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THE GENUS *HAUYA* (ONAGRACEAE)

PHILIP A. MUNZ

The genus *Hauya*, named in honor of Abbé René Just Haüy, was described by A. P. de Candolle (Prodromus 3: 36, 1828). The first species described, *H. elegans*, was based on a drawing by Moçifio and Sessé, no specimens of the plant being available. The next attention given to the genus was by Hemsley (Diag. Pl. Nov., part 1: 13, 1878 and Bot. Biol. Centr. Am. 1: 462-3, 1880 and 5: pl. 29). He described two additional species. In this country most of the work on the group has been done by J. Donnell Smith and J. N. Rose; they published an account (Contr. U. S. Nat. Herb. 16: 288-294, 1913) recognizing eleven species.

Hauya arborea (Kellogg) Curran was excluded from the genus by Smith and Rose and used as the type species of a new genus *Xylonagra*. Certain similarities caused them to keep it in the same tribe Hauyae. I am in agreement with their disposition. The chief differences between *Hauya* and *Xylonagra* as given by them were in size of plant, size of flowers, their number and location, and in the type of seeds. Further differences are to be found in the presence or absence of hairs within the basal portion of the floral tube and in the flower color. *Xylonagra* is restricted to Baja California, while *Hauya* ranges from San Luis Potosí to Costa Rica. See also Raven and Lewis, *Aliso* 4: 483-484, 1960.

Several years ago one of my students and I made a considerable attempt to work out the taxa in *Hauya*, but were too uncertain as to the status of several of them because of lack of material. Now, due largely to the additional collections made by Standley and by Steyermark, it is possible to get a much clearer concept of them. For the purpose of the present study I have had available most of the herbarium material in this country and I am greatly indebted to the various curators for its use. With the aid of Grant 4316 from the National Science Foundation I was able to visit many European herbaria in the summer of 1959. I express herewith my gratitude to the Foundation and to the Directors of these institutions. Standard abbreviations are used in citing herbarium material.

DESCRIPTION OF THE GENUS

Large shrub or a tree. Leaves alternate, petioled, simple, entire. Flowers large, solitary, axillary, sessile or pediceled, vespertine, white or pinkish (especially in age). Floral tube cylindrical, elongate, glabrous within. Sepals 4, narrow, reflexed in age, usually with subulate tips or appendages. Petals 4. Stamens 8, slightly exserted, subequal; filaments filiform; anthers as long as the filaments, awned at apex, reticulate, becoming twisted. Pistil exserted from the floral tube; stigma globose or ellipsoid; ovules very numerous, in two rows in each locule. Capsule linear-oblong, 4-valved, the valves dorsally keeled or plane, woody. Seeds ascending, imbricate, numerous, obliquely produced upward into a wing.

Type species, *H. elegans* DC.

KEY TO SPECIES

- A. Leaf-blades elliptic-lanceolate, less than half as wide as long.
 - B. The leaves drying brownish on under surface; pedicels 8-30 mm. long; floral tube 2.5-3 cm. long. Chiapas and Guatemala. 1. *H. heydeana*
 - BB. The leaves not drying brownish; pedicels 3-6 mm. long; floral tube 4-4.5 cm. long. British Honduras. 2. *H. lundellii*
- AA. Leaf-blades ovate to roundish or obovate, more than half as wide as long.
 - B. Free sepal-tips or -appendages 0-5 mm. long.
 - C. The sepal-appendages not or scarcely developed, mostly not more than 1.5 mm. long, or if longer, the plants from central Mexico.

