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ORIGINAL ARTICLE

Forgotten but not lost: Notes about the status of the often overlooked Chilean desert endemic *Loasa rotundifolia* (Loasaceae)

Olvidada pero no perdida: notas sobre el estado de *Loasa rotundifolia* (Loasaceae) un endemismo chileno frecuentemente pasado por alto

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RESUMEN

Chile es un hotspot de biodiversidad para Loasaceae. Si bien la taxonomía de Loasaceae es relativamente bien entendida en el país (especialmente en comparación con los países más al norte, a lo largo de los Andes tropicales), se espera que el número de taxones de esta familia cambie debido al trabajo taxonómico en taxones actualmente reconocidos, nuevos registros y taxones aún no descritos. *Loasa rotundifolia* es una especie endémica del desierto de Atacama, descrita en 1893, sin embargo, ha sido mayormente ignorada por los recientes catálogos florísticos nacionales y regionales que incluyen a Chile. Es una especie rara, conocida previamente a nivel mundial por sólo tres colecciones de herbario. El objetivo principal de esta contribución es proporcionar una revisión moderna de este taxón poco común, incluida una descripción expandida, la descripción de su área de distribución, notas ecológicas y una evaluación preliminar de su estado de conservación. Estudiamos material en SGO y CONC, mapeamos la distribución de la especie y evaluamos su estado de conservación preliminar en GeoCAT. Encontramos que *Loasa rotundifolia* es una especie distintiva debido a su morfología foliar diagnóstica y sus preferencias de hábitat. Nuestra revisión indica que la especie es filogenéticamente parte de *Loasa* ser. *Macrospermae*, endémica de la Región de Atacama y recomendamos considerarla "En Peligro", tanto de acuerdo a nuestros análisis en GeoCAT como por la aplicación de criterios de la UICN.

Palabras clave: desierto de Atacama, especies en peligro, historia natural, Loasoideae, taxonomía.

ABSTRACT

Chile is a biodiversity hotspot for Loasaceae. Although relatively well known (especially compared to countries further north along the tropical Andes), it is expected that the number of taxa in Chile is bound to change due to taxonomic work on currently recognized taxa, new records for the country, and undescribed diversity. *Loasa rotundifolia* is endemic to the Atacama Desert and was described in 1893, however it has mostly been overlooked by recent national and regional Floristic catalogues that include Chile. It is a rare species known previously from only three herbarium collections worldwide. The main objective of this contribution is to provide a modern revision for this rare taxon, including an amended

description, a description of its distributional range, ecological notes, and a preliminary assessment of its conservation status. We studied material in SGO and CONC, mapped the distribution of the species, and assessed its preliminary conservation status in GeoCAT. We found that *Loasa rotundifolia* is a distinct species due to its unique leaf morphology and habitat preferences. Our revision indicates that the species is phylogenetically part of *Loasa* ser. *Macrospermae*, endemic to Región de Atacama and we recommend it to be regarded as Endangered, according both to our GeoCAT analyses and the application of IUCN criteria.

Keywords: Atacama desert, endangered species, Loasoideae, natural history, taxonomy.

INTRODUCTION

Chile has the third or fourth highest species richness in Loasaceae with an estimated 48 species according to the Catálogo de Plantas Vasculares de Chile (Rodríguez *et al.* 2018), only surpassed by Peru, the United States with almost 100 species each (Hufford 2016, Acuña-Castillo & Weigend unpl. data), and possibly Mexico (Villaseñor 2016, reports 53 spp) however the exact number of species in Mexico is uncertain (*e.g.*, Schenk *et al.* 2021, accept 25 species in *Mentzelia* L., while Villaseñor 2016 accepts 29) due to the lack of a taxonomic revision for the whole country. The number of accepted species of Loasaceae from Chile has increased since Rodríguez *et al.* (2018) contribution and include a new country record for *Presliophytum incanum* (Graham) Weigend (Muñoz-Schick & Luebert 2018), previously only known from Peru, the "reinstatement" of *Grausa acaulis* (Phil.) Santilli, D.H. Cohen & R.H. Acuña, as living plants show significant differences in floral morphology and coloration from *Grausa lateritia* (Gillies ex Arn.) Weigend & R.H. Acuña (Santilli *et al.* 2020, in dry specimens these differences are subdued), and the description of a distinctive new endemic species, *Loasa chrysantha* Santilli, R.H. Acuña & Lavandero from the Andes of the Atacama Region (Santilli *et al.* 2022). This brings the total to 51 species, however this number is again expected to change, because more species will be added to the list in years to come (new records, new "reinstatements", and undescribed species being worked on), and also because some of the names currently accepted by Rodríguez *et al.* (2018) and Zuloaga *et al.* (2019, such as *Loasa argentina* Urb. & Gilg, may probably be best synonymized under other names, as our understanding of some clades improves.

Interestingly, Chile has a high percentage of endemic species with almost 50 % (25 spp) restricted to the country, particularly in the central ("Mediterranean climate like") Regions. Chile also has the most recorded genera of Loasaceae in the world, with 11 currently accepted genera (Rodríguez *et al.* 2018, Zuloaga *et al.* 2019, Acuña-Castillo *et al.* 2024), this is more than Argentina, Mexico and Peru, all ranking second, each with 8 genera (Weigend 1999, Villaseñor 2016, Acuña-Castillo *et al.* 2021, Zuloaga *et al.* 2021, Martín *et al.* 2022).

