THE SYSTEMATICS AND USES OF THE GENUS *IPOMOEA* (CONVOLVULACEAE) OF OAXACA, MEXICO

by

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INTRODUCTION

The purpose of this study was to investigate the systematics of the genus Ipomoea (Convolvulaceae) from the state of Oaxaca, Mexico, including inquiry into the uses of the plants therein. Information and data were acquired for the study by the review of pertinent literature, acquisition and study of herbarium materials, flavonoid investigations, and personal fieldwork. Present disaccord in the placement of several groups (i.e. Quamoclit, Exogonium, and Calonyction), included or excluded from the genus, as well as disorganization of the sectional divisions in the genus itself (Verdcourt, 1957; Matuda, 1964-75; Gunn, 1972; Austin, 1975) have warranted this study. Because of the large size of the genus, and the polymorphic tendencies of the species included, it has posed many problems for the taxonomist. For a 60 year period since the first North American study of Ipomoea (House, 1908) few investigations have been made on this genus. The present study continues inquiry into this large and diverse genus.

Because this study involved various aspects of the genus Ipomoea, it is divided into three sections for matters of organization and convenience. The first section includes the taxonomy of the Ipomoea species in Oaxaca:

nomenclature, keys, and descriptions. The second section, systematics, includes the phytochemistry of the plants in the genus as correlated with their morphological aspects. The third section pertains to the historical and present uses of these morning glories to the indigenous cultures of Oaxaca.

In the past the genus Ipomoea has received taxonomic attention at generic, sectional, subgeneric, and species levels by various authors (Choisy, 1833; Clarke, 1883; Hallier, 1892; House, 1908). Sectional and generic delimitations were in as little agreement as those found by contemporary authors (Verdcourt, 1957: O'Donell, 1959; Gunn, 1972; Austin, 1975). Groups Calonyction, Quamoclit, and Exogonium are included in the genus Ipomoea by the author, and sectional divisions are in agreement with those from Verdcourt (1957) and Austin (1975). Turbina is recognized as a genus distinct from Ipomoea. The sections of the genus are considered in the keys as informal groups until more is known of these plants. However, the groups are referred to as sections in the text; historically these taxa have been considered as genera, sections, or subgenera.

The keys to the groups and species are artificial and pertain only to those species in Oaxaca. In many cases the synonomies are not complete, but those synonyms

seen have been cited. Specimens examined are from the Gray Herbarium at Harvard University (GH), and the National Herbarium at the Smithsonian Institute, Washington D.C. (US). Other herbaria visited include the Lundell Herbarium at the University of Texas, Austin, Texas (LL), the National Herbarium at La Universidad Autonoma Nacional de Mexico, Mexico, D.F., Mexico (MEXU), and the herbarium at the Instituto Politecnico de Mexico, Mexico, D.F., Mexico (ENCB). Personal field studies and collections were made in Oaxaca, from June through August, 1977. Specimens are deposited in the Massey Herbarium, Virginia Polytechnic Institute and State University, Blacksburg, Virginia (VPI). "Uncertain species" are considered briefly at the end of the keys if reported from Oaxaca but not seen as herbarium specimens or in the field by the author.

A phytochemical survey of flavonoid compounds is found in the second section of this study. Chemical affinities of certain sections and species are treated with reference to their morphological characteristics. The potential utility of this method in investigating the Convolvulaceae is also discussed.

The last section includes the survey of past and present uses of Ipomoea by cultures found in Oaxaca. A review of historical accounts of plant uses (Alarcon, 1892; Hernandez, 1942; Sahagun, 1969) and personal field work

revealed the various ways in which species of this genus are utilized.

OAXACA

Oaxaca, Mexico, is a southern Mexican state found just west of the Isthmus of Tehuantepec. Its northern latitudinal boundaries range from 15° 39' to 18° 42', and its western longitudinal boundaries range from 93° 52' to 98° 32'. Bordered by the states of Chiapas to the east, Veracruz to the north, Guerrero to the west, and the Pacific Ocean to the south, Oaxaca makes up 15% of Mexico's land area, approximately 95, 364km^2.

The state is situated where three mountain ranges articulate, its relief is mostly formed by the Sierra de Soconusco (Chiapas highlands) to the east, the Sierra Madre del Sur (southern range), and the Sierra Madre Oriental (northern range). The highest range, the Sierra Madre del Sur may reach up to 13,200 ft. above sea level, the other ranges reach up to about 10,000 ft. The bulk of the Oaxacan land mass is comprised of temperate valleys and plateaus located between ranges where the majority of the state's populace resides. Three fertile valleys are present in the state, formed by the Río Atoyac to the northwest, the Río Papaloapan to the north, and the Río Tehuantepec to the southeast.

Precipitation originating from the Pacific Ocean and the Gulf of Mexico keep Oaxaca wet during the Summer months of the year. The northern and southern sierras, located on

the state's borders, cause orographic precipitation and are much wetter regions than the state's interior. The vegetation zones in Oaxaca are greatly affected by the situation of these ranges.

The higher ridges of the ranges are occupied by Tropical Evergreen Forest, Cloud Forest, or Tropical Deciduous Forest (fig. 3). Climates that support these vegetation zones are middle latitudinal rainy climates with mild winters and little or no dry season (fig. 2). The plateaus of Central Oaxaca are semi-arid, steppe, and of middle latitudinal rainy climates with dry winter seasons. These areas are dominated by Oak-Pine Forest or Scrub where not disturbed by agriculture. Tropical Deciduous Forest lines the southern coast of Oaxaca. These forests are located in tropical rainy climates with a prolonged dry season throughout half the year.

Due to these many geographical barriers, diverse climates, and many vegetation zones, the flora of Oaxaca is very rich and composed of many adaptively unique and diverse plants. Of the genus Ipomoea, there is a richness in morphological diversity found in the species as they have adapted to succeed in the different climates. These geographical barriers also have aided in isolating human cultures so that in Oaxaca there exists a large number of distinct indigenous cultures and dialects.

