

***Hoya* of Sulawesi, Indonesia: A checklist, two new species, a new subspecies and six new records**

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ABSTRACT. Two new *Hoya* R.Br. species and a new subspecies, *Hoya towutiensis* S.Rahayu, R.P.P.Ahmad & Rodda, *Hoya mamasa* S.Rahayu, R.P.P.Ahmad & Rodda and *Hoya mamasa* subsp. *longicorolla* S.Rahayu, R.P.P.Ahmad & Rodda, are described from Sulawesi, Indonesia. A checklist of *Hoya* of Sulawesi is published, including 30 species and one subspecies, six of which are newly recorded. *Hoya tsiangiana* P.T.Li is typified and considered a new synonym of *Hoya australis* R.Br. ex J.Traill s.l.

Keywords. *Hoya australis*, *Hoya caudata*, *Hoya diversifolia*, *Hoya kastbergii*, *Hoya lasiantha*, *Hoya monetteae*, *Hoya sigillatis*, *Hoya tsiangiana*, *Hoya verticillata*

Introduction

Hoya R.Br. is the largest genus of Apocynaceae in Asia (Endress et al., 2019) and includes 350–450 species (Rodda, 2015), a number which is likely outdated and constantly increasing because of new discoveries. The genus includes primarily epiphytic (or rarely lithophytic) climbers while a few are terrestrial or hemi-epiphytic climbers, epiphytic shrubs or pendulous species (Rahayu & Rodda, 2020). The distribution is primarily Indomalayan-Australasian (Forster et al., 1998). The best-studied area is Borneo where 85 species and four subspecies can be found (Lamb & Rodda, 2016; Rodda & Rahayu, 2022).

Sulawesi lies in the centre of the distribution of the genus *Hoya* and it includes widespread species mostly found east of Sulawesi, such as *Hoya australis* R.Br. ex J.Traill and *H. ischnopus* Schltr.; the unusual *Hoya surisana* Rodda & S.Rahayu which is most similar to the New Guinea endemic *Hoya albiflora* Zipp. ex Blume; the variable *H. camphorifolia* Warb. which is widespread in the Philippines; and *Hoya sigillatis* T.Green which is also found in Borneo.

The plant diversity of Sulawesi is one of the most poorly studied in Southeast Asia (De Vogel, 1989; Cannon et al., 2007), and accordingly the diversity of *Hoya* on the island, in particular when compared to neighbouring Borneo (Lamb & Rodda, 2016), is much less studied. Twenty-one years ago, Kleijn & Van Donkelaar (2001), estimated that Sulawesi should have between 15 and 20 species of *Hoya*. Their work focused on Central Sulawesi where they found eight species, three of which were newly described.

However, in recent years five new species and one new record from Sulawesi have been published (Rodda & Simonsson Juhonewe, 2016; Rahayu & Rodda, 2020; Rodda & Rahayu, 2020; Ahmad et al., 2021). This is correlated with an increase in field expeditions especially targeting *Hoya* by Roland Ahmad Putra and Sri Rahayu, as well as by local collectors and growers, who regularly post images of their findings online. The number of *Hoya* species in Sulawesi is therefore likely to keep increasing steadily in the near future.

Based on Ahmad et al. (2021), the number of species reported in Sulawesi stands at 20. This number was based only on literature records because a complete list of Sulawesi species based on specimens has yet to be compiled. We therefore publish an updated checklist of *Hoya* of Sulawesi (Appendix 1), including two new species from Central, West and South Sulawesi, a new subspecies from South Sulawesi, and new records of *Hoya diversifolia* Blume, *H. kastbergii* Kloppenb., *Hoya lasiantha* Korth., *Hoya monetteae* T.Green, *H. sigillatis* and *Hoya verticillata* (Vahl.) G.Don. We also provide notes on and a typification of *Hoya tsiangiana* P.T.Li, which we consider to be a new synonym of *Hoya australis* s.l. Sulawesi now has 30 species and one subspecies of *Hoya*.

Materials and methods

Examination of the specimens of the new species was carried out at the Herbarium Celebense (CEB), Universitas Tadulako, Palu, and Bogor Botanic Gardens, Research Center for Plant Conservation, Botanic Gardens and Forestry-BRIN. The checklist and the identification of the new species and the assessment of distribution areas were based on specimens at A, B, BO, BM, CEB, E, K, KRB and SING (Thiers, continuously updated) as well as online images at JSTOR Global Plants (<http://plants.jstor.org>), and by examining the relevant publications (Schlechter, 1908, 1916; Kleijn & Van Donkelaar, 2001; Lamb & Rodda, 2016; Rodda & Simonsson Juhonewe, 2016; Middleton & Rodda, 2019; Ahmad & Ramadani, 2020; Rahayu & Rodda, 2020; Rodda & Rahayu 2020).

In our checklist (Appendix 1), we list all *Hoya* species occurring in Sulawesi. Specimens are mentioned for species that are poorly known in Sulawesi and for the new records. Notes on identification and on possible synonyms have been added where necessary. As the examination of specimens from taxonomically complex groups proceed, we foresee that more taxa will be added to the list, in particular in the *Hoya verticillata*, *Hoya lacunosa* Blume and *Hoya revoluta* Wight ex Hook.f. complexes. In

this paper, the global conservation categories and criteria follow the IUCN Standards and Petitions Committee (2022).

