

TETRAMERIUM MACHALILLA (ACANTHACEAE: JUSTICIEAE: TETRAMERIINAE): A NEW SPECIES FROM THE SEASONALLY DRY TROPICAL FORESTS OF THE PACIFIC COAST OF ECUADOR

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Abstract. A new species of Acanthaceae, *Tetramerium machalilla*, from the seasonally dry tropical forests of the Pacific coastal lowlands of Manabí Province, Ecuador, is formally described, illustrated, mapped, and compared to morphologically similar species.

Keywords: endemics, La Plata island, Machalilla National Park, Manabí

Resumen. Se describe y presenta formalmente una nueva especie de Acanthaceae, *Tetramerium machalilla*, de las tierras bajas de la provincia de Manabí, en los bosques secos estacionales deciduos del Pacífico Ecuatorial. La nueva especie es ilustrada, cartografiada y se discute sus relaciones con las especies morfológicamente cercanas.

Palabras claves: endémicas, Isla de la Plata, Manabí, Parque Nacional Machalilla

Tetramerium Nees is a genus of Acanthaceae in tribe *Justicieae* Dumort., subtribe *Tetrameriinae* T.F. Daniel, Kiel & McDade, that comprises 33 species of perennial herbs and shrubs distributed from the southwestern United States to southern Bolivia (Daniel, 1986, 2024). The genus is characterized by a combination of 4-sided and densely bracteate spikes, a pair of inconspicuous bracteoles subtending each flower, an androecium of two stamens with bitheous anthers that lack basal appendages, tricolporate and hexapseudocolpate pollen, small capsules with septa that detach from the capsule wall below the retinacula, and up to 4 glabrous seeds (Daniel 1986). Initial studies of *Tetramerium* were based almost exclusively on limited herbarium collections (Happ, 1937) but were later monographed in more detail using over 2,000 herbarium specimens as well as field studies of additional factors such as habitat, corolla morphology, and pollination biology (Daniel, 1986). Until now, *Tetramerium* has been represented by only two species in Ecuador: *T. nervosum* Nees and *T. wasshausenii* T.F. Daniel (Wasshausen, 2013). During fieldwork by Alex Greene, plants with bluish corollas similar to *T. wasshausenii*, but with significantly different bracts were found and

photographed (but not collected) in the coastal dry forests of Manabí. Additional images from that region on iNaturalist matched the plants seen by Greene. Subsequent field and herbarium work confirmed that these plants represent a new species of *Tetramerium* that is formally described below.

MATERIALS AND METHODS

Relevant specimens at GUAY, QCA, and QCNE were studied; acronyms follow Thiers (2025). Measurements are from herbarium specimens and fresh material preserved in 70% ethanol. The botanical terms used in the species descriptions follow Wasshausen (2013). The preliminary conservation status was determined using the coordinates of the studied specimens and GeoCAT (Bachman and Moat, 2012; <http://geocat.kew.org>), with a buffer area of 2 × 2 km, as recommended by the IUCN (2024).

TAXONOMY

Tetramerium machalilla Cornejo, T.F. Daniel & A.M. Greene, *sp. nov.* TYPE: ECUADOR. Manabí:

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Near La Tomatera, 2 km from Portoviejo, very dry, disturbed seasonal forest, 01°01'24"S, 080°26'06"W, 230 m, 14 Dec 2025 (fl., fr.), *X. Cornejo, C. Andrade, M. Gallardo, V. Cornejo & D. Cornejo 10280* (holotype: GUAY-14066; isotypes: to be distributed). Figs. 1–3.

Diagnosis

Tetramerium machalilla is similar to *T. zeta* T.F. Daniel (1986, p. 66) but differs from that species by the absence of glandular trichomes (vs. present, though sometimes inconspicuous) on the young stems and leaves; leaf blades acute (to $\pm$ obtuse) at apex (vs. leaf blades acuminate); inflorescences 7–12 mm wide near mid-spike (vs. inflorescences 13–17 mm wide); floral bracts 9–13 mm long, acute at apex, margins ciliate with trichomes to 0.3 mm long (vs. floral bracts 12–23 mm long, acuminate at apex, margins ciliate with trichomes to 1.5 mm long); corollas externally glabrous (vs. externally pubescent with eglandular trichomes at least on abaxial surface of central lobe); stamens 7–8 mm long (vs. 3.5–5 mm long); and distribution restricted to dry forests of Manabí at low elevations (20–300 m) on the Pacific coast of Ecuador (vs. dry forests of the valleys of the Río Marañón and its tributaries at higher elevations [350–700 m] in the Andes of northwestern Peru).

