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Cover picture: *Gymnocalycium esperanzae*, Sierra de Ulapes, province La Rioja, Argentina (photo: T. Kulhánek)

Editorial

Dear Gymnocalycium enthusiast!

This time we are very proud to present to you a new species. Radomír Řepka and Tomáš Kulhánek describe a population of the genus Gymnocalycium from the south of the province La Rioja, Argentina. It was found almost at the southern tip of the Sierra de Ulapes, some kilometres west of the little village of Nueva Esperanza. They are very interesting plants to grow. The habitat, the Gymnocalyciums nearby and the characteristics of the plants described here, indicate that the new species is a quite recent species of hybrid origin. Nevertheless, the plant is exciting and good-looking – and I have it in my collection.

We would like to express our special thanks to Mr. Graham Charles (United Kingdom), who supports us with the English language, to Mr. Takashi Shimada (Japan), who translats SCHÜTZIANA into Japanese and to Mr. Daniel Schweich (France), who has mirrors or publication under: http://www.cactuspro.com/biblio/.

Gymnocalycium esperanzae Řepka et Kulhánek, a new species from La Rioja, Province Argentina

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ABSTRACT

A new species of the genus *Gymnocalycium* from the central-northern part of Argentina, *G. esperanzae*, is described with the morphological data. The species belongs to the subgenus *Microsemineum* and, according to the special structure of its seeds, is likely to be closely related to *G. castellanosii*, but markedly differs by less peripheral erect subulate dark spines, absence of central spines, the epidermis with a conspicuous grey bloom, significantly longer pericarpel, and by the spindle shape of fruit. The flowers have a longer pericarpel and fruit than its relatives (*G. castellanosii* s. l.). The new species grows on gravelly hills at the southern tip of the Sierra de Ulapes y Las Minas Mountains and can be indicated as stenoendemic to the Argentinean province of La Rioja.

INTRODUCTION

Gymnocalycium Pfeiff. ex Mittler is a large and heterogeneous genus with a significantly smooth pericarpel covered only with herbaceous scales. The genus includes 103 recognized species (Till et al. 2008), however, some authors (Charles 2009, Hunt et al. 2006) recognize only 56 and 49 species, respectively. The shape and size of the seeds are a taxonomically important character for distinguishing the subgenera (Kreuzinger 1935, Schütz 1968, Buxbaum 1968). The genus is divided into 6 subgenera: *Gymnocalycium, Macrosemineum, Microsemineum, Trichomosemineum,*

Muscosemineum, and *Pirisemineum* (Metzing et al. 1995, Charles 2009). The subgenus *Microsemineum* comprises many sections, subsections and species (Till et al. 2008), all with small spherical or oviform seeds, 0,5-1,3 mm in diameter. The testa is dark brown (black), either matt or glossy, the surface with tiny hemispherical warts, or maroon and glossy with tiny papillae. However, taxa of the subsection *Castellanosiana* (= *G.* ca*stellanosii* s. l.) have seeds with different morphology from other species of the subgenus (a special shape and very shiny, papillae on the testa form the typical cells, eccentrically arranged). The hilum is oval or narrowly oval, positioned upright or making an angle with the longitudinal axis of the seed, bordered with a conspicuous or inconspicuous arillus. The subgenus *Microsemineum* is represented in the Argentinean province of La Rioja by a significant number of species as follows (nomenclature by Till et al. 2008): *G. ambatoense*, *G. catamarcense*, *G. ferrarii, G. glaucum, G. hossei, G. saglionis* and species of the *G. rhodantherum* agg. (*G. alboareolatum*, *G. guanchinense*, *G. jochumii*, *G. rhodantherum, G. ritterianum*, and *G. weissianum*). Taxa of the subsection *Castellanosiana* grow geographically closest to the newly described species, in particular *G. castellanosii* subsp. *armillatum* (Piltz) Papsch, in the Sierra de Ulapes Mountains (Papsch et al. 2008).

MATERIALS AND METHODS

This new species was discovered in January 2009 on a joint research journey undertaken by both authors. The first author visited the locality again in early 2010 and has collected morphological data and stored the type plant in a herbarium. The variability was processed using Microsoft Excel 9.0 for Latin and English descriptions.

