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SCLEROCACTUS MESAE-VERDAE SUBSP. *DEPRESSUS* (CACTACEAE), A NAVAJO NATION ENDEMIC FROM NORTHWEST NEW MEXICO

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ABSTRACT

Sclerocactus mesae-verdae subsp. **depressus** O'Kane, Heil, & Clifford, **subsp. nov**. (Cactaceae), from the Colorado Plateau of northwestern New Mexico, along the eastern foothills of the Chuska Mountains, Navajo Nation, New Mexico is named, described, and illustrated with photographs. *Sclerocactus mesae-verdae* is federally listed as an Endangered, Colorado Plateau endemic. Navajo cultural significance and ethnobotany is discussed.

Until recently, a large portion of the Colorado Plateau of northwestern New Mexico, especially in San Juan and McKinley counties had been poorly botanized. This land is located on the Navajo Nation and requires Tribal permits for collecting and exploration. Recent botanical work by us (especially Clifford) has uncovered several novelties and range extensions, including the new species *Astragalus cliffordii* Welsh & Atwood and *Aliciella cliffordii* J.M. Porter and range extensions for *Erigeron sivinskii* Nesom and *E. rhizomatus* Cronquist.

While botanizing the east-facing foot slopes of the Chuska Mountains, a diminutive new subspecies of *Sclerocactus mesae-verdae* (Boissevain ex Hill & Salisbury) Benson was found. Although this location between Newcomb and Naschiti has been known for some time by several botanists, taxonomic recognition of this cactus is justified by morphological and habitat distinction as well as its 57 km (35.5 miles) disjunction from the nearest population of conspecifics.

SCLEROCACTUS MESAE-VERDAE subsp. **DEPRESSUS** O'Kane, K.D. Heil & A. Clifford, **subsp. nov.**
Figures 1–3. **TYPE: USA. New Mexico**. San Juan Co.: Navajo Nation, US Hwy 491, 2.37 mi S of Sheep Springs, 2.35 mi S of junction with State Hwy 134, W of highway, 36.11191°N, 108.70520°W, 1821 m (5975 ft.), 10 May 2008, *A. Clifford 36163* with K.D. Heil (holotype: SJNM; isotype: FLD).

Different from typical *Sclerocactus mesae-verdae* by the characters given in Table 1. Subsp. *depressus* is much smaller with narrower, shorter spines, and it is much rarer than typical *mesa-verdae*. Flowers of subsp. *depressus* are light pinkish white to cream colored. Flowers of typical *mesa-verdae* are cream to light yellow in color.

Stems mostly solitary, depressed globose, 1.0–2.5 × 1.0–4.5 cm; tubercles low but evident, not noticeably distributed on ribs; areoles wooly, glabrescent with age; central spines 0(–1(–2), reddish-tan,

spreading to erect, 7–10 mm; radial spines 7–12, straw-colored, spreading, 3–7 mm; outer perianth parts pale cream with a brownish stripe to white with a deep pinkish stripe; inner perianth parts mostly white to pale cream or pinkish, 1–3 cm long; stigmas green; stamens golden-yellow; fruit green becoming tan at maturity, short cylindroid, 5–7 mm long, indehiscent; seeds brown or black, 2.5–3 mm × 3–4 mm. Flowering late April to May.

Additional collections examined. New Mexico. San Juan Co.: 2.0 mi S of Sheep Springs, 19 Jun 1981, *Heil 1403* (SJNM); 2.3 mi S of Sheep Springs, 24 Sep 1985, *Heil 2232* (SJNM).

Table 1. Distinctions between *Sclerocactus mesae-verdae* subsp. *mesae-verdae* and subsp. *depressus.* Measurements for subsp. *mesae-verdae* are from Heil & Porter (1994, 2003).

	subsp. *depressus* (Fig. 1–3)	**subsp. *mesae-verdae* (Fig. 4)**
Stem length	1.0–2.5 cm	3.2–11 cm
Stem diameter	1.0–4.5 cm	3.8–8.0 cm
Tubercles inserted on ribs	No (or very slightly if especially turgid with plentiful moisture)	Yes
Central spine number	0(–1(–2)	0(–1)
Radial spine length	3–7 mm	6–13 mm
Inner perianth color (excluding the wide midvein area)	White to light pinkish white to pale cream	Typically cream to light yellow
Fruit length	5–7 mm	8–10 mm
Habitat	Sparse desert grassland, outwash areas and slopes; *Sporobolus airoides* and *Atriplex confertifolia* dominant; thin desert pavement and clay slopes of Menefee Formation.	Clay badlands with salt desert scrub; *Atriplex gardneri* var. *cuneata* and *A. corrugata* dominant; nearly barren outcrops of Mancos Shale (mainly) and Fruitland Shale (east of The Hogback) (Roth 2016)

Populations of *Sclerocactus mesa-verdae* subsp. *mesae-verdae* and the newly proposed subsp. *depressus* are separated by 57 km (35.5 miles), and no presumed hybrids or intermediates between the two population systems have been observed. Populations of subsp. *depressus* start about 6 miles south of Newcomb, New Mexico, and extend southward to north of Naschitti. Populations of subsp. *mesa-verdae* start from just south of Sleeping Ute Mountain, Montezuma Co., Colorado, and range southward to just south of Red Valley at the junction of Navajo Road N13 and US Highway 491, New Mexico. A small disjunct population is known from a region southwest of the Area III Navajo Mine lease boundary near the Chaco Wash drainage. These individuals are typical subsp. *mesa-verdae* and are 30 miles northeast of subsp. *depressus*.

