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A new high-altitude Andean species of *Eriopis* (Coleoptera, Coccinellidae) from Atacama Region, Chile

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Abstract

A new species of the family Coccinellidae from Chile, *Eriopis maricunga* González & Tello, **sp. nov.**, is described from the Chilean Andes of the Atacama Region, including both adult and larval records. The species appears to be abundant in the vicinity of high-altitude Andean salty lagoons and has been observed at Laguna Santa Rosa, on the margins of Salar de Maricunga (3,700 m a.s.l.), and at Laguna Verde (4,300 m a.s.l.). It represents the southernmost coccinellid species recorded above 4,000 m a.s.l. in South America.

Key Words

Atacama, salt flats, taxonomy, high-altitude species

Introduction

High-Andean salt flats are ecosystems under severe anthropogenic pressure because they harbor some of the largest lithium reserves on the planet. Consequently, the biodiversity associated with these ecosystems may be increasingly threatened by mining activities (Kirshen et al. 2025; Roche et al. 2025). During recent surveys of high-Andean environments in the Atacama Region of northern Chile, ladybird beetles belonging to the genus *Eriopis* Mulsant, 1850 were collected and found to represent an undescribed species. The collected material includes both adults and immature stages inhabiting areas surrounding high-Andean lagoons associated with salt-flat systems.

The genus *Eriopis* currently comprises 24 species, 11 of which occur in Chile (Hofmann 1970; Bustamante 2005; Bustamante and Yabar 2006; Bustamante et al. 2007, 2009; González 2014, 2015, 2018, 2025; Bustamante and Oroz 2016; Salazar and Nattier 2020). The genus is widely distributed throughout South America, mainly along the Andes and adjacent valleys, from Chile and Argentina northward to Colombia, with a few species extending into eastern South America, including Argentina, Uruguay, and Brazil. Species of *Eriopis* are predominantly aphidophagous and are often abundant in agricultural crops, although some species only occur in native vegetation. In Chile, the genus is widely distributed and has been recorded from all political regions of the country. In northern Chile (19° to 32°S), it is represented by *E. andina* Hofmann, 1970, *E. altiplanica* González, 2014, *E. concordia* González, 2014, *E. loaensis* González, 2014, and *E. minima* Hofmann, 1970 (González 2014, 2025).

The aim of this study is to describe and illustrate a new species of *Eriopis* from high-Andean environments in the Atacama Region of northern Chile. Additionally, to characterize the habitat affinities of the new species, we describe the environmental conditions at the sites where specimens were recorded and provide preliminary information on its conservation status.

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Materials and methods

Morphological terminology for adults follows Ślipiński (2007). The description of the new species follows the scheme used by Ślipiński et al. (2020), with separate sections for color pattern, morphology, terminalia (male and female), measurements, and variation. Genitalia were dissected following the procedure based on the dissolution of soft tissues in diluted KOH described by Vandenberg and Hanson (2019). Dissections were examined and photographed using Leica S9D and Olympus VMT stereomicroscopes, Leica DM2500 and Celestron #4500 microscopes, and FLEXACAM C3, FLEXACAM C5, and Kodak EasyShare C813 digital cameras. Morphological measurements and image stacking were performed using LAS X v. 5.1.0 and CombineZP, respectively. Dissected structures were preserved in glycerin in microvials or, in some cases, mounted on circular slides, and pinned beneath the corresponding specimen. Specimens with dissected genitalia were labeled with a "♂" or "♀" symbol followed by a number. Specimens that were not dissected were listed as unsexed in the examined material due to no external morphological differences are evident between males and females. Measurements were taken following the definitions of Ślipiński et al. (2020): total length (TL), pronotal length (PL), pronotal width (PW), elytral length (EL), elytral width (EW), and maximum body height (MH); and for larvae, total length (LL) and maximum width (LW).

Specimens examined in this study are deposited in the insect collection of the Museo Nacional de Historia Natural, Santiago, Chile (MNNC); the Colección Entomológica de la Universidad de Atacama, Copiapó, Chile (CEUDA); and the private collection of Víctor Manuel Diéguez, Santiago, Chile (VMDC).

Collection methods and study area

Specimens were collected using pitfall traps designed to capture insects and other terrestrial invertebrates. Each trap consisted of a ~500 mL container filled with ~250 mL of pure propylene glycol as a preservative and fitted with a funnel at the top to prevent small vertebrates from falling into the trap. Traps were arranged in groups of five in a cross-shaped configuration, with four traps oriented towards the cardinal directions and one placed at the center. The traps remained active from 1 December 2025 to 31 March 2026.