Shrubs to 1.2 m high, erect to spreading, sometimes branches decumbent or trailing. Young stems subterete, $\pm$ evenly pubescent with erect and mostly antrorse eglandular trichomes to 0.3 mm long, older stems with exfoliating bark deciduous upon contact, revealing a microverruculose epidermis, occasionally longitudinally fissured. *Leaves* petiolate; petioles to 6 mm long, borne on persistent petiolar stubs to 1 mm long, pubescent like young stems; blades ovate to shortly lanceolate, 10–20 $\times$ 8–11 mm, 2–2.5 times longer than wide, apex acute- to obtuse-mucronate, mucro 0.3–0.5 mm long, base truncate to subcordate, both surfaces and margin moderately to $\pm$ densely pubescent with suberect to antrorse eglandular trichomes < 0.1 –0.2 (–0.3) mm long. Inflorescence terminal, densely bracteate; spikes to 70 mm long, 7–12 mm wide near mid-spike (measured flat, excluding corollas/capsules), median internodes 2–3.5 mm long, rachis not visible, pubescent with strigose trichomes to 0.2 mm long. *Floral bracts* (i.e., those above lower bracts, which sometimes transition to leaves) imbricate, erect, ovate, 8–13 $\times$ 6–9 mm, 1.3–2 $\times$ longer than wide, narrowed toward base and sessile (lowermost 1–2 pairs subfoliose, broadly ovate, with petioles to 2 mm long), apex acute (to $\pm$ obtuse), straight, erect, with an apiculate tip 0.5–1 mm long, abaxial surface strigulose, margin strigose with trichomes to 0.3 mm long, major veins 3–6 on each side. *Bracteoles* narrowly lanceolate, 4–5 $\times$ 1 mm, usually equaling or surpassing calyx lobes, abaxial

surface minutely strigulose mainly at base, margin with scattered strigose hairs. *Calyces* 5-lobed, 2–3.5 mm long, lobes broadly ovate, narrowly acuminate, subequal in length, 2–3 mm long, strigose abaxially, margins pilose. *Corollas* blue, fading to whitish-blue, with a central white patch and dark purple veins on the upper lip, 10–19 mm long, externally glabrous, tube 7–9 mm long, ca. 1 mm diam. (measured flat) at base, 1.2–1.8 mm diam. at apex, upper lip obovate-elliptic, 7–9 $\times$ 2.5–3.8 mm; lower lip 8–10 $\times$ 4–5 mm; lateral lobes shortly oblanceolate, 8–9 $\times$ 3.5–4.5 mm. *Stamens* 2, 7–8 mm long (dried), 8–9 mm long (fresh), thecae 1.8–2.2 mm long. *Styles* 15–16 mm long, glabrous; stigma 2-lobed, 0.25 mm long. *Capsules* 6–9 mm long, externally glabrous, stipe 4–4.5 mm long, head 3.5–4 mm long. *Seeds* 4, subcircular, 1.7–2 mm long $\times$ ca. 2 mm wide, tuberculate.

Etymology: The epithet, a noun in apposition, refers to the pre-Hispanic Pacific coastal culture of Machalilla that was based in the province of Manabí, where the new species occurs. It also refers to the nearby Machalilla National Park.

Common names: Not known.

Habitat and distribution: *Tetramerium machalilla* is endemic to the coastal region and the offshore island Isla de la Plata, in southern Manabí Province in west-central Ecuador. Plants occur on basic soils as an understory floristic element among wiry, intertangling deciduous branches in very dry secondary forest and dry thorn scrub, at elevations between 20 and 300 m. At the type locality, *T. machalilla* occurs along trails in full sun and in partially shaded sites. Sympatric species include *Colicodendron scabridum* (Kunth) Seem., *Cynophalla heterophylla* (Ruiz & Pav. ex DC.) Iltis & Cornejo, *C. sclerophylla* (Iltis & Cornejo) Iltis & Cornejo (Capparaceae), and *Wigandia ecuadorensis* Cornejo (Boraginaceae). Infrequent Acanthaceae that are also sympatric with *T. machalilla* include *T. nervosum*, *Dicliptera unguiculata* Nees, and *Ruellia* sp.

Phenology: Flowering occurs during the dry season from July to December. Fruiting has been recorded in December and likely occurs throughout the flowering period as well.