Loasa Adans. is the most species rich and ecologically diverse genus from Loasaceae in Chile. In its current phylogenetic circumscription *Loasa* includes ca. 20 spp of what Urban & Gilg (1900) defined as *Loasa* sect. *Loasa* (≡ *Euloasa*) sers. *Deserticolae*, *Floribundae*, *Loasa* (≡*Acanthifoliae*) and *Macrospermae*. Of these, two entire series and 70 % (14) of the species are endemic to Chile (Acuña-Castillo unpl. data). Outside Chile, the genus is found in the Lomas of coastal Peru (one species - *Loasa nitida* Desr.) and central to southern Andean Argentina (*Loasa acanthifolia* Desr., *Loasa acerifolia* Dombey ex Juss., *Loasa heterophylla* Hook. & Arn., *Loasa mendocina* (Urb. & Gilg) R.H. Acuña, Weigend & D.H. Cohen and *Loasa sclareifolia* Juss.) with all these species having populations in the Chilean territory (Grau & Bayer 1996, Weigend 1999, Acuña-Castillo *et al.* 2021, Santilli *et al.* 2022).

Loasa ser. *Macrospermae* is the most species rich, widespread and collected *Loasa* with 13 accepted species according to Santilli *et al.* (2022). Species from this clade include the northernmost (*Loasa nitida*) and southernmost (*Loasa acerifolia*) representatives of *Loasa* and can be found in most of the major terrestrial ecosystems of the northern two thirds of Chile, from the coastal fog deserts and other coastal habitats, to the Andes over 3000 m, as well as in the interior deserts, the Mediterranean Matorral and the low and middle elevation Valdivian forests. The two most recently described Loasaceae species from Chile belong to *L.* ser. *Macrospermae* (*Loasa mollensis* Muñoz-Schick & Trenq. and *L. chrysantha*). Putatively included in this series is also *Loasa rotundifolia* Phil., an enigmatic, and distinctive species endemic to the Atacama

Region that was described in the late 19th Century (Philippi 1893), but still only known from three herbarium collections worldwide (including the rather fragmentary type material). It has been overlooked in the main floristic catalogues that consider the Loasaceae from Chile (Marticorena & Quezada 1985, Weigend *et al.* 2008, Rodríguez *et al.* 2018, Zuloaga *et al.* 2019). Plants of the World Online (POWO 2024) considers it as an "unplaced" name. This lack of recognition probably stems from the fact that neither Urban & Gilg (1900) nor Reiche (1901) included *L. rotundifolia* in the main text of their respective monographs, considering it as one of their "Species nobis non visae" or "Especies Problemáticas" respectively. Although both Santilli *et al.* (2022) and the online version of the "Flora del Cono Sur" (Instituto de Botánica Darwinion 2023) consider it as an "Accepted species", the "good" species status of *Loasa rotundifolia h*as not been discussed in detail in the recent literature. The main objective of this contribution is to provide a modern revision of this rare taxon, including an assessment of its phylogenetic placement, an amended morphological description, a description of its distributional range, ecological notes and a preliminary assessment of its conservation status. As we are preparing the Loasaceae treatment for the Flora de Chile project (Acuña-Castillo *et al.* in prep), we hope this will help to bring attention to this rare Chilean endemic taxon for inclusion in other future works.

MATERIALS AND METHODS

Herbarium and fieldwork

We studied specimens of *Loasa rotundifolia* deposited at CONC and SGO (Thiers 2024). Measurements for the updated description were taken directly from those specimens. Living plants were observed in Río Pulido and near Paso de Pircas Negras, Copiapó Province in the Atacama Region. Georeferenced observations (photographs, even if they had no associated herbarium voucher) were taken into consideration for the phenological information, distribution, and conservation assessment.