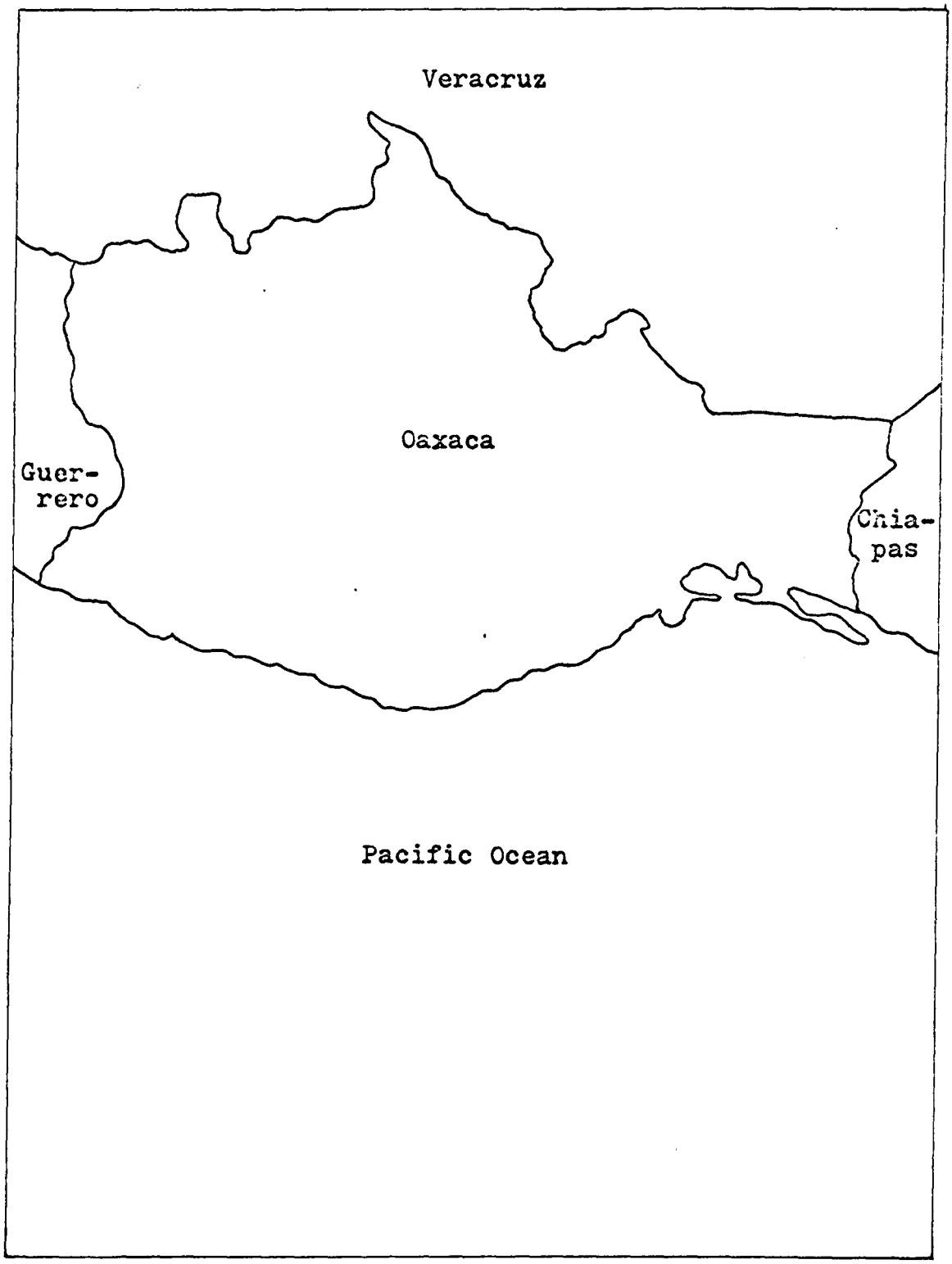

Fig. 1. Oaxaca and Adjacent States

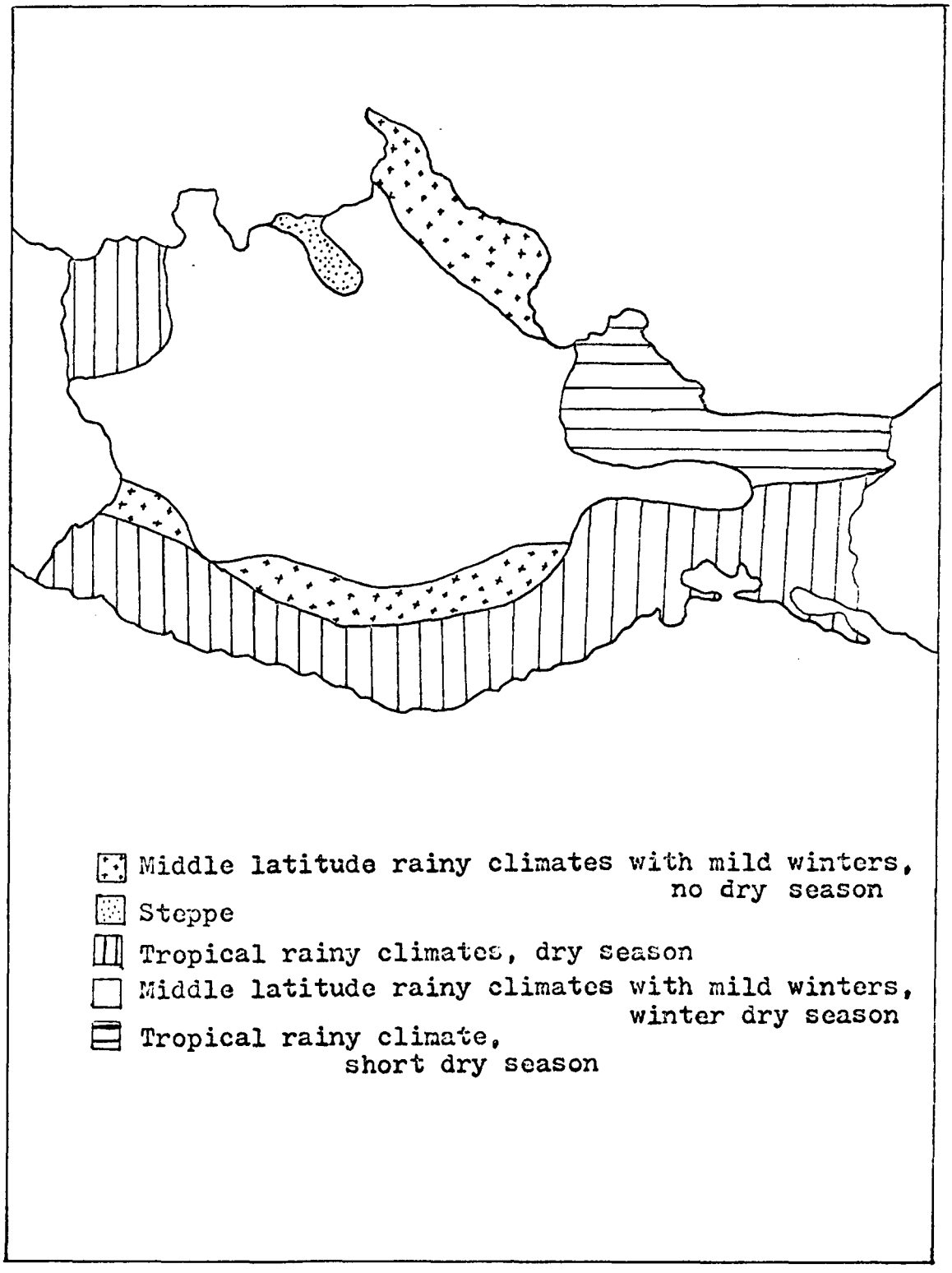

Fig. 2. Climatic Map of Oaxaca

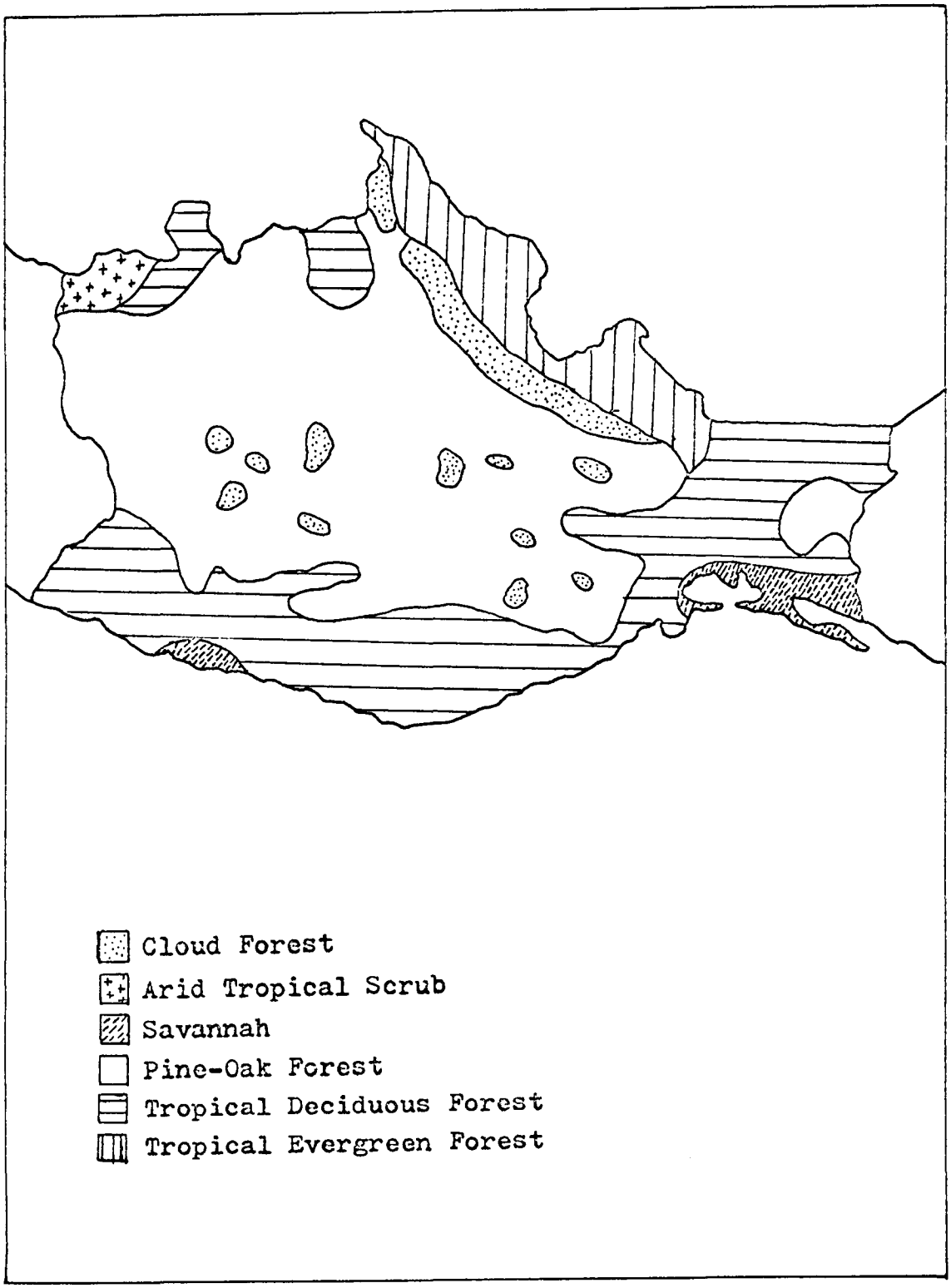

Fig. 3. Vegetative Map of Oaxaca

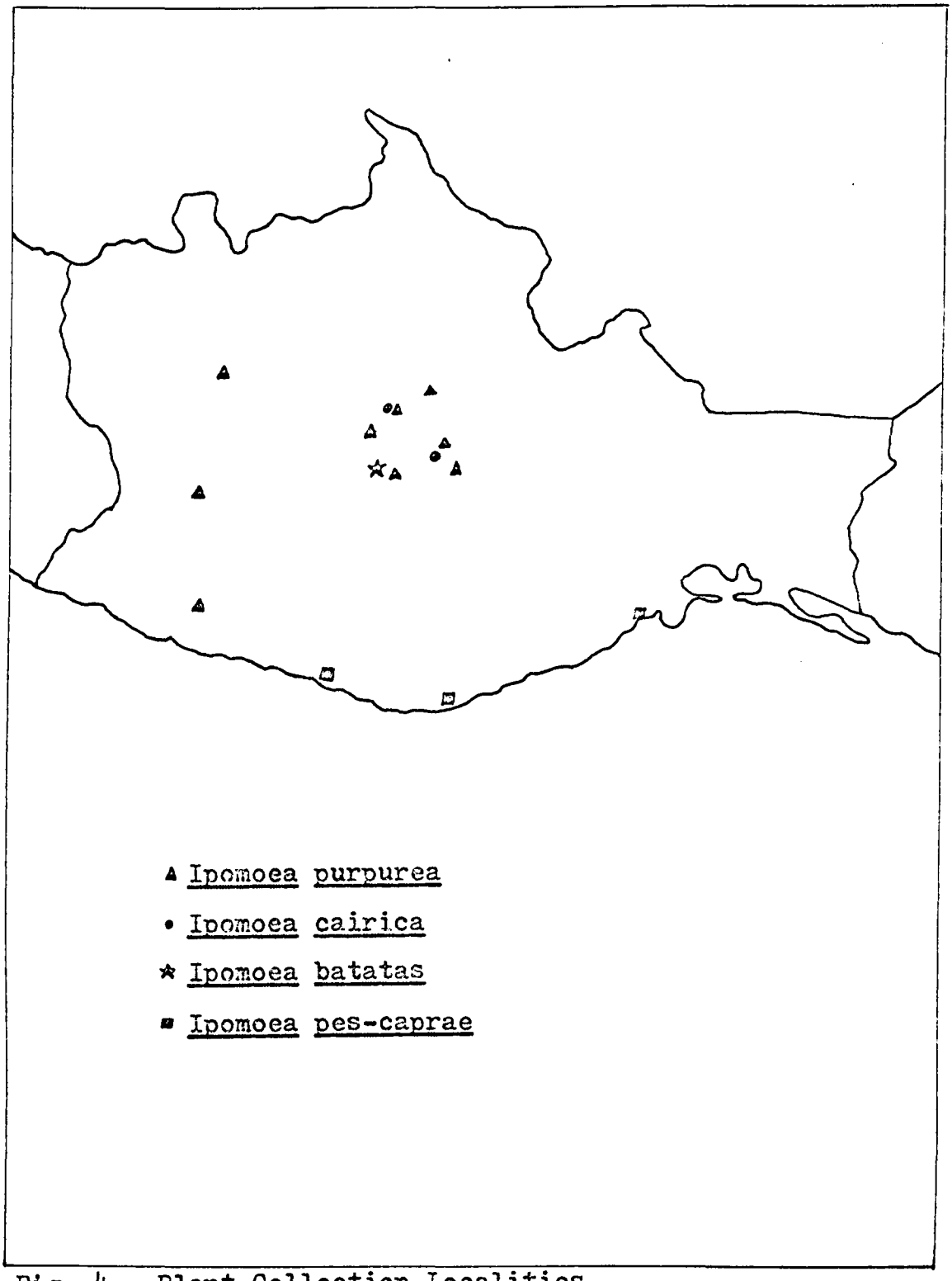

Fig. 4. Plant Collection Localities

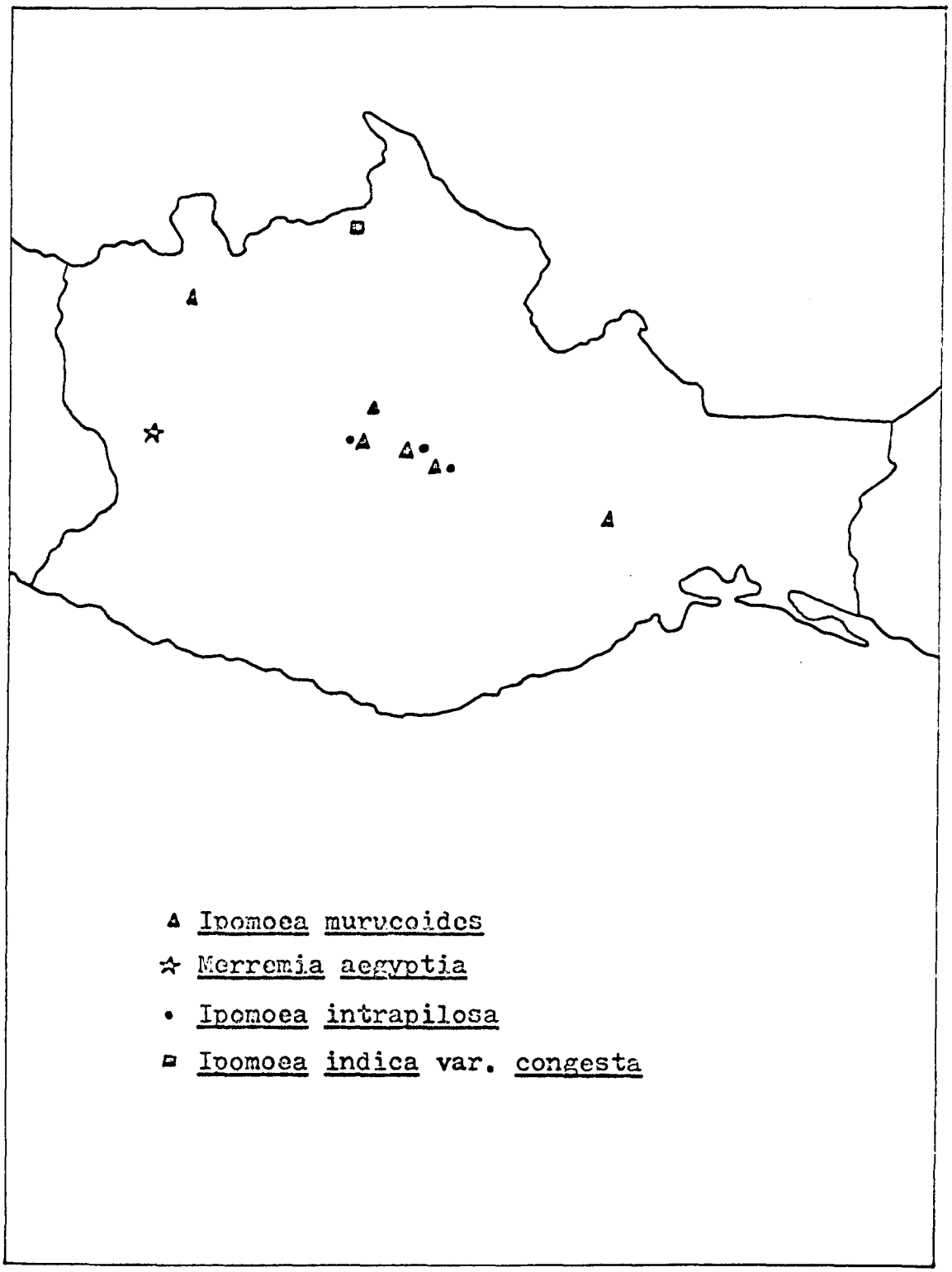

Fig. 5. Plant Collection Localities

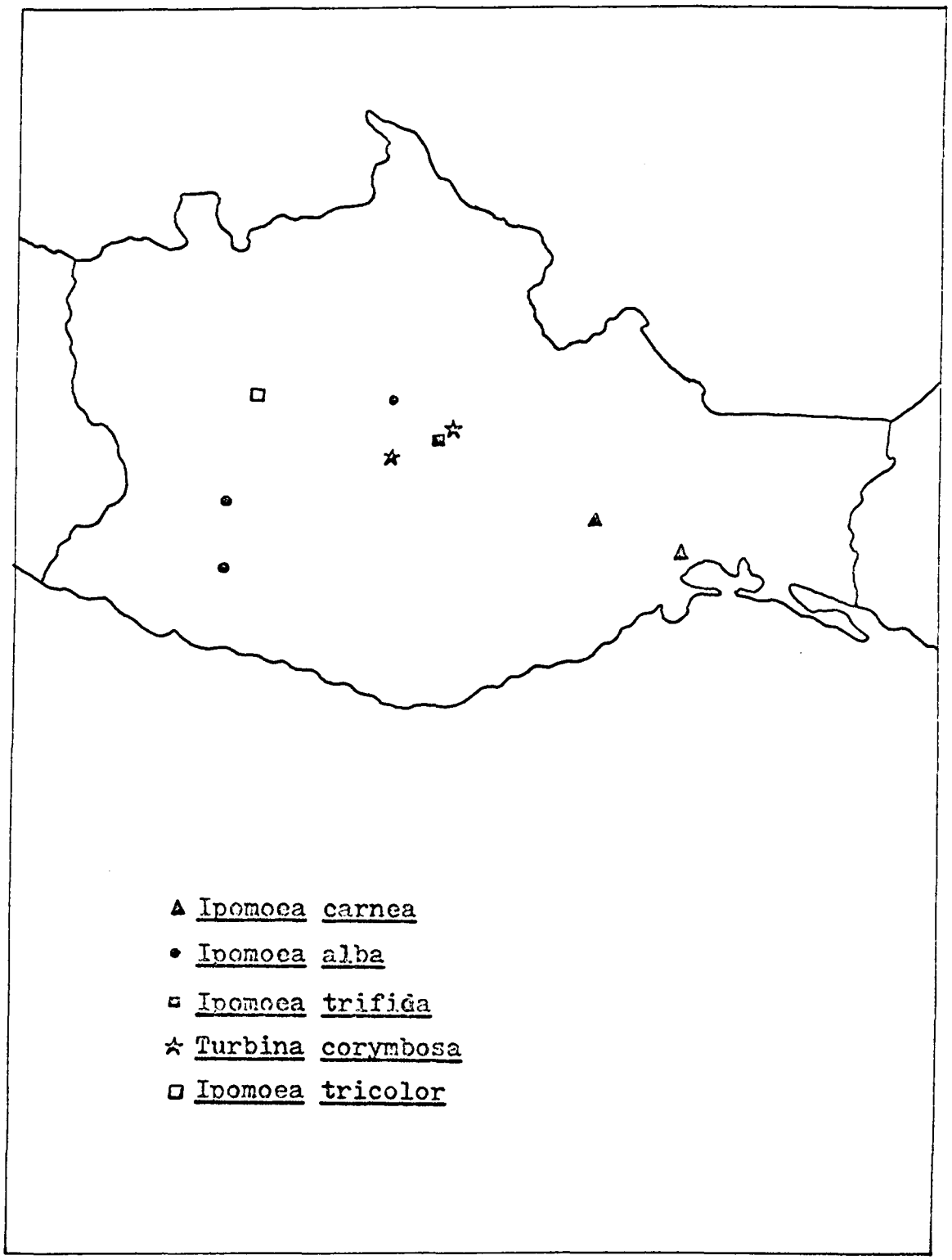

Fig. 6. Plant Collection Localities

TAXONOMY

Ipomoea L., Sp. Pl. 159. 1753; Gen. Pl. ed. 5, 76, 1754. Lectotype: I. pes-tigridis L. (House, 1908).

Quamoclit Moench, Meth. Bot. 453. 1794. Type: I. coccinea L.

Batatas Choisy, M. Soc. Phys. Genève 6:438. 1833. Type: B. edulis Choisy (=I. batatas (L.) Poir.).

Pharbitis Choisy, op. cit., 6:438. 1833. Type: I. purpurea(L.) Roth

Calonyction Choisy, op. cit. 6:441, 1833. Type: I. alba L.

Exogonium Choisy, op. cit. 6:443, 1833. Type: I. bracteata Cav.

Calboa Cav. Ic. et Descr. Pl. 5:51, 1799. Type: Cal. vitifolia Cav. (=I. neei (Spr.) O'Donell)

Vines, shrubs, or trees, twining, climbing, creeping, or erect, annual or perennial, glabrous, pubescent. Leaves mostly petiolate, alternate, mostly entire and cordate, but also lobed, angled, palmisect, or pinnatifid, rarely elliptical or lanceolate. Flowers solitary or in multi-flowered inflorescences, axillary, cymose, rarely paniculate, bracts of variable sizes and shapes; sepals imbricate, herbaceous to coriaceous, glabrous to tomentose;

corolla funnelform, salverform, infundibuliform, or campanulate, rarely suburceolate, rarely lobed, of various colors; stamens 5, exserted or included, alternate with petals, anthers oblong, pollen spinulose; ovary 2-4-loculed, ovules 1-2 per locule, style 1, filiform, stigmas globose, 2-3-lobed. Fruit a globose, ovoid, or conical capsule, 3-4-valved; seeds mostly 4-6.

A large genus found predominately in the Old and New World tropics and subtropics but also in temperate and dry areas of the world. Composed of approximately 400 species, commonly known as "morning glory".

Artificial Key to Ipomoea Groups

A. Corollas funnelform or salverform, limb abrubtly flaring at summit or only superiorly campanulate; stamens exserted.
   B. Corollas white-cream, long and funnelform to 13 cm long, closed during day...Group 6. Calonyction
   BB. Corolla yellow to red, or deep red-purple, corolla less than 5 cm long; diurnal.
      C. Sepals with subterminal aristae, or leaves pinnatifid.....Group 8. Quamoclit
      CC. Sepals without subterminal aristae, or leaves not pinnatifid.....Group 7. Exogonium

AA. Corollas infundibuliform, campanulate, or subfunnelform; stamens included.

D. Sepals herbaceous (I. tyrianthina with deep scarious margins), mostly equal, pubescent (except for variety of I. indica), stigmas 3-lobed.....Group 2. Pharbitis

DD. Sepals chartaceous, membranaceous, or coriaceous, not herbaceous, usually unequal, glabrous or pubescent; stigmas 2-lobed.

E. Plants creeping, rooting at nodes; leaves coriaceous or thick; littoral in habitat.....Group5. Erpipomoea

EE. Plants trailing, climbing, erect, arborescent, or shrubby; not rooting at nodes (except for I. batatas); leaves herbaceous, glabrous, or pubescent, not littoral in habitat.

F. Leaves not pedately dissected; sepals membranaceous, apiculate.....Group 4. Batatas

FF. Leaves simple, lobed, palmisect or pedatisect; sepals mostly chartaceous or coriaceous, not apiculate.

G. Large vines, erect shrubs, or arborescent, mostly perennial, seeds comose..Group 3. Eriospermum

GG. Plants mostly herbaceous, creeping, climbing, not arborescent; seeds glabrous or pubescent, not comose.....Group 1. Orthipomoea

Group 1. Orthipomoea

Ipomoea sect. Orthipomoea Choisy in D.C., Prodr. 9:353. 1845. Type: I. heterophylla R.Br.

a. Leaves pedatisect or palmisect.
  b. Plants erect, or at least initially erect with stems later decumbent.
    c. Branching along stems, sepals smooth, lanceolate..... 1. I. costellata
    cc. Branching from base, outer sepals muricate, ovate..... 2. I. capillacea
  bb. Plants trailing and climbing.
    d. Leaf segments to 9, filiform; sepals lanceolate, obtuse or acute, flaring apically; corolla 2-4 cm long.....3. I. pedatisecta
    dd. Leaf segments 5, ovate to lanceolate; sepals ovate and obtuse, not flaring apically; corolla 4-6 cm long.....4. I. cairica

aa. Leaves not pedatisect, but sagittate, ovate, suborbicular, or cordate.

e. Sepals less than 2.5 mm long.

f. Leaves subsessile; corolla more than 1.5 cm long.. ..... 5. I. microsepala

ff. Leaves petiolate; corolla less than 1.5 cm long... ..... 6. I. minutiflora

ee. Sepals more than 2.5 mm long.

g. Sepals 5 mm long or less, triangular, with green midrib and white borders.

h. Peduncles slender, 2mm thick, corolla 3 cm long or less..... 7. I. aristolochaefolia

hh. Peduncles thick, 3-8 mm thick, corolla more than 4 cm long..... 8. I. tricolor

gg. Sepals more than 5 mm long, ovate if shorter, borders not white.

i. Leaves ovate to lanceolate, basally cordate, mostly entire.

j. Stems slender, twining, or trailing; sepals subcoriaceous and obtuse..... ..... 13. I. simulans

jj. Stems thick, procumbent; sepals slightly mucronate, acute..... 14. I. dumetorum

ii. Leaves sagittate, hastate, or suborbicular, sinuately toothed margins if not.

k. Leaves suborbicular, basally cordate;

large leafy bract on pedicel..... 9. I. suffulta

kk. Leaves hastate or sagittate, bracts on pedicel inconspicuous.

l. Margins entire.

m. Sepals ovate-lanceolate, acute .... 10. I. elongata

mm. Sepals ovate or elliptical, obtuse..... ..... 11. I. sagittata

ll. Margins sinuately toothed..... 12. I. ignava

1. Ipomoea costellata Torr., Bot. Mex. Bound. Surv. 149. 1859.

Syntypes: Pecos River, Texas, Wright 505, 1615 (not seen)

A thin, erect, later decumbent, glabrous, herbaceous plant branching near base. Leaves palmisect, 5-9-lobed; segments linear, filiform, or lanceolate, acute or obtuse apically, 7-30 mm long, glabrous; petioles 5-30 mm long. Inflorescences 1-2-flowered; peduncles thin, 1-4 cm long; pedicels thicker than peduncles, 3-10 mm long. Sepals subequal, lanceolate, with pronounced scarious margins, awned, acute-acuminate, glabrous to pilose, 3-6 mm long; corolla infundibuliform, lavender-purple, to 15 mm long. Capsule globose, 5 mm long; seeds 4, brown, pubescent, 4 mm long.

Specimens examined: Altancingo, Conzatti 2347 (GH).

This species is uncommon in Oaxaca, occurring in the drier regions of Mexico and north to Texas. South of the Valley of Mexico, it is found only rarely in dry areas reaching into Guatemala. It closely resembles I. capillacea, I. leptotoma, and I. pedatisecta.

2. Ipomoea capillacea (H.B.K.) G. Don, Syst. 4:267. 1838.

Convolvulus capillaceus H.B.K. Nov. Gen Sp. Pl. 3:97. 1819.

Type: Colombia, Bonpland (not seen)

Ipomoea armata Roem. & Schult., Syst. Veg. 4:214. 1819. Nom. nov. for I. muricata Cav.

Ipomoea muricatisepala Matuda, Ann. Inst. Biol. Mex. 34:124. 1964. Nom. nov. for I. muricata Cav.

A perennial, erect plant branching basally from a rotund root to 5 cm long, reaching 40 cm in height. Leaves sessile or subsessile, 5-7-pedatisect; segments filiform or linear-lanceolate, glabrous, 5-35 mm long. Flowers axillary, single; peduncles 2 cm long or less. Sepals ovate or ovate-lanceolate, acute-acuminate, awned, 3-7 mm long, outer muricate, inner slightly larger and membranaceous; corolla pink-purple on limb, white in lower half of tube, 2-3 cm long. Capsule globose, glabrous, 4-valved, 5-8 mm long; seeds 4, finely pubescent.

Specimen examined: Telixtlahuaca, Smith 472 (GH).

The distribution of this plant ranges from the southwestern United States to northwestern South America. Common in dry areas in northern Mexico, this species is easily recognized by its dissected leaves and basal stems growing from a round tuber.

3. Ipomoea pedatisecta Mart & Gal., Bull. Acad. Brux. 7(2):265. 1845.

Type: reference not seen

A branching, trailing, herbaceous plant, glabrous or sparsely pilose. Leaves 7-11-lobed, pedatisect, segments filiform, oblong-lanceolate, suborbicular, obtuse or acute apically, mostly glabrous; segments 10-35 mm long, 2-10 mm wide; petioles muricate, glabrous or pilose. Peduncles axillary, glabrous, slender, 1-3-flowered, 1-4 cm long, bracts linear; pedicels 3-15 mm long. Sepals unequal, lanceolate, acute, sparsely pilose or muricate, 4-5.5 mm long, margins scarious; corolla purple, 3 cm long. Capsule subglobose, slightly elongate, 5 mm long; seeds 4, lightly pubescent.

