HISTORIC DISCOVERY OF A NEW SPECIES OF *LUVUNGA* (RUTACEAE) FROM MINDANAO, SOUTHERN PHILIPPINES

KEAN ROE F. MAZO[1] AND ARKADY A. TAHIL[2,3,4]

Abstract. After 113 years since the only *Luvunga* species was described from the Philippines and after 36 years since the latest species of the genus was formally described from Sabah, Borneo, a species new to science of *Luvunga* from Zamboanga del Norte, Southern Philippines, *L. subanense*, is described and illustrated. The new species differs from similar species, *L. philippinensis* and *L. crassifolia*, by having longer thorns, longer petioles and an inflorescence of four-flowered cymes. It further distinguishes from its most similar species, *L. philippinensis*, by having nine stamens (vs. 10), shorter filaments (4–4.5 mm vs. 6 mm) and ovoid ovary (vs. oblong) which is globular in cross-section (vs. quadrangular). Figures, a table of comparing the new species to *L. philippinensis* and *L. crassifolia*, notes on distribution, habitat and conservation status are provided. This novelty brings the total number of *Luvunga* species to 15 of which four are found in the Philippines.

Keywords: *Luvunga philippinensis*, Mindanao, morphology, Rutaceae, taxonomy, Zamboanga

Rutaceae comprise of about 150 genera that are usually trees and shrubs distributed in both tropical and temperate regions. Leaf character in this family can be alternate or opposite and simple or compound while the inflorescence can be solitary or in fascicles, axillary or terminal, and regular or perfect. Two closely related genera with unusual habit in this family, *Luvunga* Buch.-Ham. ex Wight & Arn. and *Paramigna* Wight, are clambering woody lianas that have retrorse or sometimes strongly recurved thorns that act as anchorage to the branches of trees (Swingle, 1943). All species in the genus *Luvunga* in particular, exhibit this habit that allows the plants to climb to the canopy of tropical evergreen forests. The genus *Luvunga* is composed of at least 14 species, all of which are very similar morphologically. In general, species within the genus are characterized by having 3-foliate leaves, very long wingless petioles and clusters of scented flowers in the leaf axils. In contrast to the genus is well-characterized and easily recognizable, the majority of the species are not clearly distinguishable (Stone, 1985), perhaps because reproductive characters of several species in the genus were not known or poorly. For example, the flowers of *L. calophylla* Kurz. were unknown up until recently, and the majority of the accounts for various species lacks uniformity in the description of their floral characters such as number of stamens, length of filament and calyx, and shape of the ovary both externally and in cross-section. There is also a lack of documentation on the size of flowers in almost all species. Despite being poorly described, some species are distinguishable by their unique vegetative characters. For example, *L. motleyi* Oliv. has the longest petiole within the genus which can reach up to 30.5 cm, while *L. borneensis* Hochr. is the only species with distinctly broadly elliptical leaflets and *L. papuana* Lauterb. as the only species with thorns being coiled in a spiral manner. Another example is *L. monophylla* (DC.) Mabb which is the only species in the genus with leaves being exclusively simple rather than compound. Undoubtedly the only *Luvunga* species with unique floral character, *L. minutiflora* B.C. Stone, is the latest species described in the genus from the district of Sandakan, Sabah, Borneo, in 1985: it has very small flowers, perhaps the smallest in the genus.

Species of *Luvunga* are found in India, Sri Lanka, Indo-china, Sumatra, Java, Timor, Malay peninsula, Borneo, the Philippines, Australia, and New Guinea. In the Philippines, only three species of *Luvunga* are recorded (Pelser *et al*., 2011 onwards): *L. monophylla*, *L. philippinensis* Merr. and *L. scandens* (Roxb.) Buch.-Ham., none of which are endemic to the Philippines. In fact, *L. philippinensis* has a patchy distribution from Palawan to Western Mindanao and extends downwards to Borneo. Described by Merrill in 1908 from Zamboanga (probably Zamboanga del Sur), *L. philippinensis* was the only *Luvunga* species originally described from the Philippines.