Taxonomy

1. *Hoya towutiensis* S.Rahayu, R.P.P.Ahmad & Rodda, **sp. nov.**

Similar to *Hoya sumatrana* S.Rahayu & Rodda in vegetative morphology (leaves elliptic or elliptic-lanceolate, coriaceous, succulent, surface rough, margin slightly undulate), inflorescence (pendulous, flat), and corolla colour, shape and indumentum (cream, rotate, pubescent inside); they can be separated on the corolla size (7–9 mm diam. when flattened in *H. sumatrana* vs 12–13.5 mm diam. in *H. towutiensis*) and corona lobe shape (inner process bilobed in *H. sumatrana* vs entire in *H. towutiensis*). – TYPE: Indonesia, Sulawesi, South Sulawesi, East Luwu Regency, Towuti, Lioka, 2°37'56.3"S 121°18'26.8"E, c. 551 m, 21 June 2019, *Rahayu 1277* (holotype BO). (Fig. 1)

Climber, epiphytic or lithophytic, with white or yellow latex in all vegetative parts. **Stems** slender, cylindrical, up to 3 mm diam., pubescent to glabrescent, internodes (1–)7–10(–15) cm long. **Roots** adventitious, produced all along the stem. **Leaves:** petiole terete, 0.5–2.5 × c. 0.3 cm, sparsely pubescent; lamina flat or slightly convex, coriaceous, succulent, elliptic or elliptic-lanceolate, 5–14 × 3.5–7 cm, apex acute or acuminate, base rounded to obtuse (rarely acute), margin rough and slightly undulate, rough at abaxial surface, adaxial surface pubescent when young, turning glabrous, dark green and brown purplish when very young, shiny when young; venation pinnate, secondary veins 3–5 on each side, hardly visible when fresh; basal colleters present, c. 1 mm diam. **Inflorescence** positively geotropic, flat, 3–5 cm diam., up to 18-flowered; peduncle extra-axillary, slender, pubescent, terete, 7–12 cm long, c. 1.5 mm diam., red-brown, older peduncles forming a rachis from previous flowerings; pedicels 10–22 × 1–1.5 mm, cream with dark red dots, pubescent. **Calyx** lobes narrowly triangular, 2–2.5 × 0.5–1 mm, apex acute or narrowly rounded, glabrous; colleters one at each calyx lobe sinus, narrowly triangular, 0.2–0.3 mm long. **Corolla** rotate, 10–11 mm diam., 12–13.5 mm diam. when flattened; tube 2.5–3 mm long, inside cream and pubescent, outside pinkish cream, glabrous; lobes elliptic-ovate, 7–8 × c. 4 mm, inside cream or yellowish, covered with dense long (c. 1 mm) white hairs inside except for the glabrous tip (c. 0.5 mm), outside pinkish cream, glabrous, margins recurved, apex acuminate and revolute. **Gynostegium** sessile. **Corona** staminal, conical, 2–2.5 mm high, 3.8–4.2 mm diam., red and white or pinkish white; lobes ovate to obovate, 1.5–2.2 × 1–1.3 mm, attached at the back of the anthers, ovoid/oblique, crystalline or glassy, inner process upcurved, acute at tip, red, outer process rounded, minutely bilobed at apex, white or pinkish white, inner process purple-red, acute, outer surface red or white, apex acute. **Anthers** c. 0.5 × 0.4 mm, ovate, with a linear, apically rounded membranous appendage to 2.8 mm long. **Pollinia** oblong, 0.5–0.8 × 0.3–0.5 mm, with truncate apex and round base and evident pellucid margin, caudicles attached towards