- D. Flowers subsessile; leaf-blades mostly 2-6 cm. long, with about 5-7 main veins on each side of the midrib. Hidalgo and San Luis Potosí. 3. *H. elegans*
- DD. Flowers on pedicels 7-10 mm. long; leaf-blades mostly 5-10 cm. long, with about 7-9 main veins on each side of the midrib. Michoacán to Oaxaca. 4. *H. barcenae*
- CC. The sepal-tips or -appendages evident, 2-5 mm. long.
- D. Sepals almost as long as or certainly more than half as long as the floral tube.
- E. The sepals 1.5-2 cm. long; capsule-valves distinctly keeled dorsally. Volcán de Fuego, Guatemala. 5. *H. cornuta*
- EE. The sepals 3-7 cm. long; capsule-valves plane dorsally.
- F. Young growth, floral tube, etc. obviously pubescent; floral tube 5-9 cm. long.
- G. Ovary and floral tube velvety pubescent; sepal-tips 2-4 mm. long; petals 2.5-3.3 cm. long. Guatemala. 6. *H. microcerata*
- GG. Ovary and floral tube closely strigulose; sepal-tips 3-5 mm. long; petals 3-4 cm. long. Chiapas to Guatemala. 7. *H. matudai*
- FF. Young growth, floral tube, etc. subglabrous; floral tube 3.5-4 cm. long. Tabasco, Mexico. 8. *H. purpusii*
- DD. Sepals not much more than half as long as floral tube; young growth, floral tube, etc. mostly subglabrous.
- E. Floral tube 5.5-6 cm. long, more or less 4-angled; capsule almost square in transverse section; sepals dorsally ridged along the midvein. Nicaragua. 9. *H. standleyi*
- EE. Floral tube not sharply angled; capsule round in transverse section; sepals not dorsally ridged.
- F. Floral tube 4-5 cm. long; sepals 2.5-3 cm. long. Costa Rica. 10. *H. lucida*
- FF. Floral tube 7-10 cm. long; sepals 3.5-5 cm. long. Honduras and El Salvador. 11. *H. glauca*
- BB. Free sepal-tips or -appendages 8-15 mm. long.
- C. Ovary with spreading hairs; sepals 3.5-5.5 cm. long.
- D. Capsule 6-7.5 cm. long; pubescence of floral tube and sepals mostly appressed. Widely spread in Guatemala. 12. *H. ruacophila*
- DD. Capsule 3-4.5 cm. long; pubescence of floral tube and sepals spreading. Dept. Santa Rosa, Guatemala. 13. *H. quercetorum*
- CC. Ovary densely grayish-strigose; sepals 6-7 cm. long; capsule 5.5-6 cm. long. Zacatepequez, Guatemala. 14. *H. rodriguezii*

TREATMENT OF SPECIES

1. HAUYA HEYDEANA J. D. Smith,

Bot. Gaz. 18: 3, 1893; Smith and Rose, Contr. U. S. Nat. Herb. 16: 289, 1913.

Shrubby to a rounded tree, 3-12 m. high, glabrous throughout; bark reddish; young twigs purplish; petioles 7-15 mm. long; leaf-blades elliptic-oblancoelate, 4-10 cm. long, 2-3 cm. wide, cuneate at base, rounded to acute at apex, gland-tipped, bright green above, pale green but drying brownish beneath, with 6-11 veins on each side of midrib; floral tube 2.5-3 cm. long; sepals rose, 2-3 cm. long, with blunt triangular tips, not appendaged; petals white, turning red, 15-18 mm. long, lance-oblong; filaments 15-18 (-23) mm. long; anthers 15-18 mm. long, sharp-pointed at both ends; pistil exerted 2.5-3 cm.; stigma ellipsoid-clavate, 3.5-4.5 mm. long; capsule 2-2.5 cm. long, the valves 4-5 mm. broad; seeds, including wings, 10 mm. long, 3 mm. broad.

Type locality, Belen, Dept. Quiché, Guatemala. Specimens seen, MEXICO: CHIAPAS: near Laguna Ocotal Grande, 25-30 km. se. of Monte Libano, *Dressler 1454* (GH, NY, UC); Trapichito Comitán, *Matuda 15754* (F, MICH). GUATEMALA: Dept. ALTA VERAPAZ: Cobán, *von Türckheim 11604* (BR, G, E, GH, F, L, MO, NY, US, W), 8210 (US); Cerro de Agua Tortuga, near Cubilgüitz,

Steyermark 44612 (F); mt. slopes above Finca Seamay, *Wilson 201* (F); Belen, *Heyde and Lux 2935*, type number (G, GH, K, MO, NY, P, US). Dept. HUEHUETENANGO: *Naxac-Kanal, Selser 2843* (GH, US); near Finca Soledad, between Barillas and La Florida, *Steyermark 48517* (F).

This species is amply characterized by its subglabrous narrow leaves which dry brownish on the under surface and by its small flowers. It is reported from elevations of 350 to 1500 meters.

2. HAUYA LUNDELLII Standley,

Publ. Field Mus. Nat. Hist., Bot. Ser. 17: 204, 1937.

Tree to about 23 m. high, with fluted light tan bark; twigs subglabrous to minutely strigose; petioles 0.5-2.5 cm. long, more or less strigulose; leaf-blades broadly elliptic-oblancoate, 5-12.5 cm. long, 1.5-4.5 cm. wide, more or less abruptly acute or acuminate at apex, cuneate at base, subcoriaceous, bright green above, lighter green beneath, with about 5-7 main veins on each side of the midrib; pedicels about 3-6 mm. long; ovary somewhat strigulose; floral tube about 4-4.5 cm. long, essentially glabrous; sepals greenish white, glabrous, about 3.5 cm. long, scarcely appendaged at apex; petals not seen; capsule 3.5-4.5 cm. long, about 1 cm. thick; seeds, including wing, 9-10 mm. long.

Type and only collection seen, BRITISH HONDURAS: Valentin, El Cayo District, on limestone hill, *C. L. Lundell 6318* (F, GH, MICH, NY, US).

