Berger in *Engl und Prantl, Pflanzenfam*, ed 2, 18a: 470. 1930.

Type: *Dept. Ancash inter Chiquián et Tallenga in muris rupibusque 3300–3600 m, April 1903* (Weberbauer 2853, B).

A succulent glabrous herb 20–25 cm tall. Roots 3–5 cm long, 2–2.5 mm diam., whitish. Stem strictly erect, 4–8 mm diam. at base, light gray, bark later peeling, branching at 6–10 cm. Branches 1–3, erect, 2–15 cm long, stem 1.5–1.8 mm diam., light green to reddish (Fig 31). Leaves succulent, spirally attached to stem at an acute angle, densely imbricate in the distal 6–10 cm and on young shoots, more widely spaced towards flowering tip, sessile, narrowly ovate to narrowly oblong, 6–9 mm long, 2–2.5 mm wide, 1–1.5 mm thick, blunt-subacute, upper and lower sides convex, spurred, dull green-glaucous, margins entire (Fig 32).

Inflorescence a terminal spike or short raceme (Fig 33). Flowers 10–18, appearing from April to May (Fig 34). Flower buds 3 × 4 mm, light green, bracteoles 5–6 mm long, 1.5–1.8 mm wide, with a hyaline spur. Pedicels short, longer in basal flowers, 2–4 mm long, reddish, bearing two buds in the lower nodes. Sepals lanceolate, blunt, 2.5–5 mm long, 0.8–1 mm wide. Petals oblong-hexagonal, acute-triangular at tip, united at the base, straight or slightly curved outwards, 4–4.5 mm long, 2–2.5 mm wide, induplicate, both surfaces white with brownish keel towards tip, margins entire. Stamens 10, the 5 epipetalous 2–2.5 mm long, the antesepalous 2.5–3 mm long, filaments white. Anthers ovoid, yellow. Gynoecium ovoid, 2.5 × 2.5 mm, carpels 5–8, 2.5–3.5 mm long, light green. Style 1 mm diam, greenish white. Nectary scales oblong-spathulate, 1.5–2 mm (Fig 35).

PERU. Dept. Ancash, Prov. Bolognesi, Dist. Chiquián, 7.4 km (in a straight line) N of Chiquián on the way to Tallenga, rocky slope beside the road, ca. 0.5 km N of Pachi, 3280 m, 10°04′56″ S, 77°09′02″ W, May 8, 2006, *P. Carrillo Reyes and M. Chocce 5176* (USM 210587, **neotype**). Near Chiquián, 3250 m, on hill slope, rocky-clay soil, May 18, 1950, *Ramón Ferreyra 7562.* (USM 19612) Footpath from Chiquián towards Rio Pativilca, 3000–3400 m, hedges and fields with numerous dry walls, rock outcrops with remnants of natural vegetation, March 17, 2001, *M. Weigend*, *K. Weigend and others 5184* (HUT 038973).

This species was described by Diels as *Cotyledon virgata* from plants collected by Weberbauer between Chiquián and Tallenga in 1903 (W 2853, B). The name probably refers to the twig-like shape of the erect stems. Later Berger assigned it to *Altamiranoa*, because the petals are conspicuously fused at the base. Although all Peruvian species of Subfamily Sedoideae were included in *Villadia* by MacBride (1938), Thiede and ‘t Hart (1999) transferred most of them to *Sedum* because of the cymose inflorescence, leaving only the species with true spikes or racemes in *Villadia*. After reducing *V. dyvrandae* to *S. incarum*, this would leave *V. virgata* as the only *Villadia* species in Peru. However, there are a number of unpublished villadias in northern Peru, all of them growing on the eastern slopes of the Andes, where they get heavier rains coming from the Amazon. This could also explain why they dry up so easily in cultivation. The plant published in 1995 in *Quepo* (vol. 9: 66, Fig 6) was collected near Huaraz and seems to be *Sedum reniforme* rather than *V. virgata*.

Acknowledgments

I am truly indebted to Pablo Carrillo Reyes, of Guadalajara, Mexico, who found and made all habitat photos of *Villadia virgata* presented here and provided material for the description. He is currently pursuing DNA studies of *Sedum* and *Villadia* and may, in the future, make some changes or additions to this article. Thanks to INRENA for giving plant collection permits. Thanks to Helmut Regnat for providing the lectotype of *S. decipiens*. I also want to thank brothers Benny and Guido Lombardi for their kindness and support on the dangerous trip to Huarochiri, Luisa Infante for her invaluable company in the Rimac Valley, Cecilia Valdivia for her help in Huaraz despite all adversities and to my best friend Juan Melgarejo for his unconditional support, help and company in the Rimac Valley, Santa Eulalia Valley, Caraz, Callejón de Huaylas and the Nepeña Valley, encouraging me to continue looking for *Echeveria excelsa* even when bad weather and lack of light almost made me abandon the quest.

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