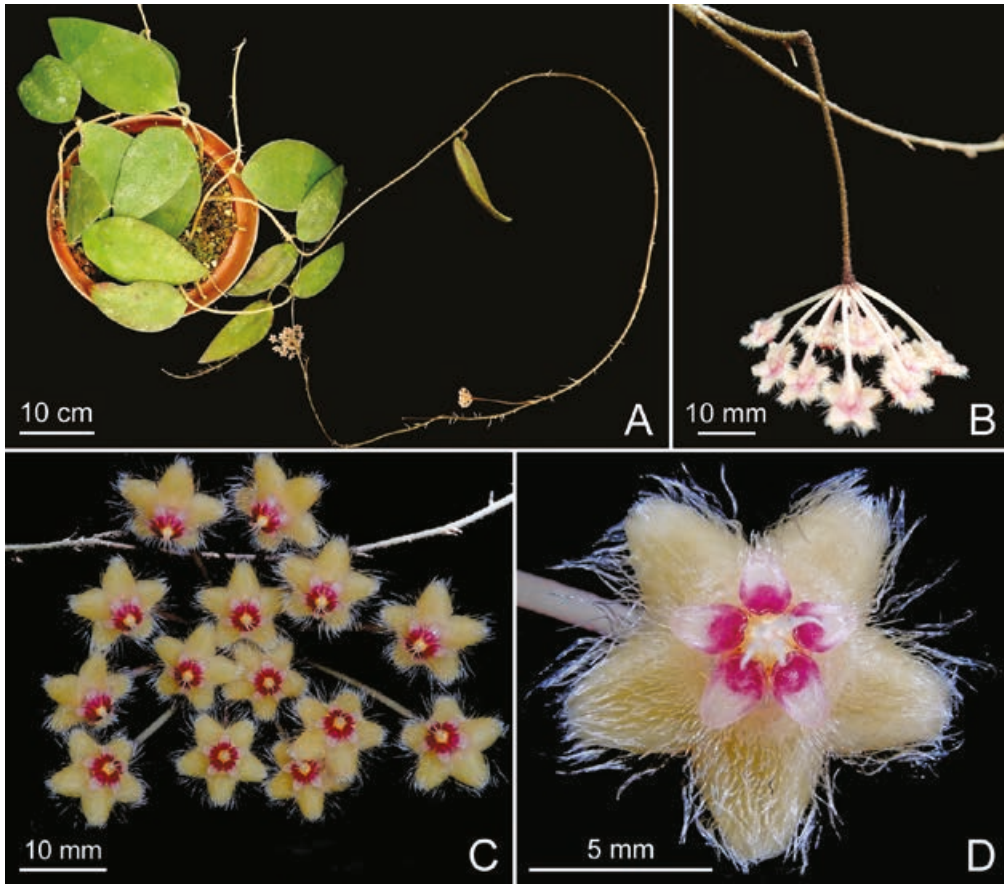


Fig. 1. *Hoya towutiensis* S.Rahayu, R.P.P.Ahmad & Rodda. **A.** Habit in cultivation. **B.** Inflorescence, side view. **C.** Inflorescence, from underneath. **D.** Flower. (Photos: W.H. Ardi)

the middle of the corpusculum, corpusculum elliptic, $0.1\text{--}0.2 \times 0.05\text{--}0.1$ mm. **Ovary** ovate, c. 1.5 mm long, 0.5–1 mm wide at the base. **Fruit** and **seed** not seen.

Distribution and ecology. *Hoya towutiensis* has been found in South and Central Sulawesi. In South Sulawesi, it was found in Towuti, in disturbed forest on limestone rocks at an elevation of 551 m (*Rahayu 1277*), while in Central Sulawesi, it was found in Kolonodale (*Ahmad RPPA 035*) where it was dangling at the mouth of a cave, on rocks almost completely covered by humus. It was also collected in nearby Gililana (*Ahmad RPPA 037*). At all collection sites the plants were rooting in ant nests forming ‘ant gardens’ (Kleijn & Van Donkelaar, 2001) and therefore it is possible that ants might have a role in the seed dispersal.

Etymology. The name *Hoya towutiensis* refers to the type locality near Towuti Lake, South Sulawesi, Indonesia. No local name or use by local people is known.

Provisional IUCN conservation assessment. (EN B1ab(iii), B2ab(iii)). The estimated EOO is about 100 km², the AOO is 12 km². Even though the localities still have undisturbed vegetation, the habitats in Kolonodale and Towuti are located near main roads which make them susceptible to conversion for both public facilities and settlements. Meanwhile, the habitat in Gililana is far safer compared to Kolonodale because it is located around 1 km away from the nearest settlements and no human activity has been seen during the survey.

Additional specimens examined. INDONESIA: **Central Sulawesi:** Morowali Regency, Petasia, Kolonodale, hanging on outer wall of the cave, 2°3'14.58"S 121°21'56.92"E, 87 m, 16 Mar 2020, *Ahmad RPPA 035* (BO, CEB); Morowali Regency, Petasia, Gililana, 1°56'1.45"S 121°23'1.10"E, 117–120 m, 20 Mar 2020, *Ahmad RPPA 037* (BO, CEB).

Notes. *Hoya towutiensis* belongs to the *Hoya caudata* Hook.f. complex, also referred to as *Hoya* sect. *Peltostemma* Schltr. The species in this group are characterised by (generally) conical corona, long (often linear) anther appendages extending well above the style-head and pollinaria with well-developed caudicle wings (Rahayu & Rodda, 2019). As mentioned in the diagnosis the most similar species to *Hoya towutiensis* is *H. sumatrana*. They can be separated on the corolla size and corona lobe shape.

Hoya towutiensis when sterile is also similar to some collections of the variable *Hoya caudata*. When in flower they can be easily separated: the flowers of *Hoya caudata* are generally larger (to 15 mm diam. when flattened vs 12–13.5 mm diam. in *H. towutiensis*), with different corolla colour (white-pinkish, very rarely cream-pink in *H. caudata* vs cream in *H. towutiensis*) and different corona size and shape (6–7 mm diam., centrally conical with spreading lobes in *H. caudata* vs 3.8–4.2 mm diam., conical without spreading lobes in *H. towutiensis*).