Gymnocalycium esperanzae Řepka & Kulhánek, sp. nov. (subgenus *Microsemineum*)

LATIN DESCRIPTION

Epidermis viridi-brunnea seu viridi-cinerea, saepe pruna pallide cinerea tecta. Spinae marginales 3-5(-7), ubi solum 3, instar litterae T positae, subulatiformes, dein fortes, oblique deorsum vel sursum flexae (rarissime adjacentes), vix deflexae vel rectae, basi brunneo-nigrae vel glaucosae, in media parte pupurascentes, apice eburneae, cum apicibus saepe sursum curvatis; longitudo (8-)12-18 (-25) mm. Spina centralis deest. Flos infundibuliformis, (45-)55-60(-70) mm longus, 35-40 mm latus, perianthio pericarpi aequilongo seu paulum breviore; tepala oblonga- late oblanceolata, obtusa, dilute erubescentia, basi saepe purpurascentia-pallide rosea. Receptaculum late crateriforme, roseum. Stylus pallescens-flavescens, stigmata 10, dilute flavescentes. Circulus superior staminum apicem

stigmatis attingens vel paulo superans, filamenta pallide virescentia, antherae pallide flavae. Cavitas ovarii alba, 12-15 mm longa, 5-7 mm lata, paries ovarii (pericarpi) usque ad 3 mm crassus. Fructus in ambitu oblongus - oblonge fusiformis (- claviformis), cinereoviridis - viridicaeruleus, (20-)22-30 (-35) mm longus et 15-18 mm latus, squamis minus quam semicircularibus, rosaceis. Semina applanate globosa, e latere visa galeiformia, apice rotundata, basi adpresse tectiformia (cum margine anguloso), atrocastanea - atrofusca, valde nitida, 0,95-1,2 mm longa et 1,0-1,3 mm lata. Papillae cellules testae acentralibus. Hilum immersum, oblongum, cum margine pallido, micropyle rotunda.

Type: Argentina, La Rioja Province, General San Martin Department, shrub community at the roadside, west of the village of Nueva Esperanza (Las Tres Marias), c. 500 m above sea level, 21 January 2010, leg. R. Řepka sub no. RER 434 = Tom 09-436/1 (holotype in CORD). (fig. 1)

DESCRIPTION

Stem flattened-globose to globose, 5-9(-16) cm in diameter and 5-8(-12) cm tall. Epidermis matt, greenish-brown or greenish-grey, often covered with a bright greyish bloom. Root markedly long, beetroot-like, utilised as a storage organ, branched only in the apical part. Ribs (7-)9-12(-16), straight, in young plants fully flat, in mature plants gibbous with undulate notches between them, divided by short, shallow cross notches into rounded humps, under the areoles projecting into slightly angular or rounded warts; in lower part 12-18(-30) mm, in upper part 7-10 mm broad. Areoles oblong to circular, slightly sunken, abundantly yellowish or grey (blackish) woolly, eventually slightly glabrescent, 7-15(-18) mm apart from each other. Radial spines 3-5(-7), if 5 or 7 in number then the upper pair the shortest, if 3 in number then making a T shape. Spines of young plants are thin, subulate, in mature plants rigid, pointing faintly upwards or inflexed towards the stem (or straight), in cross-section circular or faintly rhombic, patent-deflexed to erecto-patent (rarely appressed), in lower half to two-thirds brown to black or bluish-grey, in central part pale purple, in upper part horn-coloured, their apex often curved upwards, (8-)12-18(-25) mm long. Central spine absent. Flowers bisexual, hypocrateriform, in full bloom salver-shaped, (45-)55-60(-70) mm long and 35-40 mm wide; perianth equally long as, or slightly shorter than, pericarpel incl. receptaculum; pericarpel large, 15-25(-35) mm long and 12-15 mm wide, greyish-green, without pruinose bloom. Outer perianth segments oblong to oblanceolate, whitish-pinkish, on the outside with a broad greyish-brownish stripe, at base pale purplish, fluently passing into the scales of the receptaculum. Inner perianth segments oblong to widely oblanceolate, apex obtuse, tapering to the base, whitish-rose to pale pink, at base often pale purplish or pale rose, 18-25 mm long and 5-8 mm wide. Receptaculum wide funnel-shaped, 10-13 mm high, pinkish-purple. Style whitish-luteous, penetrating the bottom of the receptaculum, 10-13 mm long; stigma pale yellowish, 10-lobed. Stamens growing on the flanks of the recepta-

culum, not arranged in lines; top of upper stamens surpassing the top of the stigma. Stamen filaments pale greenish, lower part of lower filaments slightly rose, anthers pale yellowish. Ovary oblong to slightly obconical, 12-15 mm high and 5-7 mm wide, cavity white, wall (incl. wall of receptaculum) up to 3 mm thick. Fruit oblong to oblong-fusiform (-clavate), greyish-green to bluish-green, when fully mature to pale brownish, matt, (20-)22-30(-35) mm long and 15-18 mm wide; scales 10-14, almost hemispherical, at the top obtuse or with obtuse apex, pink with whitish margin and bluish green base. Seeds oblate globose, in side view helmet-like, upper margin curved to angular, dark maroon to blackish brown, strongly shiny, (0,92-)1,0-1,2 mm long and 1,0-1,2 (-1,3) mm wide (subgenus *Microsemineum*). Papillae on testa cells eccentric. Hilum-micropyle region sunk, oblong, in side view more flattened, with pale margin; micropyle located in lower part of hilum, circular.