Molecular analyses

DNA sequences were obtained from GenBank (https://www.ncbi.nlm.nih.gov/Genbank including recently described *Loasa chrysantha*) or generated in the present study (*Loasa rotundifolia*). Sampling included 92 species of Loasaceae, plus six species of other Asterid families. All currently recognized genera and most major infrageneric clades of Loasaceae subfamily Loasoideae were included. As outgroups, within Loasaceae we used *Mentzelia* L., *Gronovia* L., and *Eucnide* Zucc., outside Loasaceae we used *Philadelphus* L. (Hydrangeaceae), *Deutzia* Thunb. (Hydrangeaceae), *Actinidia chinensis* Planch. (Actinidiaceae), *Antirrhinum majus* L. (Plantaginaceae), and *Panax ginseng* C.A. Mey. (Araliaceae). All vouchers, including GenBank accession numbers, are listed in Appendix 1. Sequences for *Loasa rotundifolia* were generated from silica-dried material collected in the field (*de Schrevel & Dandois 421*). Total genomic DNA was extracted using the Qiagen DNeasy Plant Mini Kit (QIAGEN, Santiago, Chile) following the manufacturer's instructions. We sequenced the following plastid regions: the *matK* gene, the *trnS-trnG* and *trnL-trnF* intergenic spacers, and the *rps16* intron, following Acuña-Castillo *et al.* (2017), secuences of all four regions were obtained for all taxa except *matK* that was not obtained for *Blumenbachia scabra* (Miers) Urb.. We used the same primers as Acuña-Castillo *et al.* (2017) with the exception of the gene *matK* that was obtained using the primer pair trnK-2R and matK 3F (Johnson & Soltis 1995; Sang *et al.* 1997) and the newly generated primer pair matK 1050F (5'-TAGCCCAGAAAGTCGAGGGA-3') and matK 2831R (5'-TCGGGTTGCTAACTCAACGG-3'). We amplified all regions of *Loasa rotundifolia* in 25 ml PCR reactions using the following thermocycling conditions: initial denaturation of 95 °C for 5 min; 35 cycles at 95 °C for 1 min, a specific annealing temperature for 1 min (51 °C for *trnL-trnF* and rps16, 62 °C for *trnS-trnG*, and 55 °C for *matK*), 72 °C for 1 min; and a final elongation period of 72°C for 15 min. Sanger sequencing was performed in the Plataforma de Secuenciación y Tecnologías Ómicas, Pontificia Universidad Católica de Chile, using the ABI PRISM 3500 xl Genetic Analyzer (Applied Biosystems).

Sequences were assembled in Geneious 2022.2.1 (https://www. geneious.com) using the default De Novo assembly settings. The assembled sequences were aligned using MAFFT v7.450 algorithm (Katoh *et al.* 2002, Katoh & Standley 2013). For the *rps16*, *trnS-trnG*, and *trnL-trnF* regions we used the E-INS-i option, for the *matK* region we used the G-INS-i option. Phylogenetic analyses were run for both maximum likelihood (Felsenstein 1981) and Bayesian inference (Huelsenbeck & Ronquist 2001) using RAxML-AVX3 version (Stamatakis 2014) included in RAxMLGUI v2.0 (Silvestro & Michalak 2012, Edler *et al.* 2020) and MrBayes x64 v3.2.7 (Ronquist *et al.* 2012), respectively. The best-supported model of nucleotide sequence evolution for each region was determined using MrModeltest v2 (Nylander 2004) based on the Akaike information criterion (AIC). For the Bayesian analysis, four partitions were used corresponding to each region, in which evolutionary models for each one were: GTR + G for *rps16*, *trnL-trnF*, and t*rnS-trnG*, and GTR + I + G for *matK*. Maximum likelihood analyses were run using the GTRGAMMA approximation. The analysis included 1000 ML slow bootstrap replicates with 500 runs. Bayesian

analyses were conducted under the respective best fit models for each partition, with two independent runs for 10 million generations, sampling every 1000 generations. Time series plots and effective sample size (ESS) were analyzed using TRACER v. 1.7 (Rambaut *et al.* 2018) in order to check convergence for each run. The first 2.5 million generations were discarded as burn-in.

Conservation assessment

The tentative assessment of the conservation status was made using the International Union for Conservation of Nature (IUCN 2022) criteria. The area of occupancy (AOO) and the extent of occurrence (EOO) was calculated using GeoCat (Bachman *et al.* 2011). A cell width of 5 km was used.

RESULTS AND DISCUSSION

Loasa rotundifolia Phil., Anales Univ. Chile 85: 10. 1893 – Lectotype (designated here): [CHILE, Región de Atacama] Prov. Copiapó, Quebrada de Serna, 1885, F. San Román s.n. (SGO barcode SGO000003422!; isolectotype: SGO barcode SGO000003421!). Fig. 1.

