Terminalia oblonga (Ruiz & Pav.) Steud.

E.M. FLORES
Academia Nacional de Ciencias de Costa Rica, Costa Rica

COMBRETACEAE (INDIAN ALMOND FAMILY)

Gimbernatia oblonga Ruiz & Pav. (Flora Peruvianae, et Chilensis Prodromus 274; 1798); *Chuncoa oblonga* (Ruiz & Pav.) Pers. (Syn. Pl. 1: 486; 1805); *Terminalia tarapotensis* van Heurck & Müll.-Arg.(Observationes Botanicae 213; 1871); *Terminalia chiriquensis* Pittier (Contributions from the U.S. National Herbarium 18 [6]: 238; 1917)

Guayaba de montaña, guayabo de monte, guayabo negro, guayabón, huesillo, surá, yacushapana amarilla (Flores 1994i, Hall and Seymour 1978, Record and Hess 1949)

Terminalia oblonga is one of the emergent trees in the canopy of the humid tropical forests. The geographic range of the species extends from Honduras to the Amazon in South America (Brako and Zarucchi 1993, Flores 1994i, Hall and Seymour 1978, Jorgensen and León-Yáñez 1999, Longwood 1971, Macbride 1941, Standley and Williams 1962, Woodson and Schery 1958).

Terminalia oblonga is a large tree, reaching 25 to 45 m in height and 150 cm d.b.h., with a symmetrical bole in the distal two-thirds of its length (Flores 1994i, Standley and Williams 1962). The basal third is asymmetrical, with conspicuous buttresses more than 2 m in height. The axis is monopodial; the branches arising at the end of each growth flux are sympodial and plagiotropic (Hallé and others 1978). The branches are twisted and bend upward more than in *T. amazonia* (J.F. Gmel.) Exell (Flores 1994i). The bark exfoliates large and thin plates. The fallen plates are reddish brown or brown; the new bark is yellowish, almost white, and has a smooth texture. The average thickness is 5 mm (Flores 1994i). Phyllotaxy is spiral; internode reduction leads to spur shoot formation at the branch end. Leaves are petiolated, simple, exstipulated, membranaceous, sometimes chartaceous, oblong, obovate, oblanceolate or wide elliptic, with entire margin, acuminate apex, and attenuate leaf base. They are slightly pubescent, especially abaxially. The leaf is hypostomatic; stomata are anomocytic. The foliar ptyxis is conduplicate; young leaves are reddish brown. Leaf size and shape vary within a given tree or spur shoot. The species grows in well-drained alluvial soils of lowlands and coastal plains and frequently, is a constitutive member of the riparian flora; the temperature range is 24 to 35 ºC, and the annual rainfall varies from 1500 to 3500 mm. The elevation range is 20 to 500 m (Flores 1994i). Trees inhabiting nearly dry zones lose their foliage; the production of new leaves is synchronized with blooming (Flores 1994i).

The sapwood is creamy in green condition, and the heartwood is grayish brown; in dry condition, the sapwood is yellowish gray, and the heartwood remains grayishbrown. The wood oxidizes rapidly when exposed to air and light (Flores 1994i). Annual rings are not distinctive. It has straight or slightly undulate grain, medium luster, medium texture, and striped figure; the fresh wood smells unpleasant but is tasteless (Flores 1994i, Llach 1971, Longwood 1971, Picado and others 1983). The wood is heavy or very heavy (green weight 1120 to 1180 kg per m^3, with 50 to 71 percent moisture content). The timber has high quality and good physical and mechanical properties. Volumetric contraction (12.5) is moderate for the wood density; the radial contraction is low (4.8); and the tangential, normal (7.9) (Flores 1994i, Llach 1971, Longwood 1971, Picado and others 1983). Drying is moderately difficult but varies with wood origin. The wood may show splitting, checking, and slight warping. Working properties are medium; finishing of radial planes is difficult. Natural durability varies with origin. Resistance to fungal attack is moderate; however, the wood is susceptible to termites. It is difficult to impregnate and preserve. Many trees with diameters above 60 cm have hollow piths. The timber is used in heavy general construction, interior and exterior construction, cabinetwork, floors, bridge foundations, beams, fences, veneers, parquet, barrels, railroad ties, and ships. It is also suitable for making paper (Peteri's coefficient of flexibility is 76; Runkel factor is 0.82) (Llach 1971, Longwood 1971, Picado and others 1983).