Field surveys were conducted in the high Andes of the Atacama Region, Chile, between 3,600 and 4,400 m a.s.l., within Nevado del Tres Cruces National Park, the Ramsar Site Complejo Lacustre Laguna del Negro Francisco y Laguna Santa Rosa, and adjacent areas outside the protected area. Surveys encompassed several high-Andean wetlands within the Maricunga basin (Fig. 1a–c). At the southern end of the Salar de Maricunga, a network of brackish lagoons comprises five water bodies: Laguna Sur, Laguna Este, Laguna Mirador, Laguna Santa Rosa, and Laguna Norte. These represent the southernmost distribution of this type of wetland within the Altiplano ecoregion extending in Chile between the Arica y Parinacota and Atacama regions (Ahumada and Faúndez 2009). Specimens examined in this study were collected specifically in areas surrounding Laguna Sur (Fig. 1b; surface area 4.24 ha, perimeter 1.2 km) and Laguna Mirador (Fig. 1d; surface area 15 ha, perimeter 2.8 km), the latter being notable for its abundance and richness of bird species (CONAF 2020). Laguna Sur receives water inflows from Volcán Pastillo and possibly through infiltration from Laguna Mirador, whereas Laguna Mirador receives water from the Pastillo, La Coipa, and Coipa Lateral ravines, originating from Volcán Copayapu. Both salty lagoons are located at approximately 3,750 m a.s.l.

The second area where *Eriopis* specimens were collected was Laguna Verde, located outside the Ramsar Site, approximately 100 km from the Maricunga localities and close to the Argentine border (Fig. 1c). Laguna Verde is a hypersaline lagoon located at 4,350 m a.s.l. and is surrounded by relatively sparse visible biodiversity, with patches of high-Andean wetlands comprising "bofedal" and "vega" vegetation. At the lagoon outlet, incipient bofedal vegetation dominated by *Oxychloe andina* Phil. (Juncaceae) was observed. Pitfall traps were installed in this habitat, away from areas of human activity. Additional specimens were collected manually near the mountaineering refuge used by climbers ascending Ojos del Salado; for safety reasons, pitfall traps were not installed at this locality.

Results

Taxonomy

***Eriopis maricunga* González & Tello, sp. nov.**

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Figs 2a–n, 3a–q

Type locality. Chile, Atacama Region, Copiapó Province, Nevado de Tres Cruces National Park, Laguna Sur, 27°05'32.1"S, 69°09'49.1"W, ca. 3750 m.

Holotype, male, mounted in a triangular label, with genitalia in a separate microvial. Original label: • Chile – P.N. Nevado del Tres Cruces, Laguna Sur; -27.092240, -69.163629; 17.I.2026; *leg*. F. Tello; ♂ 2222; HOLOTYPE / *Eriopis maricunga* / González & Tello, 2026 [red label] (MNNC).

Paratypes (N = 40). • 14 exx. (unsexed); CHILE – P.N. Nevado del Tres Cruces, Laguna Mirador; -27.086163, -69.162802; 31.III.2026; *leg*. F. Tello; ♀ 2203; PARATYPE, *Eriopis maricunga*, González & Tello, 2026 [green label] (12 MNNC, 2 VMDC); • 21 exx. (4♀, 17 unsexed): CHILE – P.N. Nevado del Tres Cruces, Laguna Sur; -27.092240, -69.163629; 17.I.2026; *leg*. F. Tello; PARATYPE, *Eriopis maricunga* González & Tello, 2026