Specimens examined: Huajuapan, Nelson 1995 (US). Ixtepec, Fisher 35307 (US). Oaxaca, Nelson 1597 (GH), Kenoyer 1451 (GH). Pochutla, Reko 3524 (US). Teotitlan, Conzatti 2098 (GH).

Distribution of this species is in western and southern Mexico. It is found mostly in canyons and drier habitats.

4. Ipomoea cairica (L.) Sweet, Hort. Brit. 287. 1827.
Convolvulus cairicus L. Syst. Nat. ed. 10, 922. 1759.
Type: Egypt, (LINN, not seen)

A robust, climbing, perennial vine. Leaves glabrous, palmisect; segments mostly 5, rarely 7, lobes ovate, ovate-lanceolate, or suborbicular, obtuse or acute apically, to 6 cm long; stipules palmisect. Inflorescences simple cymes 1-5-flowered; peduncles glabrous, 1-7 cm long; pedicels thicker and shorter than peduncles, to 2.5 cm long. Sepals subequal, ovate, obtuse or acute, glabrous, margins hyaline; corolla subinfundibuliform-campanulate, lavender, to 5 cm long. Capsule subglobose, to 1 cm long.

Specimen examined: Valley of Oaxaca, McDonald 45 (VPI).

This species is found commonly throughout warm areas of the world as a cultivated ornamental.

5. Ipomoea microsepala Benth., Bot. Sulphur 136. 1844
Type: Mexico, Acapulco, Benth. (not seen)
Ipomoea amplexicaulis Fernald, Bot. Gaz. 20:535. 1895.
Holotype: Mexico, Lamb 876 (GH)

A branching, twining, slender, sparsely pilose, herbaceous plant. Leaves ovate to ovate-lanceolate,

cordate basally, acuminate to acute apically, glabrous, 1-8 cm long, 1-7 cm wide, subsessile. Inflorescences axillary, solitary flowers to simple 2-4-flowered cymes; peduncles thin, glabrous, 2-7 cm long; pedicels slender, 1-2 cm long. Sepals mostly equal, barely imbricate, glabrous, 1-2 mm long, with conspicuous hyaline borders; corolla yellow, campanulate, 20-25 mm long. Capsules globose, 4-5 mm long, 2-loculed; seeds 4, dark, oval-oblong, pubescent, 4mm long.

Specimens examined: Cafetal Concordia, Morton & Makrinius 2414 (US), Llano Grande, Nelson 2327 (GH). Oaxaca, Reko 3918 (US).

This plant is found in dry or wet mountainous areas. It is characterized by its very small sepals and yellow flowers about 2 cm long. Its distribution is throughout southern and western Mexico to Guatemala and closely resembles I. minutiflora, I. aristolochiaefolia, and I. tricolor.

6. Ipomoea minutiflora (Mart. & Gal.) House, Muhlenbergia 5:71. 1909

Convolvulus minutiflorus Mart. & Gal. Bull Acad. Voy. Brux. Ser. 7. 2:262. 1845.

Type: Mexico, Oaxaca, Galeotti (not seen)

Ipomoea filipes Benth. ex Meisn. in Mart., Fl. Bras.

7:274. 1838.

Isotype: Brazil, Spruce s.n. (GH)

A trailing or twining herbaceous plant, sparsely pilose along stems. Leaves cordate, acute, acuminate, or mucronulate apically, glabrous, 5-30 mm long, 10-35mm wide; petioles slender, 2-3 cm long. Inflorescences axillary, simple 1-2-flowered cymes; peduncles 1-5 cm long, with small filiform bracts; pedicels 3-5 mm long, recurved in fruit. Sepals triangular to lanceolate, equal, hirsute-pilose, 2.5 mm long. Corolla yellow-orange, campanulate, 5-10 mm long. Capsules globose, 2-loculed, 4mm long; seeds 4, black, glabrate.

Specimen examined; San Geronima, Mell 2107 (US).

Not common in Oaxaca, this species is found throughout southern Mexico, Central America, and northern South America. Its corollas are a bright yellow, but inconspicuous due to their size.

7. Ipomoea aristolochiaefolia (H.B.K.) G. Don., Gen. Hist. 4:277. 1838.

Convolvulus aristolochiaefolia H.B.K., Nov. Gen. Sp. Pl. 3:102. 1819.

Type: Caracas, Venezuela, Humboldt & Bonpland s.n. (not seen)

Ipomoea cardiophylla Gray, Syn. Fl. N. Amer. 2(1):

213. 1877.

A procumbent or climbing, glabrous plant. Leaves entire, cordate, acuminate apically, herbaceous-membranaceous; petioles slender, glabrous or glabrescent, 1-5 cm long. Inflorescences simple axillary cymes, 1-7-flowered; peduncles glabrous, more slender than stem, 2-9 cm long; pedicels 1-2.5 cm long. Sepals lanceolate, with prominent white scarious margins, rugose, 4-8 mm long; corolla campanulate, pink-violet, 2-3 cm long. Capsules conical, 4-valved, glabrous, to 15 mm long, style often persistent; seeds 4, black, 4-5 mm long.

Specimens examined: El Parian-Etla, Gonzalez & Conzatti 898 (GH).

This species, distributed from Mexico to Argentina, is very much like I. tricolor but is more slender with a smaller corolla. I. aristolochiaefolia is usually identified as I. cardiophylla, a synonym.

8. Ipomoea tricolor Cav., Ic. Pl. 3:t. 208. 1794.

A twining, robust, herbaceous, annual vine, glabrous in entirety. Leaves simple, cordate, acuminate apically, 4-11 cm long, 3-9 cm wide; petioles glabrous, 4-11 cm long. Inflorescences simple to compound cymes, first ramifications dichotomous and 1-2-flowered; peduncles

thick, hollow, glabrous, 3-23 cm long; pedicels shorter and more slender than peduncles, to 3 cm long. Sepals mostly equal, glabrous, lanceolate-trangular, acute, 4-6 mm long, with prominent white scarious margins and green midrib; corolla campanulate, usually blue, but also white or pink, 5-7 cm long. Capsules ovate, conical, 13mm long, style often persistent; seeds 4, dark, glabrous, 5mm long.

Specimens examined: Oaxaca, Loeseneor, 5423 (GH). City of Oaxaca, Rose & Hough 4752 (US). Vally of Oaxaca, Nelson 1311 (GH). Parian-Etla, Conzatti & Gonzalez 898 (GH). San Carlos, Yauhtepec, MacDougall s.n. (US).

This species is commonly cultivated and known as the "heavenly blue". It is distinguished from other morning glories by its thick peduncles, large cordate leaves, and large light blue flowers. Often referred to as I. violacea L., its proper name is I. tricolor (Shinners 1965).

9. Ipomoea suffulta (H.B.K.) G. Don., Gen. Syst. 4:276. 1838.

Convolvulus suffultus H.B.K., Nov. Gen. Sp. Pl. 3:102. 1819.

Type: Mexico, Volcan de Jorulla, Humboldt & Bonpland s.n. (not seen)

A procumbent, perennial, pubescent, and tuberous plant. Leaves subreniform-orbicular, deeply cordate

basally, obtusely mucronate-acuminate apically, appressed pilose above, pubescent along veins beneath; petioles pubescent, 1.5-2.5 cm long. Inflorescences with 1-2 buds forming, flowers subsessile on leafy bracts. Sepals unequal, ciliate or glabrous, membranaceous, 3-7 mm long, outer with hyaline margins; corolla purple, 3-5 cm long, funnelform and widely campanulate, limb flaring in middle of corolla tube. Fruits not seen.

Specimens examined: Monte Alban, Rose & Hough 5670 (US), Smith 142 (US). Oaxaca, Pringle 4577 (GH), Conzatti 4197 (US). Valley of Oaxaca, Nelson 1541 (US).

This species is most commonly found in the dryer mountains of Oaxaca but is also distributed throughout Chiapas, Guerrero, Michoacan, and Guatemala. A large leafy bract found enveloping the flower base distinguishes it from all other Ipomoea species. This plant closely resembles I. elongata.

10. Ipomoea elongata Choisy in D.C., Prodr. 9:327. 1845.
Type: Mexico, Andrieux (Photo, US)

A thin, trailing, procumbent, herbaceous, glabrous, perennial vine. Leaves sagittate, ovate-lanceolate and cordate, acuminate apically, with sharp lateral lobes: petioles 1-2 cm long, pubescent at articulation with blade. Flowers solitary, axillary, subtended by short

sparsely pubescent peduncles, 5-30 mm long, bracts and bracteoles inconspicuous; pedicels thicker than peduncle. Sepals unequal, lanceolate-ovate, acute, outer rugose, shorter than inner, 3-8 mm long; corolla purple-rose, subfunnelform to widely campanulate, 5-6 cm long. Capsules 4-valved; seeds 4, 1.2-1.5 cm long.

Specimens examined: Cerro Zempoaltepetl, Mitla, Hallber 1033 (US). North of Oaxaca, Kenoyer 1644 (GH). Foothills of Oaxaca, Pringle 4693(GH). Oaxaca, Nelson 1153 (US), Rose & Hough 4967 (US). Sierra de San Felipe, Smith 910 (US).

This species is very common in Oaxaca being also found in Guerrero. It grows on the drier foothills of mountains, and its large purple flowers make it quite conspicuous.

11. Ipomoea sagittata Lam., Illust. 1:466, 1791. (not seen)

A slender, twining, glabrous plant. Leaves sagittate, glabrous, 6-7 cm long, 3-10 mm wide; petioles glabrous, slender, 1.4-3 cm long. Flowers solitary, axillary; peduncles glabrous, thicker than petioles, 7-20 mm long. Sepals subcoriaceous, subequal to unequal, ovate-elliptical, obtuse, glabrous, 9-12 mm long, 5-8 mm wide; corolla large, infundibuliform, purple, 6-7 cm long.

Fruits not seen.

Specimens examined: Cerro Espino, Reko 3526 (US)

This conspicuous, slender, climbing species is found in southern Mexico, Cuba, and the southeastern United States. It is usually found in areas such as marshes or roadside ditches where water is present during parts of the year.

12. I. ignava House, Ann. N.Y. Acad. Sci. 18(6):214. 1908.
Isotype: Oaxaca, La Carbonera, Conzatti & Gonzalez 261 (GH)

A trailing, tuberous, perennial vine. Leaves simple, triangular to hastate, cordate basally, sinuately toothed, sparsely pubescent under, 1-5 cm long, 1-4 cm wide; petioles smooth or rugose, 5-40 mm long. Inflorescences solitary flowers, bracts ovate. Sepals unequal, oblong-lanceolate, outer muricate, shorter than inner, 4-7 mm long; corolla infundibuliform, blue to dark purple with white throat, 4-6 cm long. Capsules 4-valved, subglobose, slightly conical, locules 2, 1 cm long; seeds 4, dark, finely pubescent, 6 mm long.

Specimens examined: La Carbonera, Conzatti 804 (GH). Huaclilla, Conzatti & Gonzalez 1216 (GH).

The last collection of this species was in 1901 by

Conzatti and Gonzales. Ipomoea ignava is endemic to Oaxaca and is characterized by its sinuately toothed leaf margins and trailing habit.

13. Ipomoea simulans Hanbury, Journ. Linn. Soc. Bot. 11: 281. 1871.

Type: Guanajuato, Hanbury (photo, US)

A thin twining, or decumbent, tuberous plant. Leaves ovate-lanceolate to triangular, acuminate apically, cordate or truncate basally, glabrous, 5-8 cm long, 2-3.5 cm wide. Inflorescences simple, axillary 1-3-flowered cymes; peduncles slender, pendent, glabrous, 5-25 mm long; pedicels thick, glabrous, 1-2 cm long. Sepals subequal, subcoriaceous-chartaceous, ovate, obtuse or acute, margins scarious, 4-7 mm long, 3-4 mm wide; corolla campanulate, purple, 3-5 cm long. Capsules light brown, 4-valved, subglobose, slightly conical.

This species is closely related to I. purga but differs in having included stamens and a campanulate corolla. (Hanbury, 1871) It is found throughout central and southern Mexico.

14. Ipomoea dumetorum Willd. ex Roem. & Schult., Veg. 4: 789. 1819.

Type: Colombia, Humboldt & Bonpland (not seen)

Convolvulus dumetorum H.B.K., Nov. Gen. Sp. Pl. 3:79. 1819.

Ipomoea oligantha Choisy in D.C., Prodr. 9:380. 1845.

A herbaceous, procumbent, annual plant. Leaves cordate, ovate-lanceolate, or angled, acute apically, glabrous, 3-8 cm long, 3-5 cm wide; petioles 2-8 cm long, often muricate, mostly glabrous. Inflorescences simple, axillary, 1-4-flowered cymes, peduncles 3-5 cm long, more slender than pedicels, pubescent basally, with lanceolate bracts and bracteoles; pedicels dark, rugose, reflexed in fruit. Sepals mostly equal, ovate, 4-6 mm long, 3-4 mm wide, outer acute, rugose, inner smooth obtuse- acute, smooth; corolla campanulate, pink-lavender, 4-5 cm long. Capsules subglobose, 9-12 mm long; seeds black, 5 mm long, pubescent.

Specimens examined: Valley of Oaxaca, Nelson 1148 (US), Cerro San Felipe, Nelson 1153 (US), Nelson 1184 (GH).

This species is common and distributed from Mexico to Argentina. It resembles species of the section Batatas in growth habit and morphology but lacks their typically apiculate sepals.

Group 2. Pharbitis

Pharbitis Choisy, Mém. Soc. Phys. Genève 6:438. 1833.

Type: I. purpurea (L.) Roth

Ipomoea Sect. Pharbitis (Choisy) Griseb., Fl. Brit. W. Ind. 473. 1864.

Ipomoea subg. Pharbitis (Choisy) Clarke, Fl. Bras. India 4:199. 1883.

a. Sepals glabrous, or with short appressed trichomes.
   b. Sepals acuminate, attenuate; corolla glabrous.
      c. Sepals mostly glabrous, wide at base,..... ..... 15b. I. indica var acuminata
      cc. Sepals pilose, narrow at base.. 15a. I. indica
   bb. Sepals oblong-ovate, cuspidate; corolla pubescent without..... 16. I. maireti

aa. Sepals hispid, or pubescent with long usually erect or spreading trichomes.
   c. Sepals with scarious margins....19. I. tyrianthina
   cc. Sepals without scarious margins.
      d. Sepals lancelolate, acuminate, caudate, not flaring apically.
         e. Coarse trichomes on sepals erect, sepals less than 11 mm long..18. I. barbatisepala
         ee. Pubescence appressed-spreading on sepals,

sepals longer than 11 mm..15c. I. indica var congesta

dd. Sepals elliptical, acute, without lanceolate tip, flaring apically..... 17. I. purpurea

15a. Ipomoea indica (Burm.) Merr. Int. Rumph. Herb. Amboinense 445, 1917.

Convolvulus indicus, Burm. Besler Hort. Aest. 1613. Lectotype; Based on Besler. Hort. Aest. 1613., Or. 13, Fol. 8, fig. 2. (by Fosberg, 1975, not seen)

A sparsely pilose or glabrous, branching and twining vine. Leaves strongly cordate, acuminate or acute apically, ovate basally, angled, rarely trilobed, 3-12 cm long, 2-10 cm wide. Inflorescences simple corymbiform cymes; peduncles glabrous, pubescent, 2-15 cm long, with linear bracts and bracteoles to 10 mm long; pedicels pubescent or glabrous. Sepals mostly equal, lanceolate to ovate-lanceolate, often dilated basally, acuminate apically, glabrous to appressed-pilose, 10-20 mm long; corolla infundibuliform or subcampanulate, blue or red, 3-7 cm long. Capsules 1.5 cm in diameter, depressed-globose; seeds 4, black, finely pubescent, 5 mm long.

Specimen examined: Teutila, Smith 686 (GH).

15b. Ipomoea indica (Burm.) Merr., var. acuminata (Vahl) Fosberg, Bot. Not. 129:37. 1976.

Convolvulus acuminatas Vahl, Symb. Bot. 3:27. 1794. Type: St. Croix, West (not seen)

Plants mostly glabrous, leaves cordate basally, 3-lobed, lobes acuminate apically; sepals glabrous.

Specimens examined: Chiltepec, Tuxtepec, Martinez & Calderon 10 (US). Choapam, Nelson 399 (US).

15c. Ipomoea indica (Burm.) Merr. var. congesta (R.Br.) McDonald comb. nov.

I. congesta R.Br. Prodr. Fl. Nov. Holl. ed.1:485. 1810.

I. mutabilis Lindl. Bot. Reg. pl. 39. 1815.

Leaves tomentose beneath, new growth silver-canescent. Sepals to 3.5 cm long, clustered, with long appressed yellow or silver hairs.

Specimens examined: Huaultla de Jimenez, McDonald 41 (VPI). Tamaulipas, Victoria, Palmer 201 (US). Veracruz, Jalapa, Rose & Hay, 6160 (US). Veracruz, Mt. Orizaba, Seaton 36 (US).

This variety occurs in the states of Oaxaca, Veracruz, and Tamaulipas in Mexico and keys to Ipomoea mutabilis in the works of House (1908) and Matuda (1964-65). It is also found in northern South America (O'Donell, 1959).

O'Donell includes an illustration of this variety bearing the name Ipomoea congesta, a synonym of Ipomoea indica (Burm.) Merr. (Fosberg, 1976). The variety differs from the original description of Ipomoea indica by its silvery, sericious-tomentose leaf undersurface.

16. Ipomoea maireti Choisy in D.C., Prodr. 9:374. 1845. Type: Mexico, p. 374, n. 166 (photo, US)

A stout, thick stemmed, tomentose, perennial vine. Leaves ovate, cordate, acute to subacuminate apically, lightly pubescent above, densely pubescent beneath, 7-15 cm long; petioles tomentose or densely pubescent, 3-9 cm long. Inflorescences simple 1-7-flowered cymes; peduncles thick, tomentose, 6-9 cm long; pedicels thick, tomentose, 1-4 cm long;leafy bracts, ovate, acute, with short appressed pubescence, 1-2 cm long. Sepals leafy, subequal, acute to subacuminate, 18-30 mm long, 6-14 mm wide; corolla campanulate, infundibuliform, throat white, limb blue to rose, lightly pubescent without, 4-8 cm long. Capsules subglobose, 1 cm long, 1 cm wide; seeds brown, densely and finely pubescent.

