Ipomoea cambodiensis Gagnep. & Courchet (Convolvulaceae) recharacterised with notes on its distribution and ecology

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ABSTRACT
Recent field work in Lao PDR and the Malaysian state of Sabah produced multiple collections of a large-flowered *Ipomoea* that appeared to be the same species. The disjunct distribution, however, seemed anomalous. Checking type images and other specimens led to the name *I. cambodiensis* Gagnep. & Courchet, described from Cambodia. A full description, distribution map, discussion of the taxonomy, ecology, and perceived relationships, plus a compilation of all specimens seen to date are provided for this enigmatic and heretofore little known species.

KEY WORDS
biogeography,
SE Asia,
Borneo.

RÉSUMÉ
Ipomoea cambodiensis *Gagnep. & Courchet (Convolvulaceae) requalifié avec des notes sur leur distribution et l'écologie.*
Les prospections récentes en RDP Lao et dans l'état malaisien de Sabah ont fourni des récoltes nombreuses d'un *Ipomoea* à grandes fleurs, apparemment de la même espèce. La répartition disjointe semblait cependant anormale. Une comparaison avec les images des types et d'autres spécimens a conduit au nom *Ipomoea cambodiensis* Gagnep. & Courchet, décrit du Cambodge. Une description complète, une carte de répartition, une discussion taxonomique, l'écologie et les affinités envisagées, ainsi qu'une compilation de tous les spécimens vus à ce jour ont été fournies pour cette espèce énigmatique et jusqu'ici peu connue.

MOTS CLÉS
biogéographie
Asie du Sud-Est
Bornéo.

INTRODUCTION

In March 2010 the first and third authors spent 10 days collecting Convolvulaceae at various sites around the state of Sabah, Malaysia, on the island of Borneo. We encountered several times a large-flowered *Ipomoea* that was not recognized and seemed to be undescribed. However, further checking in the SING herbarium and attempts to key out the Sabah specimens using the Convolvulaceae account for *Flora Malesiana* (Ooststroom & Hoogland 1953, as amended) led to the name *I. ochracea* (Lindl.) G. Don. This identification seemed questionable: the Borneo plants differed from living populations of *I. ochracea* studied by GS (an African species naturalized in the Hawaiian Islands) in having consistently larger leaves and a more expansive habit; distinctive reddish innovations and young leaves; consistently deep basal sinus on the leaf blade; much larger flowers with a paler creamy white corolla (instead of a bright, butter yellow one); and the sepals also had a different shape and proportionality. Nevertheless, no other taxa matching the Sabah plants were found and so the name *I. ochracea* was taken up for them, albeit with misgivings. There the matter rested until 2012.

In November 2012 the first, second and fourth authors made a collecting trip to Lao PDR, under the auspices of Pha Tad Ke Botanic Garden in Luang Prabang. During the 4 days of field trips we again saw what looked to be the same large-flowered species of *Ipomoea* at several localities in Luang Prabang province. Color photos of the Sabah plants were compared with the Lao ones and they proved to be almost identical morphologically. These large-flowered plants are so different from the ones typically referred to *I. ochracea* that we believe they are specifically distinct. The name applied to Indochinese material since the *Flore Générale de l'Indochine* (Gagnepain & Courchet 1915) is *Ipomoea cambodiensis* and we think the Sabah plants are better included in this species concept, with which they agree almost perfectly. Based on the several recent collections examined, we here provide an enlarged and improved description for this species, previously known only from the syntype collections in Paris.

Ipomoea cambodiensis Gagnep. & Courchet (Figs 1; 2)

Notulae Systematicae 3: 143. 1915. — Type: **Cambodia**. Kampot, 20.XII.1903, *Geoffray 275* (syn-, P[P00288062], photo seen); without locality, same date, *Geoffray 275bis* (syn-, P[P00288063], photo seen). — **Laos**. Xiagnabouli: Paklay, anno 1866-68, *Thorel s.n.* (syn-, P[P00288064], photo seen).

