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Research Article

Psychotria caraballoensis (Rubiaceae), a new species from northern Luzon, Philippines

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In this paper, we describe and illustrate *Psychotria caraballoensis*, a new endemic species from the Caraballo Mountain Range, Luzon, Philippines. It is allied to the Subalpina species group sensu Sohmer and Davis (2007), and resembles *Psychotria sohotonensis*. However, it is distinct by its greater number of lateral veins, leaf blades drying khaki to dark brown, inflorescences/infructescences with axes branching into verticillate or oppositely branched cymules, puberulous flowers with longer corolla lobes, smaller and globose to subglobose fruits, and ruminate endosperms. It is one of few species of Philippine *Psychotria* documented to have both long and short-styled flower morphs. The conservation status of this species is proposed as 'Endangered' (EN), due to its restricted range and the presence of anthropogenic threats in the area.

Keywords: distylous, montane, Nueva Vizcaya, Philippine flora, Psychotrieae, taxonomy

Introduction

Given the immense biodiversity found within the Philippines, a renowned global hotspot (Myers et al. 2000) and a priority region for plant collection (Ondo et al. 2024), the prevalence of 'big genera' as characterized by Frodin (2004) emphasizes its vast yet often underexplored botanical wealth. Among these, *Psychotria* L. stands out as one of the country's largest genera with over a hundred endemic species (Pelser et al. 2011 onwards; POWO 2025), and as an ecologically important component of rainforests (Snow 1981, Herrera 1989, Gentry 1990). Building on the taxonomic foundation laid by Sohmer and Davis (2007), subsequent studies have expanded the understanding of the genus through recollections and rediscoveries (Ordas et al. 2019, Biag and Alejandro 2020, 2022, Batuyong et al. 2021), descriptions of new species (Bautista et al. 2024, Ordas et al. 2025), and investigations into its pharmaceutical

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potential (Aureada et al. 2023, Capistrano et al. 2025). Yet, approximately 74% of its members, as provisionally assessed by Sohmer and Davis (2007), are threatened or presumed extinct due to the severe deforestation of Philippine forests over the past century. Moreover, many species have not been recollected since their original descriptions, and large areas of Philippine forests remain unexplored, where many species potentially await discovery. Hence, continued botanical exploration is needed to understand the true diversity of *Psychotria* in the Philippines and to verify the status of its species in the wild as crucial steps for effective conservation.

In the country's northern regions, the Caraballo Mountain Range (CMR) serves as a vital watershed sanctuary and is identified as one of the 19 terrestrial biodiversity corridors and a high-priority area under the Philippine Biodiversity Conservation Priority Areas (Ong et al. 2002, Gojo Cruz and Afuang 2018, Gojo Cruz et al. 2018), linking two major mountain ranges, the Cordillera and the Sierra Madre. While listed for its significance in Philippine biodiversity, CMR remains largely undocumented regarding its local flora compared to other mountain ranges in Luzon. Ang et al. (2022) conducted the only study in CMR over the past decades, describing a new *Begonia* L. species. However, their floristic survey was performed only in the Pantabangan–Carranglan Watershed Forest Reserve in the province of Nueva Ecija, leaving the side of Nueva Vizcaya entirely undocumented.

To address this critical knowledge gap, floristic surveys in CMR were undertaken, covering several areas of Nueva Vizcaya. During our fieldwork, specifically in the municipalities of Dupax del Sur and Aritao, we collected *Psychotria* species that were initially identified as *P. subalpina* Elmer. However, upon further detailed examination of the material, we found it distinct from all known *Psychotria* species. Hence, it is described here as a species new to science.

Materials and methods

The description of the new species was based on the materials collected in 12–23 April 2025, encompassing Purok Catanan, Barangay Banila, Dupax del Sur, and Mount Kudoh, Barangay Canabuan, Aritao. Initial identification of the material was carried out using taxonomic keys and descriptions by Sohmer and Davis (2007) and through protologues, with comparisons made between specimens from USTH and PNH. In addition, we compared the specimens with available live images from Co's Digital Flora of the Philippines (Pelser et al. 2011 onwards) and digitized types deposited in the global biodiversity information facility (GBIF) and global plants on JSTOR. Morphological observations and measurements were performed under an Euromex EduBlue digital microscope and Olympus SZ51 dissecting microscope, guided by the character state terminologies by Beentje (2016). These specimens were deposited in USTH, FEUH, and PNH. The area of occupancy (AOO) was obtained using the Geospatial Conservation Assessment Tool (GeoCAT; Bachman et al. 2011) and the IUCN red list categories and criteria (IUCN Standards and Petitions Committee 2024) was used to assign preliminary conservation status.