Specimens examined: Chiltepec, Tuxtepec, Martinez & Calderon 524 (GH). Oaxaca, Reko 3765 (US). Panixtlahuaca to Juquila, Nelson 2400 (US). Plunia, Nelson 2471 (US).

This plant is a large vine found in moist or dry forests from Orizaba, Veracruz to Guatemala. It is especially distinguishable by its large leafy sepals and bracts.

17. Ipomoea purpurea (L.) Roth, Bot. Abh. 27. 1787.
Convolvulus purpureus L. Sp. Pl. ed. 2, 219. 1762.
Lectotype: U.S.A., illustration of Convolvulus folio cordato glabro flore violaceo Dill., Hort. Elth. t. 84, fig. 97. 1732. (not seen)

A twining, pilose annual, densely pubescent on new growth. Leaves ovate, simple, 3-lobed, or rarely 5- lobed, acute or acuminate apically, cordate basally, variably pubescent on both surfaces, 3-11 cm long, 2-12 cm wide; petioles 2-5 cm long. Inflorescences cymose, 1-5-flowered; peduncles pilose, 5-80 mm long, bracts linear; pedicels thicker than peduncles, 5-15 mm long. Sepals subequal, elliptical, acute, flaring apically, glabrous within, with spreading trichomes without, yellow-green with occasional dark spots, 7-15 mm long, 2.5-4.5 mm wide; corolla campanulate, blue, pink, or purple above, with tube white, 3-6 cm long. Capsules depressed-globose, 3-loculed, 3-valved, glabrous, 7 mm long; seeds 4, glabrous, round, black to dark brown, 4 mm long.

Specimens examined: Jayacatlan, Smith 805 (GH). Valley of Oaxaca, Nelson 1313 (US). Tomellin, Rose & Painter 10040 (US).

This species is found in temperate areas throughout North and South America. It is the most common morning glory in Oaxaca, usually inhabiting milpas and other disturbed areas.

18. Ipomoea barbatisepala A. Gray, Syn. Fl. N. Amer. 2: 212. 1878.

Type: El Paso, Texas, Wright (US).

A creeping, annual, mostly glabrous plant. Leaves 3-7-lobed, lobes lanceolate or ovate-lanceolate, acute or acuminate apically, sinus at leaf base, 3-5 cm long; petioles 1-5 cm long. Inflorescences simple cymes or commonly with solitary flowers;peduncles equal in length to pedicels but more slender, glabrous, 2-3 cm long. Sepals equal, lanceolate, elongate-linear, apically curving into corolla, dilated basally, densely hispid with erect trichomes, 3-11 mm long; corolla blue or purple, infundibuliform, 2-3 cm long. Capsules subglobose, 3-valved, 2-loculed, 3mm long; seeds 4-7, spheroidal, dark, mostly glabrous, 5mm long.

Specimens: Cuicatlan, Conzatti 697 (US). Oaxaca,

Gonzalez & Conzatti 1094 (GH).

This species is widely and commonly distributed from Oaxaca to the southwestern United States occurring in dry and rocky areas. It closely resembles I. purpurea.

19. Ipomoea tyrianthina Lindl., Bot. Reg. Misc. 24:87. 1838.

Type: not indicated

A climbing, pilose plant with angled, twisting stems. Leaves usually 3-lobed, angled, acute or acuminate apically, hirsute on both surfaces, marginally ciliate, 3-9 cm long; petioles with scattered trichomes up to 5 mm long, 3-5 cm long. Inflorescences simple 2-5-flowered cymes; peduncles glabrate to pubescent, 5-15 cm long; pedicels densely whit-pubescent, 5-25 mm long,bracts linear. Sepals subequal, acute to acuminate, 12-15 mm long, outer more pubescent than inner, inner with deeper scarious margins; corolla campanulate, purple, 6-8 cm long. Capsules 4-valved, 2-loculed; seeds 4, 4-5 mm long.

Specimen examined: Sierra de San Felipe, Pringle 5667 (GH), Nelson 1159 (US).

This species, closely resembling Ipomoea purpurea, is found throughout Mexico and Guatemala. It is distinguished

by its herbaceous sepals with deep scarious margins.

Group 3. Eriospermum

Ipomoea sect. Eriospermum Hall. f., Bot. Jahrb. (Syst.) 18:149. 1893. Type: I. digitata L.

Ipomoea subg. Eriospermum (Hall. f.) Verdcourt, Taxon 6: 152. 1957.

a. Plants shrubby or arborescent.
   b. Sepals and corolla tomentose.... 20. I. murucoides
   bb. Sepals and corolla glabrous.
      c. Plants shrubby, branches erect; corolla purple..... 22. I. carnea
      cc. Plants arborescent, branches pendulous; corolla white-cream..... 21. I. intrapilosa

aa. Plants stout, woody vines (except for I. tuxtlensis, not stout)
   d. Sepals setose.
      e. Peduncles setose..... 24. I. setosa
      ee. Peduncles not setose..... 25. I. tentaculifera
   dd. Sepals glabrous or pubescent, not setose.
      f. Corolla white, cream.
         g. Corolla densely pubescent without; sepals tomentose..... 23. I. praecana

gg. Corolla glabrous without; sepals glabrous.

h. Stems papillate; sepal membranaceous..... ..... 26. I. anisomeres

hh. Stems smooth; sepals coriaceous..... ..... 27. I. dimorphylla

ff. Corolla lavender or purple.

i. Outer sepals with dense-silver-pubescence; corolla purple, campanulate ..... 28. I. turtlensis

ii. Sepals glabrous; corolla lavender, infundibuliform ..... 22. I. carnea

20. Ipomoea murucoides Roem. & Schult., Syst. 4:248. 1819.

Type: not indicated.

Convolvulus macranthus H.B.K., Nov. Gen. Sp. Pl. 3:95. 1818.

Ipomoea macrantha G.Don, Gen. Syst. 4:267. 1838. not I. macrantha Roem. & Schult., 4:248. 1819

Arborescent, 4-10 m high; wood white; branches stout, new growth tomentose. Leaves simple, elliptical-lanceolate to elliptical, acute or acuminate apically, pubescent or tomentose on new growth, with prominent pubescent veins beneath, 7-17 cm long, 2-5 cm wide. Inflorescences terminal panicles; peduncles pubescent-tomentose, 2.5 cm long; pedicels tomentose, longer than peduncles, Sepals unequal, densely tomentose, outer larger than inner, 2-3 cm

long, 1.5-2 cm wide; corolla white to cream, campanulate, pubescent exteriorly, to 3 cm long. Capsules oblong, 4-valved, valves reflexed after dehiscence, locules 2, to 2 cm long; seeds 4, dark, 10 mm long, bearing long white comose trichomes on upper margins.

Specimens examined: El Marquesado, Oaxaca, Conzatti 2623 (US). Oaxaca, Rose & Hough 4571 (US). Valley of Oaxaca, Pringle 6066 (US).

This common tree of Oaxaca is found in dry valleys along fence rows or stream beds. Its erect branches can distinguish it from the closely related species, I. intrapilosa which has pendulous branches. It is distributed throughout southwestern Mexico to Guatemala.

21. Ipomoea intrapilosa Rose, Gard. & For. 7:367. 1894.
Type: Mexico, Jalisco, Palmer 703 (N, not seen)

Arborescent, glabrous to pubescent, 3-8 m high, with pendulous branches. Leaves elliptical-lanceolate, truncate to subcordate, acute or acuminate apically, glabrous, 5-7 cm long; petioles thin, glabrous, 3-6 cm long. Inflorescences axillary, cymose, clustered at branch apices, 1-5-flowered; peduncles 1 cm long; pedicels thicker than peduncles, 1-3 cm long. Sepals equal, widely ovate, acute, pubescent within, glabrous without, 6-10 mm long;

corolla white, glabrous, 4-5 cm long. Capsules ovoid, 2 cm long; seeds 4, 5-6 mm long, with long white trichomes on dorsal angles.

Specimens examined: Outskirts of Mitla, McDonald 49 (VPI). Monte Alban, Pringle 4965 (GH). Valley of Oaxaca, Smith 316 (GH).

This species is common in the Valley of Oaxaca and shares the same distribution and habitats as Ipomoea murucoides. Its distinguishing characteristic is a pubescence within the sepals. The amount of this pubescence is variable.

22. Ipomoea carnea Mart., ex Choisy in D.C., Prodr. 4: 349. 1845.

Type: Colombia, Cartagena, Jacquin (not seen)

Ipomoea fistulosa Mart. ex Choisy in D.C., Prodr. 9: 349. 1845.

Lectotype: Brazil, Martius 2398 (M, not seen)

Erect shrub to 2 m high, or stout, climbing vine, young parts finely pubescent, stems thick and hollow. Leaves simple, ovate-lanceolate, pubescent to glabrous, acuminate or acute-acuminate apically. Inflorescences axillary cymes, 1-15-flowered; peduncles 1.5-10 cm long.

Sepals subequal, broadly ovate, pubescent, inner slightly wider than outer; corolla lavender, pubescent to glabrescent, 6-8 cm long. Capsules oblong-ovate, 2-loculed, 4-valved, 1-2 cm long; seeds 4, dark, 1 cm long, covered with long dark trichomes.

Specimens examined: Tehuantepec, McDonald 52 (VPI).

This species is found in dry or wet areas. It is distributed throughout the tropical regions of Mexico and the world. Ipomoea carnea has a variable growth habit, growing either as a woody vine or a low shrub. There are also variations in the pubescence, many specimens being densely pubescent.

23. Ipomoea praecana House, Ann. N.Y. Acad. Sci. 18(6): 227. 1908.

Type: Oaxaca, Nelson 1825 (US).

A perennial, stout, tomentose, woody vine. Leaves tomentose beneath, glabrescent above, orbicular-ovate, cordate or truncate basally, obtuse apically, to 10 cm long; petioles canescent, 4 cm long. Inflorescences simple axillary cymes or terminal panicles; peduncles canescent, ridged, to 10 cm long; pedicels canescent, 1-2 cm long. Sepals subequal, tomentose-canescent, ovate to elliptical, outer subacute or acute, inner obtuse; 1.5-2.5 cm long;

corolla tomentose, infundibuliform, white-cream, over 7 cm long. Fruits not seen.

Specimens examined: Cincallan, Conzatti, 4594 (US). Los Reyes, Nelson, 1825 (US).

No fruits have been seen for this plant, nor was I able to find any fruit descriptions in the literature. This species is closely related to I. murucoides and undoubtably belongs in this groups. Its distribution is in northern Mexico and Central America, where it grows in dry forests.

24. Ipomoea setosa Ker., Bot. Reg. 4(5):335. 1818.
Ipomoea melanotricha Brandeg., Univ. Calif. Publ Bot. 4:381. 1913.
Isotype:Veracruz, Purpus (US).

A large, branching, fast growing vine, to 18 m long, covered with large dark trichomes to 2 cm in length. Leaves 3-7-lobed, lobes ovate-lanceolate, acute and acuminate apically, glabrous, sinus at leaf base; 7-20 cm long; petioles setose, 5-15 cm long. Inflorescences simple axillary cymes, 2-4-flowered; peduncles setose, 5-20 cm long, thick, with lanceolate bracts; pedicels setose, more slender than peduncles, 1-3 cm long. Sepals subequal, ovate-lanceolate, subcoriaceous, mostly acute, 10-

14 mm long, 5-13 mm wide, outer sepals setose; corolla purple to lavender, infundibuliform, 5-7 cm long, tube to 1 cm wide. Capsule ovoid, 4-lobed, 4-valved, 1.5-2 cm long; seeds 4, comose, 1 cm long.

Specimens examined: Cafetal Concordia, Reko 3627 (US). Cincallan, Conzatti 3784 (US).

Ipomoea setosa is distributed throughout tropical America where it is found growing up high into tree canopies.

25. Ipomoea tentaculifera Greenm., Proc. Amer. Acad. 33: 482. 1898.

Type: Tomellin Canyon, Oaxaca, Pringle 6702 (US).

A perennial, tuberous, climbing plant, herbaceous and glabrous. Leaves simple, ovate, acuminate apically, glabrous, 5-8 cm long, 4-7 cm wide; petioles 2-5 cm long. Flowers solitary and axillary; peduncles glabrous, 2-7 cm long, longer than petioles. Sepals subequal, obtuse, outer densely setose, inner with scarious margins, 10-12 mm long; corolla purple, to 7 cm long. Fruits not seen.

Specimen examined: Tomellin Canyon, Pringle 6702 (US).

This plant is rare and limited to Oaxaca and Guerrero. Ipomoea tentaculifera closely resembles Ipomoea setosa,

having smaller leaves, and peduncles and pedicels that are not setose.

26. Ipomoea anisomeres Rob. & Bart., Proc. Amer. Acad. Arts 43:57. 1907.

Lectotype: Guatemala, Dean 318 (GH)

A twining, thin-stemmed plant, semi-woody basally, new growth glabrous, old growth papillate, foliage herbaceous. Leaves glabrous, truncate, cordate basally, oblong-ovate to broadly ovate or sagittate, acute apically, 2-7 cm wide and long. Inflorescences cymose, 1-many-flowered; peduncles glabrous, thicker than pedicels, often striated, longer than petioles; pedicels 1.5-2.5 cm long, glabrous. Sepals unequal, outermost suborbicular, chartaceous-subcoriaceous, 4 mm long, inner most to 1 cm long, membranaceous; corolla infundibuliform, 6-7 cm long. Fruits not seen.

Specimen examined: Chiltepec, Tuxtepec, Martinez-Calderon 303 (US).

This species, distributed throughout southwestern Mexico, Yucatan, and Guatemala, is distinguished from the other woody vines by its membranaceous sepals and papillose stems on old growth. No fruits or seeds of Ipomoea

anisomeres have been seen, and its placement into the group Eriospermum is tentative until it is found to possess comose seeds.

27. Ipomoea dimorphylla Greenm., Proc. Amer. Acad. Sci. 33: 482. 1898.

Lectotype: Michoacan, Pringle 6658 (House, US)

A twining, climbing, glabrous or pubescent vine. Leaves variable, new growth simple, older leaves often 3-lobed, cordate basally, lobes oblong-ovate to ovate-lanceolate, acuminate and acute apically, pubescent or glabrescent, 3-7 cm long, 2-5 cm wide. Inflorescences cymose, 3-many-flowered; peduncles thick, pubescent, 5-20 mm long, with small linear bracts; pedicels dark, 5-20 mm long. Sepals coriaceous, glabrous or sparingly pubescent, hyaline margins, ovate to elliptical, obtuse, 5-8 mm long, corolla infundibuliform, 4-7 cm long. Fruits not seen.

Specimens examined: Sierra San Felipe, Pringle 5677 (US), Conzatti & Gonzalez 505 (GH).

Distribution of this species is limited to southwestern Mexico. I have included it in the group Eriospermum because it is a woody vine. Observation of its seeds is needed to verify its placement in this group.

28. Ipomoea tuxtlensis House, Ann. New York Acad. Sci. 18:256. 1908.

Lectotype: Chiapas, Mexico, Nelson (House, US)

A perennial, twining plant with soft-pubescent, branching stems. Leaves mostly 3-lobed (rarely 5 parted), lobes ovate to ovate-lanceolate, acute and acuminate apically, appressed pilose above, sericeous beneath, 4-6 cm long; petioles pubescent, 3-8 cm long. Inflorescences axillary, subsessile, 1-7-flowered; peduncles pubescent, .3-10 mm long, with pubescent, linear-lanceolate bracts; pedicels pubescent, 4-5 mm long. Sepals unequal, ovate to elliptical, inner chartaceous, obtuse, outer silver-sericeous, subacute, 8-13 mm long; corolla deep purple, campanulate, 3-6 cm long. Capsules depressed-globose, 6-7 mm long; seeds 4, comose with white trichomes.

Specimen examined: Martinez-Calderon, 253 (GH).

Though not woody, this species is perennial and bears seeds with comose trichomes. Thus it belongs in the group Eriospermum. This species prefers moist areas and occurs from Oaxaca to Panama.

Group 4. Batatas

Batatas Choisy, Mém. Soc. Phys. Genève 6:434. 1833.

Type: I. batatas (L.) Poir.

Ipomoea sect. Batatas (Choisy) Griseb., Fl. Brit. W. Ind. 468. 1864.

Ipomoea subg. Batatas (Choisy) Clarke, Fl. Brit. India 4: 206. 1833.

a. Corolla lavender throughout, less than 2.5 cm long... ..... 29. I. trifida

aa. Corolla white and purple or lavender, more than 2.5 cm long.

b. Stems procumbent, usually glabrous, rooting at nodes.....30. I. batatas

bb. Stems twining and viny, usually pubescent, not rooting at nodes..... 31. I. tiliacea

29. Ipomoea trifida (H.B.K.) G. Don, Gen. Syst. 4:280. 1838.

Convolvulus trifidus H.B.K., Nov. Gen. Sp. Pl. 3: 107. 1819.

Type: Venezuela, Humboldt (not seen)

A branching, slender, trailing, herbaceous plant with

thickened root and sparsely pubescent stems. Leaves simple or 3-lobed, ovate, angled, cordate basally, lobes lanceolate to ovate-lanceolate, acute and acuminate apically, glabrous to sparsely pubescent; petioles 1-4 cm long, glabrous to lightly pubescent. Inflorescences simple cymes, 1-many-flowered, corymbiform; peduncles stout, slightly longer than petioles, mostly glabrous, with lanceolate bracts to 5 mm long; pedicels less than 1 cm long, often lightly muricate, more slender than peduncles. Sepals membranaceous, concave, glabrous or lightly pubescent, ovate to oblong-lanceolate, acute, apiculate, 7-12 mm long; corolla infundibuliform, lavender throughout, 2-3 cm long. Capsules subglobose, 8 mm long, style often persistent; seeds 4, glabrous, dark, 4mm long.

Specimens examined: Cuicatlan, Nelson 1678 (US), Gonzalez 41 (GH). Dominguillo, Nelson 1617 (GH). Sierra de San Felipe, Smith 908 (US). Tomellin, Rose, Painter, & Rose 10040 (US). Tule, McDonald 44 (VPI).

This species is often confused with I. triloba L. due to their close resemblance and variation in the characters (sepal length and pubescence) that distinguish the two species. Ipomoea trifida seems to be found more inland and has longer sepals, but I am not thoroughly convinced these plants are not conspecific.

30. Ipomoea batatas (L.) Poir. in Lam. Encyl. Meth. 6: 14. 1804.

Convolvulus batatas L., Sp. Pl. 154. 1753.

Type: Linn. Herb. 218.12 (not seen)

A creeping, glabrous or sparsely pubescent plant, with tuberous roots of various colors, and mostly thick angular stems, rooting at nodes. Leaves variable, simple, cordate, 3-7-lobed, or angular, usually glabrous, obtuse, acute, or acuminate apically, 4-15 cm long, 4-18 cm wide; petioles to 14 cm long. Inflorescences corymbiform cymes 3-many-flowered; peduncles to 15 cm long, glabrous or with scattered hirsute trichomes. Sepals membranaceous, oblong, acute, outer acuminate, cuspidate, 2-10 mm long, 3-5 mm wide, pubescent or glabrous, ciliate, inner sepals wider; corolla lavender-purple, throat dark, infundibuliform, 2-4 cm long. Fruits rare (not seen).