Annual herbs or subshrubs, stems brittle, terete to ca. 50 cm tall, 1 cm diam. at the base, epidermis often exfoliating and whitish on the stem base, green on most branches, including inflorescences. Stem, petiole, peduncle and pedicel epidermis with dense, short scabrid and glochidiate trichomes, uniseriate glandular trichomes (especially on younger parts, inconspicuous or absent elsewhere) and numerous stinging, whitish trichomes to 5 mm long. Root system apparently unbranched. Leaves opposite, petiolate, petiole 5-45 mm, blade 10-50 x 7-45 mm, broadly triangular in outline, entire to shallowly lobed with 3-4 lobes per side, margins deeply and coarsely toothed to crenate, blade base cordate, the sinus usually deepest in the largest leaves near the base of the stem, apex usually obtuse. Adaxial leaf blade with veins impressed (more evident when fresh), densely pubescent, dark grayish green due to high density of scabrid and glochidiate trichomes, stinging trichomes numerous, uniseriate glandular trichomes present when young, abaxial surface lighter green, covered in a dense indumentum of scabrid and glochidiate trichomes. Inflorescences cymose, to 30+ cm long, sympodial in appearance on the largest plants, frondose, with opposite, subsessile to sessile to amplexicaul bracts, almost isodiametric, orbicular in outline, blade usually entire with large teeth on their margins, to ca. 25 x 25 mm, increasingly smaller and with less teeth towards the most terminal parts of the inflorescence, indument similar to that of leaves, each flower deflexed in anthesis; pedicels to ca. 15 mm long during anthesis, deflexed, lengthening to ca. 30 cm in fruit. Sepals five, green, patent to slightly reflexed in anthesis, lanceolate to elliptical or narrowly ovoid, 5-7 x 1-2 mm, with three main veins, margins entire, apex acute. Petals, five, cymbiform, with well differentiated claw and limb, claw white, limb yellow, with two indistinct, obtuse to rounded teeth near the base of the limb, 8-12 mm long, reflexed (sometimes just slightly) in anthesis, abaxially with abundant, short scabrid and glochidiate trichomes and soft, longer stinging trichomes along the keel, apex rounded to acute. Nectar scales five, slightly bulging near the base, tapering slightly distally, to 4 x 3 mm, bicolored (sometimes inconspicuously tricolored), the basalmost 1/5 th of the scale's back whitish to yellowish, the rest of the back about half red (proximally) and half white (distally) sometimes with tiny red markings near the neck, with three evident, flag-shaped dorsal threads, laterally compressed, outline irregularly ellipsoid with sinuate outer margins, mostly red, subequal in length, 2-3 mm long, attached near the base of the scale, tips abruptly attenuated, filiform and white, neck with distinct double arch, the ridges between the arch extending to the attachment point of the dorsal threads. Free staminodes white, two per scale, to ca. 7 mm long, sigmoid, the base somewhat flattened, the apex filiform. Stamens numerous, ca. 50, filaments 7 mm long, anthers round and yellow. Style ca. 7 mm long, with possibly three stigmatic ridges that extend onto the style. Ovary inferior, the base covered mostly with glochidiate trichomes, stinging trichomes also numerous. Fruits broadly conical, erect (when mature) capsules, to ca. 10 x 10 mm, apically dehiscent by possibly three convex valves, sepals persistent and erect in fruit. Placentae possibly 3. Seeds not seen, but probably less than 15, 3+ mm long, like other species of ser. *Macrospermae*.

Notes

The type material of this species is very fragmentary, with the only mature flower completely disaggregated into pieces. However, the distinctive bract shape is evident in both the lecto and isolectotype. This species has been rarely collected, and so far, we have seen only five additional voucher specimens in herbaria, even though, based on our own or our colleagues' observations, some populations seem healthy and are usually composed of several plants (de Schrevel, pers. comm.).