In the course of taxonomic study of flora in Zamboanga del Norte, a species of *Luvunga* was encountered, collected and studied, tentatively identified as *L.* cf. *philippinensis* due to similarities on vegetative characters. Thorough examination of materials was carried out by the authors and the specimens (see Appendix) appeared to be distinct from *L. philippinensis*. After extensive comparison, this unidentified species found no match among the all known species within the genus, and it is herein formally described and illustrated.

Luvunga subanense K.R. Mazo & Tahil, *sp. nov.* TYPE: PHILIPPINES. Mindanao, Zamboanga Del Norte Province: municipality of Leon B. Postigo, Brgy. Tinuyop, 8°3'56.34"N, 122°55'50.54"E, 330 m, 14 February 2021, *K. R. Mazo 30* (Holotype: PNH; Isotypes: CEBU, CMUH). Fig. 1–2.

We wish to express our gratitude to the Department of Environment and Natural Resources (DENR) Region 9 for the collection permit and the local government and indigenous community for their support. The first author is grateful to the Department of Science and Technology-Science Education Institute (DOST-SEI), and DOST-Science and Technology Regional Alliance of Universities for Inclusive National Development (STRAND Project) for his scholarship grant. We are also indebted to M. Appelhans of the University of Goettingen (Germany) for his insightful opinion during the early preparation of this manuscript and to the two anonymous reviewers for their constructive criticisms.

[1] Forest Biological Sciences Department, College of Forestry and Environmental Science, Central Mindanao University, Bukidnon, 8714, Philippines

[2] Institute of Oceanography and Environmental Science, Mindanao State University, Tawi-Tawi College of Technology and Oceanography, Sanga-Sanga, Tawi-Tawi 7500, Philippines

[3] Philippines Biodiversity Conservation Foundation Inc., c/o Negros Forest Ecological Foundation Compound, South Capitol Road, Bacolod City 6100, Negros Occidental, Philippines

[4] Corresponding author: kadymcrowell@gmail.com

Harvard Papers in Botany, Vol. 26, No. 2, 2021, pp. 427–431.

ISSN: 1938-2944, DOI: 10.3100/hpib.v26iss2.2021.n7, Published online: 31 December 2021