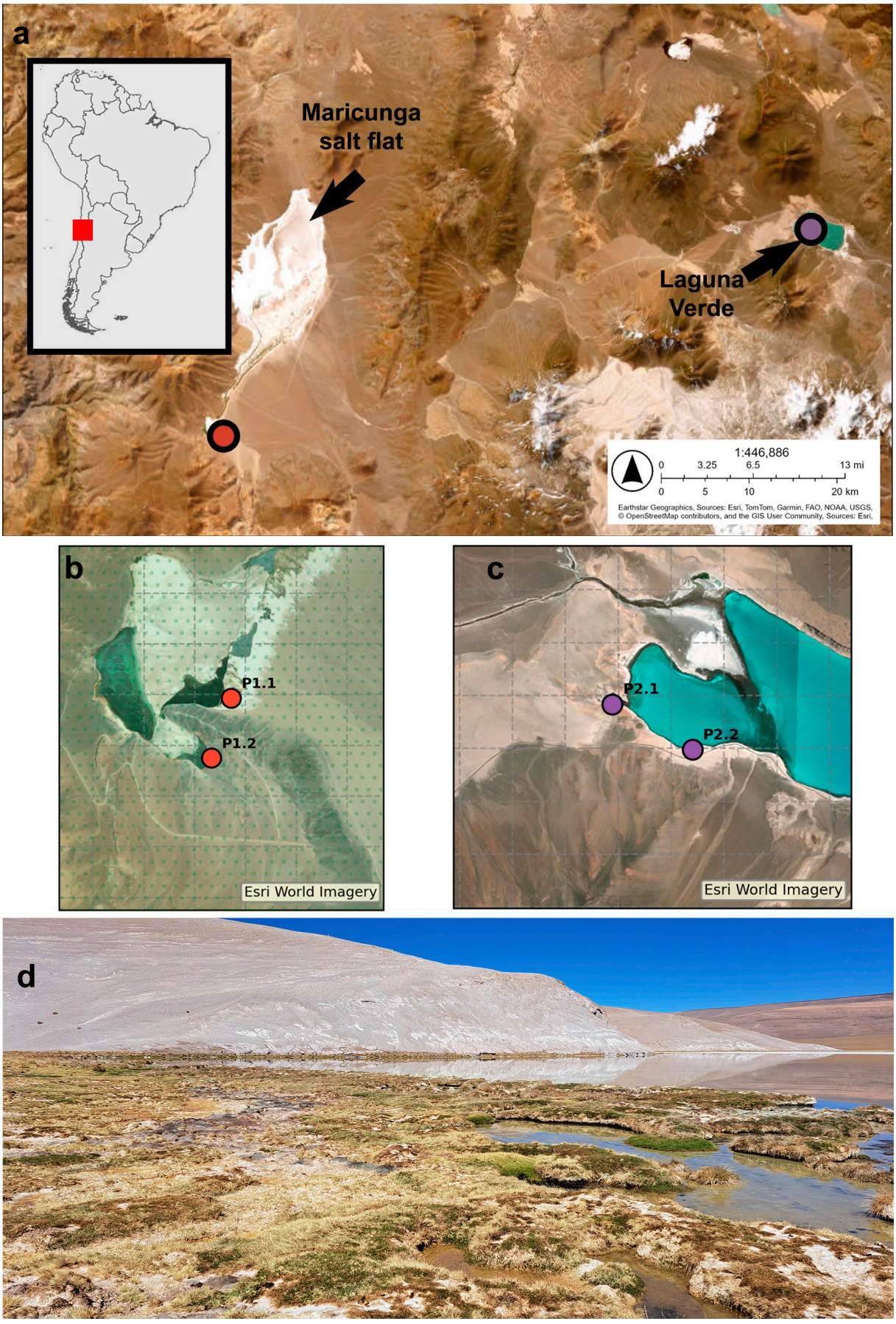

Figure 1. Locality and habitat of *Eriopis maricunga* sp. nov. **a–c.** Satellite view of the study area, with details of the collecting sites (**b, c**); **d.** Photograph of the habitat in the Laguna Mirador area, Nevado del Tres Cruces National Park.

[green label] (16 MNNC, 5 CEUDA); • 5 exx. (4♂, 1♀); CHILE – Copiapó, Atacama, Laguna Verde; -28.881517, -68.502439; 17.I.2026; *leg*. F. Tello; PARATYPE, *Eriopis maricunga* González & Tello, 2026 [green label] (4 MNNC, 1 CEUDA).

Other material examined (N = 11). • 9 exx. (3♂, 6 unsexed); CHILE – P.N. Nevado del Tres Cruces, Laguna Sur; -27.092240, -69.163629; 17.I.2026; *leg*. F. Tello (10 CEUDA); • 2 exx. (1♂, 1 unsexed); CHILE – Copiapó, Atacama, Laguna Verde; -28.881517, -68.502439; 17.I.2026; *leg*. F. Tello (1 CEUDA);

Larvae examined (N = 4). • 3 exx. (unsexed, first, third and fourth instars); CHILE – P.N. Nevado del Tres Cruces, Laguna Mirador; -27.086163, -69.162802; 31.III.2026; *leg*. F. Tello • CHILE – P.N. Nevado del Tres Cruces, Laguna Sur; -27.092240, -69.163629; 17.I.2026; *leg*. F. Tello.

