

# *Neocuatrecasia epapposa* (Compositae: Eupatorieae: Gyptidinae), a new species from a shield inselberg in the Departamento de Santa Cruz, Eastern Bolivia

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**Summary.** A new species of *Neocuatrecasia* (Compositae: Eupatorieae: Gyptidinae), *N. epapposa*, is described and illustrated from the Provincia Ñuflo de Chávez, Departamento de Santa Cruz, eastern Bolivia. The new species is compared with the other low altitude species, *N. tysonii*, described from the Departamento de Beni, but differs primarily in its epappose achenes with setulae restricted to the stipitate base. It brings the number of herbaceous species in the genus to three, the total number of species to 13, and those known from Bolivia to 6 endemics.

**Key Words.** Asteraceae, *Bosque Seco Chiquitano*, cerrado, Chiquitano Dry Forest, granite, *lajas*, Precambrian Shield formation, rock islands, rock platforms.

## Introduction

In 2008 the author participated in part of the Darwin Initiative Project 16-004, ‘Conservation of the cerrados of eastern Bolivia’ and, along with team members John Wood, Paola Pozo and Daniel Villarroel, visited some of the most easily accessible shield inselbergs in a complex alongside the road between Concepción and (San Antonio de) Lomerío, Provincia Ñuflo de Chávez, Departamento de Santa Cruz, Bolivia (Fig. 1A & B).

In eastern Bolivia, in the Depto. Santa Cruz, there is a series of flat granitic rock slabs, or platforms, and low granitic (or gneissic) shield inselbergs — forming part of the eastern Bolivian portion of the Brazilian Precambrian Shield formation (the ‘Guaporé Shield’ in Jones 1985) — restricted to the Provincias of Velasco and Ñuflo de Chávez. The term *lajas* has been applied locally to both the rock slabs and shield inselbergs (Wood pers. comm. 2014), but it is the preferred term to apply to just the shield inselbergs (Gröger 2000; Sánchez 1995). More pronounced domed shield inselbergs have been termed *cupulas* (Ibisch et al. 1995) or even *domas* (Sánchez 1995), although neither of these terms appear to have been used colloquially in Dpto. Santa Cruz according to Wood (pers. comm. 2014). The rock slabs or platforms, because of their relative weathering resistance, compared to the surrounding soil, are likely to be inselbergs in the making (see Bremer & Sander 2000). Whichever type, they form conspicuous rock islands in the *Bosque Seco Chiquitano* (= Chiquitano Dry forest) or sometimes *cerrado* vegetation and, because of the often shallow superficial soil pockets and fissures, they frequently support a unique vegetation (Mamani et

al. 2010; Mostacedo et al. 2001) (Fig. 1B), and are typically black in colour from their covering of cyanobacteria (Ibisch et al. 1995; Büdel et al. 2000; Porembski et al. 2000). They serve as refuges for drought resistant plants (e.g. *Selaginella sellowii* Hieron. and *S. convoluta* (Arn.) Spring [Selaginellaceae]), cacti (e.g. *Cereus kroenleinii* N. P. Taylor, *Echinopsis hammerschmidii* Cárdenas, *Hylocereus setaceus* (Salm-Dyck ex DC.) A. Berger ex Werderm., etc. [Cactaceae]), bromeliads (*Dyckia* spp., *Tillandsia* spp., etc. [Bromeliaceae]), bulbous plants (*Zephyranthes* cf *mesochloa* Herb. [Amaryllidaceae]), a few ferns (e.g. *Anemia ferruginea* Kunth [Schizaeaceae]), other succulents (e.g. *Portulaca eruca* Hauman [Portulacaceae]), as well as *Waltheria operculata* Rose [Sterculiaceae], *Ipomoea maurandiooides* Meisn. and *Evolvulus* spp. [Convolvulaceae], *Paspalum multicaule* Poir. and *Tripsacum multiflorus* Miré & H. Gillet [Gramineae], alongside a small number of short-lived aquatics that grow seasonally in the rock pools on the surface (e.g. *Heteranthera rotundifolia* Griseb. [Pontederiaceae]), as well as other endemics (Hind, pers. obs.; Wood, pers. comm.; Mamani et al. 2010). The vegetation on the rocks climaxes in a low rock-woodland and a *Sapium argutum* Huber [Euphorbiaceae] and *Commiphora leptophloeos* (Mart.) J. B. Gillett [Burseraceae] community along with pioneer lithophytes (Sánchez 1995). These ecosystems on the rock platforms and inselbergs are prone to natural devastation (in the form of ‘water flushes’ and fires) and man-made destruction such as human-aided interference (e.g. fire, grazing, or mechanical damage — see Hind & Frisby 2014), and should be considered as fragile environments.