Habitat

Both subspecies are limited to sedimentary outcrops of Upper Cretaceous formations. Subsp. *mesae-versae* is endemic to the upper Mancos Shale and Fruitland Shales, while subsp. *depressus* is strictly endemic to the Allison Member of the Menefee Formation of the Mesa Verde Group (Dillinger 1990; O'Sullivan 1955; O'Sullivan & Beikman 1963).

The local and scarce habitat for *Sclerocactus mesa-verdae* subsp. *depressus* occurs in three ecological settings from 1745 m (5730 ft) to 1850 m (6050 ft).

The most extensive habitat occurs in areas of desert pavement where individual stems are depressed and growing below the surface of the gravels that hide them. There is very little to no vegetation cover on the desert pavements. Along sheet flow drainage channels adjacent to the desert

pavement, sparse and scattered individuals of *Sporobolus arioides* (alkali saccaton), *Townsendia annua* (annual townsendia) and *Halogeton glomeratus* (halogeton, a weedy, succulent, introduced weed) occur. The second habitat is on gentle to moderately sloped alluvium below eroded knolls and hillocks, with a vegetation cover of sparsely scattered *Atriplex confertiflo*ra, *Chrysothamnus greenei*, *Opuntia polyacantha*, *Sporobolus arioides*, *Hilaria jamesii*, and *Sphaeralcea coccinea*. The third habitat occurs on steep side slopes of knolls, hillocks, and east–west-trending linear eroded features where individual stems are hidden among sandstone boulders and large gravels. Associates are *Atriplex confertiflora*, *Gutierrezia sarothrae*, *Artemisia bigelovii*, *Chrysothamnus greenei*, *Hilaria jamesii*, *Haplopappus gracilis*, and *Sphaeralcea coccinea*.

Etymology

The subspecific epithet, *depressus*, refers to the small size of the subspecies relative to subsp. *mesae-verdae*. We suggest that the subspecies be referred to, vernacularly, as the Sheep Springs Cactus. The Navajo name Whoosh Diikoozih Yazhi could also be used.

Endangerment

Subsp. *depressus* has a much smaller range than does subsp. *mesae-verdae* and it presumably has at least the same level of federal, tribal, and state protection (Federally Endangered) as the latter (Heil 1984). Potential threats to the species and its subspecies include damage by the cactus borer beetle, grazing by livestock and feral horses, prolonged drought, especially in desert pavement areas where temperatures can become critically high, illegal poaching for the succulent trade, energy development, oil and gas drilling, pipeline and road construction, and off-road vehicle recreation.

Figure 1. *Sclerocactus mesae-verdae* subsp. *depressus*. Typical mature plant.

Figure 2. *Sclerocactus mesae-verdae* subsp. *depressus*. Habitat showing areas of thin desert pavement over soil derived from the Menefee Formation and low slopes in the background.

Figure 3. *Sclerocactus mesae-verdae* subsp. *depressus*. Growing from Menefee Formation-derived soil through a thin layer of sand, gravel, and small cobbles.

Figure 4. *Sclerocactus mesae-verdae* subsp. *mesae-verdae*. Typical floral coloration.

Navajo cultural significance

Sclerocactus mesa-verdae is an important ceremonial plant utilized in various Navajo Chant Way systems. The Navajo name for *Sclerocactus mesa-verdae* is Whoosh Diikoozih, meaning sour cactus. The new subsp. *depressus* is known as Whoosh Diikoozih Yazhi, meaning small sour cactus. The spiny fishhook cactus, *S. parviflorus* is known as Gaah Biizhii.

Sclerocactus and other cactus genera are important to the Flint Way Chant, Navajo Wind Way Chant, Chiricahua Wind Way Chant, and they are also mentioned in the Hail Way Chant, Shooting Way Chant, and the Night Way Chant. *Sclerocactus* species are mentioned in the tales of the Navajo Hero Twins, Monster Slayer and Born for the Water. Changing Woman, mother of the Hero Twins was asked several times by the Holy People, "who was the father of the Hero Twins?" —several times she answered, the Round Cactus People and the Sitting Cactus People (*Sclerocactus* spp.) were the

father of the Hero Twins. After several questioning sessions, she finally admitted the Sun Bearer was the father of the Hero Twins.

Sclerocactus and other genera of cactus are related to the Wind and Cloud People. They are depicted in several sand paintings of the Wind Way Chant. Due to their spinyness, cacti were associated with flint, their spiny nature made them as armor in the tales of the Flint Way Chant. *Sclerocactus* spp. were created from the Changing Bear Man, a benevolent deity who was captured and destroyed. Before his destruction he pleaded to be turned into useful plants that would benefit humans in the future. As he was dismembered, his breast was cut off and tossed to the south where it turned into different species of cactus found throughout the south and southwest. This is the reason these cacti have mammillate tubercles topped by spine-clustered areoles.

Hunger were Holy People encountered by Monster Slayer during his wars with Alien Monster deities; they were ruled by a fat man who was eating *Sclerocactus* to sustain his life. Monster Slayer threatened to kill Hunger, who pleaded for their lives stating in their defense, "if they were murdered, in the future earth's surface people would not enjoy cooking or eating good food they prepared".

In historical times, different species of *Sclerocactus*, were gathered as survival food. After burning off the spines, individual cactus stems were sliced into thin sections to be dried, or heated up on stone slabs for cooking and eating.

In ceremonial use, after collecting cactus from the field, they are laid on the ground where the patient was required to step over them to regain harmony, restoration of good health, and strengthening of the mind. In the Chiricahua Wind Way Chant, cactus stems were fashioned into prayer sticks and pressed upon a patient for healing. In the Flint Way Chant, symbols were created in sand paintings for healing patients that sit upon the sand paintings.

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