Diagnosis. *Eriopis maricunga* sp. nov. has a black body with a yellow to orange colour pattern, including yellow lateral margins and small basal and apical spots on the pronotum, and seven spots on each elytron arranged 2:2:2:1 (Fig. 2a–g). Prosternal carinae and metaventral and abdominal postcoxal lines absent (Figs 2i, j, 3f, g); tarsal claws bifid, with a very short basal tooth (Fig. 3m); pronotum with a posterior marginal bead (Fig. 2a, g); metathoracic wings reduced and non-functional (Fig. 3h). This combination of morphological characters and colour pattern supports its placement in *Eriopis*. The species is distinguished from other members of the genus by its small body size; small, rounded discal elytral spots separated by approximately 1.5–2.0× their diameter; median lateral elytral spots very close to each other, narrow and elongate, frequently connected along both the lateral and inner margins, enclosing a dark area; and the shark-fin-shaped apical spot, with its apex directed towards the elytral disc (Fig. 2a–g). *Eriopis maricunga* sp. nov. is somewhat similar in size and colour pattern to *E. minima*, with which it also shares a high-Andean distribution and reduced metathoracic wings. *Eriopis minima* differs, however, in having larger elytral spots, with the discal spots usually very close to each other and separated by less than half their diameter, and a semicircular apical spot. In addition, males of *E. minima* have a penis guide with a bell-shaped apex, markedly different from the regularly curved lateral margins converging towards the apex in *E. maricunga* (Fig. 3c).

Description. Male holotype. *Measurements* (*mm*). TL 2.9–3.5; PL 0.7–0.9; PW 1.1–1.3; EL 2.2–2.6; EW 1.6–2.0; MH 0.8–0.9.

Colour pattern (Fig. 2a–f). Head entirely black. Antennae dark brown to black, with apical half of antennomere 1 light brown and antennomeres 2–6 light yellow (Fig. 3i). Mandibles light yellow with dark apices (Fig. 3q); labial and maxillary palps brown, becoming darker apically (Fig. 2h). Pronotum black, with two small oval yellow spots in the disc: the anterior yellow spot is shield-like in form and larger than the basal yellow spot; lateral margins yellow at the anterior middle portion of the pronotum, being widened at anterior angles (Fig. 2a, c). Scutellum black (Fig. 2a). Elytra black, each with seven yellow spots: first spot oval in shape, covering more than half of elytral base but separated from scutellum, extending over approximately basal 1/7 of elytral length; second spot at anterolateral angle is subtriangular in shape, elongate posteriorly; third spot discal, nearly circular, approximately 1/8 of elytral length in diameter and situated anterior to midlength; fourth lateral spot extending from 2/5 to slightly beyond the midlength of the elytron, narrow, elongate and posteriorly pointed, becoming separated from the lateral margin apically; fifth discal spot, circular, posterior to third spot, slightly larger in size and separated from it by approximately twice its diameter; the sixth lateral spot situated immediately posterior to the fourth, elongate and relatively narrow, slightly shorter than the fourth and separated from the lateral margin anteriorly; and the seventh, subapical spot shark-fin-shaped, directed obliquely forwards and diverging from the lateral margin. A very narrow yellow border extends from base to apex, connecting the basal, lateral and apical spots. The two median lateral spots are also almost connected along their inner margins, leaving a semi-isolated black area between them (Fig. 2a–d). Ventral surface black; lateral margins of hypomera yellow, strongly narrowing posteriorly; mesepimeron and posterior third of metepimeron ivory white; epipleura yellow; legs black; tarsi dark brown; abdomen black (Fig. 2e).

***General morphology*.** Body elongate, lateral margins nearly straight along anterior third, widest posterior to elytral midlength, dorsoventrally flattened (Fig. 2a–c). Frons approximately 0.6× as wide as head, strongly and irregularly impressed between eyes. Eyes oval, with approximately 25 facets across maximum diameter; inner ocular emargination subrectangular with rounded apex, extending approximately seven to eight facets into eye (Fig. 2h). Antenna capitate, with a three-antennomere club. Antennomeres 1–4 subcylindrical, with antennomere 1 the largest. Antennomere 2 nearly as wide as long; antennomeres 3 and 4 longer than wide. Antennomeres 5–10 subtrapezoidal; antennomeres 5–9 subequal in size, with antennomeres 9 and 10 larger. Antennomere 11 subquadrate, with apex straight. All antennomeres sparsely covered with short setae (Fig. 3i). Clypeus with apical margin nearly straight and lateral angles gently rounded (Fig. 3n). Labrum oval-trapezoidal, anterior margin slightly convex. Labial palps three-segmented, terminal palpomere elongate (Fig. 3o). Maxillary palps four-segmented, terminal palpomere securiform (Fig. 3p). Epipleura gradually narrowing from base to apex, ascending externally, visible in lateral view along anterior third, without foveae (Fig. 2e). Protibiae without apical spurs. Mesotibiae and metatibiae with two apical spurs; tarsi cryptotetramerous; tarsal claws bifid, thickened basally and with a very small, acute inner basal tooth (Fig. 3l–m). Metathoracic wings reduced, shorter than elytra (Fig. 3h).