The narrow leaves suggest *H. heydeana*, but the leaves do not dry brownish on their lower surface; pedicels are shorter; floral tube and sepals longer, as is the capsule. It comes from British Honduras, while *H. heydeana* is from Chiapas and Guatemala.

3. HAUYA ELEGANS DC.,

Prodr. 3: 36, 1828; Mém. Onagr., t. 1, 1829.

Said to be a shrub or tree; young branches velvety-pubescent with somewhat spreading or more or less appressed hair; petioles about 0.5-1.2 cm. long, velvety-pubescent; leaf-blades oblong-ovate, rounded at base, more or less abruptly acuminate, pubescent above, hoary-velvety beneath, 2-5 (-7) cm. long, 1.5-4 cm. wide, rather crowded at ends of twigs, and with about 5-7 main veins on each side of midrib; flowers subsessile; ovary densely and softly hoary-pubescent, sometimes strigose; floral tube 3.5-5.5 cm. long, densely pubescent; sepals mostly 3-4.5 cm. long, soft-pubescent, the free tips scarcely developed to 3 mm. long; petals rounded, 2.2-3.5 cm. long; anthers 16-18 mm. long; stigma 5-10 mm. long; capsule 3.5-4.5 cm. long, 1-1.4 cm. thick; seeds, including wing, 9-10 mm. long.

Type, locality, Mexico, the type having been a Sessé and Mociño specimen. No such now seems to exist. De Candolle had only a drawing and at Madrid I have found no example, nor in the Sessé and Mociño material of Onagraceae borrowed from Madrid some years ago by the Chicago Museum and sent to me for identification. I agree however with Hemsley in his interpretation of this species (Biol. Centr. Am. 1: 463, 1880 and 4: t. 29, fig. 1, 1880) after studying the illustration by De Candolle showing sessile ovaries in distinction to *H. barcenae* also of central Mexico.

Material seen, MEXICO: without locality, drawing of flower of Sessé and Mociño (photo at F, US). HIDALGO: Zimapán, *Coulter 172* (F, GH, K); Jacala, *V. H. Chase 7331* (F, GH, MICH, MO, NY); Chapulhuacán *Kenoyer A 612* (F). SAN LUIS POTOSÍ: Tamasopo Canyon, *Pringle 5112* (GH); Sierra del Abra east of Ciudad Valles, *C. Troll 478* (GH).

This species, as I interpret it, is characterized by its small velvety-pubescent leaves, sessile fruits, short sepal-tips and floral tube, and by its northern distribution. I have seen material from elevations of 200 to 1400 meters.

4. HAUYA BARCENAE Hemsley,

Diag. Pl. Nov. 1: 13, 1878; Biol. Centr. Am. 1: 462, 1880, and 5: t. 29, fig. 2, 1880.

H. rusbyi Smith & Rose, Contr. U. S. Nat. Herb. 16: 291, 1913, based on *Rusby 157*.

Tree, 5-13 m. high, with smooth trunk; young branches finely and densely pubescent; petioles densely pubescent, 0.5-2.5 cm. long; leaf-blades ovate to oval, 3-10 cm. long, 2.5-7

cm. wide, rounded- subcuneate at base, abruptly short-acuminate at apex, soft-pubescent on both surfaces but more so beneath, not hoary; main veins about 7-8 on each side of midrib; pedicels 5-12 mm. long; ovary densely soft-pubescent; floral tube 3-4 cm. long, pubescent; sepals about as long as the tube, pubescent, scarcely appendaged or the tips up to about 1.5 mm. long; petals white, rounded-ovate, 2.5-3 cm. long; anthers 17-22 mm. long; capsule 2.5-5 cm. long, pubescent to glabrate; seeds about 8-10 mm. long, including wing.

Type locality, Huajuapán, Oaxaca, Mexico. Specimens seen, MEXICO: MICHOACÁN, Zitacuaro-Los Guajes, *Hinton 13090* (DS, F, GH, MICH, NY, US). MORELOS, Cañon de Lobos, Yuatepec-Cuernavaca road, *C. L. & A. A. Lundell 12517* (MICH). GUERRERO, Mountains near Iguala, *Pringle 9258* (GH, US); Limón Mt., *H. H. Rusby 157*, type coll., *H. rusbyi* (GH, NY, PH, US). OAXACA, Huajuapán, *Andrieux 391*, type coll. *H. barcenae* (GH, K, W, photo US).

The species is characterized by its spreading or appressed pubescence, large leaves, long floral tube and short or no free sepal-tips. Largely from southern Mexico. The only elevation I have for it is about 1400 meters.

5. HAUYA CORNUTA Hemsley,

Diag. Pl. Mex 1: 13, 1878; Biol. Centr. Am. 1: 462, 1880, and 5: t. 29, fig. 3, 1880.

Smith and Rose, Contr. U. S. Nat. Herb. 16: 291, 1913.