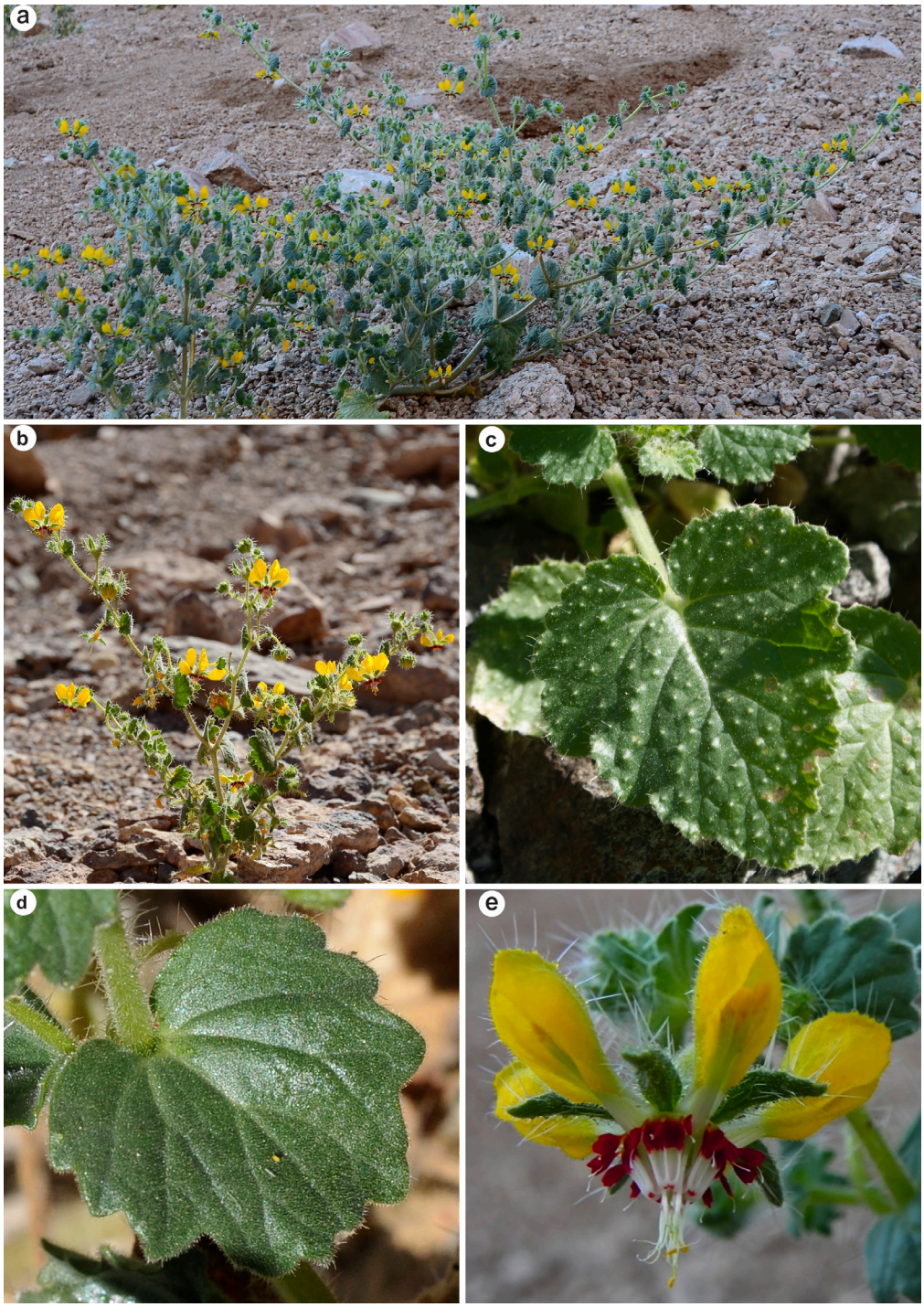

Figure 1. Habitat and morphology of *Loasa rotundifolia* a. Habitat on gravelly soil and habit of larger plants, the large plant on the right has dozens of maturing capsules, Río Pulido, Copiapó, Atacama, Dec. 2011 (M.T. Eyzaguirre). b. Habit of a smaller plant, Camino a Paso Pircas Negras, Copiapó, Atacama, Dec. 2011 (M.T. Eyzaguirre). c. Adaxial surface of a leaf, notice the long petiole, Camino a Cuesta Codoceo, Copiapó, Atacama, Sep. 2017 (C. de Schrevel). d. Amplexicaul bract, Carrera Pinto, Copiapó, Atacama, Oct. 2017 (P. Dandois). e. Flower, notice the patent sepals, Río Pulido, Copiapó, Atacama, Dec. 2011 (M.T. Eyzaguirre). / Hábitat y morfología de *Loasa rotundifolia* a. Hábitat en suelo de grava y hábito de una planta grande, la planta grande a la derecha tiene decenas de cápsulas en maduración, Río Pulido, Copiapó, Atacama, Dic. 2011 (M.T. Eyzaguirre). b. Hábito de una planta pequeña, Camino a Paso Pircas Negras, Copiapó, Atacama, Dic. 2011 (M.T. Eyzaguirre). c. Superficie adaxial de una hoja, note el peciolo largo, Camino a Cuesta Codoceo, Copiapó, Atacama, Sep. 2017 (C. de Schrevel). d. Bráctea amplexicaule, Carrera Pinto, Copiapó, Atacama, Oct. 2017 (P. Dandois). e. Flor, note los sépalos patentes, Río Pulido, Copiapó, Atacama, Dic. 2011 (M.T. Eyzaguirre).

Additional specimens examined

CHILE, Región de Atacama, Prov. Copiapó. Qda. de Puquios al S frente a Corrales. 1270 m. (27°10'S-69°53'W), 30-X-2005, Rosas 3135 (CONC); Qda. Carrizalillo. 827 m. (27°34'25''S-70°10'03''W), 18-X-2022, de Schrevel & Dandois 418 (SGO); Qda. Carrizalillo. 827 m. (27°34'25''S-70°10'03''W), 18-X-2022, de Schrevel & Dandois 421 (SGO); Carretera desde Copiapó a Lomas Bayas después de El Maray y antes del desvío a Lomas Bayas. 1279 m. (27°37'28.3''S 70°01'04.4''W), 30-X-2015, M. Muñoz 5519 (CONC); Camino a Lomas Bayas. 1800 m. (27°43'47''S-70°32'02''W), 18-X-2022. de Schrevel & Dandois 432 (SGO).

Inaturalist observations

CHILE, Región de Atacama, Prov. Copiapó. 28°15'45.12''S-69°48'3.64''W (-28.262533; -69.801011) [ca. 2310 m s.m.], 10-I-2018, Aira Francisca Faúndez Fallau available in https:// https://www.inaturalist.org/observations/50569172 ; Geograhic coordinates obscured, VIII-2024, Álvaro Parra Valdivia, available in https://www.inaturalist.org/observations/240374651; https://www.inaturalist.org/observations/237904328; https://www.inaturalist.org/observations/237897583: https://www.inaturalist.org/observations/237868966.

Etimology

rotundifolia makes reference to the more or less entire, orbicular floral bracts (the leaves are more broadly triangular but still subentire). This contrasts with the more elongated and/or more deeply dissected leaf and bract blades of other *Loasa*.