Additional specimens examined. — **Laos.** Luang Prabang, along Hwy 13 between Luang Prabang city and Vientiane, near Km marker 331, where road crosses a small stream, 4.XI.2012, *Staples et al. 1512* (SING!, HNL!, KKU!, P!, A!); PK7, Rr. Ban Khittot, 13.II.1969, *Pedrono 40* (P!); Ban Khi Mot, 2.XI.1969, *Pedroño 132* (P!); Champasak, Huay Palai, open area near stream, 19.II.2010, *T. Wongprasert 102-42* (BKF!).
Vietnam. Đong Nai province: Biên Hòa, I.1866, *L. Pierre s.n.* (P!).

FIG. 1. — Syntype specimen (*Geoffray 275*) of *Ipomoea cambodiensis* in P [P00288062].

TABLE 1. — Comparison of significant taxonomic characters for the species *Ipomoea* "*ochroleucea*" *sensu* Ooststroom (1940, 1953), *I. ochracea sensu* Ooststroom (1958), *I. ochracea sensu* Verdcourt (1963) and *I. cambodiensis* Gagnep. & Courchet (1915).

Character	*I.* "*ochroleucea*"	*I. ochracea*	*I. ochracea*	*I. cambodiensis*	Recent collections by authors
Distribution	Timor only	Timor + Sabah	Tropical E Africa	Cambodia, Laos	Sabah, Laos
Sepal proportion	Equal in length	Equal or outer ones a little shorter	Not stated "6 mm long" so presumably equal	Unequal: outer *c.* 4 mm, inner *c.* 7 mm	Unequal: outer 4-4.5 mm, inner 6-7 mm
Sepal apex	Rounded to truncate, or emarginate, mucronulate	Acutish, obtusish, rounded, or truncate + emarginate + mucronulate	acute	Ovate-obtuse + mucronate	Acute to obtuse + mucronate
Corolla length	*c.* 4 cm	4-5.5 cm	2.7-4 cm	Up to 6 cm	Up to 6.8 cm
Corolla color	Sulphur yellow	Sulphur yellow or cream colored	Yellow or white w/ dark purple or brown centre	White, pink in tube (original description)	Pale creamy w/ deep red centre
Corolla hair outside	Glabrous with exc. of apical parts of midpetaline bands = pubescent	Glabrous, the pubescent apical part of midpetaline bands excepted	glabrous	Corolla at first sericeous outside	Silky hairy midpetaline bands, otherwise glabrous
Seed pubescence	Shortly brownish tomentose	Shortly pubescent or farinose	Glabrous or pubescent	"Wrapped in long brownish cotton"	Woolly with long, wavy gray-brown hairs

Thailand. Udon Thani, Na Yung district, near entrance to Wat Ba Phu Kon, 29.XI.2013, *Traiperm et al. 596* (BKF!). **Malaysia.** Sabah: Beluran distr., along Hwy. A4 on outskirts of Gambaron, 7.III.2010, *Sugau et al. SAN-152863* (SAN!, SING!); Ranau distr., outskirts of Kampung Tampios, 8.III.2010, *Sugau et al. SAN-152872* (KEP!, SAN!, SING!); between villages of Pinausok and Kundasang (nearer to latter), 10.III.2010, *Sugau et al. SAN-152881* (KEP!, SAN!, SING!); Kota Belud distr., near end of unpaved road from Kampung Kiau at the junction to Kampung Kaung, 11.III.2010, *Sugau et al. SAN-152886* (SAN!, SING!); Nabawan via Tenom, 20.II.1989, *Tay, Shah & Tee 89-0418* (SING!).

DISTRIBUTION. — Borneo (Sabah), Vietnam, Thailand, Cambodia, Laos (Fig. 3).