**Fig. 1.** A partial view of the shield inselberg complex alongside the road just outside Concepción, Prov. Ñuflo de Chávez, Depto. Santa Cruz, Bolivia. The low dome-like inselberg in the background is separated from the flatter inselberg in the foreground — a useful drying area for the project's drying papers on the black cyanobacteria-covered bare rock surface. B A 'complex shrub and cacti mat', the typical habitat of *Neocuatrecasia epapposa*, on a flatter area of the surface of the low inselberg, showing the complex plant association with a skirt of *Selaginella* sp., a ring of *Portulaca eruca*, the conspicuous creeping and ascending stems of *Cereus kroenleinii*, fronds of *Anemia ferruginea*, and a number of bromeliads. PHOTOS D. J. N. HIND.

On the edge of the inselberg we studied, small pockets or islets of vegetation had established in the fractures and low depressions on the granite slabs, and a dense, mixed vegetation (the ‘complex “shrub mats” and cacti mats’ of Ibisch *et al.* 1995: 307), provided material of a tall, sticky-leaved “eupat” with white corollas. Closer examination in the herbarium showed that this material closely resembled other *Wood* collections that the author had determined as *Neocuatrecasia tysonii* H. Rob. (see Specimens examined).

*Neocuatrecasia* R. M. King & H. Rob. was based on four subshrubby species from the Andes of Bolivia and Peru (King & Robinson 1970). The species were essentially distinguished by the hairy style bases, the short-stipitate achene bases, narrow basal tube to the corollas, papillose inner surface of the corolla lobes and the presence of setulae on the achenes (see King & Robinson 1987; Hind & Robinson 2006). King & Robinson (1972, 1974, 1986, 1988), and Robinson (2002), added a further eight species, bringing the current total to 12: five from Bolivia, seven from Peru. The genus was placed in the ‘*Gyptis* Group’ by Hind & Robinson (2006) of the Eupatoreiae subtribe Gyptidinae R. M. King & H. Rob., and is one of a trio of genera (including *Tamaulipa* R. M. King & H. Rob. — Mexico, and *Lourteigia* R. M. King & H. Rob. — Colombia and Venezuela) with an entirely extra-Brazilian distribution. The publication of *Neocuatrecasia tysonii* H. Rob. and *N. yungasensis* H. Rob. added two herbaceous species to the genus, contrasting with the otherwise subshrubby habit of the others (Robinson 2002). Together with *N. sessilifolia* R. M. King & H. Rob. (a shrubby species from Peru) these three species formed a group, keyed out in the first couplet of Robinson’s key (Robinson 2002), possessing peduncles and pedicels densely covered in conspicuously long stipitate-glandular hairs. *N. tysonii* is a low-altitude species and the type collection, and one of the paratypes, originated from the Province of Mamoré in the north of the Departamento de Beni, Bolivia, in riverine forest alongside the Rondonian state border to Brazil; other paratypes cited by Robinson occur on the granitic inselbergs in the Lomerío area of the Depto. Santa Cruz. The inflorescences of *N. tysonii* are many-headed, compared with those of the other species, and the pappus setae conspicuously short ( $\frac{1}{3}$  the length of the corollas) in contrast with the other species where the pappus is  $\frac{1}{2}$  the length of the corolla or longer. The achenes’ short-stipitate base, whilst shorter than the other species, is typical of the subtribe, and the setuliferous achenes the norm in the genus. In many characters *Wood et al.* 24222 resembles *N. tysonii* but there are, however, some obvious differences and these were considered significant

enough to recognise this material as a new species which is described below:

## Description

*Neocuatrecasia epapposa* D. J. N. Hind, sp. nov. Type: Bolivia, Santa Cruz, Ñuflo de Chávez: Concepción, 28 a 29 km al sur de Concepción sobre el camino a Lomerío, 16°23'39"S, 61°59'12"W, alt. 528 m, 6 April 2008, *Wood et al.* 24222 (holotype K; isotypes LPB, USZ).