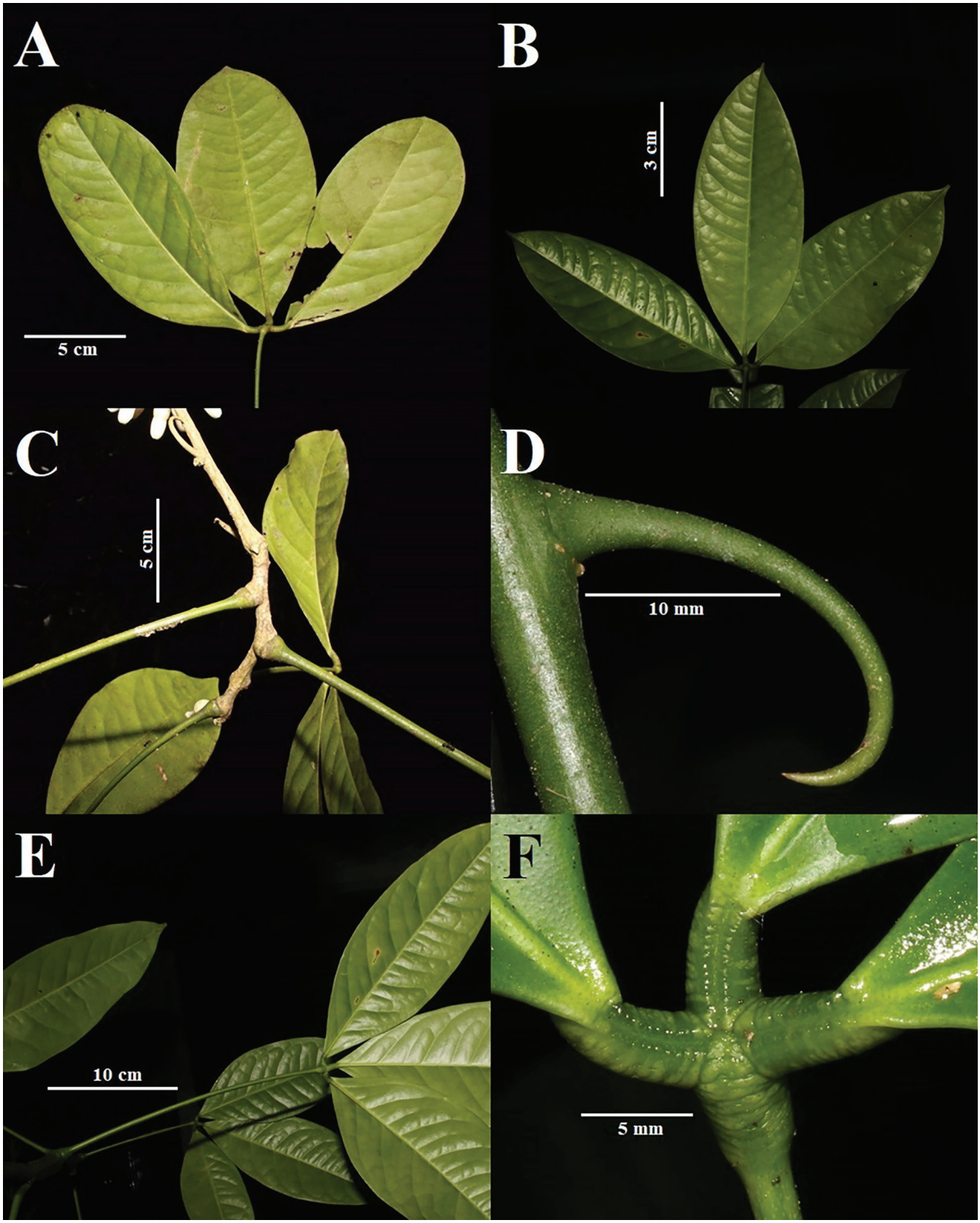

FIGURE 1. *Luvunga subanense* K.R. Mazo & Tahil. **A**, broadly elliptic leaflets; **B**, oblong-elliptic leaflets; **C**, branch showing swollen base of petiole and attachment; **D**, arcuate thorn; **E**, petiole; **F**, petiolules. Based on the holotype.

