



Escobaria abdita — a new species from northern Mexico

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Escobaria abdita — a new species from northern Mexico

Abstract

The paper describes a new species, *Escobaria abdita* Repka et Vaško, found in the Mexican state of Coahuila. It differs from similar and related species substantially by its crest-like arrangement of chalk-white, short, finger-like spines, which are four-layered in cross-section, and by rather small whitish flowers with light pink stripes on the tepals. Its fruits soon dry up into a parchment-like structure. The habitat ecology is very special: plants grow in temporarily flooded depressions, immersed in the loamy soil practically throughout the year.

Introduction

In the *Cactaceae* family, the genus *Escobaria* is positioned near the extensively and plentifully grown genera *Coryphantha* and *Mammillaria* (Anderson 2001, Hunt et al. 2006). According to molecular analyses, its phylogenetic position is very close to *Coryphantha*, but also to *Mammillaria* (Butterworth and Wallace 2004). In the current conception, this genus is very polymorphic and presents a suitable model object for future molecular analysis. Taylor (1983, 1986) and Hunt et al. (2006) divide the genus *Escobaria* into 3 and 7 sections, respectively (*Escobaria*, *Pleurantha*, *Neobesseyia*, *Acharagma*, *Pseudocoryphantha*, *Escobesseyia*, and *Cochiseia*). The genus contains a total of 23 species (Anderson 2001, Hunt 1999), mainly small plants, often more or less offsetting when mature, and producing pink,

violet, yellowish- to yellowish-white, rarely yellow-green flowers. The main part of the genus occurs in Mexico; only few species being found in the USA. An exception is *Escobaria missouriensis* (*Neobesseyia missouriensis*) and its subspecies, extends into north Mexico (Coahuila and Nuevo León States) (Anderson 2001). This species also has an extraordinary flower morphology compared to other species of the genus. Flowers are up to 6 cm in diameter with markedly narrow and long-pointed, light cream-colored (but often light yellow-green) tepals. Relatively recently the subspecies *E. missouriensis* subsp. *navajoensis* Hochstetter (1996) was described, so far known from a few localities in the state of Arizona, USA (Navajo Co.). This subspecies has an interesting spine morphology and arrangement: it superficially resembles taxa of the genus *Navajoa*, with which it shares the same habitats.

Discovery of the new *Escobaria*

A small *Escobaria*, labeled “*Escobaria* spec. north Mexico” has been grown in Czech collections for approximately 20 years. It flowered very unwillingly in cultivation, and proved very difficult to pollinate and produce seeds. The second author rediscovered this plant in the wild in north Mexico and continued to observe it for the past 5 years. Plants of this taxon are very different from other taxa of the genus, which are supposed to be related, not only by its general morphology, but

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***Escobaria abdita* Řepka et Vaško, sp. nov.**

Description **Body** to 20 mm in diameter and 25 mm high, dark-green, covered with tubercles, the hypocotyl hypertrophied into an almost ellipsoid shape 50–60 × 25–30 mm, hidden below the soil surface for most of the year. **Roots** beet-shaped, fleshy, slightly branched, approximately 10 cm long, upper lateral roots directed towards the soil surface. **Tubercles** (10–) 12 (–14) mm long and 4–5 mm in diameter, erecto-patent, arranged into spirals, shriveling at the base of body, before dying and falling off. **Areoles** at the top of the tubercles, oval, 2 mm long, at first whitish, wooly, becoming gray (to dark-gray) and losing the wool. **Spines** short, cylindrical (finger-shaped), pointed at the top, constricted at the base, arranged in a circular fashion, radials only, 3.5–5 mm long, whitish or slightly horn-colored, in areoles crest-like or radially arranged, 11–15 in number, with a four-layer structure in cross-section. **Flowers** arising from the youngest areoles, widely campanulate, 35–42 (–45) mm long and 30–35 mm wide, whitish, light cream-colored or light pinkish. **Outer tepals** brown-green to grey-green, becoming scales at the base of the perigon, all white-fringed. **Inner tepals** narrowly lanceolate, with a central, light pink-colored stripe inside and wide brown-pink central stripe outside. **Pericarp** pear- to egg-shaped, gray-green to pale brown-green. Style and stigma markedly pale green, conspicuously exceeding stamen length. **Filaments** whitish, anthers egg yolk-yellow. **Fruit** obovoid, 6–8 mm long 5–7 mm in diameter, gray-green to brown-green, soon drying into a parchment-like structure containing 15–30 seeds (section *Neobesseyia*). **Seeds** egg-shaped with characteristic, elongate oblong hilum, light brown, 1.5–1.75 mm long and 1.3–1.35 mm wide; surface covered with characteristic cavities of widely elongate-oblong shape, on their edges sharp or rounded concave.