<http://www.ipni.org/urn:lsid:ipni.org:names:77141225-1>

Sticky annual (or possibly short-lived perennial) herbs to c. 1.2 m tall. Stems erect, striate, 4 mm diam., brownish, conspicuously stipitate-glandular pubescent, relatively few-branched, branches green, opposite to subopposite, to 50 cm long, nodes often appearing fasciculate with leafy short shoots in axils. Leaves opposite below, tending to subopposite and finally alternate beneath inflorescence, pseudopetiolate with characteristically winged petiolate base, attenuate and narrowing gradually from lamina to node, c. 10 – 25 mm long  $\times$  4 – 8 mm wide, on leaves beneath inflorescence (measured from node to branching point of main venation), main lamina 18 – 80  $\times$  4 – 17 mm, lanceolate, discolorous and paler green beneath, moderately glandular-punctate throughout above and beneath, glandular exudate immersed or superficial usually shiny, clear and yellow to amber coloured, moderately long stipitate-glandular above and beneath, glands usually amber coloured, midrib prominent beneath, sometimes paler than lamina, conspicuously 3-veined from apex of pseudopetiole or suprabasally 3-veined if leaf base cuneate, secondary veins branching alternately from midrib and less prominent than midrib, midrib and secondary venation moderately stipitate-glandular, margins regularly shallowly serrate to subentire, apex acute. Inflorescences terminal, often few-branched, branches alternate, somewhat lax and spreading, many-headed, bracteate with narrowly-lanceolate to almost linear leaf-like bracts, branches and pedicels densely pubescent, hairs conspicuously stipitate-glandular, uniseriate, multicellular, glands usually amber-coloured, pedicels 6 – 11 mm long, 0.3 – 0.4 (– 0.6) mm diam., usually densely long stipitate-glandular, glands amber-coloured. Capitula discoid, homogamous; involucre hemispherical, 4 – 5 (– 6) mm diam.  $\times$  c. 3 mm tall; phyllaries distant, loosely biseriate, subequal, 3.4 – 3.5 mm long  $\times$  0.4 – 0.5 mm wide, prominently bicostate in lower half (less conspicuously so on inner phyllaries), outer moderately (towards base) or densely (towards apex) stipitate-glandular, and glandular-punctate throughout but denser towards apices, inner paler, stipitate-glandular only in upper half (more densely so towards apices) and scattered glandular-punctate in lower half,

more moderately so in upper half, margins of outer phyllaries stipitate-glandular throughout, those of inner phyllaries entire in lower half and stipitate-glandular in upper half, apices of both series acute; receptacle eventually dome-shaped, sometimes hollow at maturity (based on rehydrated material), glabrous, epaleaceous. *Florets* c. 50 per capitulum, hermaphrodite, conspicuous above phyllaries, corollas actinomorphic, white, c. 2.2 mm long, corolla tube (length of corolla enclosing nodal style base) c. 0.2 – 0.3 mm long, corolla throat 1.6 – 1.7 mm long × 0.4 – 0.7 mm diam. (rehydrated measurements), widening gradually from constriction above basal stylar node, sparsely glandular-punctate outside, more densely so towards base and dense at base of corolla, corolla lobes 5, triangular, c. 0.4 mm long × 0.3 mm wide, apices acute, markedly thickened and papillate outside at tips, glandular-punctate outside; anther cylinder included within corolla, filaments attached towards base of corolla tube, anther collar expanded from filament, anther thecae c. 0.7 mm long, apical anther appendages triangular, apices acute, rounded; style base with distinct pubescent node (hairs usually tightly adpressed against node in dry material), style shaft 1.3 mm long, glabrous, style arms 1.7 mm long × 0.2 mm wide (rehydrated measurements) and ± completely exserted from throat, appendages c. 1 mm long, finely papillate but somewhat smoother towards apices. *Achenes* 1.5 – 1.7 mm long, 0.4 – 0.5 mm diam., ribbed, ribs concolorous with body or slightly paler, sometimes brownish, apical callus annular, pale, body black, setuliferous only at base above carpodium, otherwise glabrous and eglandular, except sometimes very sparsely glandular amongst setulae at base, setulae of twin hairs, transparent, apices equal or scarcely subequal, scarcely divided, apices acute, apex of achenes with distinct pale apical callus rim; carpodium a distinct pale annulus at bottom of short-stipitate slightly curved achene base; pappus absent. Fig. 2.

**RECOGNITION.** *Neocuatrecasia epapposa* is close to *N. tysonii* H. Rob., but differs in that the achenes are epappose (rather than possessing pappus setae c. ½ the length of the corollas, c. 0.3 – 0.8 mm long), the achene setulae, together with isolated glands, are restricted to the stipitate achene base above the carpodium (vs setuliferous throughout the achene body and especially on the ribs), the capitula have c. 50 florets (vs 25 – 30) and the leaf margins are more shallowly and regularly serrate to subentire (vs more deeply and irregularly sized and spaced serrate).