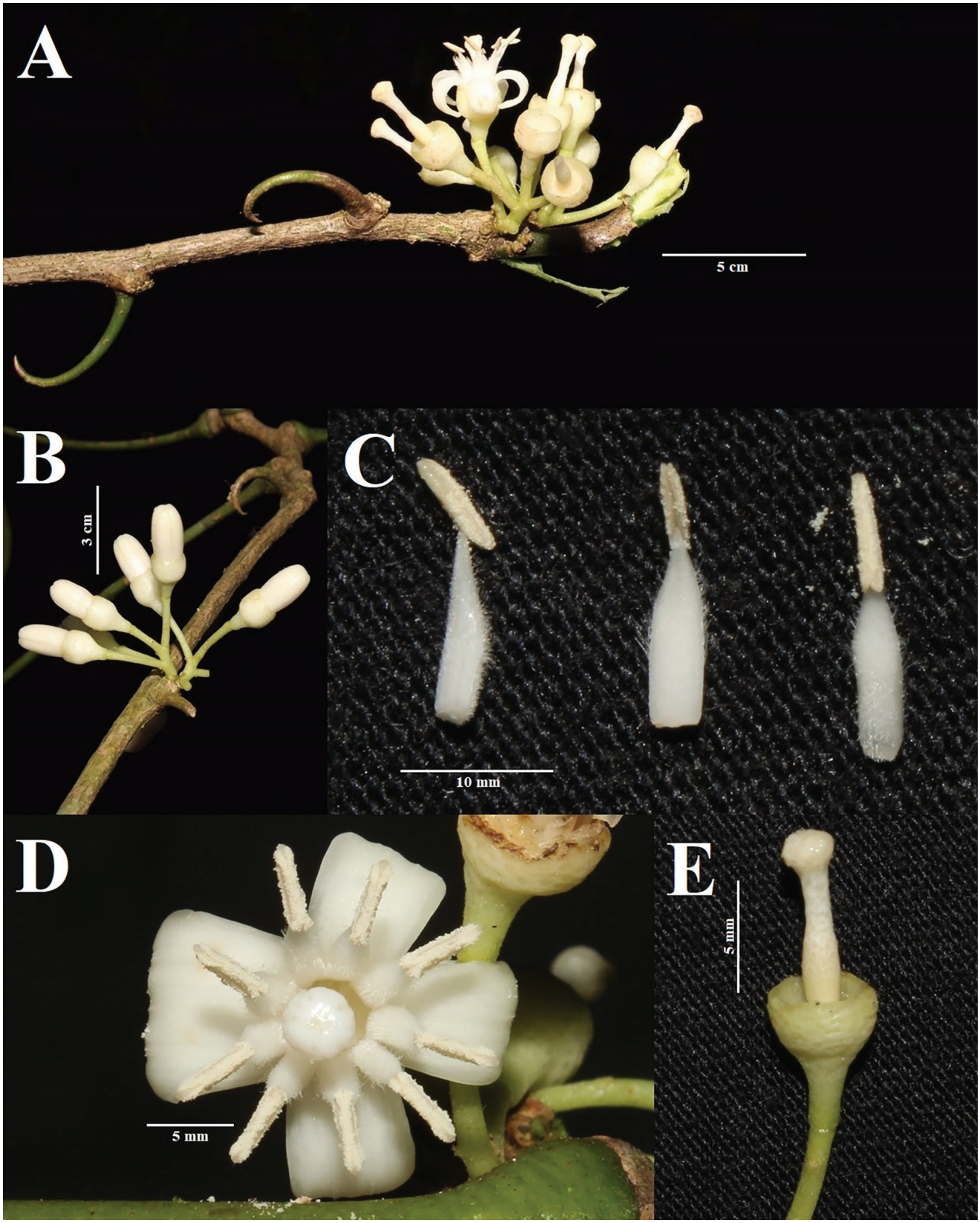

FIGURE 2. *Luvunga subanense* K.R. Mazo & Tahil. **A**, branch showing the inflorescence and arcuate thorns; **B**, flower buds; **C**, filaments and anthers; **D**, anterior close-up view of a flower showing the number of pubescent stamens and strongly reflexed petals; **E**, stipe, calyx, style and stigma. Based on the holotype.

A similar species to both *L. philippinensis* Merr. and *L. crassifolia* Tan. by having generally oblongate leaflets and pubescent filaments, but differing in the length of thorns (2.5–3.0 vs. 1.2–1.5 vs. 2.0–2.5 cm) and petioles (14–24 vs. 9–13 vs. 11–14.5 cm) and the number of flower being produced in each cyme (4 vs. 3 vs. 6). It is further distinguished from a much closer species, *L. philippinensis*, by having nine stamens (vs. 10), shorter filaments (4–4.5 vs. 6 mm) and ovoid ovary (vs. oblong) which is globular in cross-section (vs. quadrangular).

