Two new species of *Boopis* (Calyceraceae) from Argentina

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Abstract. We describe and illustrate two new species of *Boopis* from Argentina: **Boopis pterocalyx** (Mendoza province) and **Boopis necronensis** (Catamarca and La Rioja provinces). Both species are easily distinguished from the remaining species of *Boopis* (sensu lato, including *Nastanthus*) by the foliose, imbricate sepals, which become foliose and orbicular in the fruit of *B. pterocalyx,* or navicular, obtuse-mucronate and corky in the fruit of *B. necronensis*. A geographical distribution map, complete descriptions, and illustrations are also included.

Key Words: Calyceraceae, *Boopis*, taxonomy.

Boundaries among some Calyceraceae genera have been recently questioned by Hellwig (2007), who did not find synapomorphies that support *Nastanthus* Miers and *Moschopsis* Phil. as distinct from *Boopis* Juss. During an ongoing evaluation of Calyceraceae genera as part of a phylogenetic study, we found two new species from the central Andes of Argentina. In agreement with Hellwig (2007), our preliminary results do not distinguish *Boopis* from *Nastanthus*. These new species fall into the *Boopis-Nastanthus* clade (or *Boopis* sensu lato).

Boopis, in a broad sense, can be defined by isomorphic, non-spiny fruits, a differentiated involucre, free paleas, and isomorphic perfect flowers. Species of *Boopis* are diverse in life forms; they can be annuals, hemicryptophytic rosulate herbs, or subshrubs (e.g., Pontiroli, 1963; Chiapella, 1999; Hellwig, 2007; Zanotti & Pozner, 2008). *Boopis* sensu lato consists of about 29 species and eight varieties endemic to southern South America (southern Brazil, Argentina, and Chile), growing through a broad altitudinal range in various habitats from four phytogeographical domains: the Amazonian Domain (Paranense phytogeographical Province), the "Chaqueño" Domain (Chaqueña, del Espinal, Pampeana, del Monte and Prepuneña phytogeographical Provinces), the Andean-Patagonian Domain (Patagonian phytogeographical Province), and the Subantartic Domain (Subantartic Province) (cf. Cabrera & Willink, 1980). The new species here described are hemicryptophytic rosulate herbs endemic to the central Andes of Argentina.

Boopis pterocalyx Zavala, S. Denham & Pozner, **sp. nov.** Type: Argentina. Mendoza: base de la Sierra del Nevado por ruta provincial 180, 35°37′16″S, 68°31′40″W, 2340 m, 12 Dec 2004, *A. Prina, G. Alfonso & E. Morici 2627* (holotype: SI; isotype: CTES 0405304). (Fig. 1)

Boopi australi similis, sed pedunculis scapiformibus brevioribus; foliis spatulatis margine integro sinuato, foliis superioribus ad marginem villosis; lobulis involucri et paleis ad apicem villosis; lobulis calycis foliosis; limbo corollae campanulato et lobulis majoribus apice uncinatis; stylo breviore; fructu majore, per sepala accrescentia et foliosa coronato bene differt.

Perennial, hemicryptophytic, rosulate herbs about 4 cm tall and 10 cm in diam., stem not or barely branched. Leaves alternate, spatulate, 1–5 cm long, partially fleshy, round at apex, attenuate at base into a petiole; the upper ones villous at the margin and particularly at the petiole base; petiole 0.5–3×0.1–0.5 cm, furrowed; blade ovate, 0.5–1.5×0.5–2 cm, surface aciculate with margin entire, sinuate. Peduncles shorter than the leaves, terete, furrowed, bearing only one terminal head