Psychotria caraballoensis Pajarillaga, Ordas & Moran sp. nov. (Fig. 1–2)

Diagnosis

A species closely resembling *Psychotria sohotonensis* Sohmer and Davis, but distinct by its leaf blades with numerous lateral veins (14–19 versus 10–14) drying khaki to dark brown (versus dark brown to dark olivaceous brown), inflorescences/infructescences with axes that further branch into verticillate or oppositely branched cymules (versus axes terminating into shortly branched cymules), puberulous flowers (versus glabrous) with longer corolla lobes (2.7–3.2 mm versus 1.5 mm), smaller (4.0–5.5 mm versus 8–9 mm) globose to subglobose fruits (versus ellipsoid-globose), and ruminate endosperms (versus entire). Additionally, dimorphic flower morphs with long and short styles were observed.

Type: Philippines, Purok Catanan, Barangay Banila, Dupax del Sur, Nueva Vizcaya, forested area, 16°09′03.91″N, 121°06′48.11″E, 13 Apr. 2025, 1293 m a.s.l., J. D. Pajarillaga, J. A. D. Ordas, E. J. A. Odulio, A. C. Agorto, G. N. G. Cortez, L. C. P. Santiago, et al. NVB-054 (holotype: PNH; isotypes FEUH, PNH, USTH).

Etymology

This species was named after the Caraballo Mountain Range of Nueva Vizcaya Province, where it was discovered.

Description

Shrub, ca 1–2 m tall. Young stems glabrous; mature stems light gray, glabrous to rarely sparsely puberulent; internodes 2.0–5.1 cm long. Stipules caducous, valvate to semi-imbricate, linear to linear lanceolate, 1.2–1.4 × 0.5–0.6 cm, glabrous outside to becoming puberulent at base, densely villous inside at base, brownish, narrowly acute to attenuate at apex. Leaves opposite; petioles 0.6–1.5 cm long, glabrous; leaf blades narrowly lanceolate to narrowly elliptic, (4.0–4.5)5.8–11.6 × 0.9–2.6 cm, glabrous at both surfaces, chartaceous, drying khaki to dark brown; lateral veins brochidodromous, 14–19 on each side of the midrib, somewhat obscure and impressed on the adaxial side; tertiary venation manifest to obscure; base attenuate to cuneate; apex acuminate, sharp and slightly curved. Inflorescences/infructescence trichotomous, erect, (1.3–1.8–)2.6–4.5 cm long, puberulous; principal axis (0.2–0.7–)1.1–2.8 cm long, each axis with 1–2(–3) primary nodes and verticillate or 2–4 opposite branches (usually at the first node) at each node, branches terminating in cymules of 3–5 flowers; bracts semi-persistent triangular, 3 mm long, puberulous, acute at apex; bracteoles semi-persistent, narrowly ovate to linear, 0.6 mm long, puberulous. Flowers 5-merous, distylous; pedicels 1–2 mm long, puberulous; calyx (including hypanthium) 1.0–1.4 mm long, sparsely puberulous; calyx