Conservation status: *Tetramerium machalilla* inhabits fragments of secondary vegetation within a limited area of west-central Ecuador. A small population of the new species is protected on Isla de la Plata, a small rocky island of ca. 5 km² that is part of Machalilla National Park and administered by the Ecuadorian Ministry of the Environment. However, continental dry forests of the central coast that likely harbor a greater number of individuals of *T. machalilla* are among the most highly deforested habitats in Ecuador (Myers, 1988; Dodson and Gentry, 1991; Cornejo obs. pers. in the field). Plants of *T. machalilla*

there are threatened by ongoing land clearance and habitat degradation due to agricultural and livestock activities. Using IUCN (2024) criteria, there appear to be six localities, one on Isla de la Plata that is protected, and the five remaining localities on the mainland for which the threat is inferred. Based on currently known specimen vouchers, the EOO is 532 km² and the AOO is 16 km². Therefore, a preliminary conservation assessment of Endangered (EN) based on the EN B1, B2(a)(biii) criteria is proposed for *T. machalilla* (IUCN, 2024). An exclusion of the ca. 103 km² of open ocean, where the species does not occur, included in the EOO would not alter this assessment. Additional images and localities of this species verified by the authors on iNaturalist (see below) would extend both the EOO (to 2,002 km²) and the AOO (to 28 km²), and would increase the extent of open ocean included (to ca. 780 km²). Four of the iNaturalist observations are from near Playa Tortugueta Cove (southwest of Machalilla) within Machalilla National Park. If considered, these data from iNaturalist observations would also not alter the proposed status of EN for *T. machalilla*.

Additional Specimens Examined: ECUADOR. Manabí: Near La Tomatera, 2 km from Portoviejo, very dry seasonal forest, disturbed, 01°01'22"S, 080°26'03"W, 235 m, 14 Dec 2025 (fl.), *X. Cornejo*, *C. Andrade*, *M. Gallardo*, *V. Cornejo* & *D. Cornejo* 10279 (GUAY); Montecristi, base and east facing slope of Cerro Montecristi from the saddle at the top of the mountain due east to the road from Montecristi to Jipijapa, 01°10'S, 080°30'W, 200–600 m, 11 May 1985 (fl.), *P. Lewis* 2222 (QCNE); Isla de la Plata, sendero Punta Escalera, "01°18'S, 081°06'W" [ca. 01°16'S, 081°04'W], 20–50 m, 18 Aug 1993 (fl.), *T. Núñez* 124 (QCNE); Isla de la Plata, no further site information, [ca. 01°17'0.59"S, 081°03'06.71"W], ca. 50 m, Aug 1990 (fl.), *Bristol University Expedition* 3 (QCA).

Verified iNaturalist Observations: Manabí: Isla de la Plata, -1.27420, -81.06737, 29 Jul 2022 (fl.), bb_593 <https://www.inaturalist.org/observations/132369606>; Puerto López, -1.48628, -80.79209, 20 Aug 2023, Nicolás Baresch Uribe (nbareschu) <https://www.inaturalist.org/observations/179513591>; Isla de la Plata, -1.27152, -81.06887, 1 Nov 2021 (fl.), David Torres C. (dawicho) <https://www.inaturalist.org/observations/100263141>; Isla de la Plata, -1.26906, -81.06688, 1 Nov 2021 (fl.), David Torres C. (dawicho)

<https://www.inaturalist.org/observations/100259872>; Puerto López, -1.48719, -80.79226, 31 Oct 2021 (fl.), David Torres C. (dawicho) <https://www.inaturalist.org/observations/100254167>; Puerto López, -1.48638, -80.79194, 31 Oct 2021 (fl.), Diego Torres Sierra (diego torres sierra) <https://www.inaturalist.org/observations/99939231>; Isla de la Plata, -1.27040, -81.06755, 5 Dec 2021 (fl.), Daniel Velasco C. (davelascoc) <https://www.inaturalist.org/observations/102775188>; Isla de la Plata, -1.26891, -81.06674, 31 Jul 2022 (fl.), Andra Waagmeester (andrawaag) <https://www.inaturalist.org/observations/128877430>; Faro Antiguo San Lorenzo, -1.05880, -80.91100, 17 Nov 2025 (fl.), Alex Greene (accidentalshrike) <https://www.inaturalist.org/observations/342642127>; Machalilla, -1.48627, -80.79210, 20 Nov 2025 (fl.), Alex Greene (accidentalshrike) <https://www.inaturalist.org/observations/342642439>; Montecristi [Isla de la Plata], -1.26853, -81.06660, 22 Nov 2025 (fl.), Alex Greene (accidentalshrike) <https://www.inaturalist.org/observations/342641692>; XHG7+JX9 [Portoviejo], -1.02394, -80.43645, 28 Nov 2025 (fl.), Alex Greene (accidentalshrike) <https://www.inaturalist.org/observations/342641328>.