Head with coarse punctures approximately twice the diameter of an eye facet, on average separated by less

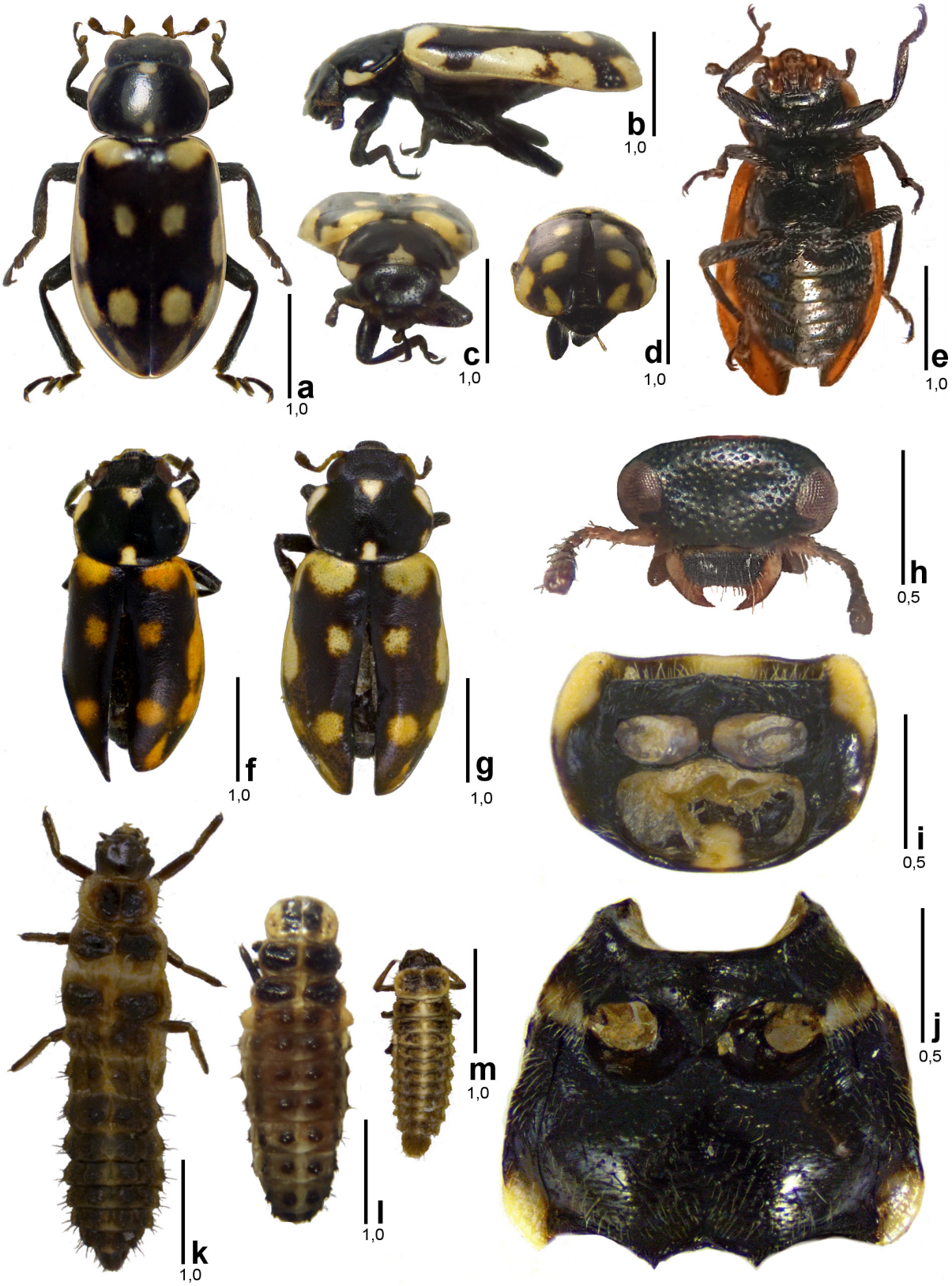

Figure 2. *Eriopis maricunga* sp. nov. **a–e.** Habitus (dorsal, lateral, frontal, posterior and ventral); **f, g.** Dorsal habitus (variations); **h.** Head; **i.** Prothorax (ventral); **j.** Meso and metathorax (ventral); **k–m.** Larval habitus (4th, 2nd and 1st instar). Scales in mm.

than one puncture diameter, many confluent (Fig. 2h). Pronotal punctures approximately as large as an eye facet, regularly distributed and separated by approximately one puncture diameter. Elytral punctures smaller, approximately half the diameter of pronotal punctures and separated by 2–3 puncture diameters; interspaces reticulate,