Distribution and habitat

Loasa rotundifolia is endemic to the Copiapó Province of the Atacama Region from ca. 800-2300 m asl (Fig. 2). It is known from only a handful of localities, growing on scree slopes, gravelly soils or at the base of large boulders, being one of the few *Loasa* that can be found in the pre-Andean desert. In lower elevation locations it has been seen growing alongside *Adesmia multicuspis* Clos (Fabaceae), *Bulnesia chilensis* Gay (Zygophyllaceae), *Cordia decandra* Hook. & Arn. (Cordiaceae) *Cumulopuntia sphaeric*a (C.F.Först.) E.F.Anderson (Cactaceae), *Heliotropium chenopodiaceum* Gay (Heliotropiaceae), *Krameria cistoidea* Hook. & Arn. (Krameriaceae), *Malesherbia humilis* Poepp. (Malesherbiaceae), *Perityle emoryi* Torr. (Asteraceae), *Pintoa chilensis* Gay (Zygophyllaceae) and *Zygophyllum chilense* (Hook. & Arn.) Christenh. & Byng (Zygophyllaceae), while at higher elevations it has been found growing in association with *Adesmia glutinosa* Hook. & Arn. (Fabaceae), *Adesmia leiocarpa* Hook. & Arn. (Fabaceae), *Argylia potentillifolia* DC. (Bignoniaceae), *Asteriscium closii* (Kuntze) Mathias & Constance (Apiaceae), *Cruckshanksia hymenodon* Hook. & Arn. (Rubiaceae), *Kieslingia chilensis* Faúndez, Saldivia & A.E.Martic. (Asteraceae) and *Mathewsia auriculata* Phil. (Brassicaceae). In Río Pulido, it grows at lower elevations than *Loasa chrysantha* Santilli, Lavandero and R.H. Acuña.

Phenology

Plants have been observed flowering during the austral winter, spring and early summer (with one record from autumn in May), but most records appear to be around spring, between September and December. This species may grow and flower sporadically throughout the year if there is enough water to allow it.

Preliminary conservation assessment

Considering this species has been rarely collected, in order to have a more accurate conservation assessment we have also included geographic data from specimens that have been photographed but not deposited in herbaria. *Loasa rotundifolia* can be tentatively considered as Endangered (EN) according to the IUCN categories and criteria B1b(iii) c(iv); D. The criterion B1 was selected because its extent of occurrence is < 5000 km^2 (2802.52 km^2). The criterion "b(iii)" was selected because there is a projected decline in the area, extent, and quality of the habitat. According to the known records, *Loasa rotundifolia* inhabits two vegetation belts of the bioclimatic classification of the vegetation of Chile (Luebert & Pliscoff 2017): Matorral desértico tropical-mediterráneo interior de *Skythathus acutus – Atriplex deserticola*, and Matorral bajo desértico tropical andino de *Atriplex imbricata*. Both belts are expected to decrease its surface in near 50 % under the IPCC AR5 scenario 2.6, and near 60-70 % under the scenario 8.5 for the period 2040-2070 (Luebert & Pliscoff 2017). Climate change represents a threat to plants in desert regions, whose habitats are highly dependent on the already irregular and scarce precipitations. In the last decade, there has been a significant reduction in precipitation and snow cover, accompanied by a rise in temperature that is expected to keep increasing (Cordero *et al.* 2019), likewise the hydric resources could be under pressure due to mining and agricultural activities (Grosjean & Veit 2005). Criterion "c(iv)" was selected because the scarcity of *L. rotundifolia* in collections may suggest that this species could go through extreme fluctuations in the number of mature individuals, probably due to the irregular precipitations of the Atacama Desert. Criterion D was selected because the total population is inferred to be less than 250 mature individuals per season. It should be pointed out that, as far as we know, no known populations are within any protected area in Chile.