Notes: Plants lacking flowers may be confused with the more commonly encountered *T. nervosum*. These species are clearly distinguished by the pinnately nerved bracts of *T. machalilla* vs. the palmately or plinerved bracts of *T. nervosum*. Núñez 124 from Isla de la Plata is described as having white flowers but otherwise conforms to *T. machalilla*. The "white" flowers likely refer to the corollas fading to whitish as they wilt, as happens in fresh material several hours after collection. No color variability has been observed in the field, and images from different areas of Isla de la Plata (the same locality as Núñez 124) uploaded at iNaturalist by several observers (accessed 1 Mar 2026) between 2021 and 2022, as well as images by A. Greene in 2025 show *T. machalilla* with typical bluish corollas. How *Tetramerium machalilla* reached Isla de la Plata, which is located 25–35 km west of the continental coast of Ecuador, may be explained by hypothetical endozoochoreal dispersal of seeds via birds, or by pre-Hispanic transportation of seeds or plants from continental Ecuador. According to the archaeological records the island has been regarded as a sacred place and oceanic sanctuary with human visitation spanning three and a half millennia (McEwan and Lunniss, 2022)

KEY TO *TETRAMERIUM* IN ECUADOR

- 1a. Corolla white with purple and/or maroon markings (often accompanied by a blue tinge) on the upper lip, and sometimes with purplish veins on distal portion of lobes of the lower lip; calyx 4-lobed...*T. nervosum*
- 1b. Corolla blue to blue-purple with darker blue to blue-purple markings in and around a central white patch on the upper lip; calyx 5-lobed...2
- 2a. Inflorescence rachis and abaxial surfaces of floral bracts, bracteoles, and calyx pubescent with eglandular trichomes only; floral bracts 6–9 mm wide, 1.3–2 times longer than wide; calyx 2–3.5 mm long...*T. machalilla*
- 2b. Inflorescence rachis and abaxial surfaces of floral bracts, bracteoles, and calyx pubescent with both eglandular and glandular trichomes; floral bracts 1.5–5 mm wide, 3.2–5.5 times longer than wide; calyx 3.5–7 mm long...*T. wasshausenii*

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LITERATURE CITED

- BACHMAN, S., AND J. MOAT. 2012. GeoCAT—an open-source tool for rapid Red List assessments. *BGjournal* 9: 11–13.
- DANIEL, T. F. 1986. Systematics of *Tetramerium* (Acanthaceae). *Syst. Bot. Monogr.* 12: 1–134.
- DANIEL, T. F. 2024. *Tetramerium* (Acanthaceae) in the Depresión del Balsas Biogeographic Province of Mexico, two new species and a new combination. *Revista Mex. Biodivers.* 95: e955471. <https://doi.org/10.22201/ib.20078706e.2024.95.5471>
- DODSON, A. H., AND A. H. GENTRY. 1991. Biological extinction in western Ecuador. *Ann. Missouri Bot. Gard.* 78: 273–295.
- HAPP, G. B. 1937. Monograph of *Tetramerium* and *Henrya*. *Ann. Missouri Bot. Gard.* 24: 501–583.
- INATURALIST. <https://www.inaturalist.org> (accessed 1 March 2026).
- IUCN STANDARDS AND PETITIONS COMMITTEE. 2024. Guidelines for Using the IUCN Red List Categories and Criteria. Version 16. <http://www.iucnredlist.org/documents/RedListGuidelines.pdf> (accessed 1 March 2026).
- MCEWAN, C., AND R. LUNNISS. 2022. Isla de la Plata, Ecuador: An Oceanic sanctuary from circa 2000 BCE to 1531 CE. Pages 531–565 in C. MCEWAN AND F. SACHSE, eds., *Waves of influence: Pacific Maritime Networks Connecting Mexico, Central America and Northwestern South America*. Dumbarton Oaks Research Library and Collection, Washington, DC.
- MYERS, N. 1988. Threatened biotas: “Hot spots” in tropical forests. *The Environmentalist* 8: 187–208.
- THIERS, B. 2025. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden’s Virtual Herbarium. Available at <http://sweetgum.nybg.org/ih/> (accessed 1 June 2025).
- WASSHAUSEN, D. C. 2013. Acanthaceae. In C. PERSSON AND B. STAHL, eds., vol. 89 of *Flora of Ecuador*. University of Gothenburg, Goteborg, Sweden.