Specimen examined: Zaachila, McDonald 45, (VPI).

Ipomoea batatas, the sweet potato, has been distributed throughout the tropical areas of the world by man. I have found only the cultivated varieties in Oaxaca.

31. Ipomoea tiliacea (Willd.) Choisy in D.C., Prodr. 9: 375. 1845.

Convolvulus tiliaceous Willd., Enum. Pl. 1:203. 1899. Type: Herb. Willd. 3091 (not seen)

A branching, slender, climbing herbaceous plant with white-pilose to glabrous stems. Leaves mostly glabrous and simple, some angled or sub-3-lobed, ovate, cordate basally, acute and acuminate basally, mucronulate, 1.5-4 cm long, 1-3 cm wide. Inflorescences simple or compound corymbiform cymes; peduncles thick, glabrous, longer than petioles, 3-18 cm long; pedicels short and more slender than peduncles. Sepals equal, innermost wider than outer, mostly glabrous, ovate to ovate-lanceolate, acute, 5-11 mm long, 3-7 mm wide; corolla limb white, throat purple, 3-5 cm long, tube 1 cm wide. Capsules depressed-globose, 4-lobed, 3-10 cm long; seeds 4, spheroidal, dark, glabrous.

Specimens examined: Cafetal Concordia, Morton & Makrinius 2576 (US). Chiltepec, Tuxtepec, Martinez-Calderon 338, 219 (GH). Putla, McDonald 50 (VPI).

Ipomoea tiliacea is found in Florida, the West Indies, and from Mexico to Brazil. It grows in the wetter areas of these regions and is easily distinguished from other species of the Batatas complex by its four-lobed capsule and wide two-tone (white-purple) corolla.

Group 5. Erpipomoea

Ipomoea sect. Erpipomoea Choisy, Mém. Soc. Phys. Genève 6:444. 1833. Type: I. pes-caprae (L.) R.Br.

a. Leaves simple, suborbicular to ovate; corolla lavender.
   b. Sepals equal, ovate..... 32. I. pes-caprae
   bb. Sepals unequal, ovate or oblong-ovate..... ..... 33. I. asarifolia

aa. Leaves simple or 3-5-lobed, mostly elliptical, linear, or oblong-lanceolate; corolla yellow..... ..... 34. I. stolonifera

32. Ipomoea pes-caprae (L.) R.Br. in Tuckey, Narr. Exped. R. Zaire. 477. 1818.
Convolvulus pes-caprae L., Sp. Pl. 159. 1753.
Type: Linn. Herb. 218-50 (not seen)

A creeping, branching, prostrate plant with thick waxy stems and foliage, rooting at nodes. Leaves glabrous, suborbicular, orbicular, ovate, or oblong-ovate, simple, emarginate apically, rounded basally, coriaceous, 4-8 cm long; petioles angular, 3-7 cm long. Inflorescences ocurring near stem apex, solitary to many-flowered axillary cymes; peduncles thick, 2-8 cm long; pedicels glabrous, 1-2 cm long. Sepals equal, glabrous, elliptical-ovate,

obtuse, minutely awned apically, 7-10 mm long, 5-6 mm wide; corolla infundibuliform, lavender-purple, 2.5-3.5 cm long. Capsules 2 cm long, conical; seeds 4, spheroidal, densely pubescent with soft, short, brown trichomes, 7 mm long.

Specimens examined: Puerto Angel, Morton & Makrinius 2728 (US). La Ventosa, Tehuantepec, McDonald 54 (VPI).

Ipomoea pes-caprae is a circumtropical littoral morning glory. Its thick emarginate leaves and equal sepals distinguish it from a morphologically similar species, I. asarifolia, which is also found in Oaxaca.

33. Ipomoea asarifolia (Desr.) Roem & Schult., Syst. 4: 251. 1819.

Convolvulus asarifolius Desr. in Lam. Encly. Meth. 3: 562. 1789.

Type: Senegal, Rousillan (not seen)

A herbaceous, creeping plant, thick-stemmed, rooting at nodes. Leaves simple, subreniform to orbicular, obtuse or subacute apically, 4-8 cm long; petioles glabrous, 3-11 cm long. Inflorescences axillary, simple or compound cymes, 2-10-flowered; peduncles thick, glabrous, 3-18 cm long, with ovate bracts; pedicels glabrous, 1-

2.5 cm long. Sepals unequal, outer cuspidate, oblong-ovate, glabrous, inner obtuse, longer than outer, to 12 mm long; corolla campanulate, lavender, 5-8 cm long. Capsules subglobose, 10-12 mm long, style persistent; seeds 4, glabrous, 6-7 mm long.

Specimen examined: North of Salina Cruz, Nevling & Gomez-Pompa (GH).

Ipomoea asarifolia is another oceanic-drift distributed morning glory found from Oaxaca to South America, the West Indies, and tropical Africa and Asia. Its unequal sepals and apically acute leaves distinguish it from I. pes-caprae.

34. Ipomoea stolonifera (Cyrill.) Gmelin, Syst. Nat. ed. 13. 2:245. 1791.

Convolvulus stoloniferus Cyrill., Pl. Rar. Neap. 1: 14, to. 5 1788.

Type: Based on Convolvulus obtusis, Plumier, Pl. Amer. 79, t. 90 f. 2. 1756. (not seen)

Convolvulus littoralis L., Syst. Nat., ed. 10. 924 1759.

Ipomoea littoralis Boiss., Fl. Orient. 4:112, 1879. non Blume (1826)

Ipomoea littoralis, Blume, Bijdr. 713. 1826.

Prostrate, twining vine with thin aerial branches, glabrous, rooting at nodes, Leaves variable, mostly entire, rarely 3-5-lobed, linear to elliptical or oblong-lanceolate, obtuse and emarginate apically, suborbicular, glabrous, 1-5 cm long; petioles glabrous 2-4 cm long. Inflorescences solitary or 2-3-flowered simple cymes; peduncles glabrous, 4-20 mm long, bracts ovate and acute; pedicels commonly longer and thicker than peduncles. Sepals oblong-ovate, unequal, inner larger than outer, glabrous subcoriaceous, to 15 mm long; corolla infundibuliform, white to yellow, 3-6 cm long. Capsules 1.5 cm long, subglobose, 4-loculed; seeds 4, 1 cm long, with yellow trichomes.

Specimen examined: Playa de Minas, Tamiltepec, Conzatti 4115 (US).

Ipomoea stolonifera is another pantropical littoral species. It is distinguished from the others by its yellow corolla.

Group 6. Calonyction

Calonyction Choisy, Mém. Soc. Phys. Genève 6:441. 1833.

Type: I. alba L.

Ipomoea sect. Calonyction (Choisy) Griseb., Fl. Brit. W. 466. 1864.

Ipomoea subg. Calonyction (Choisy) Clarke, Fl. Brit. India 4:197. 1883.

36. Ipomoea alba L., Sp. Pl. 161. 1753.

Lectotype: India, Rheed, Hort. Ind. Malabasee, t. 50, figs. 1 & 2, 1692 (Gunn 1972)

A robust, climbing, glabrous, thick-stemmed, muricate vine. Leaves cordate, simple or 3-5-lobed, acuminate apically; petioles muricate, glabrous 3-16 cm long, 3-13 cm wide. Inflorescences axillary cymes, 1-8-flowered; peduncles thick, glabrous, 2.5-25 cm long; pedicels 7-20 mm long. Sepals unequal, outer ovate-elliptical, 5-10 mm long with large thick terminal aristae, inner 8-15 mm long, longer and wider than outer; corolla funnelform, white, opening nocturnally to 13 cm long, stamens exserted. Capsule 4-valved, ovoid, 2.5-3 cm long; seeds 4, 10-12 mm long, black to tan, ovoid, slightly pubescent.

Specimens examined: Chiltepec, Tuxtepec, Martinez-Calderon 335, Cuicatlan, Smith 333 (GH). Oaxaca, Nelson

1317 (US). Putla, McDonald, 53 (VPI).

This pantropical species is cultivated in temperate as well as tropical areas and has been distributed throughout the world by man. It is a well known nocturnal, moth pollinated morning glory: the only species in Oaxaca of the group Calonyction.

Group 7. Exogonium

Exogonium Choisy, Mém. Soc. Phys. Genève 6:443. 1833.
Type: I. bracteata Cav.

Ipomoea sect. Exogonium (Choisy) Griseb., Fl. Brit. W. Ind. 472. 1864.

Ipomoea subg. Exogonium (Choisy Meisn. in Mart., Fl. Bras. 7:221. 1869.

a. Outer sepals with silvery pubescence; corollas to 3.5 cm long, limb lobed..... 37. I. argentifolia

aa. Sepals glabrous and membranaceous; corolla to 6 cm long, with far reaching subentire limb..... ..... 38. I. purga

37. Ipomoea argentifolia A. Rick. in Sagra, Fl. Cuba 2:131. 1850. (not seen)

Ipomoea Conzattii Greenman, Field Col. Mus. Publ. Bot. 2:258. 1907.

Type: Mexico, Oaxaca, Conzatti 1666 (not seen)

A highly branched, suffrutescent, often leafless plant. Leaves oblong, densely pubescent with silver trichomes, 1-6 cm long. Inflorescences axillary cymes, 3-many-flowered; peduncles 3-20 mm long, often subsessile; pedicels more slender and usually longer than peduncles. Sepals unequal, outer ovate, obtuse, dark with appressed silver pubescence, 3-5 mm long, inner slightly longer, glabrescent, often emarginate apically; corolla scarlet-red, subfunnelform, tube 3 cm long and often dilated near base; stamens and style exserted. Capsules globose, dark, glabrous.

Specimens examined: Amoloyas, Pringle 5636 (GH). Sota de Vega, Moran 10095 (US). Tlapancingo, Nelson 2095 (US). Tomellin Canyon, Pringle 636 (GH).

Ipomoea argentifolia has a distribution limited to Oaxaca, Puebla, and Cuba. It is usually leafless, shrubby, and grows in dry areas. It seems to be synonymous in description with Ipomoea Conzattii Greenm. House (1908) mentions their resemblance and spits the two species by the pubescence of the Ipomoea Conzattii corolla. However, House cites a specimen with a glabrous corolla for I. Conzattii. I was unable to find the original description of Ipomoea argentifolia. All

specimens I have seen from the West Indies and Mexico possess glabrous corollas.

38. Ipomoea purga (Wender) Hayne, Arzn. Gen. 12: pl. 33, 39. 1833.

Convolvulus purga Wenderoth, Pharm. Centralb. 1: 457. 1830.

Type: Mexico, Schiede (not seen)

A perennial, glabrous plant with herbaceous foliage and a tuberous root. Leaves thin, simple, widely ovate, cordate, acute and acuminate apically, glabrous, 5-10 cm long. Inflorescences axillary, a solitary flower or simple cymes; peduncles glabrous, 1.5-7 cm long; pedicels thicker than peduncles, 1 cm long. Sepals unequal, glabrous, acute-obtuse, membranaceous, ovate to ovate-lanceolate, outer smaller than inner, 3-8 mm long; corolla scarlet-purple, subfunnelform to salverform, 5-6 cm long, limb abruptly flaring and subentire, stamens and style exserted. Capsule 4-valved, 1.5 cm long; seeds 4, brown, lightly pubescent. 5.5 mm long.

Specimens examined: Tuxtepec, Chiltepec, Martinez-Calderon 307 (GH) Yaveo, Choapam, Mexia 9173 (GH).

This species occurs from Jalisco to Central America in cool, damp habitats. It is closely related to Ipomea

simulans in the group Orthipomoea (Hanbury, 1871), and is adapted for hummingbird pollination.

Group 8. Quamoclit

Quamoclit Moench, Meth. Bot. 453. 1794. Type: I. coccinea L.

Ipomoea L. sect. Quamoclit (Moench) Griseb., Fl. Brit. W. Ind. 472. 1864.

Ipomoea subg. Quamoclit (Moench) Clarke, Fl. Brit. India 198. 1883.

a. Leaves pinnatifid; sepals without aristae..... ..... 39. I. quamoclit

aa. Leaves entire to 7-lobed; sepals with subterminal aristae.

b. Corolla 4 cm long, superiorly campanulate..... ..... 40. I. funis

bb. Corolla less than 4 cm long, limbs mostly flaring near summit.

c. Corolla yellow; aristae more than 5 mm long.. ..... 41. I. Neei

cc. Corolla red to orange; aristae less than 5 mm long.

d. Corolla salverform with little or no curve in tube, limb 1.5 cm long or longer.....

..... 42. I. hederifolia

dd. Corolla tube with pronounced curve, limb not exceeding 7 mm in length.....43. I. hastigera

39. Ipomoea quamoclit L., Sp. Pl., 224, 1753.

Type: India, (LINN, not seen)

A twining, slender, annual with glabrous stems. Leaves pinnatifid with up to 24 opposite filiform segments, glabrous, 2-0 cm long, lobe number variable; petioles glabrous, 1-2.5 cm long; stipules resembling pinnatifid leaves as tufts in leaf axils. Inflorescences simple cymes or solitary flowers; peduncles slender, glabrous, 1-11 cm long; pedicels thicker than peduncles, to 2 cm long. Sepals unequal, glabrous, elliptical, oblong, obtuse or cuspidate, margins scarious, outer 3-5 mm long, inner 5-7 mm long. Corolla salverform, scarlet, lobed, 2-3 cm long; stamens exserted. Capsules 4-valved, conical, style persistent; seeds 4, dark, to 5 mm long.

Specimens examined:Salina Cruz, Conzatti 3683 (US).

This species has a pantropical distribution in wet habitats. Man has distributed Ipomoea quamoclit as an ornamental and obscured its origin. It is the only Quamoclit of Oaxaca with pinnatifid leaves and no aristae on its sepals.

40. Ipomoea funis Schlecht. & Cham., Linnaea 5:118. 1830.
Syntypes: Mexico, Veracruz, Schiede 228 & 556
(not seen)

A twining, woody, glabrous, or pubescent plant with slightly muricate stems. Leaves variable, simple, angled, or 3-lobed, ovate to ovate-lanceolate, acute or acuminate apically, cordate basally, with wide sinus at leaf base, petioles glabrous or pubescent, to 5 cm long. Inflorescences cymose, 3-13-flowered; peduncles glabrous or pubescent, to 30 cm long, bracts and bracteoles ovate; pedicels hollow, glabrous or pubescent, 1-3 cm long. Sepals glabrous or pubescent with subterminal aristae, ovate-oblong, emarginate, unequal; corolla funnelform below, flaring widely halfway up; stamens exserted or included. Capsules subglobose-conical, 4-valved, to 12 mm long, 10 mm wide; seeds 4, 8 mm long, dark, tomentose.

Specimens examined: Cuyacuelcalco, Smith 604 (GH). Nopala to Juquila, Nelson 2402 (GH). Tuquila, Conzatti 4340 (US).

Ipomoea funis occurs in southern and southwestern Mexico, from Guanajuato to Oaxaca. It is distinct from the other species of the Quamoclit group by its large (4 cm long), superiorly campanulate corolla that often has included stamens.

41. Ipomoea Neei (Spreng.) O'Donell, Lilloa 29:69. 1959.
Convolvulus Neei Spreng., Syst. Veg. 593. 1825.
Type: Mexico, Nayarit, Nee (MF, not seen)

A twining, woody, angled or cylindrical vine. Leaves variable, simple or 3-5-lobed, angled, ovate, or lanceolate segments, deep sinus at base; petioles glabrous, 3-18 cm long. Inflorescences cymose, 10-70-flowered, few opening at the same time; peduncles glabrous, thick, 10-30 cm long, bracts triangular; pedicels thin, 5-25 mm long. Sepals unequal, ovate-elliptical, aristate, outer slightly smaller than inner, 2-6 mm long, with subterminal arista to 4 mm long; corolla yellow, sometimes with purple markings, limb campanulate, lobes deeply divided, 2-5 cm long, tube slightly bent; stamens exserted to 3 cm. Capsules 4-valved, oblong-ovoid, to 7 mm long; seeds 4, dark, 5 mm long.

Specimen examined: San Isidro, Alexander 549 (US).

Ipomoea Neei is commonly found in wetter areas throughout southern and southwestern Mexico. It is characterized by its deep yellow corolla, clustered flower buds, and deeply lobed corolla limb.

42. Ipomoea hederifolia L. Syst. Nat. ed. 10. 1759.
Type: unseen

A twining, branching, annual with glabrous to pilose stems, to 6 m long. Leaves simple, 3-7-lobed, ovate, basally cordate, 2-10 cm long, 1.5-10 cm wide; petioles glabrous, 7-80 mm long. Inflorescences simple or compound cymes, or flowers solitary; peduncles, glabrous or pilose, 2.5-3 cm long; pedicels more slender than peduncle, to 1 cm long. Sepals unequal, oblong to elliptical, outer aristate, inner longer than outer, 1.5-3 mm long; corolla salverform, scarlet to red, subentire, 2-3 cm long; stamens exserted. Capsule subglobose, 4-valved, 5-7 mm long; seeds 4, dark, densely and finely tomentose, 3-4 mm long.

Specimen examined: Cuicatlan, Conzatti & Gonzalez 662 (GH).

Ipomoea hederifolia has long been misidentified as Ipomoea coccinea L. It is distinguished by its subentire limb and sepals only 3 mm long. The distribution of Ipomoea coccinea is limited to the United States whereas Ipomoea hederifolia is found from the southern United States to Argentina, Asia, and Africa.

43. Ipomoea hastigera H.B.K., Nov. Gen. Sp. Pl. 3:87. 1819.

Holotype: Mexico, Humbolt & Bonpland 3995 (not seen)

A branching, twining plant with angled or cylindrical, glabrous to pubescent stems. Leaves simple to 3-lobed, cordate, ovate-lanceolate, acute-acuminate apically, glabrous or sparingly pubescent; petioles angular, glabrous, 2-8 cm long. Inflorescences cymose, 3-many-flowered, flowers in tight clusters, few in bloom at same time; peduncles angular, glabrous to pubescent, 2-34 cm long, bracts small and lanceolate; pedicels mostly glabrous, 1-2 cm long. Sepals unequal, ovate, 15 mm long, aristae 7 mm long, inner longer than outer and with conspicuous hyaline margins; corolla red to dark orange, subsalverform, to 3 cm long, tube bent, limb less than 7 mm long; stamens exserted. Capsules 4-valved, 4-loculed, subglobose-conical, 6-7 mm long; seeds 4, black, 3-5.5 mm long, finely tomentose with small tufts of pale trichomes.

Specimens examined: Oaxaca, Morton & Makrinius 2506 (US). Rio Cascabel, Mell 2301 (US). San Juanito, Choapam, Mexia 9253 (US).