Shrub or small tree; young branches round, finely appressed-pubescent; petioles 6-12 mm. long; leaf-blades oblong-lanceolate to elliptical, abruptly acuminate, 4-7 cm. long, 2-3.5 cm. wide, more or less rounded-cuneate at base, short-acuminate at apex, puberulent on upper surface, whitish and velvety-tomentulose beneath, with about 8 main veins on each side of midrib; floral tube 3-3.5 cm. long, apparently 4-angled; sepals 1.5-2 cm. long, the free tips 4 mm. long; petals round, about 2 cm. long; capsule 2.2 cm. long, the valves 6 mm. wide, distinctly keeled dorsally; seeds not seen.

Type locality, Volcán de Fuego, Guatemala. The only collection seen was from Río Guacalate, Guatemala, at 1500 m., Aug. 6, 1873, *O. Salvin*, type collection (K, US, W).

Its soft appressed pubescence, small flowers, angled floral tube, short capsule with a ridge along the center of each valve, —are all characteristic.

6. HAUYA MICRO CERATA Donnell Smith & Rose,

Bot. Gaz. 52: 46, 1911; Contr. U. S. Nat. Herb 16: 292, 1913.

H. pedicellata Loesener, Verh. Bot. Ver. Brandb. 55: 177, 1913, based on *Seler 2813*.

H. hemsleyana Loesener, op. cit., 176; based on *Seler 2562* which I have not seen, but I place this in synonymy from the description.

Shrub or small tree, 2-6 m. high; young branches and buds canescent with a short soft dense more or less appressed pubescence; petioles 1-4 cm. long; leaf-blades oblong-ovate to -obovate, 4-11.5 cm. long, 2-7 cm. wide, slightly pubescent above, velvety beneath, cuneate to rounded to subcordate at base, abruptly short-acuminate to acute at apex, with about 5-9 main veins on each side of the midrib; flowers sessile or nearly so; ovary, floral tube and calyx velvety-pubescent; floral tube 5-9 cm. long; sepals mostly 3-4.5 cm. long, the terminal appendages 2-4 mm. long, subterete; petals white, ovate, 2.5-3.3 cm. long; anthers 15-17 mm. long; capsule 4-8 cm. long, tardily glabrate; seeds, including wings, 10 mm. long.

Type locality, Santa Rosa, Dept. Baja Verapaz, Guatemala. Material seen MEXICO: CHIAPAS, Santa Rosa near Escuintla, *Matuda 4238* (A, F, MO, NY); Canjob *E. A. Goldman 923* (US); Trapichito, Comitán, *Matuda 15704* (F), *5704* (MICH, MO). GUATEMALA: Dept. HUEHUETENANGO, Puente El Aguilar, e. of San Rafael Pétzal, *Standley 81405* (F); nw. of Cuilco above Carrizal, *Steyermark 50785* (A, F, US); Pyramide der Casa del Sol, Quen Santo (Yaloquil), type coll. of *H. pedicellata*, *E. Seler 2813* (DS, GH, US). Dept. BAJA VERAPAZ, Cuesta de Quilihá, near Purulhá, *Pittier 155* (NY, US); Santa Rosa, *H. von Türckheim 1423*, type coll. *H. microcerata* (GH, K, US); dry hills n. of Santa Rosa, *Standley 69792* (F, POM). Dept. GUATEMALA, Finca La Aurora, *Standley 92860* (F), *I. Aguilar 514* (F); Pamplona, Guatemala City, *Margaret Lewis in 1938* (F). Dept. ALTA VERAPAZ, Santa Rosa, *von Türckheim II 2325* (US). Dept. ZACATEPEQUEZ, Alotenango, *J. D. Smith 2527* (K, US). HONDURAS: Dept. MORAZÁN, Río Caparrosa above El Zamorano,

Standley 12615 (F); Aldea de Suyapa, *Molina 2564* (BM, F, GH, US); between Hato and Quebrada de Suyapa, *Molina 3382* (F, US); near Suyapa in Quebrada de Suyapa, *Molina 12911* (F); Aldea de Suyapa along Quebrada de Suyapa, *Molina 558* (BM, F, GH, US); near El Sauce, *Standley & Williams 2409* (F); Río Yeguaré, *Molina 395* (F, GH, US).

The species is characterized by the velvety or soft pubescence, long flowers and capsules, terete sepal-appendages, and a distribution in Chiapas and Guatemala where it grows at 1350 to 2350 meters.

7. *HAUYA MATUDAI* Lundell,
Am. Midl. Nat. 19: 431, 1938.