Scandent *shrub* up to 20 m tall, thorns distinctly arcuate, slightly dilated at the base, usually 2–3 mm in diameter, tapering toward the tip, 2.5–3.0 cm long; *bark* grayish to brown; young branch green, glabrous, becoming darker when mature. *Petiole* green, 14–24 cm × 1.5–4.5 mm in diam., glabrous, swollen at and apex and base, distinctly swollen base raised by 3–5 mm from the branch surface where it is connected, terete; *petiolules* furrowed at the surface, connected to the base of lamina, corrugated below, 3.5–9 × 2–4.3 mm, dark green, glabrous; *leaflets* 3, narrow, subcoriaceous, adaxial surface grass green, glossy, paler abaxially; terminal leaflets 15–28 × 7–10 cm, lateral leaflets 11.5–24 × 5.5–10 cm, glabrous, all blades oblong-elliptic or rarely broadly elliptic, base acute, apex acuminate, the acumen rounded, margin entire; midrib 0.8–1.0 mm in diameter, glabrous, light green, lateral veins 9–15 in each side, visible on both surfaces, much more conspicuous below, venation reticulate, tertiary veins almost inconspicuous. *Inflorescence* racemose cymes, consistently 4–flowered, axillary, borne on the branches below or sometimes away from the leaves, 2.7–3 cm long; cymes often paired into two, joining basally from a slightly swollen structure where they arise, 4–5 mm in diameter, but occasionally bears more than two cymes in cluster; pedicel 1–1.5 mm long, terete, pastel green, glabrous; peduncle 4–6.5 mm long, terete, pastel light green, glabrous. *Flowers* relatively large, 2–2.2 × 3.0 cm, divaricately borne along the cyme axis, fragrant; *Calyx* cupuliform, obscurely 5-toothed, 5–5.4 mm wide, 2.5 high, foveate, gradually tapering towards the stipe which is 3.2 mm long and articulated at the end before the peduncle; *Petals* 4, white, 9–11 × 4.5–6.6 mm, elliptic-oblong, imbricate, apically truncate, strongly arcuately reflexed. *Stamens* 9, connate; *filaments* 4–4.5 × 1.3–1.5 mm, ensiform, intensely pubescent; anthers erect, oblong, 2.8–3.0 mm long, basifixed, dehiscing longitudinally. *Ovary* globose to ovoid, glabrous, with 4 locules, 3.2 mm long, 1.6 mm thick, globular in cross-section. *Style* 7.7 mm, foveate, white; stigma capitate. *Fruit* not observed.

Etymology: This taxonomic novelty is named in honor of the indigenous Subanen people of Zamboanga Peninsula.

Distribution and habitat: *Luvunga subanense* is only known in the disturbed tropical lowland forest of barangay Tinuyop, Leon B. Postigo, Zamboanga del Norte, the Philippines along the river at elevation from 300–330 m elevation.

Phenology: This species has been observed flowering in the month of January and February.

Conservation Status: *Luvunga subanense* is currently known only from its type of locality based on three specimens studied. The information on the range of distribution of the species is still lacking. Thus, we proposed Data Deficient (DD) category (IUCN, 2019) for this species.

Luvunga subanense resembles *L. philippinensis* and *L. crassifolia* by having oblongate leaflets and pubescent filaments in general. The maximum number of lateral veins in *L. subanense* is similar to that of *L. crassifolia* (up to 15) while fewer in *L. philippinensis* (10 vs. 15). The length of the thorns is comparable among the three species. While the thorns in *L. philippinensis* is shorter of up to 1.5 cm only, the thorns of *L. subanense* are relatively longer than those of *L. crassifolia* (2.5–3.0 vs. 2.0–2.5 cm). In addition to the difference on thorn length, examination of herbarium specimens revealed that the thorns of *L. subanense* and *L. crassifolia* are thinner and more flexible that those of *L. philippinensis*. Discernable from the materials examined, unlike the thorns of *L. subanense* and *L. philippinensis*, the thorns of *L. crassifolia* are remarkably coiled at least once but not reaching to the degree as in the thorns of *L. papuana*. *Luvunga subanense* has the longest petiole (14–24 vs. 9–13 vs. 11–14.5 cm) among the three species and the second species in the genus, after *L. motleyi* which petioles can reach up to 30.5 cm. The merosity of flower in the cyme of the three species is dissimilar and this perhaps poses significance in species delimitation. *L. philippinensis* was described by Merrill (1908) in having three flowers in its racemose cymes which are fragrant and small. *Luvunga subanense* cymes bear consistently four flowers which are divaricately borne along the axis. The number of flower in the inflorescence of *L. crassifolia* was not mentioned in the original description of the species. However, Swingle (1943) noted some characters after examining a specimen identified by Tanaka as "*L. crassifolia*" in the herbarium of the Arnold Arboretum which shows an infructescence with six fruits, evidently indicating identical number of its flowers. Therefore, *L. subanense* is readily distinguishable from *L. philippinensis* and *L. crassifolia* by having longer thorns, significantly longer petioles, and the production of four flowers in its inflorescence.