2. *Hoya mamasa* S.Rahayu, R.P.P.Ahmad & Rodda, **sp. nov.**

Similar to *Hoya insularis* Rodda & S.Rahayu because both species are climbers with tubular corollas and erect corona lobes, but can be distinguished on the lamina shape (linear in *H. insularis* vs ovate to cordate in *H. mamasa*) and flower orientation (pointing towards the centre of the inflorescence in *H. insularis* vs parallel to each other in *H. mamasa*). – TYPE: Indonesia, Sulawesi, West Sulawesi, Mamasa, 21 March 2020, *Rahayu 1315* (holotype BO). (Fig. 2)

Small epiphytic climber with white exudate in all vegetative parts. **Stems** terete, up to 3 mm diam., dull green, pubescent, internodes (0.2–)2–5(–10) cm long. **Roots** adventitious, produced all along the stem. **Leaves:** petiole terete, 1–5 × 0.8–1 mm, pubescent; lamina fleshy, ovate to cordate, 1–2.5 × 0.8–1.5 cm, apex acute to shortly acuminate, base rounded to subcordate, above pale to mid green, sometimes with darker margin, pubescent, below pale green, pubescent; young leaves brownish, more markedly pubescent; venation inconspicuous; basal colleters present, c. 1 mm diam. **Inflorescences** pseudo-umbelliform, positively geotropic, flat, 0.5–1 cm diam., up to

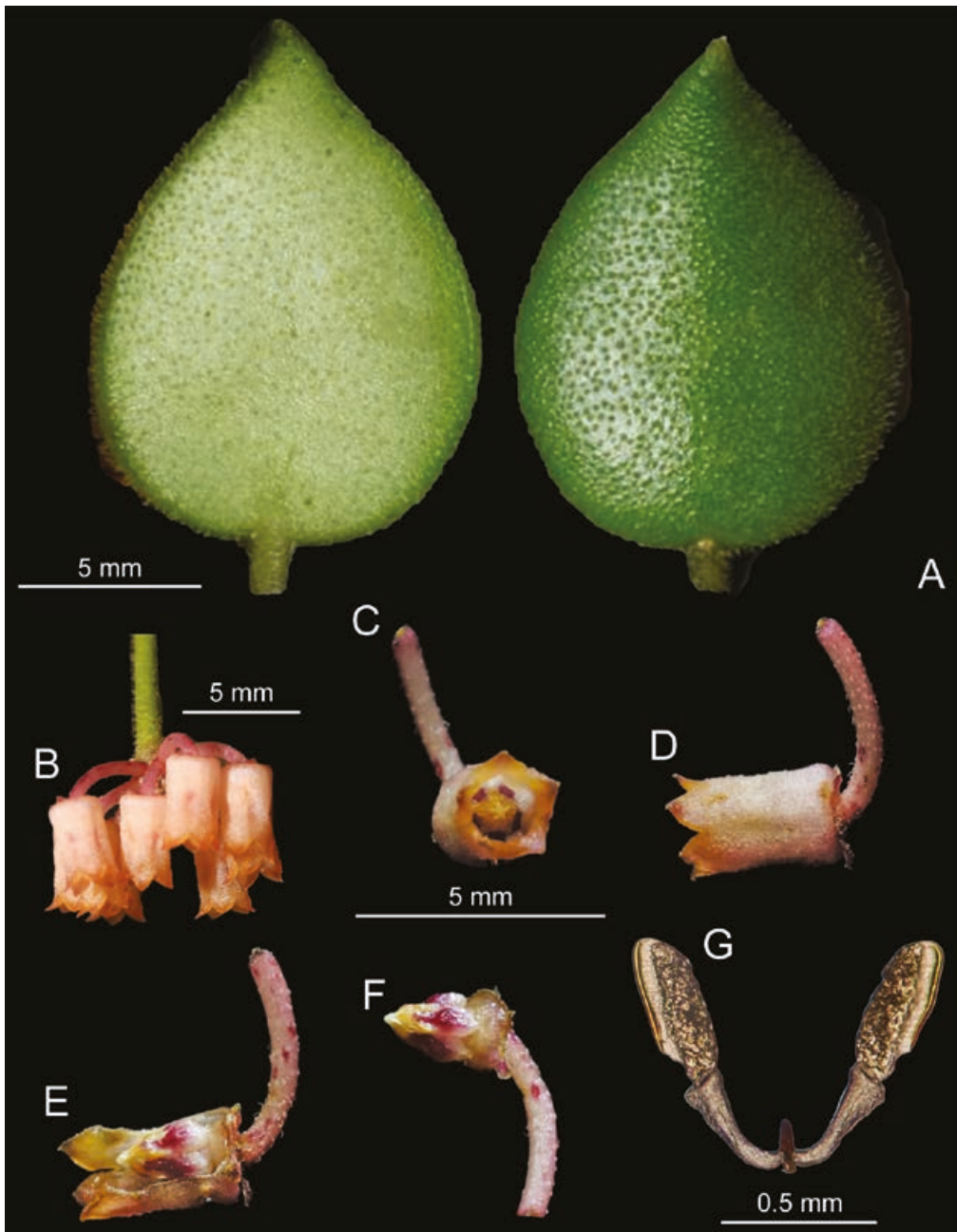


Fig. 2. *Hoya mamasa* S.Rahayu, R.P.P.Ahmad & Rodda. **A.** Leaf (right above, left underneath). **B.** Inflorescence, side view. **C.** Flower, from underneath. **D.** Flower, side view. **E.** Flower, side view with partially removed corolla and visible corona. **F.** Corona, side view. **G.** Pollinarium. (Photos: A, S. Rahayu; B, S. Somadee; C–F, Luz Bello Melda; G, R.P.P Ahmad)