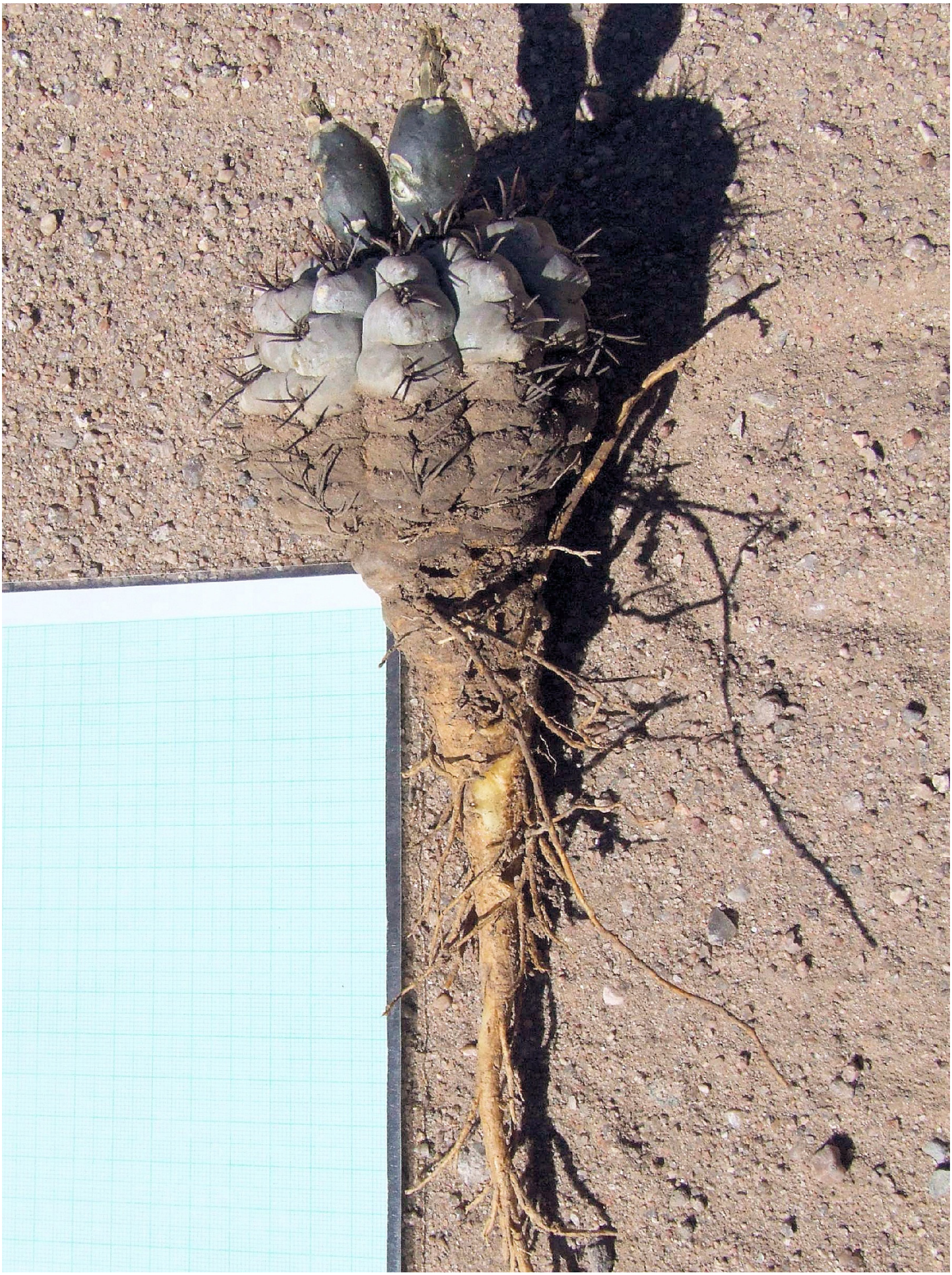

Fig. 1: Holotype of *G. esperanzae*, RER 434 = Tom 09-436/1 (holotype in CORD), photo: R. Řepka.

Fig. 2: *G. esperanzae* in situ.

Fig. 3-5: Spine arrangements.