Considering *L. philippinensis* as the most closely related species to *L. subanense* is undisputable as both are identical in shape of lamina, leaf base and leaf apex, having the calyx cupiliform which is obscurely toothed and these two species are sympatric, both shares geographic distribution in Zamboanga peninsula of the Island of Mindanao. On the other hand, *L. crassifolia* is distributed in Malay peninsula and the Islands of Borneo and Sumatra and is readily recognizable from *L. subanense* and *L. philippinensis* by having obtuse leaf base and rounded leaf apex. Despite the major diagnostic features presented above that recognizes *L. subanense* from *L. philippinensis* and *L. crassifolia*, the new species further distinguishes from *L. philippinensis* by having nine stamens (vs. 10), shorter filaments (4–4.5 vs. 6 mm) and ovoid ovary (vs. oblong) which is globular in cross-section (vs. quadrangular). A comparison of diagnostic characters of *L. subanense*, *L. philippinensis* and *L. crassifolia* is presented in Table 1.

TABLE 1. Morphological differences between *L. subanense, L. philippinensis* and *L. crassifolia*.

Character	***L. subanense***	***L. philippinensis***	***L. crassifolia***
Shape of lamina	Oblong to oblong-elliptic (rarely broadly elliptic)	Oblong to oblong-elliptic**	Obovate or oblong-ovate**
Length of thorns	2.5–3.0 cm	1.2–1.5 cm*	2.0–2.5 cm*
Length of petiole	14–24 cm	9–13 cm**	11–14.5 cm**
Leaf base	Acute	Acute**	Obtuse**
Leaf apex	Acuminate	Acuminate**	Rounded**
No. of pairs of lateral veins	9–15	8–10**	12–15**
No. of flowers in a cyme	4	3**	6**
No. of stamen	9	10**	Unknown
Length of filament	4–4.5 mm	6 mm**	Unknown
Ovary shape	Ovoid	Oblong**	Unknown
Ovary shape (in cross-section)	Globular	Quadrangular**	Unknown

* Based on specimens examined (see Appendix).
** Based on Swingle (1943).

LITERATURE CITED

IUCN. 2019. Guidelines for using the IUCN red list categories and criteria. Version 13. Prepared by the Standards and Petitions Subcommittee. Available at: http://www.redlist.org/documents/RedListGuidelines.pdf (accessed 23 July 2021)

MERRILL, E.D. 1908. New or noteworthy Philippine plants VI. The Philippine Journal of Science 3: 233.

PELSER, P. B., J. F. BARCELONA, AND D. L. NICKRENT (EDS.). 2011 onwards. *Co's Digital Flora of the Philippines*. Available at: www.philippineplants.org. (accessed April 20, 2021).

STONE, B. C. 1985. New and Noteworthy Paleotropical Species of Rutaceae. Proceedings of the Academy of Natural Sciences of Philadelphia 137, No. 2: 213–228.

SWINGLE, W. T. 1943. The Botany of *Citrus* and its wild relatives of the Orange subfamily. Pages 129–474 in H. J. WEBBER AND L. D. BATCHELOR, EDS., The Citrus Industry 1: History, Botany, and Breeding. University of California, Berkeley.

LUVUNGA SPECIMENS EXAMINED FOR MORPHOLOGICAL COMPARISON

Luvunga philippinensis Merr.

PHILIPPINES. District of Zamboanga, Mindanao, May 1913, *E. D. Merrill 8139* (K000736068)

Luvunga crassifolia Tan.

INDONESIA. Sungal Posang, Sintang, Kalimantan, Borneo, April 1994, *A. C. Church, U. W. Mahyar, I. Indah & Hamzah 1036* (L4151220). MALAYSIA. Tasik Kenyer, Hulu Terengganu, Terengganu, August 2017, *A. Julius 56137* (L4174131); Perias, West Kelantan, July 1964, *T. C. Whitmore 4214* (L2117193); Perias, West Kelantan, July 1967, *T. C. Whitmore 4159* (L2117201)