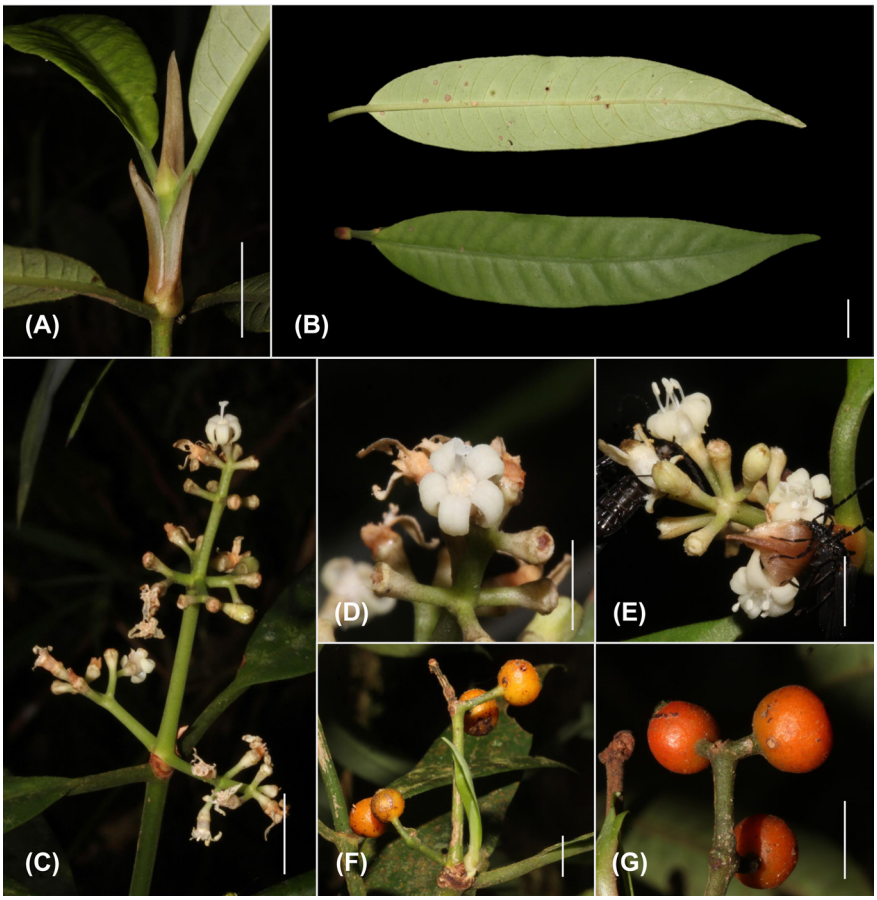


Figure 1. *Psychotria caraballoensis* sp. nov. (A) Leaf attachment and stipules, (B) leaves with abaxial side (top) and adaxial side (below), (C) inflorescence, (D) long-styled flower (pin), (E) short-styled flower (thrum), (F) infructescence, (G) fruits. Scale bar A–C = 1 cm, D–G = 5 mm. Photographs A and C–F by Lyle Christian P. Santiago and B and G by Sarah Grace S. Zamudio.

lobes truncate, reduced with a dentate margin, 0.25–0.30 mm long; corolla white to cream, short-tubular, very sparsely puberulous; corolla tube 1.5–2.0 mm long, very sparsely puberulous outside, villous at the throat within; corolla lobes oblong, 2.7–3.2 mm long, recurved to strongly recurved, acute at apex, slightly involute. Stamens of short-styled flowers exserted ca 2 mm from the corolla whereas inserted within the throat in long styled flowers; filaments 1.5–1.6 mm long; anthers 0.9–1.0 mm long. Ovary 0.8 mm long; style 0.9 mm long (short styled) and 2 mm long (long-styled), glabrous; stigma bifurcated, 1 mm long, glabrous. Fruits globose to subglobose, 4.0–5.5 mm × 3.0–5.0 mm, smooth, light orange to red-orange, puberulent above near the calyx remnant; calyx remnant persistent without lobes, 0.5 mm, truncate; pyrenes globose to ovate, smooth, unribbed, 3.0–4.0 mm × 3.5 mm; endosperm ruminate.

Phenology

We encountered *P. caraballoensis* in both flowering and fruiting during the fieldwork. Hence, it can be expected that flowering occurs during March to April, and full fruiting is expected to be in May to June.

Distribution, habitat, and ecology

Psychotria caraballoensis is currently recorded from the Caraballo Mountain Range in Dupax del Sur and Aritao, Nueva Vizcaya (Fig. 3). It occurs as understory shrubs in very moist humus soils of primary mossy forests at elevations of 1100–1300 m a.s.l. Observed floral visitors include longhorn beetles and bees, which are potential pollinators.