FIGURES

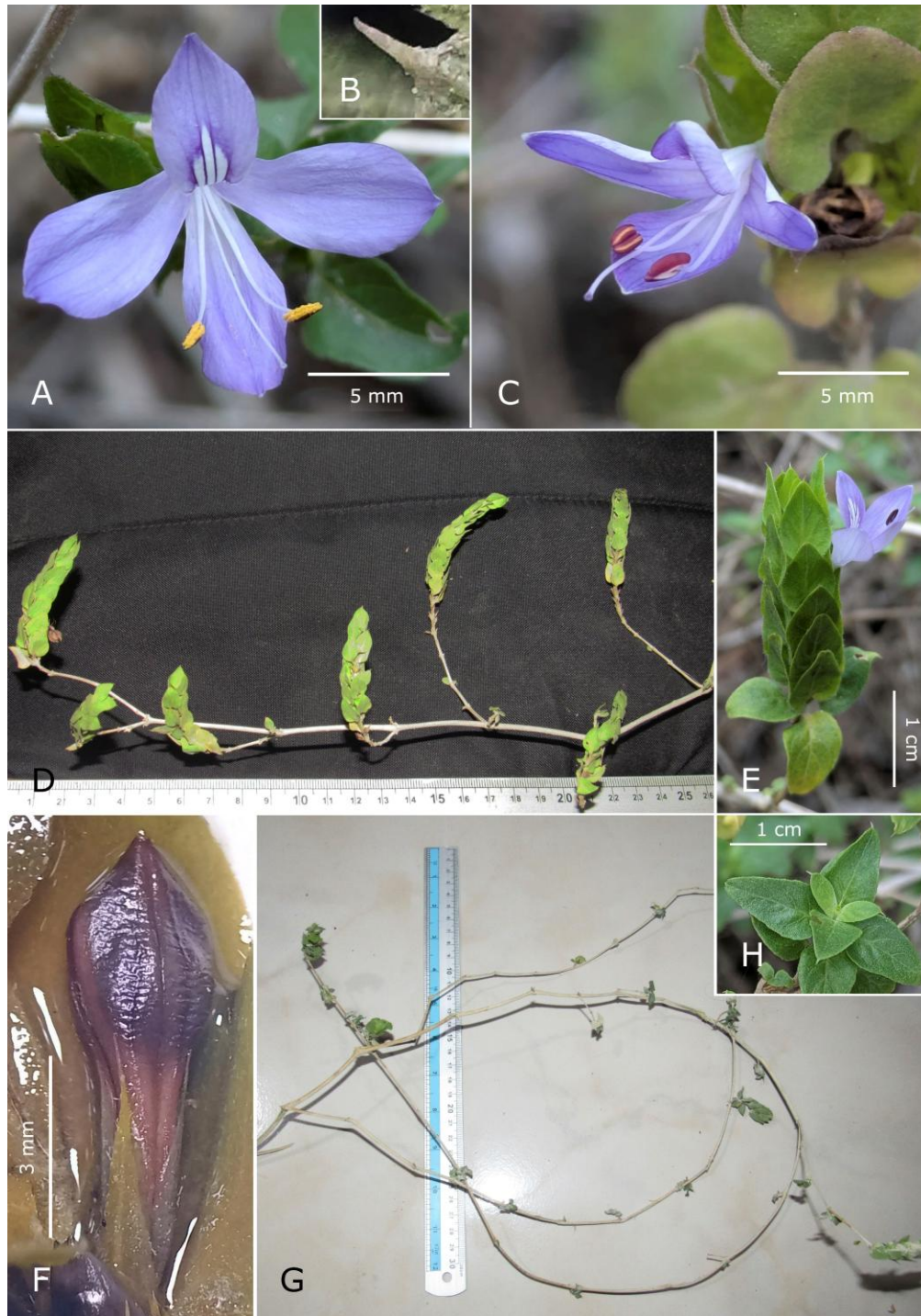


FIGURE 1. *Tetramerium machalilla*. **A**, mature open flower, frontal view; **B**, apex of floral bract; **C**, partially open flower, lateral- view from above; **D**, spreading branch with short lateral branchlets; **E**, terminal bracteate spike and open flower; **F**, capsule subtended by persistent calyx, material in alcohol; **G**, developed branches with short leaves and spikes; **H**, decussate leaves, adaxial view. **A**, **C**, **E**, and **H** from field images by Alex Greene; **B**, **D**, **F**, and **G**, are based on *Cornejo et al. 10080* (GUAY).