Shrub or small tree, mostly 2-8 m. tall, with thin bark; young branches pubescent with mostly closely appressed hairs; petioles densely strigulose, 1-2.5 cm. long; leaf-blades coriaceous, oblong- to elliptic-ovate, 3-9 cm. long, 2-6 cm. wide, abruptly short-acuminate, more or less rounded at base, with 7-9 principal veins on each side of the midrib, pubescent but almost glabrate on upper surface, permanently soft-pubescent beneath; pedicels 0-7 mm. long; ovary closely grayish-strigulose; floral tube 5-6 cm. long, more or less strigulose; sepals with some rose color within, 4-4.7 cm. long, ending in appendages 3-5 mm. long; petals white, broadly ovate, about 3-4 cm. long; capsule 2-5.5 cm. long.

Type locality, Cascade, Siltepec, District of Mariscal, Chiapas, Mexico. Material seen, MEXICO: CHIAPAS, Cascada, *E. Matuda 1734*, type coll. (A, MICH, MO). GUATEMALA, without locality, *M. Savage in 1846* (P). Dept. JUTIAPA, between Jutiapa and Plan de Urrutia, *Standley 75607* (F); near Jutiapa, *Standley 76327* (F, POM), *75287* (F, NY, POM, US), *74860* (F, G, POM, US); between Jutiapa and La Calera, *Standley 76144* (F, POM). Dept. HUEHUETENANGO, above Democracia on trail toward Jutal, *Steyermark 51041* (F). Dept. GUATEMALA, Sanarate, *Kellerman 6413* (F). Dept. JALAPA, between Jalapa and San Pedro Pinula, *Standley 76997* (F); hills ne. of Jalapa, *Standley 76840* (F, POM), *76872* (F); near Jalapa, *Standley 77405* (F, POM); Cerro Alcoba east of Jalapa, *Standley 77208* (F, POM). EL SALVADOR: Dept. CHALATENANGO, La Reina, *Calderón 2451* (F, US); Finca San Carlos, *Calderón 1572* (GH, MO, NY); Cerro del Guayabal, *Calderón 1977* (GH, NY, US).

Hauya matudai varies as to coriaceous character of leaves and whether the veins are impressed on the upper surface of the leaves, but it is characterized by grayish strigulose ovaries, floral tubes and young twigs. It is near to *H. barcenae*, but has longer sepal-tips and a more southern range. It grows at elevations of 850 to 2000 meters.

8. *Hauya purpusii* Munz, sp. nov.

A small tree; petioles 8-20 mm. long; leaf-blades oblong-ovate to subrotund, 5-8 cm. long, 2.5-5 cm. wide, subglabrous above, sparsely pubescent beneath especially near the midrib and veins; principal veins about 7-8 on each side of the midrib; pedicels 5-7 mm. long; floral tube very sparsely strigulose, 3.5-4 cm. long; sepals 3 cm. long, glabrous, purplish inside, the terminal appendages 3 mm. long, glabrous except for the minutely pubescent margins; petals about 3 cm. long; filaments about 2 cm. long, dilated; anthers with a narrow pointed tip which is about 3 mm. long; capsule 3-6 cm. long, the valves 6-8 mm. wide, dorsally plane; seeds not seen. (*Arbor parva*; petioli 8-20 mm. longis; laminis foliorum oblongo-ovatis aut subrotundatis, 5-8 cm. longis, 2.5-5 cm. latis, supra subglabris, puberulentis; filamentis circa 2 cm. longis, dilatatis; antheris cum apice angusto et 3 mm. infra sparse pubescentibus; pedicellis 5-7 mm. longis; tubo floris 3.5-4 cm. longo; sepalis 3 cm. longis, glabris, infra subpurpureis; appendiculis 3 mm. longis, glabris, in marginibus longo; capsulo 3-6 cm. longo, valvis 6-8 mm. latis, dorse planis; seminibus non visis.)

Type from rocky banks and gulches, creek east of Monserrate, state of TABASCO, MEXICO, *Purpus 10043*, U. S. Nat. Herb. no. 1209397. Other specimen seen from same locality, *Purpus 10514* (US). It is distinct in being quite glabrous about the flower, in sepals almost as long as the floral tube, and in the shortened sepal-tips.

9. *Hauya standleyi* Munz, sp. nov.

Dense shrub or tree to 7 m. high; young twigs glabrous or minutely sparingly strigulose; pedicels 0.5-2.5 cm. long, slender, more or less strigulose; leaf-blades rounded oblong-