Ipomoea hastigera is distributed in wet valleys throughout Michoacan, Guerrero, Oaxaca, and Veracruz. The tube of its corolla is quite bent and the limb is deeply lobed.

Uncertain Species

I. leoninsis Robinson This species has been reported from Oaxaca by House (1908), and Matuda (1964-65) included Oaxaca as the southernmost state of this species' distribution. It is characterized by its 5-lobed, inferiorly tomentose leaves, purple corolla to 7 cm long, and creeping habit. It belongs in the Group Orthipomoea.

I. arborescent (H.B.K.) Don. This species is reported to be found throughout Oaxaca by House (1908) and Matuda (1964-65). It closely resembles I. murucoides Roem. & Schult. but is distinguished by its glabrous corolla and smaller and less pubescent sepals. As an arborescent Ipomoea, it belongs in the Group Eriospermum.

I. pauciflora Mart. & Gal. This species is another arborescent Ipomoea reported from Oaxaca by House (1908) and Matuda (1964-65). It is distinguished from I. intrapilosa Rosa by the glabrous inner-faces of its sepals. All specimens examined in this study resembling I. pauciflora have had a variable amount of pubescence inside their sepals. Standley & Williams (1970) describe this plant as being a woody vine instead of arborescent. This is inconsistent with other descriptions.

Phytochemistry

Introduction. The use of flavonoid compounds in systematic studies of the Convolvulaceae has been very limited. As yet only studies of anthocyanins from floral materials have been attempted (Harborne et al. 1975). Other than morphological investigations of Ipomoea and other related genera, a few palynological and cytological studies have also been utilized, but with only limited success (Hallier 1893, Ting & Kehr 1953, Martin & Jones 1972, Jones 1963, Verdcourt unpubl.). Phytochemical studies for such a large and complex genus as Ipomoea are indeed merited and may reveal phylogenetic lines previously unseen. The flavonoid investigations of this work do not attempt to identify the different compounds present in the plants, but only to show possible relationships of plants by use of chromatographic profiles and to test the utility of flavonoid techniques in systematic studies of the Convolvulaceae.

Materials and Methods. Plant materials used in this investigation were acquired from field collections made from June through August, 1977, in Oaxaca, Mexico as well as from commercial seed suppliers (figs. 4-6, table 1). Dried, macerated leaf and stem materials were placed in

vials of 85% aqueous methanol to extract the flavonoid compounds. The extract was spotted on Whatman 3MM (46x 57 cm) chromatographic paper, and chomatograms were developed by standard two-dimensional descending techniques (Mabry et al. 1970). The long dimension was developed in a 3:1:1 (v/v) TBA solution (tertiary butyl alcohol glacial acetic acid: water) for 24-26 hours. After thorough drying the paper was turned 90° to be developed in a second solvent of 15:85 (v/v) HOAc solution (glacial acetic acid:water) for 5-6 hours. The paper was then removed and allowed to dry again. Compounds were observed fluorescing under ultraviolet light, and then fumed with ammonia vapor to observe color changes. Profiles were constructed by circling compounds and recording color changes.

Results. In general, flavonoid profiles of the genus are quite complex with numerous compounds. This may not be the case in all sections, Ipomoea alba L. (Section Calonyction) has only four apparent compounds (fig. 9) and Ipomoea quamoclit L. (Section Quamoclit) only three (figs. 10-12), but most species surveyed contained 9-17 compounds (figs. 7,8). Although the flavonoid constituents of the genus presented here are not identified chemically, they can be generally identified to the

family of flavonoids which they belong by their color change characteristics and chromatographic position (Mabry et al. 1970). The bulk of the compounds present in Ipomoea are flavones and flavonols, 7-O-mono or -di-glycosides with 5- or 4'-OH constituent groups. Less commonly present are flavanones and isoflavones lacking a free 5-OH.

Discussion. In all sections of the genus except for Exogonium at least one species was surveyed, and no single genus-specific compound was present. In most sections there were at least one to three purple compounds present that were common to the genus, but these compounds were lacking in sections Quamoclit and Orthipomoea. Although there were no generic markers, the chemistry of these plants reveals relations on subgeneric levels. Consistencies are apparent in the correlations of phytochemical data with morphology. Species-specific compounds as well as sectional compounds (hachured in figs 7,8) are present in every case where several species of a particular section were examined chemically.

Of the Section Eriospermum two species were surveyed: Ipomoea murucoides Roem. & Schult. and I. intrapilosa Rose. Plants of this section are typically perennial shrubs, trees, or stout vines, and bear long comose

hairs on their seeds. Ipomoea murucoides and I. intrapilosa are arborescent, morphologically similar, and closely related. Compounds 1-5 (fig. 7) are tentatively sectional-specific compounds, and compounds 6-12 are species-specific. A more thorough survey of this section will undoubtably reduce the number of sectional compounds.

A smaller section of Ipomoea, Pharbitis, also exhibits sectional-specific compounds. Ipomoea acuminata var. congesta shares six of its compounds with I. purpurea (L.) Roth (fig. 8). These two species are not quite so similar morphologically as those species seen in the section Eriospermum. They are included in Pharbitis due to their herbaceous and hispid or otherwise pubescent sepals.

A more interesting complex of compounds is found in the Section Quamoclit. Of the three species tested, Ipomoea X sloteri and I. lobata (Cerv.) Thell., show close chemical affinities to one another and the third, I. quamoclit L., is quite distinct. Ipomoea sloteri and I. lobata share three of their five compounds (figs. 10-11) and I. quamoclit shares none (fig. 12). This has interesting implications when correlating the chemical data with the morphological aspects of the plants. There are four basic characters that hold Quamoclit together as a section: subterminal aristae on sepals, 4-lobular fruits, red-

yellow salverform corollas, and exserted stamens (O'Donell 1959). Ipomoea lobata is an atypical plant for the group in that its corolla is suburceolate. Corollas of I. quamoclit and I. sloteri are salverform. However, I. quamoclit possesses no subterminal arista in its sepals, whereas I. sloteri and I. lobata do so. The chemistry presented here shows a closer relationship between the plants with diverse corolla shapes and similar sepal morphology than those with similar corolla forms and sepal diversity. It is my preference not to weigh shapes and forms of corollas highly in discerning relationships because they are so variable in the genus and data presented here support that contention. Section Quamoclit has been raised by some authors (Moench 1794, Choisy 1833, Hallier 1893, House 1908) to generic level, supported partially by the corolla shapes of the section. Chemical evidence questions the reliability of using this character for such a means. A new problem is presented, however, in the sectional placement of I. quamoclit. Morphologically, I. quamoclit is closer to those species in Section Quamoclit than any other and should remain there until more is known about the chemistry in this section.

Though the remaining sections were tested, only one species in each of the sections Orthipomoea, Erpipomoea,

and Batatas was analyzed chemically, thus sectional compounds were not ascertained. However, it may be noted that these species were chemically distinct. It would be especially useful to survey Section Orthipomoea because of the group's largeness and diverse morphology. Establishing subsectional divisions and phylogenetic lines should be facilitated with chemical data.

Suprageneric relations may also be more closely understood by use of phytochemical data. Merremia (fig. 13), a genus separated from Ipomoea by Hallier (1893) because of its different pollen morphology[1], shows more chemical affinities to sections Batatas, Eriospermum, and Pharbitis than do the sections Quamoclit and Calonyction. Shinners (1970) preferred lumping the genera Merremia and Operculina with the genus Ipomoea. With further phytochemical studies, this may be warranted. However, Shinners also questionably lumped Turbina corymbosa (L.) Raf. with the genus Ipomoea. Morphologically there is little doubt the Turbina and Ipomoea are closely related, but because T. corymbosa bears only one seed per fruit, and has an indehiscent fruit, it is justifiably separated. The chemistry supports this separation as well. Two

[1] Ipomoea species possess spinulose pollen grains, those of Merremia and Operculina have smooth pollen.

common purple compounds of Ipomoea are present in T. corymbosa, but many distinct fluorescing blue-green compounds foreign to Ipomoea profiles are also present in the latter species (fig. 14).

Conclusion. Flavonoid investigations are useful in ascertaining relationships of plants on specific, subgeneric, generic, and suprageneric levels of this family. It is possible to separate species into sections based on chemistry alone. If chemistry can be correlated with morphological and cytological information, phylogenies will be better understood. Because of the complexity and size of Ipomoea, further investigations of this nature are warranted.

TABLE 1

Origin and Voucher Numbers of
Chemosystematic Materials

Species	Origin and Voucher Number[1]
Group Pharbitis	
Ipomoea purpurea	In milpa on outskirts of Tlaxiaco, Oaxaca. McDonald 44.
I. indica var. *congesta*	Off trail to Puente de Fierro from Huautla de Jimenez, Oaxaca. McDonald 40.
Group Orthipomoea	
I. tricolor	On fence row near Tlaxiaco, Oaxaca. McDonald 51.
Group Eriospermum	
I. murucoides	Along arroyo bank S.E. of Tule, Oaxaca. McDonald 47.
I. intrapilosa	Along fence row outside of Mitla, Oaxaca. McDonald 48.

[1]Voucher specimens located at VPI&SU

TABLE 1

(Continued)

Species	Origin and Voucher Number
Group Batatas	
I. tiliacea	Off dirt road on outskirts of Putla, Oaxaca. McDonald 50.
Group Erpipomoea	
I. pes-caprae	On beach near ocean at La Ventosa, Oaxaca. McDonald 42.
Group Calonyction	
I. alba	Growing in abandoned marshy field near Putla, Oaxaca. McDonald 53.
Group Quamoclit	
I. quamoclit	Burpee Seed Co., McDonald 16.
I. X *sloteri*	Parks Seed Co., McDonald 17.
I. lobata	Parks Seed Co., McDonald 18.
Other Genera	
Convolvulus arvensis	On VPI&SU campus near Derring Hall, McDonald s.n.
Thunbergeria alata	Off railroad tracks near Zaachila, Oaxaca. McDonald 55.

TABLE 1

(Continued)

Species	Origin and Voucher Number
Merremia aegyptia	In ditch off abandoned road near Putla, Oaxaca. McDonald 52.
Turbina corymbosa	Along arroyo bank near Tule, Oaxaca. McDonald 43.
Dichondra macrantha	Collected from VPI&SU greenhouse, source unknown. McDonald s.n.