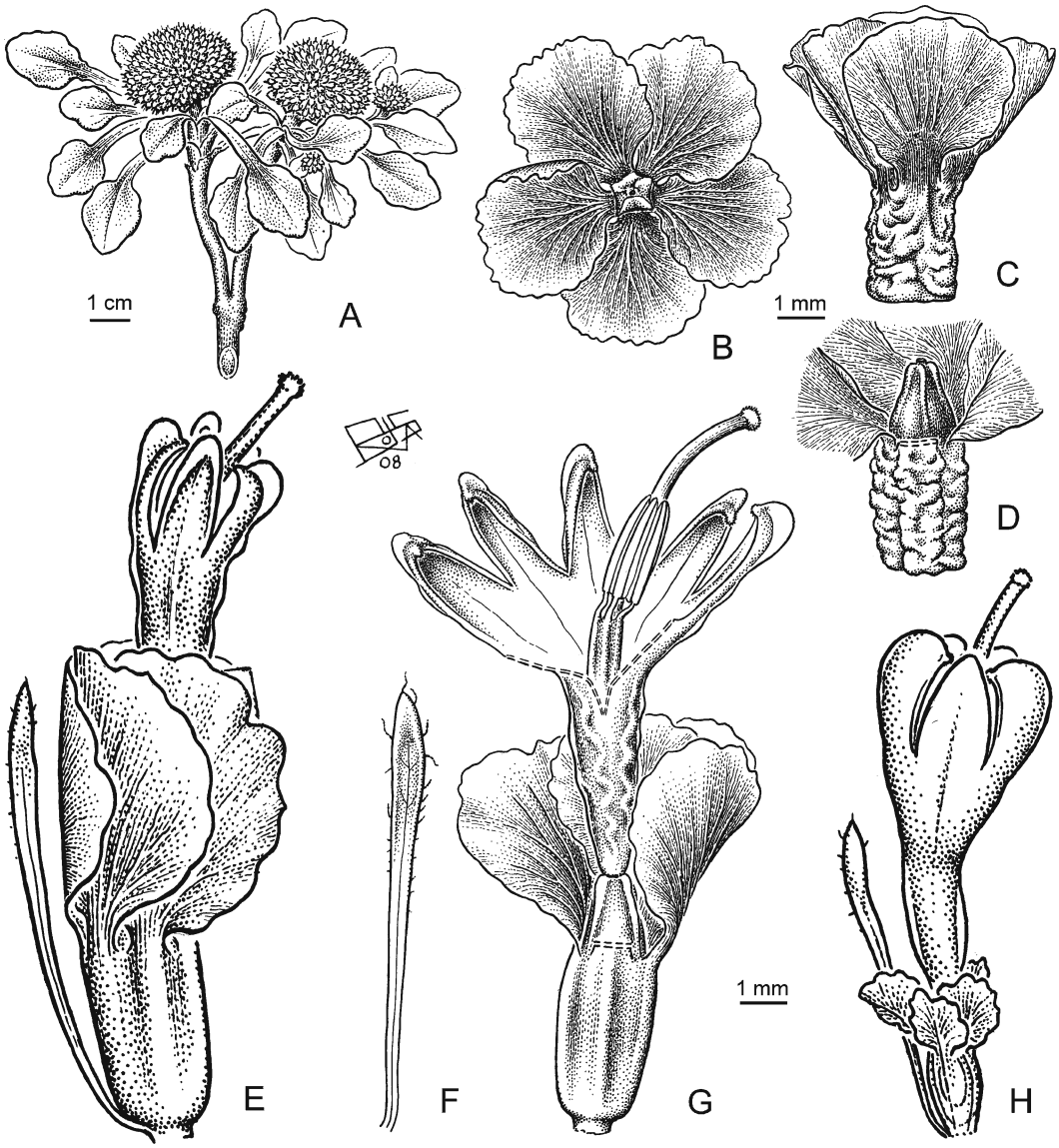

Fig. 1. *Boopis pterocalyx*. **A**. Habit. **B**. Upper view of the fruit showing foliose, accrescent sepals. **C**. Fruit, lateral view. **D**. Same as c, showing the apiculum. **E**. Fertilized flower and young fruit. **F**. Palea of the flowering receptacle. **G**. Flower in the same stage as E, partially dissected, showing the staminal tube. **H**. Flower in staminal phase. Scales: 1 cm applies to A; 1 mm applies to B-H. (Drawn from the holotype.)