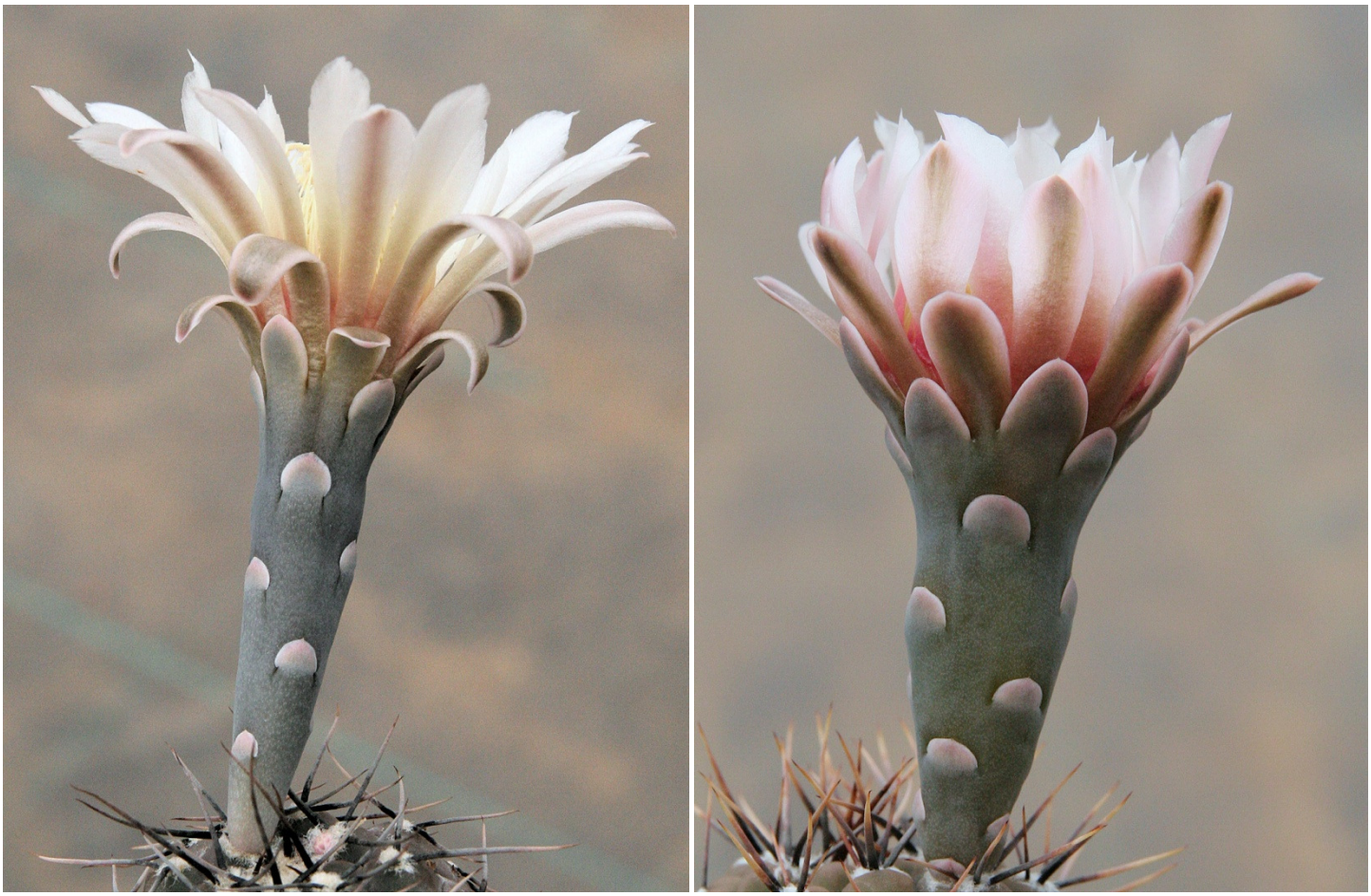

Fig. 6-7: Flower variability.

Fig. 8-9: Flower sections.

Fig. 10: Ripened fruits.