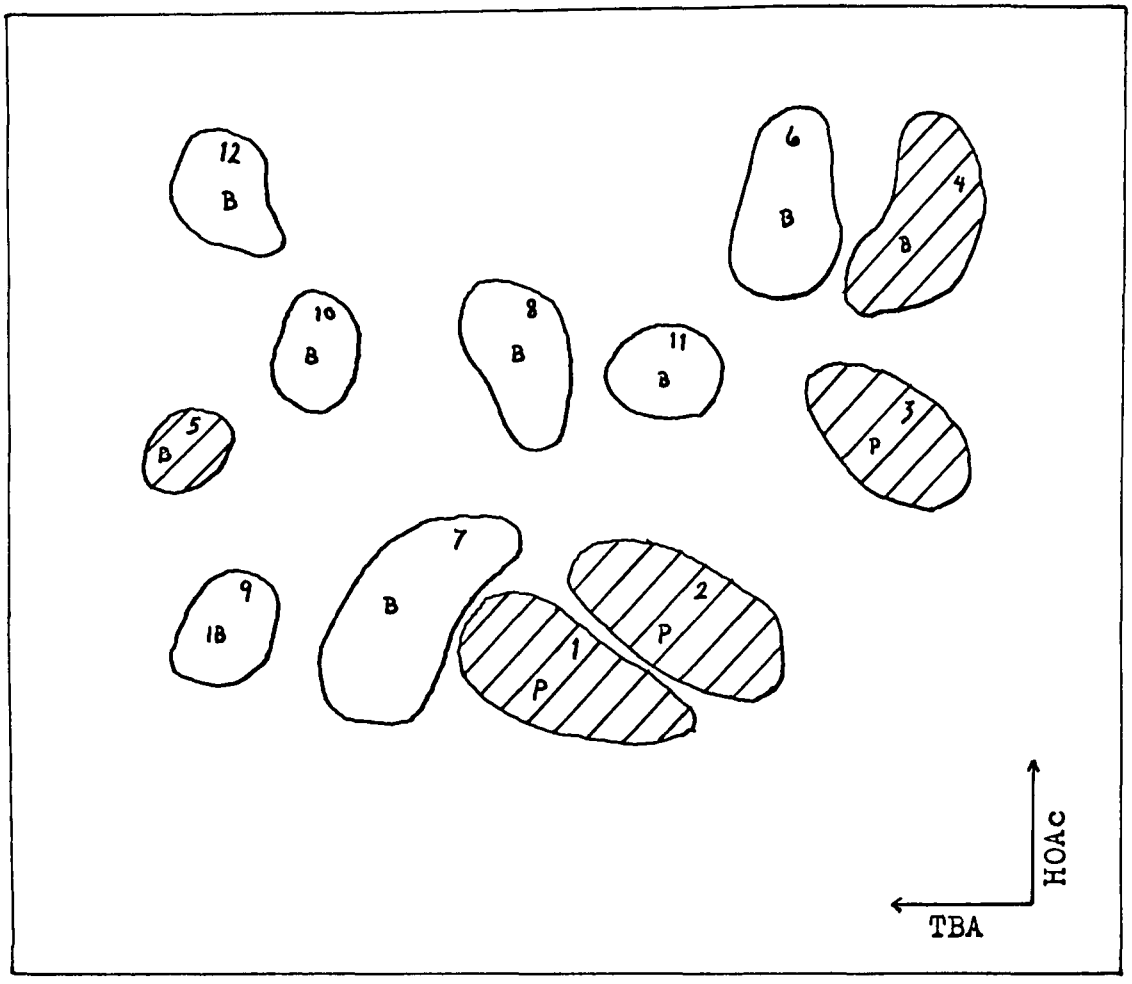

Fig. 7. Flavonoid Profile of Ipomoea murucoides

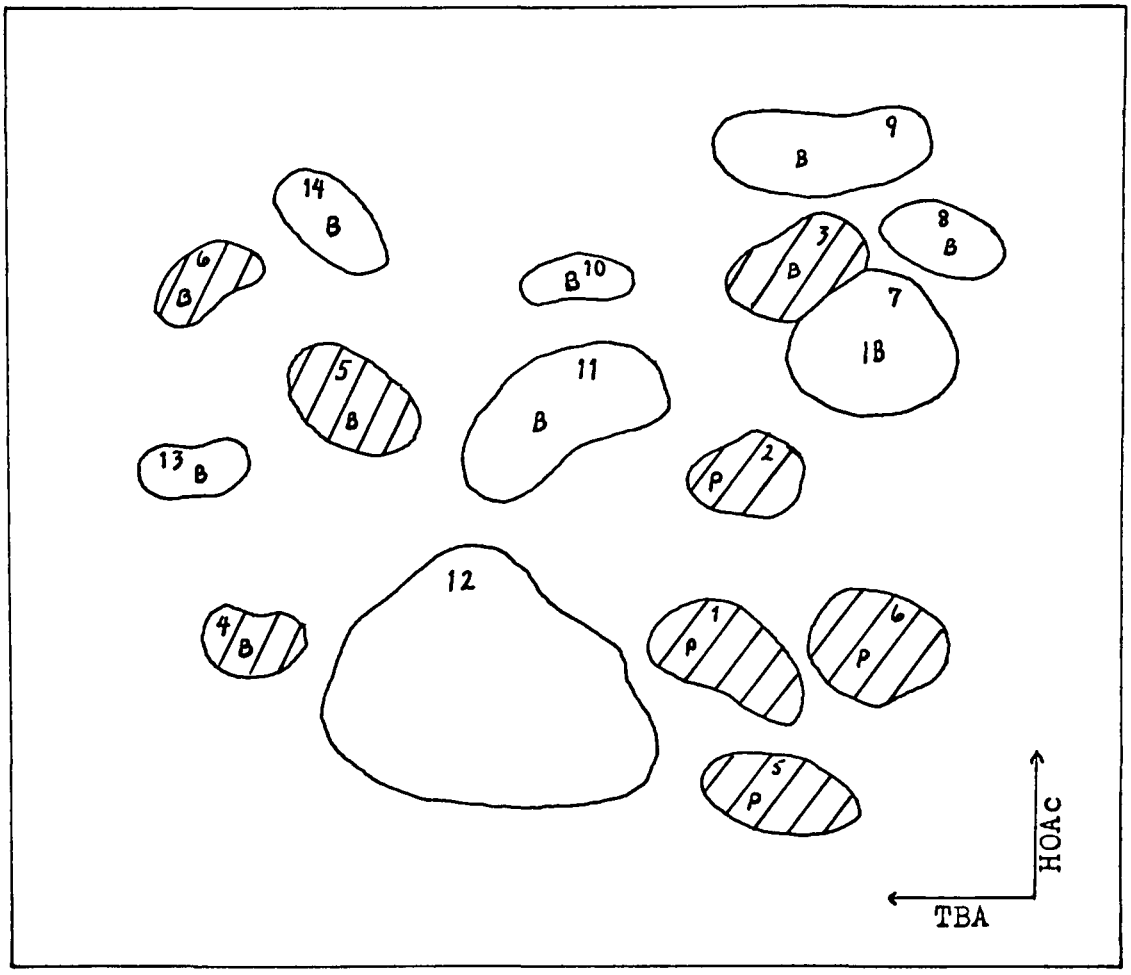

Fig. 8. Flavonoid Profile of Ipomoea indica var. congesta

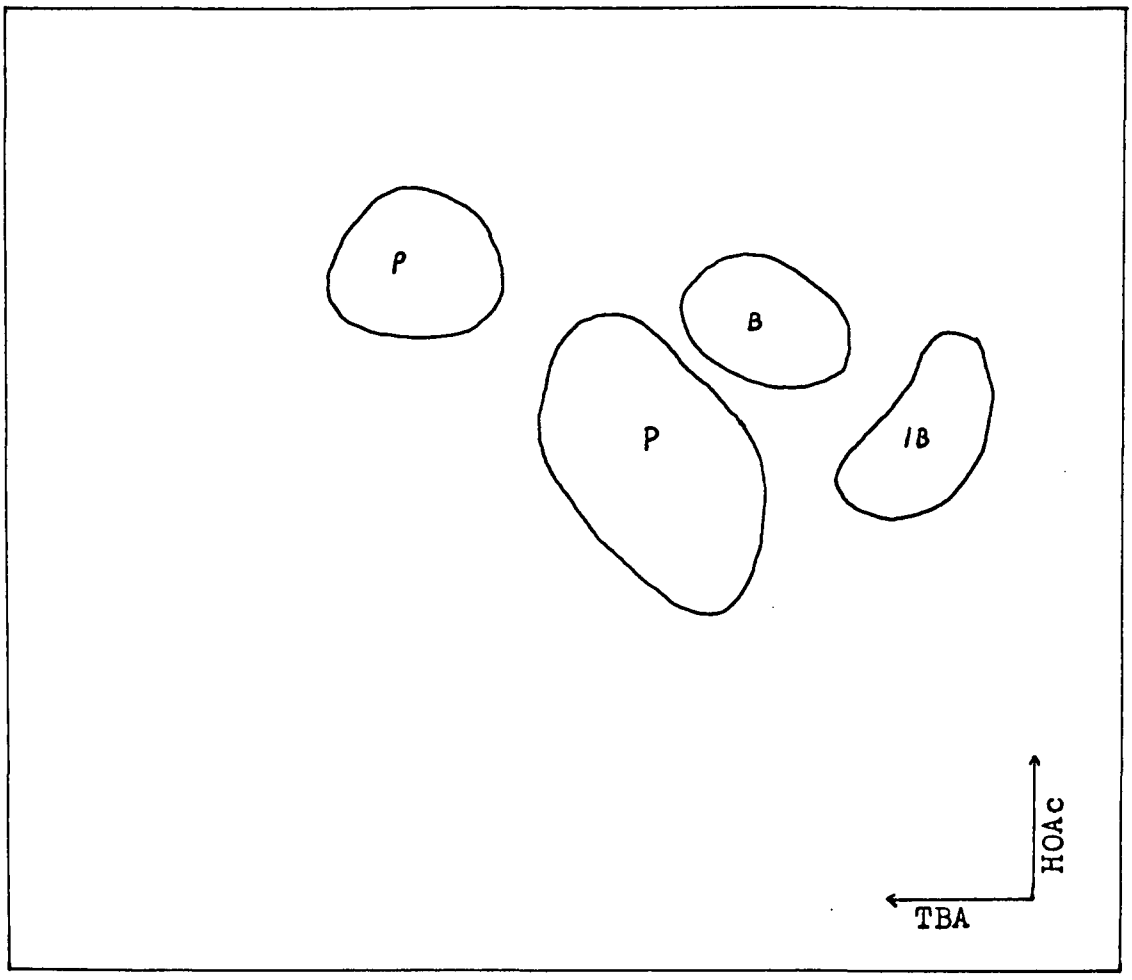

Fig. 9. Flavonoid Profile of Ipomoea alba

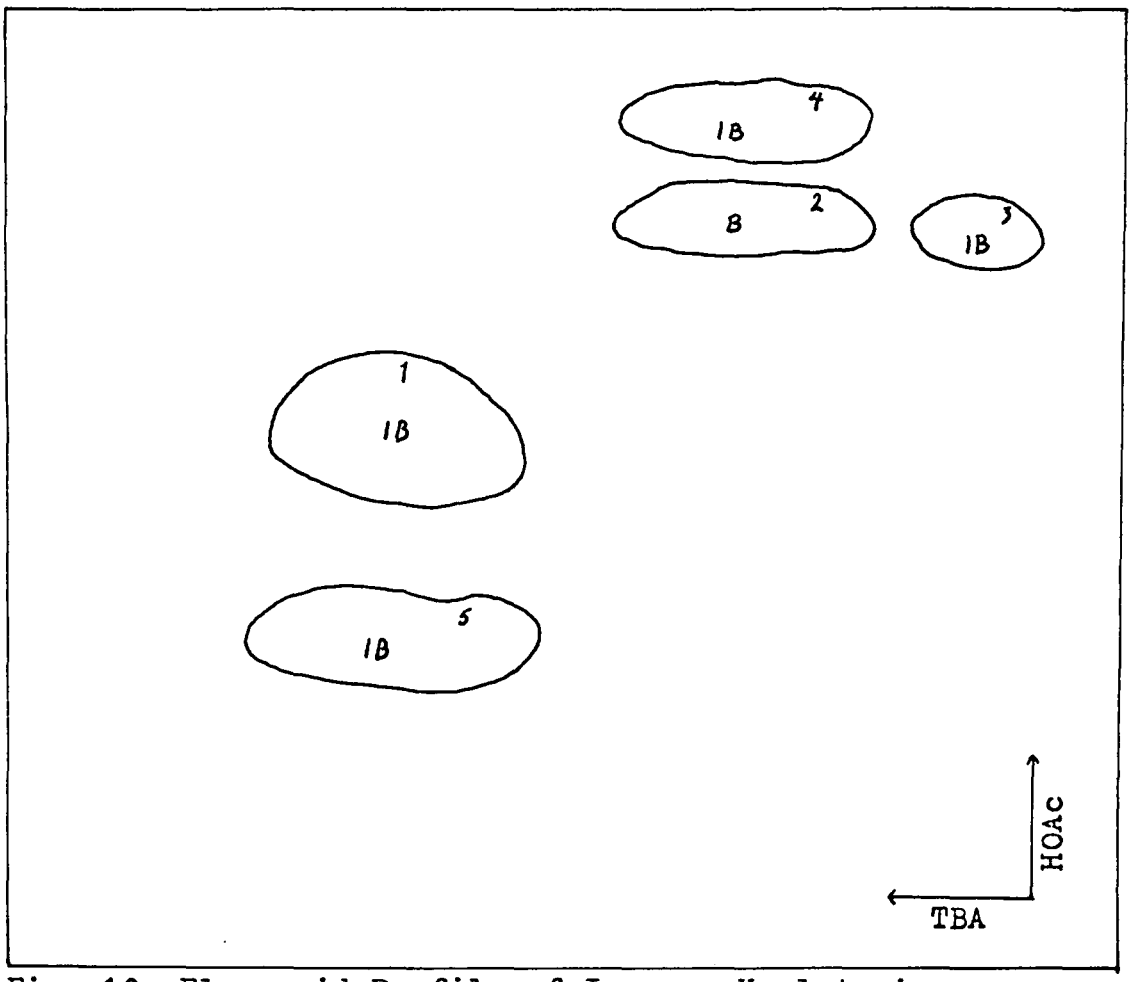

Fig. 10. Flavonoid Profile of Ipomoea X sloteri

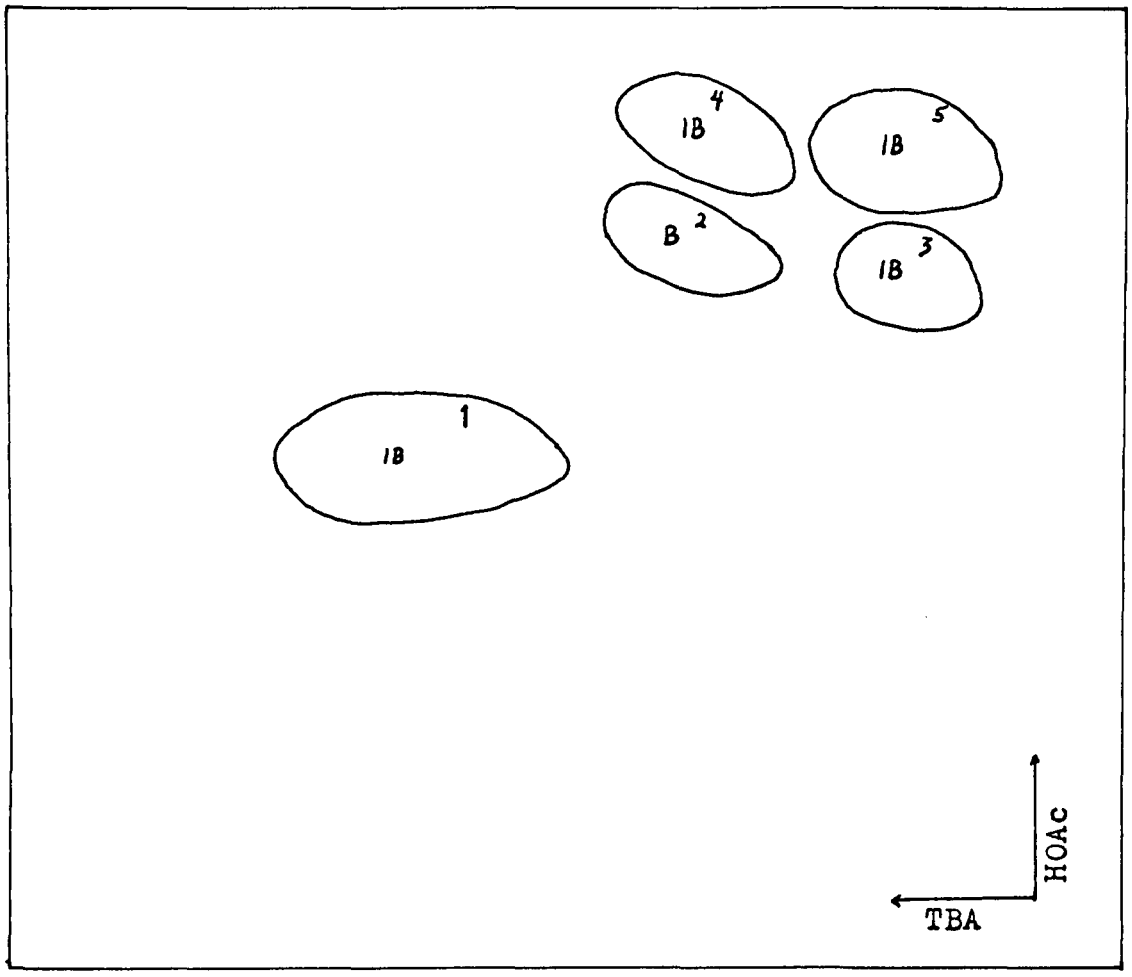

Fig. 11. Flavonoid Profile of Ipomoea lobata

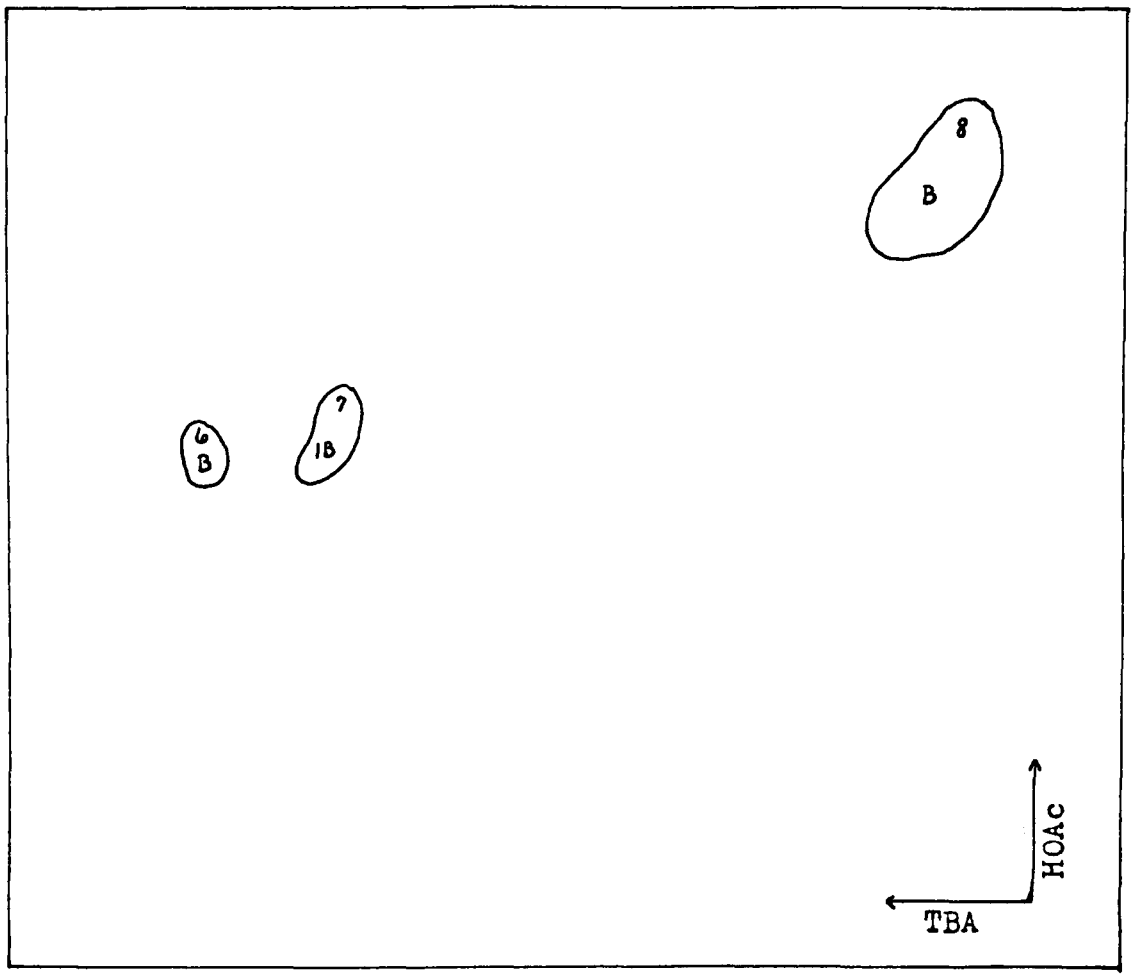

Fig. 12. Flavonoid Profile of Ipomoea quamoclit

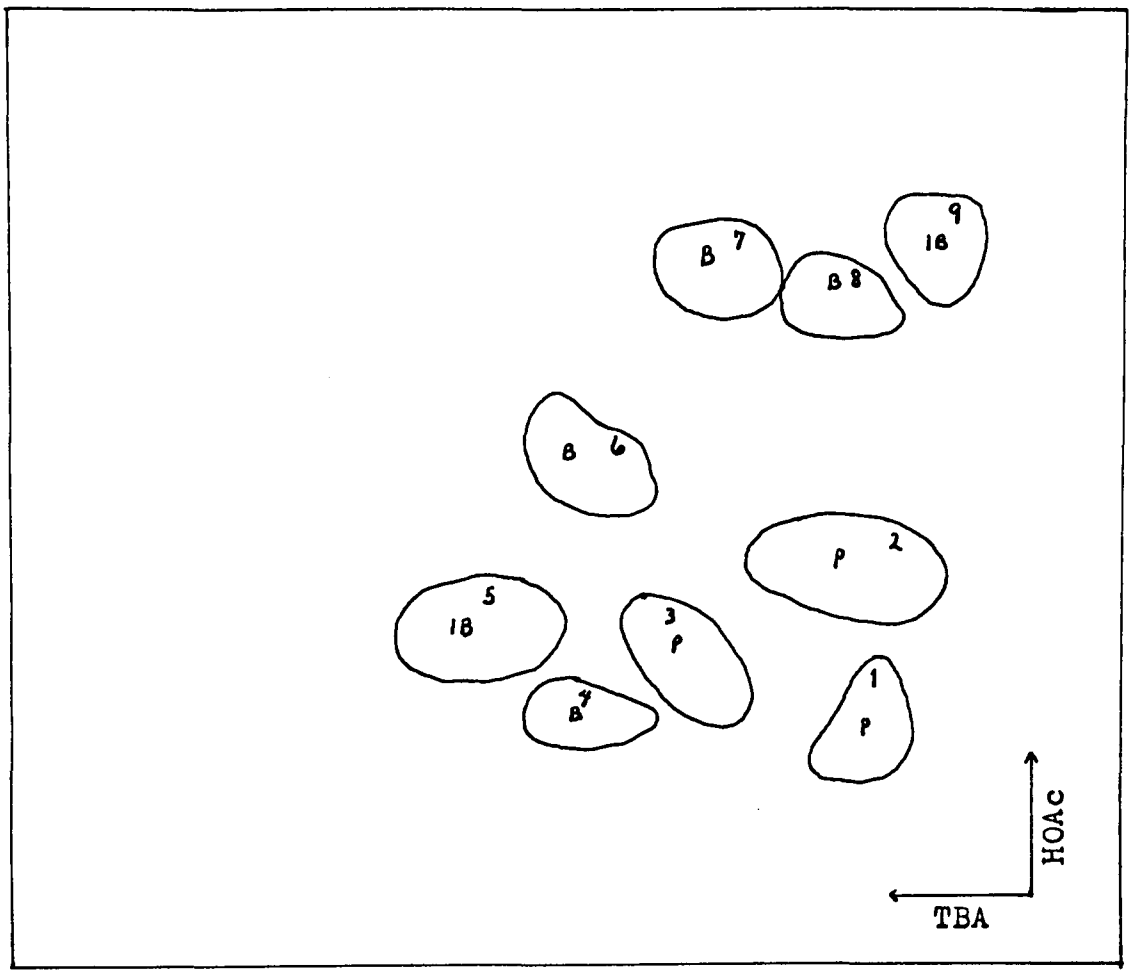

Fig. 12. Flavonoid Profile of Merremia aegyptia

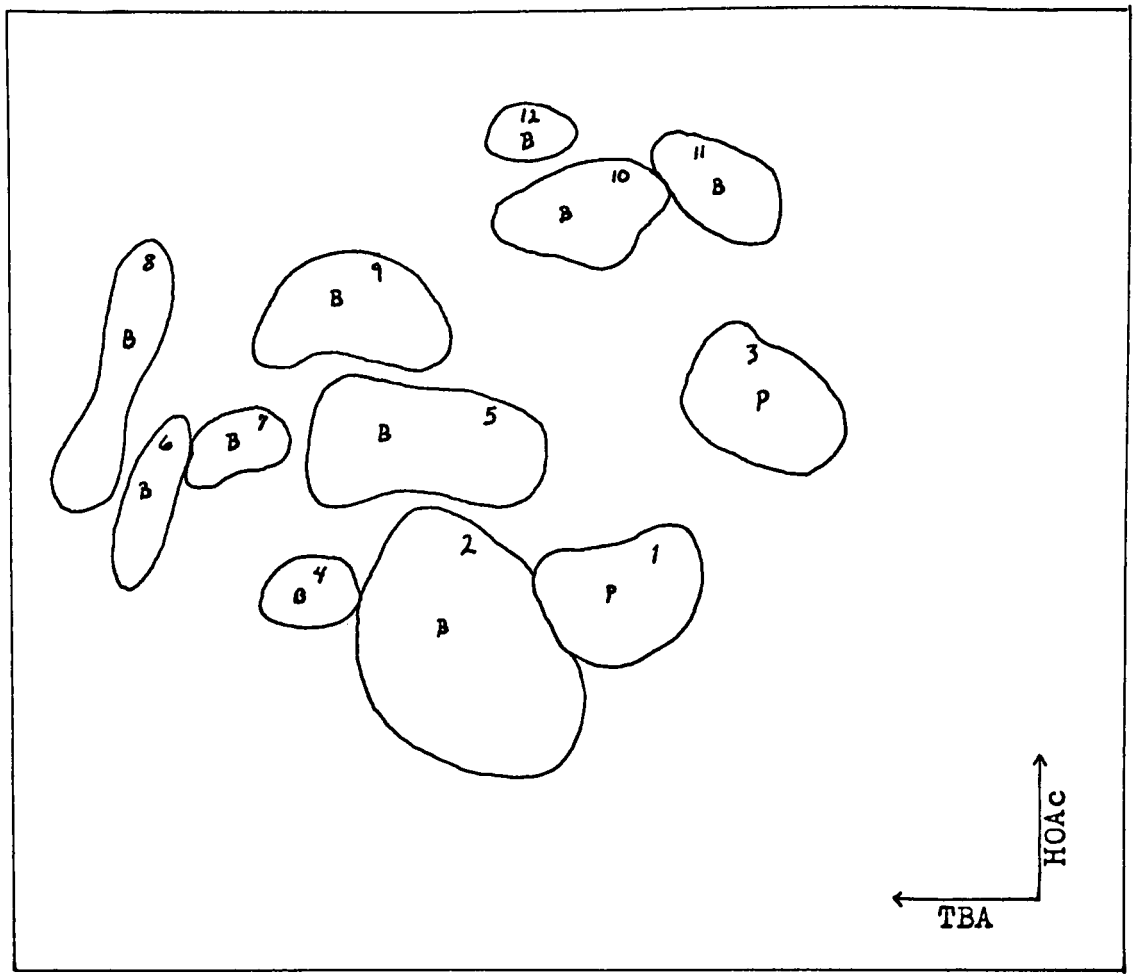

Fig. 14. Flavonoid Profile of Turbina corymbosa

PLANT USES

Introduction. The study of man and his uses of plants can be pursued from two different perspectives. The ethnobotanist mostly investigates human cultures as seen through man's utilizations of the plants that surround him. Conversely, the economic botanist studies and directs his interests towards plants, but limits his investigations those plants that have some utility to man. Ethnobotany is a multidisciplinary subject touching upon linguistics, medicine, nutrition, agriculture, the ecology of man and plants, and all aspects of culture. However academic by nature, it often leads to discoveries of practical application. The nature of the present study lies on the line between ethnobotany and economic botany. Whereas an ethnobotanical approach usually treats many species of plants and one culture of man, this study is a treatment on the genus Ipomoea and its uses by several cultures. The survey of uses is somewhat broadened by considering historical as well as present-day uses, and also by considering uses of plants in such a large and geographically diverse area as Oaxaca. The purpose of this type of study is to find the uses of plants in a particular genus for the purpose of discovering in further studies which related plants share those particular uses.