obovate, rounded cuneate at base, abruptly rounded-acuminate at apex, 3-9 cm. long, 2.5-6 cm. wide, nearly or quite glabrous, with 6-8 main veins on each side of the midrib; pedicels 0-6 mm. long, 4-angled in fruit; floral tube 5.5-6 cm. long, more or less 4-angled especially toward the base, glabrous, apparently reddish; sepals dark red, about 2.8-3.5 cm. long, glabrous, dorsally ridged along the midrib, with free subulate tips about 4-5 mm. long; petals white, aging pink to red, about 2.5 cm. long; capsule (only one immature capsule seen) glabrous, 4-ridged so as to be almost square in cross section (each ridge median on a valve), about 2 cm. long. (Frutex aut arbor ad 7 m. alta; ramulis juvenibus glabris aut sparse strigulosis; pedicellis 0.5-2.5 cm. longis, tenuibus, substrigulosis; laminis foliorum rotunde oblongo-obovatis, base rotundo-cuneatis, apice abrupte rotundo-acuminatis, 3-9 cm. longis, 2.5-6 cm. latis, subglabris; venis principalibus 6-8; pedicellis 0-6 mm. longis; tubo floris 5.5-6 cm. longo, base subangulato, glabro; sepalis purpureo-rubris, circa 2.8-3.5 cm. longis, glabris, dorso carinatis, apicibus subulatis 4-5 mm. longis; petalis 2.5 cm. longis; capsulo glabro, 4-carinato, 2 cm. longo.)

Type from an exposed cliff, Cerro de la Cruz and vicinity, in sierra west of Jinotega, Dept. JINOTEGA, NICARAGUA, at 1200-1400 m., July 7, 1947, P. C. Standley 10992, Chicago Museum (F) no. 1307469.

Other material seen, NICARAGUA: Dept. JINOTEGA, same locality and date as the type, Standley 11044 (F); region of La Montañita and Las Mesitas, sierra west of Jinotega, Standley 10336 (F, US); sierra west of Jinotega on trail to Cerro de la Cruz, Standley 10205.

The proposed species occurs at from 1000 to 1400 meters and is characterized by its subglabrous condition, the sepals much shorter than the floral tube, the strongly angled capsule, floral tube and calyx, by the free sepal-tips being 4-5 mm. long, and by being from Nicaragua. It resembles *H. cornuta* in the angled floral tube and keeled capsule.

10. HAUYA LUCIDA Donnell Smith and Rose,

Bot. Gaz. 52: 48, 1911, and Contr. U. S. Nat. Herb. 16: 289, 1913.

H. donnell-smithii Loesener, Fedde Repert. 12: 236, 1913; based on *Tonduz 7445* which I have seen.

Tree 8-20 m. high, with dense round crown; bark brown, in plates; young twigs and petioles glabrous to finely strigulose, the latter 1-4 cm. long; leaf-blades rounded- to oblong-ovate, abruptly acuminate, rounded-cuneate at base, 5-11 cm. long, 2.5-6 cm. wide, mostly shining and glabrous above, shining to more or less permanently strigulose beneath, mostly 6-8-veined on each side of the midrib; pedicels 2-8 mm. long; ovary glabrous to more or less strigulose; floral tube likewise and 4-5 cm. long; sepals 2.5-3 cm. long, mostly glabrous except for the minutely pubescent margins; calyx-appendages terete, somewhat pubescent, 3-4.5 mm. long; petals obovate, white, 2.5-3 cm. long, 1.5-2 cm. wide; anthers 15-20 mm. long; capsule 3-5 cm. long; seeds, including wing, 10-12 mm. long.

Type locality, Río Torres, San Francisco de Guadalupe, Prov. San José, Costa Rica. Material studied, COSTA RICA: locality illegible, *F. Solis 324* (F, MO); without locality, *C. H. Lankester K 303* (F, K, P). Prov. SAN JOSÉ, Río Torres a San Francisco de Guadalupe, June, 1893, *Tonduz 8005*, type coll. (BM, BR, F, G, GH, NY, P, US, W), *Tonduz 8463* (BR); Río Torres, *Tonduz 7445* (F, GH, MO, NY, US), 12719, type no. of *donnell-smithii* (BM, K, NY, US); San Francisco, *J. D. Smith 4801* (GH, K, US); San Francisco de Guadalupe, *Pittier 12719* (G); near San José, *Pittier in 1898* (US); San José, *Tonduz 7285* (BM, K, US). Prov. ALAJUELA, San Pedro de San Ramón, *Brenes 23078* (NY); 3556 (F); La Palma de San Ramón, *Brenes 5763* (F); La Verbera near Alajuelita, *Tonduz 8915* (US). Prov. CARTAGO, Dulce Nombre, *Standley 35927* (US).

Hauya lucida seems to grow at about 800 to 1200 meters altitude, in Costa Rica. It is characterized by its subglabrous twigs and flowers, short floral tube, subterete calyx-tips that are 3-4.5 mm. long.

11. HAUYA GLAUCA Standley & L. Williams,

Ceiba 1: 89-90, 1950.