DESCRIPTION

Twining perennial herb to 5 m high or more. Stem and branches filiform, rooting at nodes when touching ground, drying striate-angulate, glabrescent or sparsely puberulent; innovations coppery red, fading through olivaceous green, to deep green at maturity. Leaves triangular-ovate, 5-14 cm long, 3-7.5(-10) cm wide, both sides sparsely hairy, especially along the veins; base deeply cordate; margins, especially towards the base, drying undulate-denticulate; apex acute to acuminate, mucronulate; secondary nerves three pairs basally and 3-4 more distally, ultimate nerves ± inconspicuous; underside of blade minutely dotted; petioles 1.5-9(-13.5) cm long, shortly hairy. Inflorescences axillary, pedunculate, (1–)3-7(-10)-flowered; peduncle 0.8-1.9 cm; pedicels 1.5-2.5 cm; bracts oblong-acute, 2 mm long, subopposite. Flowers showy, diurnal, borne ± horizontally; buds apically silky hairy outside. Sepals unequal, ovate-obtuse, base subcordate, glabrous, drying verrucose-pitted below middle, smooth above; apex acute to obtuse, mucronulate, outer ones 4-4.5 mm, inner ones 6-7 mm long. Corolla funnel-shaped, 4.5-6(-6.8) cm long (when dry); tube base narrow, cylindrical, red-purple inside, widening abruptly above; limb vaguely 5-lobed or

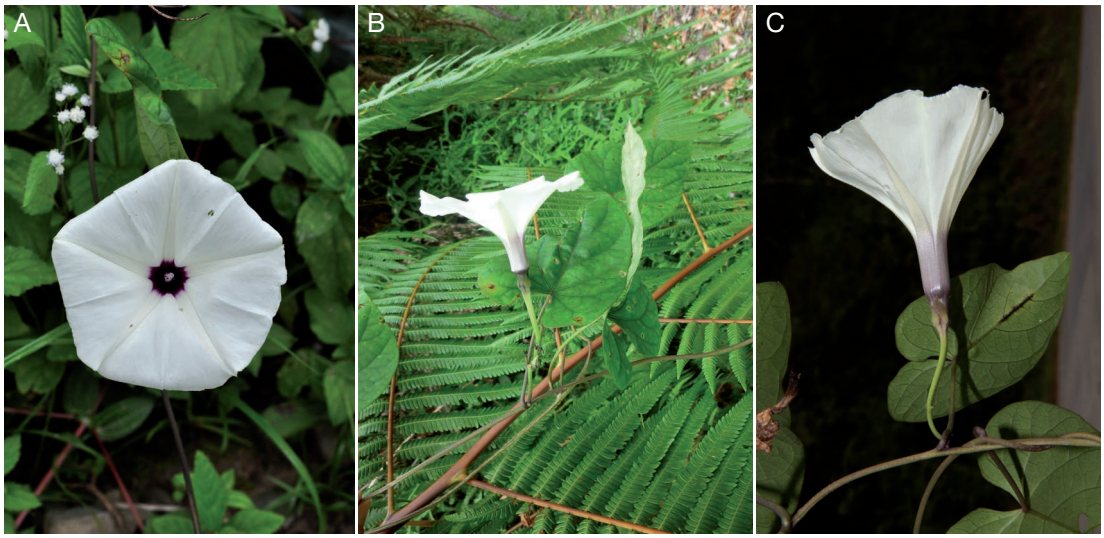

Fig. 2. — *Ipomoea cambodiensis* Gagnep. & Courchet: **A**, Sabah plant (*Sugau et al. SAN-152886*), flower in frontal view (photo: J. B. Sugau); **B**, Sabah plant (*Sugau et al. SAN-152886*) flower in side view (photo: G. Staples); **C**, Laos plant (*Staples et al. 1512*) flower in side view (photo: K. Phoutthavong).