20-flowered; peduncles extra-axillary, terete, 3–5 cm long, c. 2 mm diam., pubescent, rachis to 8 mm long; pedicels recurved, 0.5–1 cm long, c. 0.8 mm diam., pubescent. **Calyx** lobes triangular, 0.8–1 × 0.4–0.6 mm, apex acute or round, glabrous adaxially, pubescent abaxially, ciliate; colleters one at each calyx lobe sinus, ovoid, c. 0.2 mm long. **Corolla** tubular; tube 2.2–3.8 mm long, 1.5–2 mm diam., yellow flushed red, outside glabrous, gibbose, inside pubescent; lobes broadly triangular, 0.6–1 × 0.5–0.8 mm, apex acute, outside glabrous, inside sparsely pubescent. **Gynostegium** shortly stipitate, stipe c. 0.5 mm tall. **Corona** staminal, conical, 1.5–1.8 × 1–1.2 mm (at base), lobes erect, elliptic, 1.2–1.5 × 0.5–0.7 mm, longitudinally sulcate above, basally bilobed. **Pollinia** oblong, 0.4–0.45 × c. 0.2 mm, with obliquely truncate apex and round base and evident pellucid margin along outer edge, corpusculum lanceolate to oblanceolate, c. 0.2 × 0.05 mm, caudicles c. 0.2 mm long, attached to the base of the corpusculum. **Ovary** ovate, 0.5–1 mm long, 0.4–0.7 mm wide at the base. **Fruit** and **seed** not seen.

Distribution and ecology. This species is only known from Mamasa, West Sulawesi, where it is found in mixed forest. It is found in the same habitat as other *Hoya* species such as *Hoya occultata* S.Rahayu & Rodda, *H. incurvula* Schltr. and *H. ischnopus* Schltr. The roots were found associated with ants.

Etymology. The name *Hoya mamasa* refers to the type locality in Mamasa, West Sulawesi, Indonesia.

Provisional IUCN conservation assessment. Data Deficient (DD). *Hoya mamasa* subsp. *mamasa* is known only from the type specimen and its distribution and population size are insufficiently known.

Notes. *Hoya mamasa* is the only species from Sulawesi, and one of the very few species of *Hoya* overall, to have a tubular corolla terminating in short free lobes. As mentioned in the diagnosis it is most similar to *Hoya insularis* from Borneo but easily distinguished even when sterile because of the very different lamina shape. Other species with a tubular corolla are easily distinguished from *Hoya mamasa*: *Hoya manipurensis* Deb is a small epiphytic shrub from continental Southeast Asia with cordate leaves; *Hoya versteegii* Simonsson & Rodda from New Guinea and *Hoya telosmoides* Omlor from Borneo have much larger flowers with well-developed free lobes (tube 12–15 mm long, lobes 7–10 mm long in *H. versteegii*; tube 5–6.5 mm long, lobes to 10 mm long in *H. telosmoides*).

The conical corona and the recurved pedicels of *Hoya mamasa* are also observed in the Borneo endemic *Hoya retrorsa* Gavrus et al., a small epiphytic shrub from lower montane forests above 1200 m. *Hoya retrorsa* can be distinguished from *H. mamasa* because it has terete leaves and a rotate corolla with reflexed lobes.

3. *Hoya mamasa* S.Rahayu, R.P.P.Ahmad & Rodda subsp. *longicorolla* S.Rahayu, R.P.P.Ahmad & Rodda, **subsp. nov.**

Similar to *Hoya mamasa* subsp. *mamasa* because both have tubular corollas, with small triangular free lobes, and erect corona lobes, but can be distinguished on corolla tube length (2.2–3.8 mm in *H. mamasa* subsp. *mamasa* vs 4–7 mm in *H. mamasa* subsp. *longicorolla*) and corona shape (conical, 1.5–1.8 mm long, with well-developed lobes in *H. mamasa* subsp. *mamasa* vs almost columnar, 2–3 mm long, with poorly differentiated lobes in *H. mamasa* subsp. *longicorolla*). – TYPE: Indonesia, Sulawesi, South Sulawesi, East Luwu Regency, Towuti, Lioka, 2°40'50"S 121°25'54"E, 551 m, 12 March 2021, *Aspar 002* (holotype CEB). (Fig. 3)

Small epiphytic climber with white exudate in all vegetative parts. **Stems** terete, up to 3 mm diam., dull green, pubescent, internodes 2–5 cm long. **Roots** adventitious, produced all along the stem. **Leaves:** petiole terete, 2–10 × 0.7–1 mm, pubescent; lamina fleshy, ovate, elliptic to lanceolate, 1–1.5 × 0.7–0.9 cm, apex acute to shortly acuminate, base rounded or cuneate, above pale to mid green, sometimes with darker margin, pubescent, below pale green, pubescent; young leaves brownish, more markedly pubescent; venation inconspicuous; basal colleters present, c. 1 mm diam. **Inflorescences** pseudo-umbelliform, positively geotropic, flat, 0.5–1 cm diam., up to 10-flowered; peduncles extra-axillary, terete, 1.5–3 cm long, c. 1 mm diam., pubescent, rachis to 1.5 mm long; pedicels recurved, 0.5–1 cm long, c. 0.8 mm diam., pubescent. **Calyx** lobes triangular, 0.6–1 × 0.4–0.6 mm, apex acute or round, glabrous adaxially, pubescent abaxially, ciliate; colleters one at each calyx lobe sinus, ovoid, c. 0.2 mm long. **Corolla** tubular; tube 4–7 mm long, 1.5–2 mm diam., yellow flushed red, outside glabrous, gibbose, inside pubescent; lobes broadly triangular, 0.6–1 × 0.5–0.8 mm, apex acute, outside glabrous, inside sparsely pubescent. **Gynostegium** shortly stipitate, stipe c. 0.5 mm tall. **Corona** staminal, almost columnar, 2–3 × 1–1.5 mm (at base), lobes erect, oblong, c. 1.5 × 0.5 mm, basally obtuse, apically acute. **Pollinia** oblong, 0.5–0.8 × 0.1–0.2 mm, with obtusely truncate apex and round base and evident pellucid margin along outer edge, corpusculum lanceolate to oblanceolate, c. 0.2 × 0.05–0.08 mm, caudicles attached to the base of corpusculum, 0.3–0.5 mm. **Ovary** ovate, 0.5–1.5 mm long, 0.5–1 mm wide at the base. **Fruit** and **seed** not seen.