**DISTRIBUTION.** The species is currently only known from the Provincia Ñuflo de Chavéz, Departamento de Santa Cruz, Bolivia.

**SPECIMENS EXAMINED. BOLIVIA:** Santa Cruz, Ñuflo de Chávez: Concepción, 28 a 29 km al sur de Concepción sobre el camino a Lomerío, 16°23'39"S, 61°59'12"W,

alt. 528 m, 6 April 2008, Wood *et al.* 24222 (holotype K; isotypes LPB, USZ).

**HABITAT.** Probably restricted to areas of lithophytic vegetation growing in shallow soil pockets on shield inselbergs: the ‘plant mats’ referred to as ‘complex “shrub mats” and cacti mats’ by Ibisch *et al.* (1995); alt. c. 530 m. Fig. 1B.

**CONSERVATION STATUS.** Since this species is presently based on the type collection it is premature to provide a rating as more fieldwork on other shield inselbergs in the vicinity is needed; DD (Data Deficient) is probably appropriate. However, Ibisch *et al.* (1995) have pointed out that some of the vegetation mats on the inselbergs are prone to natural disturbances, such as water flushing and fire, and as such are in a constant dynamic state where an equilibrium is never really reached on the surface of the inselbergs. It is highly probable that population size, especially of an annual such as *Neocuatrecasia epapposa*, varies considerably from one year to the next.

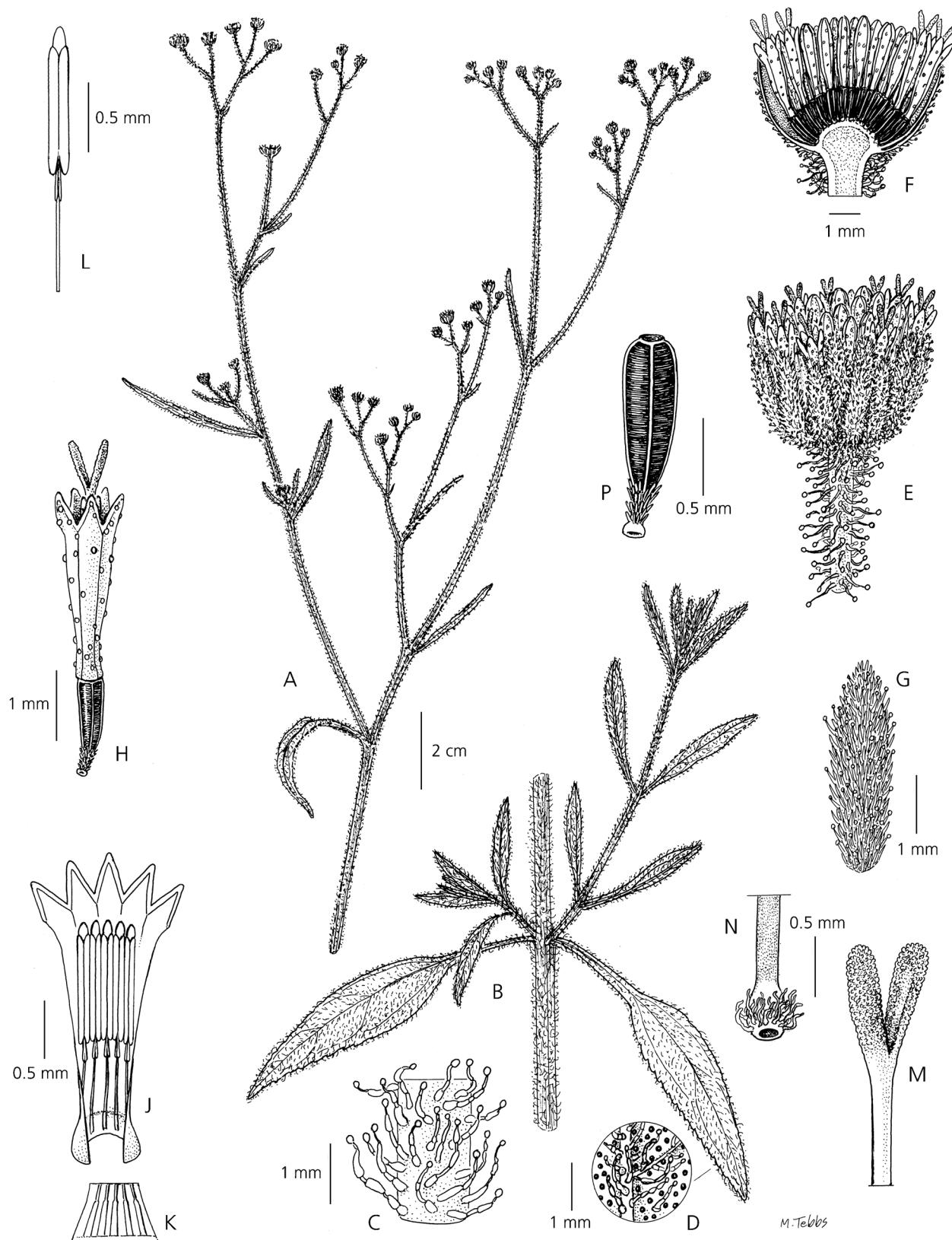
**PHENOLOGY.** Flowering and fruiting in March – April.