5-angled, creamy white or pale yellowish, lobes triangular, very short. Stamens inserted near tube base; filaments unequal, 5-15 mm long, bases abruptly widened, papillose; anthers oblong, 4 mm long, white. Pistil included, slightly longer than stamens; ovary acuminate, glabrous, locules 2, biovulate; style filiform, stigmas capitate, biglobose, white. Fruiting sepals not accrescent in fruit, at length reflexed along pedicel, drying brown-black, margins paler. Capsule ovoid-conical, 15-17 mm long, dark brown, 4-valved, glabrous, tardily dehiscent, apex often apiculate by indurated style base. Seeds 4 or less, 7-9 mm long, woolly with long, wavy, gray-brown hairs.

Distribution note

The disjunct distribution from Vietnam to Sabah is unusual; no similar biogeographic pattern is known for Convolvulaceae. Indeed only one other plant with a comparable disjunct distribution is known: *Alchornea sicca* (Blanco) Merr. (Euphorbiaceae), disjunct between Indochina (Cambodia, Laos, Vietnam) and the Philippines (Luzon) (Van Welzen & Bulalacao 2008). It is possible that the Sabah plants were introduced from Indochina at some point and have now become widespread and naturalized so as to appear native. The lack of herbarium specimens from Sabah prior to the 1950s (when Ooststroom first credited *I. ochracea* to "British North Borneo") could be significant in this regard. Searches in the BKF, K, SAN, and SING herbaria did not locate any Sabah material for *I. cambodiensis* other than the specimens cited above. Ooststroom (1958) did not cite the specimens he examined from Sabah; possibly these are in Leiden.

Ecology

In disturbed secondary forest, along roadsides, often near streams, ditches, or standing water; once collected at edge of a fruit tree orchard.

Elevation

c. 70–1158 m.

Phenology

Flowering: Feb., Mar., Nov.; fruiting: Feb., Mar.

The type specimen label reports the flowers open from morning to midday, and this agrees with what we observed in the field. The flowers are showy, pale yellow to creamy white, with a dark red-purple center inside the tube. Rather few fruits are produced in Sabah and these typically have less than four seeds.

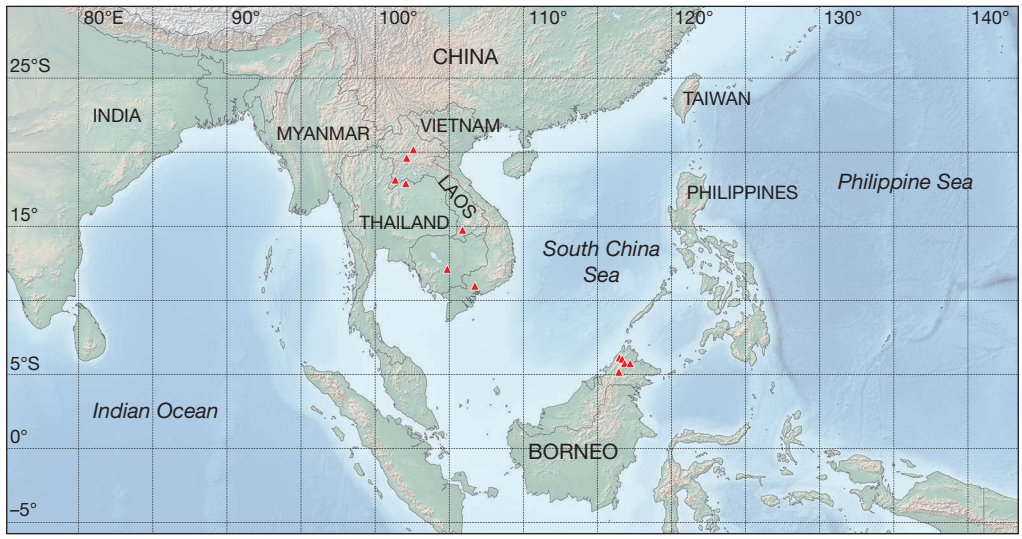

Fig. 3. — Distribution map of *Ipomoea cambodiensis* Gagnep. & Courchet in Borneo (Sabah), Vietnam, Cambodia, Thailand and Laos.