Latin description Corpus singulare, 20 mm in diametro, 25 mm altum, atroviride, maiorem partem anni hypogaeum. Radix rapiformis, carnosae, usque ad 10 cm longa. Corpus tuberculis (10–)12(–14) mm longis et 4–5 mm crassis, leviter oblique sursum ascendentibus, spiraliter dispositis tectum. Pars superior tuberculae per totam longitudinem suam raphe instructa, si exsiccata, valde conspicua. Areolae ovales, 2 mm longae, primo albide lanosae, dein canescentes (usque atroviridae) et glabrescentes. Spinae 11–15, breves, digitiformes, apice acutae, solum marginales, 3.5–5 mm longae, albidae vel pallide eburneae, pectinatim vel radiatim ordinatae, cum structura superficiali quadristrata bene evoluta, cellulis cavis magnis albidis ornata. Flores ex areolis junioribus ecescentes, late campanuliformes, 35–42 (–45) mm longi et 30–35 mm lati, albidii, pallide eburnei usque roseoli, tepalis externis anguste lanceolatis, apice protractis, stria subtili pallide rosea ornata, extus cum zona centrali lata brunneorosea; squamae ad basin perigonii fuscovirides, margine albolacinata. Pericarpium pyriforme usque ad ovale. Stylus cum stigmatem pallide virides, stamina valde superantes, filamenta albida, antherae luteae. Fructus obovatus, 6–8 mm longus et 5–7 in diametro, griseo- usque brunneoviridis, mox in pericarpelium pergamentaceum exsiccans. Semina ovata, hilo oblongo protracto, pallide brunnea, 1.5–1.75 mm longa et 1.3–1.35 mm lata, superficiei cavitatibus concavis in margine acutis. Fructus cum 15–30 seminibus (sectio *Neobesseyia*).

Type Mexico, Coahuila State, basin east of the settlement El Oro, 1100 m a. s. l., October 2011, leg. M.K. Hernández, IZTA, holotype (the entire plant deposited in alcohol); flower and above-ground part of the plant, leg. Z. Vaško sub no. VZD 1313, VIII. 2011, PRC, paratype (deposited in alcohol).

Etymology the Latin word “*abdita*, *abditus*” means hidden, secret, which characterizes the literally hidden life of this species.

Key to distinguish similar species and species related to *E. abdita* by morphological characters

1a Body small, 20–30 mm in diameter, at maturity non-proliferous (offshoots only in case of damage of apical meristem), tubercles (2–)4–10(–15) mm long, small, spines 2–5 mm long, chalk-white, solid, short, seemingly porous, surface glabrous or with trichomes; flowers rather small, 20–35 mm in diameter, whitish-yellowish to light pinkish with central brownish-pinkish stripes on tepals, fruit 5–8 mm long..... 2

1b Body larger, 40–100 mm in diameter, at maturity proliferous; tubercles 6–9 mm long, large; spines 10–20 mm long, horny to grayish colored, needle-like, on surface with trichomes; flowers larger, 25–60 mm in diameter, yellowish green without central stripes; fruit 10–20 mm long.....*E. missouriensis* subsp. *missouriensis*

2a Spines 10–15, with a constriction at the base, cylindrical, arranged in a crest-like fashion, without trichomes, tubercles 10–14 mm long, flower whitish-pinkish with pink stripes on tepals, 30–35 mm in diameter; fruit obovoid, 5–7 mm long, grayish green or brownish green to brown, soon drying up into a parchment-like pericarp structure.....*E. abdita*