Distribution and ecology. This subspecies was found on trees in peat swamp forest by the beach along Towuti Lake, East Luwu Regency in South Sulawesi. The roots were found to be associated with ants.

Etymology. The name '*longicorolla*' refers to its longer corolla when compared to *Hoya mamasa* subsp. *mamasa*.

Provisional IUCN conservation assessment. Data Deficient (DD). *Hoya mamasa* subsp. *longicorolla* is known only from the type specimen and its distribution and population size are insufficiently known.

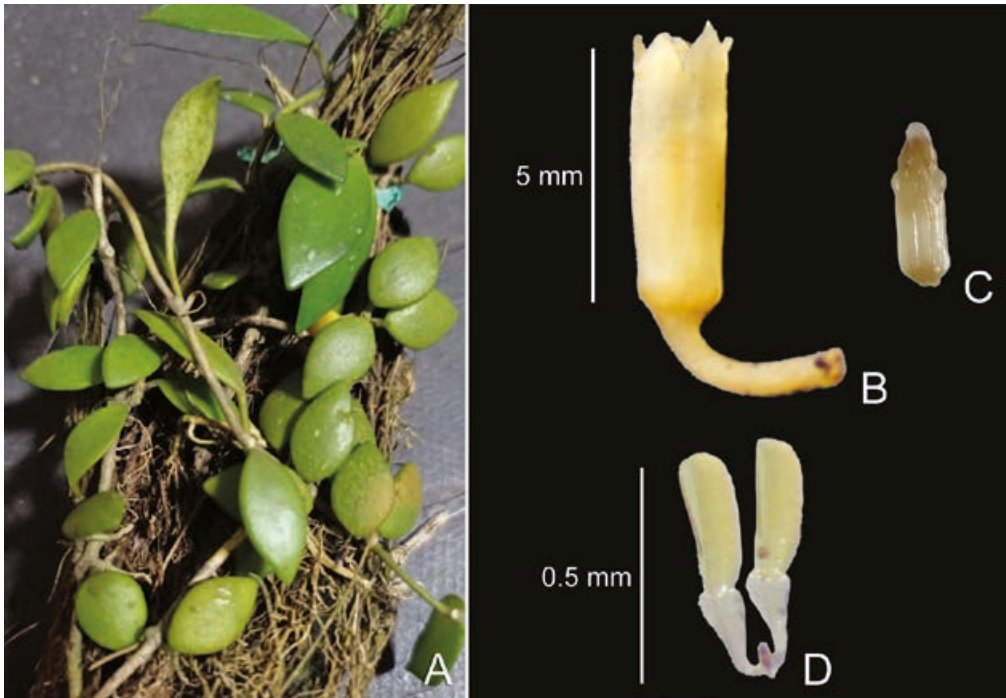


Fig. 3. *Hoya mamasa* S.Rahayu, R.P.P.Ahmad & Rodda subsp. *longicorolla* S.Rahayu, R.P.P.Ahmad & Rodda. **A.** Habit in cultivation. **B.** Corolla, side view. **C.** Corona, side view. **D.** Pollinarium. (Photos: A, S. Rahayu; B–D, R.P.P.Ahmad)

Notes. This taxon was preliminarily identified as a species of *Dischidia* when sterile because of the small leaves on short internodes. Once it flowered we realised it was similar to yet distinct from *Hoya mamasa*. As mentioned in the diagnosis, the key characters to separate the two subspecies lie in the corolla tube length and corona shape. It could be argued that these characters might be sufficient to separate this taxon as a new species distinct from *Hoya mamasa*. However, our understanding of the variation of this taxon is limited as each subspecies of *Hoya mamasa* is only known from its type specimen. We do not have any information about their variation at the population level or across their distributions and we do not yet have molecular data. Our treatment as subspecies may be revised later when more collections become available.

Hoya australis in Sulawesi

Hoya australis R.Br. ex J.Traill, Trans. Hort. Soc. London 7: 28 (1830). – TYPE: Australia, Queensland, Cook District, Cape Grafton, 1770, *Banks & Solander s.n.* (lectotype BM [BM001040528], designated by Hill (1988)).