Shrub or tree, densely branched; twigs subglabrous to more or less pubescent; petioles 1-3.5 cm. long, subglabrous to almost hirsute; leaf-blades oval or oblong-obovate, 5-11 cm.

long, 2-8 cm. wide, rounded or cuneate at base, rounded or obtusely acute at apex, subglabrous or with some pubescence especially along the veins, with about 6-8 main veins on each side of midrib, green above, more or less glaucous beneath; flowers almost or quite sessile; ovary subglabrous to sparsely strigulose; floral tube 7-10 cm. long, more or less glabrous; sepals 3.5-5 cm. long, glabrous, with more or less subulate tips 3-5 mm. long; petals, white, aging red, broadly obovate, 3-4 cm. long; anthers 12-14 mm. long; capsule terete, 3.5-6 cm. long.

Type locality, Río Lizapa at Galeras, Dept. El Paraíso, Honduras. Specimens seen, HONDURAS: Dept. MORAZÁN, Yeguaré River at junction of Jicarito and Gallo creeks, *Molina R. 136* (BM, F, GH); along road near Loarque, *Williams & Molina R. 16704* (BM); Yeguaré River at 2800 ft. altitude, *Glassman 1722* (F, NY); drainage of Río Yeguaré, road to Valle de Angeles, near San Antonio, *Molina R. 395* (BM); near El Zamorano, *Standley 28489*, planted at subdirector's house (F). Dept. EL PARAÍSO, Las Casitas, *Standley, Williams & Allen 622* (F, MO, US), *Williams & Molina R. 11066* (BM, F, US); Río Lizapa at Llano de Lizapa, *A. Molina R. 3940* (F, US); Río Lizapa at Galeras, *Williams & Molina R. 14141*, type coll. (F, MO, UC, US). EL SALVADOR: Comasagua, *Calderón 1365*, without flowers but seems to belong here (NY, US).

This species grows at elevations of 850 to 1200 meters in Honduras and apparently El Salvador. It is glabrous or sparsely pubescent and has a long floral tube.

12. HAUYA RUACOPHILA Donnell Smith & Rose,

Bot. Gaz. 52: 47, 1911, and Contr. U. S. Nat. Herb. 16: 293, 1913.

H. longicornuta and vars. *ovalifolia* and *oblongifolia* Loesener, Fedde Repert. 12: 236-237, 1913. The species was proposed as consisting of two varieties, the first named based on *J. D. Smith 2528* and the second on *Heyde & Lux 2936*, both of which I have seen.

H. lemnophila Donnell Smith & Rose, Bot. Gaz. 52: 48, 1911, and Contr. U. S. Nat. Herb. 16: 294, 1913. Based on *Heyde & Lux 2936* which I have seen.

Shrub or tree, 1.5-9 m. tall; bark smooth, brown; young twigs velvety to pubescent or almost soft-hirsute; petioles 15-35 mm. long, whitish velvety-pubescent; leaf-blades round-cordate or oval to oblong-ovate, 5-14 cm. long, 2.5-7.5 cm. wide, abruptly acuminate at apex, cuneate-rounded to cordate at base, sparsely pubescent above, more or less permanently soft-pubescent or -subhirsute beneath, with 5-7 main veins on each side of the midrib; pedicels 0-3 mm. long; ovary densely pale soft-pubescent with spreading hairs; floral tube 7-10 cm. long, finely or more coarsely pubescent with mostly appressed hairs; sepals 4.5-5 cm. long, similarly pubescent, with free somewhat flattened tips 8-15 mm. long; petals 3.5-4 cm. long, white; filaments rose; anthers 15-25 mm. long; capsule 6-7.5 cm. long, permanently densely pubescent to subhirsute.

Type locality, Volcán Acatenango, Dept. Zacatepequez, Guatemala. Material seen, GUATEMALA: without locality, *Heyde 516* (US). Dept. ZACATEPEQUEZ, Volcán Acatenango, *J. D. Smith 2528*, type coll. of *H. ruacophila* and *H. longicornuta* var. *ovalifolia* (GH, K, NY, US); Barranco above Dueñas, *Standley 63135* (A, F, MICH, NY, POM, US), 63229 (F, POM); Dueñas, *Kellerman 6668* (F). Dept. QUICHÉ, without locality, *J. Ignacio Aguilar 1333* (F). Dept. GUATEMALA, without locality, *Aguilar 377* (F); Botanic Garden, Guatemala, *Steyermark 46482* (F); near Santa Catarina Pinula, *Mrs. B. B. Lewis in 1943* (F). Dept. HUEHUETENANGO, Río San Juan Ixtán east of San Rafael Pétzal, *Standley 82879* (F); between Nentón and Las Palmas, Sierra de los Cuchumatanes, *Steyermark 51613* (F). Dept. CHIMALTENANGO, near Río Pixayo between Chimaltenango and San Martín Jilotepeque, *Standley 64420* (F, POM). Dept. SOLOLÁ, eastern slope of Volcán Atitlán above Finca Panamá, *Steyermark 46590* (F); dry slopes above San Pedro village, *Steyermark 47161* (F). Dept. SANTA ROSA, Laguna de Carrizal, *Heyde & Lux 2936*, type number of *H. lemnophila* and *H. longicornuta* var. *oblongifolia* (G, GH, K, NY, P, US); La Joya de Limón, east of Cuilapa, *Standley 78255* (F, POM).