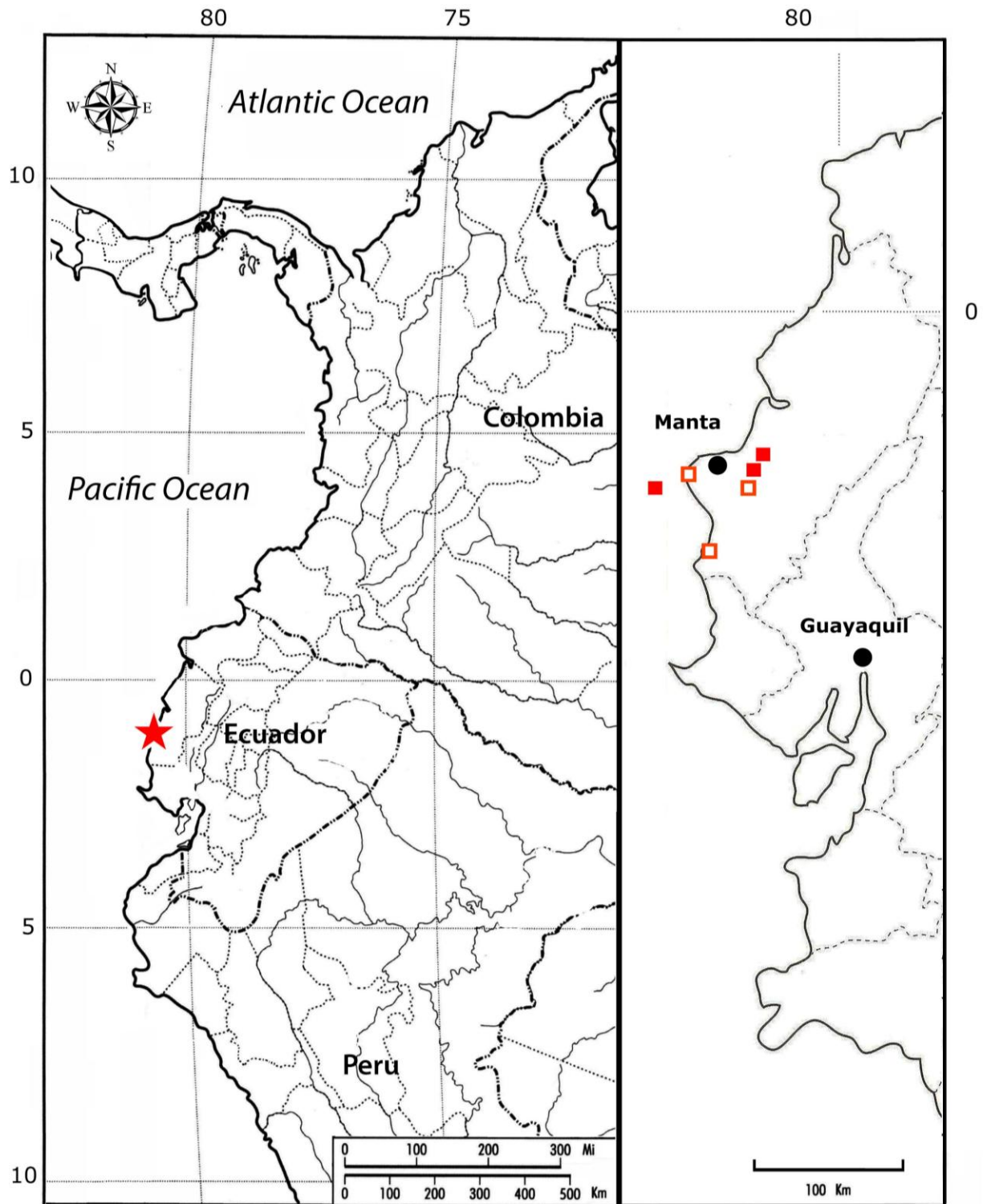


FIGURE 2. Distribution map of *Tetramerium machalilla* in northwestern South America (red star, left) and western Ecuador (right), herbarium vouchers (solid squares), additional iNaturalist observations (empty squares).



FIGURE 3. *Tetramerium machalilla*, holotype in GUAY.