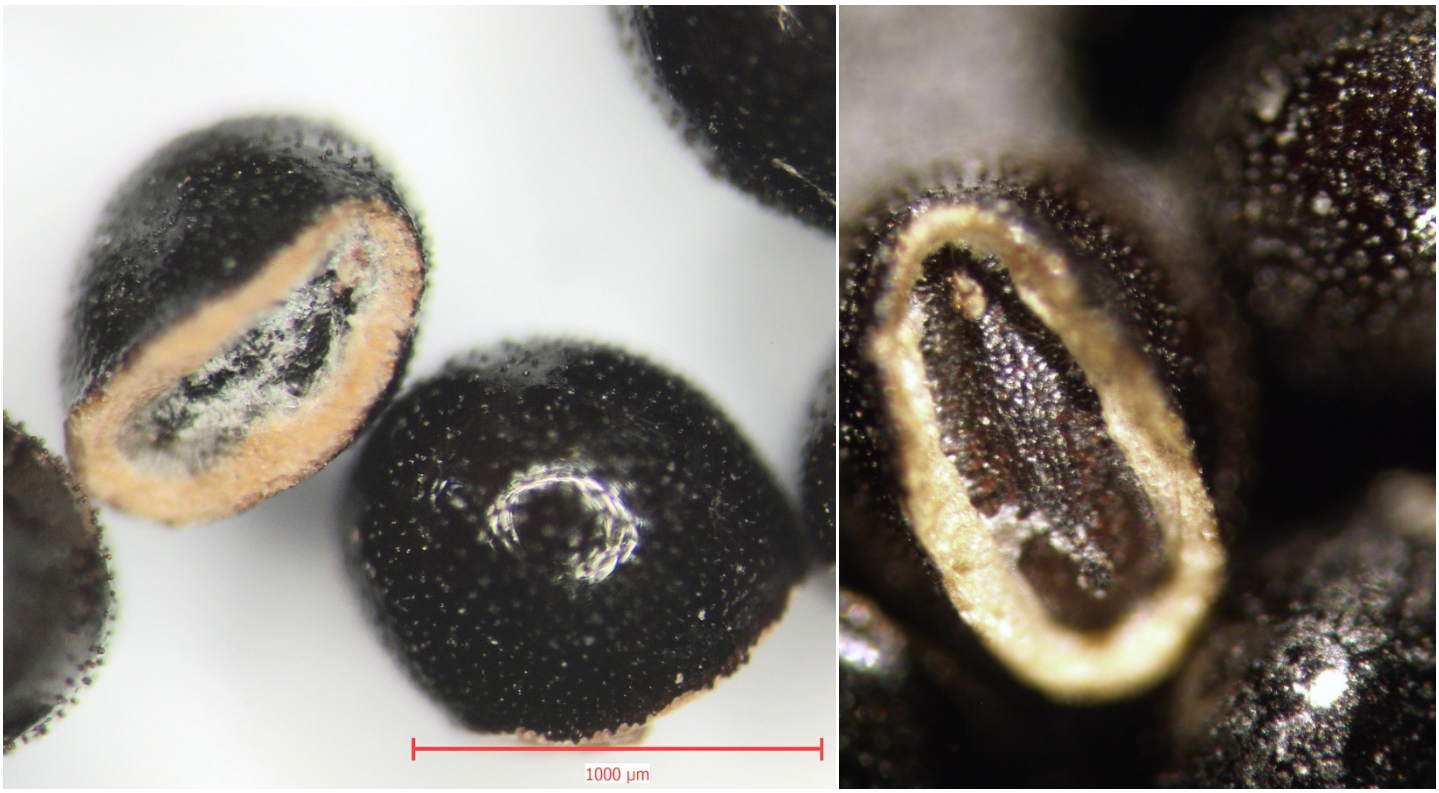

Fig. 11-12: Seeds in detail, photo: J. Záhora, J. Procházka.

KEY TO DISTINGUISH *G. esperanzae* FROM RELATED SPECIES

1a Seeds hat-like, brown to black-brown, with very fine papillae on the surface cells, hilum horseshoe-shaped with reflexed margin covered by an elaiosome. Stem discoid, flat also when old, 25(-40) mm tall and 60-95 mm in diam., epidermis grey-green to dark brown-green, not bloomy. Ribs very flat, spines 3 in young and old plants, rigid, appressed, arranged in a T shape. ..... ***G. bodenbenderianum* (Hosseus ex Berger) Backeb. in Backeb. et Knuth**

1b Seeds round or ovoid, black-brown to black, with large papillae on surface cells, hilum oval, with pale, narrow, straight margin with an elaiosome. Stem flat when young, when old taller than broad, 50-90(-160) cm in diam. and 50-12(-200) mm tall, epidermis green-brown or green-grey to grey-green, often greyish bloomy or covered with a light grey bloom. Ribs first flat, eventually gibbous to strongly gibbous in older plants, spines 3-7(-14), thin when young, subulate, hard when old, erect to inflexed towards the stem or pointing slightly upwards to strongly patent. **2**

2a Stem with grey-green epidermis, when old 100 mm in diam. and 200 mm tall, marginal spines 7-14, central ones 1-3, curved upwards; pericarpel 12-15 mm long; stamen filaments pink-carmine, style light yellow to pale pink, flower delicately pink; fruit pyriform to short ovoid, 20 mm long and 15 mm broad. ..... ***G. castellanosii* subsp. *armillatum* Piltz (Papsch)**

2b Stem with green-brown or green-grey epidermis, often covered with a light grey bloom, when old 5-9(-16) cm in diam. and 5-8(-12) cm tall. Marginal spines 3-5(-7), central ones missing; pericarpel 15-22(-30) mm long; stamen filaments pale greenish, style whitish lutaceous; fruit oval to oval-fusiform(-clavate), (20-)25-30 mm long and 15-18 mm broad. ..... ***G. esperanzae* Řepka et Kulhánek**

ETYMOLOGY

The epithet „*esperanzae*“ relates to the name of the village closest to the type locality.