**ETYMOLOGY.** The specific epithet indicates the epappose nature of the achenes of this species.

**SPECIMENS OF *NEOCUATRECASIA TYSONII* EXAMINED: BOLIVIA:** Santa Cruz: Prov. Chiquitos: c. 5 km E of Santiago de Chiquitos, alt. 550 m, 14 March 2001, Wood & Wendelberger 17244 (K), Santiago de Chiquitos, sur de la aeropista, en la senda a Las Pozas, 18°43'74"S, 59°37'11"W, alt. 547 m, 6 May 2008, Wood *et al.* 24732 (K). Prov. Velasco: 10 km del Carmen Ruiz, en el camino a San José de Campamento, 15°58'03"S, 61°04'25"W, alt. 355 m, 5 April 2011, Wood & Soto 27412 (K), 70 km N of Santa Rosa de la Roca along road to Piso Firme, 15°21'08"S, 61°29'25"W, alt. 300 m, 22 April 2002, Wood *et al.* 18285 (K).

## Discussion

In Robinson’s key to species of *Neocuatrecasia* (Robinson 2002) three species were separated with stems, inflorescence branches and phyllaries covered in conspicuous stipitate-glandular trichomes. In the key the number of pappus setae were of some importance in separating *N. sessilifolia* R. M. King & H. Rob. (20 setae) from the herbaceous species *N. tysonii* and *N. yungasensis*. However, the protologue description of *N. tysonii* recorded only 10 – 12 setae (cf 25 – 30 in *N. yungasensis*), suggesting that some modification of the key is needed, perhaps altering the order of the leads, relegating this character or removing it from this couplet of the key, whilst leaf characters might be more useful. I consider that the actual and relative length of the pappus setae (relative to the corolla tube) is also clearly significant; the shortest pappus setae present in *N. tysonii*, other than the absence of a pappus in *N. epapposa*.



**Fig. 2.** *Neocuatrecasia epapposa*. A apex of flowering stem showing several inflorescence branches; B leafy portion of lower stem; C details of stem pubescence; D detail of abaxial leaf surface; E capitulum; F l.s. capitulum; G phyllary; H floret; J corolla, opened out; K detail of inside of base of corolla showing attachment point of filaments; L stamen; M style arms; N style base; P achene. All from the holotype, Wood et al. 24222 (K). DRAWN BY MARGARET TEBBS.

*Neocuatrecasia epapposa* would key out alongside *N. tysonii* in Robinson's key, perhaps as an epappose variant, especially as both are from low altitudes (at 550 m or less), but with more florets per capitulum. However, many of the recent collections of *N. tysonii* made by Wood *et al.* from the Depto. Santa Cruz suggest that the leaf margins are more pronouncedly serrate in that species than the low-serrate to subentire margins in *N. epapposa*.

*Neocuatrecasia tysonii* is found in a wide range of habitat types, from grassland, *cerrado*, semi-deciduous woodland and on granitic inselbergs (Robinson 2002: 389), suggesting it is more tolerant about the substrate on which it grows. It remains to be seen if additional collections of *N. epapposa* are made as to whether the new species is more widespread or restricted to shield inselbergs. With an absent (*N. epapposa*) or reduced (*N. tysonii*) pappus, one of the most likely dispersal methods is by the very sticky nature of the plants: the achenes get stuck to parts of the plant, which in turn get stuck to birds (visiting to feed, or bathe in the temporary pools, or *oríangas*, on the inselbergs). These are the most likely dispersal agents able to travel easily between the inselbergs and rock slabs, especially if they are bordered by dense Chiquitano vegetation.

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