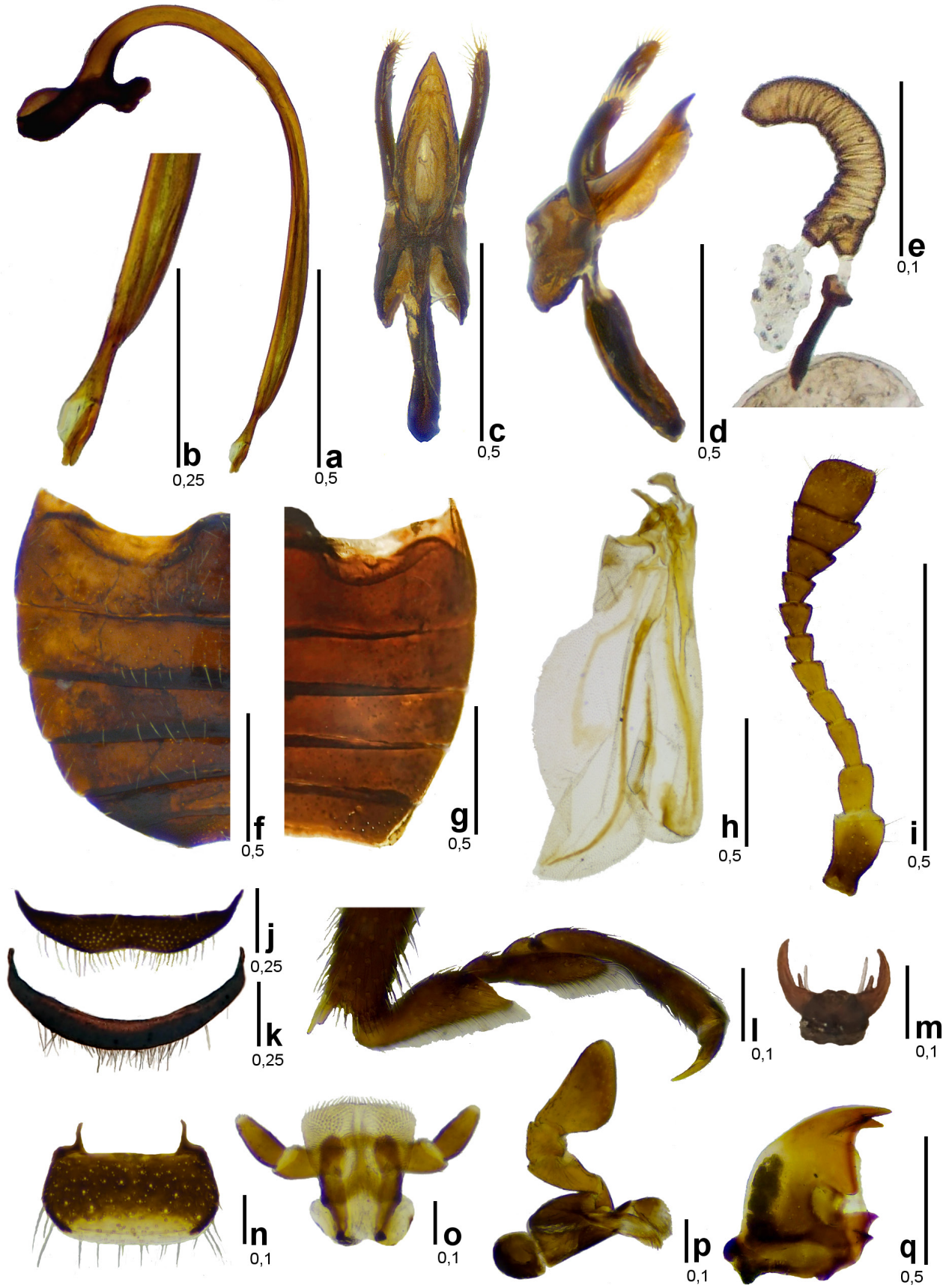

Figure 3. *Eriopis maricunga* sp. nov. Penis and apex detail. **c, d.** Tegmen (ventral and lateral); **e.** Espermatheca and infundibulum; **f, g.** Abdomen (male and female); **h.** Metathoracic wing; **i.** Antenna; **j, k.** 6th. ventrite (male and female); **l.** Tarsus; **m.** Tarsal claws; **n.** Labrum; **o.** Labium; **p.** Maxilla; **q.** Mandible. Scales in mm.

making punctures difficult to discern and giving elytra a coriaceous appearance. Pubescence short, yellowish white and decumbent, restricted dorsally to frons but present ventrally, dense on abdomen and appendages.