ECOLOGY AND DISTRIBUTION

G. esperanzae grows on low, 20-30 m high hills with shallow depressions formed by erosion; bedrock consisting of strongly permeable gravel with cobbles of 10-150 mm in diameter, mixed with loamy fine soil washed into deeper soil layers. It grows in a community of the "Chaco árido" subecoregion (Cabrera 1976) including a very scanty tree layer consisting of scattered 7-8 m tall trees of *Aspidosperma quebracho-blanco* (*Apocynaceae*). The shrub layer is dominated by *Acacia furcatispina* (*Leguminosae-Mimosoideae*) with additional species like *Larrea cuneifolia* (*Zygophyllaceae*), *Prosopis torquata* and *Senna aphylla* (both *Leguminosae-Caesalpinioideae*). Rarely, *Cercidium praecox* (*Leguminosae-Caesalpinioideae*) and *Porlieria microphylla* (*Zygophyllaceae*) occur here. The cover of the shrub layer is thick on the slopes and the vegetation is locally impenetrable. On their tops the cover is, however, lessr and the vegetation more open. *G. esperanzae* grows mostly under the cover of lax shrubs, but also elsewhere, in direct sunlight. In the latter case the epidermis is yellow-brownish straw-coloured, whereas that of plants growing under shrubs is more or less covered with a conspicuous grey bloom. The bloom is formed similarly to other taxa of the genus (*G. prochazkianum, G. castellanosii* subsp. *bozsingianum, G. striglianum* subsp. *aeneum)*, due to quite special climatic (high summer temperature, very low precipitation) and microclimatic conditions of the locality (influenced by a flow of warm, dry air rising from the depressions - bolsons - between mountain ridges). This character is genetically stable in similar conditions in culture and created here as well.

G. esperanzae has so far been found only in the southern part of the Argentinean province of La Rioja, in the vicinity of the border with San Luis province, in the hills at the southern tip of the Sierra de Ulapes y Las Minas Mountains, W and SW of the village of Nueva Esperanza. *G. esperanzae* does not share a common habit with its relatives *G. castellanosii* subsp. *armillatum*. The nearest locality for *G. castellanosii* subsp. *armillatum* was found on the southern slopes of the Sierra de las Minas at a distance of 1700 m. *G. castellanosii* subsp. *armillatum* lives in granite rocky outcrops, and is also separated from the habitat where *G. esperanzae* lives by a small flat valley (see fig. 14.). These two species are near-sympatric but not syntopic (Meregalli, personal communication). According to the field data so far collected (*G. esperanzae* was found independently also by Meregalli and Funetta in 2010 several hundred metres to the east), the new species occupies an area of several square kilometres.

Fig. 13: The place where *G. esperanzae* was discovered (the yellow point on the Google map).

Fig. 14: Small hills at the southern tip of the Sierra de Ulapes, habitat of *G. esperanzae.*