Provisional conservation status

Presently, *Psychotria caraballoensis* is only recorded in the primary montane forests of Barangays Canabuan in Aritao and Banila in Dupax del Sur. With an estimated area of occupancy (AOO) = 32.00 km^2, we propose this species to be 'Endangered' (EN). We observed numerous individuals scattered across these areas, and we expect to encounter more populations with further explorations within CMR. However, these populations face significant and escalating threats, as the surrounding areas experience extensive conversion for upland agricultural use, resulting in habitat fragmentation. This limits the gene flow between populations, therefore increasing their vulnerability. In addition to this, we observed small-scale mining and timber poaching activities

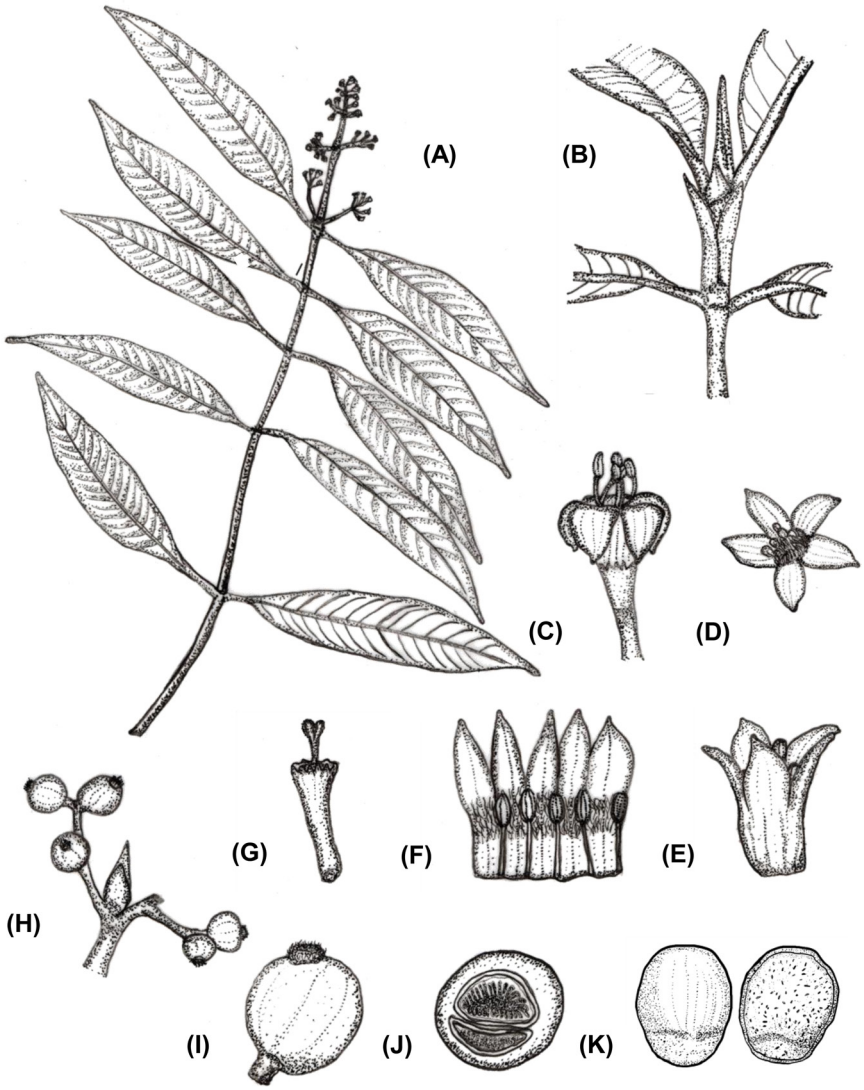


Figure 2. *Psychotria caraballoensis* sp. nov. (A) Flowering individual, (B) stipules and leaf attachment, (C) short styled flower, (D) short styled flower front view, (E) corolla, (F) opened corolla, (G) calyx and hypanthium of short styled flower, (H) infructescence, (I) fruit, (J) fruit cross-section showing pyrenes, (K) pyrenes (left – dorsal view, right -ventral view). Scale bars – A = 1 cm, B–K = 1 mm. Illustrated by Propa Joy S. Venturina.

occurring in these areas, which pose a risk to the species' current habitat and its long-term survival.