each; usually with 1 or 2 central, thicker peduncles (1.5×0.5 cm) bearing a larger inflorescence, and some lateral slender peduncles (2.5×0.15 cm), with medium size or small inflorescences. Involucre with 5 or 6 broad triangular lobules 0.3–0.7 cm long, villous marginally. Receptacle convex, 0.5–3 cm in diam., accrescent, hemispherical during fruit maturation. Paleas linear to linear-spatulate, partially fleshy, scarcely villous at apex, persistent, 0.3–0.5 cm long in receptacles with flowers, to 1 cm long in receptacles with fruits. Flowers white, 30–300 per inflorescence. Calyx pentamerous, sepals with imbricate aestivation, foliose, obovate, uneven, margin sinuate, 0.85×0.6 mm. Corolla infundibuliform with tube 1.75–1.96×0.6–0.8 mm, limb campanulate, 2.2–2.35×

1.6–1.7 mm, with a slight constriction at the base; lobules valvate, triangular, uncinate, 1.2× 0.8 mm. Staminal tube 2.3 mm long, inserted midlength on the corolla tube, nectary glands reduced, of median position; apical free filaments of 0.5 mm long. Anthers connate, 1 mm long. Style exserted, 4–5 mm (staminate phase) to 5.7–5.8 mm long (pistillate phase). Ovary terete, 1.3×0.5 mm. Achenes terete 5×1.5 mm, with 5 longitudinal, obtuse keels, and transverse wrinkles, terminating in a conical, conspicuous apiculum, 1.2–1.8 mm long, and crowned by the foliose, accrescent (4×2.5–3.3 mm), truncate, orbicular sepals. Seed 3.5×1 mm.

Distribution.—*Boopis pterocalyx* is endemic to the Sierra del Nevado, Mendoza, Argentina, growing in dunes or sandy soils at hill bases (Fig. 2).

Etymology.—The specific epithet refers to the foliose, wing-like sepals, which persist on the achenes.

Additional specimens examined. ARGENTINA. Mendoza: Sierra del Nevado, portezuelo del Blanco al E-NE del Cerro Perro Atado, 35°37′S, 68°33′W, 2300 m, 11 Dec 1973, *Boelcke et al. 15819* (SI).

FIG. 2. Geographical distributions of *Boopis necronensis* and *B. pterocalyx*.

This species can be easily recognized by the foliose, orbicular sepals in the fruit, and by its villous leaves, involucre, and paleas. *Boopis pterocalyx* is closely related to *B. australis* Decne., but the two species are readily distinguished by vegetative and reproductive characters. *Boopis pterocalyx* differs by its shorter, scapiform peduncles, spatulate leaves with entire, sinuate margins (the upper ones with villous margins), and by its involucre and paleas, which are apically villous. *Boopis pterocalyx* is also distinguished by its campanulate corolla limbs that have longer uncinate lobes, and by its shorter styles (especially noticeable in the pistillate phase, when the style reaches its maximum length). *Boopis pterocalyx* is further distinguished by its larger achenes with foliose sepals that surround a conical apiculum. *Boopis pterocalyx* is similar to *B. necronensis*; differences between these species are discussed below.

Boopis necronensis Zavala, S. Denham & Pozner, **sp. nov**. Type: Argentina**.** La Rioja: Reserva Laguna Brava, 200 m al oeste del refugio de Mulas Muertas, 3775 m, 10 Feb 1998, *F. Biurrun, J. Molina & Ruiz 5218* (holotype: CTES 307622). (Fig. 3)

Boopi pterocalyci similis, sed foliis spatulatis majoribus, margine crenato-mucronato; floribus majoribus, per inflorescentiam paucioribus; tubo corollae per glandulos tubi staminalis expanso; acheniis laevigatis, per sepala obtusa navicularia suberosa minora coronatis bene differt.