Oaxaca is an ideal location in Mesoamerica for investigations of plant uses. Approximately 25 cultures and dialects prosper in the state where so many geographical barriers are present. The Chontal, Zapotec, Mixtec, Mijes, Nahua, and Mazatec are but a few of the present cultures. Because of Mexico's underdevelopment as a nation, most of these cultures have been preserved so well that many of their preconquest customs have remained unchanged by the rest of the world's progress. Folk medicine, primitive agriculture, and food gathering exist in many areas as they have for centuries past. They should continue as such until Mexico's national development catches up with these areas. Before this happens the ethnobotanist needs to note the present uses of plants so as not to lose this potentially valuable information.

Methods. Procedures for investigating plant uses are begun in the review of pertinent literature. Past uses are mostly found in historical accounts by Catholic clergy who studied and recorded Mexican cultures for Spain during the conquest periods (Alarcon, 1892; Hernandez, 1942; Sahagun, 1969). Other authors since this period also have surveyed plant uses (Martinez, 1969; Acktshul, 1973). After gaining acquaintance through published accounts of the possible utilizations of

plants, one enters the field and speaks with the people about their uses. Making a herbarium collection and a photograph of the plant is necessary, as is immediately writing and recording the information given. It is also necessary when questioning a person not to suggest any answers or mention other known uses of a plant. One usually finds adults or older members of a community most knowledgeable of the plants in an area.

Discussion. Plants of the genus Ipomoea have three basic types utilizations; they include nutritional, medicinal, and shamanic uses. Only a few species are utilized nutritionally or shamanically, but in both cases they deeply affect the livelihoods of those cultures that utilize them in these fashions. The medicinal uses are many and differ from culture to culture; they may be quite effective or may function only as placebos.

When investigating medicinal uses there are problems in the reliability of information. It is not uncommon to find some who claim to know something of a plant but actually do not. Of the people knowledgeable of medicinal plants in Oaxaca there are three different sources of information: the curandero, the city herbalist, and the common person with common knowledge of plants.

The brujo(a) or curandero(a) is a medicine man or woman, of whom only a few are found per village. In some

cases, as in the Mazatec Sierra of northern Oaxaca, a curandero may travel to and from village to village. The titles brujo or curandero can carry different connotations depending upon the different areas where they are found. The brujo usually is a man of power, one who cures or curses others by the use of his knowledge, plant spirits, or both, by evoking or in some way manipulating spirits or powers. The curandero is one who heals with a plant. The latter, too, may communicate with spirits, but in a less powerful or self-centered manner. The title curandero often refers to a person who can prophesy or answer questions tormenting a person. In general the title curandero signifies a curer or a helping person whereas a brujo is more a sorcerer. Persons of these offices are often difficult to find and hard to obtain information from. They are usually handed their knowledge through their lineage, or otherwise apprenticed, and are not quick to divulge it.

The second source of plant uses is the herbalist who barters his wares on sidewalks, street corners, or in his own home. Many are charlatans or have only acquired their knowledge through books, hearsay, or some other source. In Guadalajara, Jalisco there is a herbal supplier who keeps many of these vendors supplied with packaged herbs and printed books on medicinal plants. On many occasions

I have asked street herbalists what a particular plant is good for, and the most typical of replies are "los nervios" (the nerves), or "los muslos" (the muscles). No statements were ever made as to what type of condition the nerves or muscles were in, but their recommended plant was surely the cureall. These vendors often serve the poorer Mexican who cannot purchase pharmaceutical drugs. Their remedies are mostly inneffective. Information about plants from this source is easily attainable, the herbalists having cures for every possible ailment. The source of this plant knowledge is of more interest to the sociologist than to the botanist.

The third source of plant knowledge is from common knowledge of plants in the culture of a village. Plant knowledge of this origin can be worthwhile. When an entire village utilizes a particular plant for an ailment it may well have properties that are indeed medicinal. However, in villages of uneducated people it is not uncommon to find some superstitious or obviously ineffective medicinal uses. For example, in the town of Tlaxiaco, Oaxaca one cures animal bites by grinding the flower and foliage of quiebraplato (Ipomoea purpurea (L.) Roth) in ones' hands and throws it to the ground. Medicinal uses of plants from common people are easily acquired since often a villager may pride himself on his

knowledge of plants and is usually fast to share his knowledge with a visitor.

The manner in which I sought plant uses poses several problems. Because I visited various areas and cultures, there were often language barriers. Most ethnobotanical investigations involve only one culture and thus the investigator can attempt to acquaint himself with the indigenous language; this of course is difficult when dealing with several different languages. Another problem arises if the investigator is not in residence in the area he is studying for at least one year. If he is transient, he may miss several species that are not in flower. On several occasions I was unable to confirm the probable use of a morning glory species because it was not in bloom at the time I entered a village. Another problem arises in trying to win the confidence of a timid native or a curandero. Often a more prolonged stay will aid in speaking with those persons knowledgeable of plant uses.

Medicinal Uses

Ipomoea purga (Wender.) Hayne - This plant is probably the most widely used medicinal species of morning glory. As its specific epithet implies, it is a strong purgative. Its active resins are found in the large tuberous roots

characteristic of this species. A New World plant, it was one of the first to be exported for use by herbalists in Europe (Hanbury, 1869; Sievers, 1948). Ipomoea purga has been grown commercially mostly in Calicut, India, where its cultivation has been refined (Sievers, 1948). References to this plant often give accounts of its use by the Aztecs, though I have found no descriptions of this particular species by Hernandez (1942) or Sahagun (1967). I have seen it only in one locality in Oaxaca, along the cool ridges of the southeastern sierras. In Putla, Oaxaca, its dried roots were being sold by an Indian herbalist in the small town market. No vegetative material was present but a clear description of the plant and its use confirmed it as Ipomoea purga.

Ipomoea simulans Hanbury - This plant, closely related to I. purga, also has purgative qualities to its roots. Hanbury (1869) referred to it as Tampico Jalap because of its close resemblance to I. purga, known then as Jalap (not to be confused with I. jalapa (L.) Pursh). Hanbury described this species as less purgative than I. purga but more prolific in cultivation, and thus it was more commonly grown. He cited its use by Indians in Guanajuato and also cited several Oaxacan specimens.

Ipomoea capillacea (H.B.K.) G. Don. - Known to the Aztecs

as acxoyactic (Hernandez, 1942), this species was used to break fevers. Its small round tubers were dried and pulverized, mixed with water, and given orally. It was often used in conjunction with hypnotically active plants. There is also mention that the plant can inebriate a person, but the text does not make clear if this is from the use of the root or other portions of the plant. It may be possible that this species could have ergoline compounds in its seeds simlar to those of Ipomoea tricolor (L.) Cav. (MacDougall, 1960; Hofmann, 1963).

Ipomoea dimorphylla Gray - This plant may possibly have fever extinguishing properties in its roots. Ochoterena identifies it (Hernandez, 1942) with only a scanty description.

Ipomoea purpurea (L.) Roth - Illustrations of mecapahtli, a morning glory that purges chills or internal animal parasites, (Hernandez, 1942) may be referring to this species. It was found in Tlaxiaco, Oaxaca to help cure animal bites if a person pulverizes the plant in his hands and throws the mash to the ground. Martinez (1969) makes reference to the rompeplato whose milky sap is a purgative. The vernacular name for I. purpurea is quiebraplato. Perhaps these are the same species.

Ipomoea hederifolia L. - To the Aztecs this may have been the chichicamotic (bitterroot) (Hernandez, 1942). Its roots were claimed to be astringent when taken with water.

Ipomoea pes-caprae (L.) R.Br. - Martinez (1969) cites a use of this plant in Baja California for its supposed curative properties for kidney infections. Leaves of this littoral morning glory are subreniform in shape, and there may be a correlation between this and the plant's use. A letter to R.E. Schultes from R. Yeshen in the Ipomoea folder at the Herbarium of the Botanical Museum of Harvard University mentions the use of its seeds for hallucinogenic purposes in Venezuela. This has never been investigated or printed in the literature.

Ipomoea murucoides Roem. & Schult. - Martinez (1969) records the use of this plant, as well as the closely related I. arborescens (H.B.K.) G. Don, to help cure paralysis if boiled or cooked in the household of the ailing person. Michoacan herders claim it to be lethal to cattle and sheep if grazed upon (Martinez, 1969). In Tule, Oaxaca leaves are boiled or wetted to be laid across cuts and bruises to aid healing.

Ipomoea intrapilosa Rose - In Tule, Oaxaca the leaves of

this plant are wrapped around an open cut to reduce swelling, and soreness, and to mend cuts. Also, toothaches were said to be relieved by wadding up a leaf and pressing it against the sore tooth. Messer (1975) makes similar reference to a related plant, I. pauciflora Mart. & Gal. in nearby Mitla, Oaxaca. Both of these species are called pajaro bobo, they both seem to have similar uses.

Ipomoea spp. - Hernandez (1945) describes several morning glories that may or may not be in this genus.

Metzonpahtli - A tuberous, smooth, and thick-stemmed, climbing plant with cordate leaves. Utilized as a laxative by grinding the leaves and placing them in water to be ingested.

Motinense - A twining, red-stemmed, small-leaved plant with a red campanulate corolla and rotund capsule. Seeds are ground and placed in water for ingestion as a purgative. This plant is probably a Quamoclit.

Axochitl - A fibrous-rooted, thin-stemmed, twining plant with white flowers and cordate leaves. The sap is reportedly a diuretic and active laxative.

Nutritional Uses

Ipomoea batatas (L.) Poir. - The only species of *Ipomoea* used to any extent nutritionally in Oaxaca is the sweet potato. Throughout various parts of Mexico the sweet potato may be cultivated and sold commercially but these areas are relatively few (Austin, 1973). Many controversies have arisen about the sweet potato's origin, with most evidence supporting a New World origin (Kehr, 1953; Yen, 1961, 1974; Nishiyama et al. 1962). Without doubt the sweet potato was cultivated in Central America before the Spanish conquest by the Aztecs (Hernandez, 1943; Sahagun, 1967). Accounts of the sweet potato's culture and description are identical to the cultivation and descrition of *I. batatas* in present-day Mexico (Hernandez, 1942). Variable leaf morphology and root colors were apparent to the Aztecs, they recognized nomenclatorially various forms. The *acamotli* was a red-tubered plant with a white skin; *hoicamotli* referred to the variety with white tubers. In the text of the sweet potato description, mention was also made of a purple-tubered plant. All three of these varieties are present in the cultivation of *I. batatas* near Zaachila, Oaxaca.

It is hard to find the sweet potato in most Mexican markets, but it is commonly found at the market in the

City of Oaxaca. The source of the Oaxacan sweet potato is Zaachila, a neighboring village to the City of Oaxaca. At the time the sweet potato was being harvested I was able to speak with farmers on their cultivation practices. The sweet potato is propagated asexually by placing 3 dm vine cuttings at 3 dm intervals. This method of propagation is necessary because of the poor seed set found in most varieties of sweet potato (Martin, 1970). It also enables the farmer to plant accurately the amount of each variety he desires. The Zaachilan farmer produces five varieties of Ipomoea batatas, the rojo (red), amarillo (yellow), crema (white-yellow), blanco (white), and morado (purple). Vegetative characteristics can be used to ascertain the color of tuber the plant will grow. The purple-tubered plant has purple stems, the yellow or cream tuber has leaves of five lanceolate segments, and the white tuber has an entire or angled leaf lamina.

Before irrigation practices entered the valley, Zaachila farmers would plant their cuttings after the beginning of the wet season, in July, and would harvest their sweet potatos from November through January. This practice, known to the Aztecs (Hernandez, 1942), permits the cuttings a chance to establish growth in the damp soil. Present-day irrigation practices permit the farmer to harvest twice a year, in July and November, and to

plant immediately after each harvest. Sr. Jose Perez, the most informative of the farmers, described how the sweet potato flowered in July or August but rarely bore seeds. He mentioned that one could sow the crops with seed but this method was not worth the time when cuttings were always available after harvests.

Cultivation of the sweet potato requires little maintenance. The fields near Zaachila are plowed with oxen, cuttings sowed, and no weeding is ever necessary. Economically the sweet potato is equally lucrative to corn. Perez describes his yields as more than corn but the demands for the product less. The town of Ocotlan and Oaxaca City were the product outlet centers for the Zaachilan agrarian.

When market informants and farmers were asked how the sweet potato was prepared they unanimously related that one can boil, bake, or candy them. The sweet potato is sold whole or candied in the markets. Austin (1973) suggests that the candied preparation of the sweet potato is post-conquest in origin. It must be noted that the recipe he was referring to, the Santa Clara camote, is only one preparation and found only in the Valley of Puebla. The consistency of the Santa Clara preparation is different from the average and common preparation of camotes I have found in most markets. The candied sweet potato may well

be pre-conquest in origin.

Shamanic Uses

Schultes (1941) identified a morning glory species, Turbina corymbosa (L.) Raf. (= Rivea corymbosa (L.) Hall., Ipomoea sidaefolia (H.B.K.) Choisy) as the ololiuhqui, one of the many sacred and hallucinatory plants of the Aztecs (Alarcon, 1892). Since then another morning glory, Ipomoea tricolor (L.) Cav. also has been found to share the same hallucinogenic compounds as Turbina corymbosa (MacDougall, 1960; Wasson, 1964). Related ergoline compounds found in the seeds of both species are responsible for their hallucinogenic effects (Hofmann, 1963). Present-day indigenous cultures of Oaxaca still utilize both species, Ipomoea tricolor, known as badoh negro to the Mixtec, and Turbina corymbosa known mostly as la semilla de la virgen (seed of the virgin), in the same fashion as done in Precolombian Mexico.

Little reference is made by Spanish chroniclers to Ipomoea tricolor, thought to have been the Aztec tliltitzen by Wasson (1964). However, reference to precolombian use of ololiuhqui is common, and several chapters are written of its use by Alarcon (1892). The small seeds would enable the partaker to understand the origin or

cause of an illness. The ingestor would often experience oratorical hallucinations or might babble to himself, which Alarcon interpreted as speaking with or being tricked by Satan. If a tormented or sick person wished not to employ the seeds himself, an intermediary called a Payni (analogous to today's curandero) could be payed to take the seeds on the patients' behalf and relate the cause or cure for an ailment. Naturally the Catholic clergy of that day, as well as presently, considered the use of these plants idolatrous and vehemently opposed and discouraged their use.

Though I did not have the opportunity to speak with the Zapotec or Mixtec on their use of Ipomoea tricolor, Turbina corymbosa grows thoughout the state and I was able to speak with persons on the use of this plant. The seeds are taken in the same fashion for both species, but Ipomoea tricolor is considered the more potent. I may also add that even as common as Turbina corymbosa is in some areas, most people are ignorant of its use as a hallucinogen. It seems that knowledge of hallucinatory plants or mushrooms in Oaxaca is usually limited to isolated areas of the state. In the Mazatec Sierra near Huautla de Jimenez hallucinogens of several origins (Salvia, Turbina, Psilocybe, Stropharia) are employed. Usually the uses of these plants or mushrooms involve Catholic

as well as "pagan" rituals. In preparation of Turbina corymbosa, one may fast a day and ingest the seeds at night. A small number of seeds, often of the number 13, though more may be necessary, are ground on a metate and placed in water or drunk with a small amount of pulque (a mild alcoholic beverage of Agave origin). Various rituals of orations and signs of the cross may be performed by the partaker. Effects of seeds take place in less than an hour, enabling a curandero or other person to find the source of an ailment, theft, or other type of curse. Blas Reko accounts for a German settler's cure of typhoid fever in one night as due to having taken seeds prescribed by a curandero (Santesson, 1937). In the Mazatec Sierra, where many of the Indians' livelihoods seem to revolve around the use of their sacred mushroom (Psilocybe, Stropharia, etc.), many utilize the semilla de la virgin during winter, the dry months of the year when the mushrooms are not present.

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THE SYSTEMATICS AND USES OF THE GENUS *IPOMOEA* (CONVOLVULACEAE) OF OAXACA, MEXICO

by

J. Andrew McDonald

(ABSTRACT)

This study is a systematic and ethnobotanical treatment of the genus *Ipomoea* in Oaxaca, Mexico. This taxon merits deeper investigations because of present disorganization and disaccord in its classification on generic, subgeneric, and species levels. A second facet of the investigation involves an ethnobotanical survey on past and present nutritional, medicinal, and shamanic uses of these plants.

The taxonomic study involved acquisition of herbarium materials from various sources with review of past descriptions and sectional organizations of the genus. Morphological relationships were correlated with phytochemical data from collected plant materials from Oaxaca. A key to species, species descriptions, and sectional organization of the genus were constructed by these studies. A survey of plant uses was also compiled with reference to the relationships of these plants and their utilizations.