Blooming occurs December through February, with variations at the beginning and end of the flowering period

along the geographic range of the species; a minor blooming occurs in August and September. The inflorescences are axillary. They are racemes 5 to 20 cm long, bearing numerous flowers grouped in pseudowhorls. A small bract subtends each flower. Flowers are bisexual, actinomorphic, epigynous, and sweetly scented. The receptacle is cup-shaped. The corolla is absent. The calyx is pentamerous, gamosepalous, tubular, and yellowish; it is fused to the androecium and gynoecium in the basal two-thirds. The distal-free third is cupuliform; calyx lobes are deltoid and pubescent in both surfaces. The androecium has 10 stamens exerted, distributed in two whorls; the external whorl alternates with the sepals while the inner verticil is opposite the sepals. There is an annular nectariferous disc surrounding the style; its secretion is slightly sugary. The gynoecium is unilocular with two anatropous, bitegmic, crassinucellate ovules; placentation is suspended. Pollination seems to be entomophilous with medium-size bees acting as pollinator agents (Bawa and others 1982); however, there is a strong possibility of partial anemophilous pollination (Flores 1994i).

Fruit ripening occurs from January to March and in September and October, although there are regional variations. Most flowers develop a fruit, but many fruits lack seeds. The fruit is a three-winged, pale yellow samara. The two larger wings, with a round or obtuse distal end, extend transversely, while the third is vestigial and carinate. The samara is pubescent, especially in the center. The exocarp is thin and papyraceous; the mesocarp is parenchymatic; and the endocarp, fibrous and woody (Flores 1994i). Fruits are wind-dispersed and because of their aerodynamic design are considered rolling autogyros (Augspurger 1986). Fruit weight is 52 to 56 mg. Fruits average approximately 18,000 per kg. The seed is enclosed in a triangular cavity surrounded by the fibrous endocarp. It is oblanceolate and has a long funiculus. The seedcoat is dull and dark yellow. The percentage of fruits containing seeds ranges from 50 to 60 percent, depending on the entry, and approximately 6 percent of them are not viable.

Fruits collected in stands with several trees have a higher number of viable seeds than those coming from isolated parent trees (Flores 1994i). Fruits collected from the tree have a higher moisture content and sometimes are immature; those lacking seed are lighter (Flores 1994i). Seed-producing trees must be selected from stands and the tree diameters must be more than 70 cm. Samaras must be mature and dry; seeds from immature samaras do not germinate well. Determining the period of seed viability is very difficult due to the high and variable percentage of sterile fruits in different fruit entries and because the seed is enclosed by the samara.

Germination is epigeal and the seedling is phanerocotylar. Under greenhouse and nursery conditions, germination is gradual. The radicle emerges at 50 to 60 days.

Samaras must be sown in boxes filled with sand, germination beds, or bancales. They require moderate shade and constant moisture. Seedling survival in the nursery is about 95 percent, and approximately 12 to 15 percent have a slower growth (Flores 1994i). The seedlings must be transplanted to plastic bags before the first eophyll extends. Plastic bags must be kept under moderate shade for 2 to 3 weeks. Soil fertilization or application of foliar nutrients increases seedling growth and vigor. The seedlings can be transferred to the field 8 to 12 months after germination. Root and leaf pruning before outplanting is recommended. When seedlings are placed in bancales, two root prunings are required: one when the seedling is 20 cm long and another 1 month before transplanting. Seedlings and saplings must be transferred to the field in adobe.

Terminalia oblonga has been planted at a planting distance of 3 by 3 m, sometimes 2 by 2 m. The species does well in monospecific plantations (Flores 1994i). Seedlings and saplings in nurseries and plantations are predated by ants *(Atta cephalotes, Acromyrmex*), which cause shoot damage and may promote shoot branching (Flores 1994i, Nichols and González 1992).

ADDITIONAL INFORMATION

The genus name, given by Linnaeus, refers to the branching pattern and the production of spur shoots. The species name is based on the leaf shape. In Central America, the species has been identified frequently as *T. lucida* Hoffm. ex Mart; nevertheless, the South American species differs from it in fruit morphology.