Male terminalia. Posterior margin of ventrite 5 slightly concave (Fig. 3f); ventrite 6 emarginate along median third (Fig. 3j). Tegmen 2.7× as long as wide; phallobase subrectangular, slightly elongate, with posterior angles pointed (Fig. 3c). Penis guide 3× as long as wide, widest at basal third, lateral margins regularly curved towards a narrowly pointed apex; in lateral view slightly sinuate, apex slightly hooked inwards, with broad membranous ventral projection. Tegminal strut approximately 2/3 as long as tegmen, curved, with membranous margin internally. Parameres slightly exceeding penis guide, narrow, of nearly uniform width and slightly curved apically towards penis guide; lateral and apical setae short, extending approximately 1/8 of paramere length beyond apex (Fig. 3c, d). Penis J-shaped, of nearly uniform width along basal half and progressively broadened along distal half, strongly constricted before apex; apical 1/10 very narrow and straight, bearing two nearly straight spines, one internal and one external, and an internal membranous area. Penis capsule with outer arm approximately as wide as penis tube, slightly inclined outwards, 2.5× as long as wide, with a large semicircular accessory piece; inner arm narrower than outer arm, short, hook-shaped and inclined towards penis tube (Fig. 3a, b).

Female terminalia. Posterior margin of ventrite 5 slightly concave (Fig. 3g); ventrite 6 regularly convex (Fig. 3k). Spermatheca C-shaped; cornu of nearly uniform width, with rounded apex; ramus short and conical, bearing an accessory gland; nodulus very similar in shape to ramus, both arising near proximal part of cornu and slightly divergent from it. Sperm duct very short, only slightly longer than nodulus. Infundibulum cylindrical, approximately half as long as cornu and 8× as long as wide, strongly expanded basally and inserted distally into bursa copulatrix (Fig. 3e).

Variation. The species exhibits a relatively constant dorsal colour pattern. The elytral ground colour may include yellowish-brown areas, while the elytral spots vary from yellow to orange and show slight variation in size and shape. The basal pronotal spot is usually shaped like an inverted cup and reaches the basal margin, whereas the lateral pronotal marking may extend along the posterior half, with a constriction at midlength. The median lateral elytral spots may be connected along their inner margins, enclosing an isolated dark area, or may be widely separated. (Fig. 2a–g).

Larvae. Measurements (mm): First instar: LL 1.8, LW 0.6; Second instar: LL 3.3, LW 1.0; Fourth instar: LL 4.4, LW 1.1. ***Diagnosis*:** The larva has characteristics similar to those of other species in the genus, such as *Eriopis connexa* (Germar, 1823) (Celli et al. 2021). The body is elongated, oval, flat on the venter and convex on the dorsum, yellowish in color, with a dark brownish-black color on the head, dorsal plates, and strumae. This pattern leaves a clear central line extending from behind the head along the entire length of the insect, and a similar line, interrupted at each segment, by the lateral margin. Legs and mouthparts are dark brown, except for the yellow mandibles with dark edges (Fig. 3q). The epicraneal suture is shaped like an inverted omega. A dorsal plate present at each side in the pro-, meso- and metanotum, with strumae with numerous chalazae and bristles. Abdominal segments with strumae located dorsally, dorsolaterally and laterally, and with dorsal and ventral bristles. Tenth segment without strumae. First and second instars are distinguished by their smaller size, a wider and flatter shape, and reduced dark areas.

Etymology. The specific epithet *maricunga* refers to the Salar de Maricunga, near which the vegetated habitats occupied by the new species occur. The name is treated as a noun in apposition.

Distribution. Chile, Atacama Region, Copiapó Province.

Habitat. *Eriopis maricunga* sp. nov. was collected at three high-Andean localities, two in the Santa Rosa sector (Laguna Sur and Laguna Mirador) and one at Laguna Verde. At Laguna Sur, the habitat consists of a degraded *bofedal* transitioning into *vega* vegetation, dominated by the juncaceous *Triglochin concinna* Burt Davy and the grass *Puccinellia frigida* (Phil.) I.M.Johnst., with patches of the sedge *Zameioscirpus atacamensis* (Phil.) Dhooge & Goetgh. and the ranunculaceous *Halerpestes exilis* (Phil.) Tamura. Pitfall traps were installed in an area with abundant Juncaceae. At Laguna Mirador, the habitat comprises a mosaic of *bofedal*, *vega*, and wet grassland. The *bofedal* near the water bodies is dominated by *Z. atacamensis*, with lower abundance of *Oxychloe andina* (Phil.) Benth. & Hook. Towards the lagoon periphery, the vegetation transitions into *vega* dominated by *T. concinna*, *H. exilis*, and *Arenaria rivularis* (Phil.). At the outer margin of the wetland, grasslands are dominated by *P. frigida* and *Cinnagrostis velutina* (Nees & Meyen) P.M.Peterson, Soreng, Romasch. & Barberá. *Eriopis maricunga* sp. nov. was observed more frequently in areas dominated by wet grassland vegetation. At Laguna Verde, a hypersaline lagoon at 4,350 m a.s.l., extensive microbial mats of various textures and colours occur and support abundant Diptera. Thermal springs are also present around the lagoon margins. Vegetation cover is generally sparse, except at the lagoon outlet, where incipient *bofedal* patches dominated by *Oxychloe andina* occur.