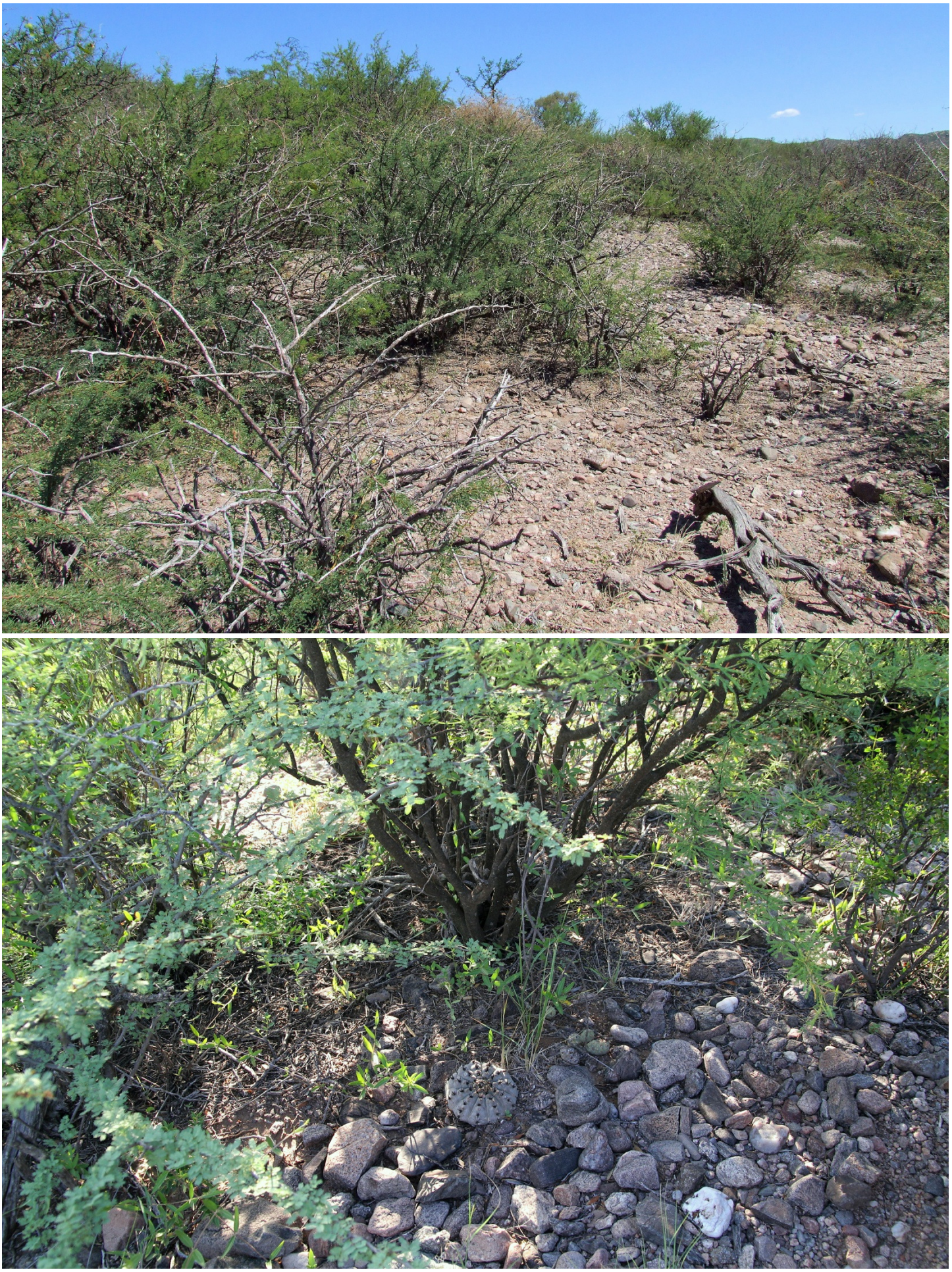

Fig. 15-16: View into the habitat of *G. esperanzae*, (fig. 15. photo: R. Řepka).

Fig. 17-18: Variability of *G. esperanzae* at the type locality.

Fig. 19-20: Variability of *G. esperanzae* at the type locality.