This species grows at elevations of 800 to 2000 meters in much of Guatemala. It is characterized by the soft spreading dense pubescence, long floral tube and much shorter sepals, as well as long fruits. Plants with coarser hairs (subhirsute) are *H. lemnophila*, but scarcely seem specifically distinct.

13. HAUYA QUERCETORUM Donnell Smith & Rose,

Bot. Gaz. 52: 47, 1911; Contr. U. S. Nat. Herb. 16: 292, 1913.

Said to be a tree; young twigs rather loosely pubescent; petioles 1.5-4 cm. long, spread-

ing-pubescent; leaf-blades oblong-ovate to round-oval, 4-12 cm. long, 2.5-7 cm. wide, cuneate to asymmetrically rounded at base, abruptly short-acuminate to rounded at apex, glabrous to pubescent along the veins especially on the under surface, sometimes glaucous beneath, with about 7-8 main veins on each side of the midrib; pedicels 1-4 mm. long; ovary rather densely spreading-pubescent; floral tube 6-8.5 cm. long, scattered-pubescent; sepals 3.5-5.5 cm. long, scattered-pubescent, the free tips 8-10 mm. long; petals about 3 cm. long; anthers about 24 mm. long; capsule 3-4.5 cm. long.

Type locality, Volcán Jumaytepeque, Dept. Santa Rosa, Guatemala. Herbarium material seen, GUATEMALA: without locality, *Heyde 743* (US). Dept. SANTA ROSA, Volcán Jumaytepeque, *Heyde & Lux 4479*, type coll. (G, GH, K, US), 4336 (GH, K, MO, US in part).

These collections are from about 1800 meters elevation; they are characterized by the loose spreading pubescence on the younger parts, the long floral tube and sepal-tips, the short capsule.

14. HAUYA RODRIGUEZII J. Donnell Smith,

Bot. Gaz. 18: 3, 1893; Smith & Rose, Contr. U. S. Nat. Herb. 16: 292, 1913.

Tree about 10 m. high; young branches more or less strigulose with also a few more spreading hairs; petioles 1.5-3 cm. long, strigulose and somewhat pubescent; leaf-blades oblong-ovate to elliptical, cuneate or rounded at base, abruptly acuminate, 4-11 cm. long, 3-7 cm. wide, coriaceous, subglabrous except for minute appressed hairs along the veins especially when young, with about 8-10 main veins on each side of the midrib; pedicels 0-4 mm. long; ovary densely strigulose; floral tube 7-8 cm. long, it and the calyx less densely strigulose; sepals 6-7 cm. long, the flattened-subulate appendages 8-10 mm. long; petals ovate, 4 cm. long, 2.5 cm. wide; anthers 2 cm. long; capsule 5.5-6 cm. long, subglabrous.

Type locality, Acatepeque, Dept. Zacatepequez, Guatemala. Specimens seen, GUATEMALA: Dept. ZACATEPEQUEZ, Acatepeque, southeast slopes of Volcán de Fuego, at 4300 ft., March, 1892, *J. D. Smith 2529*, type collection (G, GH, K, MO, NY, P, US).

The species is near to *H. matudai* in strigosity, but apparently different in longer sepal-tips, somewhat larger flowers, more glabrous larger leaves. Additional collections might break down these differences.

EXCLUDED SPECIES

Hauya arborea Curran, Proc. Calif. Acad. Sci., Ser. II, 1: 253, 1888, is *Xylonagra arborea* (Kell.) Donn. Smith & Rose.

Hauya californica Wats., Proc. Am. Acad. 20: 366, 1885, is *Xylonagra arborea* (Kell.) Donn. Smith & Rose.

THE GENUS XYLONAGRA (ONAGRACEAE)

PHILIP A. MUNZ

Based on the single species *X. arborea*, the genus *Xylonagra* was separated from the genus *Hauya* by J. Donnell Smith and J. N. Rose (Contr. U. S. Nat. Herb. 16: 294, 1913). *Hauya* is a rather large shrub or a tree with large white flowers, large leaves, capsules with many biseriolate seeds in each locule, and floral tube glabrous within. It ranges from north central Mexico to Costa Rica. *Xylonagra*, on the other hand, is a small shrub with smaller scarlet flowers, small leaves, few uniseriate seeds in each locule, and the floral tube pubescent within. It is found in rather a limited area on the west side of Baja California and is very much more xerophytic in character. Grateful acknowledgment is made for the support given by National Science Foundation Grant 4316 which was of aid in the preparation of this paper.