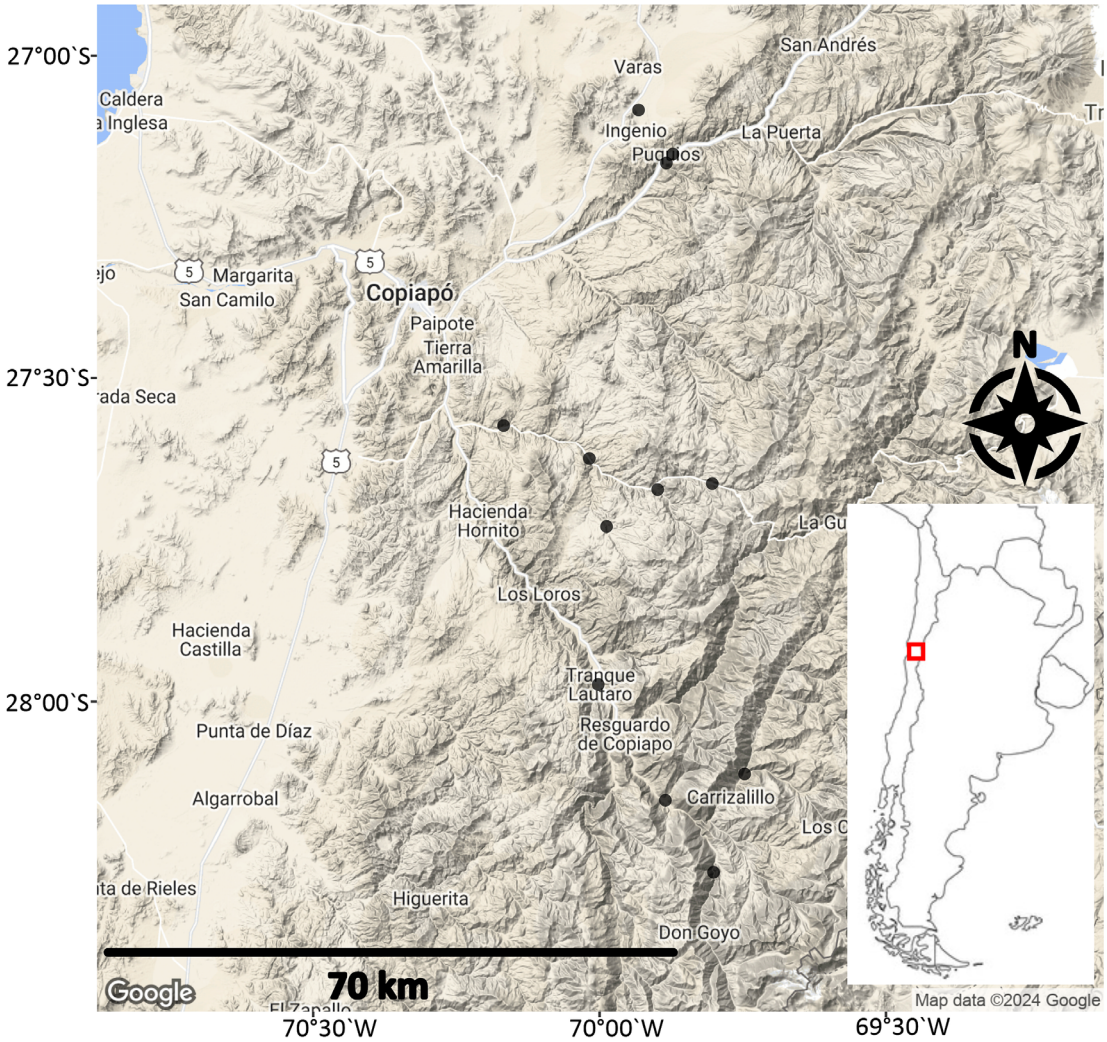

Figure 2. Known distribution of *Loasa rotundifolia*. / Distribución conocida *de Loasa rotundifolia*

Affinities and similar species

Loasa rotundifolia is distinctive and can be recognized easily if studied carefully, even change a in poorly preserved herbarium material (Philippi, 1893). *Loasa chrysantha* and *L. rotundifolia* share several morphologic aspects as well as a similar distribution. These species approach each other's distribution, but apparently, they do not overlap in their altitudinal range. Both taxa have entire or subentire leaf blades (something unusual in *Loasa*, most species have lobed leaves: Weigend *et al.* 2004, de Trenqualye & Rojas 2019), nectar scales almost as wide basally as distally, with a weakly developed, barely recurved neck apex and poorly developed lateral "ears". However, *L. chrysantha* has obviously proportionally longer leaves, and the petiolate (lowermost) leaves appear to have proportionally shorter petioles, while its nectar scales are yellow and white with smaller dorsal flags (Santilli *et al.* 2022). All other *Loasa* with yellow corollas and predominantly red and white nectar scales have more deeply dissected leaf blades. Our phylogenetic analyses using plastid markers, however, suggest significantly different relationships. Both ML and BI reconstructions retrieve strong support for a monophyletic *Loasa* ser. *Macrospermae* (Bootstrap support [=BS]: 100, Posterior probability [=PP]: 1.00) with *Loasa triloba* Dombey ex Juss. sister to the rest of the series (Fig. 3). The species pair of *L. rotundifolia* and *L. nitida* was retrieved as sister to all the other *Loasa* ser. *Macrospermae*, however this sister species pair received low support in our reconstructions (BS: 60, PP: 0.74). This suggests that although *L. rotundifolia* is firmly nested and unequivocally part of *Loasa* ser. *Macrospermae* its relationships within the clade remain uncertain. For a key of all currently accepted species of *Loasa* ser. *Macrospermae* including *Loasa rotundifolia*, see Santilli *et al.* (2022).