Discussion

The new species exhibits several traits previously associated with high-Andean species, including small body size, brachyptery, and dark colouration (González et al. 2019). In terms of body size, *Eriopis maricunga* sp. nov. includes the smallest individuals so far recorded within the genus, with a minimum total length of 2.9 mm. This is consis-

tent with the relatively small body size observed in other high-altitude species, such as *E. lawalawani* Bustamante, González & Oroz, 2007 and *E. minima*, both of which reach a minimum length of 3.1 mm. In contrast, species occurring at lower elevations have larger minimum body sizes, e.g., approximately 4.5 mm in *Eriopis connexa* and *E. chilensis* Hofmann, 1870. Brachyptery is also frequent among high-Andean species and has been associated with the reduced efficiency of flight under the low temperatures and reduced oxygen availability prevailing at high elevations (Mani 1968). However, brachyptery does not necessarily imply a limited geographic distribution, as *E. minima*, which also has reduced wings, occurs across four countries and has a north–south distribution extending over more than 2,000 km. The predominantly dark colouration of *E. maricunga*, resulting from the relatively small extent of its pale markings, may likewise represent an adaptation to high-altitude conditions, where increased exposure to ultraviolet radiation can be an important environmental constraint (Mani 1968).

Based on currently known records, *E. maricunga* sp. nov. has a highly restricted distribution, with records from the Laguna Santa Rosa sector within Nevado de Tres Cruces National Park and from Laguna Verde, near the protected area. The known collecting sites encompass an estimated area of 5 km^2 and are separated by approximately 100 km. Collection records nevertheless suggest locally abundant populations, and the occurrence of larvae indicates that the species is reproducing at the surveyed sites.

Among the main threats to the conservation of these high-Andean ecosystems, water extraction associated with mining activities has been documented as particularly relevant (Kirshen et al. 2025; Roche et al. 2025), while livestock grazing and associated overgrazing represents an additional, although apparently less important, pressure. Both ground and surface water extraction for mining can lower the water availability and reduce groundwater inputs to surface water bodies and wetlands, leading to declines in water availability and changes in the hydrological conditions that sustain these ecosystems. Such alterations may result in the contraction or degradation of aquatic and wetland habitats, ultimately affecting the local flora and fauna that depend on these water resources. Mining-related pressures may become increasingly relevant. At Laguna Verde, a Contrato Especial de Operación de Litio (CEOL; Special Lithium Operation Contract) is currently undergoing administrative processing following its submission by the Ministry of Mining on 10 March 2026 through a supreme decree for review by the Contraloría General de la República. For the Salar de Maricunga, Decree No. 64 of 26 October 2017 remains in force and establishes the requirements and conditions for a special operating contract for lithium exploration, extraction, and processing in the Salar de Maricunga and surrounding areas. In contrast, livestock grazing is likely to have a relatively minor influence within Nevado de Tres Cruces National Park, where pastoral activities are restricted, and around Laguna Verde, where vegetation suitable for grazing is scarce.

Under the criteria of the International Union for Conservation of Nature (IUCN 2012), *E. maricunga* sp. nov. could potentially qualify as Endangered (EN) under criterion B1a, given its apparently restricted extent of occurrence and the small number of currently known locations. However, such an assessment should be regarded as preliminary. Increased sampling effort in basins adjacent to Nevado de Tres Cruces National Park is required before its conservation status can be assessed with confidence. High-Andean environments extend northwards to the San Pedro de Atacama (600 km from Copiapó) area and contain numerous salt flats and lagoons that remain poorly surveyed for Coccinellidae. Furthermore, population sizes have not been estimated, and there is currently no evidence of population decline. Consequently, Data Deficient (DD) appears to be the most appropriate provisional categorization until additional information on the species' distribution, population trends, and threats becomes available.

The description of *E. maricunga* sp. nov. is particularly relevant considering that a substantial portion of the high-Andean environments with which the species is associated is subject to increasing pressures related to mining activities. Studies such as the present one reveal the persistence of species that remain unknown to science and contribute to documenting components of Chilean biodiversity potentially exposed to increasing environmental pressures. The discovery of *E. maricunga* therefore highlights the need to increase biological exploration and biodiversity inventories in high-Andean environments, whose ecological singularity contrasts with both the limited biological knowledge currently available and the magnitude of the pressures they face.

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Additional information

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The authors have declared that no competing interests exist.

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Data availability

All of the data that support the findings of this study are available in the main text.