Similar species

With small leaf blades and trichotomous inflorescences, *Psychotria caraballoensis* is affiliated with the Subalpina group of Sohmer and Davis (2007). It highly resembles *P. acuminatissima* Elmer, a Luzon endemic, and *P. sohotonensis*, a Samar endemic, due to their linear-narrow leaves. However, both species are easily distinguished from this new species based on their inflorescences and their fruits alone, despite the lack of floral features for *P. sohotonensis* upon investigation of the types, hence requiring recollection in the field. A detailed comparison between the three species is provided in Table 1.

Interestingly, *Psychotria caraballoensis* and ten other Philippine species are so far confirmed with distylous flowers, with the majority with no flowers observed and bearing either long-styled (pin) or short-styled (thrum) flowers only (Sohmer and Davis 2007, Bautista et al. 2024, Ordas et al. 2025). During the fieldwork, we observed pin individuals bearing fruits but have yet to observe whether thrum individuals bear fruit, as we have only encountered them as flowering. As heterostyly occurs on separate individuals for this species, we have examined the anther sacs of thrum individuals for the presence of pollen grains, with their absence as a possible indicator for functional dioecy as seen in *Psychotria rubra* (Lour.) Poir. (treated as a synonym of *Psychotria asiatica* L.), occurring in the Ryukyu Islands, Japan (Watanabe et al. 2013). While there are pollen grains present within its anthers, it is yet to be confirmed whether these are functional with detailed anatomical investigations and further field observations.

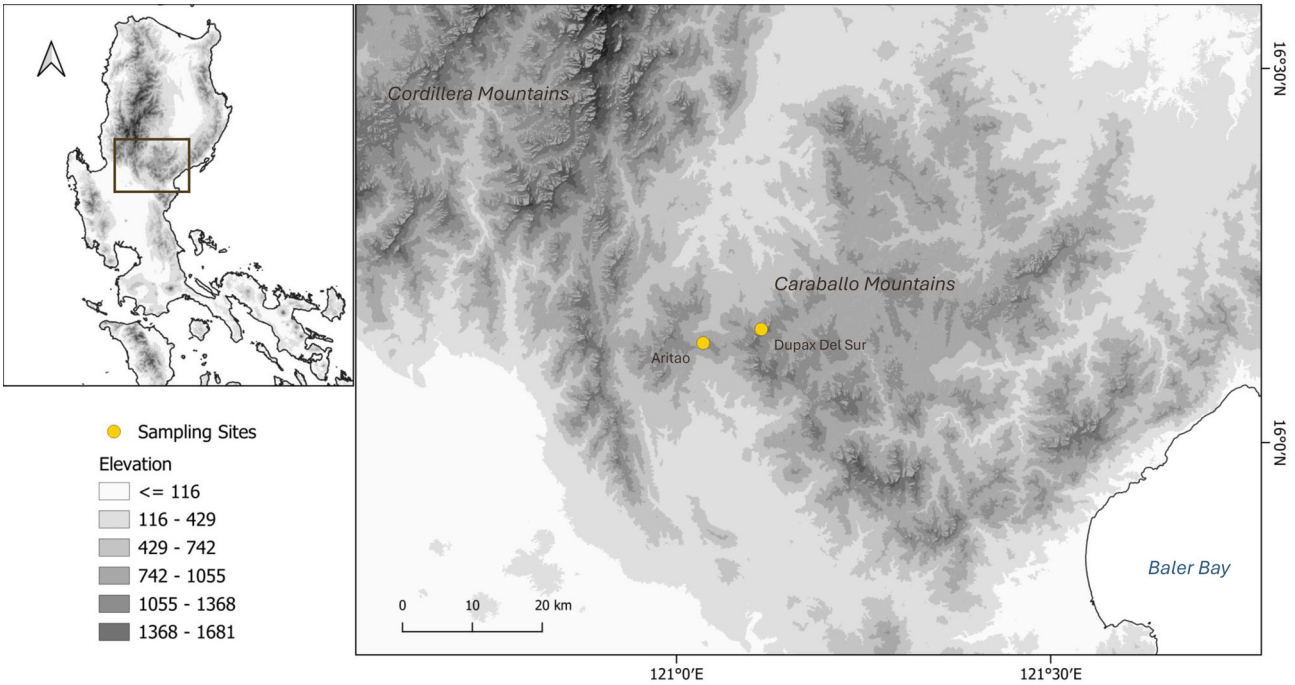


Figure 3. Recorded distribution of *Psychotria caraballoensis* sp. nov. in the Caraballo Mountains, Nueva Vizcaya.