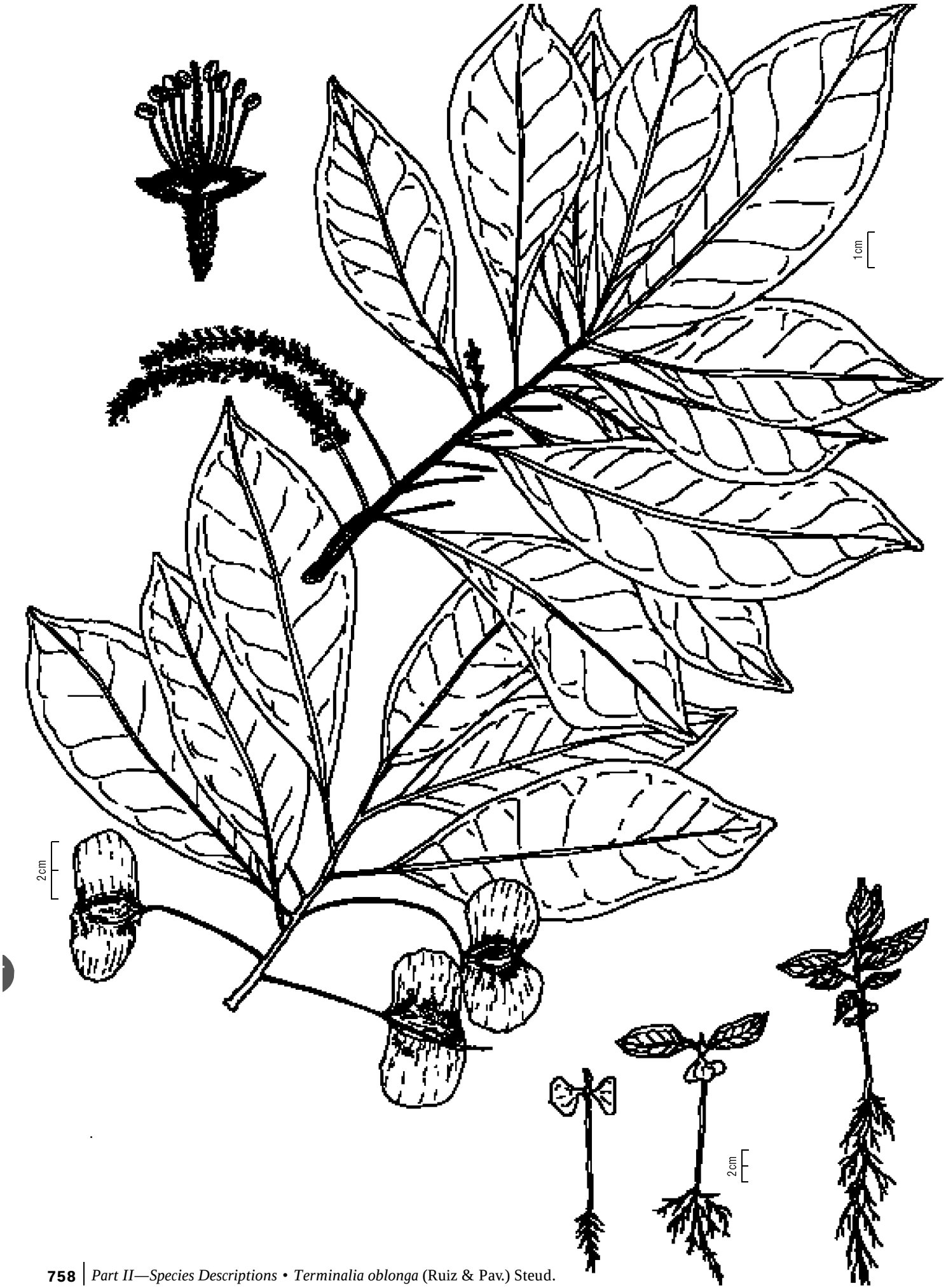
The leaves have numerous abaxial domatia, surrounded by trichome clusters. The areoles have translucent dots; they correspond to mesophyll idioblasts. Venation is eucamptodromous. The midrib is thick, with a straight course and projects abaxially; the secondary veins have an acute angle of divergence with respect to the midvein. Tertiary veins are transverse and form an angle of 80 to 90° with respect to the midvein; the pattern is distinctive for this species.

Stamen filaments are 2.0 to 2.5 mm long; they are filiform, glabrous, and yellowish. The anthers are subglobose, small (2.2 to 2.5 mm long), extrorse, dorsifixed, and yellow; anther dehiscence is longitudinal. Pollen is abundant and liberated in monads. In the gynoecium, the style is narrow and filiform with gold trichomes; the stigma is truncate, glandular, hollow, and reddish yellow (Flores 1994i).

Testa and tegmen form the seedcoat. The mature seed is exospermic and lacks perisperm. The endosperm is nuclear and is absorbed during embryo development. The embryo is small, oblong, and whitish. It is straight and has contorted

foliar cotyledons. Although the ovary has two ovules, only a single ovule develops, is fertilized, and forms a seed.

After 5 to 8 days, the hypocotyl begins its development; cotyledon emergence occurs 9 to 12 days later. The pericarp and the seedcoat fall down 5 to 6 days later. Cotyledons are reniform, green, and foliaceous; after they are outside, they continue growing for several days. They remain attached to the seedling for more than 3 months; abscission takes place at the petiole base (Flores 1994i). The eophylls have conduplicate ptyxis; they are greenish brown or reddish brown. The first flux of growth ends 5 months later, and the first group of plagiotropic lateral branches is produced.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