Taxonomic Notes

Table 1 quantifies the important characters useful for distinguishing *I. cambodiensis* from *I. ochracea*: larger corollas (up to 6.8 cm long); paler whitish or cream corollas with deep red tube base inside; sepals unequal, 4-7 mm long with acute to obtuse, mucronate apex; finely sericeous midpetaline bands outside; and seeds covered in long, wavy, gray-brown hairs.

The presence of silky puberulous trichomes on the corolla is most evident on young buds, as these enlarge and the corolla later expands, the pubescence is less obvious; it is there when checked with a hand lens. The presence of hairy flower buds is uncommon in Asian *Ipomoea*; only *I. rubens* Choisy, a rather rare aquatic species, has it. In fact, the specimen *Tay et al. 89-0418* in SING was misidentified as *I. rubens* based on this bud character.

Ooststroom (1940: 523-524) first took up the name *"Ipomoea ochroleucea"* Span. for plants from Timor; his description says the sepals are equal in length, broadly rounded to truncate, emarginate, with mucronulate point; the corolla is *c.* 4 cm long and sulphur yellow. This description agrees very closely with African populations of *I. ochracea* and reasonably well with naturalized populations from the Hawaiian Islands (Austin 1990), as seen alive by the first author. This first description and distribution (i.e. only Timor is mentioned) was repeated in the *Flora Malesiana* account (Ooststroom & Hoogland 1953), with just an orthographic correction to the epithet: "*ochroleucea*" became *ochroleuca*. Later, in the series of corrections and additions to the *Flora Malesiana* account, Ooststroom (1958: 561) provided a new description for the species and included plants from North Borneo (now Sabah) and New Caledonia. This revised description reads rather differently and attempts to account for the larger flower size, differences in corolla color, and calyx proportionality of plants from Sabah relative to those from Timor. Still later Ooststroom (1972: 941), changed the name for this species to *I. ochracea* (Lindl.) G. Don.

During the same time period, Verdcourt (1958: 208-209) had published on the extraordinary variability of African plants that made it nearly impossible to identify some populations accurately; Verdcourt's conclusion (1963: 117) was that *Ipomoea ochracea* intergraded with the closely related *I. obscura* (L.) Ker Gawler. Indeed, it seems that these two species are at the centre of a species complex that is taxonomically difficult and needs further study. This is primarily an African complex with only *I. obscura* known (at that time) to extend as far eastward as

Asia and the Pacific Islands. Ooststroom was very likely influenced by Verdcourt's findings and thus chose to accommodate a greater range of variation in the Malesian plants he ultimately called *I. ochracea.* Quite apart from the morphological diversity, there is the extraordinary disjunction from East Tropical Africa to Timor. However some of the African forms of *I. ochracea* with bright yellow corollas have been moved around as horticultural subjects. One has to wonder if the original report of sulphur yellow-flowered plants from Timor is such a horticultural introduction, the Portuguese having traded for centuries between East Africa and their colony on Timor. However, the plants from Sabah differ markedly on several morphological points noted above (Table 1) and Ooststroom's inclusion of them in a broadened concept of *I. ochracea* seems, in hindsight, ill-advised; we think they are much better placed with *I. cambodiensis*.

Ooststroom's association of Malesian populations with *I. ochracea* makes sense on a broad scale, because the plants are clearly allied with this complex of species, but we would argue that *I. cambodiensis* should be recognized at species rank and is the more accurate placement for SE Asian and Bornean populations.

The status of the New Caledonian plants that Ooststroom (1958) mentioned requires further investigation to see if they are correctly placed in *I. ochracea*. The key and terse description in the *Flore de la Nouvelle-Calédonie* (Heine 1984: 76-78) suggest that they are, but it would be essential to examine specimens to confirm this. The description for the New Caledonian plants differs in several respects from the Sabah and Lao ones. Perhaps the most significant example is the seeds are illustrated (Heine 1984: 77) as glabrous with a tuft of hairs around the hilum, which is markedly different from the Lao and Sabah plants with their long, wavy hairs covering the entire seed surface.

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