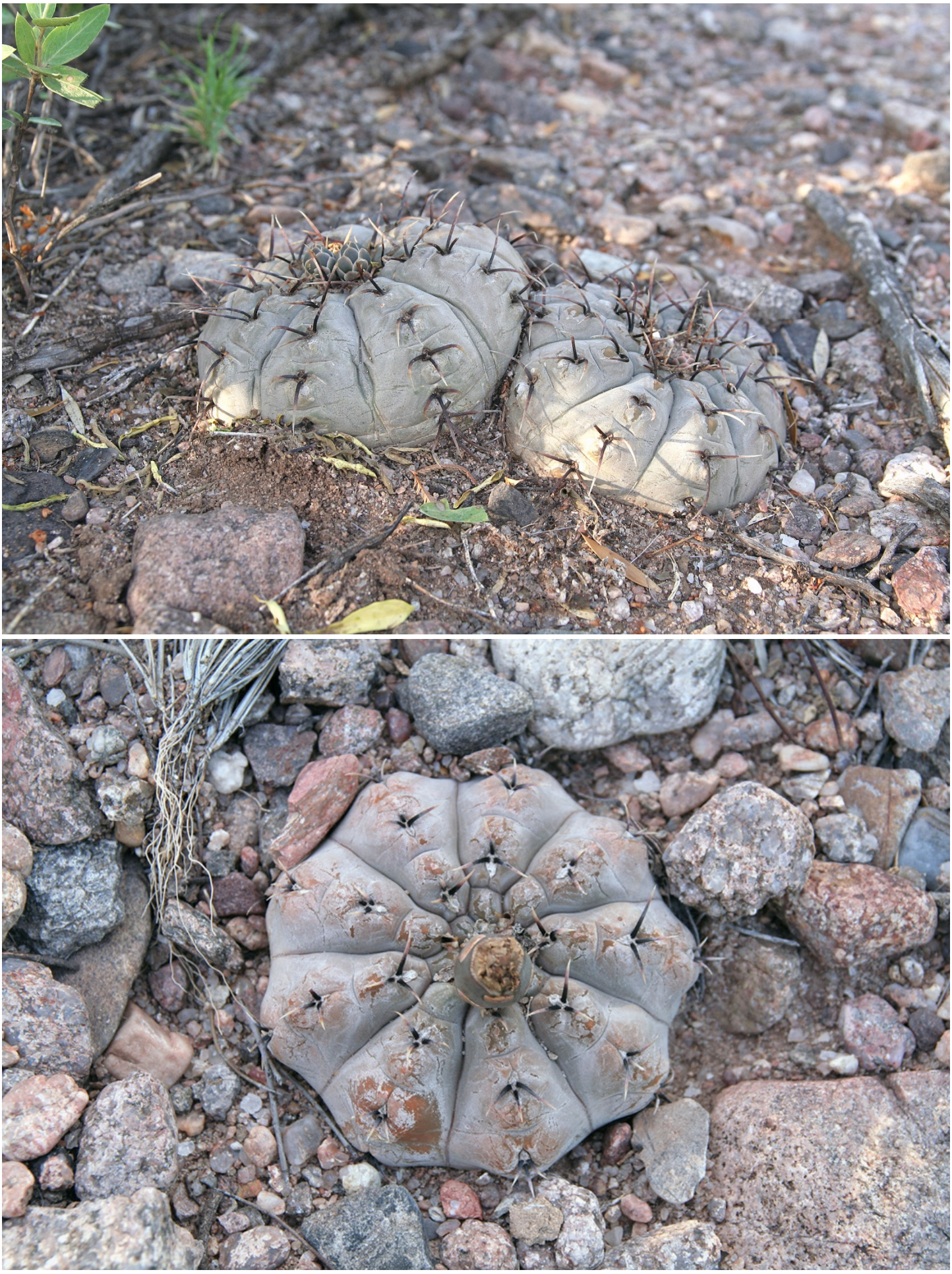

Fig. 21-22: Variability of *G. esperanzae* at the type locality.

Fig. 23-24: Variability of *G. esperanzae* at the type locality.

Fig. 25: Variability of *G. esperanzae* at the type locality.

DISCUSSION

G. esperanzae shows, even in its relatively small distribution, a marked variability, most of all in epidermis colour and in length, number, strength and positioning of the spines. At first glance, it strongly resembles *G. bodenbenderianum* (Hosseus ex Berger) Backeb., which grows in the surroundings, by 3-5 erect spines and a long pericarpel. However, *G. bodenbenderianum* differs from *G. esperanzae* by a flat body with brown epidermis without a greyish bloom, 3 appressed spines, in cross-section circular, and dark at the base, arranged in a T formation. It strongly differs in its seeds, where *G. bodenbenderianum* is like all other members of subgenus *Trichomosemineum* and has hat-like seeds, with a very shiny testa and small papillae placed centrally on the cells; the seeds show very strong elaiosom on the edge of the undulating elongated hilum (see key). *G. esperanzae* has, with G. *castellanosii* subsp. *armillatum*, a similar perianth colour, flower throat colour and the same type of seeds. *G. esperanzae* differs from *G. castellanosii* subsp. *armillatum* by its adult body shape (flattened-globose to globose), grey bloom on the epidermis, usually dark, less radial spines, absence of central spines and significantly longer pericarpel, and by the shape of its fruit (see key and figures).

The morphologic observations led us to conclude a presumption that *G. esperanzae* is a relatively young species which has originated by hybridization of *G. bodenbenderianum* and *G. castellanosii* subsp. *armillatum*, both of which occur in the surroundings. The hybridisation process in genus *Gymnocalycium* was previously supposed between subgenus *Trichomosemineum* and *Microsemineum* (Papsch et al. 2008), but has not yet been scientifically proven. This process is one of the important question of the genus *Gymnocalycium* phylogeny that needs to be answered in future.

G. esperanzae grows in large populations and develops fully grown pollen grains; freshly collected seeds have a germination rate of almost 80 %. Therefore, we do not consider this taxon to be recent hybrid. The morphological differences of *G. esperanzae* exceed the variability of *G. castellanosii* s. l. as mentioned in the work of Papsch et al. (2008), particularly of *G. castellanosii* subsp. *armillatum* and support the recognition of *G. esperanzae* as a separate species, rather than as a subspecies of *G. castellanosii* or recent hybrid.

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If not indicated, pictures are by Tomáš Kulhánek

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