Perennial, hemicryptophytic, rosulate herbs about 4 cm tall and 11 in cm diam., stem not or barely branched. Leaves alternate, spatulate, 2–5.5 cm long, thick, glabrous; petiole 1–2.5×0.5 cm; limb 1.2–3×1–2 cm, margin crenate-mucronate, base cuneate-attenuate, apex obtuse; blade adaxial surface slightly aciculate, and nervation strongly marked on the abaxial surface. Peduncles shorter than the leaves, 1–2 cm long, terete, furrowed, bearing only one terminal head each; usually with only one central peduncle surrounded by 1–5 lateral ones, or the central inflorescence sessile. Involucre with 5–6 wide triangular

lobules, 0.3–0.7×0.25–0.85 cm; lobes with apex obtuse to rounded, mucronate. Receptacle convex, 1–4 cm diam., accrescent, hemispherical during fruit ripening. Paleas few, very dispersed, linear-spatulate, mucronate, fleshy, glabrous, persistent, 0.3 cm long in receptacles with flowers, to 0.5 cm long in receptacles with fruits. Flowers 100–150 per inflorescence. Calyx pentamerous; lobules with imbricate aestivation, foliose, uneven, margin undulate, 1–2×1–1.15 mm. Corolla infundibuliform, 4–4.5 mm long; tube 1.85–2.2×0.7–1.2 mm; limb 2–2.5×1.2–2.35 mm, deeply cleft; lobules triangular, uncinate-cucullate, 1.6–2×0.8 mm, with a globose expansion at apex and valvate aestivation. Staminal tube 3 mm long, inserted at midlength on the corolla tube, with 5 oblong glands in the central portion, 1×0.25 mm, and distally ending in 5 minute free filaments. Anthers connate, 1.5 mm long. Style exserted, 2 mm long (staminate phase) to 5.5 mm long (pistillate phase). Ovary terete, 2–2.5×1–1.4 mm. Achenes prismatic, 4.5×2.5 mm, glabrous, smooth, or eventually developing some wrinkles; apiculum 0.4–0.6 mm long, with 5