2b Spines 6–8, without constriction at their base, gradually tapering to the apex, arranged radially, with trichomes on surface, tubercles 2–5 mm long; flower yellowish with brownish stripes on tepals, 20–30 mm in diameter; fruit ovoid, 3–5 mm long, red, with juicy pericarp..... *E. missouriensis* subsp. *navajoensis*

Table 1: List of taxa examined and their origin

TAXON	FIELD NO.	LOCALITY
<i>E. ABDITA</i>	VZD 1313	El Oro, Coahuila, Mexico
<i>E. MISSOURIENSIS</i> SUBSP. <i>MISSOURIENSIS</i>	VZD 868	Electric, Park Co., Montana, USA
<i>E. MISSOURIENSIS</i> SUBSP. <i>NAVAJOENSIS</i>	HH 274	Holbrook, Navajo Co., Arizona, USA

also in the spine anatomy (unpublished). Moreover, it differs in its natural habitat and hence it deserves recognition as a new.

Discussion

Taxonomic notes on *E. abdita*

The newly described species differs from others of the genus by the following characters: slightly branched, spherical, beet-shaped taproot serving as storage organ with a length of max. 10 cm (Fig. 1); above-ground body single, only in case of damage of the apical meristem overgrown with individual offset; body small, maximum 20 mm in diameter (also in cultivation); hidden for most of the year under the soil surface (Fig. 2). There is a visible groove on the upper side of the tubercles along the whole length, which is imperceptible after watering. However, after the plant has dried up, it is very conspicuous. Flowers are whitish, with a diameter of 35 mm, with a relatively conspicuous spherical to egg-shaped pericarp; inner tepals with light pink stripes (Fig. 3); outer tepals have conspicuous white fringes on their edge at the base. Fruit obovoid, its pericarp very soon drying up into a fragile parchment structure, hidden among tubercles at the top of the plant, which matures after approximately 12 months, when the plants are fully soaked and new flower buds are created (Fig. 4). The flower bud develops only from the youngest, top areoles. The morphology and anatomy of the spines are very characteristic, both by the constriction at the base and the four-layered tissue in cross-section. Cultivated plants often form 1–3 central spines, which soon die. Areoles easily fall off the bottom part of the body. Seeds are egg-shaped with a characteristic, elongate oblong hilum. The surface of the seed contains characteristic cavities (elongate-oblong, compared to sharp and lanceolate in *E. missouriensis*). It is evident that the shape of the seeds and the cavities on the surface of plants of *E. abdita* are significantly different from those of *E. missouriensis*.

Morphological characteristics of species with supposed close relationships to *E. abdita* are given in the key (see above). From Fig. 3 it is evident that flowers of *E. abdita* are similar to those of plants from the group around *E. missouriensis*, but differ in coloration, a longer pericarp and the ratio of perigon to pericarp size, which amounts to 3.4–3.75 (compared to *E. missouriensis*, which has ratios of 5.0–6.25). Moreover, the shape of open flowers is funnel-shaped (*E. missouriensis* has plate-shaped open flowers, often with tepal tips folded back to the body). Flowers of the new-described species open for at most three days, depending on daily temperatures (Fig. 6).