Hoya tsiangiana P.T.Li, Bull. Bot. Res., Harbin 4(1): 120 (1984), **syn. nov.** – *Hoya retusa* Warb., Repert. Spec. Nov. Regni Veg. 3: 344 (1907), nom. illeg. non *Hoya retusa* Dalzell (1852). – TYPE: [Indonesia], Sulawesi, 29 September 1894, *Sarasin 552* (lectotype K, designated here).

Hoya retusa Warb. was described from a duplicate of *Sarasin 552*, likely at B; although as this was not explicitly stated, all duplicates are syntypes. The B specimen is no longer extant as it was likely destroyed together with most of the Berlin herbarium in 1943 (Hiepko, 1978; Nicholas, 1992). Li (1984), upon realising that *Hoya retusa* Warb. is a later homonym of *Hoya retusa* Dalzell, published the new name *Hoya tsiangiana* P.T.Li without, however, mentioning a type. The only extant duplicate of *Sarasin 552* was found at K and is here designated as the lectotype of *Hoya tsiangiana*. Upon examination we have concluded it is a synonym of *Hoya australis* s.l. *Hoya australis* is considered to be a variable superspecies with seven subspecies (Liddle & Forster, 2008; Kloppenburg, 2012) that was formerly considered to be distributed in Australia, New Guinea and the Western Pacific islands (Liddle & Forster, 2008) until it was also collected in Sabah, Borneo and noted as also occurring in Sulawesi (Lamb & Rodda, 2016). Numerous specimens from Sulawesi are available in herbaria and their placement to subspecies level is uncertain as morphologically they are close to both *Hoya australis* subsp. *australis* and *H. australis* subsp. *tenuipes* (K.D.Hill) P.I.Forst. & Liddle, which are distinguished mostly based on geography, flowering period and indumentum of the leaves.

Specimens in this complex from Sulawesi all have a pubescent calyx and pedicel (pointing to *Hoya australis* ssp. *australis*; for example, *Hennipman 5777* (A, BO, K, KEP, L)). However, while the specimen *Wieringa 1875* (K, L) has larger flowers, which is generally considered to be associated with *Hoya australis* ssp. *australis* (Liddle & Forster, 2008), the specimens *Sarasin 552* (K) and *Brown et al. 116* (A, BO n.v., CEB n.v.) have smaller flowers, which are closer to those of *Hoya australis* subsp. *tenuipes*. At this moment, it would be futile to try to assign the Sulawesi collections to known subspecies of *Hoya australis* without a re-evaluation of the entire complex based on molecular data.

Specimens examined. INDONESIA: **Central Sulawesi:** Donggala Regency, Sojol, Balukang II, 0°32'18.61"N 120°06'22.56"E, 7 Aug 2018, *Ahmad RPPA 012* (CEB); Balukang, last crossing of Sungai Siboang before climbing to Puncak Pinimoang, 0°28'19"N 120°09'27"E, 24 Jul 2002, *Brown et al. 116* (A, BO n.v., CANB [CANB637803], CEB n.v.). **South Sulawesi:** along South shore of Lake Matano, West of Soroako, 400 m, 12 Jun 1979, *Hennipman 5777* (A, BO, K, KEP, L); 5 km S of Rantepao, just S of Londa, 3°02'S 119°54'E, 800 m, 12 Aug 1992, *Wieringa 1875* (K, L).

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for providing images of *Hoya mamasa*, and Wisnu H. Ardi for providing images of *Hoya towutiensis*. We are grateful to the President of the Singapore Gardening Society (SGS), Mr Tan Jiew Hoe, and to Wisnu H. Ardi for their support of the *Hoya* of Sulawesi project; and to the head and curators of CEB herbarium and the Department of Biology at the Faculty of Science at Tadulako University for allowing us access to herbarium material and facilities during the identification process. We also thank Mr Endang Kusmayadi (BBG) for assistance in pressing the materials. We would like to thank the curators of BCU, BK, BKF, BM, BO, BRUN, FI, K, KEP, KRB, L, LAE, P, SAN, SAR, SING, SNP, UC and UPM herbaria for allowing access and/or for providing high quality images of herbarium specimens.

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Appendix 1. A checklist of *Hoya* species recorded from Sulawesi, Indonesia. For the endemic species, the protologue is the publication in which the species is first recorded for Sulawesi. For species that are not endemic to Sulawesi and have been previously recorded, the publication in which it was first recorded for Sulawesi is indicated. For those species newly recorded for Sulawesi here, they are indicated thus: new record*, new taxa**.

1. *Hoya australis* R.Br. ex J.Traill.

Specimen examined. INDONESIA: **Central Sulawesi:** Donggala Regency, 0°32'18.61"N 120°06'22.56"E, *Ahmad RPPA 012* (CEB).

Notes. First mentioned in Lamb & Rodda (2016) as occurring in Sulawesi.

2. *Hoya batutikarensis* R.P.P.Ahmad, S.Rahayu & Rodda (endemic)

3. *Hoya breviaolata* Kleijn & Donkelaar (endemic)

4. *Hoya camphorifolia* Warb.

Notes. Although first recorded by Kleijn & Van Donkelaar (2001), their collections have since been redetermined as *Hoya paulshirleyi* T.Green & Kloppenb. The presence of this species in Sulawesi has, however, been confirmed by Ahmad (2021).

5. *Hoya coronaria* Blume

Notes. First recorded as *Hoya ariadna* Decne (Blume, 1849). A number of taxa might be included under this name but an extensive analysis including molecular and morphological data is necessary to support taxonomic decisions.