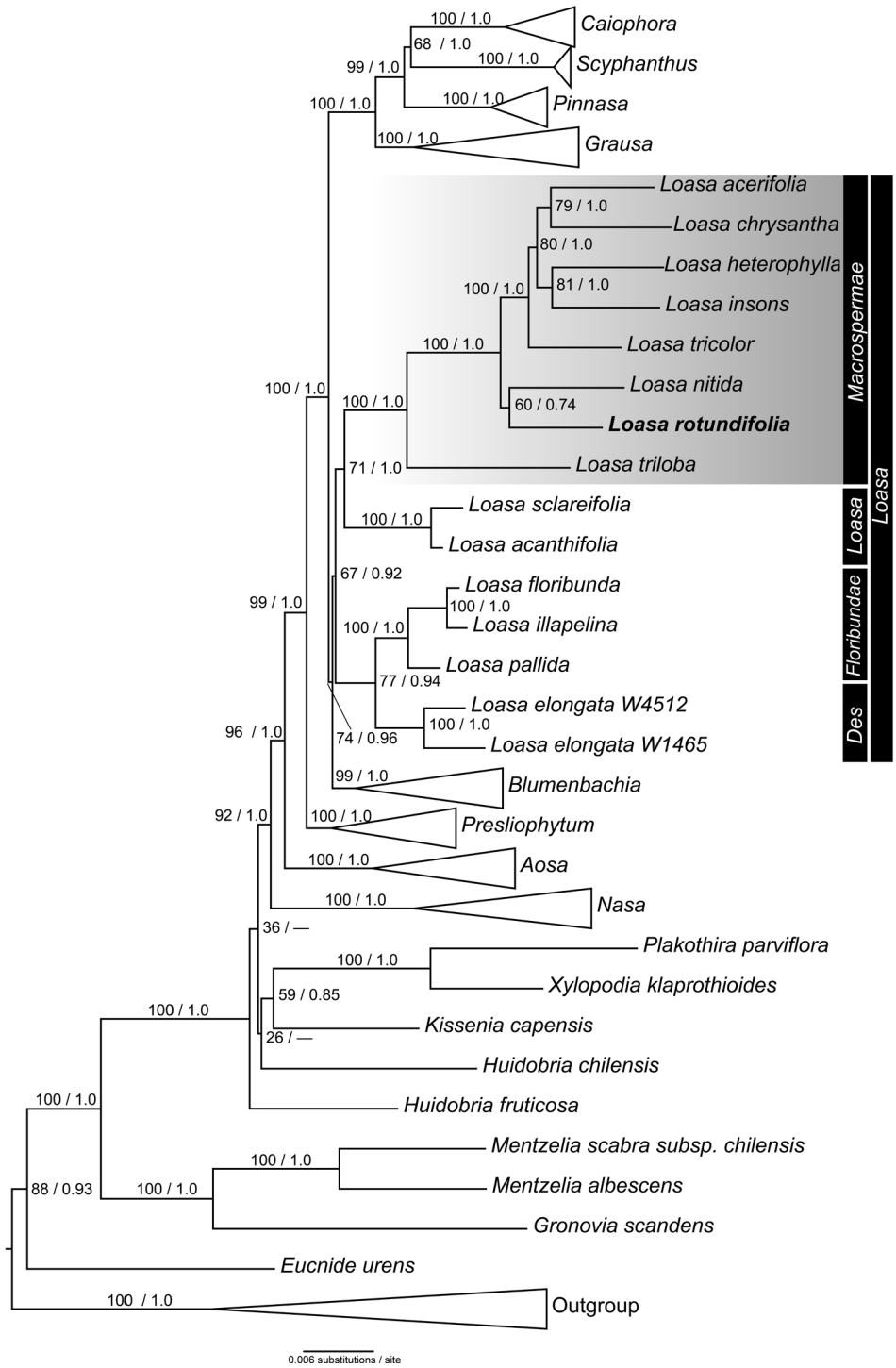

Figure 3. Concatenated plastid (*trnL-trnF*, *matK*, *trnS-trnG*, *rps16*) maximum likelihood tree, focusing on the South Andean Loasas clade and including *Loasa rotundifolia*. For each node, the values for bootstrap support under maximum likelihood and Bayesian posterior probabilities are to the left and right of the slash, respectively. Large vertical black bar at right delimits the genus *Loasa*. Shorter black bars at the left delimit the series of *Loasa*: *Loasa* ser. *Deserticolae (Des)*, *Loasa* ser. *Floribundae*, *Loasa* ser. *Loasa*, and *Loasa* ser. *Macrospermae* (highlighted). / Árbol de concatenado de máxima verosimilitud de marcadores de plastidio (*trnL-trnF*, *matK*, *trnS-trnG*, *rps16*), centrándose en las Loasas Sudandinas e incluyendo a *Loasa rotundifolia*. Para cada nodo, los valores para de soporte de del bootstrap bajo máxima verosimilitud y probabilidades posteriores bayesianas están a la izquierda y derecha de la barra, respectivamente. Barra negra vertical a la derecha delimita el género *Loasa*. Barras negras verticales a la izquierda delimitan las series de *Loasa*: *Loasa* ser. *Deserticolae (Des)*, *Loasa* ser. *Floribundae*, *Loasa* ser. *Loasa*, y *Loasa* ser. *Macrospermae* (destacadas).

CONCLUSIONS

Loasa rotundifolia is a distinctive species endemic to Chile and deserves to be accepted and included in regional and national species listings and floristic treatments. It is distinguished from every other species of *Loasa* by its round, entire bracts as well as patent sepals, yellow petals and mostly red nectar scales. So far it is only known from the Prov. of Copiapó, Región de Atacama and can be considered endangered because of its reduced distributional range and decline in habitat quality due to global climatic change. No known populations are found within any protected area of Chile. This taxon was overlooked in most of the recent floristic works (including the exhaustive catalogues of Rodríguez *et al.*, 2018 and Zuloaga *et al.*, 2019), probably due to the fragmentary nature of the type, the scarcity of herbarium material and the lack of collections in European and North American herbaria. The case of *Loasa rotundifolia*, underlines how the evaluation of older types from herbaria in the global south needs to be exhaustive and detailed, as taxa that have been forgotten, lost, or considered extinct for decades, could still lurk, known by local botanists and aficionados, but overlooked by the main botanical community at large. Some of these taxa could be so rare and threatened that they have not been collected but a handful of times, but still persist in low densities, sadly others may have gone extinct before they could be rediscovered.

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