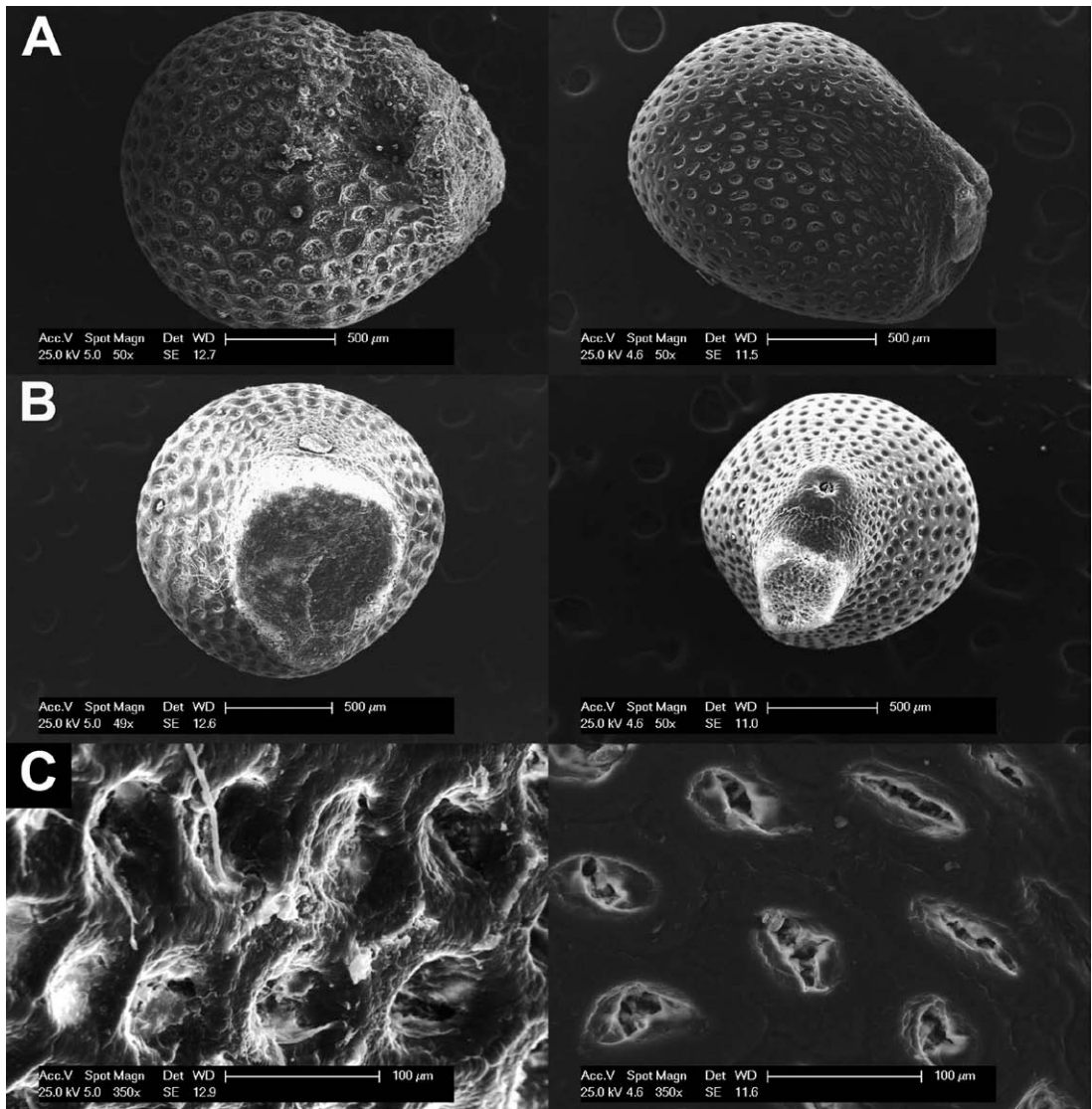
We presume that the newly described species is most closely related to *E. missouriensis* s.l. However, to confirm this hypothesis molecular data analyses should be performed. *E. abdita* spines differ in their macro-morphology and anatomy from other studied *Escobaria* species (unpublished observations), and are without any doubt an important adaptation of this plant to the extreme ecological conditions of the habitat.

Micromorphological features of seeds

Seeds of *E. missouriensis* s.l. (in this case of *E. missouriensis* s.s.), assumed to be related to *E. abdita*, were used for seed surface structure comparison. The seeds have lateral projections of different shapes (*E. missouriensis* orbicular-ovate, *E. abdita* oblong-ovate, Fig. 7a). *E. missouriensis* has an almost spherical hilum shape with a rounded exerted part occupying nearly the entire hilum, and a micropyle placed outside the hilum edge (micropyle disjunct). Seeds of *E. abdita* have an oval hilum, whereby the exerted part occupies only half of the hilum and the micropyle strongly resembles a navel, placed against the upper edge of the hilum (micropyle conjunct) (Fig. 7b). *E. missouriensis* seeds have a surface with par-concave relief, the cavities are circular, with a distinctive embossed marginal mound and the testa has a wave-like structure. In contrast, seeds of *E. abdita* have a surface with a flat-concave relief