6. *Hoya diversifolia* Blume*

Specimen examined. INDONESIA: **Central Sulawesi:** Parigi Moutong Regency, 14 Oct 2019, *Ahmad RPPA 021* (CEB).

7. *Hoya dolichosparte* Schltr. (endemic)

Notes. A taxon belonging to the *Hoya verticillata* complex. This species should be included in a molecular phylogeny and compared to material from throughout the distribution area of the entire complex in order to verify its biogeography and relationships.

8. *Hoya gracilis* Schltr. (endemic)

9. *Hoya incurvula* Schltr. (endemic)

10. *Hoya isabelchanae* Rodda & Simonsson (endemic)

11. *Hoya ischnopus* Schltr.

Notes. First recorded in Ahmad et al. (2021).

12. *Hoya imbricata* Call. ex Decne.

Notes. Formerly recorded in Sulawesi as *Conchophyllum maximum* H.Karst; *Hoya maxima* (H.Karst) Warb. is a later homonym of *Hoya maxima* Teijsm. & Binn.

13. *Hoya kastbergii* Kloppenb.*

Specimen examined. INDONESIA: **Central Sulawesi:** Parigi Moutong Regency, 24 Oct 2022, *Rahayu 1375* (KRB [acc. no. B2014030079]).

14. *Hoya lasiantha* Korth.*

Specimen examined. INDONESIA: **Central Sulawesi:** Donggala Regency, 5000 m, 30 Dec 2000, *Saripudun 48* (KRB [acc. no. B2001020357]).

15.1 *Hoya mamasa* S.Rahayu, R.P.P.Ahmad & Rodda subsp. *mamasa*** (endemic)**15.2 *Hoya mamasa*** S.Rahayu, R.P.P.Ahmad & Rodda subsp. *longicorolla* S.Rahayu, R.P.P.Ahmad & Rodda** (endemic)**16. *Hoya maxima*** Teijsm. & Binn.

Notes. A doubtful species, no type material has been found so far and, based on the description (leaves oblong or elliptic-oblong, base rounded or obtuse, apex shortly acuminate, margins reflexed; corolla lobes broadly ovate, apex acuminate, revolute, inside papillose-pubescent, outside glabrous), it is similar to numerous other species occurring in Sulawesi in *Hoya* section *Acanthostemma*.

17. *Hoya minahassae* Schltr. (endemic)**18. *Hoya monetteae*** T.Green*

Specimen examined. INDONESIA: **North Sulawesi:** s.d., *Koorders 16238* (K [K001045431]).

19. *Hoya multiflora* Blume

Notes. First recorded in Sulawesi as *Centrostemma micranthum* Blume.

20. *Hoya myrmecopa* Kleijn & Donkelaar (endemic)**21. *Hoya obovata*** Decne. (endemic)

Notes. Costantin (1912) recognised two varieties of *H. obovata* (*Hoya obovata* var. *obovata* and *H. obovata* var. *kerrii* (Craib) Costantin.) but the relationships between *H. obovata*, *H. kerrii* Craib and similar species have yet to be studied. Rodda (2015) tentatively identified the sterile specimen *Teysmann 12615* (BO) from Sulawesi as *Hoya excavata* Teijsm. & Binn. but it is instead most likely *H. obovata*.

22. *Hoya occultata* S.Rahayu & Rodda (endemic)**23. *Hoya pallilimba*** Kleijn & Donkelaar (endemic)**24. *Hoya paulshirleyi*** T.Green & Kloppenb. (endemic)

Notes. Part of the *Hoya camphorifolia* complex that will have to be studied together with numerous similar taxa found in the Philippines.

25. *Hoya sigillatis* T.Green*

Specimen examined. INDONESIA: **Central Sulawesi:** Morowali, originally collected by

Taucchio ET 36, IPPS7731, 10 Nov 1992, vouchered in cultivation at Singapore Botanic Gardens on 25 May 2021, *Rodda & Yap MR2145* (SING).

Notes. *Rodda & Yap MR2145* (SING) belongs to the variable species *Hoya sigillatis*. However, it does not well match either of the currently recognised subspecies of *Hoya sigillatis* as it has convex, tightly placed leaves, similar to these of *Hoya isabelchaniae*. Molecular data is necessary to assess the relationships between the different morphotypes of *Hoya sigillatis*.

26. *Hoya sulawesiana* S.Rahayu & Rodda (endemic)

27. *Hoya surisana* Rodda & S.Rahayu (endemic)

28. *Hoya tomataensis* T.Green & Kloppenb. (endemic)

Notes. Part of the *Hoya camphorifolia* complex that will have to be studied together with numerous similar taxa found in the Philippines.

29. *Hoya towutiensis* S.Rahayu, R.P.P.Ahmad & Rodda** (endemic)

30. *Hoya verticillata* (Vahl.) G.Don*

Specimens examined. INDONESIA: **North Sulawesi:** near Cape Batu Angus, on rocks by the sea, 24 Jun 1954, *Alston 16037* (A). **Central Sulawesi:** Poso Regency, Tineba mountain range, originally collected by Paul Shirley, IPPS 08898, vouchered in cultivation at Singapore Botanic Gardens on 26 Apr 2013, *Rodda MR326* (SING).