Table 1. Morphological comparison of *Psychotria caraballoensis* sp. nov. with *P. acuminatissima* and *P. sohotonensis*. Hyphen (-) indicates the characters were not observed.

Characters	*Psychotria caraballoensis*	*Psychotria sohotonensis*	*Psychotria acuminatissima*
Stipules			
Length (cm)	1.2–1.4	0.7–1.8	0.6–1.6
Leaf blade			
Drying color	khaki to dark brown	dark brown to dark olivaceous brown	dark brown to dark olivaceous brown
Venation	brochidodromous	brochidodromous	camptodromous
No. of secondary veins	14–19	10–14	8–13
Inflorescences			
Arrangement	axis with 1–2(–3) primary nodes and verticillate or 2–4 opposite branches (usually at the first node) at each node, branches terminating in cymules of 3–5 flowers	axis terminating in a node with 5–15 shortly branched cymules	axis with 1(–2) nodes with a single cymule at each node
Texture	puberulous	glabrous	glabrous
Flowers			
Calyx size (mm)	1.0–1.4	1.5–2.0	–
Corolla color	white to cream	greenish white	–
Corolla texture	puberulous	glabrous	–
Corolla lobe length (mm)	2.7–3.2	1.5	–
Filament length (mm)	1.5–1.6	ca 1	–
Anther length (mm)	0.9–1.0	0.6	–
Fruits			
Pedicel length (mm)	1–2	1	2–4(–5)
Shape	globose to subglobose	ellipsoid-globose	obovoid
Size (mm)	4.0–5.5	8–9	5–7
Texture	puberulent above near the calyx	glabrous	glabrous
Calyx remnant	persistent without lobes	persistent but obscure	not persistent
Pyrenes	smooth, unribbed	smooth or slightly ribbed	smooth unribbed
Endosperm	ruminate	entire	ruminate

Paratypes
Philippines, Purok Catanan, Barangay Banila, Dupax del Sur, Nueva Vizcaya, forested area, 16°09′03.91″N, 121°06′48.11″E, 13 Apr. 2025, 1293 m a.s.l., J. D. Pajarillaga, J. A. D. Ordas, E. J. A. Odulio, A. C. Agorto, G. N. G. Cortez, L. C. P. Santiago, et al. NVB-059 (FEUH, PNH, USTH). Philippines, Purok Catanan, Barangay Banila, Dupax del Sur, Nueva Vizcaya, forested area, 16°09′03.91″N, 121°06′48.11″E, 13 Apr. 2025, 1293 m a.s.l., J. D. Pajarillaga, J. A. D. Ordas, E. J. A. Odulio, A. C. Agorto, G. N. G. Cortez, L. C. P. Santiago, et al. NVB-261 (FEUH, PNH, USTH). Philippines, Mount Kudoh, Barangay Canabuan, Aritao, Nueva Vizcaya, forested area, 16°07′57.34″N, 121°02′08.64″E, 22 Apr. 2025, 1165 m a.s.l., J. D. Pajarillaga, J. A. D. Ordas, E. J. A. Odulio, A. C. Agorto, L. C. P. Santiago, S. G. S. Zamudio, et al. NVC-026 (FEUH, PNH, USTH).

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Conflict of interest – The authors declare no conflict of interest.

Author contributions

Jenifer D. Pajarillaga: Data curation (equal); Funding acquisition (lead); Investigation (lead); Resources (lead); Writing – original draft (lead); Writing – review and editing (equal). **Jorge Anton D. Ordas**: Conceptualization (lead); Investigation (supporting); Supervision (supporting); Writing – original draft (supporting); Writing – review and editing (equal). **Eiana Joshier A. Odulio**: Data curation (equal); Investigation (supporting); Writing – review and editing (equal). **Propa Joy S. Venturina**: Investigation (supporting); Visualization (lead); Writing – review and editing (equal). **Cecilia B. Moran**: Conceptualization (supporting); Supervision (lead); Writing – review and editing (equal).

Data availability statement
This article has no additional data.

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