1 The massive root system of *Escobaria abdita*, an adaptation to extreme habitat conditions. **2** *Escobaria abdita*, just visible beneath a layer of soil in a flooded depression, El Oro. **3** Longitudinal section of flower *Escobaria abdita*. **4** *Escobaria abdita*, in bud in habitat at El Oro. **5** Turgid body of *Escobaria abdita* with a well-developed bud. **6** Fully open flower of *Escobaria abdita*, showing the very light pink stripes on the tepals. Photos 1–6 by Zdeněk Vaško.



7 Microstructure of seeds (left – *E. abdita*, right – *E. missouriensis* s.s.): A – lateral projection; B – hilum and micropyle; C – microstructure of testa showing cavities. Photo: Světlana Kozubová.

covered with oval to crevice-like cavities, often with sharp edges (porous-like structure) (Fig. 7c).

Ecology

The new species occupies an exceptional habitat when compared to other species of the genus. It grows in relatively large flat basins, filled with rainwater sporadically during the year, or periodically in springtime, when loamy or clay-loamy soil is washed down from the surrounding eroded hillsides. These hillsides often contain gypsum, hence the soil of the basin contains a significant

amount of calcium. Water can accumulate up to a depth of 15–20 cm in depressions of the basins. *E. abdita* are usually so completely covered with loam that only the flowers, produced from the top of the plant, are visible at the surface. The beet-shaped root serves as storage organ for water and starch during very long dry periods. Higher plants, other than *E. abdita*, do not occur in this habitat. Sparsely shrubby communities called “mattoral microphilo”, dominated by *Larrea tridentata*, grow in the close surroundings of the basin (outside the flooded area) and surprisingly members of the *Fabaceae* family (*Prosopis* sp.) are absent.

Geographical notes

E. minima, growing near the town of Marathon in the state of Texas (USA), is geographically the closest to the newly described species. The closest populations of *E. missouriensis* (*E. asperispina*) are those growing in the state of Nuevo León, on the edge of the Chihuahua desert basin. 🌵

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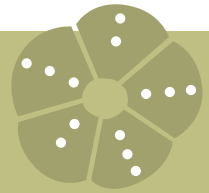
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LITTLE BITS OF PEOPLE HISTORY by Chuck Staples, CSSA Historian

Edith Cole (1859–1940) was a British explorer who joined the Lort-Phillips expedition to Berbera and Golis Mountains in British Somaliland 1894–95. While Ethelbert Edward Lort-Phillips hunted big game, his spouse Louisa Jane and Edith Cole collected butterflies and plants. Plant specimens were sent to Cambridge Botanical Garden and to Kew in England. The succulent plant genus *Edithcolea* was named in Edith Cole's honor (who collected the type species *E. grandis*), along with species *Caralluma edithae* that she discovered on that expedition.

Joseph Harry Johnson, Sr (1894–1987) was a US horticulturist and nurseryman who became well known for the *Echinopsis-Lobivia* hybrids at his *Johnson Cactus Gardens* in Paramount, California—known as the *Paramount Hybrids*. He and his spouse, Hazel May Johnson (1893–1974), were founding members of California Cactus Growers' Association. Harry was its president from 1952 to 1954. He became a CSSA Fellow

in 1952 and its president from 1958 to 1959. Harry produced a number of illustrated, color catalogues with cultural information and plant offerings from 1936 to 1968. He described the genera *Azurocereus* and *Pygmaeoereus* — with *Echeveria johnsonii* named in his honor.

Alfred Byrd Graf (1901–2001), a centenarian, was a German who emigrated to the US in 1925—who was a horticulturist, botanist and photographer. He was employed at *Julius Roehrs Company* nursery in New Jersey from about 1930. He explored in world's tropical and subtropical countries for over 50 years. Alfred became famous for his three books: *Exotica* (1957 with 645 pages), *Tropica* (1978 with 1,120 pages) and *Hortica* (1992 with 1,218 pages) with many, many photos, including succulent plants. The first two books have been revised and reprinted a number of times.

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