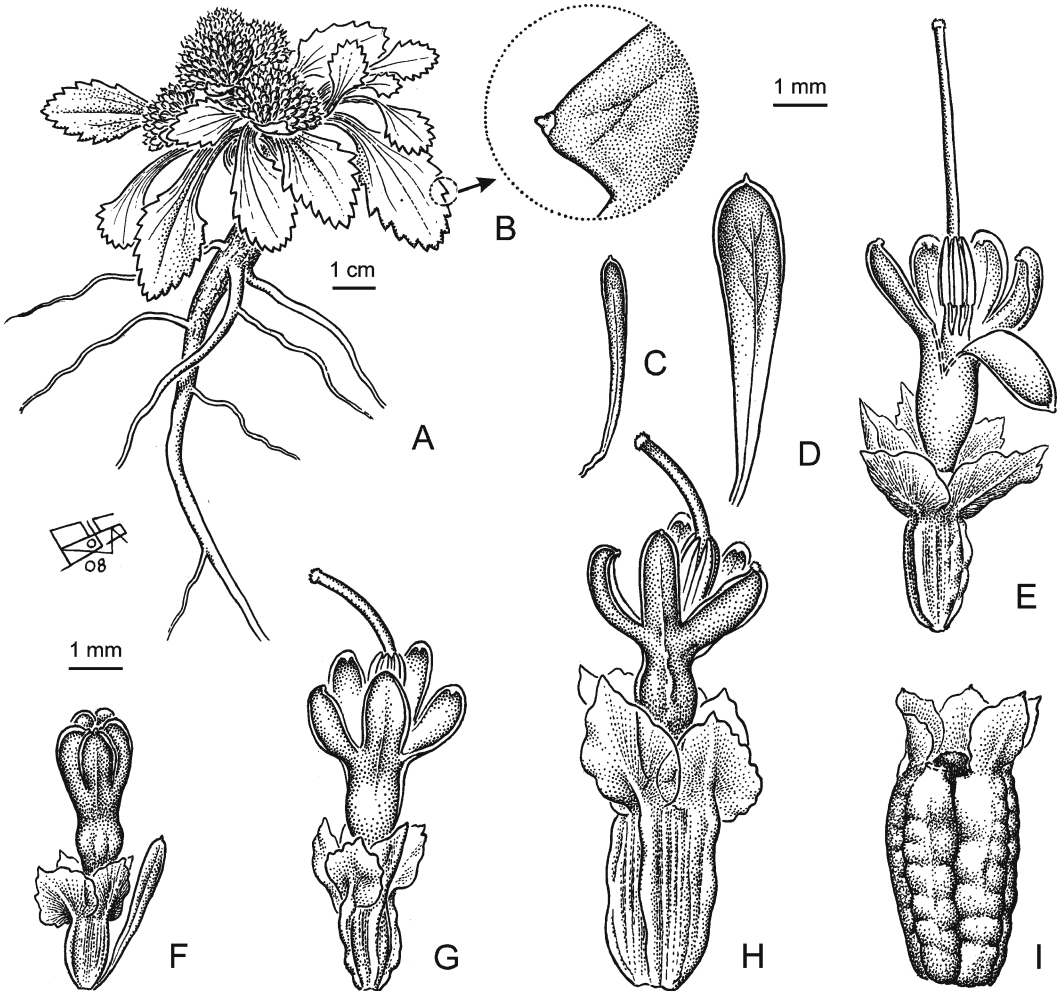

Fig. 3. *Boopis necronensis*. **A**. Habit. **B**. Detail of a foliar tooth. **C**. Palea of the flowering receptacle. **D**. Palea of the receptacle with fruits. **E**. Flower at the pistillate phase, partially dissected, showing the staminal tube. **F**. Flower bud. **G**. Fertilized flower. **H**. Young fruit. **I**. Fruit. Scales: 1 cm applies to A; 1 mm applies to B-I. (A–H, drawn from the holotype; I, drawn from *Hunziger 2163*, SI.)

longitudinal wings of rhomboid transverse section and acute margin, crowned by the accrescent sepals that are 1.5–2.6 × 1.1–1.25 mm, navicular, obtuse-mucronate, corky, with undulate margin. Seed 3 × 1 mm.

Distribution.—*Boopis necronensis* is known from Laguna Brava Park, in La Rioja province, growing in high, flat, arid landscapes, with gravel soils and broken stones (Fig. 2). In addition, one specimen is known from Catamarca (Depto. Tinogasta).

Etymology.—The specific epithet refers to the site where the holotype was collected, the "Mulas Muertas" refuge [from the Greek, *necrós* = muerto (= dead) and *ónos* = mula, asno (= mule)].

Additional specimens examined. ARGENTINA. Catamarca: Depto. Tinogasta, Negro Muerto a Reales Blancos, 4300 m, 2 Feb 1930, *Schreiter 6111* (LIL89019, LIL89281). **La Rioja**: Laguna Brava. Cordillera, 4200 m, 4 Feb 1947, *Hunziker 2163* (CORD, SI); Refugio de Mulas Muertas, alrededores del refugio, 15 Dec 1996, *Biurrun & Molina 4565* (SI), dentro del corral de pircas, 28º16′28″S, 68º44′43″W, 4200 m, 7 Jan 2009, *Donadío et al. 66* (SI).

Boopis necronensis is closely related to *B. pterocalyx*, but the former is distinguished by its larger, spatulate leaves with crenate-mucronate margins, and larger flowers with an expanded corolla tube (due to the staminal glands) and deeply cleft limb. The achenes of *B. necronensis* are also different because they have a reduced apiculum, smooth texture, and are crowned by smaller sepals that are navicular, obtuse-mucronate, and corky. Field observations reveal that the corolla of *B. necronensis* is green with white-margined lobes.

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